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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))

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- with international search report (Art. 21(3))
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(54) **Title:** EXPANSION TOOL FOR NON-CEMENTED CASING-CASING ANNULUS (CCA) WELLBORES

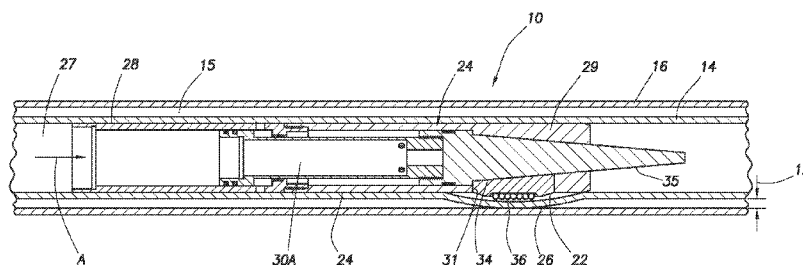


FIG. 4

(57) **Abstract:** The present invention relates to expansion tools used to centralize a casing-casing annulus in a wellbore. One embodiment provides a method for centralizing an inner casing within an outer casing that includes introducing an expansion tool into the inner casing. The expansion tool has an elongate body 10 having a first force multiplier case 28 coupled to an expansion tool case 29. A piston 30A arranged within the first force multiplier case 28 is actuated to move the piston axially in a first direction within the first force multiplier case. The piston 30A engages a ram 34 arranged within the expansion tool case 29, and causes the radial expansion of one or more lug assemblies 36 arranged within the expansion tool case 29. The inner casing 28 is then plastically deformed with the one or more lug assemblies 36 as they expand radially.

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2013/029829

A. CLASSIFICATION OF SUBJECT MATTER
INV. E21B43/10 E21B17/10
ADD.

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

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2010/072751 A2 (SHELL INT RESEARCH [NL]; HESSELS JOHANNES LOUIS LEONARDUS [NL]; ROGGE) 1 July 2010 (2010-07-01) page 6, line 18 - page 7, line 18 page 8, line 3 - line 20 page 12, line 22 - line 27 figures 1-5	1-15
A	US 7 090 025 B2 (HAUGEN DAVID [US] ET AL) 15 August 2006 (2006-08-15) column 9, line 48 - column 10, line 8; figure 6	1-15
A	US 2009/242213 A1 (BRADDICK BRITT O [US]) 1 October 2009 (2009-10-01) paragraphs [0032], [0034], [0039]; figures 1A, 6A	1-15
	----- -/-	



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 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

29 April 2014

Date of mailing of the international search report

04/07/2014

Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

International application No

PCT/US2013/029829

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 309 891 A (POGONOWSKI IVO C) 12 January 1982 (1982-01-12) column 4, line 18 - line 37; figure 3 -----	1-15
A	EP 1 306 519 A2 (HALLIBURTON ENERGY SERV INC [US]) 2 May 2003 (2003-05-02) paragraphs [0084] - [0087] -----	1-15

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2013/029829

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:

see additional sheet

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 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.:
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.:

"see additional sheet(s)"

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.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-15

A method for centralizing an inner casing within an outer casing comprising: introducing an expansion tool 10 (figure 1) into the well, the expansion tool having an elongate body having a first force multiplier case coupled to an expansion tool case; actuating a piston arranged within the first force multiplier case and thereby moving the piston axially in a first direction within the first force multiplier case. e) engaging a ram 48/49 arranged within the expansion tool case 42 with the piston 28 (page 7, line 16-18); e) radially expanding one or more lug assemblies 50 (figures 2,5 and 3,4) arranged within the expansion tool case (figure 2) with the ram as the ram axially translates in the first direction (page 8, line 16-20); f) and plastically deforming the inner casing (figures 2,5) with the one or more lug assemblies 50, g) the one or more lug assemblies 50 generating a corresponding one or more lugs in the inner casing configured to engage an inner surface of the well (figures 3 and 4 and page 3, line 25-30).

2. claims: 16-18

A method, comprising: running an expansion tool into an inner casing arranged within an outer casing, the inner and outer casings being arranged within a wellbore and defining an annulus therebetween having a first stand-off percentage; centering the inner casing relative to the outer casing with the expansion tool, thereby increasing a clearance of the annulus to a second stand-off percentage; perforating the inner casing to fluidly communicate the inner casing with annulus; introducing a settable fluid into the annulus via the inner casing; and defining a window through the inner casing, the settable fluid, and the outer casing in order to initiate a lateral wellbore.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2013/029829

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2010072751 A2	01-07-2010	AU 2009331539 A1 CA 2748162 A1 CN 102264996 A EP 2368013 A2 US 2011259609 A1 WO 2010072751 A2	01-07-2010 01-07-2010 30-11-2011 28-09-2011 27-10-2011 01-07-2010
US 7090025 B2	15-08-2006	CA 2465933 A1 GB 2401131 A US 2004159446 A1	02-11-2004 03-11-2004 19-08-2004
US 2009242213 A1	01-10-2009	CA 2707431 A1 EP 2273065 A2 US 2009242213 A1	11-12-2010 12-01-2011 01-10-2009
US 4309891 A	12-01-1982	NONE	
EP 1306519 A2	02-05-2003	EP 1306519 A2 US RE42733 E1 US 2003075339 A1	02-05-2003 27-09-2011 24-04-2003