



(12) **United States Patent**
Matsuda et al.

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(54) **SEMICONDUCTOR DEVICE UTILIZING DUMMY FEATURES TO FORM UNIFORM SIDEWALL STRUCTURES**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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(22) Filed: **Nov. 21, 2002**

(65) **Prior Publication Data**

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(30) **Foreign Application Priority Data**

Nov. 27, 2001 (JP) 2001-361244

(51) **Int. Cl.**⁷ **H01L 23/52**

(52) **U.S. Cl.** **257/365; 257/774**

(58) **Field of Search** 257/202, 365,
257/508, 513, 623, 774, 775; 438/639,
926

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(57) **ABSTRACT**

An inventive semiconductor device includes: a substrate; a plurality of first projections each including at least a gate electrode and formed on the substrate; and a plurality of second projections formed on the substrate. When a contour surface constituted by the uppermost face of the substrate and by side and upper faces of the first and second projections is measured for every partial area per unit area of the substrate, the maximum partial area of the contour surface is 1.6 or less times larger than the minimum partial area of the contour surface.

12 Claims, 11 Drawing Sheets

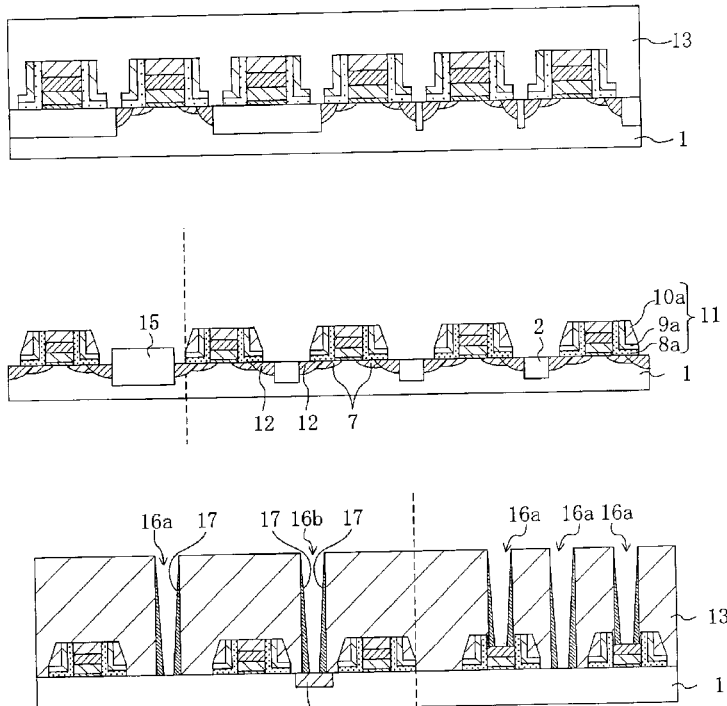
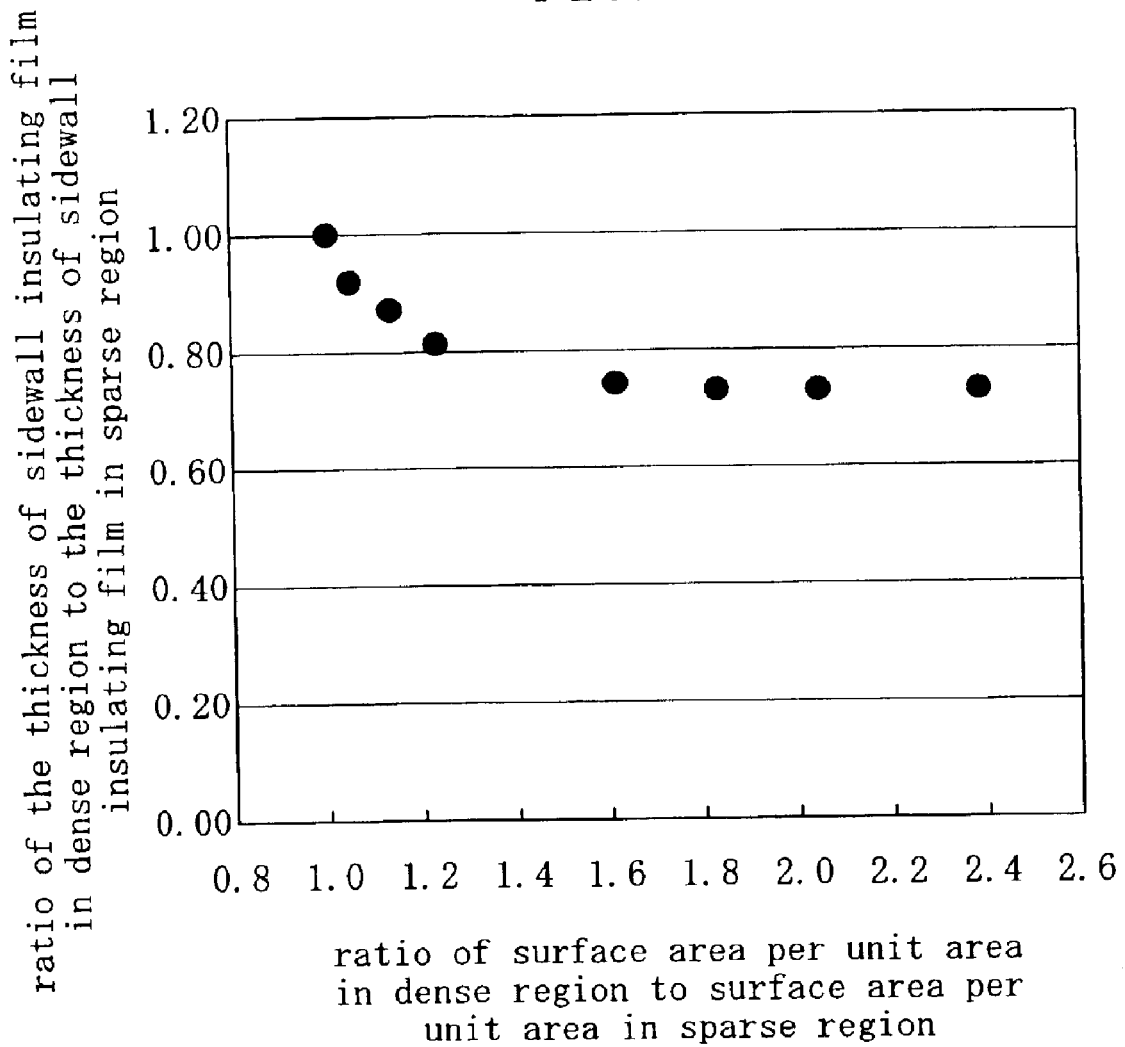


