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(54) Title: FLEXIBLE DRILL BIT AND ANGLED DRILL GUIDE FOR USE WITH THE SAME

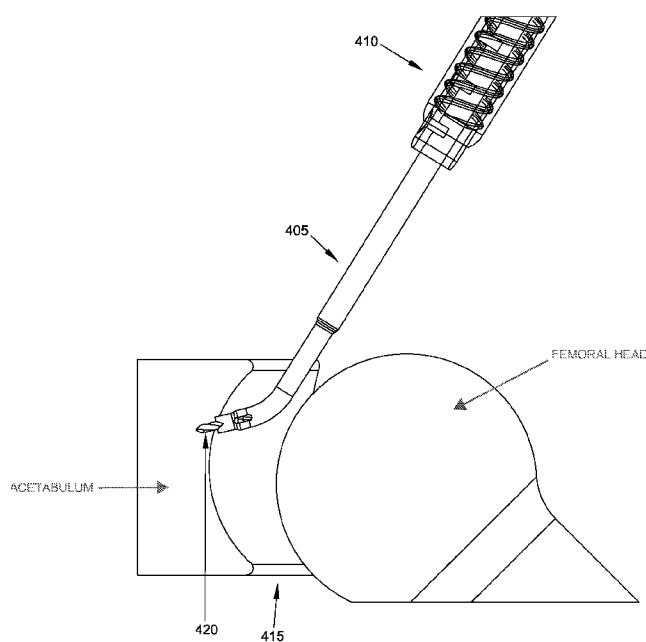


FIG. 57

(57) Abstract: A flexible drill bit comprising: a proximal shaft portion for connecting to a source of turning; a distal cutting tip portion for boring into a material; and an intermediate shaft portion extending between the proximal shaft portion and the distal cutting tip portion, the intermediate shaft portion being characterized by (i) sufficient longitudinal flexibility so as to permit the flexible drill bit to be passed along a curve, and (ii) sufficient torsional strength to permit the flexible drill bit to bore into the material. Apparatus for drilling a hole in material, the apparatus comprising: an angled drill guide comprising a curved distal section, a less-curved proximal section, and a lumen extending there between, wherein the less-curved proximal section comprises a flat extending there along for reducing the effective diameter of the less-curved proximal section so as to minimize interference between the angled drill guide and the side wall of an access cannula.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 14/10511

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - A61B 17/00 (2014.01)

CPC - A61B 17/1617; A61B 17/1714

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)

CPC: A61B 17/1617; A61B 17/1714 IPC(8): A61B 17/00 (2014.01)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC: 606/80, 96; IPC(8): A61B 17/58, 17/70, 17/68 (2014.01) (keyword limited; terms below)Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PatBase; Google Patents; Google; Search Terms Used: taper*, narrow*, lumen, conduit, channel, drill, align*, guide%, decreas*, diameter, center*, sleeve, jig, curv*, arcuate, drill bit, flex*, FEP, fluorinated ethylene propylene, nitinol, heat shrink*, heat shrunk, reamer, coat*, friction, polymer, plastic, rubber, proximal, flat*, square

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2010/0191248 A1 (MEHTA et al) 29 July 2010 (29.07.2010) fig 13-17, para [0067]-[0071]	1, 3-7, 58-61, 72-73, 96-98
X	US 2007/0264093 A1 (WHITE et al) 15 November 2007 (15.11.2007) fig 1, 2, para [0041]	1, 4, 8-9
X	US 2011/0015674 A1 (HOWARD et al) 20 January 2011 (20.01.2011) fig 5, 12, para [0013], [0017], [0040]-[0042], [0045]-[0046]	1-2, 41, 43, 45-49, 68-69, 89-90, 95
Y		44, 52-53, 91-92
A		39-40, 50-51, 67, 70, 75-88, 93-94
X	US 2011/0251621 A1 (SLUSS et al) 13 October 2011 (13.10.2011) fig 5, para [0024]	41-42
Y		44
X	US 4,541,423 A (BARBER) 17 September 1985 (17.09.1985) fig 6	54-55
X	US 6,309,396 B1 (RITLAND) 30 October 2001 (30.10.2001) fig 5, col 1, ln 34-38, col 2, ln 9-12, col 2, ln 37-48	56-57, 71
X	WO 2011/161676 A1 (TENNE et al) 29 December 2011 (29.12.2011) pg 7, middle pg 8, bot pg 9	62-64, 74
A		65-66

