



(51) International Patent Classification:

G01D 5/14 (2006.01) H03K 17/95 (2006.01)
G01R 33/06 (2006.01)

NETIER-LECOEUR, Myriam; 41 Rue de la Mutualite, 91440 Bures sur Yvette (FR). CADUGAN, Bryan; 61 Grapevine Road, Bedford, New Hampshire 03110 (US).

(21) International Application Number:

PCT/US2018/028475

(74) Agent: MILMAN, Seth, A. et al.; Daly, Crowley, Mofford & Durkee, LLP, Suite 301A, 354A Turnpike Street, Canton, MA 02021 (US).

(22) International Filing Date:

20 April 2018 (20.04.2018)

(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.

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

15/606,358 26 May 2017 (26.05.2017) US

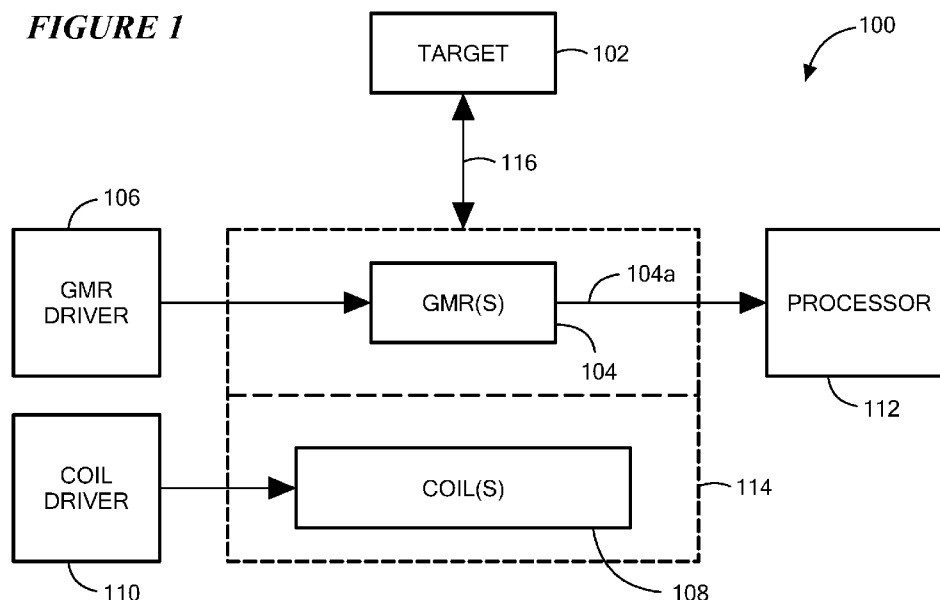
(71) Applicants: ALLEGRO MICROSYSTEMS, LLC [US/US]; 955 Perimeter Road, Manchester, New Hampshire 03103-3353 (US). COMMISSARIAT À L'ÉNERGIE ATOMIQUE ET AUX ÉNERGIES ALTERNATIVES [FR/FR]; 25 rue Leblanc, Bâtiment le Ponant D, 75015 Paris Cedex (FR).

(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,

(72) Inventors: LATHAM, Alexander; 200 Still River Road, Harvard, Massachusetts 01451 (US). FERMON, Claude; 6 Allee Boileau, 91400 Orsay (FR). PAN-

(54) Title: COIL ACTUATED POSITION SENSOR WITH REFLECTED MAGNETIC FIELD

FIGURE 1



(57) Abstract: A magnetic field sensor (100) includes at least one coil (108) responsive to an AC coil drive signal; at least two spaced apart magnetic field sensing elements (104) responsive to a sensing element drive signal and positioned proximate to the at least one coil; and a circuit (112) coupled to the at least two magnetic field sensing elements to generate an output signal of the magnetic field sensor indicative of a difference between a distance of a conductive target (203) with respect to each of the at least two spaced apart magnetic field sensing elements.



