

(19)



(11)

EP 4 324 964 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention of the grant of the patent:
26.03.2025 Bulletin 2025/13

(51) International Patent Classification (IPC):
D01F 1/10 (2006.01) D01F 6/60 (2006.01)
D01F 9/16 (2006.01)

(21) Application number: **23191623.0**

(52) Cooperative Patent Classification (CPC):
D01F 6/88

(22) Date of filing: **16.08.2023**

(54) **TEXTILE YARN**

TEXTILGARN

FIL TEXTILE

(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 ME MK MT NL NO PL PT RO RS SE SI SK SM TR

(30) Priority: **18.08.2022 IT 202200017400**

(43) Date of publication of application:
21.02.2024 Bulletin 2024/08

(73) Proprietor: **Fiorenza, Daniele**
59100 Prato (IT)

(72) Inventor: **Fiorenza, Daniele**
59100 Prato (IT)

(74) Representative: **Mannucci, Michele et al**
Ufficio Tecnico
Ing. A. Mannucci S.r.l.
Via della Scala, 4
50123 Firenze (IT)

(56) References cited:
GB-A- 830 867 US-A1- 2008 090 945
US-A1- 2010 021 679

EP 4 324 964 B1

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description

Technical field

[0001] The present invention relates to the field of textile materials.

[0002] More in particular, the subject matter of the present invention is an innovative textile yarn which can be used for example for making clothes, making bags, umbrellas, clothing accessories, furnishing products such as curtains, rugs and upholstery for indoor and outdoor furnishings and further for making wigs and extensions, etc.

State of the art

[0003] As is known, yarns generally consist of textile fibres of natural or synthetic origin. The fibres are generally provided with a colour which is inadequate for textile use and therefore the yarns (or fabrics) deriving therefrom them must be dyed.

[0004] The textile market is always seeking new yarns capable of creating particular fabrics and visual effects on the final fabric.

[0005] In this sense, new fibres have been presented on the market such as, for example, Bermuda grass fibre and orange peel fibre. These have not found great use because they had scarce processing ductility and practicality to be used on a large scale.

[0006] Furthermore, attempts have been made for fabrics or non-woven fabrics capable of having a mesh structure capable of giving volume to the fabric.

[0007] Such attempts have had very specific and limited uses and, in general, have not been well appreciated by the market.

Summary

[0008] The object of the present invention is to make a textile yarn which allows to obtain visual effects on the final textile products which allow a particular three-dimensionality of the products themselves.

[0009] Another important object of the present invention is to make a textile yarn which does not require colouring.

[0010] Another important object of the present invention is to make a textile yarn which can be easily processed with the known art.

[0011] These and other objects, which will become clearer hereinafter, are achieved with a textile yarn, comprising at least 10% acacia gum by weight on the weight of the yarn (w/w), and at least 5% polyamide by weight on the weight of the yarn (w/w).

[0012] Such a yarn has a natural and a synthetic component and is substantially colourless, i.e., it is at least partly transparent. Such a yarn also combines the features of a thermosetting material, such as acacia gum, and a thermoplastic material, such as polyamide (for

example in the form of hot-melt adhesive material).

[0013] Conveniently, in preferred embodiments, the textile yarn can be transparent or at least partially transparent, thanks to the adequate use of acacia gum.

[0014] In preferred embodiments, the yarn comprises at least 15% w/w of acacia gum

In preferred embodiments, the yarn comprises at least 20% w/w of acacia gum.

[0015] In other embodiments, the yarn comprises at least 30% w/w of acacia gum.

[0016] In still other embodiments, the yarn comprises at least 40% w/w of acacia gum.

[0017] In some embodiments, the yarn comprises at most 70% w/w of acacia gum, or at most 60% w/w of acacia gum.

[0018] In some embodiments, the acacia gum can be comprised between 12% and 70% by weight on the weight of the yarn and more preferably comprised between 15% and 60%, and even more preferably comprised between 18% and 55% by weight on the weight of the yarn.

[0019] In preferred embodiments, the acacia gum is of the Kordofan type.

[0020] In preferred embodiments, the yarn comprises at least 10% w/w of polyamide.

