United States Patent [19]

Fazan et al.

[11] **Patent Number: 5,053,351**

[45] **Date of Patent: Oct. 1, 1991**

[54] **METHOD OF MAKING STACKED E-CELL CAPACITOR DRAM CELL**

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[73] Assignee: **Micron Technology, Inc.**, Boise, Id.

[21] Appl. No.: **671,312**

[22] Filed: **Mar. 19, 1991**

[51] **Int. Cl.**[5] **H01L 21/70**

[52] **U.S. Cl.** **437/52;** 437/47; 437/48; 437/60; 437/233; 437/919; 357/23.6

[58] **Field of Search** 437/47, 48, 51, 52, 437/60, 191, 193, 195, 228, 233, 235, 919; 357/23.6, 51

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,742,018	5/1988	Kimura et al.	
4,953,126	8/1990	Ema	357/23.6
5,021,357	6/1991	Taguchi et al.	437/919

FOREIGN PATENT DOCUMENTS

0058254	5/1981	Japan .
0042161	2/1989	Japan .
0187847	3/1989	Japan .
0270343	10/1989	Japan .

OTHER PUBLICATIONS

"A Spread Stacked Capacitor (SCC) Cell for 64MBit DRAMS", by S. Knoue et al., pp. 31–34.

"3-Dimensional Stacked Capacitor Cell for 16M and 64M DRAMS", by T. Ema et al., pp. 592–595.

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Assistant Examiner—Tom Thomas
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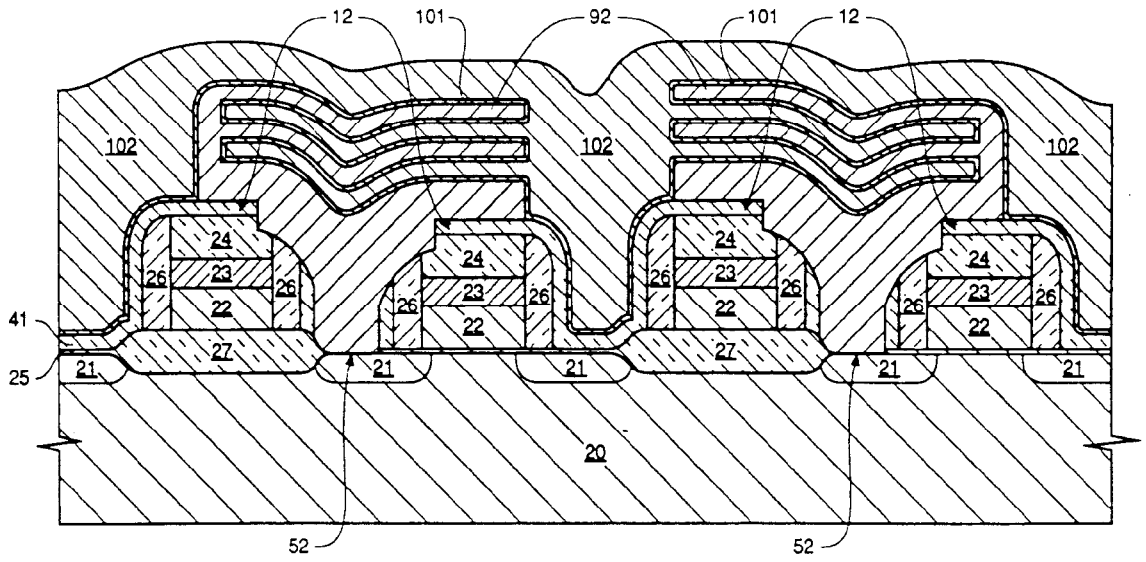
[57] **ABSTRACT**

An existing stacked capacitor fabrication process is modified to construct a three-dimensional stacked capacitor, referred to hereinafter as a stacked E cell or SEC. The SEC design defines a capacitor storage cell that in the present invention is used in a DRAM process. The SEC is made up of a polysilicon storage node structure having an E-shaped cross-sectional upper portion and a lower portion making contact to an active area via a buried contact. The polysilicon storage node structure is overlaid by polysilicon with a dielectric sandwiched in between to form a completed SEC capacitor. With the 3-dimensional shape and a texturized surface of a polysilicon storage node plate, substantial capacitor plate surface area of 3 to 5X is gained at the storage node.

