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

(11) **EP 3 875 646 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
08.09.2021 Bulletin 2021/36

(21) Application number: **21158961.9**

(22) Date of filing: **24.02.2021**

(51) Int Cl.:
D01D 11/06 *(2006.01)* ***D01F 8/04*** *(2006.01)*
D01F 8/10 *(2006.01)* ***D06M 15/347*** *(2006.01)*
D02G 3/04 *(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:
KH MA MD TN

(30) Priority: **03.03.2020 TW 109202337 U**

(71) Applicant: **Lin, Chun Wei**
Taichung City (TW)

(72) Inventor: **Lin, Chun Wei**
Taichung City (TW)

(74) Representative: **Melchior, Robin**
Octrooibureau Vriesendorp & Gaade B.V.
Koninginnegracht 19
2514 AB Den Haag (NL)

(54) **COMPOSITE YARN**

(57) The invention relates to a composite yarn (1). The composite yarn (1) includes a core (10) and a sheath (20). The core (10) is made of a thermoplastic material; wherein the thermoplastic material is selected from a group consisting of: a polyester, a polyamide, a polyacrylonitrile and any combination thereof. The sheath (20) formed around the core (10) is made of a cladding material, and the cladding material comprises polyvinyl butyral; wherein the polyvinyl butyral has a melt flow rate ranging from 2 g/10 min to 35 g/10 min; the melt flow rate is measured by a standard method ASTM D1238 at 190°C with 2.16 kg load.

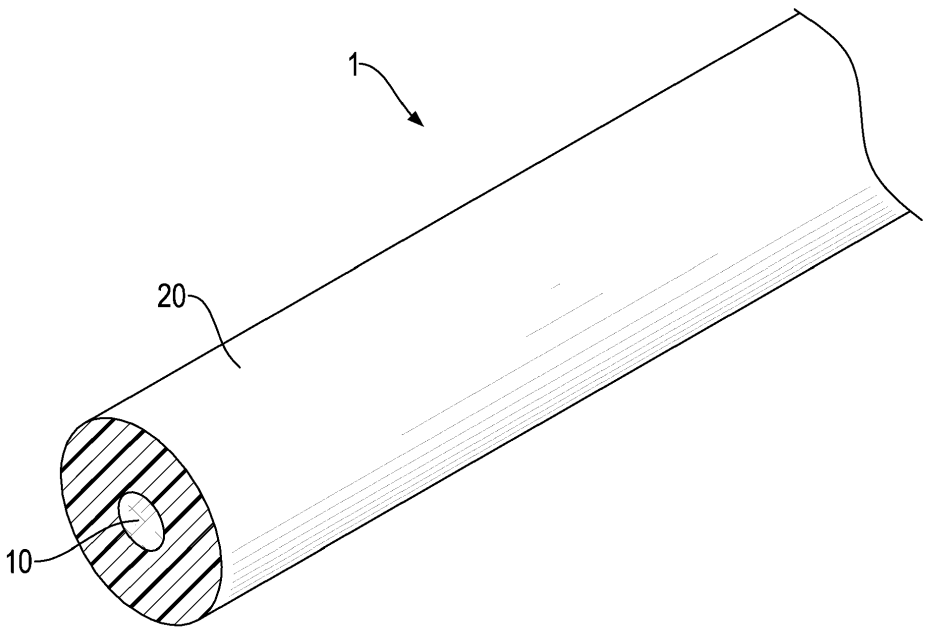

FIG.1

EP 3 875 646 A1

Description

BACKGROUND

1. Field of the Invention

[0001] The present disclosure relates to a composite yarn, and more particular to a core-sheath type composite yarn.

2. Description of the Prior Arts

[0002] Conventionally, after a fabric is obtained by weaving with yarns, the whole fabric needs to be subjected to a sizing step or a sticking step at junctions of multiple crossing yarns by a thermoplastic material. After that, the fabric can be subjected to a setting step. However, the above-mentioned process makes the sizing and setting steps more complicated, and characteristics of the resulting fabric will be easily affected. For example, the resulting fabric may be stiff, and the touch of the resulting fabric or the morphology of the resulting fabric may be affected. Further, the thermoplastic material used in the art generally is polyvinyl chloride (PVC), which is toxic and cannot meet the requirements of environmental protection. It can be seen that yarns or the sizing and setting steps after weaving still need to be developed and improved continuously.

