

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
7 October 2004 (07.10.2004)

PCT

(10) International Publication Number
WO 2004/086092 A3

(51) International Patent Classification⁷: G01V 1/38,
A01K 73/05, B63B 21/66

(21) International Application Number:
PCT/EP2004/050379

(22) International Filing Date: 26 March 2004 (26.03.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
0307018.2 27 March 2003 (27.03.2003) GB

(71) Applicant (for AE, AG, AL, AM, AT, AU, AZ, BA, BB, BE, 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, SZ, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW only): WESTERNGECO SEISMIC HOLDINGS LIMITED [GB/GB]; Citco Building, PO Box 662, Road Town, Tortola (VG).

(71) Applicant (for FR only): SERVICES PETROLIERS SCHLUMBERGER [FR/FR]; 42, rue Saint Dominique, F-75007 Paris (FR).

(72) Inventors; and

(75) Inventors/Applicants (for US only): TOENNESSEN, Rune [NO/NO]; Schlumberger House, PO Box 234,

N-1371 Asker (NO). KESKES, Emmanuel [FR/FR]; 20 rue Prefet Bonnefoy, F-44000 Nantes (FR). STORTEIG, Eskild [NO/NO]; WesternGeco, 10 Solbraaveien, N-1372 Oslo (NO). HELGERUD, Per [NO/NO]; Haugerudveien 29, N-3300 Hokksund (NO). MOOSAVI, Vahid [NO/NO]; PO Box 234, N-1371 Asker (NO). SAINT-PERE, Philippe [FR/FR]; 1, Lieu Dit Cabland, F-33480 Castelnau De Medoc (FR).

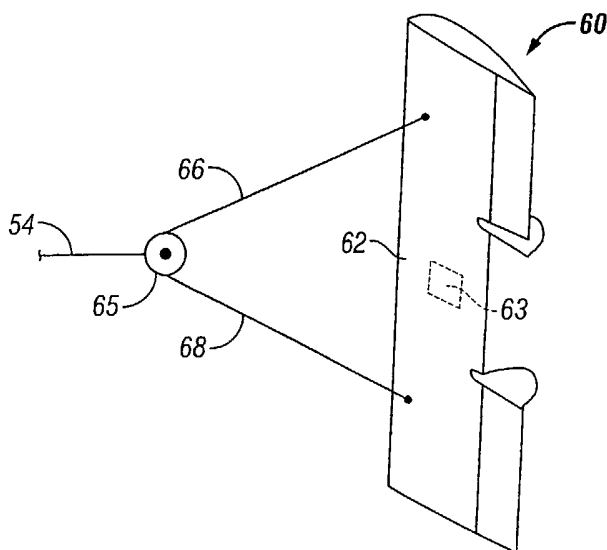
(74) Agent: SUCKLING, Andrew; Marks & Clerk, 4220 Nash Court, Oxford Business Park South, Oxford Oxfordshire OX4 2RU (GB).

(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, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: SYSTEM FOR DEPTH CONTROL OF A MARINE DEFLECTOR



(57) Abstract: A system for adjusting a deflector in a seismic survey comprises a generally upright deflector body and at least one bridle connected to a seismic cable. The bridle includes an upper segment secured to an upper connection point on the deflector body, and a lower segment coupled to a lower connection point on the deflector body. The upper bridle segment, lower bridle segment and deflector body define a geometry between themselves. This geometry is adjustable by at least one actuator so as to control the tilt angle of the deflector body.

WO 2004/086092 A3



Published:

- *with international search report*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

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.

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

25 November 2004

INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP2004/050379

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G01V1/38 A01K73/05 B63B21/66

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 G01V A01K B63B

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, WPI Data, INSPEC, COMPENDEX

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category ° | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|---|-----------------------|
| X | US 4 574 723 A (BABB HARVEY M ET AL) 11 March 1986 (1986-03-11) the whole document column 5, line 35 - line 51 column 6, line 4 - line 16; figures 1-5 ----- | 1-70 |
| X | WO 00/76839 A (SHATTOCK BERNARD AUBREY) 21 December 2000 (2000-12-21) page 1, line 1 - line 14; figures 1-6 page 12, line 22 - page 13, line 22 page 18, line 4 - line 6 the whole document ----- -/-- | 1-70 |

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

14 September 2004

Date of mailing of the international search report

21/09/2004

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

De Bekker, R

INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP2004/050379

| C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT | | |
|--|---|--|
| Category ° | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
| X | GB 2 122 562 A (SEISMOGRAPH SERVICE) 18 January 1984 (1984-01-18) abstract; figures 1-4 the whole document page 2, line 32 - line 50 ----- | 1,2,9, 11,26, 30,31, 35-38,49 |
| X | BE 497 522 A (TNO NEDERLAND) 1 December 1950 (1950-12-01) ----- | 40 |
| A | figure 3 ----- | 3 |
| X | US 2 980 052 A (FEHLNER LEO F) 18 April 1961 (1961-04-18) column 1, line 54 - line 69; figures 1-4 the whole document ----- | 40-70 |
| A | DE 976 740 C (EMMA SUEBERKRUEB) 2 April 1964 (1964-04-02) figures 1,2 ----- | 1-70 |
| X | US 4 991 534 A (WARNAN FRANCOIS ET AL) 12 February 1991 (1991-02-12) abstract; figures 1,3-5 ----- | 49 |
| A | EP 0 168 959 A (TEXAS INSTRUMENTS INC) 22 January 1986 (1986-01-22) abstract; figures 4,5 ----- | 1-70 |
| A | US 5 357 892 A (VATNE ODD O ET AL) 25 October 1994 (1994-10-25) cited in the application the whole document ----- | 1-70 |

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP2004/050379

| Patent document cited in search report | | Publication date | Patent family member(s) | Publication date |
|--|---|------------------|---|--|
| US 4574723 | A | 11-03-1986 | NONE | |
| WO 0076839 | A | 21-12-2000 | AT 238943 T AU 757879 B2 AU 5094400 A CA 2374496 A1 CN 1355750 T DE 60002463 D1 EP 1187757 A1 WO 0076839 A1 NO 20016104 A | 15-05-2003 13-03-2003 02-01-2001 21-12-2000 26-06-2002 05-06-2003 20-03-2002 21-12-2000 14-02-2002 |
| GB 2122562 | A | 18-01-1984 | NO 832339 A | 29-12-1983 |
| BE 497522 | A | | NONE | |
| US 2980052 | A | 18-04-1961 | US 2960960 A US 2981220 A | 22-11-1960 25-04-1961 |
| DE 976740 | C | 02-04-1964 | NONE | |
| US 4991534 | A | 12-02-1991 | FR 2637561 A1 CA 1331319 C GB 2223728 A , B | 13-04-1990 09-08-1994 18-04-1990 |
| EP 0168959 | A | 22-01-1986 | CA 1241103 A1 DE 3564410 D1 EP 0168959 A1 NO 852459 A , B, US 4719987 A | 23-08-1988 22-09-1988 22-01-1986 20-12-1985 19-01-1988 |
| US 5357892 | A | 25-10-1994 | NO 921155 A NO 930904 A DE 69302513 D1 DE 69302513 T2 EP 0562780 A1 | 27-09-1993 13-09-1994 13-06-1996 19-09-1996 29-09-1993 |