



(51) International Patent Classification:

A61B 34/20 (2016.01) A61B 17/00 (2006.01)
A61B 5/06 (2006.01)

(21) International Application Number:

PCT/US2016/067134

(22) International Filing Date:

16 December 2016 (16.12.2016)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

14/983,818 30 December 2015 (30.12.2015)

US

(71) Applicant: **DEPUY SYNTHES PRODUCTS, INC.**
[US/US]; 325 Paramount Drive, Raynham, Massachusetts
02767-0350 (US).

(72) Inventors: **HALL, Mark**; 325 Paramount Drive,
Raynham, Massachusetts 02767 (US). **LOMELI, Roman**;
325 Paramount Drive, Raynham, Massachusetts 02767
(US). **HAWKINS, John Riley**; 325 Paramount Drive,
Raynham, Massachusetts 02767 (US). **FRASIER, William**;
325 Paramount Drive, Raynham, Massachusetts 02767
(US). **CHIEN, Dennis**; 1302 Wrights Lane East, West
Chester, Pennsylvania 19380 (US).

(74) Agents: **SHIRTZ, Joseph F.** et al.; Johnson & Johnson,
One Johnson & Johnson Plaza, New Brunswick, New Jer-
sey 08933 (US).

(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, 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, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(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).

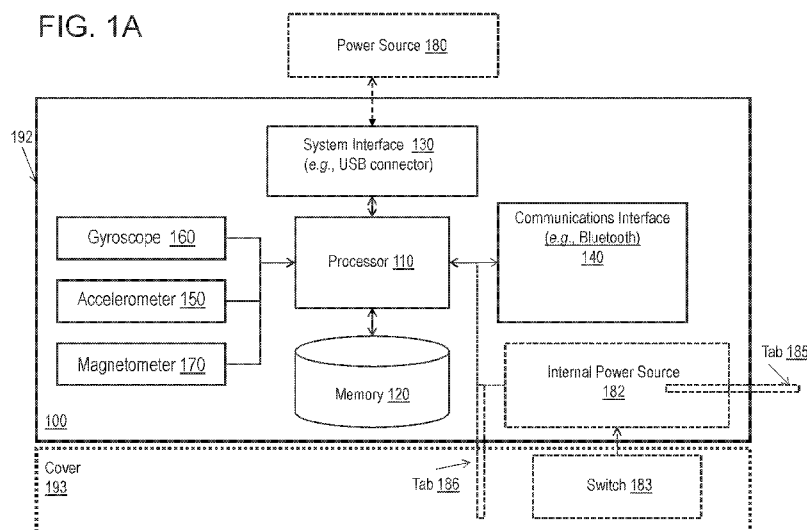
Declarations under Rule 4.17:

- 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))

[Continued on next page]

(54) Title: METHOD AND APPARATUS FOR INTRAOPERATIVE MEASUREMENTS OF ANATOMICAL ORIENTATION

FIG. 1A



(57) Abstract: Electronic devices that detect their position and/or orientation with respect to earth's frame of reference are described. A coupler can removeably maintain the electronic devices in physical proximity of one another. Each electronic device can have a housing and the coupler can be included on the housing and arranged to physically connect the housing of the electronic device to the housing of at least one other electronic device. Alternatively, the coupler can be a packaging that maintains the electronic devices in physical proximity of one another. Each electronic device can be calibrated using the orientation or position information obtained by other electronic devices maintained by the coupler. Further, each electronic device can include a power source that remains inactive until the device is ready for use.

**Published:****(88) Date of publication of the international search report:**

19 October 2017

- *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))*

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2016/067134

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.:

1-10, 17-26, 30-37, 42-44

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/US2016/067134

A. CLASSIFICATION OF SUBJECT MATTER

INV. A61B34/20

ADD. A61B5/06 A61B17/00

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 2014/276871 A1 (SHERMAN JASON T [US] ET AL) 18 September 2014 (2014-09-18) figures 1-3, 5, 12, 13 paragraphs [0043], [0044], [0046], [0052], [0053], [0056], [0068], [0070], [0075] - [0077] -----	1-5, 17-24, 30-33, 42-44
X	WO 2014/063181 A1 (INLINE ORTHOPAEDICS PTY LTD [AU]) 1 May 2014 (2014-05-01) paragraphs [0025], [0029], [0066], [0106], [0118], [0219] - [0223], [0235] - [0239], [0256], [0257] figures 3-7 ----- -/-	1,6-10, 19,25, 26, 34-37,42



Further documents are listed in the continuation of Box C.



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

7 June 2017

Date of mailing of the international search report

11/09/2017

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

Mathis, Martin

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2016/067134

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2011/275957 A1 (BHANDARI SACHIN [US]) 10 November 2011 (2011-11-10) paragraphs [0024] - [0026], [0090] - [0106], [0121] figure 4 -----	1,7,10, 19,25, 35,42
X	WO 2014/025305 A1 (ORTOMA AB [SE]) 13 February 2014 (2014-02-13) figures 2, 12 -----	1
A	US 2014/031829 A1 (PARADIS FRANCOIS [CA] ET AL) 30 January 2014 (2014-01-30) the whole document -----	1-10, 17-26, 30-37, 42-44

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2016/067134

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2014276871 A1	18-09-2014	AU 2014238115 A1 CN 105050546 A EP 3001807 A1 JP 2016510662 A US 2014276871 A1 US 2017172762 A1 WO 2014149487 A1	29-10-2015 11-11-2015 06-04-2016 11-04-2016 18-09-2014 22-06-2017 25-09-2014
WO 2014063181 A1	01-05-2014	AU 2013334469 A1 CN 104755036 A EP 2911598 A1 JP 2015533310 A RU 2015115741 A US 2015272696 A1 WO 2014063181 A1	30-04-2015 01-07-2015 02-09-2015 24-11-2015 20-11-2016 01-10-2015 01-05-2014
US 2011275957 A1	10-11-2011	NONE	
WO 2014025305 A1	13-02-2014	EP 2882368 A1 US 2015157416 A1 WO 2014025305 A1	17-06-2015 11-06-2015 13-02-2014
US 2014031829 A1	30-01-2014	CA 2866197 A1 CN 104271065 A EP 2879611 A1 US 2014031829 A1 WO 2014019087 A1	06-02-2014 07-01-2015 10-06-2015 30-01-2014 06-02-2014

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1-10, 17-26, 30-37, 42-44

An apparatus, a system, and a related method according to claims 1-5, 17-19, 22-24, 30-33, and 42-44, and further comprising/using specific features regarding markings, packaging, and data processing according to dependent claims 6-10, 20, 21, 25, 26, and 34-37, so that calibration, initialization, error check, and/or startup procedures can be conducted, and a medical instrument can be tracked.

2. claims: 11, 16, 27, 38

The apparatus, system, and method further comprising/using a temperature controller, so that the electronic device can be maintained at a predetermined temperature.

3. claims: 12-15, 28, 29, 39-41

The apparatus, system, and method further comprising/using an internal power source and various activation features, the power source configured to remain inactive until the activation features are activated, so that draining of the battery prior to use can be prevented.
