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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
16 August 2012 (16.08.2012)

WIPO | PCT

(10) International Publication Number
WO 2012/109247 A3

(51) International Patent Classification:
G01V 5/04 (2006.01) *E21B 47/00* (2006.01)

(21) International Application Number:
PCT/US2012/024150

(22) International Filing Date:
7 February 2012 (07.02.2012)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/440,626 8 February 2011 (08.02.2011) US
13/366,970 6 February 2012 (06.02.2012) US

(71) Applicant *(for CA only)*: **SCHLUMBERGER CANADA LIMITED** [CA/CA]; 525-3rd Avenue Southwest, Calgary, alberta T2P 0G4 (CA).

(71) Applicant *(for FR only)*: **SERVICES PETROLIERS SCHLUMBERGER** [FR/FR]; 42 rue Saint Dominique, F-75007 Paris (FR).

(71) Applicant *(for JP, NL only)*: **SCHLUMBERGER HOLDINGS LIMITED** [GB/GB]; P.O. BOX 71 Craigmuir Chambers, Road Town, Tortola Virgin Island 1110 (GB).

(71) Applicant *(for AL, AM, AU, AZ, BF, BG, BJ, BY, CF, CG, CI, CM, CO, CZ, DE, DK, GA, GN, GQ, GR, GW, HU, ID, IE, IL, IT, KG, KP, KR, KZ, LT, MD, ML, MR, MX, MY, NE, NO, NZ, OM, PL, QA, RO, RU, SI, SK, SN, TD, TG, TH, TJ, TM, TN, TR, TT, UZ, ZA only)*: **SCHLUMBERGER TECHNOLOGY B.V.** [NL/NL]; Parkstraat 83-89, 2514 JG The Hague, NL-2514 The Hague (NL).

(71) Applicant *(for all designated States except US)*: **PRAD RESEARCH AND DEVELOPMENT LIMITED** [GB/GB]; P.O. Box 71, Craigmuir Chambers, Road Town, Tortola Virgin Islands 1110 (GB).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: **CHIROVSKY, Leo** [US/US]; 54 Einstein Way, Eas Windsor, New Jersey 08512 (US). **DURKOWSKI, Anthony** [FR/US]; 21 Kite Court, Lawrenceville, New Jersey 08648 (US). **HILES,**

[Continued on next page]

(54) Title: HIGH VOLTAGE INSULATING SLEEVE FOR NUCLEAR WELL LOGGING

(57) Abstract: A well logging instrument includes an instrument housing to traverse a wellbore penetrating subsurface formations. An electrically operated energy source that emits ionizing radiation is disposed inside the housing. An insulating sleeve is disposed between the energy source and an interior wall of the housing. The insulating sleeve comprises a thin dielectric film arranged in a plurality of tightly fitting layers of dielectric material disposed adjacent to each other and successively. A thickness of each layer and a number of layers is selected to provide a dielectric strength sufficient to electrically insulate the energy source from the housing and to provide a selected resistance to dielectric failure resulting from the ionizing radiation.

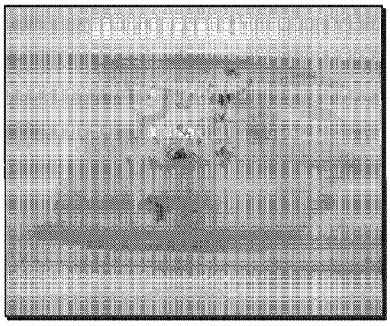

FIG. 1A

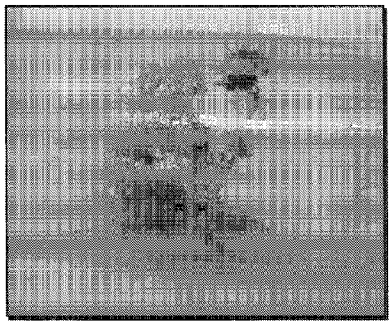

FIG. 1B

WO 2012/109247 A3

Kevin [US/US]; 20 Wallace Raod, Princeton Junction, New Jersey 08550 (US). **REIJONEN, Jani** [FI/US]; 1212 Barclay Blvd., Princeton, New Jersey 08540 (US). **SIMON, Matthieu** [US/US]; 284 Ewing St., Princeton, New Jersey 08558 (US). **WRAIGHT, Peter** [US/US]; 10 Lilac Way, Skillman, New Jersey 08558 (US).

