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- (81) **Designated States (unless otherwise indicated, for every kind of national protection available):** AE, AG, AL, AM,

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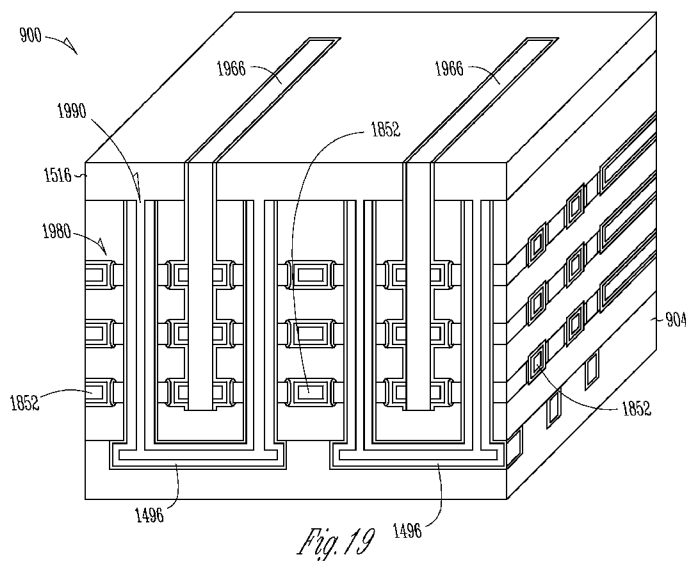
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(54) **Title:** CHARGE STORAGE APPARATUS, SYSTEMS AND METHODS



(57) **Abstract:** Methods of forming multi-tiered semiconductor devices are described, along with apparatus and systems that include them. In one such method, an opening is formed in a tier of semiconductor material and a tier of dielectric. A portion of the tier of semiconductor material exposed by the opening is processed so that the portion is doped differently than the remaining semiconductor material in the tier. At least substantially all of the remaining semiconductor material of the tier is removed, leaving the differently doped portion of the tier of semiconductor material as a charge storage structure. A tunneling dielectric is formed on a first surface of the charge storage structure and an intergate dielectric is formed on a second surface of the charge storage structure. Additional embodiments are also described.

A. CLASSIFICATION OF SUBJECT MATTER***H01L 21/8247(2006.01)i, H01L 27/115(2006.01)i***

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H01L 21/8247; H01L 27/115; H01L 21/205; H01L 21/8234; H01L 29/788

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS(KIPO internal) & Keywords: opening, dielectric, charge, storage

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2010-0276743 A1 (KUNIYA TAKUJI et al.) 04 November 2010 See Paragraph [0063], [0064], [0075], [0140] Figure 1,3,13,18	1-30
A	US 2010-0112769 A1 (SON YONG-HOON et al.) 06 May 2010 See Paragraph [0064], [0070], [0076], [0079], [0080], [0086] Figure 1,2,3H,4,5L	1-30
A	US 2010-0181612 A1 (KITO MASARU et al.) 22 July 2010 See Paragraph[0039], [0068], [0069] Figure 4,16	1-30



Further documents are listed in the continuation of Box C.



See patent family annex.

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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