



(51) International Patent Classification:

B65H 54/10 (2006.01) D02G 3/02 (2006.01)
D01F 2/02 (2006.01)

(21) International Application Number:

PCT/US2024/027128

(22) International Filing Date:

01 May 2024 (01.05.2024)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

63/500,040 04 May 2023 (04.05.2023) US

(71) Applicant: EASTMAN CHEMICAL COMPANY

[US/US]; 200 South Wilcox Drive, Kingsport, Tennessee 37660 (US).

(72) Inventors: QIN, Guo-Wei; 211 Emerald Chase Circle,

Johnson City, Tennessee 37615 (US). MCLEOD, Andrew Ervin;

1729 Harmony Road, Jonesborough, Tennessee 37659 (US). ESTEP, Robert Noah;

940 Murrell Road, Kingsport, Tennessee 37660 (US). SHEN, Yubin;

113 Lee Carter Drive, Johnson City, Tennessee 37601 (US).

(74) Agent: OWEN, Steven, A.; P.O. Box 511, Kingsport, Tennessee 37660 (US).

(81) Designated States (unless otherwise indicated, for every

kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CV, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, MG, MK, MN, MU, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every

kind of regional protection available): ARIPO (BW, CV, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SC, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, ME, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

(54) Title: PROCESS FOR MAKING MULTI-END YARN PACKAGES

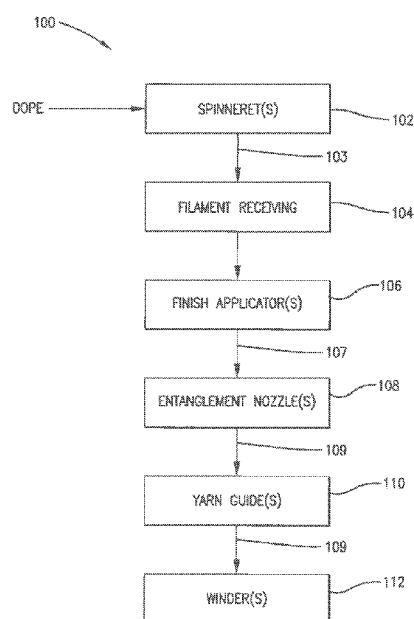


Fig. 1.

(57) Abstract: A method of producing cellulosic yarn packages. The method comprises passing at least a first and a second group of filaments through a common cabinet, entangling the first group of filaments at a first location to form a first yarn, entangling the second group of filaments at a second location to form a second yarn, and winding at least the first and second yarns around a common core. The yarns may be wound around different sections, or around at least one common section of the core. The yarns are not entangled or twisted with one another on the core, which enables the yarns to be unwindable from the core individually.



Published:

— *with international search report (Art. 21(3))*

(88) Date of publication of the international search report:

27 March 2025 (27.03.2025)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2024/027128

A. CLASSIFICATION OF SUBJECT MATTER

IPC - INV. B65H 54/10; D01F 2/02; D02G 3/02 (2024.01)

ADD.

CPC - INV. B65H 54/10; D01F 2/02; D02G 3/02

ADD. B65H 2701/18442; D10B 2201/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

See Search History document

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

See Search History document

Electronic database consulted during the international search (name of database and, where practicable, search terms used)

See Search History document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2020/0002847 A1 (EASTMAN CHEMICAL COMPANY) 02 January 2020; abstract, FIG 1a, paragraphs [0046]-[0054], [0069], [0071], [0101], [0157], [0175]	1-7, 10-29
Y	US 2011/0133011 A1 (KAH LEAP LEE ET AL.) 09 June 2011; figs. 1-2, paragraphs [0001], [0008], [0011], [0019], [0021]-[0023], [0037], [0049]-[0050], claims 1-2, 4, 7	1-7, 10-29
Y	US 5,262,110 A (ALBERT E. SPALLER ET AL.) 16 November 1993; column 2 lines 55-56, 60-61; column 3 lines 29-32, 36-37, 64-65; column 4 lines 4-5, 65-66, claims 1, 5	5-6
Y	US 3,946,100 A (HERBERT L. DAVIS ET AL.) 23 March 1976; abstract, column 2 line 51; column 5 lines 28-29; column 12, lines 26-27, 29-30	7, 22
Y	US 4,313,576 A (JEAN P. CLARET ET AL.) 02 February 1982; abstract, FIGS 1-2, column 2 lines 17-30; column 4 lines 60-64, 67; column 5 lines 6-8	2, 4, 11
Y	US 2,431,435 A (WILLIAM IVAN TAYLOR) 25 November 1947; column 2 lines 49-55; column 3 lines 3, 10-11	23
Y	US 3,584,089 A (ROLAND KEITH KUNKEL ET AL.) 08 June 1971; column 5 lines 20-23, 26-27, 29	25-27

