

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

(19) World Intellectual Property
Organization
International Bureau

(43) International Publication Date
11 June 2020 (11.06.2020)



(10) International Publication Number
WO 2020/113578 A1

(51) International Patent Classification:
H01L 27/24 (2006.01)

(21) International Application Number:
PCT/CN2018/119908

(22) International Filing Date:
07 December 2018 (07.12.2018)

(25) Filing Language: English

(26) Publication Language: English

(71) Applicant: **YANGTZE MEMORY TECHNOLOGIES CO., LTD.** [CN/CN]; Room 7018, No. 18, Huaguang Road, Guangdong Science and Technology Industrial Park, East Lake Development Zone, Wuhan, Hubei 430074 (CN).

(72) Inventors: **SONG, Yali**; Room 7018, No. 18, Huaguang Road, Guangdong Science and Technology Industrial Park, East Lake Development Zone, Wuhan, Hubei 430074 (CN).
XIAO, Lihong; Room 7018, No. 18, Huaguang Road, Guangdong Science and Technology Industrial Park, East

Lake Development Zone, Wuhan, Hubei 430074 (CN).
WANG, Ming; Room 7018, No. 18, Huaguang Road, Guangdong Science and Technology Industrial Park, East Lake Development Zone, Wuhan, Hubei 430074 (CN).

(74) Agent: **NTD UNIVATION INTELLECTUAL PROPERTY AGENCY LTD.**; 10th Floor, Tower C, Beijing Global Trade Center, 36 North Third Ring Road East, Dongcheng District, Beijing 100013 (CN).

(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, 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, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(54) Title: NOVEL 3D NAND MEMORY DEVICE AND METHOD OF FORMING THE SAME

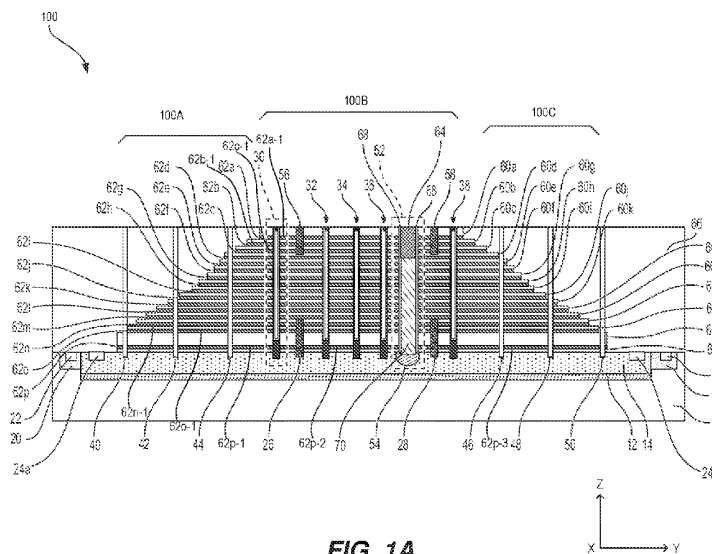


FIG. 1A

(57) Abstract: A 3D-NAND memory device is provided. The memory device includes a substrate, a bottom select gate (BSG) disposed over the substrate, a plurality of word lines positioned over the BSG with a staircase configuration and a plurality of insulating layers disposed between the substrate, the BSG, and the plurality of word lines. In the disclosed memory device, one or more first dielectric trenches are formed in the BSG and extend in a length direction of the substrate to separate the BSG into a plurality of sub-BSGs. In addition, one or more common source regions are formed over the substrate and extend in the length direction of the substrate. The one or more common source regions further extend through the BSG, the plurality of word lines and the plurality of insulating layers.

[Continued on next page]

WO 2020/113578 A1

(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, 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).

Published:

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