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

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(54) Title: ROBOTIC SURGICAL SYSTEMS, INSTRUMENT DRIVE ASSEMBLIES, AND DRIVE ASSEMBLIES

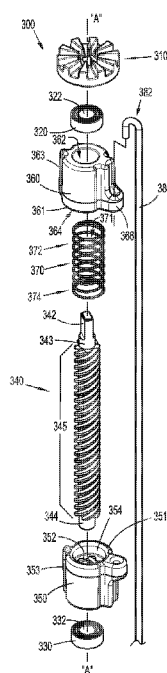


FIG. 8

(57) Abstract: A drive assembly of an instrument drive assembly, is provided. The drive assembly includes a drive screw, a drive nut, a follower, a biasing element, and a drive element. The drive nut is threadedly engaged with a threaded portion of the drive screw such that rotation of the drive screw results in longitudinal movement of the drive nut. The follower is longitudinally slidable with respect to the drive screw. The biasing element is disposed in mechanical cooperation with the drive nut and the follower. The drive element is disposed in mechanical cooperation with the follower. Longitudinal translation of the drive element is configured to drive a function of the surgical instrument.

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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08 August 2019 (08.08.2019)

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:

- Group 1: Claims 1-11 relate to an interface for use with a surgical system, the interface comprising a proximal body portion, a distal body portion, a cavity, a proximal coupler, a distal coupler and a biasing element.

- Group 2: Claims 12-19 relate to an instrument drive assembly for use with a surgical instrument, the instrument drive assembly comprising: a proximal housing, a distal housing and a locking mechanism.

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 any 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.:
1-11

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.

A. CLASSIFICATION OF SUBJECT MATTER**A61B 34/30(2016.01)i, A61B 17/29(2006.01)i, A61B 17/00(2006.01)i**

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 34/30; A61B 17/00; A61B 17/29; A61B 18/00; A61B 18/12; A61B 18/14; A61B 19/00; F16H 25/12

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS(KIPO internal) & keywords: interface, surgical system, proximal body portion, instrument control unit, distal body portion, cavity, proximal coupler, driving element, distal coupler, instrument drive assembly, biasing element

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2017-116793 A1 (COVIDIEN LP) 06 July 2017 See paragraphs [0008], [0014], [0015], [0050]-[0052], [0057], [0065], [0072], [0074], [0077], [0078], [0081], [0090]; and figures 2-7, 9, 13-17.	1-11
Y	WO 2017-151993 A1 (COVIDIEN LP) 08 September 2017 See paragraphs [0041], [0042]; and figure 5.	1-11
Y	US 2016-0135868 A1 (COVIDIEN LP) 19 May 2016 See claim 9.	5,6
A	US 2015-0105799 A1 (KUKA LABORATORIES GMBH) 16 April 2015 See the whole document.	1-11
A	US 2011-0174099 A1 (ROSS, A. J. et al.) 21 July 2011 See the whole document.	1-11



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

03 July 2019 (03.07.2019)

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Name and mailing address of the ISA/KR

