Exhibit 7

US006566805B1

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

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(54) **ORGANIC ELECTRO-LUMINESCENT DEVICE WITH FIRST AND SECOND COMPOSITE LAYERS**

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(73) Assignee: **Industrial Technology Research Institute**, Hsinchu (TW)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 253 days.

(21) Appl. No.: **09/672,920**

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(30) **Foreign Application Priority Data**

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(51) **Int. Cl.**[7] **H01J 1/62**; H01J 63/04

(52) **U.S. Cl.** **313/504**; 313/506; 313/509; 428/690

(58) **Field of Search** 313/504, 503, 313/506, 509; 428/690

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,885,211	A	12/1989	Tang et al.	428/457
5,237,439	A	8/1993	Misono et al.	349/122
5,245,457	A	9/1993	Fukuchi	349/138
5,808,715	A	9/1998	Tsai et al.	349/122
5,844,363	A	12/1998	Gu et al.	313/506
5,909,081	A *	6/1999	Eida et al.	313/504
6,228,514	B1 *	5/2001	Tadashi et al.	313/504
6,235,414	B1 *	5/2001	Epstein et al.	257/103

OTHER PUBLICATIONS

"The "Plastic" Led: A Flexible Lihgt–Emitting Device Using a Polyaniline Transparent Electrode", Synthetic Metals, 55–57 (1993), pp4123–27.

"Annealing effects on the properties of indium tin oxide films coated on soda glasses with a barrier layer of TiO2–SiO2 composite films", Opt. Eng. 36(8), p2335–40 (Aug. 1997).

"Influences of the deposition rate on the microstructure and hardness of composite films prepared by reactive ion–assisted coevaporation", Opt. Eng. 34(10) p3075–82 (Oct. 1995).

* cited by examiner

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Assistant Examiner—Kevin Quarterman
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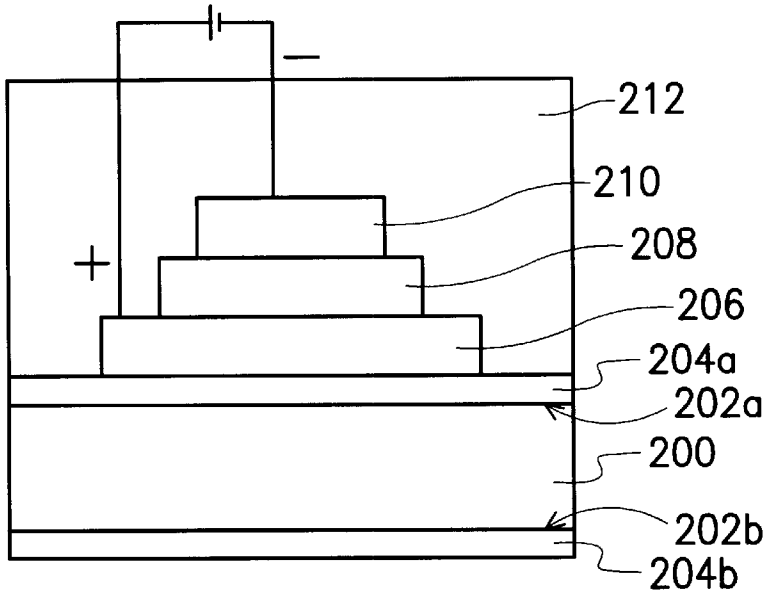
(57) **ABSTRACT**

A flexible organic electro-luminescent device is provided, in which a titanium dioxide-silicon dioxide composite layer is formed on the upper and lower surfaces of a transparent plastic substrate. A transparent conductive electrode and an organic luminescent layer are formed in sequence on one of surfaces of the composite layer. The organic luminescent layer is either small molecule luminescent material or polymer luminescent material. Then, a metal electrode is formed on the organic luminescent layer, and a silicon dioxide protecting layer is formed on the metal electrode to enclose the metal electrode and the organic luminescent layer completely. The titanium dioxide-silicon dioxide composite layer and silicon dioxide protecting layer are formed by ion-assisted electron gun evaporation in the temperature lower than 100° C., which does not result in the thermal loading to the small molecule and polymer organic electro-luminescent device.

