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Sunrise, FL 33325 (US). **MAGEN, Eitan**; 799 International Parkway, Sunrise, FL 33325 (US). **PARANJAPE, Harshad**; 799 International Parkway, Sunrise, FL 33325 (US). **RUSH, Scott, Lyle**; 799 International Parkway, Sunrise, FL 33325 (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, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, 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, 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.

(54) Title: EXPANDABLE LUMINAL STENTS AND METHODS OF USE

FIG. 19A

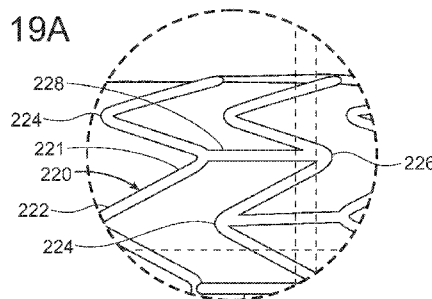
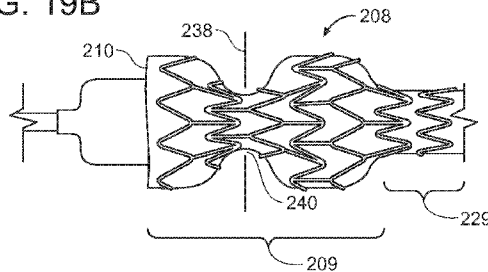


FIG. 19B



(57) Abstract: At least one of axial stiffness (i.e. bending stiffness) and radial stiffness of a luminal stent of a luminal stent assembly, or of the luminal stent assembly, linking a fenestrated aortic prosthesis to a branch of a branched artery, decreases with increasing distance from a proximal end of the luminal stent or the luminal stent assembly, and a method of their use implants the luminal stent, the luminal stent, or a luminal stent system that includes at least one of the luminal stent or stent assembly in a branched artery to therapeutically treat a diseased tissue at the branched artery.



**(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, 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, 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).

**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))*

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05 November 2020 (05.11.2020)

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US2020/016218

## 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.: 132-139  
because they relate to subject matter not required to be searched by this Authority, namely:  
Rules 39.1 (iv) and 67.IV PCT - Method for treatment of the human or animal body by surgery. The feature "delivering a fenestrated graft" in independent claims 132 and 135 implies surgery.
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:

see additional 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 an 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.:  
1-117, 121-131
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.:

### 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/US2020/016218

**A. CLASSIFICATION OF SUBJECT MATTER**  
 INV. A61F2/915 A61F2/958 A61F2/954 A61F2/07  
 ADD.  
 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)  
 A61F  
 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)  
 EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2012/047308 A1 (NITINOL DEVICES AND COMPONENTS INC [US]; BONSIGNORE CRAIG [US] ET AL.) 12 April 2012 (2012-04-12) paragraphs [0085], [0098], [0130]; figures 6c,14	1-20
X	WO 01/35863 A1 (SCIMED LIFE SYSTEMS INC [US]) 25 May 2001 (2001-05-25)  page 1, lines 5-12 page 3, line 32 - page 4, line 5 page 10, lines 21-30 page 14, line 25 - page 16, line 14; figures 9a,9b	1-12, 15-17, 21, 26-54, 66,67

Further documents are listed in the continuation of Box C.

See patent family annex.

\* Special categories of cited documents :

<p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>	<p>"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</p> <p>"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</p> <p>"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</p> <p>"&amp;" document member of the same patent family</p>
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Date of the actual completion of the international search <b>9 September 2020</b>	Date of mailing of the international search report <b>02/10/2020</b>
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Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer  <b>Espuch, Antonio</b>
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## INTERNATIONAL SEARCH REPORT

