United States Patent [19]

Abe

[54] **DISPLAY DEVICE WITH LEDS HAVING A REDUCTION OF THE THERMAL EXPANSION COEFFICIENTS AMOUNG THE ASSOCIATED COMPONENTS**

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[73] Assignee: **Sharp Kabushiki Kaisha**, Osaka, Japan

[21] Appl. No.: **576,653**

[22] Filed: **Sep. 4, 1990**

[30] **Foreign Application Priority Data**

Sep. 4, 1989 [JP] Japan .... 1-103839[U]

[51] Int. Cl.⁵ **H01L 29/161; H01L 33/00; H01L 23/48; H01L 23/29**

[52] U.S. Cl. **257/98;** 257/88; 257/100

[58] Field of Search 357/16, 17, 72, 74, 357/81, 70, 72, 19

[56] **References Cited**

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Primary Examiner—Andrew J. James
Assistant Examiner—Carl Whitehead, Jr.

[57] **ABSTRACT**

A display device with LEDs includes an interconnection frame in which an electrical lead interconnection is formed by conductive metal plating on a surface including a main surface of a resin substrate capable of receiving a plating process. LEDs are bonded at the predetermined positions on the main surface of this interconnection frame so that they are connected to the electric lead interconnection. A reflection case having openings with their inner peripheral surfaces serving as reflection surfaces surrounding the LEDs is affixed to the main surface of the interconnection frame at a position corresponding to the LED arrangement. In the openings of the reflection case, the LEDs are covered with light transmissive resin members. Because the interconnection frame for the lead is formed of resin as well as the reflection case and provided with metal plating interconnection, thermal stresses are not produced due to difference of thermal expansion coefficient between the interconnection frame and the reflection case.
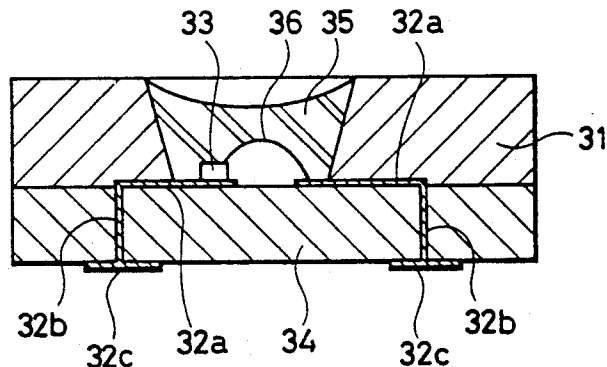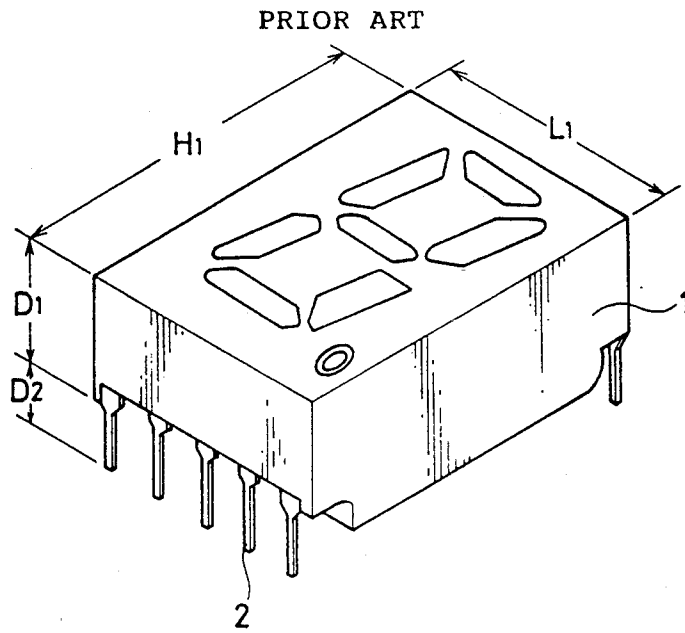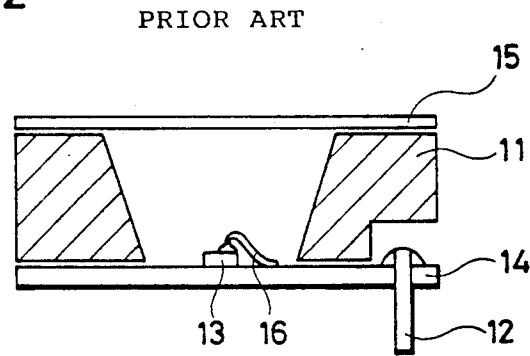
10 Claims, 8 Drawing Sheets

