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61/578,042 20 December 2011 (20.12.2011) US
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- (74) Agents: JAMES, Kurt, F. et al.; Senniger Powers LLP, 100 North Broadway, 17th Floor, St. Louis, Missouri 63102 (US).
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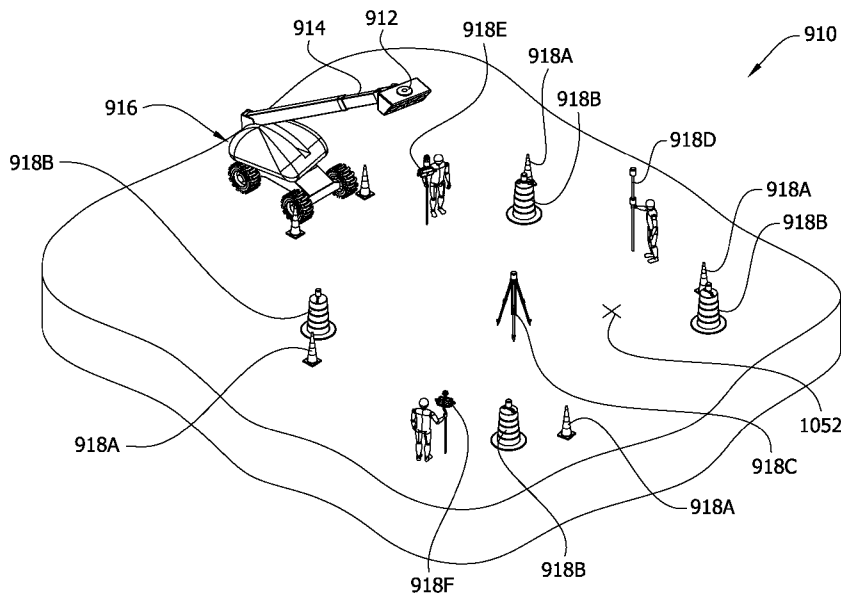
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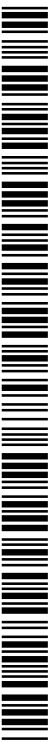
- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

- (88) Date of publication of the international search report:
19 December 2013

(54) Title: SCANNERS, TARGETS, AND METHODS FOR SURVEYING



(57) Abstract: Apparatus and methods useful in surveying to provide information rich models. In particular, information not readily or possibly provided by conventional survey techniques can be provided. In some versions targets provide reference for baseline positioning or improving position information otherwise acquired. Scanning may be carried out in multiple locations and merged to form a single image. Machine mounted and hand mounted scanning apparatus is disclosed.



INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2012/071100

A. CLASSIFICATION OF SUBJECT MATTER IPC(8) - G01S 13/90 (2013.01) USPC - 342/25A 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) IPC(8) - G01S 13/88, 13/89, 13/90 (2013.01) USPC - 348/168; 342/25A, 179 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched CPC - G01S 13/88, 13/89, 13/90 (2013.01) Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) Google, Orbit, Google Patents																															
C. DOCUMENTS CONSIDERED TO BE RELEVANT <table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>Y</td> <td>US 5749549 (ASHAJEE) 12 May 1998 (12.05.1998) entire document</td> <td>1-20,78-85</td> </tr> <tr> <td>Y</td> <td>US 2005/0270225 A1 (TOKORO) 08 December 2005 (08.12.2005) entire document</td> <td>1-20,47,48</td> </tr> <tr> <td>Y</td> <td>TOPPERINDUSTRIES. Bouys. 12 October 2011. [retrieved on 2013-10-16]. Retrieved from the Internet: <URL: http://web.archive.org/web/20111012011805/http://www.topperfloats.com/en_us/bouys.asp>. entire document.</td> <td>1-20,36,37,47,48,80</td> </tr> <tr> <td>Y</td> <td>WO 2008/001092 (BURCHETT et al) 03 January 2008 (03.01.2008) entire document</td> <td>3,4,36,37,78-85</td> </tr> <tr> <td>Y</td> <td>US 2009/0309724 A1 (CECIL) 17 December 2009 (17.12.2009) entire document</td> <td>9-11,47,48,82</td> </tr> <tr> <td>Y</td> <td>WO 2011/146517 A2 (BROWN et al) 24 November 2011 (24.11.2011) entire document</td> <td>10,11,14</td> </tr> <tr> <td>Y</td> <td>BIRCH et al. A Configurable Multi-Sensor Tripod For the Study of Near-Bottom Ocean Processes. 2003. [retrieved on 2013-10-16]. Retrieved from the Internet: <URL: http://www.aslenv.com/reports/Oceans2003-Norton.pdf>. entire document.</td> <td>12-16,79,81</td> </tr> <tr> <td>Y</td> <td>US 2011/0018756 A1 (WISE et al) 27 January 2011 (27.01.2011) entire document</td> <td>18,36,37</td> </tr> <tr> <td>Y</td> <td>US 5748139 (KAWAKAMI et al) 05 May 1998 (05.05.1998) entire document</td> <td>47,48</td> </tr> </tbody> </table>		Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	Y	US 5749549 (ASHAJEE) 12 May 1998 (12.05.1998) entire document	1-20,78-85	Y	US 2005/0270225 A1 (TOKORO) 08 December 2005 (08.12.2005) entire document	1-20,47,48	Y	TOPPERINDUSTRIES. Bouys. 12 October 2011. [retrieved on 2013-10-16]. Retrieved from the Internet: <URL: http://web.archive.org/web/20111012011805/http://www.topperfloats.com/en_us/bouys.asp >. entire document.	1-20,36,37,47,48,80	Y	WO 2008/001092 (BURCHETT et al) 03 January 2008 (03.01.2008) entire document	3,4,36,37,78-85	Y	US 2009/0309724 A1 (CECIL) 17 December 2009 (17.12.2009) entire document	9-11,47,48,82	Y	WO 2011/146517 A2 (BROWN et al) 24 November 2011 (24.11.2011) entire document	10,11,14	Y	BIRCH et al. A Configurable Multi-Sensor Tripod For the Study of Near-Bottom Ocean Processes. 2003. [retrieved on 2013-10-16]. Retrieved from the Internet: <URL: http://www.aslenv.com/reports/Oceans2003-Norton.pdf >. entire document.	12-16,79,81	Y	US 2011/0018756 A1 (WISE et al) 27 January 2011 (27.01.2011) entire document	18,36,37	Y	US 5748139 (KAWAKAMI et al) 05 May 1998 (05.05.1998) entire document	47,48
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<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/>																															
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"P" document published prior to the international filing date but later than the priority date claimed																															
Date of the actual completion of the international search 16 October 2013	Date of mailing of the international search report 29 OCT 2013																														
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774																														

