



(51) International Patent Classification:
A61F 2/06 (2013.01)

(21) International Application Number:
PCT/US2012/041183

(22) International Filing Date:
6 June 2012 (06.06.2012)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/494,018 7 June 2011 (07.06.2011) US

(71) Applicant (for all designated States except US): **LIU, Qing** [CN/US]; 55 Nostrand Road, Hillsborough, NJ 08844 (US).

(72) Inventors; and

(71) Applicants (for all designated States except US): **LIU, Qing** [CN/US]; 55 Nostrand Road, Hillsborough, NJ 08844 (US). **LI, Zhonghua** [CN/US]; 27 Nostrand Road, Hillsborough, NJ 08844 (US).

(74) Common Representative: **LIU, Qing**; 55 Nostrand Road, Hillsborough, NJ 08844 (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, BR, BW, BY, BZ,

CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, 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, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

(88) Date of publication of the international search report:
31 January 2013

(54) Title: HYBRID POLYMER STENT FABRICATED BY A NON-LASER CUT FABRICATION METHOD

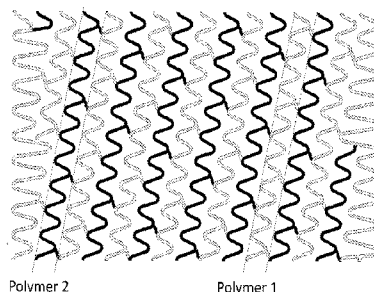


Figure 1

(57) Abstract: The present invention provides a hybrid polymer stent with two or more polymer component structures which are integrated in the polymer stent main structure. The methods for fabrication of the hybrid stents is also provided. It is a further object to the present invention to provide a 4 axis RP system in which the 4th axis is a computer controlled rotation shaft added to an xyz position system. In preferred embodiments, the 4 axis RP system also has 2 or more material delivery systems that sequentially deposit two or more polymer hot melt filaments or viscous solution filaments.



INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2012/041183

A. CLASSIFICATION OF SUBJECT MATTER IPC(8) - A61F 2/06 (2012.01) USPC - 623/1.15 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) IPC(8) - A61F 2/06; B23K 26/38; B29C 47/00; C12N 5/071 (2012.01) USPC - 428/36.9; 623/1.15, 1.42 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) PatBase, Google Patents, Google																				
C. DOCUMENTS CONSIDERED TO BE RELEVANT <table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>X</td> <td>US 2010/0256728 A1 (REA PETERSON) 07 October 2010 (07.10.2010) entire document</td> <td>1, 2, 12-15, 17, 18</td> </tr> <tr> <td>----</td> <td></td> <td>-----</td> </tr> <tr> <td>Y</td> <td></td> <td>3, 16, 19, 20</td> </tr> <tr> <td>Y</td> <td>US 2010/0179644 A1 (JENNINGS et al) 15 July 2010 (15.07.2010) entire document</td> <td>3, 16, 19, 20</td> </tr> <tr> <td>A</td> <td>US 2004/0117007 A1 (WHITBOURNE et al) 17 June 2004 (17.06.2004) entire document</td> <td>1-3, 12-20</td> </tr> </tbody> </table>			Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X	US 2010/0256728 A1 (REA PETERSON) 07 October 2010 (07.10.2010) entire document	1, 2, 12-15, 17, 18	----		-----	Y		3, 16, 19, 20	Y	US 2010/0179644 A1 (JENNINGS et al) 15 July 2010 (15.07.2010) entire document	3, 16, 19, 20	A	US 2004/0117007 A1 (WHITBOURNE et al) 17 June 2004 (17.06.2004) entire document	1-3, 12-20
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.																		
X	US 2010/0256728 A1 (REA PETERSON) 07 October 2010 (07.10.2010) entire document	1, 2, 12-15, 17, 18																		
----		-----																		
Y		3, 16, 19, 20																		
Y	US 2010/0179644 A1 (JENNINGS et al) 15 July 2010 (15.07.2010) entire document	3, 16, 19, 20																		
A	US 2004/0117007 A1 (WHITBOURNE et al) 17 June 2004 (17.06.2004) entire document	1-3, 12-20																		
☐ Further documents are listed in the continuation of Box C. ☐																				
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "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 29 November 2012		Date of mailing of the international search report 11 DEC 2012																		
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201		Authorized officer: Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774																		

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2012/041183

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.: 10, 11
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:

See extra sheet.

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.:
1-3, 12-20

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/US2012/041183

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 1-3, 12-20, are drawn to a hybrid polymer stent.

Group II, claims 4-9, are drawn to an apparatus for manufacturing.

The inventions listed as Groups I and II 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, a hybrid polymer stent, are not present in Group II. The special technical features of Group II, a three-axis XYZ system, multiple dispensing systems, nozzle, and a fourth axis system, are not present in the invention of Group I.

Since none of the special technical features of the Group I and II inventions are found in more than one of the inventions, unity of invention is lacking.