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61/579,958 23 December 2011 (23.12.2011) US
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- (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, 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, PA, 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.
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[Continued on next page]

(54) **Title:** HEART VALVE PROSTHESIS WITH OPEN STENT

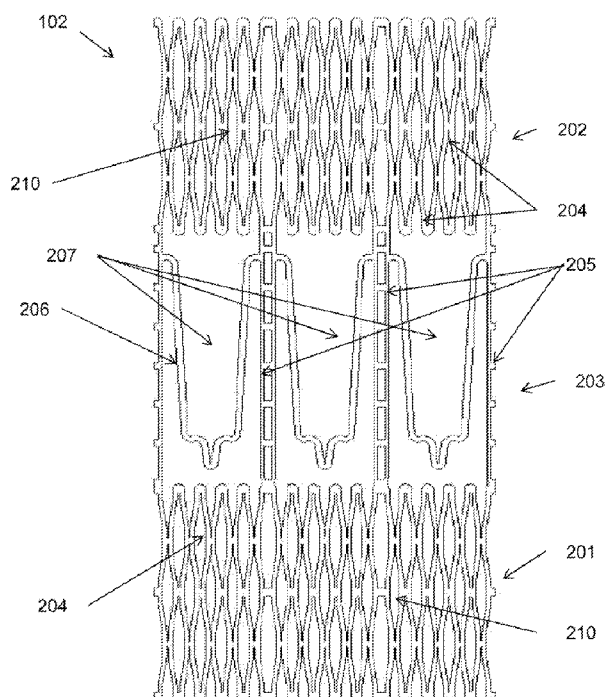


Fig. 2B

(57) **Abstract:** A prosthetic apparatus is disclosed including: a tubular stent disposed about a longitudinal axis and extending from a proximal end to a distal end, the stent defining a tubular passage between the ends. The tubular stent has a proximal portion, a distal portion, and a middle portion located between the proximal and distal portions. The proximal and distal portions each comprise a mesh of support struts forming at least one ring of open elements disposed about the longitudinal axis. The middle portion features open regions which reduce or eliminate blockage of sensitive anatomical features at an implantation site.



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).

— *before the expiration of the time limit for amending the
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Published:

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

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 12/71403

A. CLASSIFICATION OF SUBJECT MATTER IPC(8) - A61F 2/24 USPC - 623/002.18 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 (2013.01) USPC: 623/1.24, 623/900 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched USPC: 623/2.1, 2.12, 2.13, 2.14, 2.15, 2.4, 2.17, 2.19, 2.38 Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) PatBase; PubWEST (PGPB,USPT,EPAB,JPAB); Google (Web, Scholar) Search Terms: stent, valve, proximal, distal, mesh, valve, leaflet, ring, crown, mount, attach, secure, post, strut, standoff, connector, polymer, leaflet, opening, diamond, sheath, sleeve, cover, frame, reinforce, thicker, thickened, prosthesis																							
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 2009/0222082 A1 (LOCK et al.) 03 September 2009 (03.09.2009) Abstract; Fig. 7, 15; Para [0010], [0017], [0071], [0075]-[0076], [0078]</td> <td>1-8 =====</td> </tr> <tr> <td>Y</td> <td></td> <td>9-11</td> </tr> <tr> <td>X</td> <td>US 2005/0234546 A1 (NUGENT et al.) 20 October 2005 (20.10.2005) Abstract; Figs. 21-26; Para [0015]-[0016], [0020], [0107]-[0112]</td> <td>1</td> </tr> <tr> <td>Y</td> <td>US 5,562,729 A (PURDY et al.) 08 October 1996 (08.10.1996) Fig. 1-3, 4B-4C; col 6, ln 41-56</td> <td>9-11</td> </tr> <tr> <td>A</td> <td>US 2010/0168839 A1 (BRAIDO et al.) 01 July 2010 (01.07.2010) Fig. 1-4; Para [0052]-[0072]</td> <td>1-11</td> </tr> <tr> <td>A</td> <td>US 2009/0287299 A1 (TABOR et al.) 19 November 2009 (19.11.2009) Fig. 19; Para [0070]</td> <td>1-11</td> </tr> </tbody> </table>			Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X =====	US 2009/0222082 A1 (LOCK et al.) 03 September 2009 (03.09.2009) Abstract; Fig. 7, 15; Para [0010], [0017], [0071], [0075]-[0076], [0078]	1-8 =====	Y		9-11	X	US 2005/0234546 A1 (NUGENT et al.) 20 October 2005 (20.10.2005) Abstract; Figs. 21-26; Para [0015]-[0016], [0020], [0107]-[0112]	1	Y	US 5,562,729 A (PURDY et al.) 08 October 1996 (08.10.1996) Fig. 1-3, 4B-4C; col 6, ln 41-56	9-11	A	US 2010/0168839 A1 (BRAIDO et al.) 01 July 2010 (01.07.2010) Fig. 1-4; Para [0052]-[0072]	1-11	A	US 2009/0287299 A1 (TABOR et al.) 19 November 2009 (19.11.2009) Fig. 19; Para [0070]	1-11
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☐ 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 04 June 2013 (04.06.2013)		Date of mailing of the international search report 18 JUN 2013																					
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: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774																					

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 12/71403

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.: 12-26, 31-32
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:

Group I: Claims 1-11, drawn to a prosthetic apparatus.

Group II: Claim 27-30, drawn to a method of making a prosthetic apparatus.

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.:
1-11

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.