

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
28 February 2008 (28.02.2008)

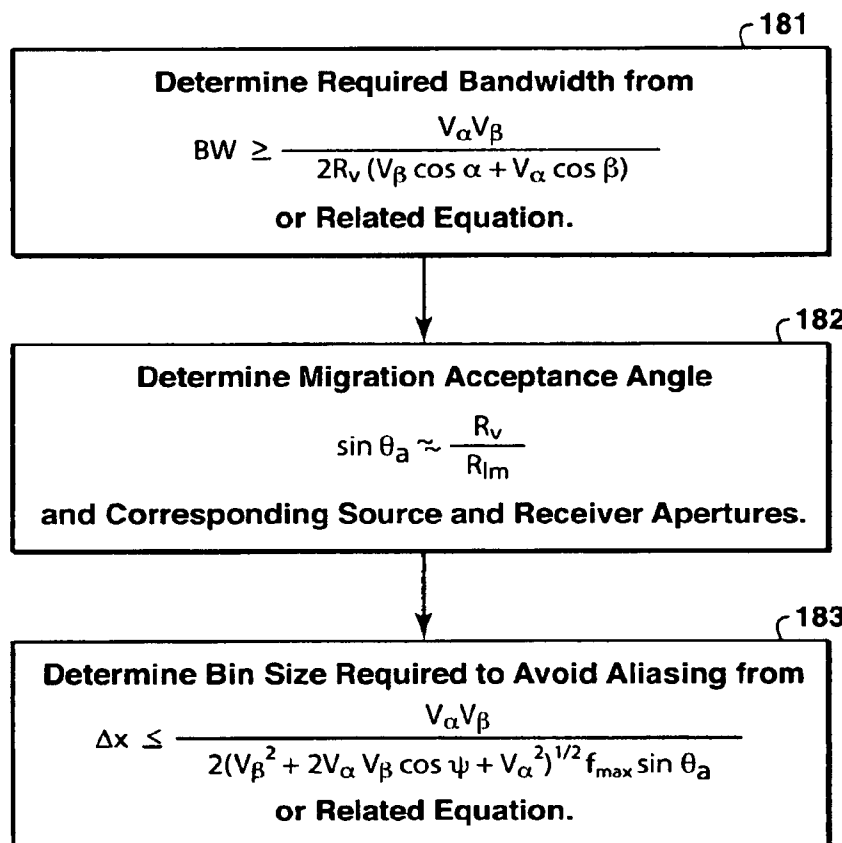
PCT

(10) International Publication Number
WO 2008/024150 A3

- (51) International Patent Classification: *G01V 1/28* (2006.01) *G01V 1/36* (2006.01) [US/US]; 3133 Buffalo Speedway, #2201, Houston, TX 77098 (US).
- (21) International Application Number: PCT/US2007/014942
- (22) International Filing Date: 27 June 2007 (27.06.2007)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data: 60/839,209 22 August 2006 (22.08.2006) US
- (71) Applicant (for all designated States except US): **EXXON-MOBIL UPSTREAM RESEARCH COMPANY** [US/US]; P.O. Box 2189 (CORP-URC-SW 337), Houston, TX 77252-2189 (US).
- (72) Inventor; and
- (75) Inventor/Applicant (for US only): **MEIER, Mark, A.**
- (74) Agents: **BROWN, Adam, P.** et al.; Exxonmobil Upstream Research Company, P.O. Box 2189 (CORP-URC-SW 337), Houston, TX 77252-2189 (US).
- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, 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, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, 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, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM,

[Continued on next page]

(54) Title: CONVERTED MODE SEISMIC SURVEY DESIGN



(57) Abstract: Method for designing a converted mode (PS or SP) seismic survey to accomplish specified vertical and lateral resolution objectives at target depth. An equation (181) is provided for determining the minimum bandwidth required for a desired vertical resolution at a selected scattering angle, as a function of incident and reflected wave velocities, one of which is the P-wave velocity and the other is the S-wave velocity. A second equation (182) is provided for determining migration acceptance angle from the desired vertical and lateral resolutions. Source and receiver apertures may then be determined by ray tracing. Finally, a third equation (183) is provided for the maximum bin size to avoid aliasing, given the migration acceptance angle and a maximum frequency needed to achieve the bandwidth requirement. Source and receiver spacing may then be based on the maximum bin size.

WO 2008/024150 A3



ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, 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*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

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

23 October 2008

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US07/14942

A. CLASSIFICATION OF SUBJECT MATTER
 IPC: G01V 1/28(2006.01),1/36(2006.01)

 USPC: 367/38,50,51,52,56,58
 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)
 U.S. : 367/38, 50, 51, 52, 56, 58

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)
 EAST - converted, PP and PS, bandwidth, bin, angle, frequency

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Mahmoudian, et al. Three parameter AVO inversion with PP and PS data using offset binning. CREWES Project, SEG Report 2004	1-8
A	US 6128580 (Thomsen) 3 Oct. 2000 (03.10.2000)	1-8
A	US 6820010 (Sahai et al) 16 Nov. 2004 (16.11.2004)	1-8
A	US20050105393 (Martinez, et al) 19 May 2005 (19.05.2005)	1-8
A	US 6731568 (Audebert et al) 4 May 2004 (04.05.2004)	1-8


Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:	"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
"A" document defining the general state of the art which is not considered to be of particular relevance	"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
"E" earlier application or patent published on or after the international filing date	"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
"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)	"&"	document member of the same patent family
"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		

Date of the actual completion of the international search
 10 July 2008 (10.07.2008)

Date of mailing of the international search report
14 AUG 2008

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
 Scott Hughes 
 Telephone No. 571-272-3600