



- (51) **International Patent Classification:**  
*G02B 5/18* (2006.01) *G02B 27/01* (2006.01)
- (21) **International Application Number:**  
PCT/US2024/041533
- (22) **International Filing Date:**  
08 August 2024 (08.08.2024)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**  
63/518,478 09 August 2023 (09.08.2023) US
- (71) **Applicant: APPLIED MATERIALS, INC.** [US/US];  
3050 Bowers Avenue, Santa Clara, California 95054 (US).
- (72) **Inventors: BHARGAVA, Samarth;** c/o Applied Materials, Inc., Law Dept., M/S 1269, 3050 Bowers Avenue, Santa Clara, California 95054 (US). **LIU, Yingnan;** c/o Applied Materials, Inc. Law Dept., MS/1269, 3050 Bowers Avenue, Santa Clara, California 95054 (US). **MESSER, Kevin;** c/o Applied Materials, Inc., Law Dept., MS/1269, 3050 Bowers Avenue, Santa Clara, California 95054 (US). **WANG, Evan;** c/o Applied Materials, Inc., Law Dept., M/s 1269, 3050 Bowers Avenue, Santa Clara, California 95054 (US). **SELL, David Alexander;** c/o Applied Materials, Inc., Law Dept., M/S 1269; 3050 Bowers Avenue, Santa Clara, California 95054 (US). **LORENZO, Simon;** c/o Applied Ma-

terials, Inc., Law Dept., M/S 1269, 3050 Bowers Avenue, Santa Clara, California 95054 (US).

- (74) **Agent: PATTERSON, B. Todd et al.;** 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, 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).

- (54) **Title:** FUNCTIONAL IMPRINTED OPTICAL STRUCTURES FOR OPTICAL DEVICES

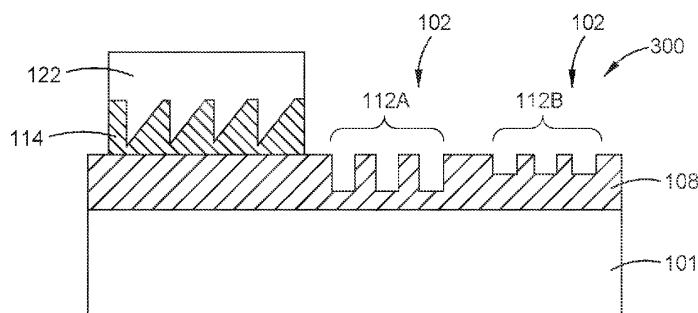


FIG. 3H

- (57) **Abstract:** Embodiments of the present disclosure include apparatus and methods for optical devices. In one embodiment, a method for forming an optical device generally includes disposing a first material device layer on a substrate, patterning a portion of the first material device layer to form a first plurality of device structures in the first material device layer, disposing a second material device layer on an unpatterned portion of the first device material layer, and patterning the second material device layer to form a second plurality of device structures disposed on the first material device layer.

**Published:**

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