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(54) **PULSE OXIMETER AND SENSOR OPTIMIZED FOR LOW SATURATION**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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Related U.S. Application Data

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(51) **Int. Cl.**
A61B 5/1464 (2006.01)
A61B 5/1455 (2006.01)

(52) **U.S. Cl.** **600/338**; 600/323

(58) **Field of Classification Search** 600/310, 600/322, 323, 330, 331, 336, 338
See application file for complete search history.

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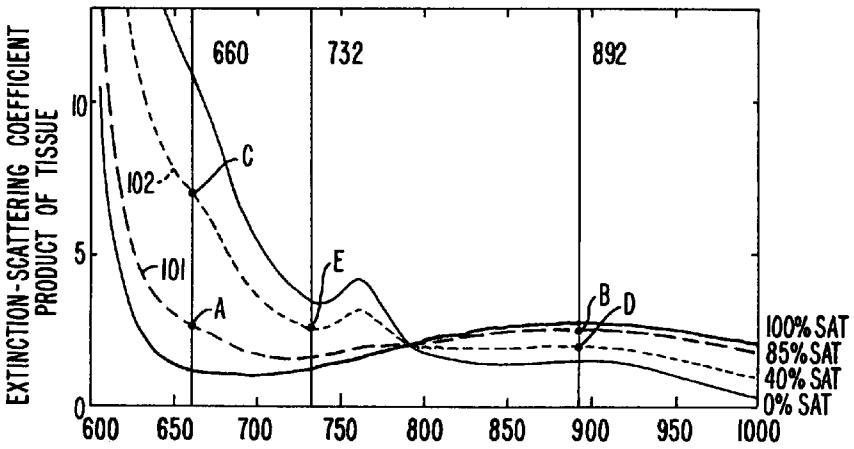
(57) **ABSTRACT**

A pulse oximeter sensor with a light source optimized for low oxygen saturation ranges and for maximizing the immunity to perturbation induced artifact. Preferably, a red and an infrared light source are used, with the red light source having a mean wavelength between 700-790 nm. The infrared light source can have a mean wavelength as in prior art devices used on patients with high saturation. The sensor of the present invention is further optimized by arranging the spacing between the light emitter and light detectors to minimize the sensitivity to perturbation induced artifact. The present invention optimizes the chosen wavelengths to achieve a closer matching of the absorption and scattering coefficient products for the red and IR light sources. This optimization gives robust readings in the presence of perturbation artifacts including force variations, tissue variations and variations in the oxygen saturation itself.

16 Claims, 14 Drawing Sheets



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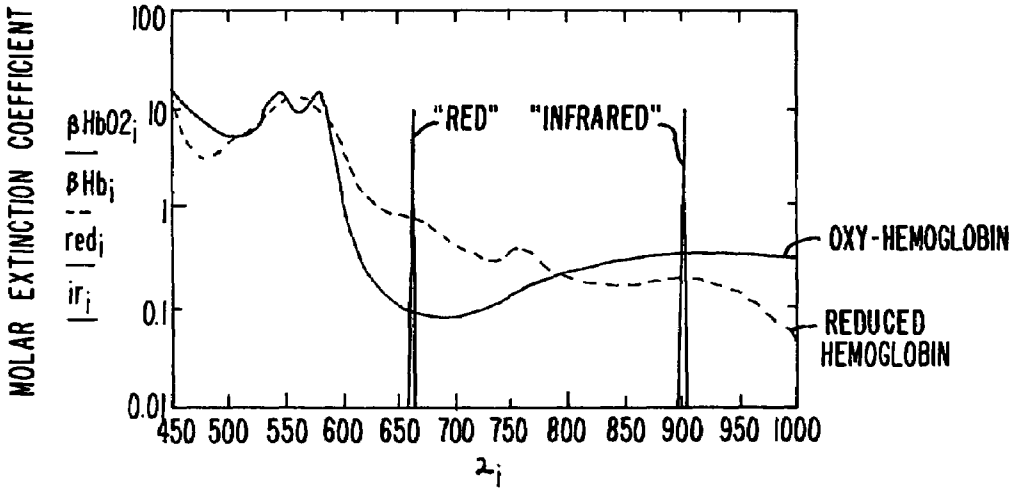

FIG. 1.

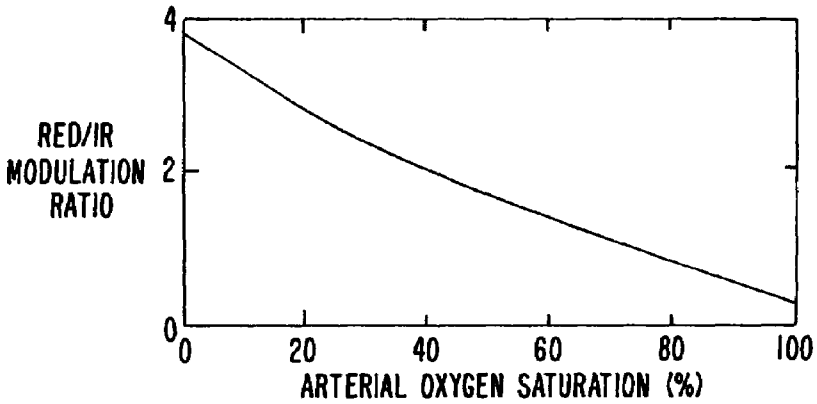

FIG. 2.

