



- (51) International Patent Classification:
H05H 1/00 (2006.01)
- (21) International Application Number:
PCT/US2012/043548
- (22) International Filing Date:
21 June 2012 (21.06.2012)
- (25) Filing Language:
English
- (26) Publication Language:
English
- (30) Priority Data:
13/165,556 21 June 2011 (21.06.2011) US
13/437,599 2 April 2012 (02.04.2012) US
- (71) Applicant (for all designated States except US): **FEI COMPANY** [US/US]; 5350 NE Dawson Creek Dr., Hillsboro, Oregon 97124 (US).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): **KELLOGG, Sean** [US/US]; 3026 NE 55th Ave, Portland, Oregon 97213 (US). **GRAUPERA, Anthony** [US/US]; 2577 NE Anna Ave, Hillsboro, Oregon 97124 (US). **PARKER, N. Willi-**

am [US/US]; Apt. 1312, 2669 NW Overlook Dr., Hillsboro, Oregon 97124 (US). **UTLAUT, Mark W.** [US/US]; 29430 Dutch Canyon Rd., Scappoose, Oregon 97056 (US). **WELLS, Andrew B.** [US/US]; 2922 NE 32nd Ave, Portland, Oregon 97212 (US). **MCGINN, James B.** [US/US]; 2365 NW Marshall, Portland, Oregon 97210 (US).

(74) Agent: **SCHEINBERG, Michael O.**; P.O. Box 164140, Austin, Texas 78716 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, 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, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH,

[Continued on next page]

(54) Title: ENCAPSULATION OF ELECTRODES IN SOLID MEDIA FOR USE IN CONJUNCTION WITH FLUID HIGH VOLTAGE ISOLATION

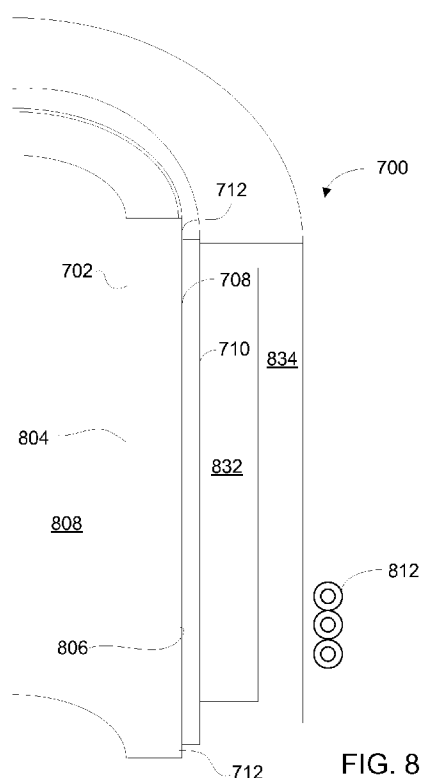


FIG. 8

(57) Abstract: An inductively-coupled plasma source for a focused charged particle beam system includes a conductive shield that provides improved electrical isolation and reduced capacitive RF coupling and a dielectric fluid that insulates and cools the plasma chamber. The conductive shield may be enclosed in a solid dielectric media. The dielectric fluid may be circulated by a pump or not circulated by a pump. A heat tube can be used to cool the dielectric fluid.



GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, 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, RS, 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:

28 February 2013

Published:

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

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/043548**A. CLASSIFICATION OF SUBJECT MATTER****H05H 1/00(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)

H05H 1/00; H01J 1/00; C23C 16/00; B23K 10/00

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) & Keywords: Inductively coupled plasma(ICP), plasma chamber, faraday shield, cooling, lense, electrode, conductor, coil, beam, fluid

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2005-0183667 A1 (JOHN KELLER et al.) 25 August 2005 See paragraphs [0018]–[0022], [0033], claims 1, 9 and figures 1–4	1–22
A	US 2002-0023899 A1 (MARWAN H. KHATER et al.) 28 February 2002 See paragraphs [0029], [0031], [0037], [0040], claims 1,4 and figure 1	1–22
A	US 6447636 B1 (QIAN; XUE-YU et al.) 10 September 2002 See column 3, lines 47–67, column 4, lines 18–27, claim 1 and figure 1 * In case of claim 14, "The plasma source of claim 14" is assumed "The plasma source of claim 13", because claim 13 relates to the plasma source.	1–22

☐ 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

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of 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

31 DECEMBER 2012 (31.12.2012)

Date of mailing of the international search report

02 JANUARY 2013 (02.01.2013)

Name and mailing address of the ISA/KR

Korean Intellectual Property Office
189 Cheongsu-ro, Seo-gu, Daejeon Metropolitan
City, 302-701, Republic of Korea

Facsimile No. 82-42-472-7140

Authorized officer

LEE, HYEON HONG

Telephone No. 82-42-481-5682



INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2012/043548

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2005-0183667 A1	25.08.2005	EP 1725697 A2	29.11.2006
		EP 1725697 A4	25.11.2009
		JP 2007-529091 A	18.10.2007
		JP 2007-529091 T	18.10.2007
		US 2008-0017319 A1	24.01.2008
		US 2010-0294648 A1	25.11.2010
		US 7241361 B2	10.07.2007
		US 7670455 B2	02.03.2010
		US 8168957 B2	01.05.2012
		WO 2005-081940 A2	09.09.2005
		WO 2005-081940 A3	12.07.2007
		WO 2005-081940 A3	09.09.2005
US 2002-0023899 A1	28.02.2002	AU 2001-286661 A8	13.03.2002
		AU 2001-86661 A1	13.03.2002
		TW 536437 B	11.06.2003
		US 6459066 B1	01.10.2002
		WO 02-19387 A2	07.03.2002
		WO 02-19387 A3	30.01.2003
		WO 02-19387 A3	07.03.2002
US 6447636 B1	10.09.2002	None	