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G01S 13/95 (2006.01) G01S 7/40 (2006.01)

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(54) Title: A SYSTEM FOR MONITORING A MARITIME ENVIRONMENT

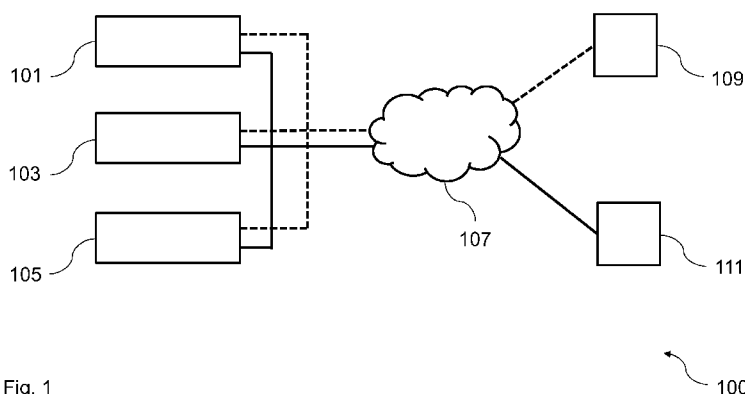


Fig. 1

(57) Abstract: A system for monitoring a maritime environment The invention relates to a system (100) for monitoring a maritime environment, the system (100) comprising a plurality of radio detection and ranging devices (101, 103, 105) being configured to perform a synchronous detection of an object in the maritime environment, to transmit a plurality of sensor signals respectively relating to a location of the object in the maritime environment over a communication network(107), and to receive a synchronization signal, each radio detection and ranging device (101, 103, 105) being configured to synchronize its operation according to the synchronization signal, a synchronization source (109) being configured to generate the synchronization signal for synchronizing operations of the plurality of radio detection and ranging devices(101, 103, 105), and to provide the synchronization signal over the communication network (107) to the plurality of radio detection and ranging devices(101, 103, 105), and a processing device (111) being configured to receive the plurality of sensor signals from the plurality of radio detection and ranging devices(101, 103, 105), and to determine the location of the object in the maritime environment upon the basis of the plurality of sensor signals.



## INTERNATIONAL SEARCH REPORT

International application No  
PCT/EP2015/077744

A. CLASSIFICATION OF SUBJECT MATTER		
INV.	G01S13/87 G01S7/40	G01S7/00 G01S13/95 G01S13/86 G01S13/93
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, INSPEC		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2011/032141 A1 (ELLEAUME PHILIPPE [FR]) 10 February 2011 (2011-02-10)	1-7,15, 16
Y	abstract; figures 4,5,8 paragraphs [0002], [0006], [0012], [0033], [0043], [0052] - [0066], [0074], [0078], [0084], [0091]	6,14
Y	US 2012/188125 A1 (POMIETLASZ DANIEL J [US]) 26 July 2012 (2012-07-26)	6
A	paragraphs [0002], [0003], [0009] abstract; figures 1,5	1-5,7, 15,16
X	WO 2010/067057 A2 (QINETIQ LTD [GB]; NEW CHRISTOPHER [GB]; LAVELL-SMITH ALAN PETER [GB]) 17 June 2010 (2010-06-17)	1-7,15, 16
Y	abstract; figure 4 page 2, line 30 - page 3, line 30 page 15, line 22 - page 22, line 7	1,8,9, 15,16
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<input checked="" type="checkbox"/>	Further documents are listed in the continuation of Box C.	<input checked="" type="checkbox"/> 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	"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	
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"P" document published prior to the international filing date but later than the priority date claimed		
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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 Grübl, Alexander	

