

- (51) International Patent Classification:
G03B 21/14 (2006.01) G02F 1/017 (2006.01)
- (21) International Application Number:
PCT/US2024/022416
- (22) International Filing Date:
29 March 2024 (29.03.2024)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
63/493,004 30 March 2023 (30.03.2023) 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, 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).

Published:

— without international search report and to be republished upon receipt of that report (Rule 48.2(g))

(54) Title: PATTERN PROJECTION AND DETECTION USING FLAT OPTICS

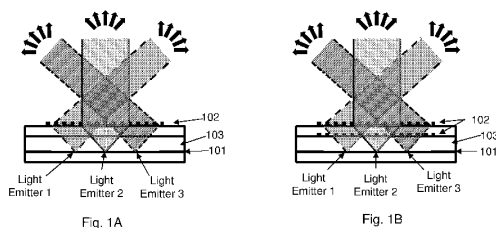


Fig. 1C



Fig. 1D

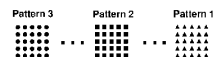
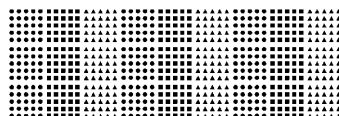


Fig. 1E



(57) Abstract: An optical pattern projection device includes a light emitter or light emitter array and one or more flat optics layers configured to project and split light beams from the light emitters to generate a projected light pattern including multiple sub-patterns each corresponding to one of the light emitters. The flat optics layers may include a single optical metasurface containing superposed beam shaping and/or projection phase profile and a beam splitting phase profile. Alternatively, the flat optics layers may include two optical metasurfaces each containing a light shaping and/or projection phase profile, which together produce a linear relationship between light emitter position and corresponding beam projection angle, and one or both of the metasurfaces further contains a superposed beam splitting phase profile. The light shaping and/or projection phase profile may have a function similar to a micro-lens array. A structured light camera combining optical pattern projection and detection is also provided.