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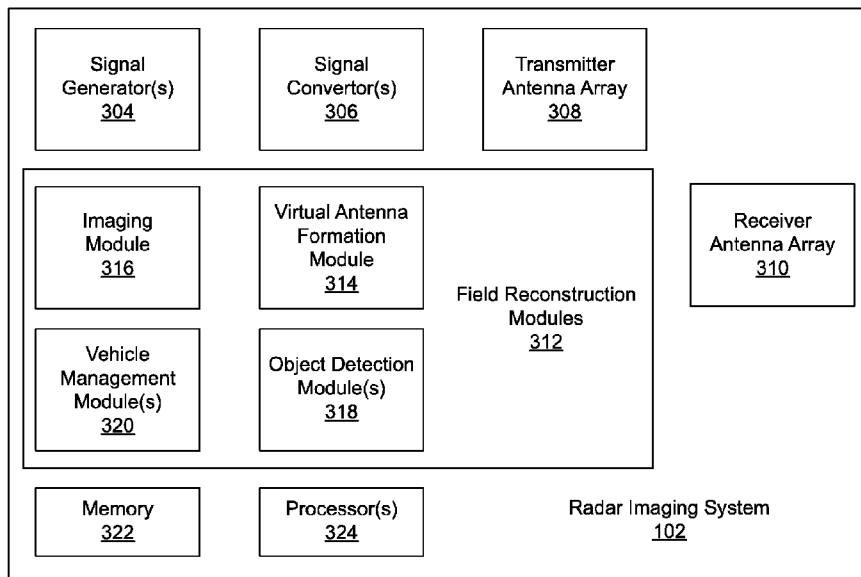
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(54) Title: OBJECT SENSING FROM A POTENTIALLY MOVING FRAME OF REFERENCE WITH VIRTUAL APERTURES FORMED FROM SPARSE ANTENNA ARRAYS

FIG. 3



(57) Abstract: In some examples, a first plurality of independent waveforms can be generated and converted into a first plurality of independent transmitted radar signals transmitted towards a field of view using a transmitter array comprising a first plurality of transmitter antennas. Further, a second plurality of receive radar signals to the first plurality of independent transmitted radar signals can be received from the field of view using a receiver array comprising a second plurality of receiver antennas. The second plurality of receive radar signals can be combined to form a combined receive radar signal and a representation of one or more areas of interest in the field of view can be provided using the combined receive radar signal. One or more attributes of the one or more areas of interest can be rendered using the representation of the one or more areas of interest.



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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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:

06 August 2020 (06.08.2020)

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2019/062424

A. CLASSIFICATION OF SUBJECT MATTER					
INV.	G01S13/50	G01S13/89			
ADD.	G01S7/03	G01S13/56	G01S13/58	G01S13/90	G01S13/931
	G01S7/35	G01S13/02			
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
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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2018/147929 A2 (UNIV WASHINGTON [US]) 16 August 2018 (2018-08-16)	1-5,7,8, 31,32, 58-61, 64,65, 90,91
A	paragraphs [0044] - [0059], [0066] - [0072], [0076] - [0081], [0109] - [0111], [0115], [0131] - [0133]; figures 1,5 -----	6,62,63

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 18 February 2020	Date of mailing of the international search report 06/07/2020
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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 Reeck, Guido
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2019/062424

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2018147929 A2	16-08-2018	EP 3552041 A2	16-10-2019
		JP 2020504811 A	13-02-2020
		WO 2018147929 A2	16-08-2018

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2019/062424

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.:

1-8, 31, 32, 58-65, 90, 91

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.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1-8, 31, 32, 58-65, 90, 91
radar imaging system and method in relative motion to a target object

2. claims: 9-14, 25, 33-35, 37, 39, 40, 66-71, 84, 92-94, 96, 98, 99
imaging module for a radar imaging system and method

3. claims: 26-29, 36, 38, 41, 42, 85-88, 95, 97, 100, 101
areas of interest for a radar imaging system and method

4. claims: 43-45, 50, 54, 72, 102-104, 109, 113
objects within a field of view of a radar imaging system and method

5. claims: 46-49, 105-108
resolution for areas of interest of a radar imaging system and method

6. claims: 15-17, 73-76
signal generation for a radar imaging system and method

7. claims: 18-24, 30, 56, 57, 77-83, 89, 115, 116
virtual antenna formation module for a radar imaging system and method

8. claims: 51, 52, 110, 111
receive antenna arrangement for a radar imaging system and method

9. claims: 55, 114
receive array for a radar imaging system and method

10. claims: 53, 112

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

vehicle management module for a radar imaging system and
method
