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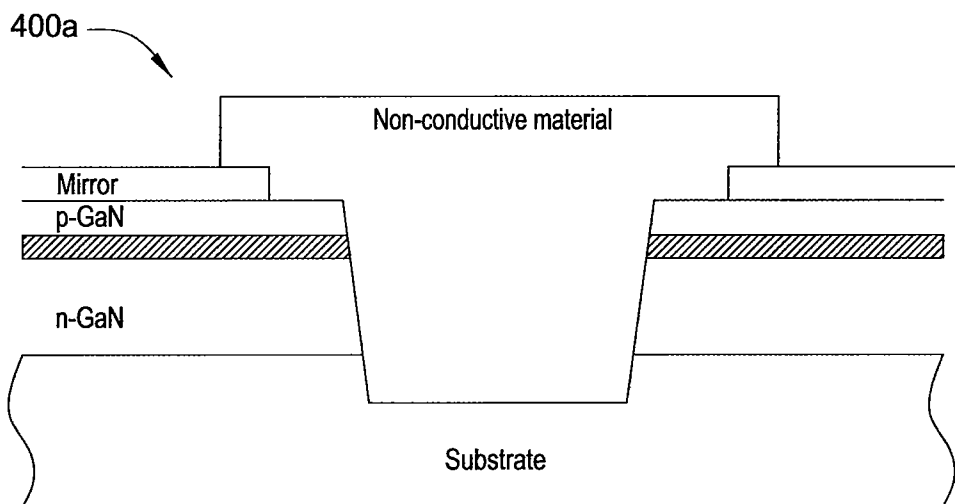
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[Continued on next page]

(54) Title: PROTECTION FOR THE EPITAXIAL STRUCTURE OF METAL DEVICES



(57) Abstract: Techniques for fabricating metal devices, such as vertical light-emitting diode (VLED) devices, power devices, laser diodes, and vertical cavity surface emitting laser devices, are provided. Devices produced accordingly may benefit from greater yields and enhanced performance over conventional metal devices, such as higher brightness of the light-emitting diode and increased thermal conductivity. Moreover, the invention discloses techniques in the fabrication arts that are applicable to GaN-based electronic devices in cases where there is a high heat dissipation rate of the metal devices that have an original non- (or low) thermally conductive and/or non- (or low) electrically conductive carrier substrate that has been removed.

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A. CLASSIFICATION OF SUBJECT MATTER

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USPC - 438/44

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 H01L 21/00 (2008.01)

USPC 438/44

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC 257/94, 102, 103; 438/29, 39, 44; Backward/forward citation searches, Text Search

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
WEST (PGPB, USPT, USOCR EPAB, JPAB); Terms: (substrate with remov\$4 with laser) and (light adj emitt\$3 led); Google (?light emitting diodes LED with metal host substrates?)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X -- Y	US 2006/0071230 A1 (Lee et al.) 06 Apr 2006 (06.04.2006) figs. 1-15	1, 3-7, 9-12, 16-20, 22, 23, 26-28, 34, 35, 37-39, 42-51 and 53-60 ----- 2, 8, 13-15, 21, 24, 25, 29-33, 36, 40, 41, and 52
Y	US 6,365,429 B1 (Kneissl et al.) 02 Apr 2002 (02.04.2002) figs. 7a-7e	2, 21, 36, and 52
Y	US 6,967,981 B2 (Chua et al.) 22 Nov 2005 (22.11.2005) figs. 1-6	13-15 and 29-33
Y	US 7,015,117 B2 (Urbanek) 21 Mar 2006 (21.03.2006) figs. 21-33	8, 24, 25, 40 and 41

☐ Further documents are listed in the continuation of Box C. ☐

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

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