18 Claims, 11 Drawing Sheets



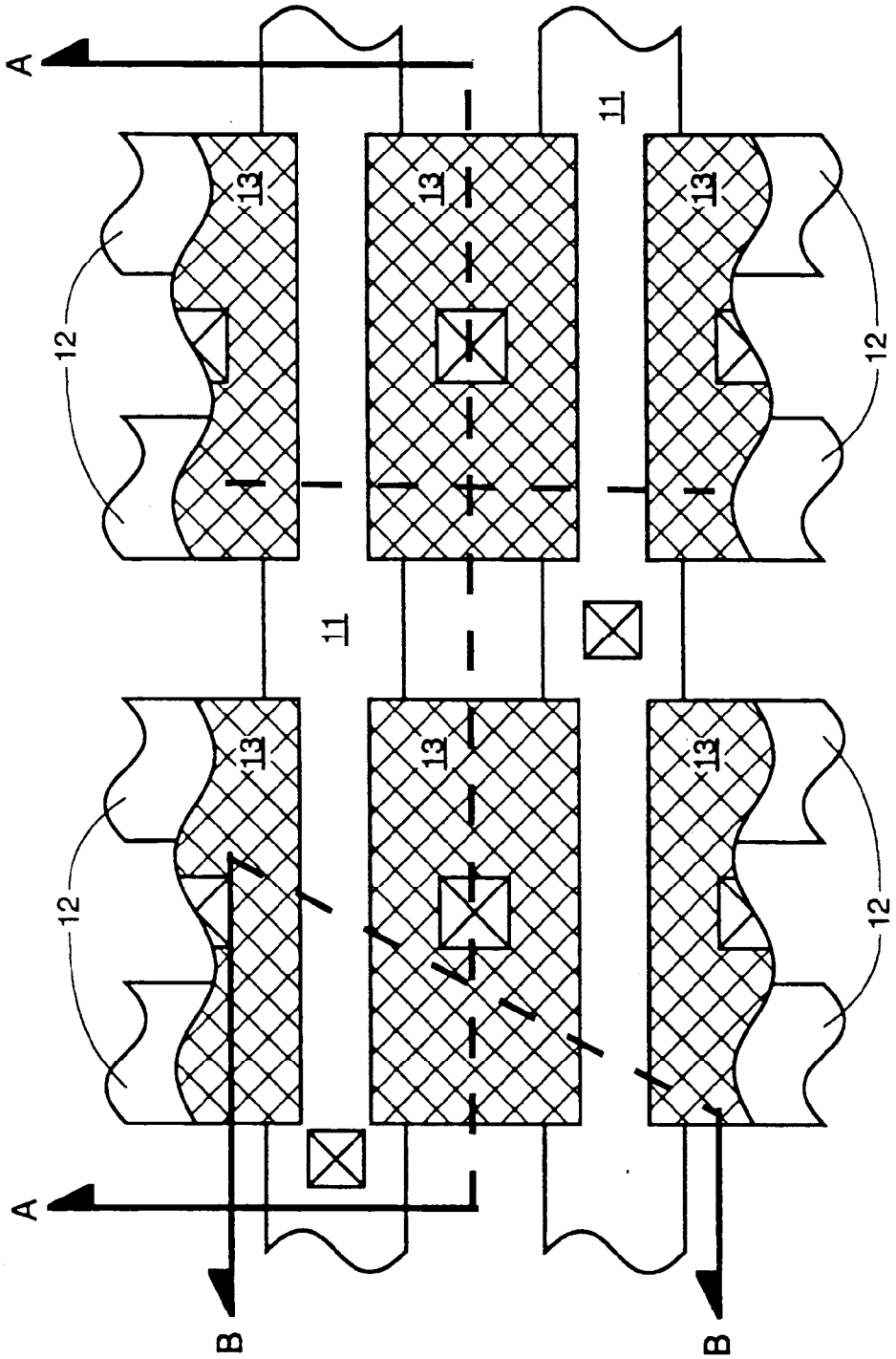


FIG. 1

