



(51) International Patent Classification:

E21B 33/12 (2006.01) E21B 36/00 (2006.01)  
E21B 43/10 (2006.01)

(21) International Application Number:

PCT/GB2018/053333

(22) International Filing Date:

16 November 2018 (16.11.2018)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

1719093.5 17 November 2017 (17.11.2017) GB

(71) Applicant: **BISN TEC LTD** [GB/GB]; 713 Cavendish Avenue, Birchwood, Warrington Cheshire WA3 6DE (GB).

(72) Inventor: **CARRAGHER, Paul**; c/o 713 Cavendish Avenue, Birchwood, Warrington Cheshire WA3 6DE (GB).

(74) Agent: **FORRESTERS IP LLP**; Port of Liverpool Building, Pier Head, Liverpool Merseyside L3 1AF (GB).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(54) Title: AN EXPANDABLE EUTECTIC ALLOY BASED DOWNHOLE TOOL AND METHODS OF DEPLOYING SUCH

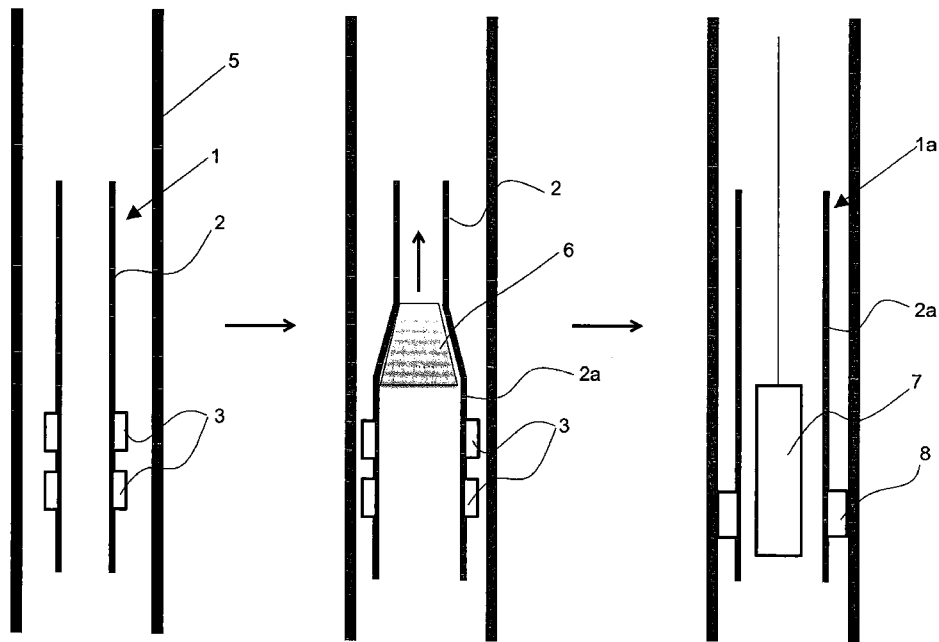


Fig.3

(57) Abstract: The present invention provides a method of deploying a eutectic alloy based tool within an oil/gas well. The method comprising providing a eutectic alloy based downhole tool comprising a tubular body with eutectic alloy located on an outer surface thereof, said tool having an outer diameter with a clearance from the inner diameter of the well. The downhole tool is delivered to a target region within an oil/gas well where the tool is to be deployed. Once the tool is in position within the well a tubular expanding tool is run through the interior of the tubular body so as to increase the outer diameter of the sealing downhole tool and in so doing reduce the clearance between the alloy and the well. Following the expansion of the tubular body a heater is deployed within the tubular body proximal to the alloy and operated to melt the alloy. The alloy is then allowed to cool and resolidify, whereby the tool is sealed in place within the target region of the well using the alloy.



