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United States Patent [19]**Diab et al.**[11] **Patent Number:** **5,758,644**[45] **Date of Patent:** **Jun. 2, 1998**[54] **MANUAL AND AUTOMATIC PROBE CALIBRATION**

[75] Inventors: **Mohamed Kheir Diab**, Mission Viejo;
Massi E. Kiani, Laguna Niguel;
Charles Robert Ragsdale, Newport Beach;
James M. Lepper, Jr., Trabuco Canyon, all of Calif.

[73] Assignee: **Masimo Corporation**, Irvine, Calif.[21] Appl. No.: **478,493**[22] Filed: **Jun. 7, 1995**[51] **Int. Cl.**⁶ **A61B 5/00**[52] **U.S. Cl.** **128/633; 128/664; 128/665; 356/41**[58] **Field of Search** **128/633, 634, 128/664, 665; 356/39, 41; 315/151, 307, 310, 311; 250/552, 214 R**[56] **References Cited****U.S. PATENT DOCUMENTS**

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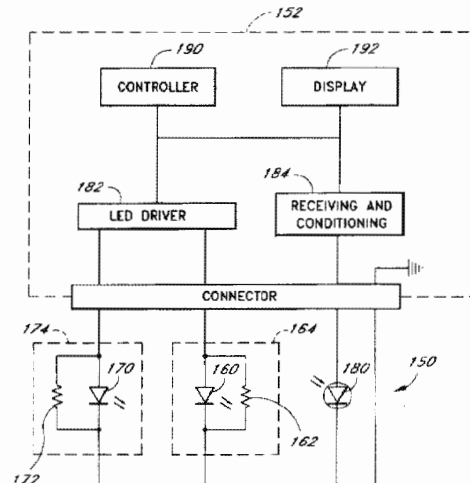
Primary Examiner—Jennifer Bahr

Assistant Examiner—Eric F. Winakur

Attorney, Agent, or Firm—Knobbe, Martens, Olsen & Bear

[57] **ABSTRACT**

The method and apparatus of the present invention provides a system wherein light-emitting diodes (LEDs) can be tuned within a given range by selecting their operating drive current in order to obtain a precise wavelength. The present invention further provides a manner in which to calibrate and utilize an LED probe, such that the shift in wavelength for a known change in drive current is a known quantity. In general, the principle of wavelength shift for current drive changes for LEDs is utilized in order to allow better calibration and added flexibility in the use of LED sensors, particularly in applications when the precise wavelength is needed in order to obtain accurate measurements. The present invention also provides a system in which it is not necessary to know precise wavelengths of LEDs where precise wavelengths were needed in the past. Finally, the present invention provides a method and apparatus for determining the operating wavelength of a light emitting element such as a light emitting diode.

26 Claims, 20 Drawing Sheets

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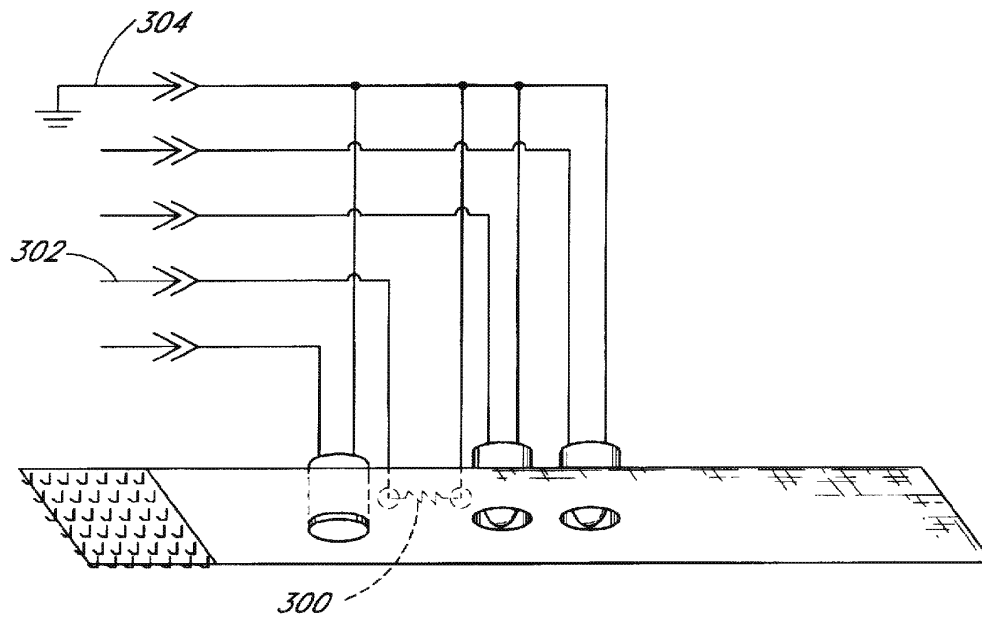


FIG. 1 (PRIOR ART)

