



(51) International Patent Classification:

G01S 17/42 (2006.01) G01S 7/481 (2006.01)
G01S 17/87 (2006.01) G01S 17/93 (2006.01)

(21) International Application Number:

PCT/US2016/051859

(22) International Filing Date:

15 September 2016 (15.09.2016)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

14/859,341 20 September 2015 (20.09.2015) US

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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, 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, 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))

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:

8 September 2017

(54) Title: LIGHT DETECTION AND RANGING (LIDAR) SYSTEM WITH DUAL BEAM STEERING

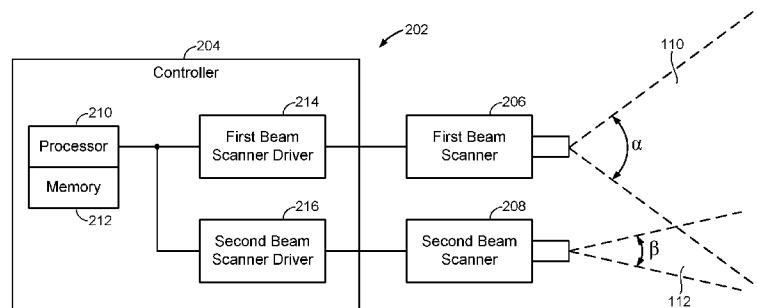


FIG. 2

(57) Abstract: A light detection and ranging (LIDAR) apparatus includes dual beam scanners with dual beam steering. A first beam scanner in the LIDAR apparatus scans a wider area in one or more of a first plurality of scan patterns, and a second beam scanner in the LIDAR apparatus scans a narrower area in one or more of a second plurality of scan patterns different from the first plurality of scan patterns.

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2016/051859

A. CLASSIFICATION OF SUBJECT MATTER

INV. G01S17/42 G01S17/87 G01S7/481 G01S17/93
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)
G01S

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 2007/219720 A1 (TREPAGNIER PAUL G [US] ET AL) 20 September 2007 (2007-09-20) paragraphs [0043] - [0134] figures 1-13 -----	1-30
X	US 5 638 164 A (LANDAU UZI [IL]) 10 June 1997 (1997-06-10)	23-30
A	column 2, line 27 - column 5, line 3 column 5, line 31 - column 9, line 35 figures 1-3 -----	1-22
X	US 8 818 609 B1 (BOYKO ALEKSEY S [US] ET AL) 26 August 2014 (2014-08-26)	23-30
A	column 3, line 1 - column 22, line 24 figures 1-9 -----	1-22
	-/-	



Further documents are listed in the continuation of Box C.



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Date of the actual completion of the international search

31 July 2017

Date of mailing of the international search report

07/08/2017

Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

International application No
PCT/US2016/051859

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2010/328644 A1 (LU YUESHENG [US] ET AL) 30 December 2010 (2010-12-30) paragraphs [0003], [0004], [0009] - [0018], [0024] - [0037] figures 1-4 -----	1-30
E	WO 2016/153687 A1 (GOOGLE INC [US]) 29 September 2016 (2016-09-29) paragraphs [0032] - [0185] figures 1-10 -----	1-30

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2016/051859

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2007219720 A1	20-09-2007	US 2007219720 A1	20-09-2007
		US 2012035788 A1	09-02-2012
		US 2013131908 A1	23-05-2013
		WO 2008048707 A2	24-04-2008

US 5638164 A	10-06-1997	IL 110611 A	10-01-1997
		US 5638164 A	10-06-1997

US 8818609 B1	26-08-2014	NONE	

US 2010328644 A1	30-12-2010	US 2010328644 A1	30-12-2010
		US 2012008129 A1	12-01-2012
		US 2015332102 A1	19-11-2015
		US 2016306041 A1	20-10-2016

WO 2016153687 A1	29-09-2016	US 2016282468 A1	29-09-2016
		US 2017176597 A1	22-06-2017
		WO 2016153687 A1	29-09-2016
