

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

(19) World Intellectual Property  
Organization  
International Bureau

(43) International Publication Date  
06 October 2022 (06.10.2022)



(10) International Publication Number  
**WO 2022/212038 A1**

(51) International Patent Classification:  
G01N 33/487 (2006.01)

(21) International Application Number:  
PCT/US2022/020395

(22) International Filing Date:  
15 March 2022 (15.03.2022)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
63/169,041 31 March 2021 (31.03.2021) US

(71) Applicant: **ILLUMINA, INC.** [US/US]: 5200 Illumina Way, San Diego, California 92122 (US).

(72) Inventors: **MOON, John**; c/o Illumina, Inc., 5200 Illumina Way, San Diego, California 92122 (US). **BOYANOV, Boyan**; c/o Illumina, Inc., 5200 Illumina Way, San Diego, California 92122 (US).

(74) Agent: **FULLER, Michael L.**; Knobbe Martens Olson & Bear LLP, 2040 Main Street, Fourteenth Floor, Irvine, California 92614 (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, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, 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, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ,

(54) Title: SCALABLE CIRCUIT FOR MOLECULAR DETECTION

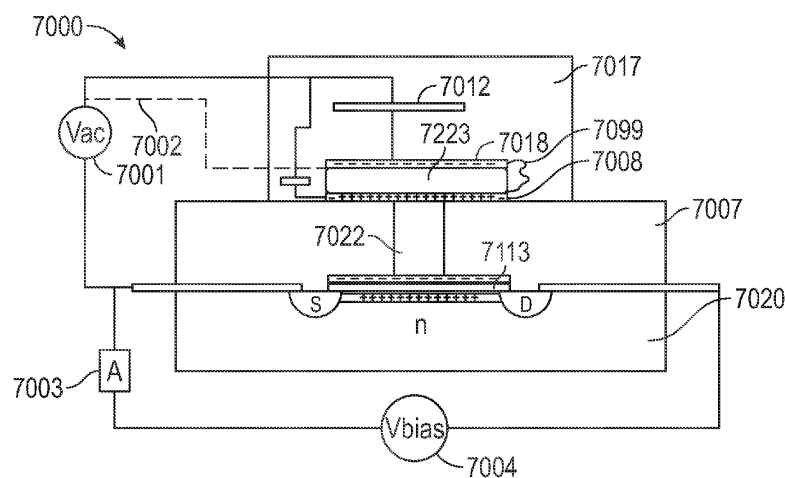


FIG. 7

(57) Abstract: In one aspect, the disclosed technology relates to systems and methods for sequencing polynucleotides. In one embodiment, the disclosed technology relates to a nanopore sensor device for identifying nucleotides, the nanopore sensor device including: one or more cis wells; one or more cis electrodes associated with the one or more cis wells; a plurality of trans wells, each of the plurality of trans wells separated from the one or more cis wells by a lipid or solid-state membrane having a nanopore; a plurality of field effect transistors (FETs), each of the plurality of FETs associated with one of the plurality of trans wells; an electrical source configured to provide alternating current (AC) inputs between the one or more cis electrodes and the source terminals of the plurality of FETs; and a controller operably coupled to the plurality of FETs, the controller configured to measure AC responses of the plurality of FETs, wherein the AC responses depend on the identities of the nucleotides within or near the nanopores.

[Continued on next page]

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))*