

(2004073532)

10 DEC 2004

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

(19) World Intellectual Property
Organization
International Bureau



162162

(43) International Publication Date
8 January 2004 (08.01.2004)

PCT

(10) International Publication Number
WO 2004/003963 A3

(51) International Patent Classification⁷: **H01J 37/32**

(21) International Application Number:
PCT/US2003/019366

(22) International Filing Date: 20 June 2003 (20.06.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
10/180,978 27 June 2002 (27.06.2002) US

(71) Applicant (for all designated States except US): **LAM RESEARCH CORPORATION** [US/US]; 4650 Cushing Parkway, Fremont, CA 94538-6516 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **VAHEDI, Vahid** [US/US]; 1503 Posen Avenue, Albany, CA 94706 (US). **LOEWENHARDT, Peter** [CA/US]; 5602 Selena Court, Pleasanton, CA 94566 (US). **ELLINGBOE, Bert** [US/IE]; Inglefield, Hanlons Lane, Luncan, Co. Dublin (IE). **KUTHI, Andy** [US/US]; 717 Pamela Wood Street, Thousand Oaks, CA 91320 (US). **FISCHER, Andreas** [DE/US]; 18989 Mount Lassen, Castro Valley, CA 94552 (US).

(74) Agent: **LOWE, Allan, M.**; Lowe Hauptman Gilman & Berner, LLP, Suite 310, 1700 Diagonal Road, Alexandria, VA 22314 (US).

(81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, 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, NO, NZ, PH, PL, PT, RO, RU, SD, SE, SG, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

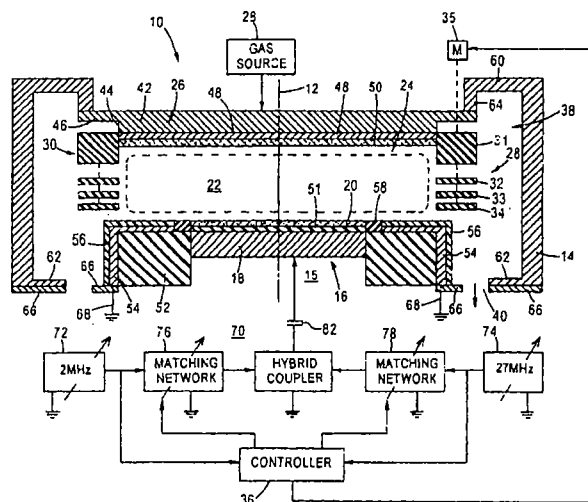
(84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SI, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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

[Continued on next page]

(54) Title: **PLASMA PROCESSOR WITH ELECTRODE SIMULTANEOUSLY RESPONSIVE TO PLURAL FREQUENCIES**



(57) Abstract: A plasma in a vacuum chamber where a workpiece is processed is bounded by a plasma confinement volume including a region between a first electrode simultaneously responsive to power at first and second RF frequencies and a DC grounded second electrode. A DC grounded extension is substantially aligned with the first electrode. A substantial percentage of power at the first frequency is coupled to a path including the first and second electrodes but not the extension while a substantial percentage of power at the second frequency is coupled to a path including the first electrodes and extension, but not the second electrode. Changing the relative powers at the first and second frequencies, as applied to the first electrode, controls DC bias voltage of the first electrode.

WO 2004/003963 A3



ACTION

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

22 July 2004

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.