☒ Further documents are listed in the continuation of Box C. ☐

* 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 another 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

18 October 2014 (18.10.2014)

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 14/10511

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 application contains the following species of the generic invention which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid

Group I: Claims 1-9 directed to rigid drill portions.
Group II: Claims 1, 4-5, 10-27 directed to a unibody drill bit.
Group III: Claims 1, 4-5, 28 direct to a one piece proximal and intermediate section.
Group IV: Claims 1, 4-5, 35-36 directed to materials used to create drill bit.
Group V: Claims 37-38 directed to a method for forming a hole in a material.
Group VI: Claims 39-98 directed to apparatuses for drilling a hole in a material and methods of use.

Claims 1 and 4-5 are generic to groups I-IV.

---Continued on Supplemental Page---

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 additional fees, this Authority did not invite payment of additional fees.
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.:
1-9 and 39-98
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

International application No.

PCT/US 14/10511

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2005/0059975 A1 (FANGER et al) 17 March 2005 (17.03.2005) fig 7B, [0036]	52-53
Y	US 2012/0123417 A1 (SMITH) 17 May 2012 (17.05.2012) fig 1	91-92

Continuation of Box III: Observations where unity of invention is lacking

The inventions listed as Groups I-VI do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

SPECIAL TECHNICAL FEATURES

Groups I-IV share the generic special technical feature of a distal cutting tip portion for boring into a material, not required by Group VI. The special technical feature of each species (Groups I-IV) is provided in the group descriptions above. None of these special technical features are common to the other species, nor do they correspond to a special technical feature in the other species.

Group V includes the special technical feature of A method for forming a hole in a material, the method comprising: providing a flexible drill bit comprising: a proximal shaft portion for connecting to a source of turning; a distal cutting tip portion for boring into a material; and an intermediate shaft portion extending between the proximal shaft portion and the distal cutting tip portion, the intermediate shaft portion being characterized by (i) sufficient longitudinal flexibility so as to permit the flexible drill bit to be passed along a curve, and (ii) sufficient torsional strength to permit the flexible drill bit to bore into the material; advancing the flexible drill bit to the material along a first angle of approach; contacting the material at a second angle of approach; and turning the flexible drill bit so as to form a hole in the material, not required by Groups I-IV or VI.

Group VI includes the special technical feature of an angled drill guide, not required by Groups I-V.

COMMON TECHNICAL FEATURES

Groups I-V share the technical features of claim 1. Groups I-IV are species of generic independent claim 1. Groups I-V are related as an apparatus (Groups I-IV) and methods for using the apparatus (Group VI). The apparatus is known in prior art as shown in US 2007/0264093 A1 to White, et al. (hereinafter White).

Regarding claim 1, White discloses flexible drill bit (10, fig 1) comprising: a proximal shaft portion (12) for connecting to a source of turning (15, fig 2, para [0041]); a distal cutting tip portion (14) for boring into a material (fig 2, para [0041]); and an intermediate shaft portion (11) extending between the proximal shaft portion and the distal cutting tip portion (fig 2, para [0041]), the intermediate shaft portion being characterized by (i) sufficient longitudinal flexibility so as to permit the flexible drill bit to be passed along a curve, and (ii) sufficient torsional strength to permit the flexible drill bit to bore into the material (fig 1).

Groups I-VI share the technical features of a flexible drill bit, which is known in the prior art as shown in White. White teaches a flexible drill bit (para [0041]).

As the common features were known in the art at the time of the invention, they cannot be considered special technical features that would otherwise unify the groups.

Therefore, Groups I-VI lack unity under PCT Rule 13 because they do not share a same or corresponding special technical feature.