[0021] In other preferred embodiments, the yarn comprises at least 20% w/w of polyamide.

[0022] In other preferred embodiments, the yarn comprises at least 40% w/w of polyamide.

[0023] In some embodiments, the yarn comprises at most 70% w/w of polyamide.

[0024] In some embodiments, the yarn comprises at most 50% w/w of polyamide.

[0025] In some embodiments, the yarn comprises at most 30% w/w of polyamide.

[0026] In some embodiments, the polyamide is comprised between 10% and 70% by weight on the weight of the yarn and more preferably comprised between 12% and 65%, and even more preferably comprised between 15% and 55% by weight on the weight of the yarn.

[0027] Preferably, the polyamide comprises caprolactam and lauro lactam, and more preferably caprolactam comprised between 50% and 70% and lauro lactam comprised between 30% and 50%.

[0028] According to preferred embodiments, the textile yarn also comprises a polymerizing substance, such as preferably polyethylene glycol (PEG).

[0029] In preferred embodiments, the yarn comprises at least 5% w/w of polymerizing substance.

[0030] In other preferred embodiments, the yarn comprises at least 10% w/w of polymerizing substance.

[0031] In other preferred embodiments, the yarn comprises at least 20% w/w of polymerizing substance.

[0032] In some embodiments, the yarn comprises at most 70% w/w of polymerizing substance.

[0033] In some embodiments, the yarn comprises at most 50% w/w of polymerizing substance.

[0034] In some embodiments, the yarn comprises at

most 30% w/w of polymerizing substance.

[0035] In some embodiments, said polymerizing substance is preferably comprised between 5% and 50% by weight on the weight of the yarn and more preferably comprised between 410% and 40%, and even more preferably comprised between 15% and 35% by weight on the weight of the yarn.

[0036] In preferred forms, the textile yarn also comprises triglyceride, preferably of the capryl/capric type, preferably relating to fatty acids derived from coconut and palm oil.

[0037] In preferred embodiments, the yarn comprises at least 0.2% w/w of triglyceride.

[0038] In other preferred embodiments, the yarn comprises at least 0.7% w/w of triglyceride.

[0039] In other preferred embodiments, the yarn comprises at least 1.2% w/w of triglyceride.

[0040] In some embodiments, the yarn comprises at most 26% w/w of triglyceride.

[0041] In some embodiments, the yarn comprises at most 17% w/w of triglyceride.

[0042] In some embodiments, the yarn comprises at most 12% w/w of triglyceride.

[0043] In some embodiments, the triglyceride is comprised between 0.5% and 25% by weight on the weight of the yarn and more preferably comprised between 1% and 15%, and even more preferably comprised between 1.5% and 13% by weight on the weight of the yarn.

[0044] Still, preferably, the yarn comprises a bactericidal or preservative substance, preferably in an amount comprised between 0.1% and 10% by weight on the weight of the yarn; such as 2,4dimethylbenzoic acid. For example, such a bactericidal/preservative substance can be combined with acacia gum before the yarn production step. Therefore, the amount of acacia gum in the composition of the textile yarn can be calculated both as pure acacia gum and as an amount of a raw material, for example in solid form (for example in powder) consisting of the union of the acacia gum combined with one or more preservative or bactericidal substances (or still another type of substance) before the yarn production step.

[0045] Suitably, in preferred embodiments, the textile yarn has a metric count (or metric number) comprised between 2000 Nm and 50000 Nm and more preferably comprised between 3000 Nm and 30000 Nm, and even more preferably comprised between 5000 Nm and 22000 Nm, or between 4500 and 35000 Nm.

[0046] Suitably, in preferred embodiments, the textile yarn is made by extrusion, preferably hot, or the textile yarn is in the form of an extruded filament, preferably hot.

[0047] According to another aspect, an object of the invention is also a textile fibre produced starting from the yarn as described above.

