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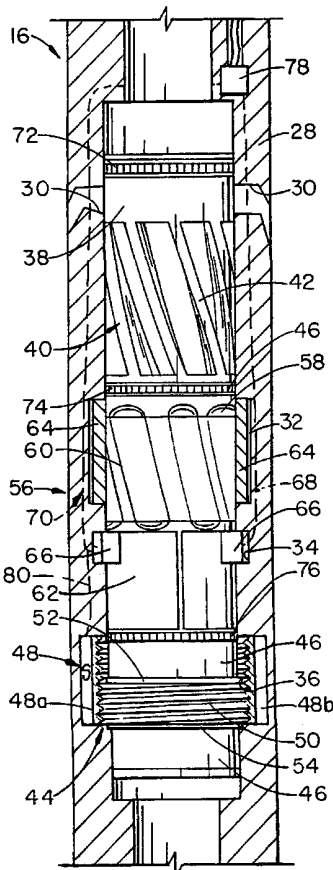
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- (74) Agent: SMITH, Marlin, R.; Konneker & Smith, P.C., Suite 230, 660 North Central Expwy., Plano, TX 75074 (US).
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[Continued on next page]

(54) Title: TOOL AND METHOD FOR MANAGING FLUID FLOW IN A WELL



(57) Abstract: A tool and method for managing fluid flow in a well use flow control and monitoring functions. A particular tool provides valve and metering functions combined with electrical generator and pump functions. Two of these tools can be used such that one generates electricity downhole to power the other tool to operate as a pump or other flow control. A method of managing fluid flow in a well includes operating the tool in either a generator mode or a pump mode. The tool, which is a flow control device, has a body in which an opening (30) is defined between an annulus outside the body (38) and a flow channel inside. The tool also has a flow control body, a rotor (40) and electromagnetic members (56). A method includes moving the flow control body (38), the rotor (40), and the electromagnetic members (56) together to selectively block or unblock the opening.



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CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

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INTERNATIONAL SEARCH REPORT

Int. lional Application No

PCT/US 00/19330

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 E21B41/00 E21B43/12 E21B43/38 F03B13/02 F03B3/10

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 F03B

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.
X	US 5 839 508 A (ROSS ROBERT CHAPMAN ET AL) 24 November 1998 (1998-11-24) column 4, line 25 - line 57 ---	1,2,8,9
X	EP 0 500 303 A (HALLIBURTON CO) 26 August 1992 (1992-08-26) column 4, line 51 -column 5, line 15 column 6, line 40 -column 7, line 2 ---	43
A	DE 197 06 371 A (BECFIELD DRILLING SERVICES GMB) 20 August 1998 (1998-08-20) column 1, line 54 - line 66 ---	1-34, 43-52
A	US 4 782 896 A (WITTEN ERIC B) 8 November 1988 (1988-11-08) abstract --- -/--	1-34, 43-52

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

22 January 2001

Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT

International Application No

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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 4 275 989 A (GUTIERREZ ATENCIO FRANCISCO J) 30 June 1981 (1981-06-30) abstract -----	18,23,28
X	US 5 443 120 A (HOWELL DAVID A) 22 August 1995 (1995-08-22) column 4, line 8 - line 20 -----	35
X	US 5 425 416 A (HAMMEKE MICHAEL N ET AL) 20 June 1995 (1995-06-20) column 5, line 29 - line 54 -----	35
A	US 5 165 235 A (NITSCHKE GEORGE S) 24 November 1992 (1992-11-24) column 5, line 54 -column 6, line 9 -----	35-42
A	US 4 262 747 A (MCDANIEL MILTON W ET AL) 21 April 1981 (1981-04-21) column 3, line 41 - line 50 -----	35-42

INTERNATIONAL SEARCH REPORT

international application No.
PCT/US 00/19330

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: 1-34,43-52

Flow control device operable as pump or as alternator

2. Claims: 35-42

Method for producing, separating and reinjecting fluids in a well

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 00/19330

Patent document cited in search report	Publication date	Patent family member(s)	Publication date	
US 5839508	A	24-11-1998	US 5597042 A	28-01-1997
			AU 719755 B	18-05-2000
			AU 4923896 A	27-08-1996
			CA 2187432 A	15-08-1996
			GB 2302113 A, B	08-01-1997
			NO 960519 A	12-08-1996
			WO 9624748 A	15-08-1996
			US 5730219 A	24-03-1998
			US 5662165 A	02-09-1997
			US 6006832 A	28-12-1999
			US 5959547 A	28-09-1999
			US 6065538 A	23-05-2000
			AU 6335296 A	22-01-1997
			CA 2221463 A	09-01-1997
			GB 2320512 A, B	24-06-1998
			NO 976039 A	20-02-1998
			WO 9701018 A	09-01-1997
EP 0500303	A	26-08-1992	US 5149984 A	22-09-1992
			AU 641113 B	09-09-1993
			AU 1101092 A	27-08-1992
			AU 644511 B	09-12-1993
			AU 1103692 A	03-09-1992
			CA 2061701 A	21-08-1992
			DE 69210280 D	05-06-1996
			DE 69210280 T	19-09-1996
			DK 500303 T	03-06-1996
			NO 920656 A	21-08-1992
DE 19706371	A	20-08-1998	NONE	
US 4782896	A	08-11-1988	NONE	
US 4275989	A	30-06-1981	AR 223066 A	15-07-1981
US 5443120	A	22-08-1995	CA 2155704 A	26-02-1996
			GB 2292574 A, B	28-02-1996
			NO 953282 A	26-02-1996
US 5425416	A	20-06-1995	AU 675380 B	30-01-1997
			AU 1449195 A	01-08-1995
			BR 9506459 A	28-10-1997
			CA 2167277 A	13-07-1995
			CN 1138361 A	18-12-1996
			CZ 9601961 A	16-07-1997
			EP 0738365 A	23-10-1996
			HU 74471 A	30-12-1996
			JP 9507276 T	22-07-1997
			NO 962857 A	04-09-1996
			WO 9518911 A	13-07-1995
			US 5165235	A
US 4262747	A	21-04-1981	US 4378047 A	29-03-1983