



- (51) **International Patent Classification:**  
H01L 21/30 (2006.01) H01C 17/02 (2006.01)  
H05B 3/68 (2006.01)
- (21) **International Application Number:** PCT/IB2012/054903
- (22) **International Filing Date:** 17 September 2012 (17.09.2012)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**  
13/238,396 21 September 2011 (21.09.2011) US
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- (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, BN, 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, PA, 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, 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).

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(54) Title: THERMAL PLATE WITH PLANAR THERMAL ZONES FOR SEMICONDUCTOR PROCESSING

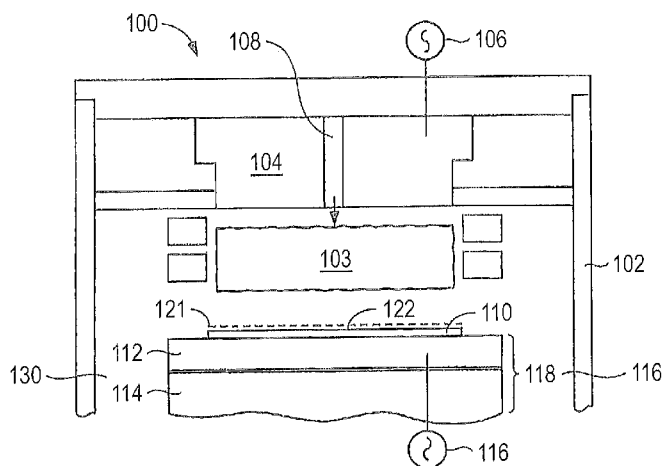


FIG. 1

(57) **Abstract:** A thermal plate for a substrate support assembly in a semiconductor plasma processing apparatus, comprises multiple independently controllable planar thermal zones arranged in a scalable multiplexing layout, and electronics to independently control and power the planar heater zones. Each planar thermal zone uses at least one Peltier device as a thermoelectric element. A substrate support assembly in which the thermal plate is incorporated includes an electrostatic clamping electrode layer and a temperature controlled base plate. Methods for manufacturing the thermal plate include bonding together ceramic or polymer sheets having planar thermal zones, positive, negative and common lines and vias.

**Declarations under Rule 4.17:**

- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

**Published:**

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

**(88) Date of publication of the international search report:**  
25 June 2015

**INTERNATIONAL SEARCH REPORT**

International application No.

PCT/IB12/54903

**A. CLASSIFICATION OF SUBJECT MATTER**  
 IPC(8) - H01L 23/38 (2013.01)  
 USPC - 136/203  
 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(8) - H01L 23/38, 27/16, 35/28 (2013.01)  
 USPC - 136/203; 438/9, 710, 715

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 practicable, search terms used)  
 MicroPatent (US Granted, US Applications, EP-A, EP-B, WO, JP, DE-G, DE-A, DE-T, DE-U, GB-A, FR-A); DialogPro (Derwent, INSPEC, NTIS, PASCAL, Current Contents Search, Dissertation Abstracts Online, Inside Conferences); IEEE.com; Google Scholar; KEYWORDS: peltier\*, thermoelectric\*, diode\*, insulat\*, volt\*, plate\*, plane\*, planar\*

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2011/0143462 A1 (GAFF, K et al.) June 16, 2011; entire document	1-18
A	US 2011/0092072 A1 (SINGH, H et al.) April 21, 2011; entire document	1-18
A	US 5,515,683 A (KESSLER, R) May 14, 1996; entire document	1-18
A	US 5,255,520 A (O'GEARY, D et al.) October 26, 1993; entire document	1-18

Further documents are listed in the continuation of Box C.

\* 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 another citation or other special reason (as specified)  
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 "&" document member of the same patent family

Date of the actual completion of the international search 03 January 2013 (03.01.2013)	Date of mailing of the international search report <b>07 FEB 2013</b>
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