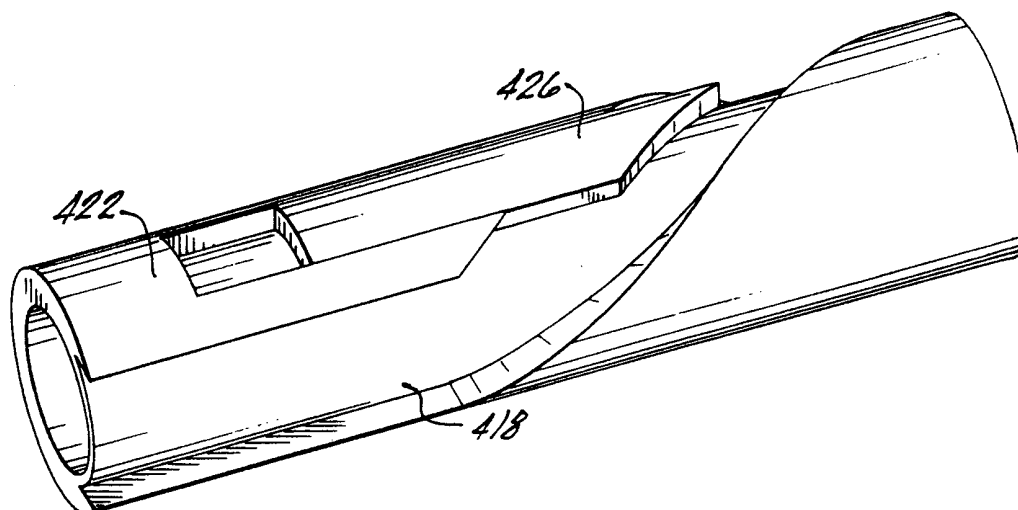




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification</b> <sup>6</sup> : <b>E21B 34/06, 34/10, 34/14, 47/00, 21/10, 41/00</b>	<b>A3</b>	<b>(11) International Publication Number:</b> <b>WO 97/37102</b> <b>(43) International Publication Date:</b> 9 October 1997 (09.10.97)
<b>(21) International Application Number:</b> PCT/US97/05510 <b>(22) International Filing Date:</b> 1 April 1997 (01.04.97) <b>(30) Priority Data:</b> 60/014,644            1 April 1996 (01.04.96)            US 60/014,518            1 April 1996 (01.04.96)            US <b>(71) Applicant (for all designated States except US):</b> BAKER HUGHES INCORPORATED [US/US]; 3900 Essex Lane, Houston, TX 77027 (US). <b>(72) Inventors; and</b> <b>(75) Inventors/Applicants (for US only):</b> CARMODY, Michael, A. [-/US]; 1906 Wagon Gap Trail, Houston, TX 77090 (US). JONES, Kevin, R. [-/US]; 5702 Kiowa Timbers, Humble, TX 77436 (US). COON, Robert, J. [-/US]; 14215 Providence Pine Trail, Houston, TX 77062 (US). MURRAY, Douglas, J. [-/US]; 5922 Culross Close, Humble, TX 77346 (US). HOPMANN, Mark, E. [-/US]; Route 1, Box 258, Alvin, TX 77511 (US). JENNINGS, Steven, L. [-/US]; 1711 Keystone Drive, Friendswood, TX 77546 (US). ROTH, Brian, A. [-/US]; 710 West Melwood, Houston, TX 77009 (US).		<b>(74) Agents:</b> CARSON, Matt, W. et al.; Baker Hughes Incorporated, 3900 Essex Lane, Houston, TX 77027 (US). <b>(81) Designated States:</b> AU, CA, GB, NO, US. <b>Published</b> <i>With international search report.</i> <b>(88) Date of publication of the international search report:</b> 20 January 2000 (20.01.00)
<b>(54) Title:</b> DOWNHOLE FLOW CONTROL DEVICES		

**(57) Abstract**

Several downhole flow control devices are disclosed which are meterable and are also capable of shutting off a particular zone in a well. Several embodiments include a multiple valve body, a toroidal inflatable valve, and a series of related choke systems. The downhole flow control and choke mechanisms each include a downhole electronics package to provide programming or decision making capacity as well as motor actuation systems. Each choke mechanism also includes a system whereby the device can be converted to manual operation and actuated by a conventional shifting tool.

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INTERNATIONAL SEARCH REPORT

International Application No

PL/US 97/05510

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 E21B34/06 E21B34/10 E21B34/14 E21B47/00 E21B21/10  
E21B41/00

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 6 E21B F16K

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.
X	US 3 490 732 A (LEROY GENE) 20 January 1970 see column 2, line 38-42 see column 3, line 46 - column 4, line 2 see column 4, line 34-66 see figures 1-6	1-5
X	EP 0 701 834 A (BOUSSIGNAC GEORGES ; LABRUNE JEAN CLAUDE (FR)) 20 March 1996 see page 5, column 7, line 1-5 see page 5, column 7, line 39 - column 8, line 3 see figure 4	1-4
A	US 5 429 609 A (YOON INBAE) 4 July 1995 see column 8, line 32 - column 9, line 10 see figures 4-6	1
	-/--	

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

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- \*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

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- \* & \* document member of the same patent family

Date of the actual completion of the international search

30 October 1997

Date of mailing of the international search report

11.11.97

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## INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 97/05510

## 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 5 205 325 A (BRITTON F. PIPPER) 27 April 1993 see the whole document ---	1
X	EP 0 065 601 A (LAWRENCE JAMES DORMAN) 1 December 1982 see page 11, paragraph 4 - page 14 see figures 6,7 ---	23
Y	---	99-101
X	US 5 038 862 A (GIROUX RICHARD L ET AL) 13 August 1991 see column 3, line 11 - column 4, line 3 see figure 1 ---	23
A	US 4 846 272 A (LEGGETT HENRY H) 11 July 1989 see column 4, line 46 - column 8, line 31 see figures 3-6 ---	38,39
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# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US 97/05510

## 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.:  
  
1-5, 23-37, 38-52, 60-74, 93-103
  
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**

The following inventions and respective potential special technical features were identified:

- A. Claims 1-5: A pressure controlled bladder valve for controlling flow through a pipe.
- B. Claims 6-12, 18-22: A valve assembly (not necessarily pressure controlled), comprising a housing having at least one axial fluid conduit and at least one valve body receptacle.
- C. Claims 23-30, 37: A dependent sleeve choke mechanism, characterized by the inner sleeve and the outer sleeve being fixed together.
- D. Claims 38-45, 52: An independent sleeve choke mechanism, characterized by the inner sleeve being moveable independently of the outer sleeve.
- E. Claims 53-55, 58, 59: A nose seal choke mechanism.
- F. Claims 60-69, 73: A helical key choke mechanism.
- G. Claims 75-77: A spiral choke mechanism.
- H. Claims 83, 88-92: An orifice choke mechanism.
- I. Claims 93-103, 13-17, 31-36, 46-51, 56, 57, 70-72, 74, 78-82, 84-87: A computer controlled flow control device using a downhole electronics system.  
The dependant claims 13-17, 31-36, 46-51, 56, 57, 70-72, 74, 78-82, 84-87 and the claims 93-103 have corresponding features and have therefore been grouped together.

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 97/05510

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