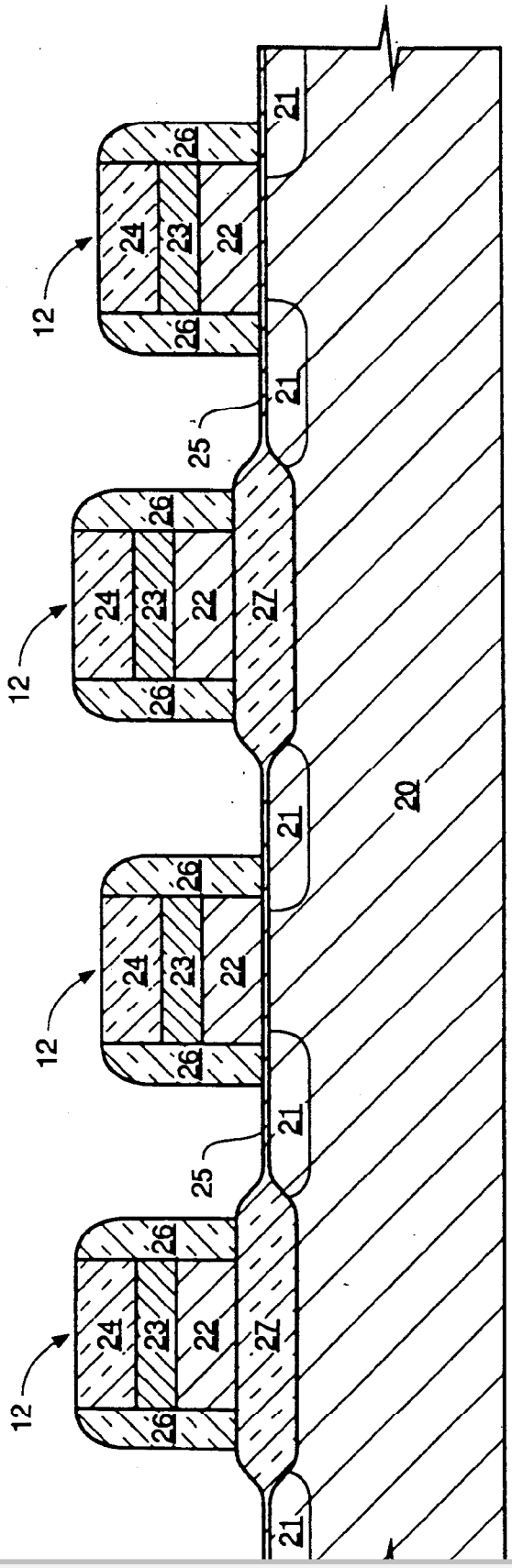


FIG. 2

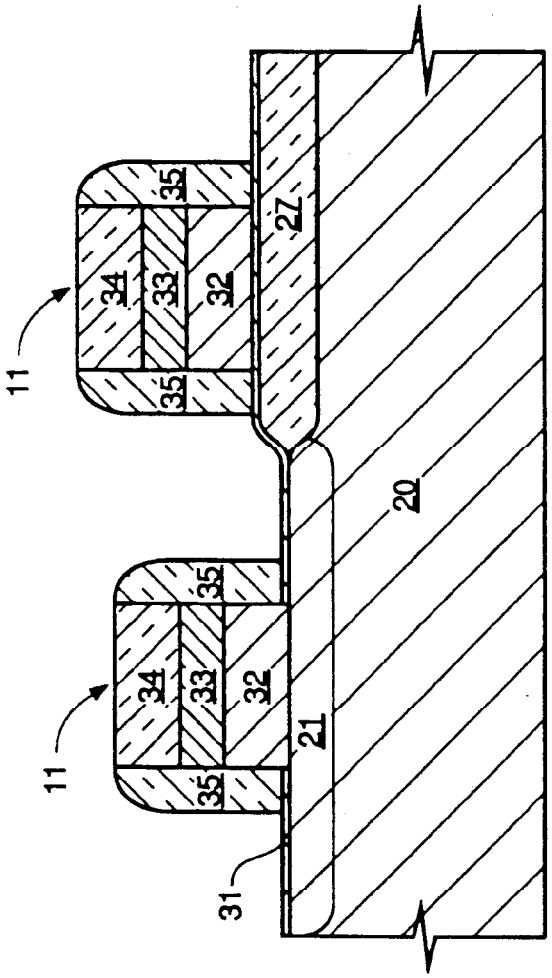


FIG. 3