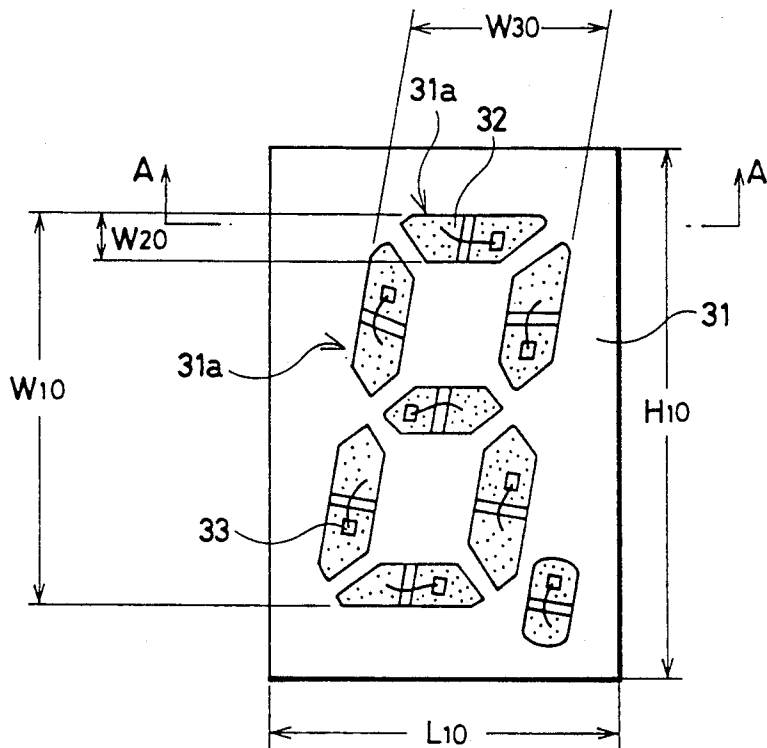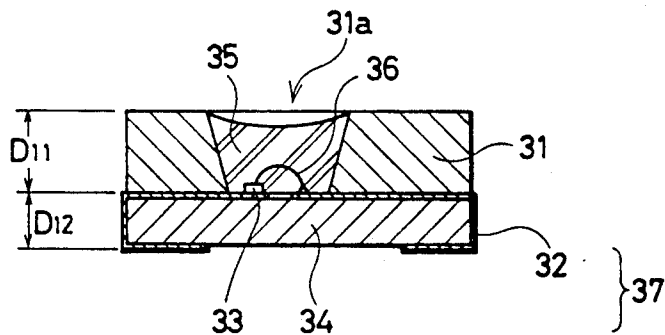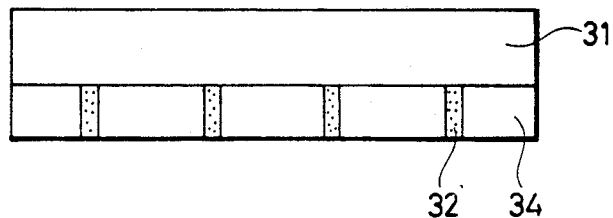# FIG.1

