



- (51) **International Patent Classification:**
G03F 7/00 (2006.01)
- (21) **International Application Number:**
PCT/US2024/061160
- (22) **International Filing Date:**
19 December 2024 (19.12.2024)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**
63/613,905 22 December 2023 (22.12.2023) US
- (71) **Applicant:** **APPLIED MATERIALS, INC.** [US/SA];
3050 Bowers Avenue, Santa Clara, California 95054 (US).
- (72) **Inventors:** **HOUK, Roman**; 3050 Bowers Avenue, Santa Clara, California 95054 (US). **VERHAVERBEKE, Steven**; 3050 Bowers Avenue, Santa Clara, California 95054 (US). **STONAS, Bernhard**; 3050 Bowers Avenue, Santa Clara, California 95054 (US). **TUMMALA, Vudaya Sankar**; 3050 Bowers Avenue, Santa Clara, California 95054 (US). **DELMAS, Jean**; 3050 Bowers Avenue, Santa Clara, California 95054 (US).
- (74) **Agent:** **KRUEGER, Paul M.** 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, 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, 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).

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))

(54) **Title:** WARPAGE CONTROL FOR ADVANCED PACKAGING



FIG. 3B

(57) **Abstract:** A stage for securing a substrate is provided. In some cases, the stage can include a body and a flat surface configured to support a substrate. In some cases, the stage can further include a clamping mechanism including multiple vacuum ports distributed across the flat surface. In some cases some of the vacuum ports are configured to exert a localized clamping force to respective areas above the vacuum ports. In some cases, the stage can further include a clamp ring configured to transmit the localized clamping forces from a some of the respective vacuum ports beneath the clamp ring to at least portion of a supported substrate.

[Continued on next page]

Published:

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