International Application Division

Korean Intellectual Property Office

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2018/061916

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2017-116793 A1	06/07/2017	CN 108463185 A EP 3397189 A1 US 2019-0008600 A1	28/08/2018 07/11/2018 10/01/2019
WO 2017-151993 A1	08/09/2017	AU 2017-225996 A1 CA 3013225 A1 CN 108697478 A EP 3422989 A1 JP 2019-509104 A	09/08/2018 08/09/2017 23/10/2018 09/01/2019 04/04/2019
US 2016-0135868 A1	19/05/2016	EP 3040041 A2 EP 3040041 A3 EP 3040041 B1 US 2018-0103997 A1 US 9867656 B2	06/07/2016 30/11/2016 14/03/2018 19/04/2018 16/01/2018
US 2015-0105799 A1	16/04/2015	CN 104363854 A CN 104363854 B CN 104546138 A CN 104546138 B CN 104546139 A CN 104546139 B CN 104605933 A CN 104605933 B DE 102012008537 A1 DE 102013004591 A1 EP 2841001 A1 EP 2841001 B1 EP 2881068 A1 EP 2881068 B1 EP 2881069 A1 EP 2881070 A1 EP 2881070 B1 KR 10-1635697 B1 KR 10-1635698 B1 KR 10-1687088 B1 KR 10-1687089 B1 KR 10-2014-0145206 A KR 10-2014-0145207 A KR 10-2014-0145208 A KR 10-2015-0013568 A US 10130431 B2 US 2015-0105798 A1 US 2015-0105800 A1 US 2015-0164593 A1 US 2017-0135773 A1 US 9743995 B2 US 9993307 B2 WO 2013-159933 A1	18/02/2015 31/10/2017 29/04/2015 12/04/2017 29/04/2015 28/07/2017 13/05/2015 01/01/2019 31/10/2013 18/09/2014 04/03/2015 02/01/2019 10/06/2015 07/12/2016 10/06/2015 10/06/2015 19/09/2018 01/07/2016 08/07/2016 15/12/2016 15/12/2016 22/12/2014 22/12/2014 22/12/2014 05/02/2015 20/11/2018 16/04/2015 16/04/2015 18/06/2015 18/05/2017 29/08/2017 12/06/2018 31/10/2013

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2018/061916

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2011-0174099 A1	21/07/2011	AU 2004-281832 A1	28/04/2005
		AU 2004-281832 B2	18/11/2010
		AU 2007-216826 A1	24/04/2008
		AU 2007-216826 B2	01/11/2012
		AU 2008-229719 A1	23/04/2009
		AU 2008-229719 B2	22/05/2014
		AU 2008-302039 A1	26/03/2009
		AU 2008-302039 B2	18/07/2013
		AU 2010-201320 A1	11/11/2010
		AU 2010-201320 B2	05/06/2014
		AU 2010-202567 A1	03/02/2011
		AU 2010-202567 B2	02/04/2015
		AU 2010-226967 A1	21/04/2011
		AU 2010-226969 A1	21/04/2011
		AU 2010-226969 A8	09/04/2015
		AU 2010-226969 B2	02/04/2015
		AU 2010-226969 B8	29/04/2015
		AU 2010-241367 A1	09/06/2011
		AU 2010-241367 B2	25/02/2016
		AU 2010-246326 A1	23/06/2011
		AU 2010-246403 A1	16/06/2011
		AU 2010-246403 B2	12/06/2014
		AU 2011-200961 A1	29/09/2011
		AU 2011-200961 B2	29/05/2014
		AU 2011-200995 A1	06/10/2011
		AU 2011-200995 B2	07/08/2014
		AU 2011-201182 A1	03/11/2011
		AU 2011-201182 B2	24/04/2014
		AU 2011-201186 A1	27/10/2011
		AU 2011-201186 B2	28/05/2015
		AU 2012-261711 A1	04/07/2013
		AU 2012-261711 B2	06/11/2014
		AU 2013-203675 A1	19/12/2013
		AU 2013-203675 B2	27/11/2014
		AU 2013-206719 A1	23/01/2014
		AU 2013-206719 B2	14/12/2017
		AU 2013-206732 A1	23/01/2014
		AU 2013-206732 B2	02/02/2017
		AU 2014-200501 A1	25/09/2014
		AU 2014-200501 B2	24/08/2017
		AU 2014-203594 A1	17/07/2014
		AU 2014-203594 B2	19/11/2015
		AU 2014-204542 A1	07/08/2014
		AU 2014-204542 B2	19/05/2016
		AU 2014-210681 A1	28/08/2014
		AU 2014-210681 B2	12/11/2015
		AU 2014-213498 A1	04/09/2014
		AU 2014-213498 B2	02/02/2017
		AU 2015-200264 A1	12/02/2015
		AU 2015-200264 B2	02/03/2017

