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Declarations under Rule 4.17:

[Continued on next page]

(54) Title: METHODS SYSTEMS AND COMPOSITIONS FOR MANUFACTURING DOWNHOLE TOOLS AND DOWNHOLE TOOL PARTS

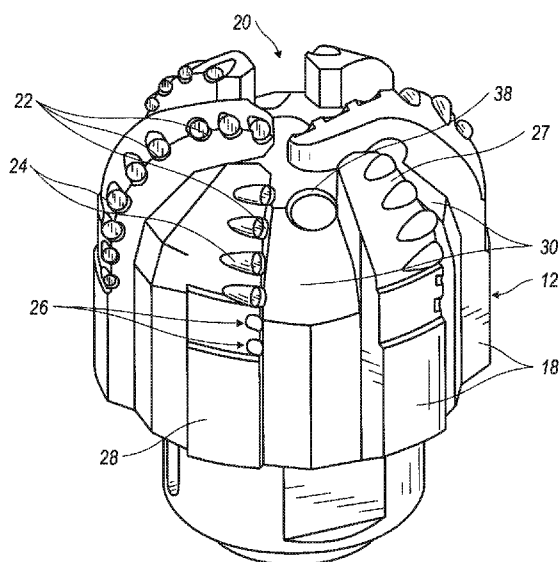


FIG. 1

(57) Abstract: Methods, systems and compositions for manufacturing downhole tools and downhole tool parts for drilling subterranean material are disclosed. A model having an external peripheral shape of a downhole tool or tool part is fabricated. Mold material is applied to the external periphery of the model. The mold material is permitted to harden to form a mold about the model. The model is eliminated and a composite matrix material is cast within the mold to form a finished downhole tool or tool part.



- *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))*
- *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:

10 March 2011

Published:

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

A. CLASSIFICATION OF SUBJECT MATTER***B22D 19/06(2006.01)i, C22C 29/06(2006.01)i, E21B 10/42(2006.01)i, E21B 10/54(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)

B22D 19/06; B22C 9/04; E21B 10/36; B29C 33/38; B22D 19/02; E21B 9/36; B29C 35/08; B21K 5/02

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: 'drill bit', 'cast'

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2007-0056777 A1 (OVERSTREET) 15 March 2007	36-38
A	See abstract; figures 5,6,9; paragraphs [0038]-[0055]; claims 1-23	1-4,25-27
A	US 6200514 B1 (MEISTER) 13 March 2001 See abstract; figures 5-8; columns 6-11; claims 22-32	1-4,25-27,36-38
A	US 4499795 A (RADTKE) 19 February 1985 See abstract; figures 3,4; columns 6,7; claims 1-22	1-4,25-27,36-38
A	US 4423646 A (BERNHARDT) 03 January 1984 See abstract; figures 3-10; columns 4-6; claims 1-18	1-4,25-27,36-38



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

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"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

14 JANUARY 2011 (14.01.2011)

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2010/037056**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.: 10,11,13-16,18-20,23,32,33,40,42
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:
They are dependent on the claims which are not drafted in accordance with the second and third sentences of Rule 6.4(a).
Therefore, the claims are too broad to make meaningful search.
3. ☒ Claims Nos.: 5-9,12,17,21,22,24,28-31,34,35,39,41,43
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/US2010/037056

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2007-0056777 A1	15.03.2007	CA 2621421-A1	15.03.2007
		CA 2630914-A1	24.05.2007
		CA 2630917-A1	24.05.2007
		CA 2664212-A1	10.04.2008
		CA 2667079-A1	10.04.2008
		CA 2668192-A1	10.04.2008
		CA 2668416-A1	15.05.2008
		CA 2709672-A1	09.07.2009
		CN 101292054 A	22.10.2008
		CN 101356031 A	28.01.2009
		CN 101356340 A	28.01.2009
		CN 101535516 A	16.09.2009
		CN 101542067 A	23.09.2009
		CN 101563521 A	21.10.2009
		CN 101605920 A	16.12.2009
		CN 101627177 A	13.01.2010
		EP 1922428 A1	21.05.2008
		EP 1957223 A1	20.08.2008
		EP 1960630 A1	27.08.2008
		EP 2066864 A1	10.06.2009
		EP 2079898 A1	22.07.2009
		EP 2084305 A1	05.08.2009
		EP 2084306 A1	05.08.2009
		EP 2089604 A1	19.08.2009
		EP 2089604 B1	28.07.2010
		EP 2235316 A2	06.10.2010
		NO 20081168 A	08.04.2008
		NO 20081168 B	08.04.2008
		RU 2008113189 A	20.10.2009
		US 2007-0056776 A1	15.03.2007
		US 2007-0102198 A1	10.05.2007
		US 2007-0102199 A1	10.05.2007
		US 2007-0102200 A1	10.05.2007
		US 2007-0102202 A1	10.05.2007
		US 2008-0029310 A1	07.02.2008
		US 2008-0073125 A1	27.03.2008
		US 2008-0083568 A1	10.04.2008
		US 2008-0128176 A1	05.06.2008
		US 2010-132265 A1	03.06.2010
		US 7597159 B2	06.10.2009
		US 7703555 B2	27.04.2010
		US 7776256 B2	17.08.2010
		US 7784567 B2	31.08.2010
		US 7802495 B2	28.09.2010
		US 7807099 B2	05.10.2010
		WO 2007-030707 A1	15.03.2007
		WO 2007-058904 A1	24.05.2007
		WO 2007-058905 A1	24.05.2007
		WO 2008-027484 A1	06.03.2008

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2010/037056

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6200514 B1	13.03.2001	WO 2008-042328 A1	10.04.2008
		WO 2008-042329 A1	10.04.2008
		WO 2008-042330 A1	10.04.2008
		WO 2008-057489 A1	15.05.2008
		WO 2009-086081 A2	09.07.2009
		WO 2009-086081 A3	09.07.2009
		WO 2009-086081 A4	09.07.2009
US 4499795 A	19.02.1985	BE 1015735 A5	02.08.2005
		GB 0001781 D0	22.03.2000
		GB 2348393 A	04.10.2000
		GB 2348393 B	29.10.2003
		IT 1319894 B1	12.11.2003
US 4423646 A	03.01.1984	IT T020000123 A1	08.08.2001
		None	
US 4423646 A	03.01.1984	None	