FIG. 1



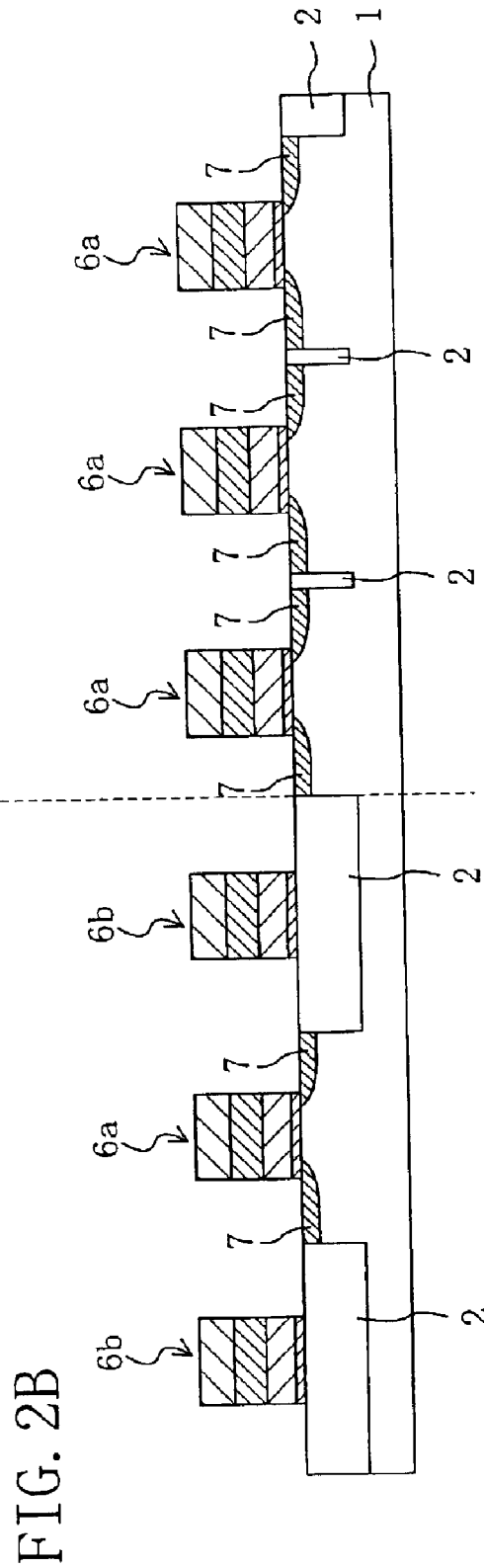
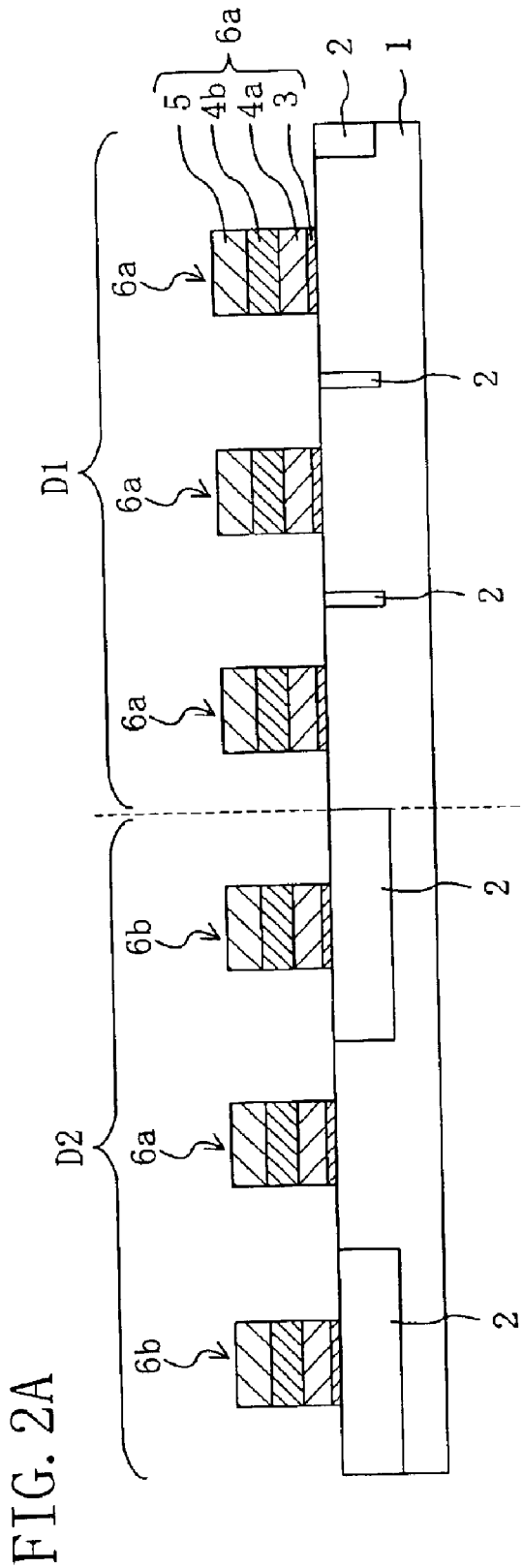


