(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
11 September 2009 (11.09.2009)

PCT

(10) International Publication Number
WO 2009/111412 A3

(51) International Patent Classification:
E21B 47/12 (2006.01) *E21B 47/16* (2006.01)

(21) International Application Number:
PCT/US2009/035767

(22) International Filing Date:
2 March 2009 (02.03.2009)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/033,249 3 March 2008 (03.03.2008) US

(71) Applicant *(for all designated States except US)*: **INTELLISERV, INC.** [US/US]; 7909 Parkwood Circle Drive, Houston, Texas 77036 (US).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: **HERNANDEZ, Maxima** [MX/US]; 12615 Paloma Park Ln, Houston, Texas 77041 (US).

(74) Agent: **SEGURA, Victor, H.**; National Oilwell Varco, L.P., 7909 Parkwood Circle Drive, Houston, Texas 77036 (US).

(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, 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, ST, 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, 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, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

[Continued on next page]

(54) **Title**: MONITORING DOWNHOLE CONDITIONS WITH DRILL STRING DISTRIBUTED MEASUREMENT SYSTEM

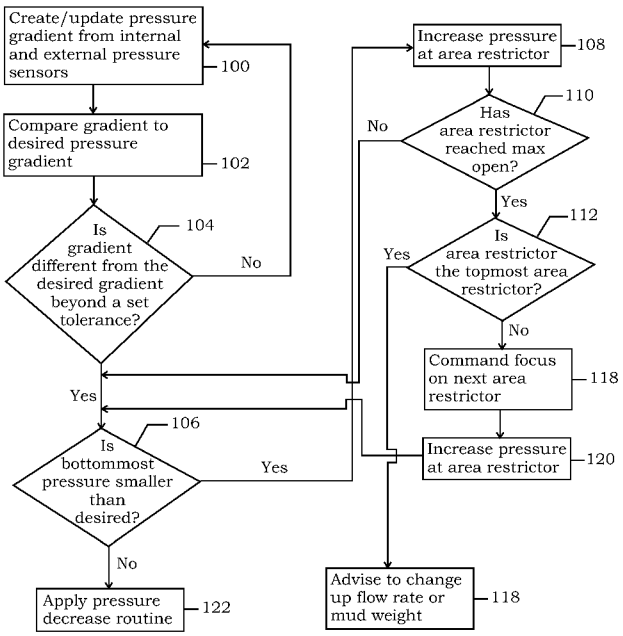


FIG. 7

(57) **Abstract**: A method of monitoring downhole conditions in a borehole includes receiving sensor data through a network of nodes provided at selected positions on a drill string disposed in the borehole. An inference is made about the downhole condition from the sensor data. A determination is made whether the downhole condition matches a target downhole condition within a set tolerance. At least one parameter affecting the downhole condition is selectively adjusted if the downhole condition does not match the target downhole condition within the set tolerance.

WO 2009/111412 A3

— *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:
10 December 2009

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2009/035767

A. CLASSIFICATION OF SUBJECT MATTER

E21B 47/12(2006.01)i, E21B 47/16(2006.01)i

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: E21B 3/06, 47/12, 47/16, G01V 3/18

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean Utility models and applications for Utility models since 1975
Japanese Utility models and applications for Utility models since 1975

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & keywords: downhole electromagnetic network, sensor, parameter adjusting

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6233524 B1 (HARRELL et al.) 15 MAY 2001 See the ABSTRACT, Figs. 1, 4 and Columns 14-17 and Claims 1, 2, 3.	1-4, 8, 10, 11, 18, 19, 21
Y		5-7, 13-17
X	US 6186248 B1 (SILAY et al.) 13 FEBRUARY 2001 See the ABSTRACT, Fig. 6, Column 7 and Claims 1, 2, 3.	1-4, 8, 10, 11, 18, 19, 20
Y		5-7, 13-17
Y	US 2003/0209365 A1 (DOWNTON) 13 NOVEMBER 2003 See the ABSTRACT, Fig. 3 and Paragraphs 23, 26-29.	5-7, 13-17
A	US 5581024 A (MEYER, JR. et al.) 3 DECEMBER 1996 See the ABSTRACT, Fig. 3, Column 11 and Claim 15.	1-21

☐ 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 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	Date of mailing of the international search report
21 OCTOBER 2009 (21.10.2009)	**21 OCTOBER 2009 (21.10.2009)**

Name and mailing address of the ISA/KR
Korean Intellectual Property Office
Government Complex-Daejeon, 139 Seonsa-ro, Seo-gu, Daejeon 302-701, Republic of Korea
Facsimile No. 82-42-472-7140

Authorized officer
NA, Dong Kyu
Telephone No. 82-42-481-8444

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2009/035767

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6233524 B1	15.05.2001	AU 1999-48695 A1	08.07.1999
		CA 2336655 A1	20.01.2000
		CA 2269498 C	11.01.2005
		CA 2235134 C	09.01.2007
		EP 0857249 B1	19.04.2006
		EP 0857249 A2	12.08.1998
		GB 2354325 A	21.03.2001
		US 2003-0014190 A1	16.01.2003
		US 06614360 B1	02.09.2003
		US 06581010 B2	17.06.2003
		US 05842149 A	24.11.1998
		US 06021377 A	01.02.2000
		US 06023443 A	08.02.2000
		US 06084826 A	04.07.2000
		US 06088294 A	11.07.2000
		US 06206108 B1	27.03.2001
		US 06427124 B1	30.07.2002
		WO 1997-015749 A2	01.05.1997
		WO 1996-021871 A1	18.07.1996
		WO 1998-017894 A2	30.04.1998
		WO 2000-003269 A1	20.01.2000
US 6186248 B1	13.02.2001	AU 1999-25791 A1	02.02.1999
		CA 2322893 A1	05.08.1999
		WO 1999-039078 A1	05.08.1999
US 2003-209365 A1	13.11.2003	US 07168507 B2	30.01.2007
US 5581024 A	03.12.1996	CA 2160968 C	23.05.2006
		EP 0713104 A3	06.05.1998
		EP 0713104 B1	28.08.2002
		EP 0713104 A2	22.05.1996