SUMMARY OF THE INVENTION

[0003] Compared with PVC, which cannot meet the requirements of environmental protection, polyvinyl butyral (PVB) is a more eco-friendly material. Besides, PVB can be obtained by recycling wasted laminated safety glass; thus, the recycled PVB can meet the requirements of environmental protection and conform to the business model of circular economy. In view of that, if the recycled PVB is applied to a yarn production or the sizing and setting steps after weaving, the defects of the conventional textile manufacturing should be overcome promisingly.

[0004] An objective of the instant disclosure is to provide a composite yarn, which is beneficial for setting and reinforcing an obtained fabric comprising the same and meets the requirements of environmental protection.

[0005] The instant disclosure provides a composite yarn. The composite yarn includes a core and a sheath. The core is made of a thermoplastic material; wherein the thermoplastic material is selected from a group consisting of: a polyester, a polyamide, a polyacrylonitrile and any combination thereof. The sheath, which is formed around the core, is made of a cladding material, and the cladding material comprises PVB; wherein the PVB has a melt flow rate (MFR) ranging from 2 grams per 10 minutes (g/10 min) to 35 g/10 min. The MFR is measured by a standard method ASTM D1238 at 190°C with 2.16 kilograms (kg) load.

[0006] Since the sheath of the composite yarn fully wraps the core, and the sheath is composed of the cladding material comprising PVB, when the composite yarn is subsequently used in manufacture of fabrics, the sheath will help the direct set of the obtained fabrics through a hot-melt step. Thus, a necessary setting step by using a glue or an adhesive film in the conventional process is no longer needed and textile manufacturing will be simplified. In addition, in the cladding material of the instant disclosure, PVB is used to replace PVC, so the composite yarn can meet the requirements of eco-friendliness. Moreover, by controlling the MFR of the PVB of the instant disclosure within a specific range, the PVB will have a suitable flowability during a hot-melt step. Therefore, even though the cladding material does not comprise any plasticizer, the cladding material still can make the surface of the obtained fabric smooth and make the touch of the obtained fabric comfortable.

[0007] Preferably, the cladding material may further comprise a polymer material. Specifically, the polymer material may comprise a phenol-formaldehyde resin, an epoxy resin, a thermoplastic polyurethane (TPU), a poly(methyl methacrylate), an ethylene-vinyl acetate copolymer (EVA), a methyl methacrylate-butadiene-styrene copolymer (MBS), a styrene-butadiene block copolymer (SBC) or any combination thereof.

[0008] More preferably, the polymer material may be the TPU. When the cladding material comprises the TPU, the cladding material can further adjust the elasticity thereof. In an embodiment, the TPU is in an amount from larger than 0 part by weight to 100 parts by weight relative to 100 parts by weight of the PVB.

[0009] Preferably, the cladding material may further comprise a plasticizer. Specifically, the plasticizer may comprise acetyl tributyl citrate (ATBC), acetyl trioctyl citrate (ATOC), an alkyl benzyl phthalate such as butyl benzyl phthalate, an alkyl phthalate, blown linseed oil, butyl ricinoleate, castor oil, a dialkyl adipate such as dihexyl adipate and dioctyl adipate (DOA), a dialkyl phthalate such as dibutyl phthalate (DBP) and dioctyl phthalate (DOP), di-isononyl-cyclohexane-dicarboxylate (DINCH), ethylene glycol di-N-butyrate, isodecyl diphenyl phosphate, N-ethyl toluenesulfonamide, polyethylene glycol, tert-butylphenyl diphenyl phosphate, toluenesulfonamide, triaryl phosphate ester blend, tributyl citrate (TBC), tricresyl phosphate (TCP), triethyl citrate (TEC), triethylene glycol, triethylene glycol bis(2-ethylhexanoate), triphenyl phosphate (TPP), 2-ethylhexyl diphenyl phosphate or any combination thereof.