[0048] According to another aspect, the invention also relates to a process for making a textile yarn which includes:

- making a first mixture of powdered polyamide, pow-

dered acacia gum-based material, and emulsifying and/or stabilizing substance, preferably based on polyphosphates;

- 5 - making a second mixture of a catalyst substance, preferably vinegar, and a substance which facilitates the extrusion and polishing process, such as preferably turpentine or turpentine essence;

- 10 - making a third mixture of urea, triglyceride and polymerizing agent (preferably polyethylene glycol PEG);

- 15 - heating said third mixture to a melting temperature comprised between about 135°-160°C;

- adding the first and the second mixture to the third mixture when at melting temperature, to form a homogeneous and viscous mass;

- 20 - transferring the mixture obtained, at a temperature higher than room temperature, into a pellet-forming mould;

- 25 - letting the pellets cool;

- extruding, preferably hot, the pellets obtained in an extruder to make an extruded yarn.

30 **[0049]** Preferably the extrusion occurs in an extrusion chamber with two heating zones, in sequence: a first zone set at a temperature comprised between 96°C and 108°C and a second zone set at a temperature comprised between 52°C and 75°C.

35

Brief description of the drawings

[0050] Graphs are attached to the present description relating to the characterization of a sample of yarn according to the invention. In particular,

- 40 - Figure 1 represents the IR spectrum obtained on a sample of yarn according to the invention;

- 45 - Figure 2 represents a thermogram relating to the Differential Scanning Calorimetry (DSC) analysis carried out on the yarn sample under analysis in figure 1;

- 50 - Figures 3 and 4 represent the positive and negative chromatographic spectrum (with HPLC technique) of the yarn extract in solvent of the sample under analysis.

55 **Detailed description of embodiments**

[0051] The yarn according to the invention comprises two fundamental materials, such as acacia gum and

polyamide. Such two components allow to have a transparent or almost transparent yarn which has both the features of a natural fibre and the technical properties of a synthetic fibre.

[0052] An example of yarn according to the invention is made by means of thermal extrusion, inside an extruder, of a base material.

[0053] Such a base material includes the combination of powdered acacia gum (in such an example, acacia gum means acacia gum mixed with a preservative or bactericidal substance and subsequently such mixture is made powdered; alternatively, the acacia gum can be pure or mixed with other substances), preferably of the Kordofan type and powdered polyamide, which substantially acts as a hot-melt adhesive. In order to improve the combination and processing at the extruder, polyethylene glycol (PEG) and capryl/capric triglyceride (triglyceride of fatty acids derived from coconut and palm oil suitable for cosmetic use) are also added. To further improve the process, 99.5% urea, bleached vinegar, polyphosphates (for example E450 80% and E339 20%), turpentine essence are added.

[0054] The mixing process of the base material components is as follows.

[0055] In a recipient, 15.5 g of powdered hot-melt adhesive-type polyamide, 0.7 g of polyphosphates, and 7.5 g of powdered acacia gum-based material are mixed together. For example, such acacia gum-based material substantially comprises acacia gum and may contain a bactericidal or preservative substance, such as 2,4dimethylbenzoic acid.

[0056] The polyphosphates are mainly used as emulsifiers, stabilizers, and acidity regulators. They are used to bind metal ions, prevent drying and the formation of lumps which can originate in the creation of the final product. They also facilitate the extrusion step by decreasing the viscosity generated by the acacia gum.

[0057] In another recipient, 4.2 g of vinegar and 1.6 g of turpentine essence are mixed.

[0058] The vinegar contains 80% water, amino acids, mineral salts. It is used as a catalyst, as it pushes the reaction between the polyamide and the acacia gum while maintaining an acid pH so that the acacia gum does not lose its viscosity.

[0059] The turpentine essence is used to facilitate the extrusion process, to give brightness and increase the transparency effect of the yarn.

[0060] In a further recipient, 6.6 g of polyethylene glycol (PEG), 7 g of 99.5% urea and 0.6 g of capryl/capric triglyceride are mixed. Such a third mixture is heated to a melting temperature comprised between about 145°-150°C.

[0061] PEG has a high mobility in solution, and being a polymerizing agent, it facilitates the bond between the polyamide and the acacia gum.

[0062] The triglyceride gives a silky touch to the yarn and is also used as a solubilizing agent for less soluble active substances.