FIG. 3A

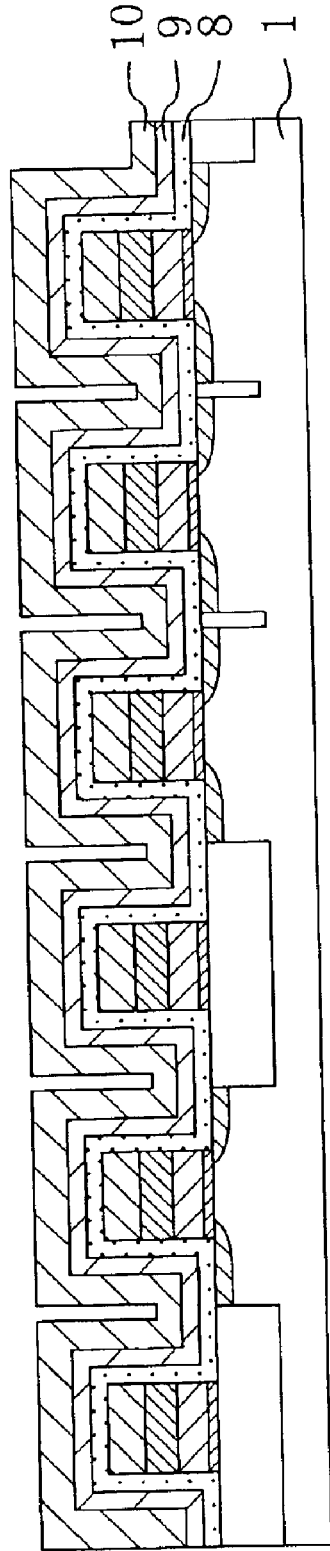


FIG. 3B

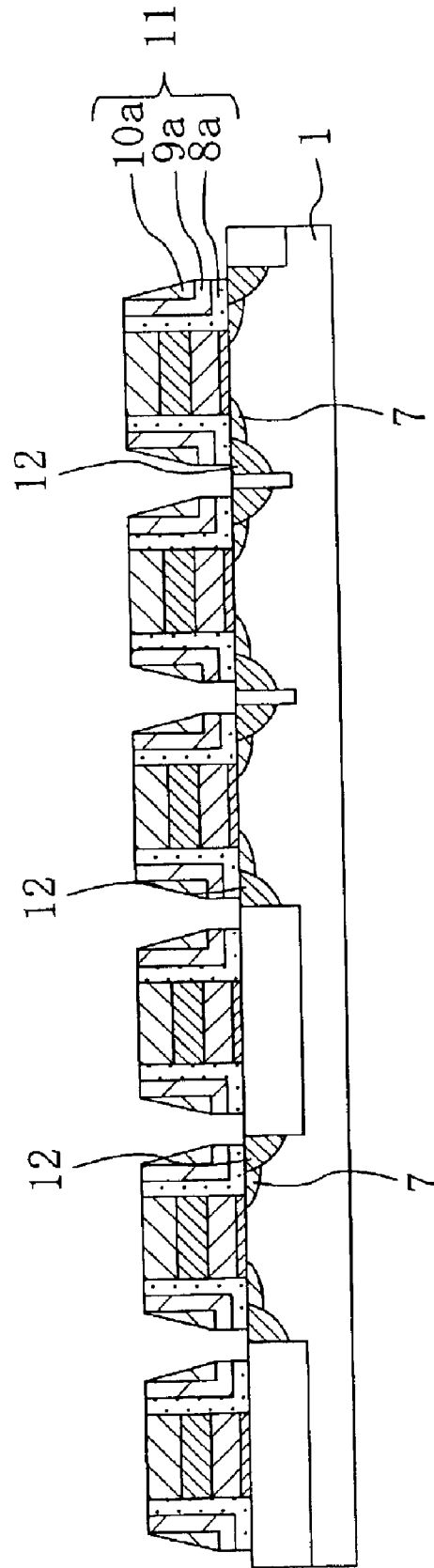


FIG. 4A

