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| 61/487,868 | 19 May 2011 (19.05.2011) | US |
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| 13/241,906 | 23 September 2011 (23.09.2011) | 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.

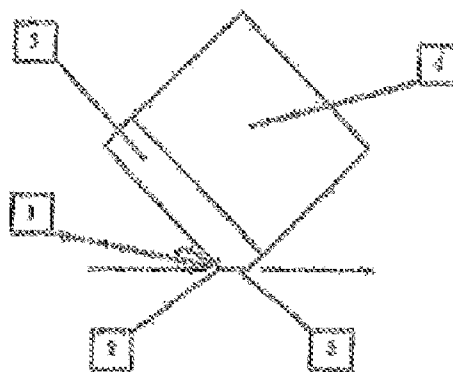
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- (88) **Date of publication of the international search report:**
2 May 2013

(54) **Title:** HIGH ABRASION LOW STRESS DIAMOND CUTTING ELEMENT



(57) **Abstract:** A polycrystalline diamond cutting element for use in rock drilling or other operations that requires very high abrasion resistance with high transverse rupture strength at temperatures above 700 degrees centigrade. The cutting element includes a diamond layer that contains pre-sintered polycrystalline diamond agglomerate (PPDA) bonded to a supporting substrate. The PPDA can be made thermally stable and can be selected to produce a cutting element with any desired abrasion resistance characteristic without affecting internal stress. In another aspect, a composite body has a material layer formed from aggregated diamond nanorods (AD-NRs); The ADNRR material layer has a first surface and a substrate. The first surface of the diamond material layer and the substrate are bonded together under high pressure and high temperature.



A. CLASSIFICATION OF SUBJECT MATTER***E21B 10/46(2006.01)i, C01B 31/06(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)

E21B 10/46; E21B 10/36; C09K 3/14; B24D 18/00

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: diamond, agglomerate, catalyst and similar terms

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2005-0051366 A1 (ROBERT, H. FRUSHOUR) 10 March 2005 See paragraphs 32-38 and claims 1-6	1-4, 6, 9, 11, 12 , 14-19, 41-43, 45, 47
Y		5, 7, 8, 10, 13, 44
Y	US 7845438 B1 (VAIL, MICHAEL A. et al.) 07 December 2010 See the abstract, column 6, lines 41-63 and figure 2	5, 7, 8, 10, 13, 44
A	US 2009-0152015 A1 (SANI, MOHAMMAD N. et al.) 18 June 2009 See paragraphs 37-53 and figure 1-4	1-19, 41-45, 47
A	US 7806206 B1 (MIESS, DAVID P.) 05 October 2010 See the abstract, column 3, line 21- column 4, line 25 and figure 3	1-19, 41-45, 47



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

26 DECEMBER 2012 (26.12.2012)

Date of mailing of the international search report

14 JANUARY 2013 (14.01.2013)

Name and mailing address of the ISA/KR

Korean Intellectual Property Office
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/035170

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

Claims 1-37 are directed to a cutting element and claims 41-45, 47 are directed to a method of manufacturing the cutting element. Claims 38-39 are directed to a cutting element and claims 40, 46 are directed to a cutting element. Since the above mentioned groups of claims do not share any of the technical features identified. Accordingly, the claims do not relate to one invention or to a single inventive concept, a priori.

Regarding claims 1-37, there are multiple groups as follows since claim 1 lacks novelty:

Group I: In claims 2-19, PPDA comprises a first technical feature.

Group II: In claim 20-22, the feature about the substrate comprises a second technical feature.

Group III: In claims 23-37, ADNR comprises a third technical feature.

Claims 1-37 do not relate to one invention or to a single inventive concept, a posteriori.

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.: 1-19,41-45,47

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2012/035170

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2005-0051366 A1	10.03.2005	AU 2003-247636 A1 AU 2003-247636 A8 CN 1301188 C0 CN 1662364 A CN 1662364 C0 EP 1515837 A1 EP 1515837 A4 US 6852414 B1 US 7070635 B2 WO 2004-000543 A1 WO 2004-000543 A8	06.01.2004 06.01.2004 21.02.2007 31.08.2005 21.02.2007 23.03.2005 27.01.2010 08.02.2005 04.07.2006 31.12.2003 06.05.2004
US 7845438 B1	07.12.2010	None	
US 2009-0152015 A1	18.06.2009	EP 2032243 A1 US 8316969 B1 WO 2007-149266 A1	11.03.2009 27.11.2012 27.12.2007
US 7806206 B1	05.10.2010	None	