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2018/061916

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		AU 2016-200084 A1	04/08/2016
		AU 2016-200478 A1	18/02/2016
		AU 2016-200478 B2	27/07/2017
		AU 2016-200924 A1	03/03/2016
		AU 2016-200924 B2	11/05/2017
		AU 2016-202115 A1	27/10/2016
		AU 2016-202962 A1	02/06/2016
		AU 2016-204387 A1	14/07/2016
		AU 2016-204387 B2	18/01/2018
		AU 2017-202913 A1	25/05/2017
		AU 2017-202913 B2	15/11/2018
		AU 2017-213554 A1	31/08/2017
		AU 2017-265019 A1	14/12/2017
		AU 2017-265019 B2	17/01/2019
		AU 2018-200975 A1	01/03/2018
		AU 2018-200975 B2	14/02/2019
		AU 2018-202629 A1	29/11/2018
		AU 2018-202813 A1	22/11/2018
		AU 2019-202294 A1	18/04/2019
		CA 2542532 A1	28/04/2005
		CA 2542532 C	14/08/2012
		CA 2603725 A1	06/04/2008
		CA 2603725 C	03/11/2015
		CA 2640399 A1	05/04/2009
		CA 2640399 C	15/11/2016
		CA 2698571 A1	26/03/2009
		CA 2698571 C	20/12/2016
		CA 2699134 A1	27/10/2010
		CA 2699134 C	04/04/2017
		CA 2708867 A1	14/01/2011
		CA 2708867 C	01/05/2018
		CA 2716235 A1	05/04/2011
		CA 2716235 C	19/12/2017
		CA 2716697 A1	05/04/2011
		CA 2720209 A1	20/05/2011
		CA 2721880 A1	02/06/2011
		CA 2721880 C	03/10/2017
		CA 2721882 A1	09/06/2011
		CA 2733377 A1	12/09/2011
		CA 2733406 A1	16/09/2011
		CA 2733801 A1	16/10/2011
		CA 2734160 A1	13/10/2011
		CA 2734160 C	17/04/2018
		CA 2796768 A1	20/06/2013
		CA 2813984 A1	30/11/2013
		CA 2820263 A1	09/01/2014
		CA 2820337 A1	09/01/2014
		CA 2844035 A1	07/09/2014
		CA 2921566 A1	26/03/2009
		CA 2921566 C	22/05/2018

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2018/061916

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		CA 2935353 A1	05/04/2009
		CA 2935353 C	18/09/2018
		CN 101401736 A	08/04/2009
		CN 101401736 B	26/06/2013
		CN 101801284 A	11/08/2010
		CN 101801284 B	03/10/2012
		CN 101869495 A	27/10/2010
		CN 101869495 B	09/03/2016
		CN 101953703 A	26/01/2011
		CN 101953703 B	19/11/2014
		CN 102028509 A	27/04/2011
		CN 102048567 A	11/05/2011
		CN 102068289 A	25/05/2011
		CN 102068289 B	20/01/2016
		CN 102090907 A	15/06/2011
		CN 102113902 A	06/07/2011
		CN 102113902 B	01/04/2015
		CN 102188270 A	21/09/2011
		CN 102188270 B	25/03/2015
		CN 102217961 A	19/10/2011
		CN 102217961 B	11/03/2015
		CN 102247177 A	23/11/2011
		CN 102247177 B	10/02/2016
		CN 102389324 A	28/03/2012
		CN 102389324 B	27/05/2015
		CN 102793571 A	28/11/2012
		CN 102793571 B	17/12/2014
		CN 103211635 A	24/07/2013
		CN 103211635 B	08/09/2017
		CN 103349558 A	16/10/2013
		CN 103349558 B	09/03/2016
		CN 103445815 A	18/12/2013
		CN 103445815 B	26/04/2017
		CN 103536326 A	29/01/2014
		CN 103536326 B	24/07/2018
		CN 103637825 A	19/03/2014
		CN 103637825 B	12/04/2017
		CN 104224255 A	24/12/2014
		CN 104224255 B	13/10/2017
		CN 104473670 A	01/04/2015
		CN 104473670 B	24/05/2017
		CN 104706396 A	17/06/2015
		CN 104739476 A	01/07/2015
		CN 104739476 B	12/04/2017
		CN 104970843 A	14/10/2015
		CN 104970843 B	22/12/2017
		CN 105411636 A	23/03/2016
		CN 105596047 A	25/05/2016
		CN 105662508 A	15/06/2016
		CN 105662508 B	08/01/2019

