United States Patent [19]

Tamaki et al.

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[54] **GALLIUM NITRIDE-BASED COMPOUND SEMICONDUCTOR LIGHT-EMITTING DEVICE AND METHOD FOR MAKING THE SAME**

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[73] Assignees: **Toyoda Gosei Co. Ltd.**, Nishikasugai; **Kabushiki Kaisha Toyota Chuo Kenkyusho**, Aichi, both of Japan

[21] Appl. No.: **969,769**

[22] Filed: **Oct. 30, 1992**

[30] **Foreign Application Priority Data**

Oct. 30, 1991 [JP] Japan 3-313977

[51] Int. Cl.⁵ H01L 29/205; H01L 33/00
[52] U.S. Cl. **257/99**; 257/94; 257/103; 257/749; 257/766
[58] Field of Search 257/94, 101, 99, 102, 257/103, 749, 766

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[57] **ABSTRACT**

A light-emitting device comprises an n-type layer made of an n-type gallium nitride-based compound of the formula $Al_xGa_{1-x}N$, wherein $0 \leqq X < 1$, and an i-type layer formed on the n-type layer and made of a semi-insulating i-type gallium nitride-based compound semiconductor and doped with a p-type impurity for junction with the n-type layer. A first electrode is formed on the surface of the i-type layer and made of a transparent conductive film and a second electrode is formed to connect to the n-type layer through the i-type layer. The device is so arranged that light is emitted from the side of the i-type layer to the outside. When an electric current is supplied to the first electrode from a wire contacted thereto, the first electrode is held entirely at a uniform potential. Light is emitted from the entire interface beneath the first electrode and can thus be picked up from the first electrode which is optically transparent.
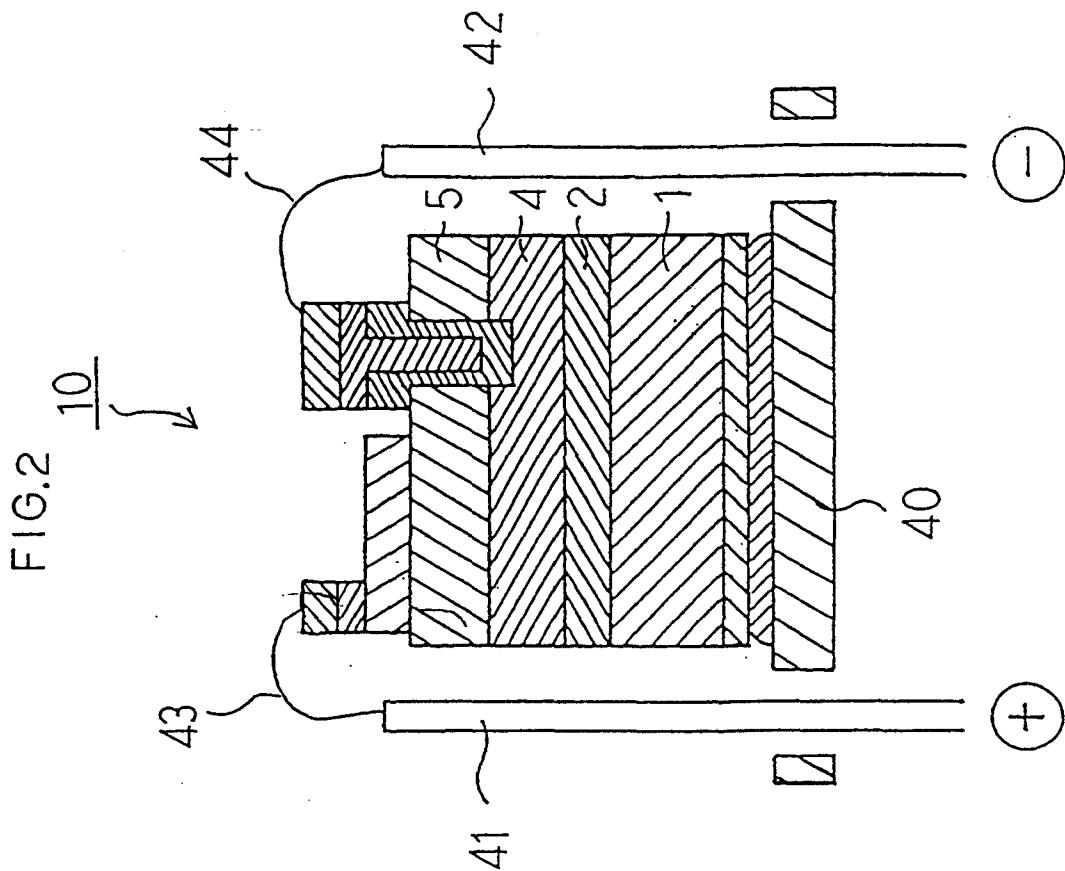
18 Claims, 9 Drawing Sheets

