

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
6 February 2003 (06.02.2003)

PCT

(10) International Publication Number
WO 2003/010412 A3

(51) International Patent Classification⁷: **E21B 34/10**

(21) International Application Number:
PCT/US2002/021190

(22) International Filing Date: 3 July 2002 (03.07.2002)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09/912,689 24 July 2001 (24.07.2001) US

(71) Applicant: **BAKER HUGHES INCORPORATED**
[US/US]; 3900 Essex Lane, Suite 1200, Houston, TX
(US).

(72) Inventor: **THOMPSON, Grant, R.**; 7905 South 77th East
Avenue, Tulsa, OK 74133 (US).

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZM, ZW.

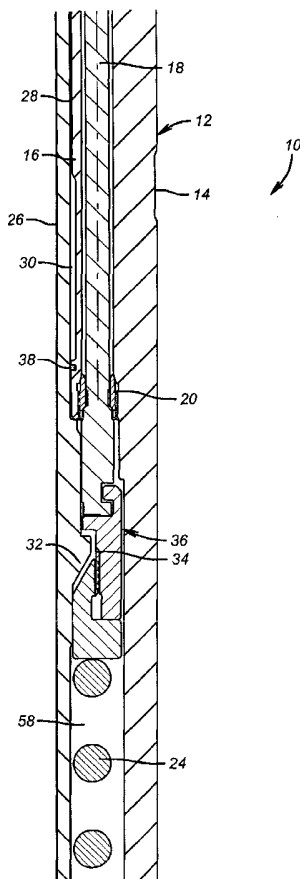
(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(74) Agents: **CARSON, Matt et al.**; Baker Hughes Incorporated, 3900 Essex Lane, Suite 1200, Houston, Texas (US).

Published:
— with international search report

[Continued on next page]

(54) Title: SAND CONTROL SEAL FOR SUBSURFACE SAFETY VALVE



(57) Abstract: A seal (38) is provided to prevent contamination by sand or grit in the clearance (28) between a flow tube (26) and the inner housing wall (16) in a safety valve. An enlarged space is provided adjacent the seal to allow accumulation of sand or grit in the annular clearance space without causing seizure of the flow tube. Disclosed is also an insert safety valve which is assembled without a spacer and with a seal mounted to the lower end of the insert valve to engage the bottom sub on the SSV. As a result, particularly for larger sizes of insert safety valves, the assembly is lighter and shorter, which facilitates use of readily available standard lubricator and wireline equipment.



(88) Date of publication of the international search report:

12 February 2004

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

In nal Application No
PCT/US 02/21190

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 E21B34/10

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

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)

EP0-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 475 598 A (BRAKHAGE JR WILLIAM L ET AL) 9 October 1984 (1984-10-09) column 1, line 12 - line 14	1-4,9
Y	column 3, line 37 - line 40 column 4, line 8 - line 9; figure 1A ---	7,8,11, 13-16,18
X	US 4 569 398 A (PRINGLE RONALD E) 11 February 1986 (1986-02-11) column 4, line 59 - line 63; figure 1A ---	1-4,9
X	US 5 411 096 A (AKKERMAN NEIL H) 2 May 1995 (1995-05-02) figure 2 ---	1-4,9
X	US 4 597 445 A (KNOX RICHARD H) 1 July 1986 (1986-07-01) figure 1D ---	1-4,9
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☒ 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

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"&" document member of the same patent family

Date of the actual completion of the international search

14 January 2003

Date of mailing of the international search report

2 1. 01. 03

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

Bellingacci, F

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 02/21190

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	GB 2 334 540 A (BAKER HUGHES INC) 25 August 1999 (1999-08-25) page 5, line 18 - line 20; figure 2 ---	7, 8
A	US 5 058 682 A (PRINGLE RONALD E) 22 October 1991 (1991-10-22) the whole document ---	
X	US 3 799 258 A (TAUSCH G) 26 March 1974 (1974-03-26) column 1, line 44 - line 52 Y column 3, line 55 - line 65; figures 2A,,2B ---	12
X	US 3 786 863 A (TAUSCH G) 22 January 1974 (1974-01-22) figure 2C ---	11, 13-16,18
A	US 4 460 046 A (PRINGLE RONALD E) 17 July 1984 (1984-07-17) figures 2-5 -----	12

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 02/21190

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: 1-10

Subsurface safety valve provided with a particulate retention device

2. Claims: 11-18

Insert subsurface safety valve provided with seals to engage an existing safety valveniple

INTERNATIONAL SEARCH REPORT

Information on patent family members

In International Application No.

PCT/US 02/21190

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