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United States Patent [19]

Diab et al.

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[54] **SIGNAL PROCESSING APPARATUS**

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[73] Assignee: **Masimo Corporation**, Irvine, Calif.

[*] Notice: This patent is subject to a terminal disclaimer.

[21] Appl. No.: **08/859,837**

[22] Filed: **May 16, 1997**

Related U.S. Application Data

[63] Continuation of application No. 08/320,154, Oct. 7, 1994, Pat. No. 5,632,272, which is a continuation-in-part of application No. 08/132,812, Oct. 6, 1993, Pat. No. 5,490,505, and a continuation-in-part of application No. 08/249,690, May 26, 1994, Pat. No. 5,482,036, which is a continuation of application No. 07/666,060, Mar. 7, 1991, abandoned.

[51] **Int. Cl.**[7] **A61B 5/00**

[52] **U.S. Cl.** **600/323**; 600/336; 600/509; 600/529

[58] **Field of Search** 600/310, 322, 600/323, 324, 336, 473, 476, 481, 483, 484, 500, 508, 509, 529

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[57] **ABSTRACT**

The present invention involves method and apparatus for analyzing two measured signals that are modeled as containing primary and secondary portions. Coefficients relate the two signals according to a model defined in accordance with the present invention. In one embodiment, the present invention involves utilizing a transformation which evaluates a plurality of possible signal coefficients in order to find appropriate coefficients. Alternatively, the present invention involves using statistical functions or Fourier transform and windowing techniques to determine the coefficients relating to two measured signals. Use of this invention is described in particular detail with respect to blood oximetry measurements.

52 Claims, 37 Drawing Sheets

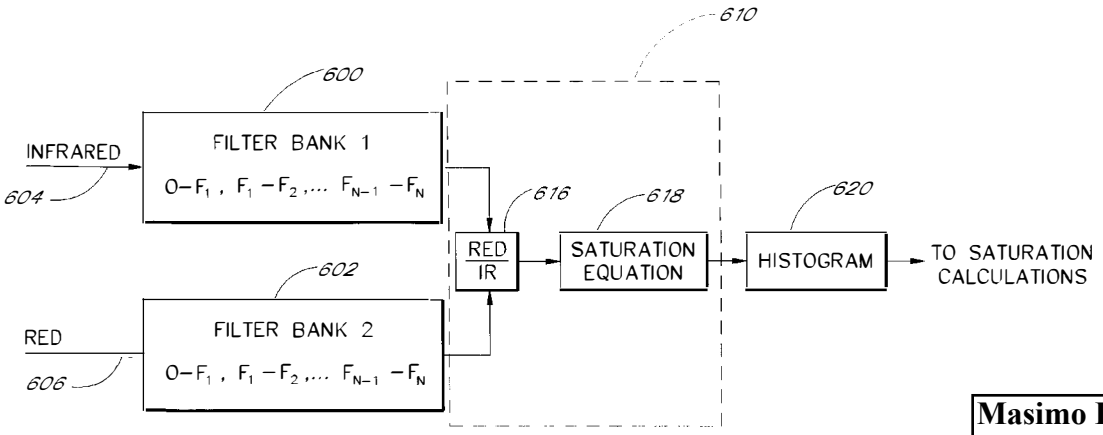

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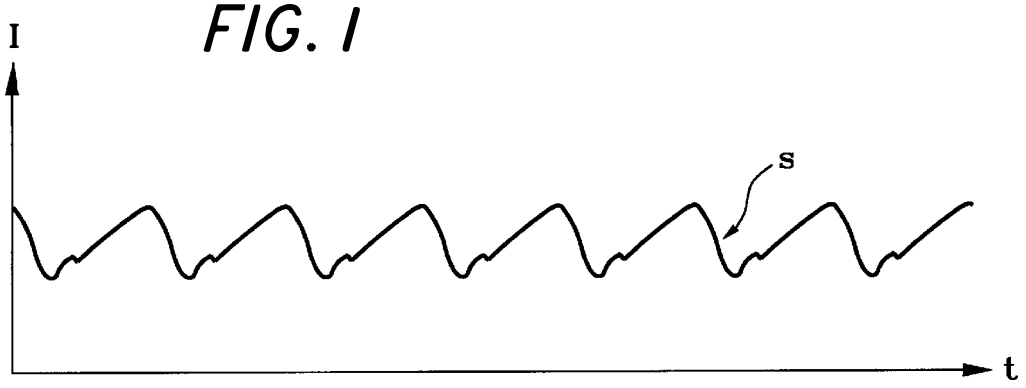
FIG. 1