International application No  
PCT/US2020/016218

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2007/146021 A2 (COOK INC [US]; COOK WILLIAM A AUSTRALIA [AU] ET AL.) 21 December 2007 (2007-12-21) page 12, paragraph 2 page 16, paragraph 4 - page 17, paragraph 2 page 20, paragraphs 3,4 page 22, paragraphs 3,4 figures 4b-4d,8-10 page 10, paragraph 3 -----	1-11, 13-34, 37-69
X	EP 3 381 416 A1 (COOK MEDICAL TECHNOLOGIES LLC [US]) 3 October 2018 (2018-10-03) paragraphs [0024], [0025], [0034], [0041] - [0049]; figures 2-9 -----	70-117, 131
A	US 2006/135985 A1 (COX DANIEL L [US] ET AL) 22 June 2006 (2006-06-22) paragraphs [0105] - [0106]; figures 21-23 -----	70-117, 131
X	WO 2015/013344 A2 (ATRIUM MEDICAL CORP [US]) 29 January 2015 (2015-01-29) -----	121,129
Y	columns 80,86-89; figures 4a,4b,8a-8c -----	122-128
X	US 2009/163994 A1 (QUIGLEY FERGUS [US] ET AL) 25 June 2009 (2009-06-25) -----	129,130
Y	paragraphs [0034], [0037]; figure 1 -----	122-128
X	DE 10 2013 111593 A1 (JOTEC GMBH [DE]) 23 April 2015 (2015-04-23) -----	129
A	paragraphs [0062] - [0064]; figures 1,2 -----	121-128, 130

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International application No

PCT/US2020/016218

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2012047308	A1	12-04-2012	EP 2624791 A1 14-08-2013 US 2011230957 A1 22-09-2011 US 2018092764 A1 05-04-2018 WO 2012047308 A1 12-04-2012
WO 0135863	A1	25-05-2001	AU 776435 B2 09-09-2004 CA 2386946 A1 25-05-2001 DE 60014149 T2 17-11-2005 EP 1229863 A1 14-08-2002 JP 2003513747 A 15-04-2003 US 6610087 B1 26-08-2003 US 2004106981 A1 03-06-2004 US 2007185563 A1 09-08-2007 WO 0135863 A1 25-05-2001
WO 2007146021	A2	21-12-2007	AU 2007258592 A1 21-12-2007 CA 2653190 A1 21-12-2007 EP 2023854 A2 18-02-2009 EP 2591751 A1 15-05-2013 JP 5025726 B2 12-09-2012 JP 2009539477 A 19-11-2009 US 2007293940 A1 20-12-2007 US 2016135970 A1 19-05-2016 US 2019336311 A1 07-11-2019 WO 2007146021 A2 21-12-2007
EP 3381416	A1	03-10-2018	EP 3381416 A1 03-10-2018 US 2018280168 A1 04-10-2018
US 2006135985	A1	22-06-2006	EP 1833419 A2 19-09-2007 JP 2008523955 A 10-07-2008 US 2006135985 A1 22-06-2006 WO 2006068944 A2 29-06-2006
WO 2015013344	A2	29-01-2015	AU 2014293273 A1 11-02-2016 AU 2019204766 A1 18-07-2019 CA 2918936 A1 29-01-2015 CN 105517508 A 20-04-2016 CN 108814768 A 16-11-2018 EP 3024417 A2 01-06-2016 JP 6742239 B2 19-08-2020 JP 2016527025 A 08-09-2016 JP 2018138182 A 06-09-2018 JP 2020011085 A 23-01-2020 US 2016184079 A1 30-06-2016 US 2019183631 A1 20-06-2019 WO 2015013344 A2 29-01-2015
US 2009163994	A1	25-06-2009	EP 2231214 A2 29-09-2010 US 2009163994 A1 25-06-2009 WO 2009086015 A2 09-07-2009
DE 102013111593	A1	23-04-2015	DE 102013111593 A1 23-04-2015 EP 3060177 A1 31-08-2016 ES 2780687 T3 26-08-2020 WO 2015059019 A1 30-04-2015

**FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210**

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-69

A stent with decreasing axial and radial stiffness

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2. claims: 70-117, 131

A stent and a balloon with differing diameter.

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3. claims: 118-120

A stent with nested components.

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4. claims: 121-130

A stent graft assembly with at least two stents, the second stent having a different radial stiffness.

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