(74) **Agents**: **BERMAN, Jeremy** et al.; 10001 Richmond Avenue, Houston, Texas 77042 (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, 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, SM, 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))*

(88) **Date of publication of the international search report**:
27 December 2012

(15) **Information about Correction**:

Previous Correction:
see Notice of 18 October 2012

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/024150

A. CLASSIFICATION OF SUBJECT MATTER

G01V 5/04(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 5/04; G01T 1/00; H05H 3/06; G01V 5/10

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: well logging, wellbore, energy, source, insulating, sleeve, neutron, ionizing radiation, dielectric failure

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 7692140 B1 (HALL, DAVID R. et al.) 06 April 2010 See abstract, columns 4-6, claims 1,5,8,15, and figures 3-5,14	1-19
A	US 7633058 B2 (STOLLER, CHRISTIAN et al.) 15 December 2009 See abstract, columns 3-5, claims 1-4,9,14-15, and figures 2-6	1-19
A	US 2009-0135982 A1 (GROVES, JOEL L.) 28 May 2009 See abstract, pages 2-3, claims 1-5, and figures 1-2b	1-19
A	US 2002-0014583 A1 (BOTHNER, RONALD E.) 07 February 2002 See abstract, pages 2-4, claims 1,12,17, and figure 1	1-19

☐ 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
30 AUGUST 2012 (30.08.2012)	**12 SEPTEMBER 2012 (12.09.2012)**

Name and mailing address of the ISA/KR
Korean Intellectual Property Office
189 Cheongsa-ro, Seo-gu, Daejeon Metropolitan City, 302-701, Republic of Korea
Facsimile No. 82-42-472-7140

Authorized officer
Park young Keun
Telephone No. 82-42-481-3462

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2012/024150

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 7692140 B1	06.04.2010	US 2010-0155137 A1	24.06.2010
		US 2010-0155589 A1	24.06.2010
		US 7897914 B2	01.03.2011
		US 7897915 B2	01.03.2011
US 7633058 B2	15.12.2009	CN 101451433 A	10.06.2009
		EP 2245483 A2	03.11.2010
		US 2009-0140134 A1	04.06.2009
		WO 2009-073646 A2	11.06.2009
		WO 2009-073646 A3	05.11.2009
		WO 2009-073646 A4	23.12.2009
US 2009-0135982 A1	28.05.2009	CN 101553076 A	07.10.2009
		EP 2215898 A1	11.08.2010
		US 2011-0169492 A1	14.07.2011
		WO 2009-070535 A1	04.06.2009
US 2002-0014583 A1	07.02.2002	AU 2002-247388 B2	13.12.2007
		AU 2003-205366 A1	02.09.2003
		CA 2431288 A1	15.08.2002
		CA 2431288 C	21.08.2007
		CA 2469456 A1	20.03.2003
		CA 2469456 C	05.08.2008
		CA 2475153 A1	14.08.2003
		CA 2509603 A1	14.12.2005
		CA 2509603 C	29.07.2008
		CA 2527331 A1	30.05.2006
		CA 2530915 A1	30.06.2006
		CA 2530915 C	08.06.2010
		CA 2537502 A1	23.08.2006
		CA 2537502 C	29.04.2008
		CA 2543877 A1	22.10.2006
		CA 2543877 C	16.06.2009
		EP 1358396 A1	05.11.2003
		EP 1358396 B1	12.11.2008
		EP 1425614 A1	09.06.2004
		GB 2404681 A	09.02.2005
		GB 2421748 A	05.07.2006
		GB 2423541 A	30.08.2006
		GB 2425553 A	01.11.2006
		GB 2443293 A	30.04.2008
		NO 20041030 A	07.05.2004
		US 2002-0104653 A1	08.08.2002
		US 2002-0170711 A1	21.11.2002
		US 2003-0147360 A1	07.08.2003
		US 2004-0221986 A1	11.11.2004
		US 2005-0139759 A1	30.06.2005
		US 2005-0211433 A1	29.09.2005
		US 2005-0269106 A1	08.12.2005

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2012/024150

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		US 2005-0274511 A1	15.12.2005
		US 2005-0274518 A1	15.12.2005
		US 6736210 B2	18.05.2004
		US 6825459 B2	30.11.2004
		US 6915849 B2	12.07.2005
		US 7000692 B2	21.02.2006
		US 7185700 B2	06.03.2007
		US 7350569 B2	01.04.2008
		US 7407006 B2	05.08.2008
		US 7513305 B2	07.04.2009
		WO 02-063137 A1	15.08.2002
		WO 03-023454 A1	20.03.2003
		WO 03-067828 A1	14.08.2003