[0010] In certain embodiments, the plasticizer is in an amount from 20 parts by weight to 100 parts by weight relative to 100 parts by weight of the PVB.

[0011] Preferably, the PVB may be obtained by recycling wasted laminated safety glass. In particular, the process of producing the recycled PVB from the wasted laminated safety glass contains a separation procedure and a purification procedure. The separation procedure may comprise steps in sequence: cutting edges of the

wasted laminated safety glass that are adhered to impurities, crushing the aforesaid wasted laminated safety glass, soaking the original PVB layer of the aforesaid wasted laminated safety glass, and striking the aforesaid wasted laminated safety glass to make the glass fall off. The purification procedure may comprise steps in sequence: tearing the aforesaid PVB layer, further removing remaining glass, adding magnesium silicate and then drying at 45°C, and finally obtaining the recycled PVB.

[0012] Preferably, the PVB has the MFR ranging from 7 g/10 min to 15 g/10 min.

[0013] Preferably, the sheath has a thickness ranging from 0.08 millimeters (mm) to 5.0 mm. More preferably, the sheath has the thickness ranging from 0.08 mm to 0.9 mm. The thickness of the sheath is a distance defined as a difference between a radius of the composite yarn and a radius of the core.

[0014] In accordance with the instant disclosure, the core may be a single yarn or a strand. The single yarn with a certain strength and a certain density is produced by two or more staple fibers or filaments which are arranged almost in parallel and then are twisted helically along an axial direction. The strand is composed of two or more single yarns twisted together. Both of the aforesaid single yarn and the aforesaid strand are made of the thermoplastic material.

[0015] In accordance with the instant disclosure, the composite yarn can be used to produce a fabric by knitting, circular weaving, plain weaving or weaving, but it is not limited thereto.

[0016] In accordance with the instant disclosure, the fabric produced by the composite yarn can be applied for various purposes such as curtains, carpets, awnings, beach umbrellas, table mats and mobile phone bags, but it is not limited thereto.

[0017] Other objectives, advantages and novel features of the disclosure will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWING

[0018] Fig. 1 is a structural schematic view showing that a composite yarn of one preferable example in accordance with the instant disclosure.

DETAILED DESCRIPTION OF THE INVENTION

[0019] Hereinafter, one skilled in the arts can easily realize the advantages and effects of the instant disclosure from the following example.

[0020] The preferred embodiment of the instant disclosure will hereinafter be described in conjunction with the appended drawing, provided to illustrate the technical means adopted to achieve the objective of the instant disclosure.

[0021] With reference to Fig. 1, a composite yarn 1 of Example 1 of the instant disclosure comprised a core 10 and a sheath 20.

[0022] The core 10 was a single yarn made by twisting multiple polyamide filaments.

[0023] The sheath 20 was wrapped around the core 10. The sheath 20 was composed of a cladding material, which comprised PVB and a plasticizer. Provided that the PVB was in an amount of 100 parts by weight, the plasticizer was in an amount of 20 parts by weight.

[0024] The PVB had a melt flow rate of 12 g/10 min according to a standard method ASTM D1238 at 190°C with 2.16 kg load.

[0025] The PVB was obtained by recycling wasted laminated safety glass.

[0026] The sheath 20 had a thickness of 0.25 mm.

[0027] In conclusion, the sheath of the composite yarn of the instant disclosure is fully wrapped around the core and the sheath is composed of the cladding material comprising PVB, so the sheath can make an obtained fabric set directly through a hot-melt process when the composite yarn is used in subsequent manufacture of fabrics. Therefore, the textile manufacturing will be simplified. In addition, the cladding material is essentially composed of PVB, which can sufficiently meet the requirements of environmental protection, so the composite yarn indeed can achieve the objective of the instant disclosure.

Claims

1. A composite yarn (1), **characterized in that** the composite yarn (1) comprises:

   a core (10) which is made of a thermoplastic material; wherein the thermoplastic material is selected from a group consisting of: a polyester, a polyamide, a polyacrylonitrile and any combination thereof; and
   a sheath (20) which is formed around the core (10); wherein the sheath (20) is made of a cladding material, and the cladding material comprises polyvinyl butyral; wherein the polyvinyl butyral has a melt flow rate ranging from 2 grams per 10 minutes to 35 grams per 10 minutes; the melt flow rate is measured by a standard method ASTM D1238 at 190°C with 2.16 kilograms load.