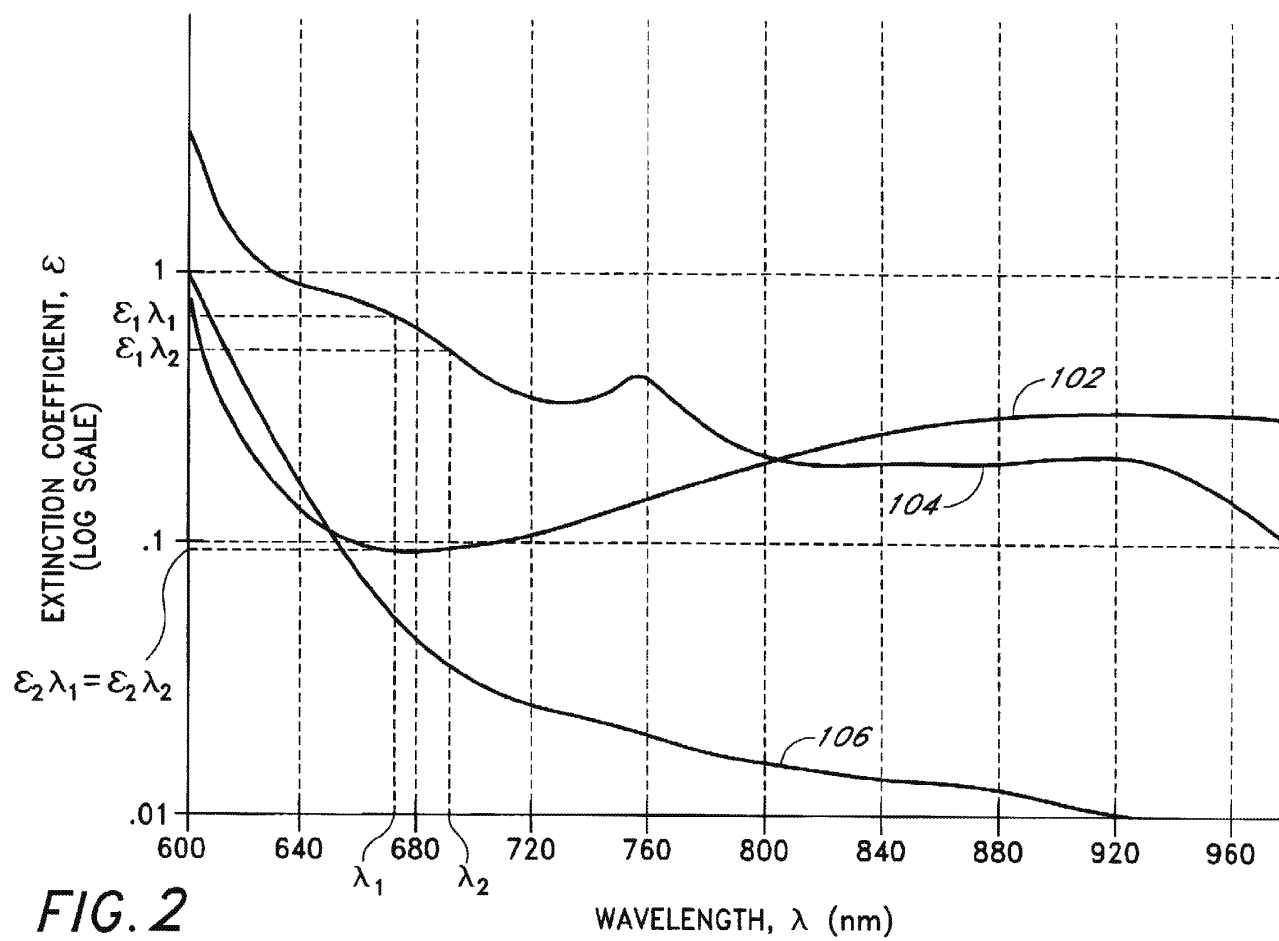


FIG. 2

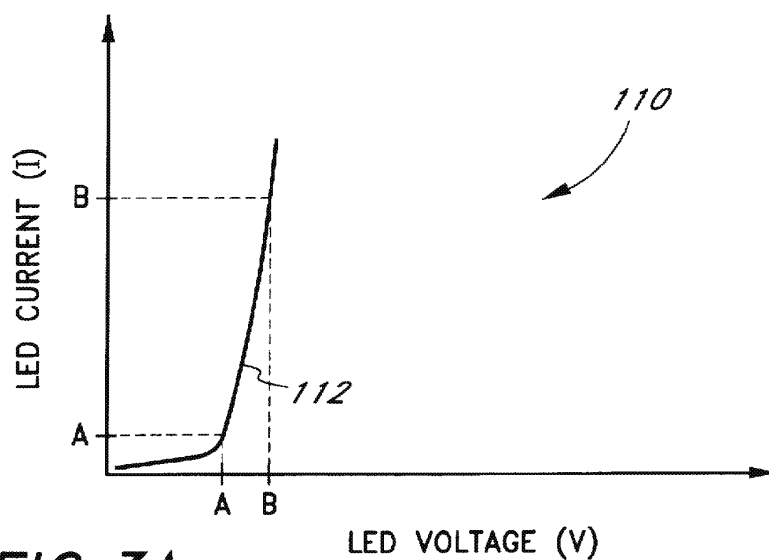


FIG. 3A

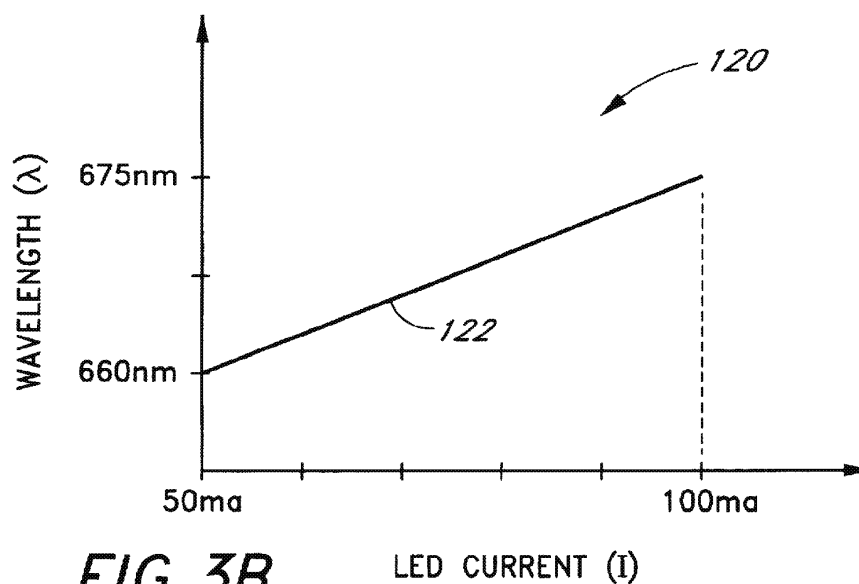
