



- (51) **International Patent Classification:**
H01L 21/67 (2006.01)
- (21) **International Application Number:**
PCT/US2022/040374
- (22) **International Filing Date:**
15 August 2022 (15.08.2022)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**
63/260,301 16 August 2021 (16.08.2021) US
17/886,748 12 August 2022 (12.08.2022) US
- (71) **Applicant:** **APPLIED MATERIALS, INC.** [US/US];
3050 Bowers Avenue, Santa Clara, California 95054 (US).
- (72) **Inventors:** **MEDURE, Robert A.**; 3050 Bowers Avenue,
Santa Clara, California 95054 (US). **TAN, Raechel Chu-**
Hui; 3050 Bowers Avenue, Santa Clara, California 95054
(US). **WANG, Changgong**; 3050 Bowers Avenue, Santa
Clara, California 95054 (US). **GUO, Yuanhong**; 3050

Bowers Avenue, Santa Clara, California 95054 (US). **PAD-**
HY, Sai; 3050 Bowers Avenue, Santa Clara, California
95054 (US). **OKADA, Ashley M.**; 3050 Bowers Avenue,
Santa Clara, California 95054 (US). **LE, Kenneth**; 3050
Bowers Avenue, Santa Clara, California 95054 (US). **KILI-**
CARSLAN, Atilla; 3050 Bowers Avenue, Santa Clara,
California 95054 (US). **HRUZEK, Dean C.**; 3050 Bowers
Avenue, Santa Clara, California 95054 (US).

- (74) **Agent:** **PORTNOVA, Marina** et al.; Lowenstein Sandler
LLP, One Lowenstein Drive, Roseland, New Jersey 07068
(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, 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, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH,

- (54) **Title:** PREVENTION OF CONTAMINATION OF SUBSTRATES DURING PRESSURE CHANGES IN PROCESSING
SYSTEMS

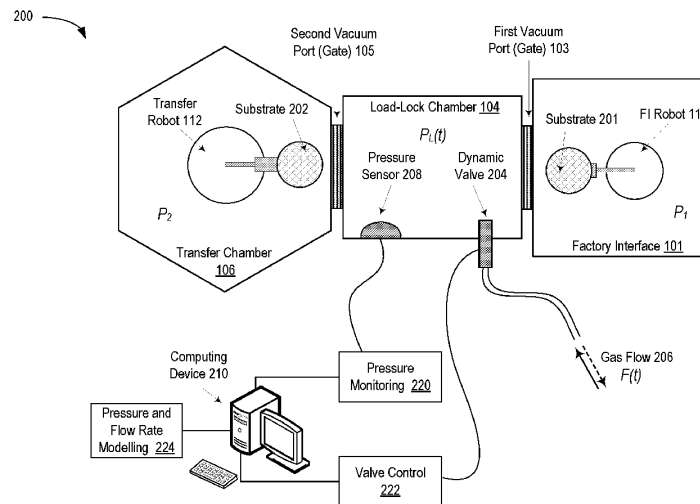


FIG. 2

- (57) **Abstract:** Disclosed are implementations for minimizing substrate contamination during pressure changes in substrate processing systems. Over a duration of a pressure change (increase or decrease) in a chamber of a substrate processing system, a flow rate is adjusted multiple times to reduce occurrence of contaminant particles in an environment of the chamber. In some instances, the flow rate is changed continuously using at least one dynamic valve that enable continuous control over the pressure dynamics of the chamber.

[Continued on next page]

TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS,
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, 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, 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).

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))*