

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
24 May 2007 (24.05.2007)

PCT

(10) International Publication Number
WO 2007/058904 A1

(51) International Patent Classification:

B22F 3/12 (2006.01) **E21B 10/00** (2006.01)
C22C 29/00 (2006.01)

(21) International Application Number:

PCT/US2006/043669

(22) International Filing Date:

10 November 2006 (10.11.2006)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

11/272,439 10 November 2005 (10.11.2005) 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: **SMITH, Redd, H.**; 46 Clovergate Circle, The Woodlands, TX 77382 (US). **STEVENS, John, H.**; 174 North Milport, Spring, TX 77382 (US). **DUGGAN, James, L.**; 16035 Arboreta Drive, Friendswood, TX 77546 (US). **LYONS, Nicholas, J.**; 2300 McCue Street, #116, Houston, TX 77056 (US). **EASON, Jimmy, W.**; 34 Crested

Point Place, The Woodlands, TX 77382 (US). **GLADNEY, Jared, D.**; 3839 Pebble Garden Lane, Katy, TX 77449 (US). **OXFORD, James, A.**; 7219 Nickaburr Creek, Magnolia, TX 77354 (US). **CHREST, Benjamin, J.**; 8787 Shenandoah Park Drive, Apt.#132, Conroe, TX 77385 (US).

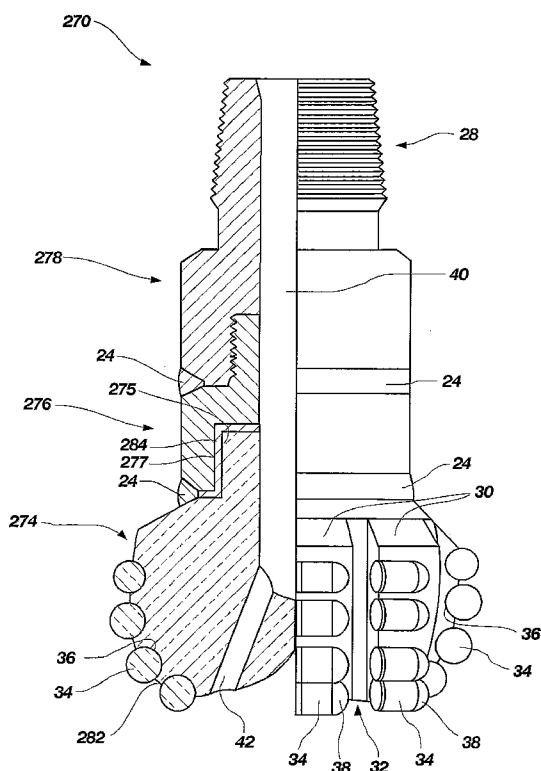
(74) Agents: **WELBORN, Brian, S.** et al.; BAKER HUGHES INCORPORATED, P.O. BOX 4740, Houston, TX 77210-4740 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, 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, LV, LY, MA, MD, 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, 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,

[Continued on next page]

(54) Title: EARTH-BORING ROTARY DRILL BITS AND METHODS OF MANUFACTURING EARTH-BORING ROTARY DRILL BITS HAVING PARTICLE-MATRIX COMPOSITE BIT BODIES



(57) Abstract: Methods of forming bit bodies for earth-boring bits include assembling green components, brown components, or fully sintered components, and sintering the assembled components. Other methods include isostatically pressing a powder to form a green body substantially composed of a particle-matrix composite material, and sintering the green body to provide a bit body having a desired final density. Methods of forming earth-boring bits include providing a bit body (52) substantially formed of a particle-matrix composite material and attaching a shank to the body. The body is provided by pressing a powder to form a green body and sintering the green body. Earth-boring bits include a unitary structure substantially formed of a particle-matrix composite material. The unitary structure includes a first region configured to carry cutters and a second region that includes a threaded pin. Earth-boring bits include a shank attached directly to a body substantially formed of a particle-matrix composite material.



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, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, 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))*
- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

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*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.