

Exhibit A



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

(10) **Patent No.:** US 6,949,771 B2
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- (54) **LIGHT SOURCE**
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- (73) Assignee: **Agilent Technologies, Inc.,** Palo Alto,
 CA (US)
- (*) Notice: Subject to any disclaimer, the term of this
 patent is extended or adjusted under 35
 U.S.C. 154(b) by 157 days.

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(21) Appl. No.: **10/128,446**

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(65) **Prior Publication Data**

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(30) **Foreign Application Priority Data**

Apr. 25, 2001 (MY) PI 2001 1952

(51) **Int. Cl.**⁷ **H01L 33/00**

(52) **U.S. Cl.** **257/99**

(58) **Field of Search** 257/79, 81, 98-100

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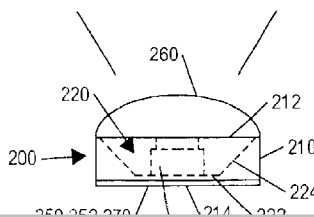
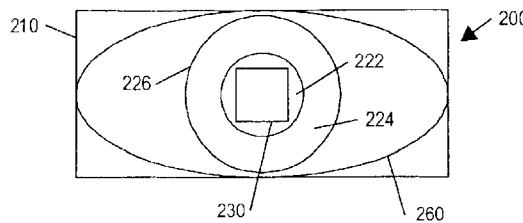
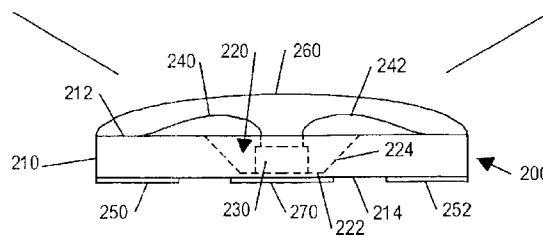
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(57) **ABSTRACT**

A light source suitable for surface mounting onto a printed circuit board. The light source includes a planar substrate with a centrally positioned aperture. A light emitting diode is mounted on a metallic layer covering the bottom of the aperture, and is encapsulated by a transparent encapsulant material. The metallic layer provides a thermal path for heat generated by the light emitting diode.