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2012/071100

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 Extra 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 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.:
1-20, 36-37, 47-48, 78-85

- 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.

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/US2012/071100

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claims 1-20, 36-37, 47-48, 78-85, drawn to a target comprising a support on which a generally symmetrical structure and radar reflector are mounted.

Group II, claims 21-35, 38-46, 49, 86-91, drawn to a method and apparatus of imaging a zone to produce a three dimensional image.

Group III, claims 50-51, 77, drawn to a target comprising a marking device for marking a surface.

Group IV, claims 52-54, 61-64, drawn to a method of radar imaging to create a synthetic aperture radar image.

Group V, claims 55-60, drawn to a method for locating a position within a scan.

Group VI, claims 65-76, drawn to a synthetic aperture radar scanning pod comprising a portable housing and an adaptor.

The inventions listed as Groups I-VI do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: the special technical feature of the Group I invention: a target comprising a support on which a generally symmetrical structure and radar reflector are mounted, the reflector mounted in a predetermined position with respect to the generally symmetrical structure as claimed therein is not present in the invention of Groups II-VI. The special technical feature of the Group II invention: a method and apparatus of imaging a zone comprising a flash source for emitting a flash of electromagnetic radiation detectable by a scanning device, and processing positional and image data to produce a three dimensional image of the zone as claimed therein is not present in the invention of Groups I, III-VI. The special technical feature of the Group III invention: a target comprising a marking device for marking a surface in the zone, scanning ground visible markings and using the ground visible marking image for location as claimed therein is not present in the invention of Groups I, II, IV-VI. The special technical feature of the Group IV invention: a method of radar imaging comprising placing targets at different points whose position is known, moving the radar device and making scans at different locations, and creating a synthetic aperture radar image as claimed therein is not present in the invention of Groups I, II, III or V-VI. The special technical feature of the Group V invention: a method for locating a position within a scan comprising scanning the position of a target and sending a signal including information regarding position of target as claimed therein is not present in the invention of Groups I-IV, VI. The special technical feature of the Group VI invention: a synthetic aperture radar scanning pod comprising a portable housing, an adaptor for selectively and releasably mounting the housing on a mechanical support, first and second radar devices comprising three antennas as claimed therein is not present in the invention of Groups I-V.

Groups I, II, III, IV, V and VI lack unity of invention because even though the inventions of these groups require the technical feature of a method and apparatus for imaging a zone using a target including a support and a radar reflector, acquiring photographic data and correlating the target between reflected radar and photographic data, illuminating a zone for imaging, receiving return reflections and creating a radar image, this technical feature is not a special technical feature as it does not make a contribution over the prior art in view of US 2011/0018756 A1 (WISE et al) 27 January 2011 (27.01.2011), paragraphs 5-7, 17-20; US 2011/0202277 A1 (HADDAD) 18 August 2011 (18.08.2011), paragraphs 8, 12, 67, 106, 115 and WO 2011/146517 A2 (BROWN et al) 24 November 2011 (24.11.2011), abstract, paragraphs 29-30, 33, 59, 99, 140.

Since none of the special technical features of the Group I, II, III, IV, V or VI inventions are found in more than one of the inventions, unity of invention is lacking.