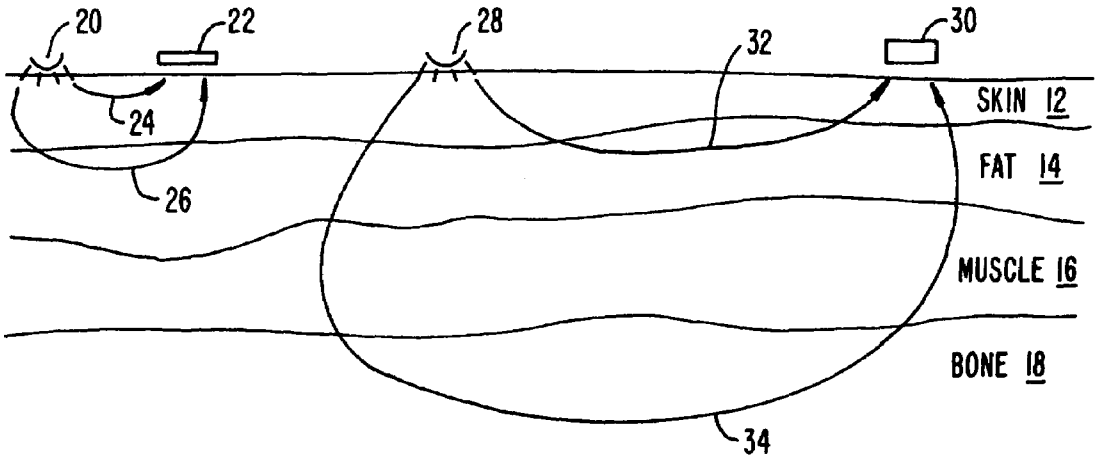

FIG. 3.

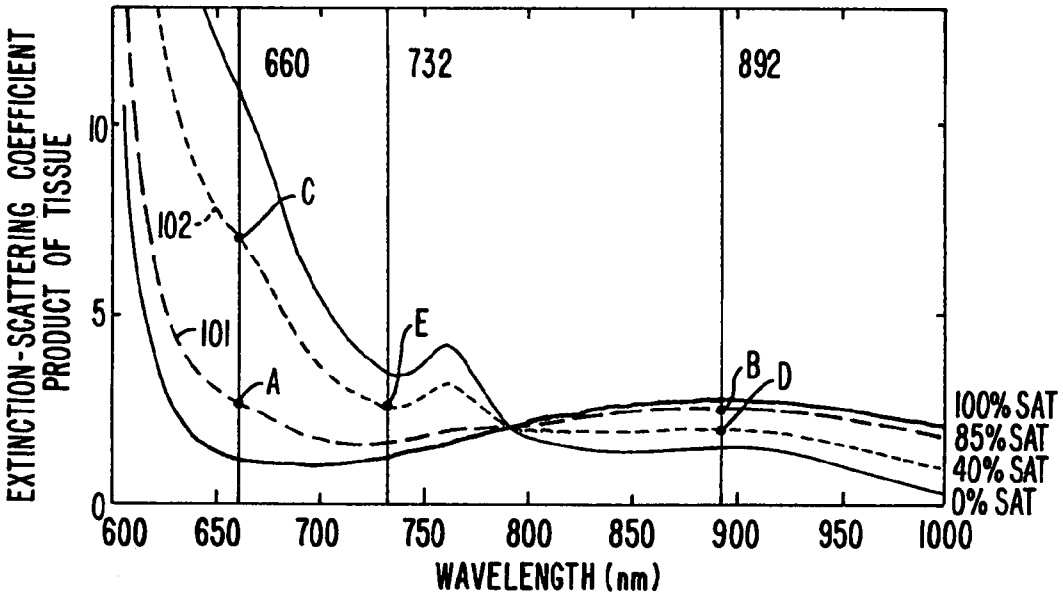

FIG. 4A.

EXTINCTION-SCATTERING COEFFICIENT PRODUCT	660 nm	732 nm	892 nm
(L/mmole-cm^2)			
$\mu's \cdot \beta_{HbO2}$	1.23	1.31	2.82
$\mu's \cdot \beta_{85\%}$	2.67	1.63	2.64
$\mu's \cdot \beta_{40\%}$	7.00	2.58	1.84
$\mu's \cdot \beta_{Hb}$	10.85	3.41	1.59

FIG. 4B.

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