[0063] When the melting temperature is reached, the first two powder mixtures are added to the third mixture, which are also mixed, to form a homogeneous and viscous mass. Such a mass is transferred while still hot onto a die for forming pellets of base material to be extruded.

[0064] The extrusion step includes the base-material pellet inside an extruder, for example of the screw type. In a known manner, the extruder has a pellet loading hopper, which feeds a heated extrusion chamber, inside which there is an extrusion screw which advances the pellet, melting it. The extrusion chamber has two heating zones, in sequence: a first zone set at a temperature comprised between 96°C and 108°C and a second zone set at a temperature comprised between 52°C and 75°C. At the end of the chamber, the molten material reaches the extrusion die, from which the yarn emerges.

[0065] In order to verify the composition of the textile yarn, an examination is carried out on a 5-gram sample of yarn produced as indicated above.

[0066] For the definition of the chemical structure of the polymer, the following were performed:

- DSC analysis (Differential Scanning Calorimetry)
- IR analysis (infrared spectroscopy)
- HPLC/MS-MS characterization

[0067] The analysis was carried out directly on the solid sample received using the ATR accessory.

[0068] An identification of the organic compounds present in the yarn was carried out using liquid chromatography with tandem mass spectrometry (HPLC/MS-MS). Such a technique includes an extraction of the yarn in solvent and subsequent injection of the extract in Shimadzu Nexera X2 UHPLC instrumentation coupled with a high resolution Sciex 4600 QTOF mass spectrometer.

[0069] By means of the LC-Q-TOF analytical technique, it is possible to detect pollutants present in various kinds of matrices, at very low concentrations.

[0070] Such a technique performs a first chromatographic separation of the analytes by means of the UHPLC system. Subsequently the analytes are desorbed from the ESI (electron spray ionization) source and enter the QTOF system, where they are further separated by the first quadrupole based on their mass/charge ratio and finally by the time-of-flight analyser, which allows to obtain a high resolution of the molecular ions, allowing the identification of the raw formula. All the ions in both positive and negative modes are acquired with a mass charge ratio comprised between 50 and 1200 Da.

[0071] Figure 1 shows the spectrum of the IR analysis and can be traced back to that of a polyamide polymer. The absorption bands of acacia gum are less intense with respect to polyamide.

[0072] The yarn sample was also subjected to DSC analysis with the following thermal programme: - 1st

heating from -60 °C to 155 °C, 20 °C/min in N₂ - Cooling from 155 °C to -60 °C, -20 °C/min in N₂ - 2nd heating from -60 °C to 155 °C, 20 °C/min in N₂. The result can be seen in figure 2. The analysis was conducted up to 155 °C because beyond that, the sample material degrades. The DSC analysis shows endothermic transitions for the sample (melting of crystalline zones), not visible in the second heating, at T= 74.1 °C, 100.7 °C and 137.5 °C (first heating curve, figure 2). The sample also shows an endothermic peak in the second heating at 33.9 °C. such a very small transition is due to the gummy fraction of the sample (at the end of the analysis the DSC capsule was opened and gummy residue was observed).

[0073] Figure 3 shows the positive chromatographic spectrum of the yarn extract in solvent relating to the characterization in HPLC/MS-MS. The analysis was conducted on the extract in ethanol after a 200-factor dilution. The compounds found are attributable to polyamide and PEG.

[0074] Figure 4 shows the negative chromatographic spectrum of the yarn extract in solvent relating to the characterization in HPLC/MS-MS.

[0075] In essence, the yarn analysis led to the following composition:

- 51% polyamide
- 22.5% acacia gum
- 22% polyethylene glycol (PEG)
- 2% triglyceride
- 2.5% Bactericidal/preservative substance (2,4dimethylbenzoic acid)

The metric count or number of the yarn is approximately 20,000 Nm.

[0076] A further example of a textile yarn according to the invention is shown below.