☐ Further documents are listed in the continuation of Box C.☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"D" document cited by the applicant in the international application

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

05 September 2024 (05.09.2024)

Date of mailing of the international search report

SEP 27 2024

Name and mailing address of the ISA/

Mail Stop PCT, Attn: ISA/US, Commissioner for Patents
P.O. Box 1450, Alexandria, Virginia 22313-1450

Facsimile No. 571-273-8300

Authorized officer

Shane Thomas

Telephone No. PCT Helpdesk: 571-272-4300

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2024/027128

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

-Please See Supplemental Page-

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
1-7, 10-29

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2024/027128

-Continued From Box No. III: Observations where unity of invention is lacking-

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I: Claims 1-7, 10-29, is directed toward a method of producing cellulosic yarn packages comprising passing a first and second group of filaments through a common cabinet.

Group II: Claim 8, is directed toward a method of producing cellulosic yarn packages wherein no more than four yarns are wound on at least one core.

Group III: Claim 9, is directed toward a method of producing cellulosic yarn packages where the yarns have a denier of less than 300.

The inventions listed as Groups I, II, and III do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: the special technical features of Group I include passing at least a first and a second group of filaments through a common cabinet, not present in Groups II-III; the special technical features of Group II include wherein no more than four yarns are wound on the at least one core, not present in Groups I, III; and the special technical features of Group III include yarn having a denier of less than 300, not present in Groups I-II.

Groups I-III share the technical features including: a method of producing cellulosic yarn packages, the method comprising: entangling the first group of filaments at a first location to form a first yarn; entangling the second group of filaments at a second location to form a second yarn; routing the first and second yarns towards at least one common spool; and winding the first and second yarns around at least one core on the common spool; wherein at least two yarns are wound on one core.

However, these shared technical features are previously disclosed by US 2011/0133011 A1 to LEE et al. (hereinafter 'LEE') in view of US 2,319,077 A to MCNALLY et al. (hereinafter 'MCNALLY').

LEE discloses a method of producing yarn packages (a method of making a multiend package of yarns; paragraph [0001]), the method comprising: entangling the first group of filaments at a first location to form a first yarn; entangling the second group of filaments at a second location to form a second yarn; routing the first and second yarns towards at least one common spool; and winding the first and second yarns around at least one core on the common spool; wherein at least two yarns are wound on one core (figs. 1-2 show a yarn spinning apparatus which includes melt spinning polymers 12A and 12B to form multiple side-by-side bicomponent filaments; where each of 16a and 16b, 16c and 16d, and 16e and 16f are combined to form multiend bundles 24c, 24b, and 24a around a common tube core going through the middle of the three bundles; figs. 1-2, paragraphs [0049]-[0050], claim 1). LEE does not disclose a method of producing cellulosic yarn. MCNALLY discloses a method of producing cellulosic yarn (the production of yarns of cellulose and cellulose derivatives; column 1 lines 4-6). It would have been obvious to one of ordinary skill in the art, before the relevant date, to modify the method of LEE to include a method of producing cellulosic yarn, as taught by MCNALLY, because MCNALLY teaches a method of producing a yarn capable of producing a true crepe effect capable of being adapted for a variety of textile operations (MCNALLY; column 1, lines 13-31).

Since none of the special technical features of the Groups I-III inventions is found in more than one of the inventions, and since all of the shared technical features are previously disclosed by a combination of the LEE and MCNALLY references, unity of invention is lacking.