

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
26 August 2004 (26.08.2004)

PCT

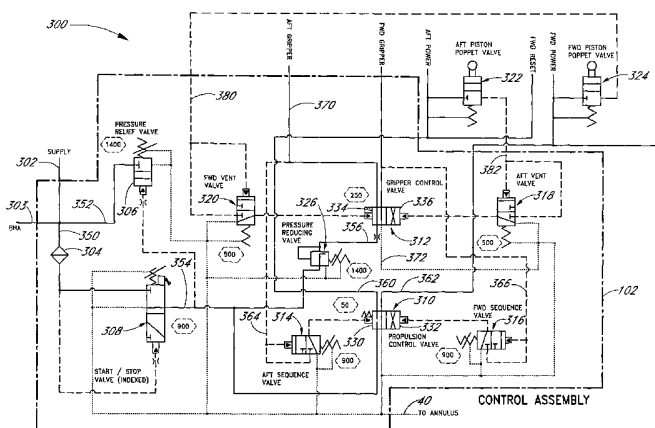
(10) International Publication Number  
WO 2004/072433 A3

- (51) International Patent Classification<sup>7</sup>: E21B 4/18
- (21) International Application Number: PCT/US2004/004171
- (22) International Filing Date: 10 February 2004 (10.02.2004)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
  - 60/446,644 10 February 2003 (10.02.2003) US
  - 60/448,163 14 February 2003 (14.02.2003) US
  - 10/745,400 23 December 2003 (23.12.2003) US
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- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, 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, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published: — with international search report

[Continued on next page]

(54) Title: DOWNHOLE TRACTOR WITH IMPROVED VALVE SYSTEM



(57) Abstract: A hydraulically powered tractor 100 adapted for advancement through a borehole including an elongate body, aft and forward gripper assemblies 104, 106, and a valve control assembly 102 housed within the elongate body. The aft and forward gripper assemblies 104, 106 are adapted for selective engagement with the inner surface of the borehole. The valve control assembly 102 includes a gripper control valve 312 for directing pressurized fluid to the aft and forward gripper assemblies 104, 106. The valve control assembly 102 also includes a propulsion control valve 310 for directing fluid to an aft or forward power chamber for advancing the body relative to the actuated gripper assembly. Aft and forward mechanically actuated valves 322, 324 may be provided for controlling the position of the gripper control valve 312 by detecting and signaling when the body has completed an advancement stroke relative to an actuated gripper assembly. Aft and forward sequence valves 314, 316 may be provided for controlling the propulsion control valve 310 by detecting when the gripper assemblies become fully actuated. Furthermore, a pressure relief valve 306 is preferably provided along an input supply line 302, 352 for limiting the pressure of the fluid entering the valve control assembly 102.

WO 2004/072433 A3



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**(88) Date of publication of the international search report:**  
2 December 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

International Application No  
PCT/US2004/004171

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 E21B4/18

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)

EPO-Internal

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6 241 031 B1 (BEAUFORT RONALD E ET AL) 5 June 2001 (2001-06-05) cited in the application column 7, line 33 - line 40 column 13, line 32 - line 36 -----	1-12,33, 36
A	WO 98/01651 A (LUCAS BRIAN RONALD ; HAVER NELSON ALAN (US); CTES L C (US); NEWMAN KEN) 15 January 1998 (1998-01-15) page 6, line 16 - line 21 page 9, line 34 - page 10, line 4; figures 1B,1C -----	1,33,36
A	US 6 431 270 B1 (ANGLE COLIN M) 13 August 2002 (2002-08-13) column 11, line 1 - line 9 -----	1,33,36
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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
- "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.
- "&" document member of the same patent family

Date of the actual completion of the international search

11 June 2004

Date of mailing of the international search report

16. 09. 2004

Name and mailing address of the ISA

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# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/US2004/004171

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 4 141 414 A (JOHANSSON SVEN H) 27 February 1979 (1979-02-27) column 9, line 61 - column 10, line 14 -----	1, 33, 36

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US2004/004171

## Box 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 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 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.:

see annex

### 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: 1-12, 33, 36

Tractor comprising aft and forward gripper assemblies, aft and forward propulsion assemblies and aft and forward mechanically actuated valves for controlling the gripper assemblies

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2. claims: 13-31, 34,35,37

Tractor comprising aft and forward gripper assemblies, aft and forward propulsion assemblies and aft and forward pressure relief valve

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3. claim: 32

Tractor comprising aft and forward gripper assemblies, aft and forward propulsion assemblies and first and second sequence valves

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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US2004/004171

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