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))*

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))*

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

03 January 2019 (03.01.2019)

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2018/028475

A. CLASSIFICATION OF SUBJECT MATTER
INV. G01D5/14 G01R33/06 H03K17/95
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)
G01D G01R G01B G01V H03K G07D
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, COMPENDEX, INSPEC, IBM-TDB, 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 2013/207648 A1 (ZIBOLD TOBIAS [DE] ET AL) 15 August 2013 (2013-08-15)	1-4,6,7, 12,13, 17,18, 20-22, 26,28
A	abstract paragraph [0007] paragraph [0027] - paragraph [0034]; figure 1 paragraphs [0039], [0040]; figure 2 paragraph [0044] - paragraph [0048]; figures 4a-4d paragraph [0049] - paragraph [0054]; figures 5a-5d ----- -/--	8,9, 14-16, 19,23,24

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 15 November 2018	Date of mailing of the international search report 23/11/2018
---	--

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 Jakob, Clemens
--	--

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2018/028475

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>US 2015/022193 A1 (BURDETTE ERIC [US] ET AL) 22 January 2015 (2015-01-22)</p> <p>abstract paragraph [0024] - paragraph [0032]; figure 1 paragraphs [0035], [0036]; figure 2 paragraph [0037]; figure 3 paragraphs [0038], [0039]; figure 4A paragraphs [0084], [0104]; figures 10A, 10B paragraphs [0040] - [0044], [0047]; figure 4B</p> <p style="text-align: center;">-----</p>	<p>1-3,5,6, 10-13, 17, 20-22, 26-28</p>
X	<p>EP 2 685 273 A1 (UNIV MONTPELLIER II [FR]; CENTRE NAT RECH SCIENT [FR]) 15 January 2014 (2014-01-15)</p>	<p>1-4,7, 10,13, 17,18, 20-22, 26-28</p>
A	<p>paragraph [0021] - paragraph [0029]; figure 1 paragraphs [0057], [0058]; figure 2 pages 178, 179 paragraphs [0072], [0075]; figure 3</p> <p style="text-align: center;">-----</p>	<p>8,9</p>
X	<p>US 2008/211492 A1 (TSUKADA KEIJI [JP] ET AL) 4 September 2008 (2008-09-04)</p> <p>sentence 138, paragraph 136; figures 1-3 paragraph [0145] - paragraph [0146]; figures 9, 10 paragraphs [0045], [0072]</p> <p style="text-align: center;">-----</p>	<p>1,4,7, 13,17, 20-22, 25,26,28</p>
X	<p>US 2013/300406 A1 (PEPKA GARY T [US] ET AL) 14 November 2013 (2013-11-14)</p> <p>abstract paragraphs [0024], [0025]; figure 1 paragraph [0030]; figure 5</p> <p style="text-align: center;">-----</p>	<p>1,2,5, 12,18, 20-22, 26,28</p>

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/US2018/028475

Patent document cited in search report	Publication date	Patent family member(s)	Publication date	
US 2013207648	A1	15-08-2013	CN 102859393 A	02-01-2013
			CN 102870013 A	09-01-2013
			DE 102010031142 A1	10-11-2011
			DE 102010031147 A1	10-11-2011
			EP 2567264 A2	13-03-2013
			EP 2567265 A2	13-03-2013
			RU 2012152545 A	20-06-2014
			US 2013193959 A1	01-08-2013
			US 2013207648 A1	15-08-2013
			WO 2011138150 A2	10-11-2011
			WO 2011138151 A2	10-11-2011
US 2015022193	A1	22-01-2015	US 2015022193 A1	22-01-2015
			WO 2015009441 A1	22-01-2015
EP 2685273	A1	15-01-2014	BR 112015000765 A2	27-06-2017
			CN 104969085 A	07-10-2015
			EP 2685273 A1	15-01-2014
			EP 2872911 A1	20-05-2015
			ES 2585007 T3	03-10-2016
			JP 6335894 B2	30-05-2018
			JP 2015524919 A	27-08-2015
			KR 20150083072 A	16-07-2015
			RU 2015104778 A	10-09-2016
			US 2015168507 A1	18-06-2015
			WO 2014009516 A1	16-01-2014
US 2008211492	A1	04-09-2008	JP 3987941 B2	10-10-2007
			JP WO2006109382 A1	09-10-2008
			US 2008211492 A1	04-09-2008
			WO 2006109382 A1	19-10-2006
US 2013300406	A1	14-11-2013	EP 2823327 A1	14-01-2015
			EP 3139190 A1	08-03-2017
			JP 2015517657 A	22-06-2015
			JP 2018021925 A	08-02-2018
			KR 20150018521 A	23-02-2015
			US 2013300406 A1	14-11-2013
			US 2018011150 A1	11-01-2018
WO 2013169455 A1	14-11-2013			