18 Claims, 4 Drawing Sheets



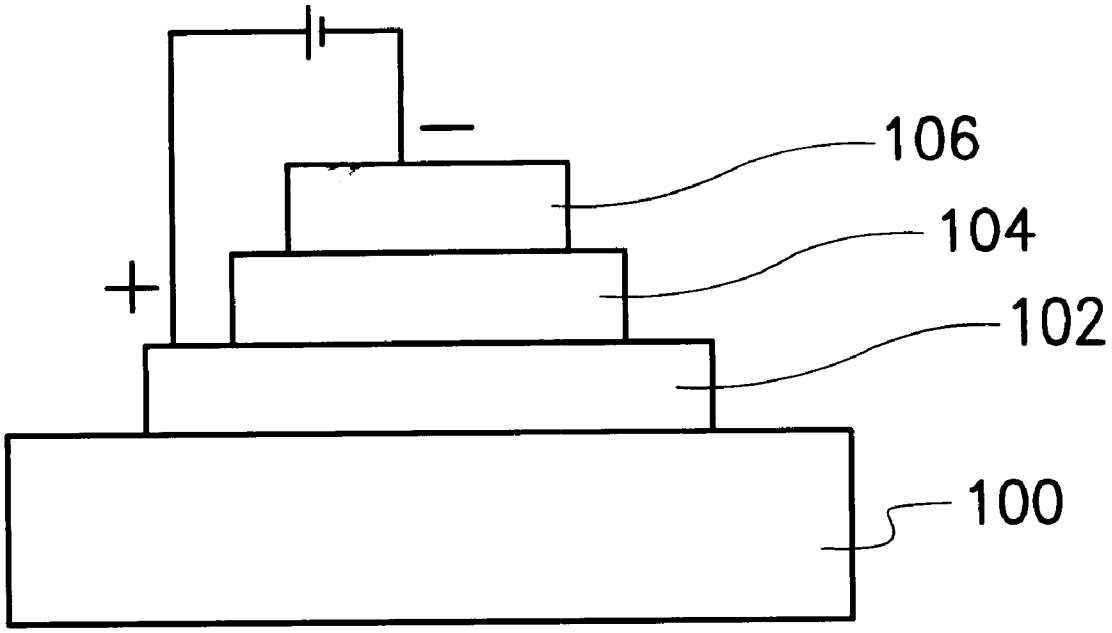


FIG. 1 (PRIOR ART)