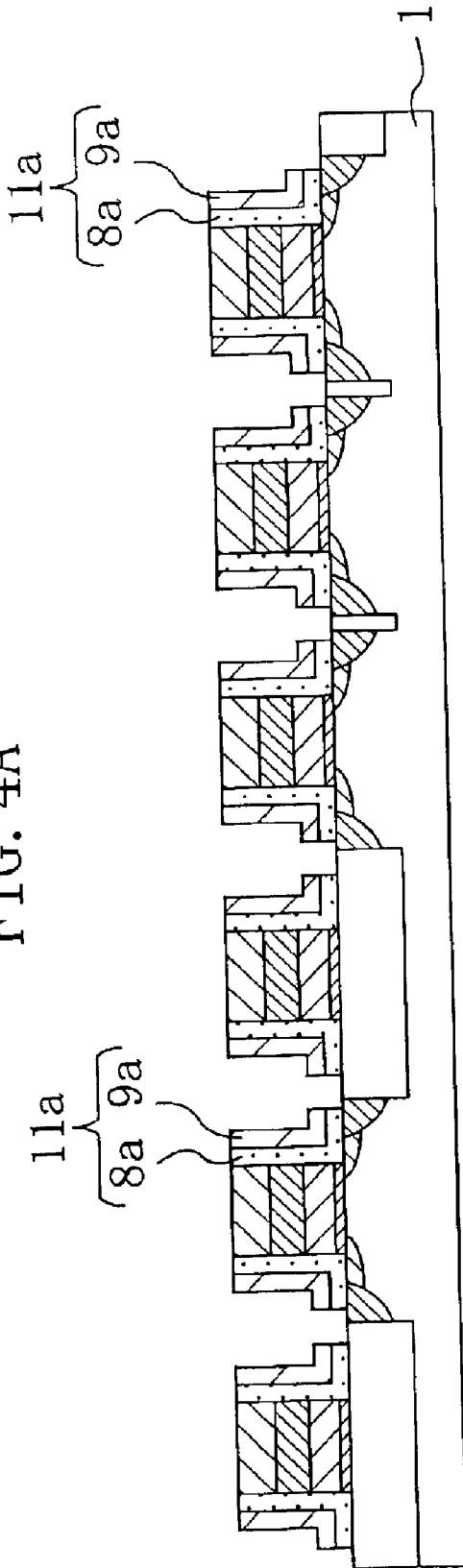
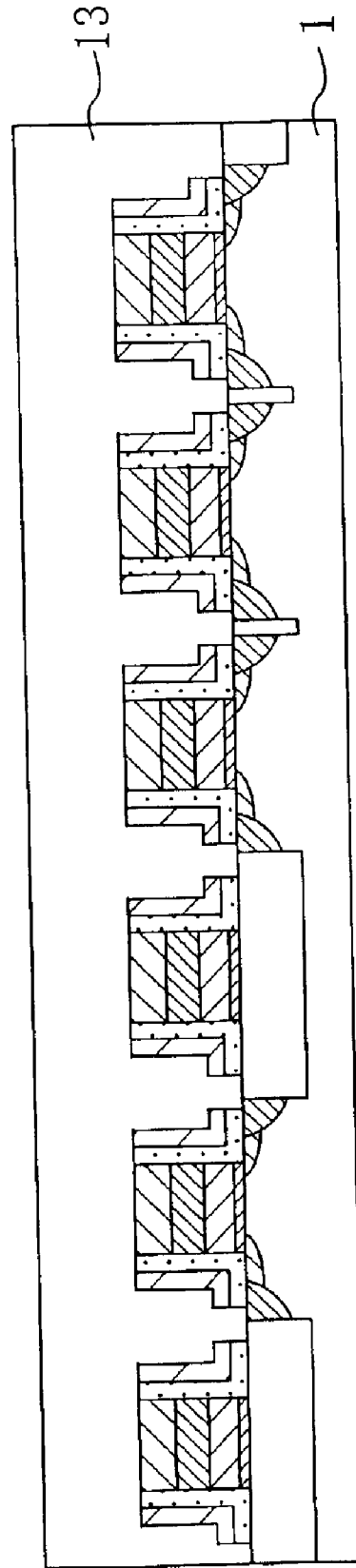


FIG. 4B



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