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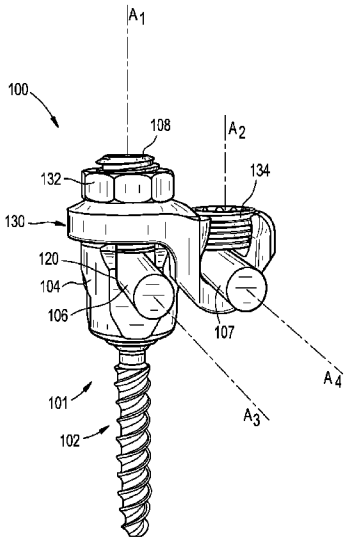
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(54) **Title:** TANDEM ROD CONNECTORS AND RELATED METHODS

FIG. 1A



(57) **Abstract:** Connectors are disclosed herein that can be used to attach a rod to a bone anchor assembly that is already occupied by a separate rod. Various ways of attaching the connector to the bone anchor assembly are disclosed, including arrangements in which the connector is locked to the bone anchor, arrangements in which the connector is constrained in one or more degrees of freedom relative to the bone anchor, arrangements in which the connector is adjustable in one or more degrees of freedom relative to the bone anchor, and arrangements that include a spherical articulation joint. In some embodiments, attachment of the connector to a bone anchor can be aided with the use of a positioner. The geometry of the connector is selected to minimize the offset between a first rod received in the bone anchor assembly and a second rod received in the connector.

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[Continued on next page]

TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

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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20 September 2018 (20.09.2018)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2018/017034

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. [X] Claims Nos.: 37-46
because they relate to subject matter not required to be searched by this Authority, namely:

Rule 39.1(iv) PCT - Method for treatment of the human or animal body by 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.:

4. [X] 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.:

1-16, 18, 19, 21-32

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/US2018/017034

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61B17/70
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)
A61B

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	US 2008/177323 A1 (NULL WILLIAM B [US] ET AL) 24 July 2008 (2008-07-24)	1-8,11, 12, 23-28, 30-32
Y	page 2, paragraph 20 - page 4, paragraph 39 figures 4, 6, 7	29

Y	US 9 247 964 B1 (SHOSHTAEV EUGENE [US]) 2 February 2016 (2016-02-02)	1-8, 12-14, 16,18, 19, 26-28, 30,32
	column 6, lines 22-36 column 8, lines 23-32 figures 7, 23	

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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
9 May 2018	01/08/2018

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	Kakoullis, Marios

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Form PCT/ISA/210 (second sheet) (April 2005)

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 8 920 475 B1 (ZIEMEK TERRY [US] ET AL) 30 December 2014 (2014-12-30) column 6, line 29 - column 8, line 44 column 10, lines 17-50 figures 1, 1A, 5A-5E	1-8, 12-14, 16, 26-28, 30,32

Y	US 2003/045878 A1 (PETIT DOMINIQUE [FR] ET AL) 6 March 2003 (2003-03-06)	18,19,29
A	page 2, paragraph 39 - page 3, paragraph 73 page 3, paragraph 79 figures 10, 11, 14, 15	1,26-28

A	US 2016/143665 A1 (BIEDERMANN LUTZ [DE] ET AL) 26 May 2016 (2016-05-26) page 4, paragraph 57 - page 5, paragraph 59 figures 17-19b	1,26,27

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2018/017034

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		US 2016143665 A1	26-05-2016
		US 2018140330 A1	24-05-2018

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1-16, 18, 19, 21-32

   The second rod-receiving recess includes a proximal opening and a distal seat and wherein the proximal opening is offset from the distal seat in a direction perpendicular to the proximal-distal axis.

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2. claims: 17, 20, 33-36

   The assembly has an unlocked configuration in which the connector is polyaxially movable relative to the fastener and a locked configuration in which an orientation of the connector relative to the fastener is fixed, the locking nut being radially expanded in the locked configuration as compared to the unlocked configuration.
