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 <i>E21B 10/18</i> (2006.01)</p> <p>(21) International Application Number:
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 11/957,207 14 December 2007 (14.12.2007) US</p> <p>(71) Applicant (for all designated States except US): BAKER HUGHES INCORPORATED [US/US]; P.O. Box 4740, Houston, TX 77027 (US).</p> <p>(72) Inventors; and</p> <p>(75) Inventors/Applicants (for US only): FLOREY, James, R. [US/US]; 9110 Grogans Mill Road, The Woodlands,</p> | <p>TX 77380 (US). BUSKE, Robert, J. [US/US]; 9110 Grogans Mill Road, The Woodlands, TX 77380 (US).</p> <p>(74) Agents: WELBORN, Brian, S. et al.; Intellectual Property Counsel, Baker Hughes Incorporated, P.O. Box 4740, Houston, TX 77210-4740 (US).</p> <p>(81) Designated States (<i>unless otherwise indicated, for every kind of national protection available</i>): 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.</p> <p>(84) Designated States (<i>unless otherwise indicated, for every kind of regional protection available</i>): 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,</p> |
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[Continued on next page]

- (54) Title:** EROSION RESISTANT FLUID PASSAGEWAYS AND FLOW TUBES FOR EARTH-BORING TOOLS, METHODS OF FORMING THE SAME AND EARTH-BORING TOOLS INCLUDING THE SAME

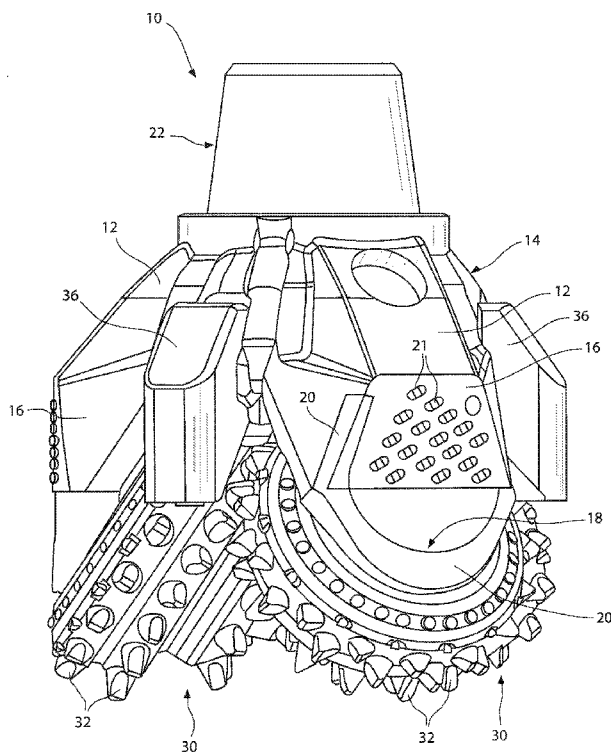


FIG. 1

(57) Abstract: Flow tubes for earth-boring tools include hardfacing material for protecting the tubes from erosion due to the flow of fluid through a fluid passageway extending therethrough. Earth-boring tools include an erosion-resistant material covering a surface of a body of the tools for protecting the bodies from erosion due to the flow of fluid through a fluid passageway extending therethrough. Methods of forming earth-boring tools include forming a body having a fluid passageway extending therethrough and covering a surface of the body with a hardfacing material. The surface of the body may be located in a region susceptible to erosion when fluid is caused to flow through the fluid passageway.



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).

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

(88) Date of publication of the international search report:

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Published:

— *with international search report (Art. 21(3))*

A. CLASSIFICATION OF SUBJECT MATTER***E21B 10/08(2006.01)i, E21B 10/18(2006.01)i, E21B 10/24(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: E21B 10/08, 10/18, 10/24, 10/60

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)

eKOMPASS(KIPO internal) & keywords: fluid passageway, hardfacing material

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 072 796 A(SHEN et al.) 17 DECEMBER 1991 See the Abstract, Fig. 2, Column 2 and Claim 2	1-4, 6-8, 14-16, 18-20
X	US 5 829 539 A(NEWTON et al.) 3 NOVEMBER 1998 See the Abstract, Fig. 3 and Column 4	1-4, 6-8, 14-16, 18-20
A	US 5 669 459 A(LARSEN et al.) 23 SEPTEMBER 1997 See the Abstract, Fig. 3 and Column 6	1-4, 6-8, 14-16, 18-20
A	US 4 759 415 A(PESSIER) 26 JULY 1988 See the Abstract and Fig. 2	1-4, 6-8, 14-16, 18-20



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

23 JULY 2009 (23.07.2009)

Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORTInternational application No.
PCT/US2008/086394**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.: 10-13
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:

Claims 10-13 are not clear enough to make meaningful search possible, because they substantially depend on a multiple dependent claim which does not comply with Rule 6.4(a).
3. ☒ Claims Nos.: Claims 5, 9-13 and 17
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:

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.:

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/US2008/086394Patent document
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member(s)Publication
date

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NONE

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