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# United States Patent [19]

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Gravenstein et al.

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[54] **METHOD FOR NONINVASIVE INTERMITTENT AND/OR CONTINUOUS HEMOGLOBIN, ARTERIAL OXYGEN CONTENT, AND HEMATOCRIT DETERMINATION**

4,805,623 2/1989 Jobsis ..... 128/633

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[21] Appl. No.: **368,636**

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### Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 264,119, Oct. 28, 1988, abandoned.

[51] Int. Cl.<sup>5</sup> ..... **A61B 5/00**

[52] U.S. Cl. .... **128/633; 128/637; 128/664; 128/898**

[58] Field of Search ..... **128/633, 634, 665, 664, 128/898, 637; 606/10, 11, 13**

### ABSTRACT

Described here are a novel means and device for noninvasively quantifying important blood constituents. Total hemoglobin, arterial oxygen content, hematocrit, and other parameters can all be determined quickly and easily without the need for skin puncture or lengthy laboratory analysis. The invention described here concerns the simultaneous measurement of volume changes and changes in the mass of either oxyhemoglobin, total hemoglobin, or reduced hemoglobin. The data obtained by these measurements is used to quantify the parameters of interest.

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**14 Claims, 4 Drawing Sheets**