PRIOR ART

FIG.2

PRIOR ART

FIG.3

PRIOR ART
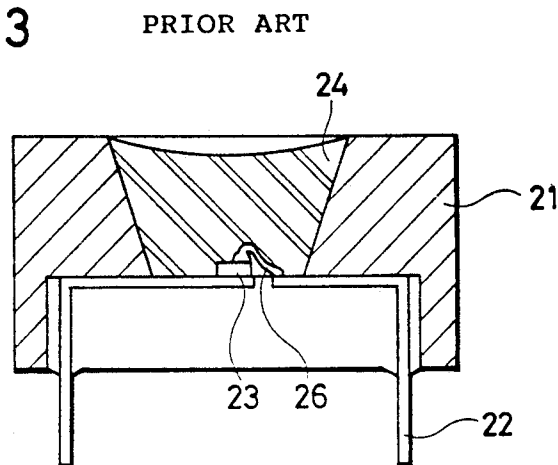
FIG.4A

FIG.4B

FIG.4C

FIG.4D
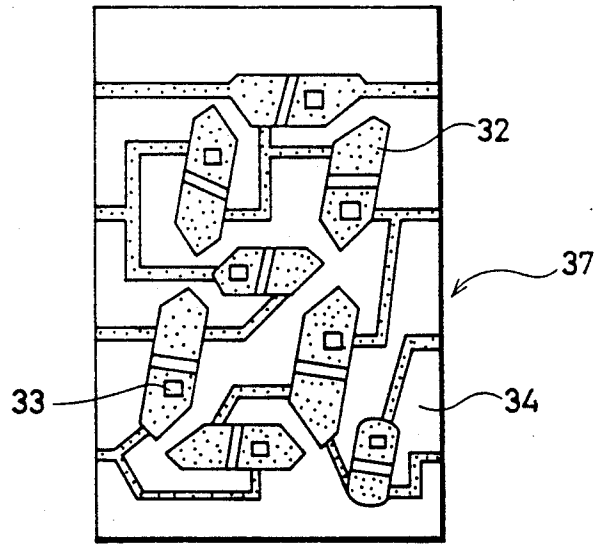
FIG.5A

FIG.5B
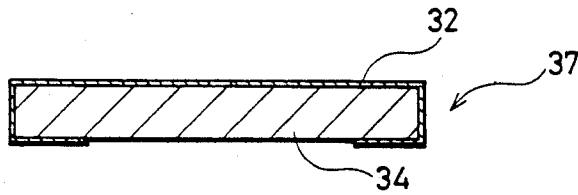
FIG.5C

FIG.5D

FIG.5E

DOCKET ALARM
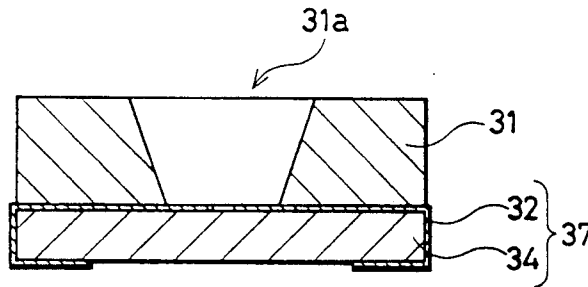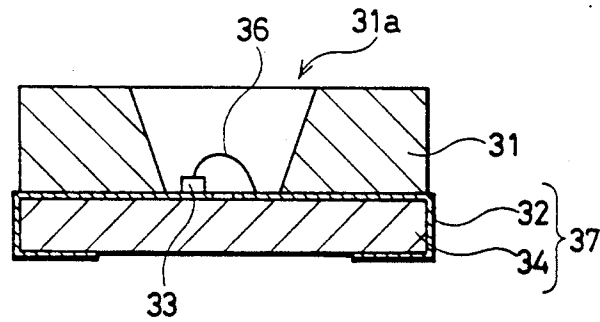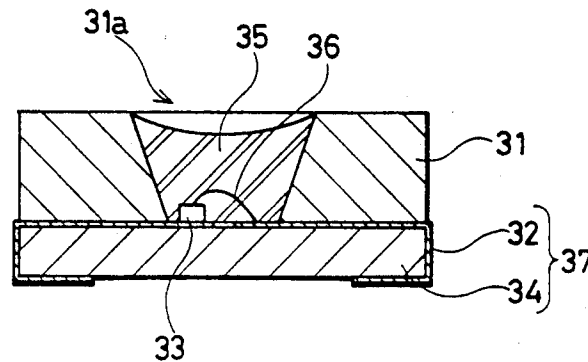
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