FIG.2 10

FIG.1 10
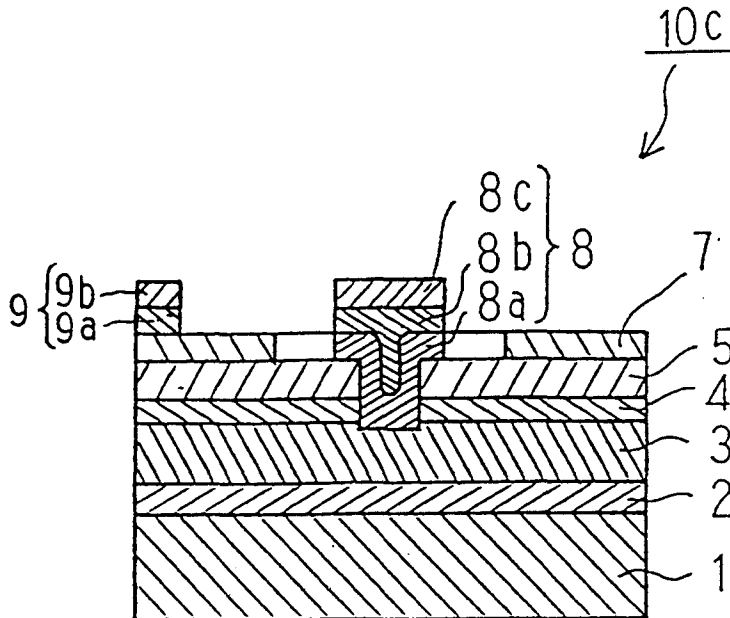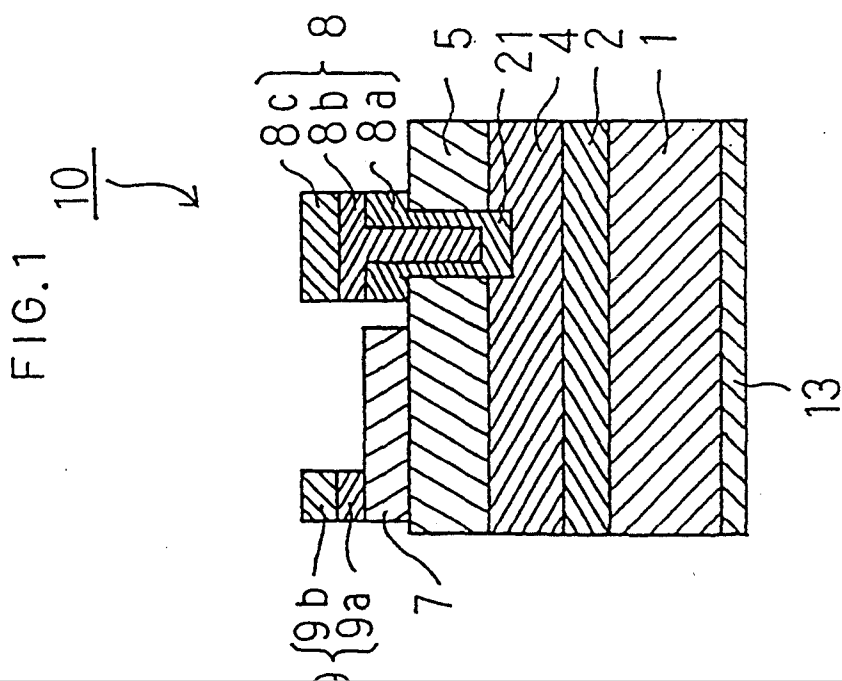
FIG.4
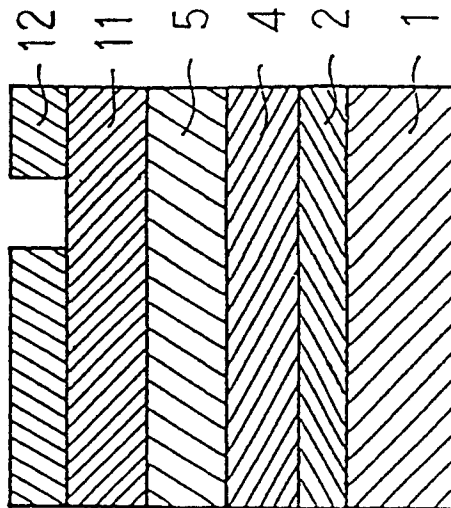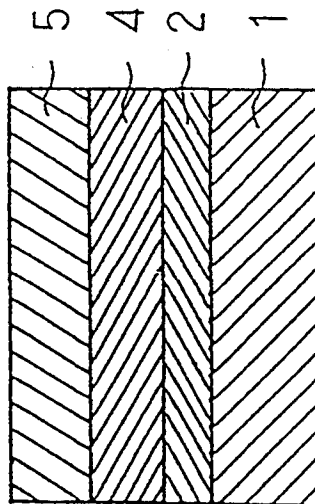
FIG.3

