



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification ⁷ : E21B 33/16</p>	<p>A3</p>	<p>(11) International Publication Number: WO 00/15944</p> <p>(43) International Publication Date: 23 March 2000 (23.03.00)</p>
<p>(21) International Application Number: PCT/GB99/03015</p> <p>(22) International Filing Date: 10 September 1999 (10.09.99)</p> <p>(30) Priority Data: 9819795.7 12 September 1998 (12.09.98) GB</p> <p>(71) Applicant (for all designated States except US): WEATHER-FORD/LAMB, INC. [US/US]; Corporation Company, 1013 Centre Road, Wilmington, DE 19805 (US).</p> <p>(71) Applicant (for GB only): HARDING, Richard, Patrick [GB/GB]; Marks & Clerk, 4220 Nash Court, Oxford Business Park South, Oxford OX4 2RU (GB).</p> <p>(72) Inventor; and (75) Inventor/Applicant (for US only): BUDDE, Peter [NL/NL]; Waterleidingstrasse No. 1, NL-3134 KS Vlaardingen (NL).</p> <p>(74) Agent: LIND, Robert; Marks & Clerk, 4220 Nash Court, Oxford Business Park South, Oxford OX2 2RU (GB).</p>		<p>(81) Designated States: AU, CA, GB, NO, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).</p> <p>Published <i>With international search report.</i></p> <p>(88) Date of publication of the international search report: 29 June 2000 (29.06.00)</p>
<p>(54) Title: PLUG AND PLUG SET FOR USE IN WELLBORE</p>		
<p>(57) Abstract</p> <p>A plug for use in a wellbore, said plug (201; 301) having a body with an upstream end and a downstream end, characterised in that a major portion of the length of said body is hollow and open to the upstream end of said plug. A plug set for use in a wellbore, said plug set comprising a top plug and a bottom plug, characterised in that a major portion of the volume of said bottom plug is hollow and a major portion of the length of said top plug can be accommodated therein. A plug for use in a wellbore, said plug comprising a body and at least a first fin which is made of resilient material and which projects radially outwardly from said body to engage, in use, the inner wall of a tubular, characterised in that said first fin is segmented and is provided with means to inhibit liquid passing through the gaps between said segment. The body and fin(s) of the plug can be made as a one piece injection moulding. Alternatively, the plug may be of modular construction, each module comprising a body part and a fin and each module being separately injection moulded.</p> <div data-bbox="925 1209 1340 2083" style="text-align: right;"> </div>		

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 99/03015

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 E21B33/16

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)

IPC 7 E21B B08B

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 practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2 717 645 A (S.B.SCHNITTER) 13 September 1955 (1955-09-13) figures 1-3 ---	1
A	US 1 527 749 A (E.F. RAYMOND) 24 February 1925 (1925-02-24) figures 1,2 ---	1
A	US 4 378 838 A (OGDEN JAMES D ET AL) 5 April 1983 (1983-04-05) the whole document ---	1,2,4,15
A	US 4 979 562 A (LANGER FRIEDRICH H) 25 December 1990 (1990-12-25) ---	1,15-18
X	SU 1 673 727 A (TURKMENSKIJ NI PVNII PRIRODNYK) 30 August 1991 (1991-08-30) ---	5,6
A	abstract ---	1
-/--		

Further documents are listed in the continuation of box C.

Patent family members are listed in 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 document 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.
- *Z* document member of the same patent family