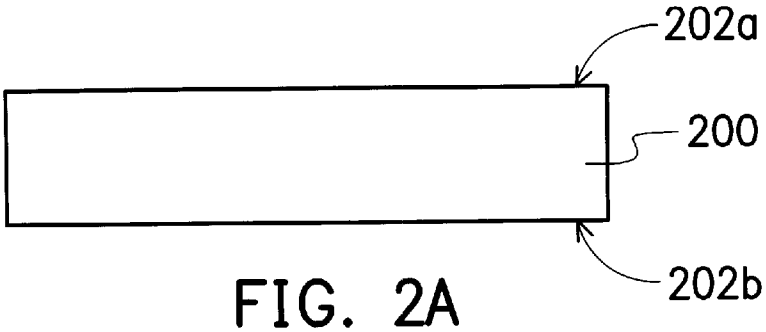


FIG. 2A

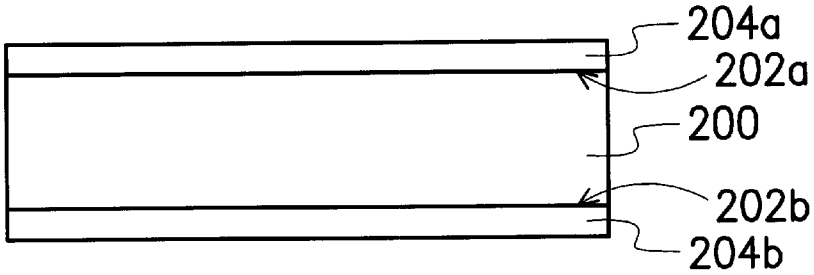


FIG. 2B

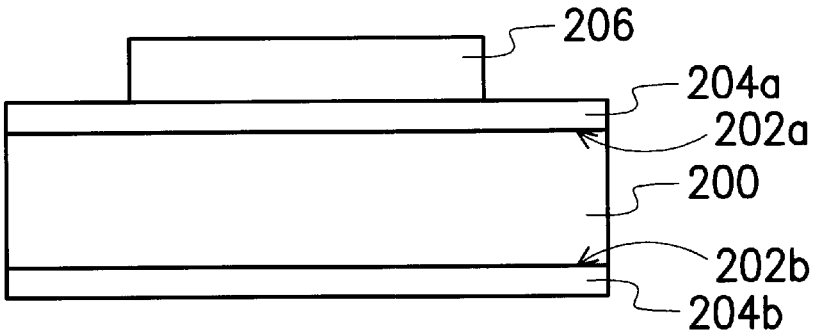


FIG. 2C

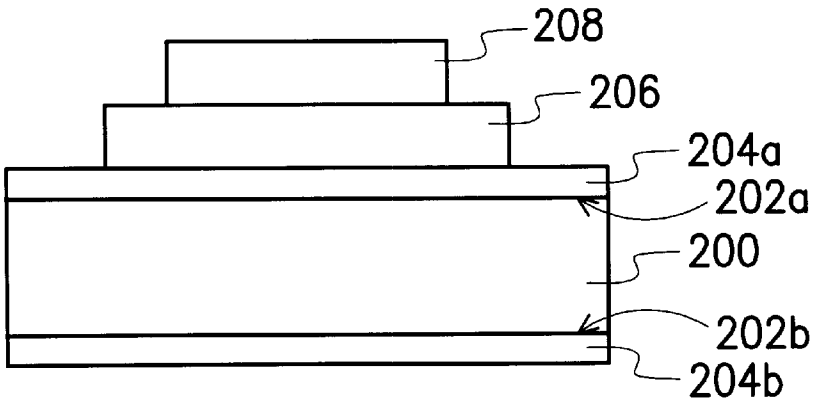


FIG. 2D

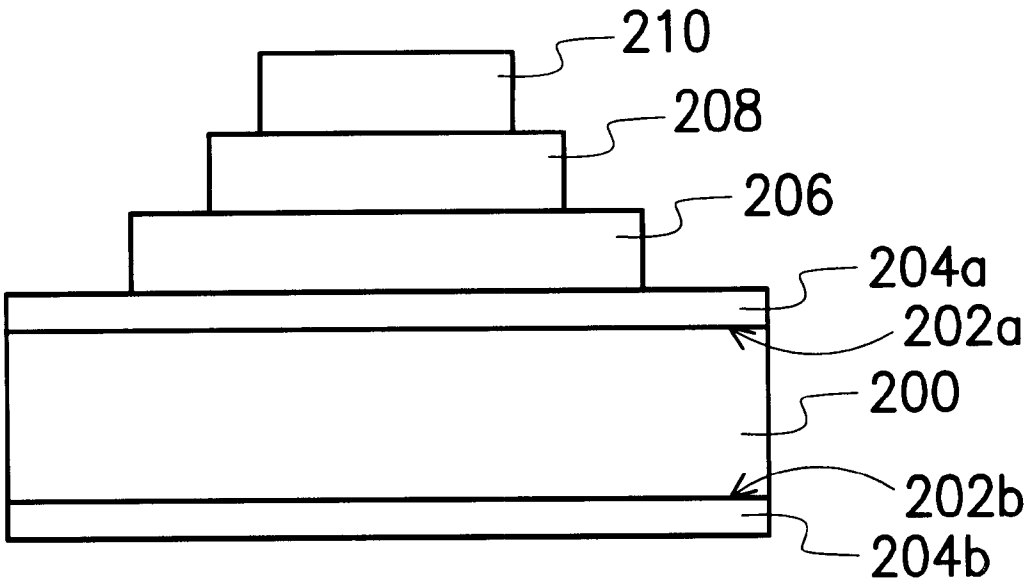


FIG. 2E

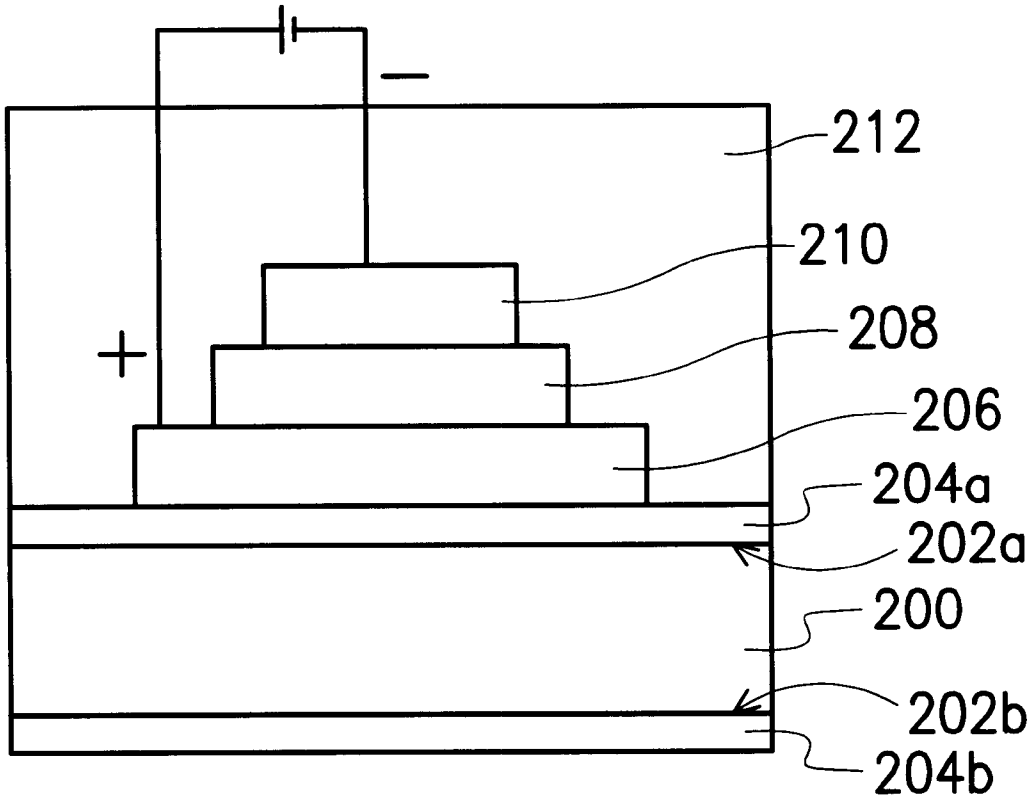


FIG. 2F

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