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# United States Patent [19]

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Secker

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[54] **SENSOR, APPARATUS AND METHOD FOR NON-INVASIVE MEASUREMENT OF OXYGEN SATURATION**

0353619 7/1989 European Pat. Off. .  
08901758 9/1989 European Pat. Off. .  
3328862A1 3/1985 Fed. Rep. of Germany .

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[57] **ABSTRACT**

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

[52] U.S. Cl. .... **128/633; 128/666; 356/41**

[58] Field of Search ..... **128/633, 664-666; 356/41; 250/341, 345**

A sensor for non-invasive measurement of oxygen saturation using the reflection method comprises a red transmitter (55), an infrared transmitter (58) and a receiver (57). The distances between the transmitters and the receiver are selected such that the length of the light path (60, 61) between the red transmitter (55) and the receiver (57) is substantially equal to the length of the light path (62, 63) between the infrared transmitter (58) and the receiver (57). The sensor comprises a further red transmitter (56) which is used for another application at the human body or another tissue characteristics where the depth of penetration at the various wavelengths is different from the shown example. Together with an appropriate oximeter, manual or automatic adaptation is possible. Further signal improvement may be obtained by autocorrelating the received signal, detecting its frequency and cross-correlating it with a pattern function of the same frequency.

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**36 Claims, 11 Drawing Sheets**

