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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
04 September 2025 (04.09.2025)

WIPO | PCT

(10) International Publication Number
WO 2025/184477 A1

(51) International Patent Classification:
*H01L 21/683* (2006.01) *H02N 13/00* (2006.01)
*H01L 21/67* (2006.01) *B23Q 3/15* (2006.01)
*H01L 23/00* (2006.01)

(21) International Application Number:
PCT/US2025/017802

(22) International Filing Date:
28 February 2025 (28.02.2025)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
63/560,362 01 March 2024 (01.03.2024) US

(71) Applicant: **APPLIED MATERIALS, INC.** [US/US]; 3050 Bowers Avenue, Santa Clara, California 95054 (US).

(72) Inventors: **PARKHE, Vijay D.**; c/o Applied Materials, Inc., Law Dept., M/S 1269, 3050 Bowers Avenue, Santa Clara, California 95054 (US). **TEDESCHI, Leonard M.**; c/o Applied Materials, Inc., Law Dept., M/S 1269, 3050 Bowers Avenue, Santa Clara, California 95054 (US). **RAMASWAMY, Kartik**; c/o Applied Materials, Inc., Law Dept., M/S 1269, 3050 Bowers Avenue, Santa Clara, California 95054 (US).

(74) Agent: **STEVENS, Joseph J.** et al.; Patterson + Sheridan LLP, 24 Greenway Plaza, Suite 1600, Houston, Texas 77046 (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, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CV, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY,

WO 2025/184477 A1

(54) **Title:** SUBSTRATE WARPAGE COMPENSATION

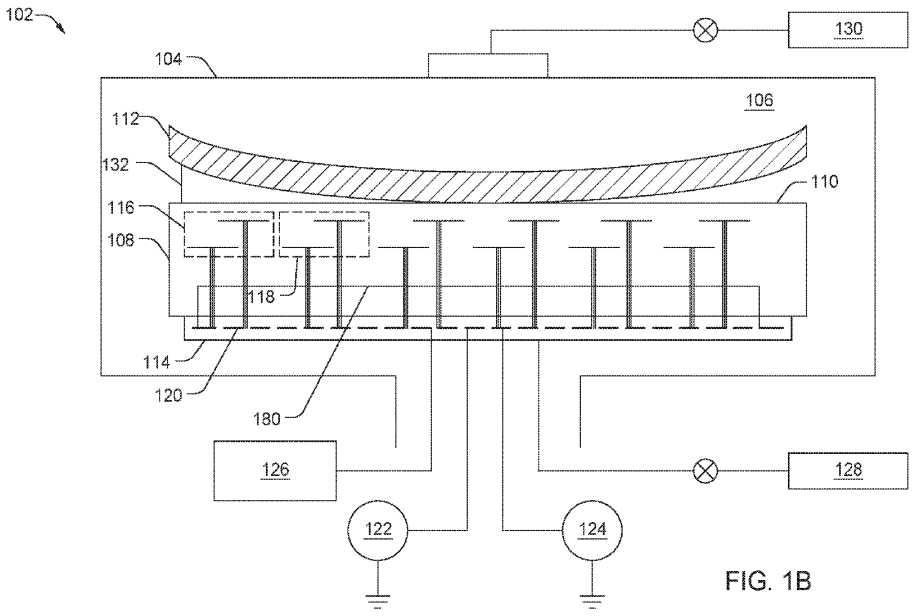



FIG. 1B

(57) **Abstract:** Embodiments of the disclosure include apparatus and methods for substrate processing. A method includes applying a first DC bias to a first pair of electrodes and a second pair of electrodes, the first pair is disposed within a first portion of a substrate support and the second pair is disposed within a second portion of the substrate support. The method further includes detecting a difference in a first electrical characteristic of a first flow and a second electrical characteristic of a second flow between the electrode pairs and the substrate. A second DC bias is applied to the first pair and a third DC bias, different from the second DC bias, is applied to the second pair. The second DC bias and the third DC bias are selected based on the difference in the first and second flows.

*[Continued on next page]*

MA, MD, MG, MK, MN, MU, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UY, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) **Designated States** *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, CV, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SC, SD, SL, ST, 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, ME, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

**Published:**

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