[0077] The production steps are substantially the same as previously described. The starting materials are for example the following:

- Acacia gum 14.5 g
- Polyamide 7g
- PEG 8.1 g
- Triglyceride 0.6 g

The remainder of the substances is substantially the same as in the preceding example

- Polyphosphates 0.7 g

- Vinegar 4.2 g
- Turpentine 1.6 g
- 5 - 99.5% urea 7g

[0078] After the extrusion, the metric count of the yarn of this example is approximately 5000 Nm, while its composition is as follows:

- 10 20% polyamide
- 50% acacia gum
- 15 23.5% polyethylene glycol (PEG)
- 2.5% triglyceride
- 20 4% Bactericidal/preservative substance (2,4dimethylbenzoic acid).

[0079] With such yarns it is possible to make fabrics, or non-woven fabrics, having a particular softness and silkiness.

25 **[0080]** The yarn which is the object of this invention can be placed between natural vegetable yarns and synthetic yarns, as it has a natural vegetable component and a synthetic component.

30 **[0081]** Such a yarn also arises from the need to renew the variety of yarns existing on the market. The yarn according to the invention is an absolute novelty with respect to the existing yarns because in order to give the fabric the desired effect, it must not be coloured so as to remain transparent and so as to create a fabric with a particular depth effect. or three-dimensionality.

35 **[0082]** The invention finds application mainly in the textile field; in fact, it can be used in clothing by using it for making clothes, bags and umbrellas, and for making all clothing accessories; in the furnishing fabrics sector to make curtains, rugs and upholstery for furnishings, in the beauty sector to make wigs and extensions, and lastly in the vehicle interior upholstery sector. Furthermore, the material according to the invention can be used for packaging and objects.

45 **[0083]** It is understood that what has been illustrated represents only possible non-limiting embodiments of the invention, which can vary in forms and arrangements without departing from the scope of the concept underlying the invention. The possible presence of reference numbers in the attached claims has the sole purpose of facilitating the reading thereof in the light of the foregoing description and the accompanying drawings and does not in any way limit the scope of protection.

55

Claims

1. Textile yarn, comprising acacia gum between 10%

- and 80% by weight on the weight (w / w) of the yarn, and polyamide between 75% and 5% (w/w).
2. Textile yarn according to claim 1, wherein the yarn comprises at least 20% w / w of acacia gum, or at least 30% w / w of acacia gum, or at least 40% w / w of acacia gum. 5
 3. Textile yarn according to one or more of the preceding claims, wherein the yarn comprises at least 10% w / w polyamide, or at least 20% w / w polyamide, or at least 40% w / w polyamide. 10
 4. Textile yarn according to one or more of the preceding claims, further comprising a polymerizing substance, preferably polyethylene glycol, preferably in an amount of at least 5% w / w. 15
 5. Textile yarn according to one or more of the preceding claims, further comprising triglyceride, preferably of the capril / capric type, preferably relating to fatty acids derived from coconut and palm oil, preferably in amounts at least equal to 0.2% w / w. 20
 6. Textile yarn according to one or more of the preceding claims, further comprising bactericidal or preservative substance, preferably in an amount comprised between 0.1% and 10% by weight on the weight of the yarn, preferably said substance being 2,4-dimethylbenzoic acid; preferably said substance being combined with acacia gum before the yarn production step. 25 30
 7. Textile yarn according to one or more of the preceding claims, wherein said polyamide comprises caprolactam and laurilactam, and more preferably caprolactam comprised between 50% and 70% of polyamide and laurilactam comprised between 30% and 50% of polyamide. 35 40
 8. Textile yarn according to one or more of the preceding claims, **characterized in that** it is transparent or at least partially transparent. 45
 9. Textile yarn according to one or more of the preceding claims, having a metric count between 2000 Nm and 50000 Nm and more preferably between 3000 Nm and 30000 Nm, and even more preferably between 5000 Nm and 22000 Nm. 50
2. Textilgarn nach Anspruch 1, wobei das Garn mindestens 20% w/w Akaziengummi oder mindestens 30% w/w Akaziengummi oder mindestens 40% w/w Akaziengummi umfasst.
 3. Textilgarn nach einem oder mehreren der vorhergehenden Ansprüche, wobei das Garn mindestens 10% w/w Polyamid oder mindestens 20% w/w Polyamid oder mindestens 40% w/w Polyamid umfasst.
 4. Textilgarn nach einem oder mehreren der vorhergehenden Ansprüche, ferner umfassend eine polymerisierende Substanz, vorzugsweise Polyethylenglykol, vorzugsweise in einer Menge von mindestens 5% w/w.
 5. Textilgarn nach einem oder mehreren der vorhergehenden Ansprüche, ferner umfassend Triglyceride, vorzugsweise vom Capryl-/Capric-Typ, vorzugsweise bezogen auf Fettsäuren, die aus Kokosnuss- und Palmöl gewonnen werden, vorzugsweise in Mengen von mindestens 0,2 % w/w.
 6. Textilgarn nach einem oder mehreren der vorhergehenden Ansprüche, ferner umfassend eine bakterizide oder konservierende Substanz, vorzugsweise in einer Menge zwischen 0,1% und 10% Gewichtsanteile des Garngewichts, wobei es sich bei dieser Substanz vorzugsweise um 2,4-Dimethylbenzoesäure handelt; wobei diese Substanz vorzugsweise vor dem Garnherstellungsschritt mit Akaziengummi kombiniert wird.
 7. Textilgarn nach einem oder mehreren der vorhergehenden Ansprüche, wobei das Polyamid Caprolactam und Laurinlactam enthält, und wobei Caprolactam vorzugsweise zwischen 50% und 70 % des Polyamids und Laurinlactam zwischen 30% und 50% des Polyamids enthält.
 8. Textilgarn nach einem oder mehreren der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** es transparent oder zumindest teilweise transparent ist.
 9. Textilgarn nach einem oder mehreren der vorhergehenden Ansprüche, mit einer metrischen Feinheit zwischen 2000 Nm und 50000 Nm und bevorzugter zwischen 3000 Nm und 30000 Nm und noch bevorzugter zwischen 5000 Nm und 22000 Nm.