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2018/061916

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		CN 105796147 A	27/07/2016
		CN 106037845 A	26/10/2016
		CN 106901788 A	30/06/2017
		CN 107595341 A	19/01/2018
		CN 108784770 A	13/11/2018
		CN 108852443 A	23/11/2018
		EP 1677684 A2	12/07/2006
		EP 1677684 A4	26/05/2010
		EP 1677684 B1	05/12/2012
		EP 1908415 A1	09/04/2008
		EP 1908415 B1	25/04/2012
		EP 2044890 A1	08/04/2009
		EP 2044890 B1	08/11/2017
		EP 2197363 A1	23/06/2010
		EP 2197363 A4	24/11/2010
		EP 2197363 B1	02/11/2016
		EP 2233081 A2	29/09/2010
		EP 2233081 A3	24/11/2010
		EP 2233081 B1	04/03/2015
		EP 2233081 B2	28/03/2018
		EP 2245994 A1	03/11/2010
		EP 2275042 A2	19/01/2011
		EP 2275042 A3	03/08/2011
		EP 2275042 B1	04/03/2015
		EP 2305136 A2	06/04/2011
		EP 2305136 A3	22/01/2014
		EP 2308388 A1	13/04/2011
		EP 2308388 B1	07/12/2016
		EP 2324776 A2	25/05/2011
		EP 2324776 A3	17/08/2011
		EP 2324776 B1	23/03/2016
		EP 2329773 A1	08/06/2011
		EP 2329773 B1	28/08/2013
		EP 2332472 A1	15/06/2011
		EP 2364651 A1	14/09/2011
		EP 2364651 B1	30/11/2016
		EP 2366342 A1	21/09/2011
		EP 2366342 B1	11/10/2017
		EP 2377472 A1	19/10/2011
		EP 2377472 B1	13/04/2016
		EP 2377476 A1	19/10/2011
		EP 2377476 B1	18/03/2015
		EP 2389875 A2	30/11/2011
		EP 2389875 A3	03/07/2013
		EP 2389875 B1	06/09/2017
		EP 2606834 A2	26/06/2013
		EP 2606834 A3	02/03/2016
		EP 2647341 A1	09/10/2013
		EP 2647341 B1	01/05/2019
		EP 2668910 A2	04/12/2013

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2018/061916

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		EP 2668910 A3	14/09/2016
		EP 2684530 A1	15/01/2014
		EP 2684530 B1	11/03/2015
		EP 2684531 A1	15/01/2014
		EP 2789299 A1	15/10/2014
		EP 2789299 B1	03/05/2017
		EP 2898850 A1	29/07/2015
		EP 2901943 A1	05/08/2015
		EP 2901943 B1	12/09/2018
		EP 2901944 A1	05/08/2015
		EP 2901944 B1	01/02/2017
		EP 3042614 A1	13/07/2016
		EP 3042614 B1	15/08/2018
		EP 3047806 A1	27/07/2016
		EP 3058879 A1	24/08/2016
		EP 3058879 B1	05/09/2018
		EP 3078334 A1	12/10/2016
		EP 3078334 B1	21/11/2018
		EP 3111854 A1	04/01/2017
		EP 3146912 A1	29/03/2017
		EP 3158948 A2	26/04/2017
		EP 3158948 A3	28/06/2017
		EP 3195813 A1	26/07/2017
		EP 3195815 A1	26/07/2017
		EP 3207883 A1	23/08/2017
		EP 3289984 A1	07/03/2018
		EP 3403590 A1	21/11/2018
		EP 3406205 A1	28/11/2018
		EP 3446645 A1	27/02/2019
		ES 2386154 T3	10/08/2012
		ES 2534049 T3	16/04/2015
		ES 2534292 T3	21/04/2015
		ES 2534292 T5	04/07/2018
		ES 2534568 T3	24/04/2015
		ES 2534916 T3	30/04/2015
		ES 2571280 T3	24/05/2016
		ES 2611081 T3	04/05/2017
		ES 2632064 T3	08/09/2017
		ES 2646491 T3	14/12/2017
		ES 2703678 T3	12/03/2019
		JP 2007-508868 A	12/04/2007
		JP 2008-093420 A	24/04/2008
		JP 2009-090113 A	30/04/2009
		JP 2010-246943 A	04/11/2010
		JP 2010-253272 A	11/11/2010
		JP 2010-540041 A	24/12/2010
		JP 2011-019904 A	03/02/2011
		JP 2011-078772 A	21/04/2011
		JP 2011-078773 A	21/04/2011
		JP 2011-104379 A	02/06/2011