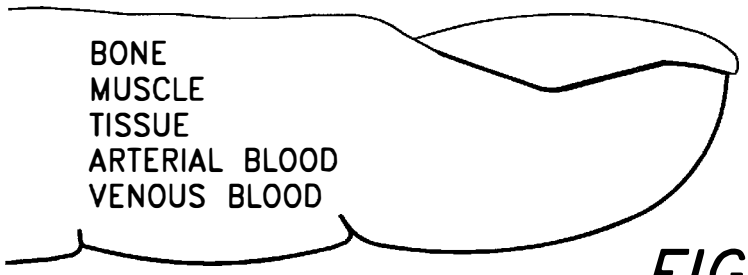
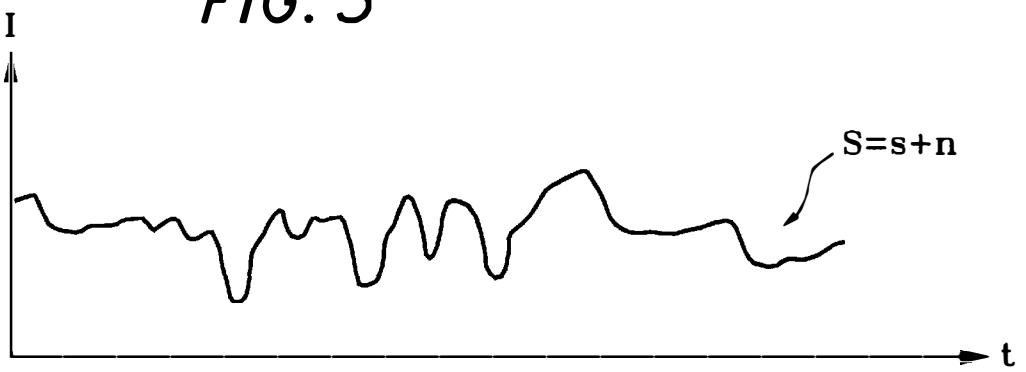


