(54) Title: ASCENDING AORTA STENT-GRAFT SYSTEM

(57) Abstract: A generally tubular stent-graft (20) includes a generally tubular support element (30) and a covering element (32) that is attached to and at least partially covers the support element (30). When the stent-graft (20) is unconstrained in a radially-expanded state, a proximal end portion (40) of the covering element (32) is shaped so as to define at least first and second proximally-extending pieces (42A, 42B). When the stent-graft (20) is unconstrained in the radially-expanded state and the proximally-extending pieces (42A, 42B) are fully proximally extended, the proximally-extending pieces (42A, 42B) (a) are shaped so as to define respective distal bases (46), which (i) have respective base lengths (LI) measured circumferentially around the stent-graft (20), and (ii) circumferentially circumscribe respective base arcs (a) of between 100 and 140 degrees, (b) are shaped so as to define respective proximal-most portions (48) more proximal than all other respective portions of the covering element (32) that circumscribe the respective base arcs (a), and (c) have respective axial lengths (L2) that equal between 50% and 150% of the respective base lengths (L1).
(88) Date of publication of the international search report:
22 January 2015
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

IPC (8) - A61F 2/06, 2/66, 2/90 (2014.01)
CPC - A61F 2/07, 2/915, 2/89

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: A61F 2/06, 2/66, 2/90 (2014.01)
CPC: A61F 2/07, 2/915, 2/89

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)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<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 7628803 B2 (PAVCNIK, D et al.) December 8, 2009; figures 6, 18, 21, 26, 62; column 12, lines 6-28, column 15, lines 29-34; column 19, lines 1-10; column 20, lines 19-23, 44-53</td>
<td>1-7, 19/1-7, 26/1-7, 27/26/1-7, 41/1-7, 42/41/1-7, 43/1-7, 44/43/1-7, 45/44/43/1-7, 46/45/44/31/7, 47/44/43/1-7, 48/1-7, 49/48/1-7 and 50/48/1-7</td>
</tr>
<tr>
<td>Y</td>
<td></td>
<td>8, 9/1-8, 10/9/1-8, 11/9/1-8, 12/9/1-8, 13/129/1-8, 14/19/1-8, 16/9/1-8, 17/1-8, 19/8, 20/19/1-8, 21/20/19/1-8, 22/20/19/1-8, 26/8, 27/26/8, 28/26/1-8, 41/8, 42/41/8, 43/8, 44/43/8, 45/44/43/8, 46/45/44/31/8, 47/44/43/8, 48/8, 49/43/8, 50/48/8, 51/1-8, 52/51/1-8, 53/52/51/1-8, 54/53/52/51/1-8, 64-67</td>
</tr>
</tbody>
</table>

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: 8 October 2014 (08.10.2014)

Date of mailing of the international search report: 28 Nov 2014

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: Shane Thomas
PCT Helpdesk: 571-272-4300
PCT OSP: 571-272-7774
### DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<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><strong>Y</strong></td>
<td>US 201/0218619 A1 (BENICHOU, N et al.) September 8, 2011; figure 2; paragraphs [0075]-[0076], [0140]</td>
<td>8, 9/1-8, 10/9/1-8, 11/9/1-8, 13/12/9/1-8, 14/9/1-8, 16/9/1-8, 17/1-8, 19/8, 20/19/1-8, 21/20/19/1-8, 22/20/19/1-8, 26/8, 27/26/8, 29/26/1-8, 41/8, 42/41/8, 43/8, 44/43/8, 45/44/43/8, 46/45/44/43/8, 47/44/43/8, 48/8, 49/43/8, 50/48/8, 51/1-8, 52/51/1-8, 53/52/51/1-8, 54/53/52/51/1-8</td>
</tr>
<tr>
<td><strong>Y</strong></td>
<td>US 2009/0264993 A1 (GREENAN, T) October 22, 2009; figures 5, 9; paragraph [0024]</td>
<td>64-67</td>
</tr>
<tr>
<td><strong>Y</strong></td>
<td>US 2010/0249899 A1 (CHUTER, TA et al.) September 30, 2010; figure 1; paragraphs [0019], [0043], [0059]</td>
<td>12/9/1-8, 13/12/9/1-8</td>
</tr>
<tr>
<td><strong>Y</strong></td>
<td>EP 1772120 B1 (ARBEFEUILLE, S et al.) August 24, 2011; figure 27; paragraph [0131]</td>
<td>54/53/52/51/1-8</td>
</tr>
</tbody>
</table>
**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:

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 1-54 and 64-74 are directed toward apparatus and method comprising a generally tubular stent-graft.

Group ii: Claims 55-63 and 75-76 are directed toward apparatus and method for delivering at least a first stent-graft, the apparatus comprising a delivery tool.

-"-Continued Within the Next Supplemental Box."**

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.: 1-54, 64-74

**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.
The inventions listed as Groups I-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 include (a) have respective base lengths measured circumferentially around the stent-graft, and (b) circumferentially circumscribe respective base arcs, each of which base arcs has an angle of between 100 and 140 degrees, are shaped so as to define respective proximal-most portions, which are more proximal than all other respective portions of the covering element that circumscribe the respective base arcs, and have respective axial lengths, measured axially between the respective distal bases and the respective proximal-most portions, which lengths equal between 50% and 150% of the respective base lengths, which are not present in Group II; the special technical features of Group II include (b) comprises: a primary inner shaft, which is shaped so as to define a primary bore therethrough; a proximal tip, which is coupled to a proximal end portion of the primary inner shaft, and which has an external surface that is shaped so as to define at least one groove, which extends axially along at least an axial portion of the tip; and at least one inner shaft, which is shaped so as to define a secondary bore therethrough, and has a proximal end portion that is removably positioned at least partially within the at least one groove, which are not present in Group I.

The common technical features of Groups I and II are stent-graft.

These common technical features are disclosed by US 2013/0013051 A1 (BENARY). Benary discloses a stent-graft (apparatus comprising an endovascular stent-graft system; claim 1).

Since the common technical features are previously disclosed by the Benary reference, the common features are not special and so Groups I and II lack unity.