2. The composite yarn (1) as claimed in claim 1, wherein the sheath (20) has a thickness ranging from 0.08 millimeters to 5.0 millimeters.

3. The composite yarn (1) as claimed in claim 1, wherein the sheath (20) has a thickness ranging from 0.08 millimeters to 0.9 millimeters.

4. The composite yarn (1) as claimed in any one of claims 1 to 3, wherein the cladding material further comprises a thermoplastic polyurethane.

5. The composite yarn (1) as claimed in claim 4, wherein the thermoplastic polyurethane is in an amount from larger than 0 part by weight to 100 parts by weight relative to 100 parts by weight of the polyvinyl butyral.

6. The composite yarn (1) as claimed in any one of claims 1 to 5, wherein the cladding material further comprises a plasticizer.

7. The composite yarn (1) as claimed in claim 6, wherein the plasticizer is in an amount from 20 parts by weight to 100 parts by weight relative to 100 parts by weight of the polyvinyl butyral.

8. The composite yarn (1) as claimed in any one of claims 1 to 7, wherein the polyvinyl butyral has the melt flow rate ranging from 7 grams per 10 minutes to 15 grams per 10 minutes; the melt flow rate is measured by the standard method ASTM D1238 at 190°C with 2.16 kilograms load.

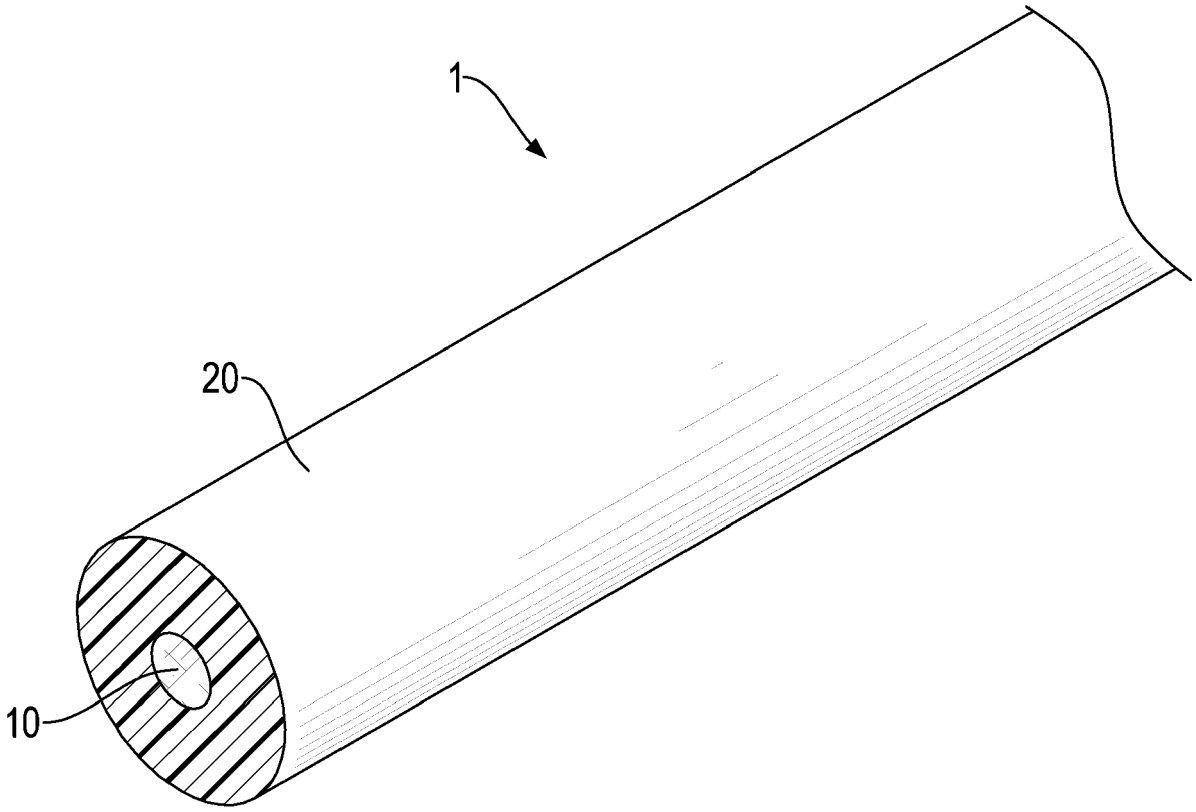

FIG.1

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 21 15 8961

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	GRASSMANN CARSTEN ET AL: "Recycled Polyvinyl Butyral for Textile Applications", TEXTILE COATING AND LAMINATING CONGRESS, GHENT, [Online] 1 September 2019 (2019-09-01), XP055820514, Retrieved from the Internet: URL:https://www.researchgate.net/publication/329363645_Coating_of_Recycled_Polyvinyl butyral_on_Yarns> [retrieved on 2021-07-06] * the whole document *	1-8	INV. D01D11/06 D01F8/04 D01F8/10 D06M15/347 D02G3/04
Y	Graßmann Carsten ET AL: "Coating of Recycled Polyvinylbutyral on Yarns", , 1 November 2018 (2018-11-01), XP055820517, Retrieved from the Internet: URL:https://www.researchgate.net/publication/329363645_Coating_of_Recycled_Polyvinyl butyral_on_Yarns [retrieved on 2021-07-02] * the whole document *	1-8	
