

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
21 December 2007 (21.12.2007)

PCT

(10) International Publication Number
WO 2007/144631 A3

(51) International Patent Classification:

<i>B01D 17/02</i> (2006.01)	<i>B04C 5/14</i> (2006.01)
<i>B01D 21/00</i> (2006.01)	<i>B04C 5/15</i> (2006.01)
<i>B01D 21/24</i> (2006.01)	<i>E21B 43/34</i> (2006.01)
<i>B01D 21/26</i> (2006.01)	<i>E21B 43/36</i> (2006.01)
<i>B04C 5/04</i> (2006.01)	<i>E21B 43/40</i> (2006.01)
<i>B04C 5/13</i> (2006.01)	

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(21) International Application Number:

PCT/GB2007/002220

(22) International Filing Date: 15 June 2007 (15.06.2007)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

0611941.6 16 June 2006 (16.06.2006) GB

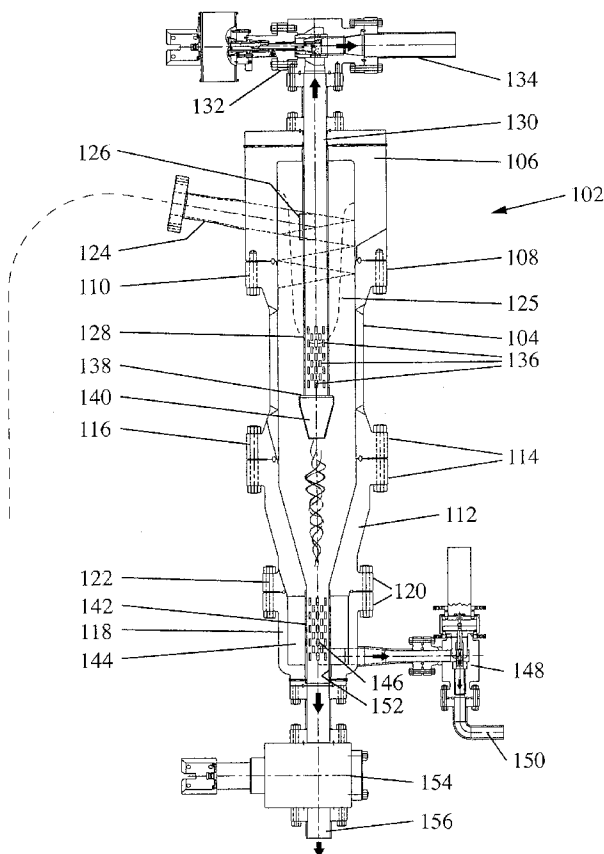
(81) Designated States (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),

[Continued on next page]

(54) Title: CYCLONE SEPARATOR AND METHOD OF SEPARATION



(57) Abstract: A method of separating a multiphase fluid, the fluid comprising a relatively high density component and a relatively low density component, comprises introducing the fluid into a separation region (104); imparting a rotational movement into the multiphase fluid; forming an outer annular region of rotating fluid of predetermined thickness within the separation region; and forming and maintaining a core of fluid in an inner region (125); wherein fluid entering the separation vessel is directed into the outer annular region (126); and the thickness of the outer annular region is such that the high density component is concentrated and substantially contained within this region, the low density component being concentrated in the rotating core. A separation system employing the method is also provided. The method and system are particularly suitable for the separation of solid debris from the fluids produced by a subterranean oil or gas well at wellhead flow pressure.

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European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

Published:

— *with international search report*

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

21 February 2008

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2007/002220

A. CLASSIFICATION OF SUBJECT MATTER				
INV. B01D17/02	B01D21/00	B01D21/24		
B04C5/13	B04C5/14	B04C5/15		
E21B43/40		B01D21/26		
		E21B43/34		
		B04C5/04		
		E21B43/36		
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) B01D B04C 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.		
X	US 2 717 695 A (MARTIN CARL C) 13 September 1955 (1955-09-13) column 2, line 3 - line 63; figures 1-3	1-66,69		
X	US 4 120 795 A (LAVAL JR CLAUDE C) 17 October 1978 (1978-10-17) column 2, line 63 - column 4, line 49; figure 1	1-66,69		
X	DE 20 2006 004089 U1 (OELDE GMBH VENTILATORFAB [DE]) 11 May 2006 (2006-05-11) paragraphs [0019] - [0025]; figure 1 paragraphs [0004] - [0007]; claims 1-7	1-66,69		
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<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.				
* Special categories of cited documents : <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none; vertical-align: top;"> *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 </td> <td style="width: 50%; border: none; vertical-align: top;"> *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 </td> </tr> </table>			*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
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	Date of mailing of the international search report			
11 September 2007	19/12/2007			
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 Roider, Josef			

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2007/002220

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 5 711 374 A (KJOS TORE [NO]) 27 January 1998 (1998-01-27) column 1, line 41 - column 3, line 61; figure 1 -----	1-66,69
X	US 5 028 318 A (ASLIN DAVID J [US]) 2 July 1991 (1991-07-02) column 10, line 13 - column 11, line 5; figure 5 -----	1-66,69
X	WO 2005/089950 A (SHELL INT RESEARCH [NL]; SHELL CANADA LTD [CA]; TEE LIH-DER [NL]; VERB) 29 September 2005 (2005-09-29) page 3, line 15 - page 5, line 14; figure 1 -----	1-66,69
X	US 3 898 068 A (MCNEIL JOHN A) 5 August 1975 (1975-08-05) column 2, line 25 - column 3, line 59; figure 1 -----	1-66,69

INTERNATIONAL SEARCH REPORT

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Box No. 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 No. 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 allsearchable claims.
2. As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
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 additional sheet

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- 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: 1-66,69

Group I is directed to a cyclone for separating a multiphase flow.

2. claim: 67

Group II is directed to a subsea processing assembly having a not further specified separator for removing debris from fluids

3. claim: 68

Group III is directed to a platform processing assembly having a not further specified separator for removing debris from fluids

4. claims: 70-76

Group IV is directed to a method and device to flow a multiphase fluid stream along an arcuate flowpath prior to its introduction into a separation region

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/GB2007/002220

Patent document cited in search report	A	Publication date	Patent family member(s)	Publication date
US 2717695	A	13-09-1955	NONE	
US 4120795	A	17-10-1978	NONE	
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US 5711374	A	27-01-1998	AU 5721194 A BR 9307679 A CA 2152070 A1 EP 0715678 A1 NO 924896 A NO 952414 A WO 9413930 A1	04-07-1994 31-08-1999 23-06-1994 12-06-1996 20-06-1994 16-06-1995 23-06-1994
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