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2018/061916

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		JP 2011-115594 A	16/06/2011
		JP 2011-120911 A	23/06/2011
		JP 2011-189128 A	29/09/2011
		JP 2011-189136 A	29/09/2011
		JP 2011-218164 A	04/11/2011
		JP 2011-224368 A	10/11/2011
		JP 2013-009973 A	17/01/2013
		JP 2013-128768 A	04/07/2013
		JP 2013-150877 A	08/08/2013
		JP 2013-208472 A	10/10/2013
		JP 2013-248395 A	12/12/2013
		JP 2014-014685 A	30/01/2014
		JP 2014-014686 A	30/01/2014
		JP 2014-171879 A	22/09/2014
		JP 2014-176722 A	25/09/2014
		JP 2014-184334 A	02/10/2014
		JP 2015-006388 A	15/01/2015
		JP 2015-180340 A	15/10/2015
		JP 2016-013450 A	28/01/2016
		JP 2016-131883 A	25/07/2016
		JP 2016-198491 A	01/12/2016
		JP 2017-006748 A	12/01/2017
		JP 2017-140482 A	17/08/2017
		JP 2017-196520 A	02/11/2017
		JP 2018-187390 A	29/11/2018
		JP 2018-192248 A	06/12/2018
		JP 4642770 B2	02/03/2011
		JP 5143509 B2	13/02/2013
		JP 5393096 B2	22/01/2014
		JP 5425786 B2	26/02/2014
		JP 5461634 B2	02/04/2014
		JP 5647711 B2	07/01/2015
		JP 5701516 B2	15/04/2015
		JP 5722013 B2	20/05/2015
		JP 5739647 B2	24/06/2015
		JP 5744108 B2	01/07/2015
		JP 5770497 B2	26/08/2015
		JP 5855180 B2	09/02/2016
		JP 5944108 B2	05/07/2016
		JP 5974049 B2	23/08/2016
		JP 6121153 B2	26/04/2017
		JP 6192396 B2	06/09/2017
		JP 6239868 B2	29/11/2017
		JP 6250605 B2	20/12/2017
		US 10022123 B2	17/07/2018
		US 10041822 B2	07/08/2018
		US 10105140 B2	23/10/2018
		US 10111657 B2	30/10/2018
		US 10136879 B2	27/11/2018
		US 10159481 B2	25/12/2018