Patentansprüche

1. Textilgarn, umfassend Akaziengummi zwischen 10% und 80% Gewichtsanteilen des Gewichts (w/w) des Garns und Polyamid zwischen 75% und 5% (w/w).

Revendications

1. Fil textile comprenant de la gomme d'acacia constituant entre 10% à 80% en poids basé sur le poids du fil (poids/poids) et entre 75% et 5% (poids/poids) de polyamide.

2. Fil textile selon la revendication 1, dans lequel le fil comprend au moins 20% en poids/poids de gomme d'acacia ou au moins 30% en poids/poids de gomme d'acacia ou au moins 40% en poids/poids de gomme d'acacia. 5

3. Fil textile selon l'une ou plusieurs des revendications précédentes, dans lequel le fil comprend au moins 10% en poids/poids de polyamide ou au moins 20% en poids/poids de polyamide ou au moins 40% en poids/poids de polyamide. 10

4. Fil textile selon l'une ou plusieurs des revendications précédentes, comprenant en outre une substance polymérisable, de préférence du polyéthylène glycol, de préférence en une quantité d'au moins 5% en poids/poids. 15

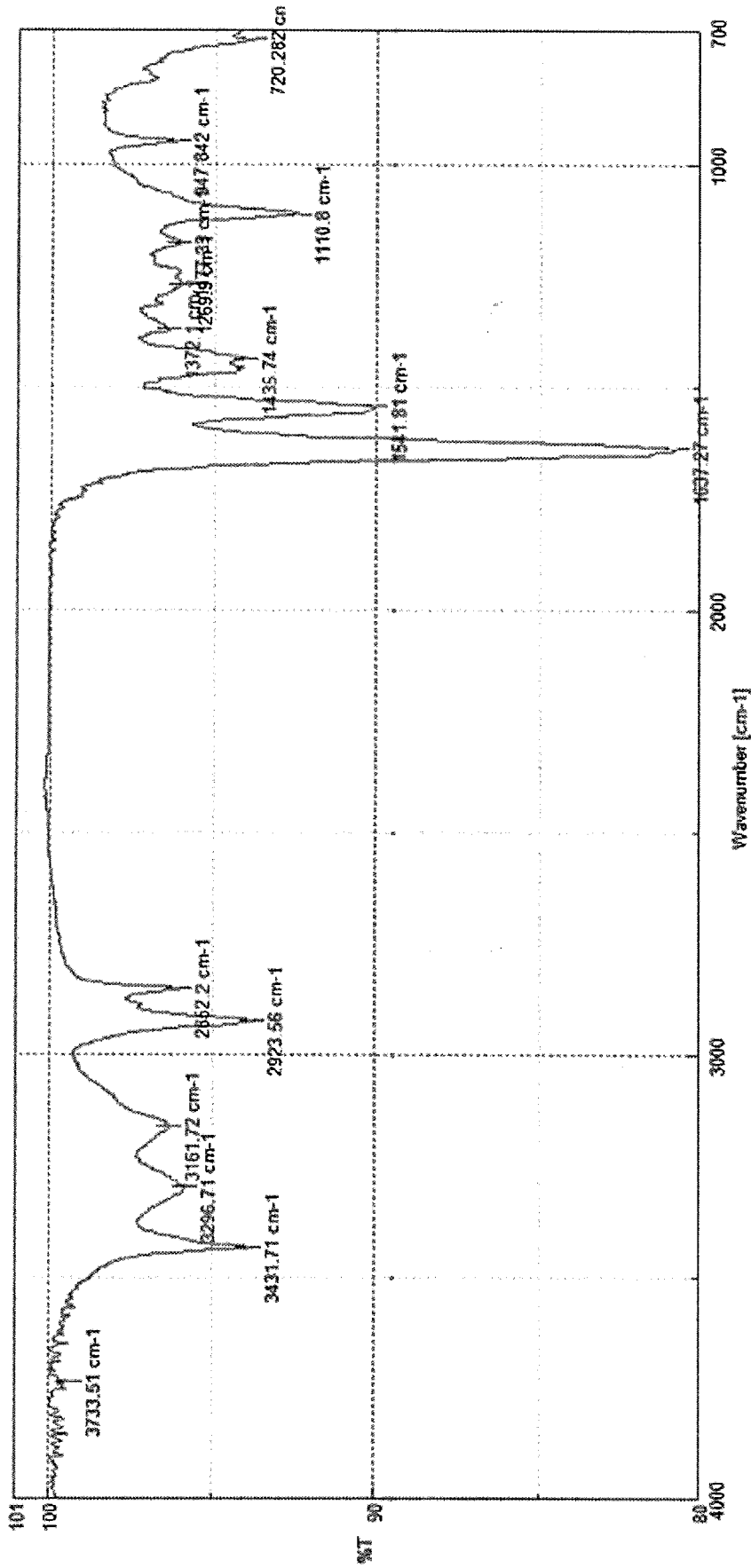
5. Fil textile selon l'une ou plusieurs des revendications précédentes, comprenant en outre un triglycéride, de préférence du type capryle/caprique, de préférence relatif à des acides gras dérivés d'huile de coco et de palme, de préférence en des quantités au moins égales à 0,2 % en poids/poids. 20
25

6. Fil textile selon l'une ou plusieurs des revendications précédentes, comprenant en outre une substance bactéricide ou conservatrice, de préférence en une quantité comprise entre 0,1% et 10% en poids basé sur le poids du fil, ladite substance étant de préférence de l'acide 2,4-diméthyl-benzoïque ; ladite substance étant de préférence combinée avec de la gomme d'acacia avant l'étape de production du fil. 30

7. Fil textile selon l'une ou plusieurs des revendications précédentes, dans lequel ledit polyamide comprend du caprolactame et du lauro lactame et plus préférentiellement du caprolactame à raison d'entre 50% et 70% du polyamide et du lauro lactame à raison d'entre 30% et 50% du polyamide. 35
40

8. Fil textile selon l'une ou plusieurs des revendications précédentes, **caractérisé en ce qu'il** est transparent ou au moins partiellement transparent. 45

9. Fil textile selon l'une ou plusieurs des revendications précédentes, ayant un comptage métrique compris entre 2000 Nm et 50 000 Nm et plus préférentiellement entre 3000 Nm et 30 000 Nm et encore plus préférentiellement compris entre 5000 Nm et 22 000 Nm. 50
55



