



(51) International Patent Classification:
E21B 10/567 (2006.01) *E21B 10/62* (2006.01)

(21) International Application Number:
PCT/US2011/047610

(22) International Filing Date:
12 August 2011 (12.08.2011)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/373,617 13 August 2010 (13.08.2010) US

(71) Applicant (for all designated States except US): **BAKER HUGHES INCORPORATED** [US/US]; P.O. Box 4740, Houston, TX 77210-4740 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **DIGIOVANNI, Anthony A.** [US/US]; 8910 Opper Lane, Houston, TX 77064 (US). **SCOTT, Danny E.** [US/US]; 3015 Poe Drive, Montgomery, TX 77356 (US). **CHAKRABORTY, Soma** [IN/US]; 10919 West Road, #718, Houston, TX 77064 (US). **AGRAWAL, Gaurav** [US/US]; 18231 East Peakview Place, Aurora, CO 80016 (US).

(74) Agents: **WELBORN, Brian, S.** et al.; Intellectual Property Counsel, Baker Hughes Incorporated, P.O. Box 4740, Houston, TX 77210-4740 (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, 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, 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).

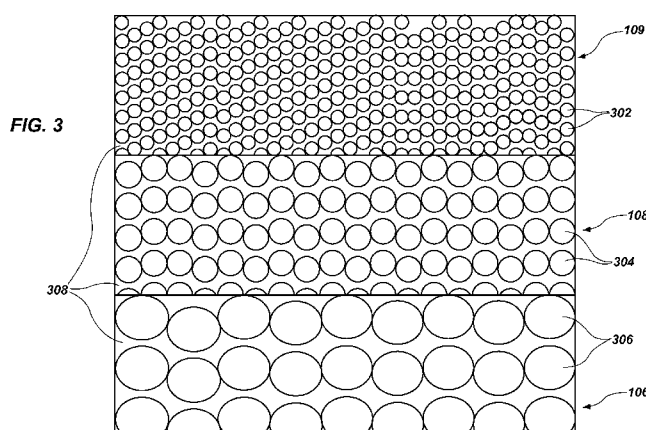
Declarations under Rule 4.17:

— as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))

Published:

— without international search report and to be republished upon receipt of that report (Rule 48.2(g))

(54) Title: CUTTING ELEMENTS INCLUDING NANOPARTICLES IN AT LEAST ONE PORTION THEREOF, EARTH-BORING TOOLS INCLUDING SUCH CUTTING ELEMENTS, AND RALTED METHODS



(57) Abstract: Cutting elements comprise a multi-portion polycrystalline material. At least one portion of the multi-portion polycrystalline material comprises a higher volume of nanoparticles than at least another portion. Earth-boring tools comprise a body and at least one cutting element attached to the body. The at least one cutting element comprises a hard polycrystalline material. The hard polycrystalline material comprises a first portion comprising a first volume of nanoparticles. A second portion of the hard polycrystalline material comprises a second volume of nanoparticles. The first volume of nanoparticles differs from the second volume of nanoparticles. Methods of forming cutting elements for earth-boring tools comprise forming a volume of superabrasive material, including forming a first portion of the superabrasive material comprising a first volume of nanoparticles. A second portion of the superabrasive material is formed comprising a second volume of nanoparticles, the second volume differing from the first volume.

