

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
2 April 2009 (02.04.2009)

PCT

(10) International Publication Number
WO 2009/042629 A3

- (51) International Patent Classification:
H01L 41/08 (2006.01) H01L 29/78 (2006.01)
H01L 41/24 (2006.01)
- (21) International Application Number:
PCT/US2008/077431
- (22) International Filing Date:
24 September 2008 (24.09.2008)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
60/974,590 24 September 2007 (24.09.2007) 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, 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, 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
 — before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

[Continued on next page]

(54) Title: FLEXTENSIONAL TRANSDUCER WITH VARIABLE BEAM PATTERN AND FREQUENCY CONTROL

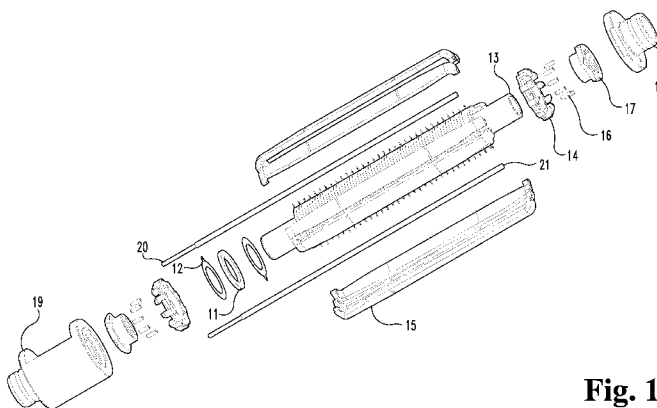


Fig. 1

(57) Abstract: A flextensional transducer for use in the instrumentation of an oil well drill bit includes a stack of piezoceramic elements arranged to define a longitudinal axis and to move longitudinally in response to an electric signal, and a plurality of flexible, generally arcuate longitudinal ribs directly or indirectly connected to the piezo stack so that the ends of the ribs move longitudinally in response to the longitudinal movement of the piezo stack. This longitudinal movement of the ends of the ribs causes the middle portions of the ribs to flex radially, thus producing acoustic waves. The transducer is designed to operate in the hostile environment of the drilling bit of an oil well, and operates effectively at temperatures of at least -40°C to 150°C. The transducer provides sound waves at a frequency of about 15 KHz, with a -6dB bandwidth of 5KHz to 25 KHz and at a sound pressure of at least 2 kPa. The piezoceramic elements may be made of a material having a base formula of : $Pb_xSr_{(1-x)}(Mn_{1/3}Sb_{2/3})_{(1-y)}(Zr_zTi_{1-z})_yO_3$ wherein x is in the range of 0.95 to 0.99; wherein y is in the range of 0.92 to 0.97; and wherein z is in the range of 0.45 to 0.55; with the composition further including one or more dopants selected from the group consisting of : PbO, CeO₂, SnO₂, Sm₂O₃, TeO₂, MoO₃, Nb₂O₅, SiO₂, CuO, CdO, HfO₂, Pr₂O₃, and mixtures thereof.

WO 2009/042629 A3



(88) Date of publication of the international search report:
28 May 2009

A. CLASSIFICATION OF SUBJECT MATTER**H01L 41/08(2006.01)i, H01L 41/24(2006.01)i, H01L 29/78(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 H01L, G01V

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)

eKIPASS (KIPO internal) & keyword : "flexextensional", "transducer", "piezoceramic"

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 7207397 B2 (KENICHIRO MIYAMOTO et al.) 24 April 2007 See figures 2-4 and claims 1-9.	1-12
A	US 6614143 B2 (JINDONG ZHANG et al.) 2 September 2003 See abstract; figure 3 and claim 1.	1-12
A	US 5069308 A (HEZHU YIN et al.) 3 December 1991 See abstract; figure 6 and claim 1.	1-12
A	US 4674067 A (JOSEPH ZEMANEK JR.) 16 June 1987 See abstract and claim 1.	1-12

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

* Special categories of cited documents:

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"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

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"&" document member of the same patent family

Date of the actual completion of the international search

07 APRIL 2009 (07.04.2009)

Date of mailing of the international search report

07 APRIL 2009 (07.04.2009)

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

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Telephone No. 82-42-481-5728



INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2008/077431

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