FT/IR-ATR Spectrum yarn sample

Fig. 1

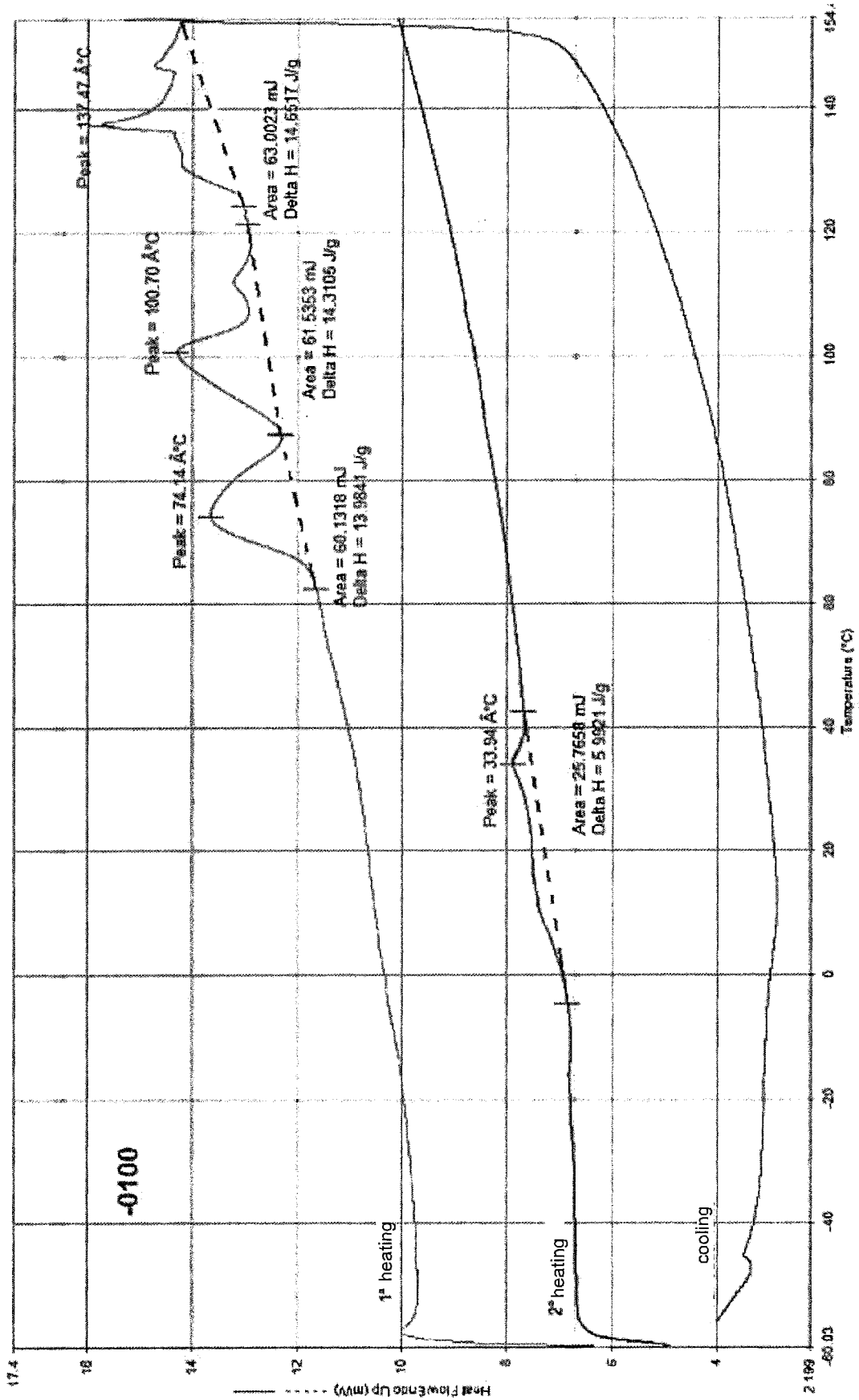


Fig. 2