WO 2019/097252 A3

**(84) Designated States** (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

**Declarations under Rule 4.17:**

- *as to the identity of the inventor (Rule 4.17(i))*
- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

**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:**

20 June 2019 (20.06.2019)

**INTERNATIONAL SEARCH REPORT**

International application No  
PCT/GB2018/053333

A. CLASSIFICATION OF SUBJECT MATTER  
INV. E21B33/12 E21B43/10 E21B36/00  
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, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 02/099247 A1 (SHELL INT RESEARCH [NL]; SHELL CANADA LTD [CA]; BOSMA MARTIN GERARD RE) 12 December 2002 (2002-12-12)	1,2,6-8
Y	page 5, lines 26-29; figures 1-4 page 6, lines 11-16	3-5
Y	----- US 3 208 530 A (ALLEN THOMAS O ET AL) 28 September 1965 (1965-09-28) figure 1	3-5
A	----- WO 2016/049424 A1 (SCHLUMBERGER CA LTD [CA]; SCHLUMBERGER SERVICES PETROL [FR]; SCHLUMBER) 31 March 2016 (2016-03-31) figures 1-3	1-9
X	----- US 2015/047841 A1 (MAZYAR OLEG A [US] ET AL) 19 February 2015 (2015-02-19) paragraphs [0022], [0025]; figures 2C, 5	10-18
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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  6 May 2019	Date of mailing of the international search report  16/05/2019
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer  Georgescu, Mihnea

# INTERNATIONAL SEARCH REPORT

International application No

PCT/GB2018/053333

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 2003/178204 A1 (ECHOLS RALPH H [US] ET AL) 25 September 2003 (2003-09-25) paragraph [0048]; figures 13, 14 -----	10-19

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/GB2018/053333

## 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.:  
  
1-19
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.

**FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210**

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

1. claims: 1-9

Method of deploying a eutectic alloy based tool within an oil/gas well, said method comprising: a) providing a eutectic alloy based downhole tool comprising a tubular body with eutectic alloy located on an outer surface thereof, said tool having an outer diameter with a clearance from the inner diameter of the well;b) delivering the downhole tool to a target region within an oil/gas well where the tool is to be deployed;c) running a tubular expanding tool through the interior of the tubular body so as to increase the outer diameter of the downhole tool and in so doing reduce the clearance between the eutectic alloy and the well;d) positioning a heater within the tubular body proximal to the eutectic alloy and operating the heater to melt the eutectic alloy; and e) allowing the eutectic alloy to cool and resolidfy so as to seal the tool in place within the target region of the well using the alloy.

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2. claims: 10-19

An expandable eutectic alloy based downhole tool, said tool comprising: a tubular body configured to be expanded when an expanding tool is run through the inside thereof;one or more eutectic alloy elements provided on the outside of the tubular body, wherein each eutectic alloy element only extends partially around the circumference of the outside of the tubular body.

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3. claims: 20-24

An expandable eutectic alloy based downhole tool, said tool comprising: a tubular body configured to be expanded when an expanding tool is run through the inside thereof;an outer sleeve, wherein the tubular body and the outer sleeve together define a housing with a volume within which eutectic alloy can be retained; and wherein the eutectic alloy retained with the housing does not fill the volume of the housing defined by the tubular body and the outer sleeve.

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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/GB2018/053333
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 02099247	A1	12-12-2002	AT 302330 T 15-09-2005
			BR 0210156 A 08-06-2004
			CA 2449664 A1 12-12-2002
			CN 1514905 A 21-07-2004
			DE 60205621 D1 22-09-2005
			DK 1395732 T3 19-12-2005
			EP 1395732 A1 10-03-2004
			NO 331567 B1 23-01-2012
			RU 2290491 C2 27-12-2006
			US 2004149418 A1 05-08-2004
			US 2007137826 A1 21-06-2007
			WO 02099247 A1 12-12-2002
US 3208530	A	28-09-1965	NONE
WO 2016049424	A1	31-03-2016	GB 2544695 A 24-05-2017
			US 2017247971 A1 31-08-2017
			WO 2016049424 A1 31-03-2016
US 2015047841	A1	19-02-2015	NONE
US 2003178204	A1	25-09-2003	NONE