



(51) International Patent Classification:

G01V 3/20 (2006.01) G01V 3/38 (2006.01)
G01V 3/24 (2006.01) E21B 47/00 (2006.01)

(21) International Application Number:

PCT/US2012/031421

(22) International Filing Date:

30 March 2012 (30.03.2012)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

61/469,939 31 March 2011 (31.03.2011) US

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(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, CL, 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, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, 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.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, 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, RS, SE, SI, SK,

[Continued on next page]

(54) Title: FORMATION RESISTIVITY MEASUREMENTS USING PHASE CONTROLLED CURRENTS

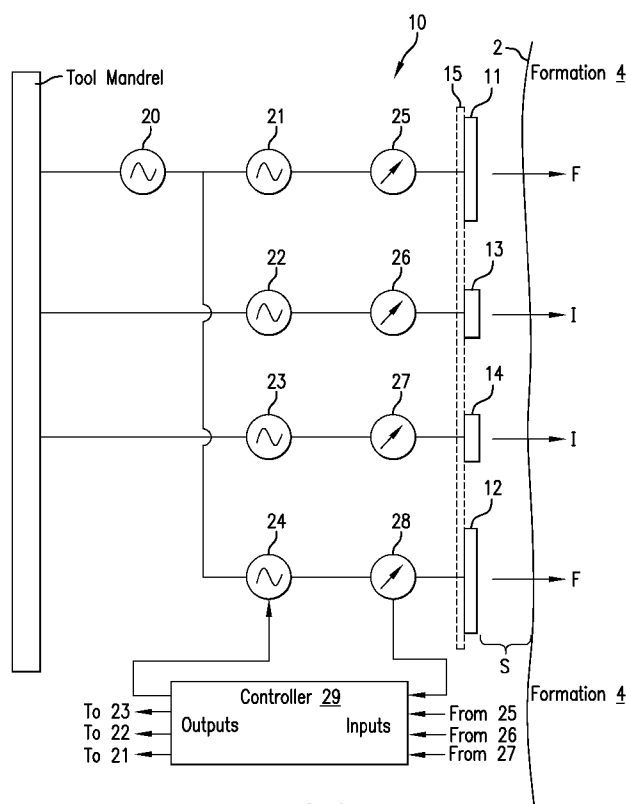


FIG. 2

(57) Abstract: Disclosed is an apparatus for estimating a property of an earth formation penetrated by a borehole. The apparatus includes a carrier configured to be conveyed through the borehole and having a first transmitter electrode configured to inject electrical current into the formation and a first measurement electrode configured to receive electrical current for measurement due to the current injection in order to estimate the property of the earth formation. A controller is configured to determine a phase difference between injected electrical current and received electrical current. A first buckler amplifier is coupled to the first measurement electrode and configured to apply a voltage to the first measurement electrode based on the determined phase difference in order for a phase of current received by the first measurement electrode to be substantially in phase with the current injected by the first transmitter electrode.



SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:**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))*

— *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:

27 December 2012

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/031421**A. CLASSIFICATION OF SUBJECT MATTER*****G01V 3/20(2006.01)i, G01V 3/24(2006.01)i, G01V 3/38(2006.01)i, E21B 47/00(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)

G01V 3/20; G01V 3/00; G01V 1/40

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

Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS(KIPO internal) & Keywords: electrode, current, phase difference, buckler amplifier

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3579098 A (MARCEL L. MOUGNE et al.) 18 May 1971 See column 3, lines 27-40; claim 1 and figure 2.	1-20
A	US 2009-0072833 A1 (LEONTY A. TABAROVSKY) 19 March 2009 See paragraphs 38-41; claims 6, 7 and figure 1.	1-20
A	US 5056067 A (DOUGLAS S. DRUMHELLER) 08 October 1991 See column 3, lines 51-68 and figure 1.	1-20
A	US 2001-0043066 A1 (ROBERT HAWKES et al.) 22 November 2001 See paragraph 50.	1-20

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

* Special categories of cited documents:

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"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

30 OCTOBER 2012 (30.10.2012)

Date of mailing of the international search report

31 OCTOBER 2012 (31.10.2012)

Name and mailing address of the ISA/KR

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2012/031421

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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