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(71) Applicant *(for all designated States except US)*: **NATIONAL OILWELL VARCO, L.P.** [US/US]; 7909 Parkwood Circle Drive, Houston, Texas 77036 (US).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: **JELLISON, Michael Joseph** [US/US]; 13405 Park Centre Court, Houston, Texas 77069 (US).

(74) Agents: **FALESKI, Thaddeus J.** et al.; CONLEY ROSE, P.C., P. O. Box 3267, Houston, Texas 77253-3267 (US).

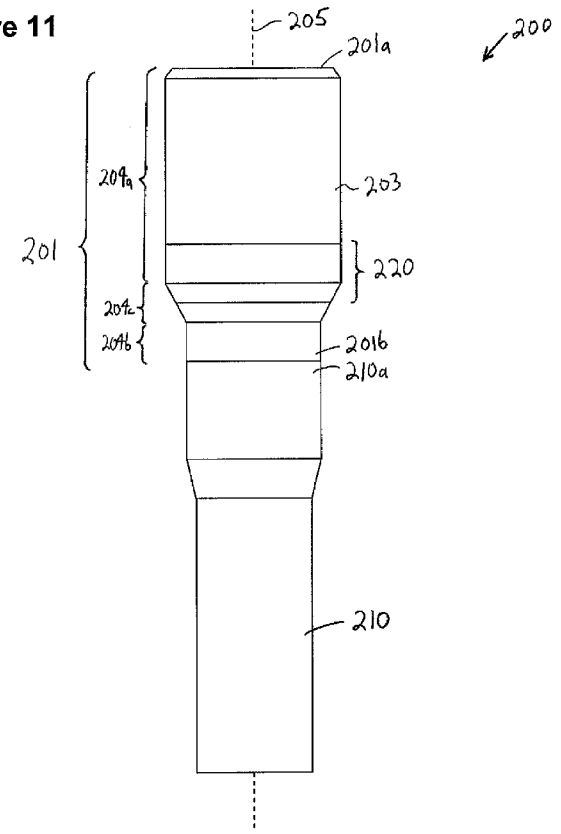
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[Continued on next page]

(54) Title: CASING FRIENDLY, SHEARABLE HARDBANDS AND SYSTEMS AND METHODS FOR SHEARING SAME

Figure 11



(57) Abstract: A tool joint comprises a body having a central axis, a first end, and a second end opposite the first end, wherein the body is made of a first material having a first hardness. In addition, the tool joint comprises an annular hardband disposed about the body. The hardband is made of a second material. The second material comprises a base material and a plurality of discrete pellets dispersed throughout the base material. The base material has a second hardness and the pellets have a third hardness. The second hardness is substantially the same as the first hardness. The third hardness is greater than the second hardness and less than the hardness of tungsten carbide.

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TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

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

— *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:
28 June 2012

INTERNATIONAL SEARCH REPORT

International application No.
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A. CLASSIFICATION OF SUBJECT MATTER

E21B 29/08(2006.01)i, E21B 33/06(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 29/08; B32B 9/00; B05D 1/36; F16C 29/02; E21B 10/50; B26B 27/00

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: hardfacing, hardband, particle, pellet 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 Y	US 2004-0157066 A1 (ARZOUMANIDIS, G. ALEXIS) 12 August 2004 See paragraphs 26-35 and figures 1-4	1-3,9 4-8,10-23
Y A	US 06138779 A (BOYCE, JAMES EDWARD) 31 October 2000 See column 5, line 27 - column 7, line 8 and figures 5-9	4-8,13-16,18-23 1-3,9-12,17
Y A	US 04277108 A (WALLACE, DUANE W.) 07 July 1981 See column 1, line 62 - column 3, line, 49 and figures 1, 2	10,20 1-9,11-19,21-23
Y A	US 2008-0286534 A1 (SPRINGETT, FRANK BENJAMIN et al.) 20 November 2008 See paragraphs 67-69 and figures 1A-1C	11-18 1-10,19-23

☐ 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	Date of mailing of the international search report
07 JUNE 2012 (07.06.2012)	**08 JUNE 2012 (08.06.2012)**

Name and mailing address of the ISA/KR

Korean Intellectual Property Office
189 Cheongsa-ro, Seo-gu, Daejeon Metropolitan City, 302-701, Republic of Korea

Facsimile No. 82-42-472-7140

Authorized officer

Bonghoon Lee

Telephone No. 82-42-481-8553

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2011/051589

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:

This ISA found multiple inventions as follows:

Group 1, claims 1-18 are directed to a tool joint and a system.
Group 2, claims 19-23 are directed to a method for forming a hardband on downhole tool.

1. ☒ As all required addtional 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/US2011/051589

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