Date of the actual completion of the international search

28 January 2000

Date of mailing of the international search report

25.04.2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Fonseca Fernandez, H

INTERNATIONAL SEARCH REPORT

Inter. Patent Application No

PCT/GB 99/03015

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 1 994 072 A (J.A. HARDCSTKE) 12 March 1935 (1935-03-12)	5,6
Y	page 2; figures 7-10 ---	10-12
X	US 5 762 139 A (LAUREL DAVID F ET AL) 9 June 1998 (1998-06-09)	7,9
Y	column 8, line 7 - line 44; figures ---	10-12
A	US 5 234 052 A (COONE MALCOLM G ET AL) 10 August 1993 (1993-08-10) abstract; figure 1 ---	1
A	WO 94 15062 A (WEATHERFORD LAMB ;LUCAS BRIAN RONALD (GB)) 7 July 1994 (1994-07-07) cited in the application figures ---	1
A	US 4 671 358 A (LINDSEY JR HIRAM E ET AL) 9 June 1987 (1987-06-09) figures ---	1
A	EP 0 498 990 A (HALLIBURTON CO) 19 August 1992 (1992-08-19) figures ---	1
A	US 3 939 519 A (MUIRHEAD WALTER B) 24 February 1976 (1976-02-24) figures ---	1,5,7,15
A	WO 96 34175 A (LUCAS BRIAN RONALD ;WEATHERFORD LAMB (US)) 31 October 1996 (1996-10-31) figures ---	1,5,7,15
A	US 1 803 057 A (Z.A. DYER) 28 April 1931 (1931-04-28) -----	

INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB 99/03015

Box I Observations where certain claims were found unsearchable (Continuation of item 1 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 II Observations where unity of invention is lacking (Continuation of item 2 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 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.
- 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: 1-4,15-18

A plug for use in a wellbore for cementing casings having at least a first fin projecting radially outwardly, where said fin is segmented and having means to inhibit liquid passing through the segmenting gaps

2. Claims: 5-6

A plug for use in a wellbore having a body with an upstream and a downstream end and having hollow a major portion of the length of said body.

3. Claims: 7-14

A plug set for use in a wellbore comprising a top plug and a bottom plug and where a major portion of the bottom of the top plug can be accommodated in a hollow portion of the bottom plug.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 99/03015

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2717645	A	13-09-1955	NONE

US 1527749	A	24-02-1925	NONE

US 4378838	A	05-04-1983	AU 543149 B 04-04-1985 AU 7907181 A 09-09-1982 CA 1172162 A 07-08-1984

US 4979562	A	25-12-1990	CA 1320903 A 03-08-1993 WO 9004699 A 03-05-1990 EP 0439484 A 07-08-1991

SU 1673727	A	30-08-1991	NONE

US 1994072	A	12-03-1935	NONE

US 5762139	A	09-06-1998	CA 2219732 A 05-05-1998 EP 0851093 A 01-07-1998 NO 974877 A 06-05-1998

US 5234052	A	10-08-1993	CA 2094884 A,C 02-11-1993 DE 4314374 A 02-12-1993 FR 2690708 A 05-11-1993 GB 2266547 A 03-11-1993 MX 9302525 A 01-12-1993 NL 9300713 A 01-12-1993 NO 931559 A 02-11-1993

WO 9415062	A	07-07-1994	NL 9202234 A 18-07-1994 AU 673043 B 24-10-1996 AU 5696294 A 19-07-1994 CA 2149230 A 07-07-1994 DE 69321258 D 29-10-1998 DE 69321258 T 04-03-1999 EP 0676002 A 11-10-1995 NO 951660 A 28-04-1995 US 5390736 A 21-02-1995 AU 5696394 A 19-07-1994 WO 9415063 A 07-07-1994

US 4671358	A	09-06-1987	NONE

EP 0498990	A	19-08-1992	US 5095980 A 17-03-1992 CA 2055127 A,C 16-08-1992 DE 69112600 D 05-10-1995 DE 69112600 T 15-02-1996

US 3939519	A	24-02-1976	NONE

WO 9634175	A	31-10-1996	US 5553667 A 10-09-1996 AU 710356 B 16-09-1999 AU 5768396 A 18-11-1996 CA 2218106 A 31-10-1996 EP 0820556 A 28-01-1998 EP 0969183 A 05-01-2000 NO 974757 A 10-12-1997 US 5787979 A 04-08-1998 US 5813457 A 29-09-1998

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 99/03015

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 1803057	A	NONE	