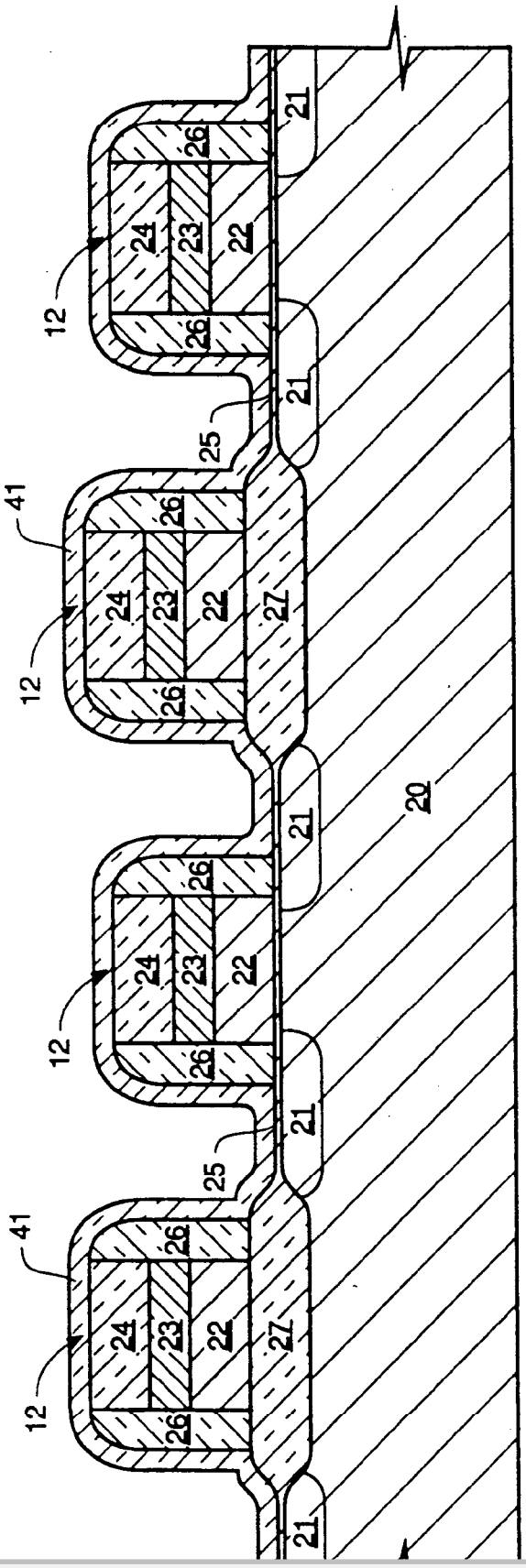


FIG. 4

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