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(54) Title: REDUCTION OF FORMING VOLTAGE IN SEMICONDUCTOR DEVICES

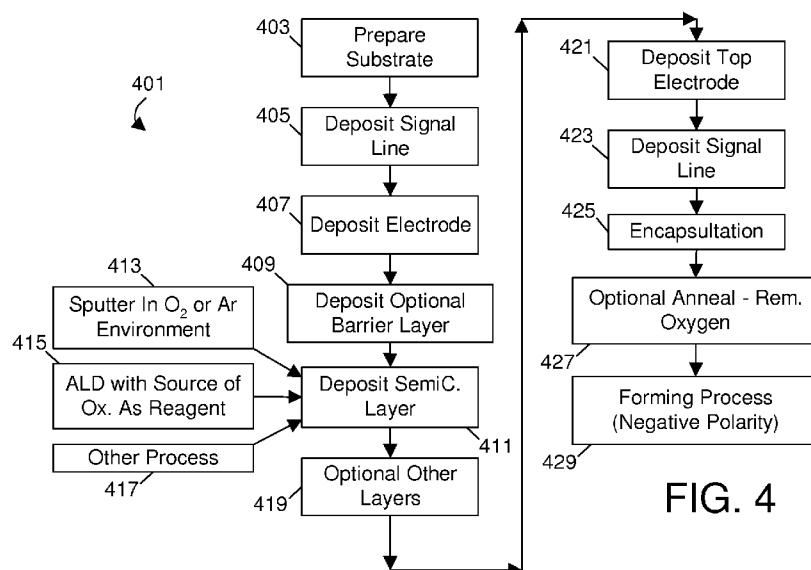


FIG. 4

(57) Abstract: This disclosure provides a nonvolatile memory device and related methods of manufacture and operation. The device may include one or more resistive random access memory (RRAM) that use techniques to provide a memory device with more predictable operation. In particular, forming voltage required by particular designs may be reduced through the use of a barrier layer, a reverse polarity forming voltage pulse, a forming voltage pulse where electrons are injected from a lower work function electrode, or through the use of an anneal in a reducing environment. One or more of these techniques may be applied, depending on desired application and results.



— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

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A. CLASSIFICATION OF SUBJECT MATTER*G11C 5/14(2006.01)i, G11C 16/00(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)

IPC: G11C 5/14; H01L 21/20; H01L 21/82; H01L 21/8247; H01L 27/115; H01L 29/78

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 since 1975.

Japanese utility models and applications for utility models since 1975.

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

e-Kompass "RRAM, ReRAM, barrier, layer"

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y	KR 10-2000-0048092 A (LUCENT TECHNOLOGIES INC.) 25 July 2000 See claims 1-5 and figures 1, 2.	3,12
A	US 2004-0043578 A1 (EUGENE, P. MARSH) 04 March 2004 See abstract, claims 1, 5, 7 and figures 1, 2.	1-24



Further documents are listed in the continuation of Box C.



See patent family annex.

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Information on patent family members

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