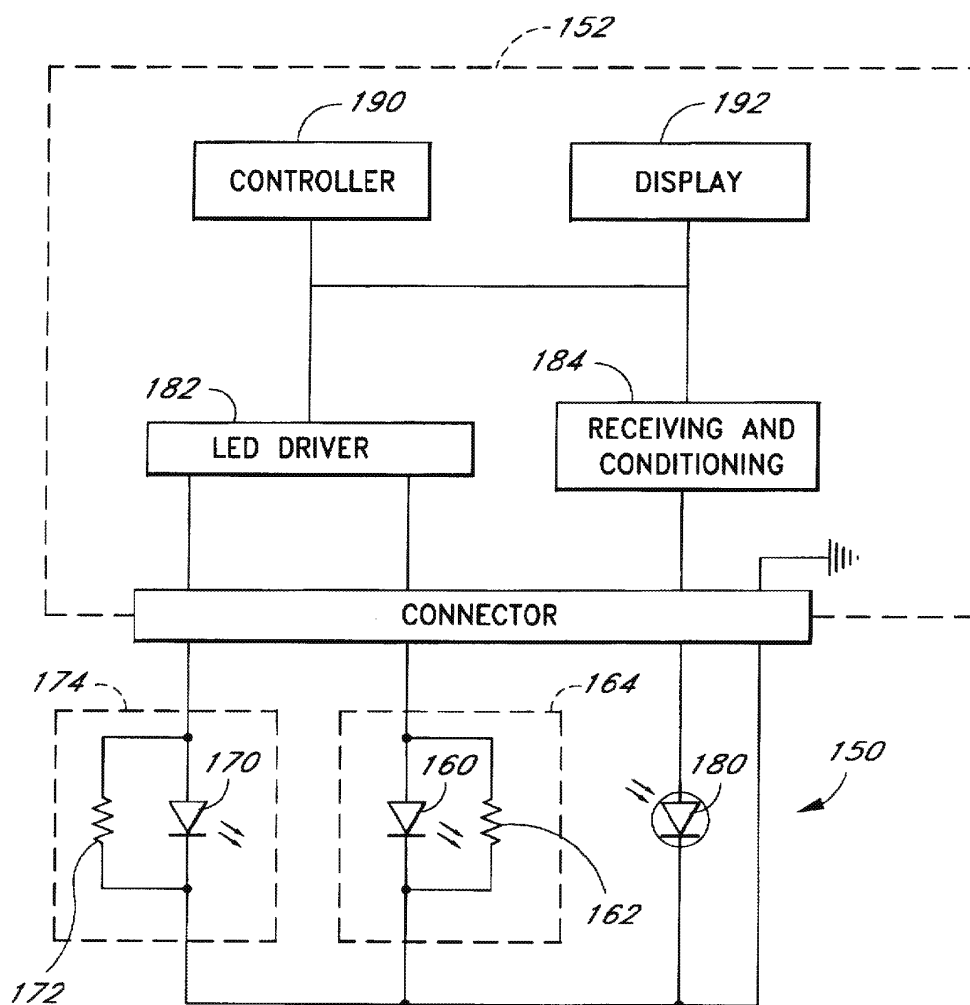


FIG. 3B

FIG. 4A



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