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[Continued on next page]

(54) Title: OFF-CENTER TISSUE ANCHORS WITH TENSION MEMBERS

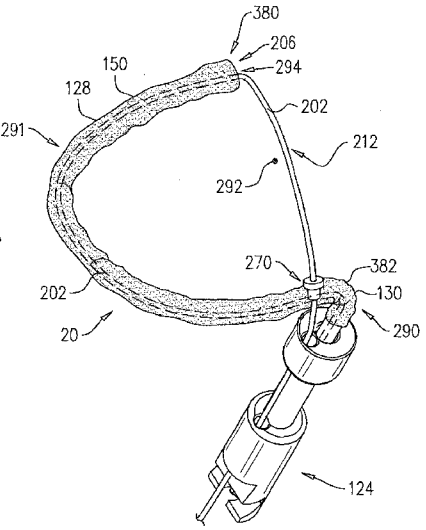

FIG. 10A

(57) Abstract: A tissue anchor (290, 420, 450, 470, 490) is provided including an anchor shaft (122); a tissue-coupling element (128), which (a) extends from a distal end (130) of the anchor shaft (122), (b) comprises a wire (150), and (c) is shaped as an open shape (291) when the tissue anchor (290, 420, 450, 470, 490) is unconstrained by a deployment tool (30); and a flexible elongate tension member (202), which (a) extends from a distal site (380) on the open shape (291), the distal site (380) located within 7 mm of a distal end (294) of the open shape (291), and (b) includes a proximal portion (208), which has a longitudinal segment (209) that runs alongside at least a portion (210) of the anchor shaft (122) when the tissue anchor (290, 420, 450, 470, 490) is unconstrained by the deployment tool (30). The tissue anchor (290, 420, 450, 470, 490) is configured to allow relative axial motion between the at least a portion (210) of the anchor shaft (122) and the longitudinal segment (209) of the proximal portion (208) of the flexible elongate tension member (202) when the tissue anchor (290, 420, 450, 470, 490) is unconstrained by the deployment tool (30).

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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
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B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A61B 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.
A	US 2002/013571 A1 (GOLDFARB ERIC A [US] ET AL) 31 January 2002 (2002-01-31) figures 24, 25	1-68
X	US 2008/027446 A1 (STONE KEVIN T [US] ET AL) 31 January 2008 (2008-01-31)	1-9, 24-32, 34,35, 39,40, 46,47, 50,59,60
Y	figures 1-4 paragraphs [0019], [0023], [0024], [0026], [0028]	51-56
X	US 2007/185532 A1 (STONE KEVIN T [US] ET AL) 9 August 2007 (2007-08-09) figures 18, 19	1,49,57, 58

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[X] Further documents are listed in the continuation of Box C.

[X] 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

"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	Date of mailing of the international search report
28 September 2016	08/12/2016

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Mathis, Martin

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2016/000840

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 2015/015497 A1 (ARCURO MEDICAL LTD [IL]) 5 February 2015 (2015-02-05) figures 5A, 5B	1
X	WO 2013/003228 A1 (UNIV MARYLAND [US]; GAMMIE JAMES [US]; PATEL RAHUL [US]; GHOREISHI MEH) 3 January 2013 (2013-01-03) figures 12a-13c	1
X	US 2005/251208 A1 (ELMER MARVIN C [US] ET AL) 10 November 2005 (2005-11-10) figures 33A, 33B	1,44,45
Y	WO 2011/089601 A1 (4TECH SA [CH]; MAISANO FRANCESCO [IT]; VANERMEN HUGO [BE]; PEREVALOV V) 28 July 2011 (2011-07-28) cited in the application figures 8E, 11A-12B	51-56

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2016/000840

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:

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.:

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.:

1-68

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.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1-68

An apparatus for delivery in a constrained state within a deployment tool, the apparatus comprising a tissue anchor, which comprises:
an anchor shaft;
a tissue-coupling element, which (a) extends from a distal end of the anchor shaft, and (b) comprises a wire; and
a flexible elongate tension member, which includes a proximal portion, which has a longitudinal segment that runs alongside at least a portion of the anchor shaft,
wherein the tissue anchor is configured to allow relative axial motion between the at least a portion of the anchor shaft and the longitudinal segment of the proximal portion of the flexible elongate tension member when the tissue anchor is unconstrained by the deployment tool;
further wherein
the tissue-coupling element is shaped as an open shape when the tissue anchor is unconstrained by the deployment tool;
the flexible elongate tension member extends from a distal site on the open shape, the distal site located within 7 mm of a distal end of the open shape; and
the longitudinal segment runs alongside at least a portion of the anchor shaft when the tissue anchor is unconstrained by the deployment tool;
so that
the the distal site on the open shape of the tissue-coupling element is drawn towards the anchor shaft when tension is applied to the flexible elongate tension member, the tissue-coupling element thus assuming a closed shape with a smaller footprint.

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2. claims: 69-81

An apparatus for delivery in a constrained state within a deployment tool, the apparatus comprising a tissue anchor, which comprises:
an anchor shaft;
a tissue-coupling element, which (a) extends from a distal end of the anchor shaft, and (b) comprises a wire; and
a flexible elongate tension member, which includes a proximal portion, which has a longitudinal segment that runs alongside at least a portion of the anchor shaft,
wherein the tissue anchor is configured to allow relative axial motion between the at least a portion of the anchor shaft and the longitudinal segment of the proximal portion of the flexible elongate tension member when the tissue anchor is unconstrained by the deployment tool;
further wherein
the wire is shaped as an open shape when the tissue anchor is unconstrained by the deployment tool;

the anchor has a central longitudinal axis;
if the tissue-coupling element were to be projected onto a plane that is perpendicular to the central longitudinal axis, the open shape would surround between 170 and 355 degrees of a point in the plane;
the flexible elongate tension member includes a distal portion that is fixed to a site on the wire, and a crossing portion which (i) is disposed between the distal and the proximal portions along the flexible elongate tension member, and (ii) crosses at least a portion of the open shape when the tissue anchor is unconstrained by the deployment tool;
so that
the the site on the wire of the tissue-coupling element is drawn towards the anchor shaft when tension is applied to the flexible elongate tension member, the tissue-coupling element thus remaining an open shape with an elongated footprint.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2016/000840

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