US005932895A

United States Patent [19]

Shen et al.

[11] **Patent Number: 5,932,895**

[45] **Date of Patent: *Aug. 3, 1999**

[54] **SATURATED FULL COLOR STACKED ORGANIC LIGHT EMITTING DEVICES**

[75] Inventors: **Zilan Shen**, Lawrenceville; **Stephen R. Forrest**; **Paul Burrows**, both of Princeton, all of N.J.

[73] Assignee: **The Trustees of Princeton University**, Princeton, N.J.

[*] Notice: This patent issued on a continued prosecution application filed under 37 CFR 1.53(d), and is subject to the twenty year patent term provisions of 35 U.S.C. 154(a)(2).

[21] Appl. No.: **08/858,994**

[22] Filed: **May 20, 1997**

[51] **Int. Cl.**[6] **H01L 33/00**

[52] **U.S. Cl.** **257/89**; 259/98; 259/103; 259/40

[58] **Field of Search** 257/40, 88, 89, 257/98, 99, 103; 313/503, 506

[56] **References Cited**

U.S. PATENT DOCUMENTS

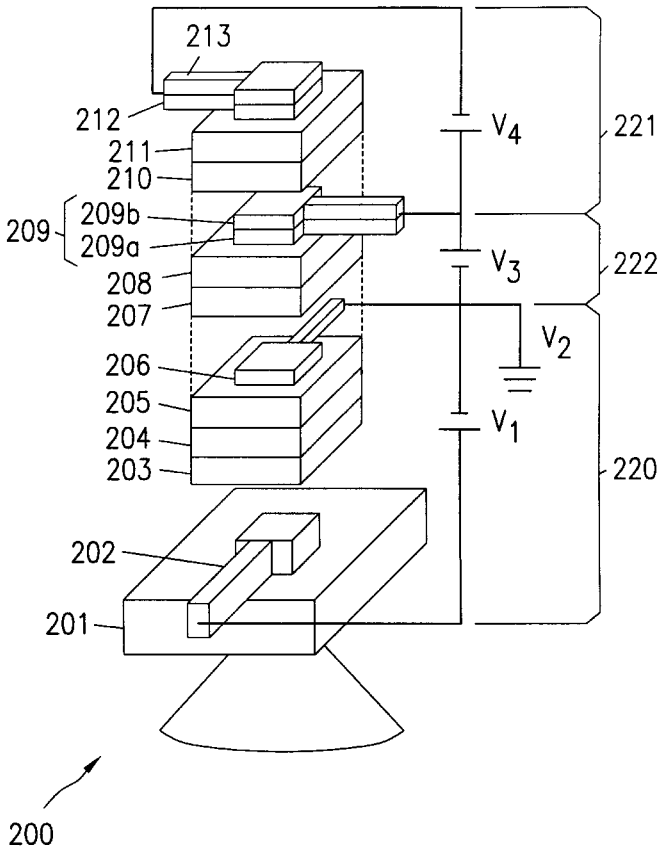
5,294,870	3/1994	Tang et al.	313/504
5,478,658	12/1995	Dodabalapur et al.	428/690
5,559,400	9/1996	Nakayama et al.	313/506
5,617,445	4/1997	Jewell et al.	372/96
5,674,636	10/1997	Dodabalapur et al.	428/690
5,682,402	10/1997	Nakayama et al.	372/99
5,703,436	12/1997	Forrest et al.	313/506
5,707,745	1/1998	Forrest et al.	257/89
5,757,139	5/1998	Forrest et al.	315/169.3

OTHER PUBLICATIONS

O.S. Heavens, Optical Properties of Thin Solid Films (Butterworth Scientific, London, 1955), pp. 46–95.

Primary Examiner—Minh Loan Tran
Attorney, Agent, or Firm—Kenyon & Kenyon

[57] **ABSTRACT**

Optical cavities in a stacked organic light emitting device (SOLEDS) can shift or attenuate the light emitted by the individual organic light emitting devices (OLEDs) in the stack. Interference caused by reflections within the stack, absorption, positioning of the light source, and the polarization of the emitted light can all determine how the spectra of the emitted light are affected by the SOLED structure. A detailed model that provides a good fit to measured SOLED emissions can be used to predict how a SOLED will affect light emitted by OLEDs. As a result, SOLED geometries that will optimize color saturation and external quantum efficiency can be predicted.

27 Claims, 10 Drawing Sheets