11 Claims, 14 Drawing Sheets



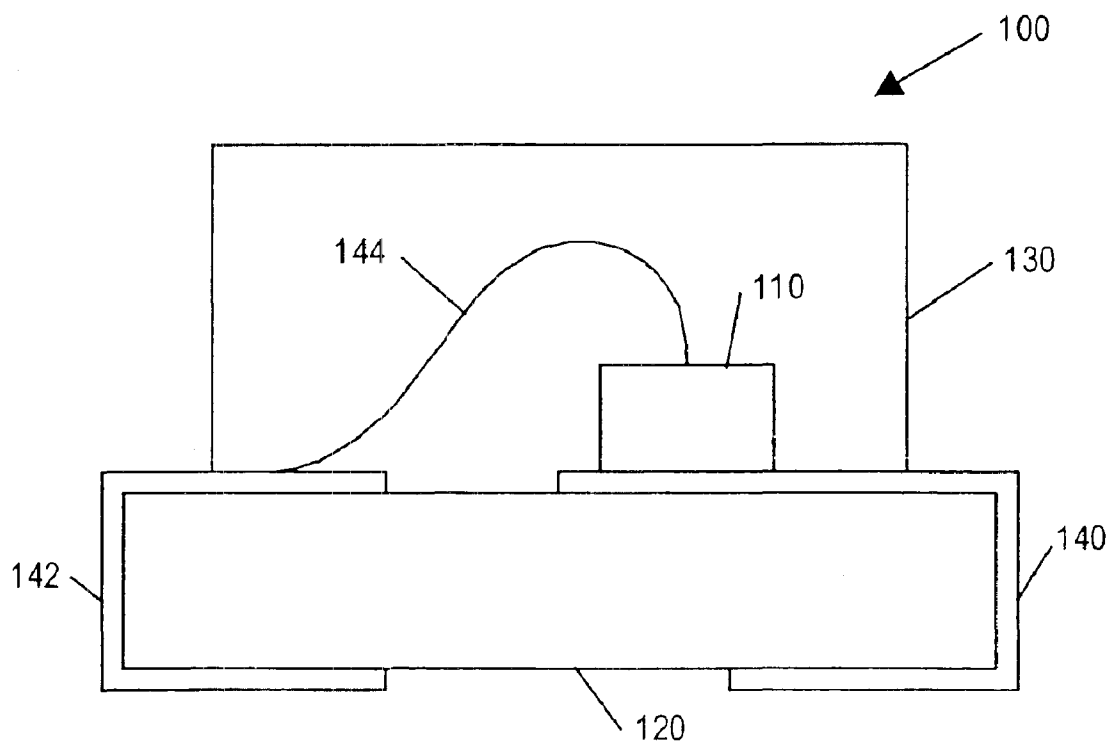


FIG 1

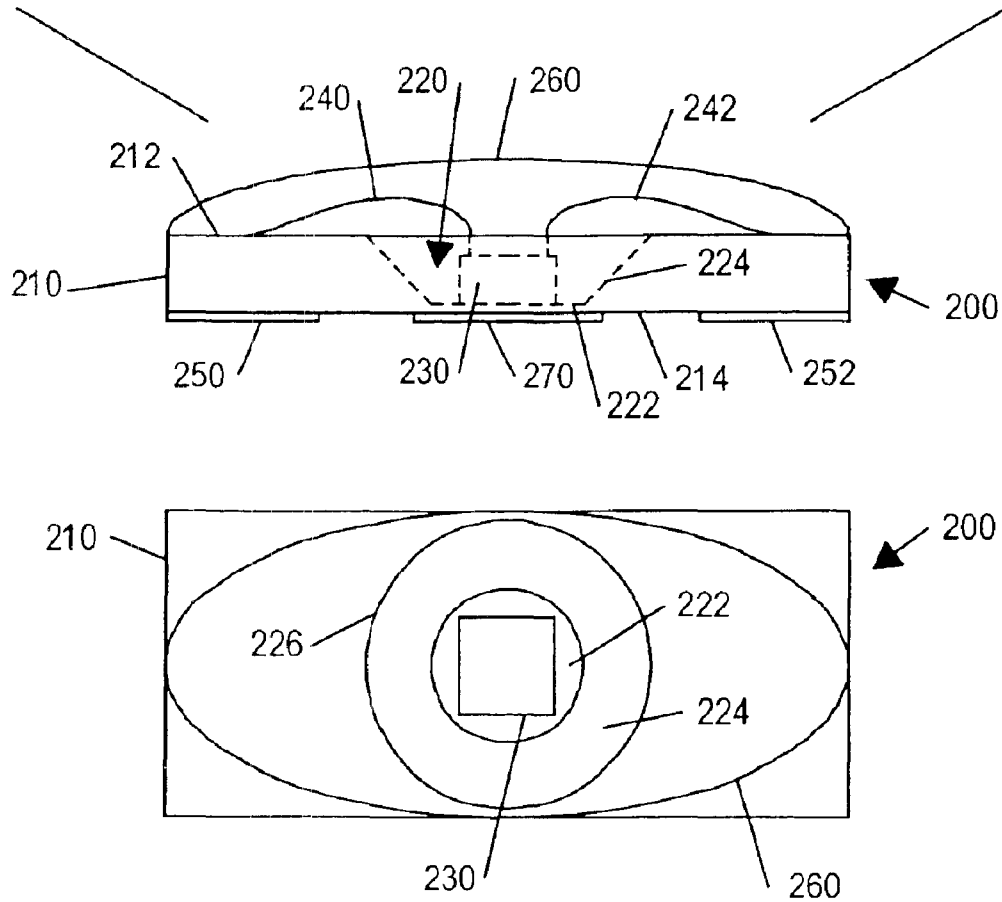
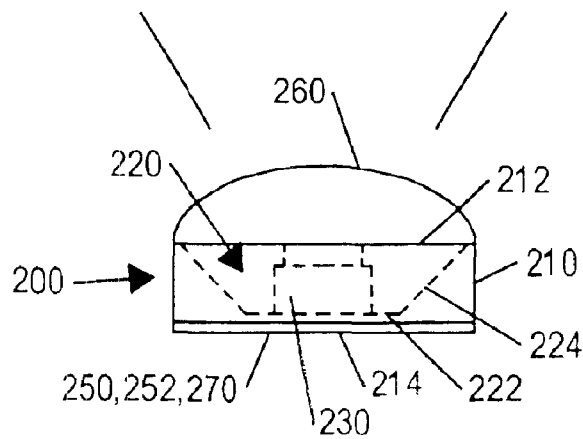


FIG 2



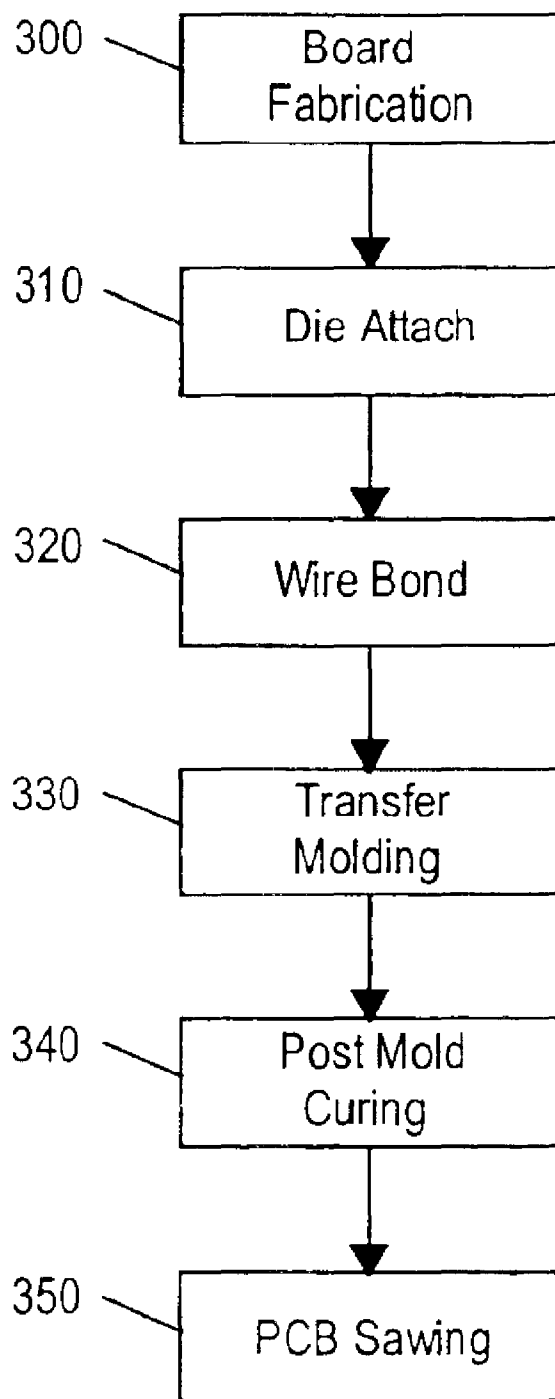


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