FIG.6
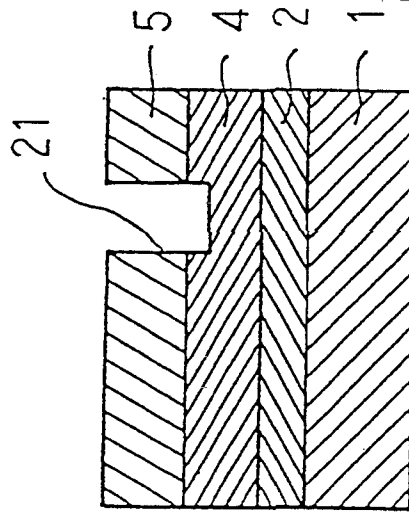
FIG.5

FIG.9

FIG.7

FIG.8

DOCKET ALARM
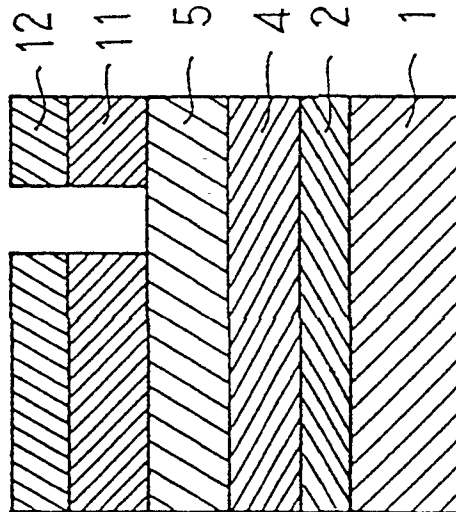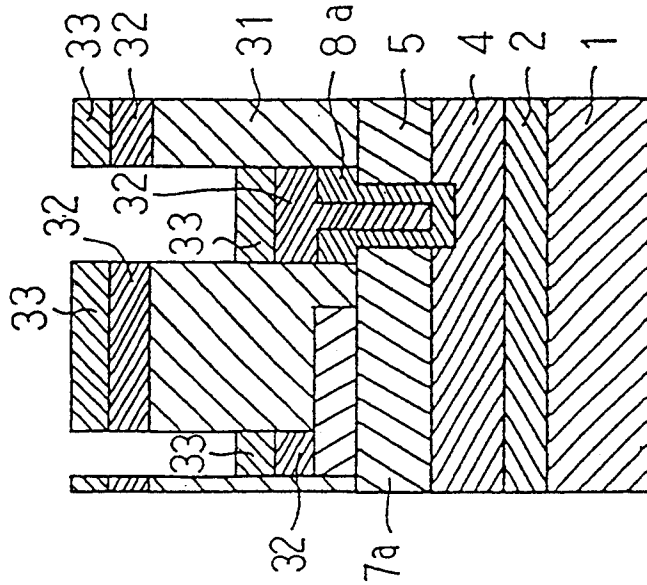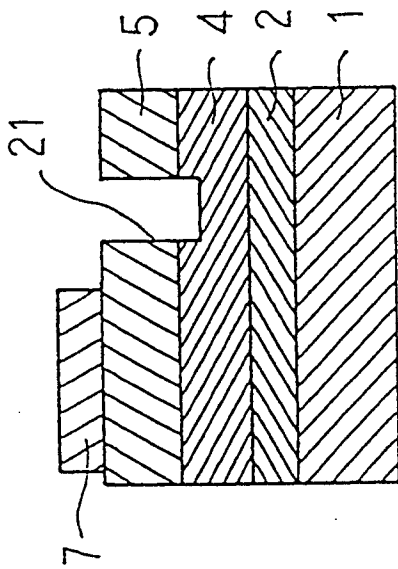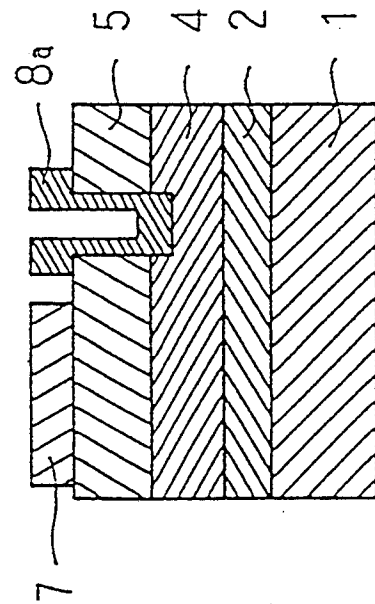
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