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(71) Applicant (for SM only): **SHELL OIL COMPANY**  
[US/US]; One Shell Plaza, P.O. Box 2463, Houston,  
Texas 77252-2463 (US).

(71) Applicant (for all designated States except US): **SHELL  
INTERNATIONALE RESEARCH MAATSCHAPPIJ  
B.V.** [NL/NL]; Carel van Bylandtlaan 30, NL-2596 The  
Hague (NL).

(72) Inventor; and

(75) Inventor/Applicant (for US only): **HATTON, Gregory,  
John** [US/US]; 18215 Emerald Stone Lane, Houston,  
Texas 77094 (US).

(74) Agent: **HICKMAN, William, E.**; Shell Oil Company,  
One Shell Plaza, P.O. Box 2463, Houston, Texas  
77252-2463 (US).

(81) Designated States (unless otherwise indicated, for every  
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CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO,  
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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,  
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[Continued on next page]

(54) Title: COLD FLOW CENTER AND CENTERS

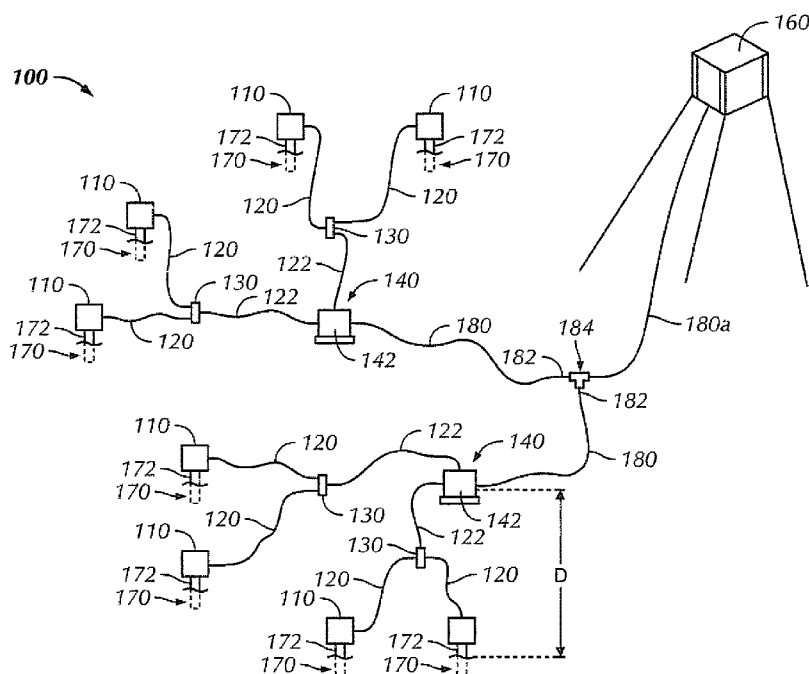


FIG. 1

(57) Abstract: A subsea production system, comprising a plurality of wells located on a sea floor, the wells producing a fluid comprising hydrocarbons; a cold flow center on the sea floor, the cold flow center fluidly connected to the plurality of wells; and a production facility on land or on

[Continued on next page]





TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM, 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 (Rule 48.2(h))*

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

14 October 2010

**Published:**

— *with international search report (Art. 21(3))*

**A. CLASSIFICATION OF SUBJECT MATTER*****E21B 36/00(2006.01)i, E21B 43/01(2006.01)i***

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)

E21B 36/00; E21B 29/12; E21B 33/037; E21B 43/36

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS(KIPO internal) &amp; Keywords: subsea production, cold flow center, and similar terms

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2006-0175062 A1 (ROBERT BENSON) 10 August 2006	1, 18, 19
Y	See abstract; figures 1A-1E, 2; pages 4-6.	2
Y	US 2006-0175063 A1 (SZABOLCS BALKANYI et al.) 10 August 2006	2
	See abstract; figure 5; and paragraphs 64-68.	
A	US 6672391 B2 (ANDERSON; CLAY F. et al.) 06 January 2004	1, 2, 18, 19
	See abstract; figures 1, 5; columns 2, 3, 6, 7.	
A	US 7426963 B2 (O'NEILL MARGUERITE E.) 23 September 2008	1, 2, 18, 19
	See abstract; figure 3; and column 5.	



Further documents are listed in the continuation of Box C.



See patent family 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 application or patent but published on or after the international filing date

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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

"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

"&amp;" document member of the same patent family

Date of the actual completion of the international search

20 AUGUST 2010 (20.08.2010)

Date of mailing of the international search report

**20 AUGUST 2010 (20.08.2010)**

Name and mailing address of the ISA/KR

Korean Intellectual Property Office  
Government Complex-Daejeon, 139 Seonsa-ro, Seo-  
gu, Daejeon 302-701, Republic of Korea

Facsimile No. 82-42-472-7140

Authorized officer

LEE, SUNG JOON

Telephone No. 82-42-481-5530



**INTERNATIONAL SEARCH REPORT**International application No.  
**PCT/US2010/020421****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.: 21  
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:  
  
Claim 21 is not clear enough to make meaningful search possible, because it substantially depends on a multiple dependent claim which does not comply with Rule 6.4(a).
3. ☒ Claims Nos.: 3-17 and 20  
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:

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 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.

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International application No.

**PCT/US2010/020421**

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2006-0175062 A1	10.08.2006	None	
US 2006-0175063 A1	10.08.2006	AU 2005-319451 A1 AU 2005-319451 B2 BR P10519128A2 GB 0710203 D0 GB 2435582 A GB 2435582 B N020073539A US 2009-020288 A1 US 7530398 B2 WO 2006-068929 A1	29.06.2006 23.07.2009 23.12.2008 04.07.2007 29.08.2007 28.10.2009 18.09.2007 22.01.2009 12.05.2009 29.06.2006
US 6672391 B2	06.01.2004	US 2003-188873 A1	09.10.2003
US 7426963 B2	23.09.2008	US 2007-0012451 A1 WO 2005-042905 A2 WO 2005-042905 A3	18.01.2007 12.05.2005 12.05.2005