Y	Graßmann Carsten ET AL: "Investigation of Recycled Polyvinyl Butyral for Yarn Based Textile Coatings", , 1 November 2019 (2019-11-01), XP055820506, DOI: 10.13140/RG.2.2.29480.32008 Retrieved from the Internet: URL:https://www.researchgate.net/publication/337398746_Investigation_of_Recycled_Polyvinyl_Butyral_for_Yarn_Based_Textile_Coatings [retrieved on 2021-07-02] * the whole document *	1-8	TECHNICAL FIELDS SEARCHED (IPC) D01D D01F D06M D02G

-/--

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	12 July 2021	Fiocco, Marco

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 21 15 8961

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	EP 1 867 771 A1 (KURARAY CO [JP]; KURARAY SPECIALITIES EUROPE [DE]) 19 December 2007 (2007-12-19) * paragraph [0016] - paragraph [0017] * * example 5 * * claims *	1-8	
Y	US 10 522 269 B1 (MALHEURTY LAUREENE [FR] ET AL) 31 December 2019 (2019-12-31) * claims *	4,5	
Y	DATABASE WPI Week 198736 Thomson Scientific, London, GB; AN 1987-255288 XP002803549, & SU 1 282 222 A (CABLE IND RES INST) 7 January 1987 (1987-01-07) * abstract * & SU 1 282 222 A1 (VNI PK T I KABELNOJ PROMY [SU]) 7 January 1987 (1987-01-07) * the whole document *	4,5	TECHNICAL FIELDS SEARCHED (IPC)
Y	US 2 238 694 A (WITT GRAVES GEORGE DE) 15 April 1941 (1941-04-15) * page 1, column 2, line 22 - line 25 * * example VII *	6,7	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	12 July 2021	Fiocco, Marco

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 21 15 8961

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

12-07-2021

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1867771 A1	19-12-2007	EP 1867771 A1	19-12-2007
		JP WO2006101175 A1	04-09-2008
		US 2009068914 A1	12-03-2009
		WO 2006101175 A1	28-09-2006
US 10522269 B1	31-12-2019	NONE	
SU 1282222 A	07-01-1987	----------	
US 2238694 A	15-04-1941	DE 743508 C	28-12-1943
		DE 752536 C	20-08-1963
		FR 51149 E	08-08-1941
		FR 824548 A	10-02-1938
		FR 918711 A	17-02-1947
		GB 501197 A	20-02-1939
		GB 504344 A	19-04-1939
		GB 542509 A	13-01-1942
		US 2137235 A	22-11-1938
		US 2212770 A	27-08-1940
		US 2212772 A	27-08-1940
		US 2238694 A	15-04-1941

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82