FIG. 2

FIG. 3



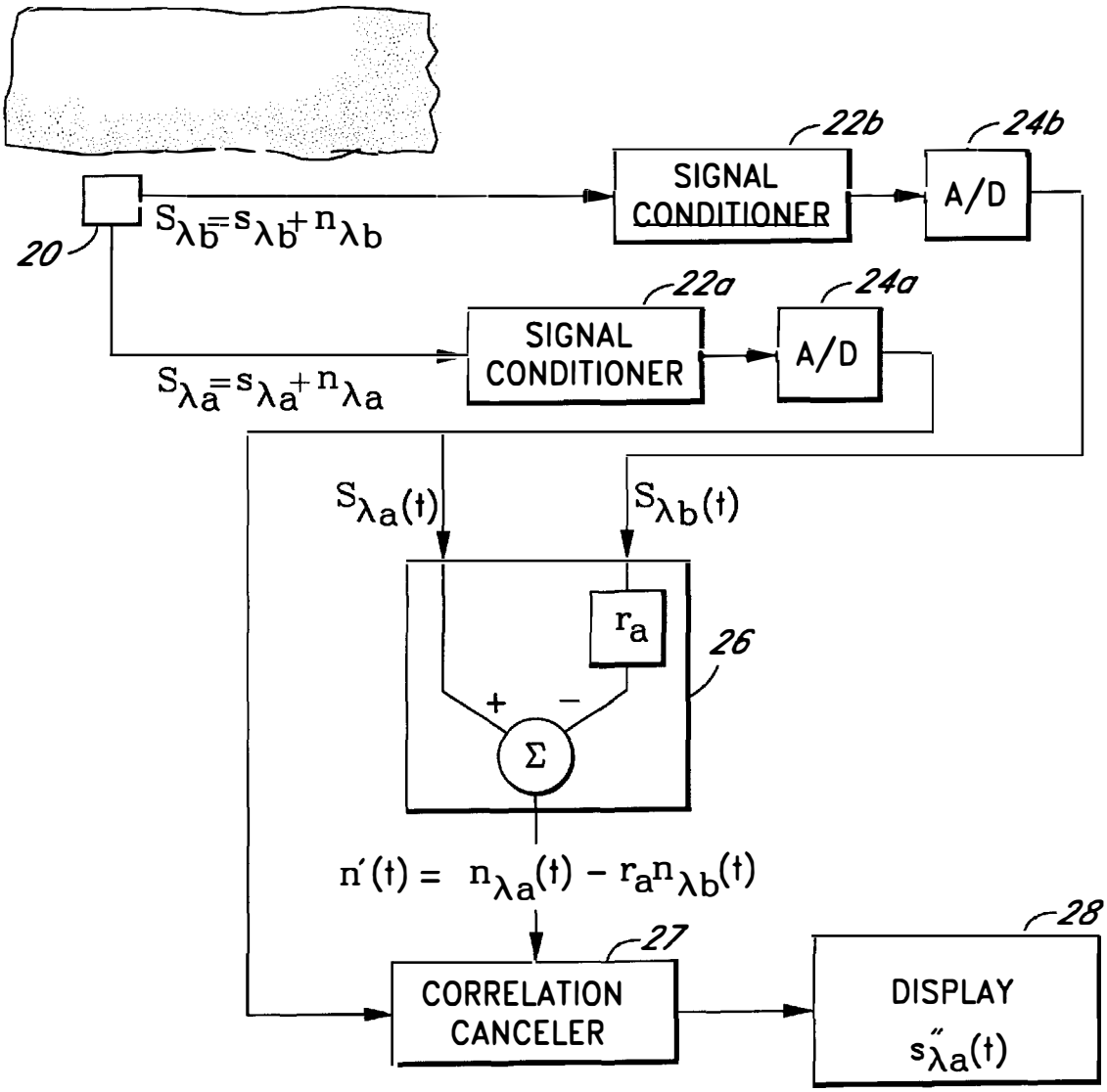


FIG. 4a

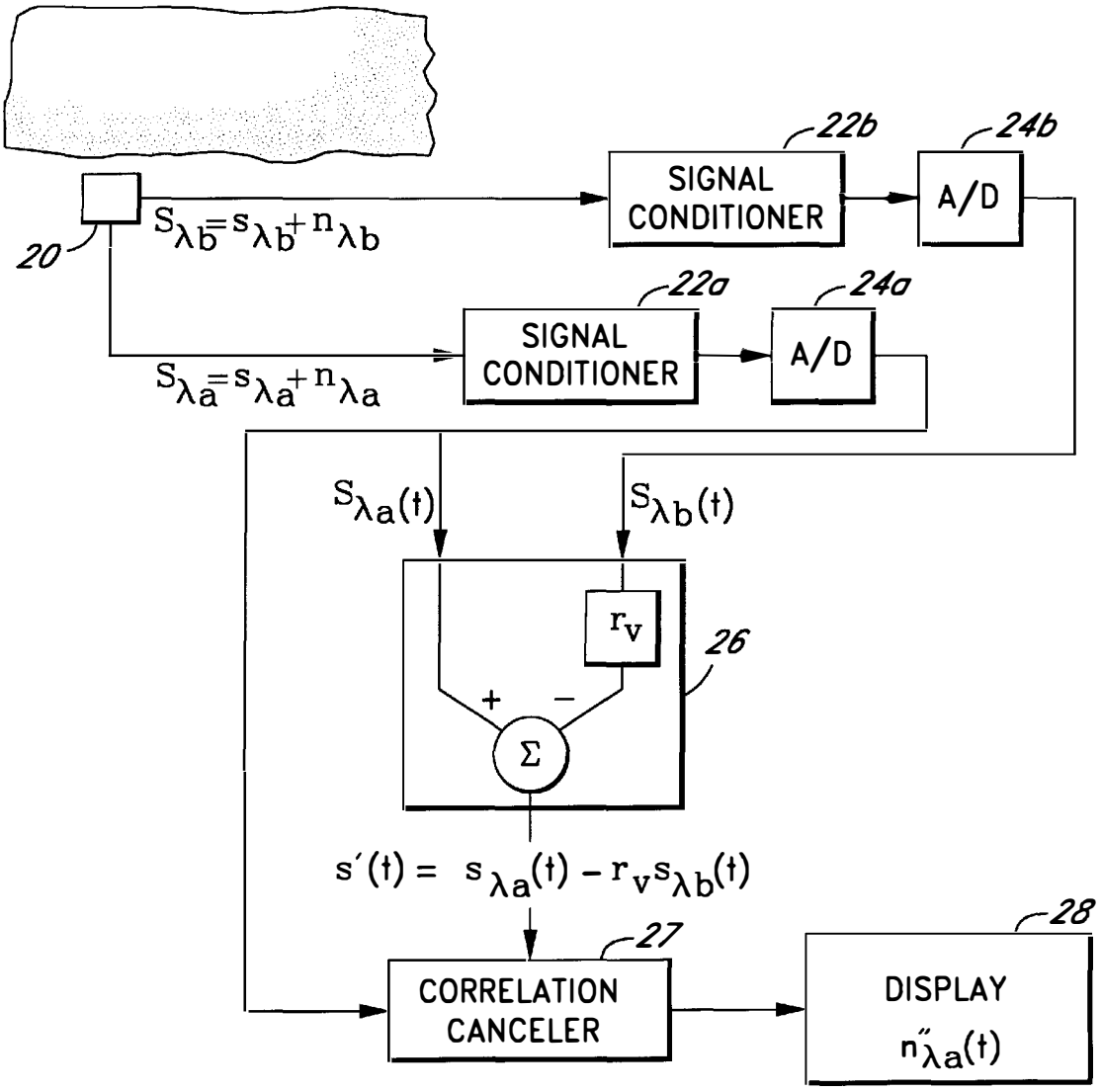


FIG. 4b

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