## INTERNATIONAL SEARCH REPORT

International application No  
PCT/EP2015/077744

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 2013/194126 A1 (PAOLETTI PAOLO ALBERTO [IT]) 1 August 2013 (2013-08-01)	1-7,15, 16
Y	abstract; figures 1,2,3 paragraphs [0001], [0016], [0020], [0034] - [0041], [0056], [0059], [0060], [0067], [0095]	14
X	US 2010/097263 A1 (VACANTI DAVID C [US]) 22 April 2010 (2010-04-22)	1-5,15, 16
Y	abstract; figures 1,4 paragraphs [0001], [0012] - [0023]	10,14
X	CN 101 738 600 A (UNIV WUHAN) 16 June 2010 (2010-06-16)	1,8,15, 16
	abstract; claim 1 paragraphs [0001] - [0003], [0036] - [0038]	
Y	GB 2 393 871 A (CODAR OCEAN SENSORS LTD [US]) 7 April 2004 (2004-04-07)	1,8,15, 16
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Y	GAD A ET AL: "Data fusion architecture for maritime surveillance", INFORMATION FUSION, 2002. PROCEEDINGS OF THE FIFTH INTERNATIONAL CONFERENCE ON JULY 8-11, 2002, PISCATAWAY, NJ, USA, IEEE, vol. 1, 8 July 2002 (2002-07-08), pages 448-455, XP010595155, ISBN: 978-0-9721844-1-0	1,9,15, 16
	abstract sections 3, 3.2.b	
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## INTERNATIONAL SEARCH REPORT

International application No  
PCT/EP2015/077744

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 2008/165046 A1 (FULLERTON LARRY W [US] ET AL) 10 July 2008 (2008-07-10)	1,11,12, 15,16
Y	abstract; figures 2,4,5 paragraphs [0010], [0087], [0088], [0091], [0097], [0098], [0148] -----	13
Y	US 2009/271054 A1 (DOKKEN SVERRE THUNE [MC]) 29 October 2009 (2009-10-29) paragraphs [0009], [0021], [0052] - [0061], [0085], [0086], [0181]; figures 3,4a -----	13
Y	US 2013/169809 A1 (GRIGNAN PATRICK [FR] ET AL) 4 July 2013 (2013-07-04) paragraphs [0001], [0068], [0071], [0075] -----	14
Y	GB 2 500 931 A (SELEX GALILEO LTD [GB]) 9 October 2013 (2013-10-09) page 3, paragraph 4 -----	14
Y	US 2005/062615 A1 (BRAEUCHLE GOETZ [DE] ET AL) 24 March 2005 (2005-03-24) paragraphs [0002], [0010], [0012], [0013], [0022], [0023] -----	10
Y	EP 2 604 478 A1 (DELPHI TECH INC [US]) 19 June 2013 (2013-06-19) paragraphs [0002], [0006], [0007], [0008], [0036] - [0040] -----	10

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/EP2015/077744

## 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.:

### 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: 1-7, 15, 16

Special technical feature: The synchronization source comprises a global navigation satellite system receiver. Technical effect: A global navigation satellite system receiver can provide a stable timebase. Problem: Providing a stable timebase.

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## 2. claim: 8

Special technical feature: Determine a meteorological or oceanographic parameter of the maritime environment. Technical effect: Meteorological or oceanographic parameter of the maritime environment are obtained. Problem: Providing meteorological or oceanographic parameter of the maritime environment.

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## 3. claim: 9

Special technical feature: Combine the plurality of sensor signals using a state estimation filter. Technical effect: A common situation picture is obtained. Problem: To obtain a common situation picture.

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## 4. claim: 10

Special technical feature: Detect a malfunction of a radio detection and ranging device. Technical effect: A degradation of device functionality is detected. Problem: To indicate degradation of device functionality.

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## 5. claims: 11, 12

Special technical feature: A plurality of receiving devices being configured to perform a synchronous reception of an electromagnetic signal originating from a further object in the maritime environment. Technical effect: Electromagnetic signals can be detected passively. Problem: Supporting object detection.

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## 6. claim: 13

Special technical feature: A further radio detection and ranging device. Technical effect: Can be used for an initial detection of the object. Problem: Initially detect the object.

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FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

7. claim: 14

Special technical feature: A man-over-board radio detection and ranging device. Technical effect: Can detect a human falling overboard. Problem: Detect a human falling overboard.

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## INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2015/077744

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