

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

(19) World Intellectual Property
Organization
International Bureau

(43) International Publication Date
18 January 2024 (18.01.2024)



(10) International Publication Number
WO 2024/015012 A1

(51) International Patent Classification:

G02B 1/00 (2006.01) B82Y 20/00 (2011.01)
H04N 23/10 (2023.01) H04N 23/55 (2023.01)

(21) International Application Number:

PCT/SG2022/050485

(22) International Filing Date:

12 July 2022 (12.07.2022)

(25) Filing Language:

English

(26) Publication Language:

English

(71) Applicant: **AGENCY FOR SCIENCE, TECHNOLOGY AND RESEARCH** [SG/SG]; 1 Fusionopolis Way, #20-10 Connexis North Tower, Singapore 138632 (SG).

(72) Inventors: **BARANIKOV, Anton**; c/o Institute of Materials Research and Engineering (IMRE), 2 Fusionopolis Way, #08-03, Innovis, Singapore 138634 (SG). **KHAI-DAROV, Egor**; c/o Institute of Materials Research and Engineering (IMRE), 2 Fusionopolis Way, #08-03, Innovis, Singapore 138634 (SG). **LASSALLE, Emmanuel**; c/o Institute of Materials Research and Engineering (IMRE), 2 Fusionopolis Way, #08-03, Innovis, Singapore 138634 (SG). **PANIAGUA DOMINGUEZ, Ramon Jose**; c/o Institute of Materials Research and Engineering (IMRE), 2 Fusionopolis Way, #08-03, Innovis, Singapore 138634 (SG). **KUZNETSOV, Arseniy**; c/o Institute of Materials

Research and Engineering (IMRE), 2 Fusionopolis Way, #08-03, Innovis, Singapore 138634 (SG).

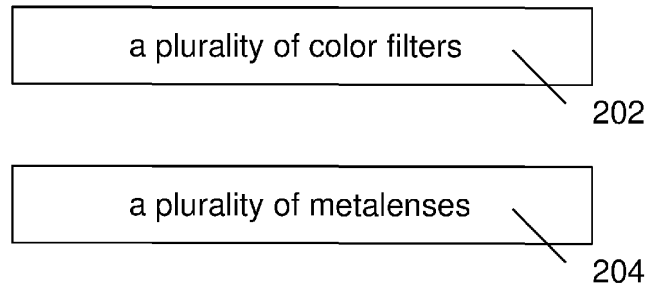
(74) Agent: **VIERING, JENTSCHURA & PARTNER LLP**; P.O. Box 1088, Rochor Post Office, Rochor Road, Singapore 911833 (SG).

(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, 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, 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, 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: OPTICAL SYSTEM AND METHOD OF FORMING THE SAME, METHOD OF FORMING A MULTI-COLOR IMAGE

FIG. 2



(57) Abstract: Various embodiments may relate to an optical system. The optical system may include a plurality of color filters, a first color filter of the plurality of color filters configured to select light of different wavelength ranges representing different color channels. The optical system may also include a plurality of metalenses, each of the plurality of metalenses associated with a respective color channel of the plurality of color channels. Each of the plurality of metalenses may have a focal length, the plurality of metalenses having equal focal lengths such that the different color channels are combined on a common focal plane to form a multi-color image. Each of the plurality of metalenses may include a plurality of nanostructures, have a (FOV) field of view of more than 30 degrees, and a desired working spectral bandwidth dependent on an extended depth of focus, a central wavelength of the associated color channel, and the focal length at the central wavelength.

[Continued on next page]

WO 2024/015012 A1

Published:

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