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2018/061916

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		US 10251644 B2	09/04/2019
		US 10271844 B2	30/04/2019
		US 10271848 B2	30/04/2019
		US 2005-0103819 A1	19/05/2005
		US 2008-0083811 A1	10/04/2008
		US 2009-0090763 A1	09/04/2009
		US 2009-0101692 A1	23/04/2009
		US 2009-0101694 A1	23/04/2009
		US 2009-0114700 A1	07/05/2009
		US 2010-0211053 A1	19/08/2010
		US 2010-0270355 A1	28/10/2010
		US 2010-0320253 A1	23/12/2010
		US 2011-0017801 A1	27/01/2011
		US 2011-0022032 A1	27/01/2011
		US 2011-0024480 A1	03/02/2011
		US 2011-0062211 A1	17/03/2011
		US 2011-0121049 A1	26/05/2011
		US 2011-0125138 A1	26/05/2011
		US 2011-0139851 A1	16/06/2011
		US 2011-0174099 A1	21/07/2011
		US 2011-0192883 A1	11/08/2011
		US 2011-0192884 A1	11/08/2011
		US 2011-0198385 A1	18/08/2011
		US 2011-0204119 A1	25/08/2011
		US 2011-0253765 A1	20/10/2011
		US 2011-0284612 A1	24/11/2011
		US 2012-0000962 A1	05/01/2012
		US 2012-0089131 A1	12/04/2012
		US 2012-0091182 A1	19/04/2012
		US 2012-0239067 A1	20/09/2012
		US 2012-0253329 A1	04/10/2012
		US 2012-0323226 A1	20/12/2012
		US 2013-0214025 A1	22/08/2013
		US 2013-0221060 A1	29/08/2013
		US 2013-0317486 A1	28/11/2013
		US 2014-0008410 A1	09/01/2014
		US 2014-0012236 A1	09/01/2014
		US 2014-0252063 A1	11/09/2014
		US 2014-0350530 A1	27/11/2014
		US 2015-0122870 A1	07/05/2015
		US 2015-0150556 A1	04/06/2015
		US 2015-0182221 A1	02/07/2015
		US 2015-0209035 A1	30/07/2015
		US 2015-0223805 A1	13/08/2015
		US 2015-0223812 A1	13/08/2015
		US 2015-0223815 A1	13/08/2015
		US 2015-0272577 A1	01/10/2015
		US 2015-0327854 A1	19/11/2015
		US 2015-0342601 A1	03/12/2015
		US 2016-0166250 A1	16/06/2016

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2018/061916

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		US 2016-0183938 A1	30/06/2016
		US 2016-0262736 A1	15/09/2016
		US 2016-0367249 A1	22/12/2016
		US 2017-0042535 A1	16/02/2017
		US 2017-0245854 A1	31/08/2017
		US 2017-0258467 A1	14/09/2017
		US 2017-0311938 A1	02/11/2017
		US 2017-0333033 A1	23/11/2017
		US 2018-0070941 A1	15/03/2018
		US 2018-0070943 A1	15/03/2018
		US 2018-0340806 A1	29/11/2018
		US 2019-0046181 A1	14/02/2019
		US 2019-0076135 A1	14/03/2019
		US 2019-0117218 A1	25/04/2019
		US 7481348 B2	27/01/2009
		US 7815090 B2	19/10/2010
		US 7815091 B2	19/10/2010
		US 7963433 B2	21/06/2011
		US 8012170 B2	06/09/2011
		US 8033441 B2	11/10/2011
		US 8100309 B2	24/01/2012
		US 8210413 B2	03/07/2012
		US 8272554 B2	25/09/2012
		US 8342379 B2	01/01/2013
		US 8424739 B2	23/04/2013
		US 8499992 B2	06/08/2013
		US 8517241 B2	27/08/2013
		US 8733614 B2	27/05/2014
		US 8770459 B2	08/07/2014
		US 8806973 B2	19/08/2014
		US 8807414 B2	19/08/2014
		US 8960520 B2	24/02/2015
		US 8967443 B2	03/03/2015
		US 8968276 B2	03/03/2015
		US 9010611 B2	21/04/2015
		US 9016540 B2	28/04/2015
		US 9017371 B2	28/04/2015
		US 9023014 B2	05/05/2015
		US 9055943 B2	16/06/2015
		US 9113877 B1	25/08/2015
		US 9113880 B2	25/08/2015
		US 9282961 B2	15/03/2016
		US 9351714 B2	31/05/2016
		US 9433418 B2	06/09/2016
		US 9498212 B2	22/11/2016
		US 9706981 B2	18/07/2017
		US 9706994 B2	18/07/2017
		US 9820740 B2	21/11/2017
		US 9913644 B2	13/03/2018
		WO 2005-037329 A2	28/04/2005

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2018/061916Patent document
cited in search reportPublication
datePatent family
member(s)Publication
date

WO 2005-037329 A3

01/09/2005

WO 2009-039506 A1

26/03/2009