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# United States Patent [19]

Amano et al.

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## [54] ARRHYTHMIA DETECTING APPARATUS

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Mar. 10, 1997 [JP] Japan ..... 9-055263

[51] Int. Cl.<sup>7</sup> ..... **A61B 5/04**; A61B 5/02

[52] U.S. Cl. ..... **600/500**; 600/481; 600/513;  
600/515

[58] Field of Search ..... 600/515, 513,  
600/500, 509, 481

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Primary Examiner—Cary O'Connor  
Assistant Examiner—Navin Natnithidatha

## [57] ABSTRACT

The arrhythmia detecting apparatus of the present invention is provided with a pulse wave detecting means which non-invasively detects the pulse waveform, and an arrhythmia detecting means which detects arrhythmia by monitoring changes in the pulse waveform detected by the pulse wave detecting means. The arrhythmia detection means has a decision element which determines that arrhythmia has occurred when there is an interruption in the continuity of this change. Methods employed for investigating the continuity of change in the pulse waveform include a time domain method employing pulse wave interval values, and a frequency domain method in which frequency analysis (FFT or wavelet transformation) is carried out on the pulse waveform, with continuity studied based on the results of this analysis. As a result of this design, it is possible to detect arrhythmia by means of a simpler structure and easier operations as compared to an electrocardiogram and so on. Further, it is also acceptable to provide a body motion detecting means, and to determine continuity of change for a pulse wave component after the body motion component detected by the aforementioned means has been removed therefrom. In this case, since it is possible to remove the body motion component from the pulse waveform, arrhythmia can be detected even more accurately throughout the course of daily activities.

37 Claims, 43 Drawing Sheets

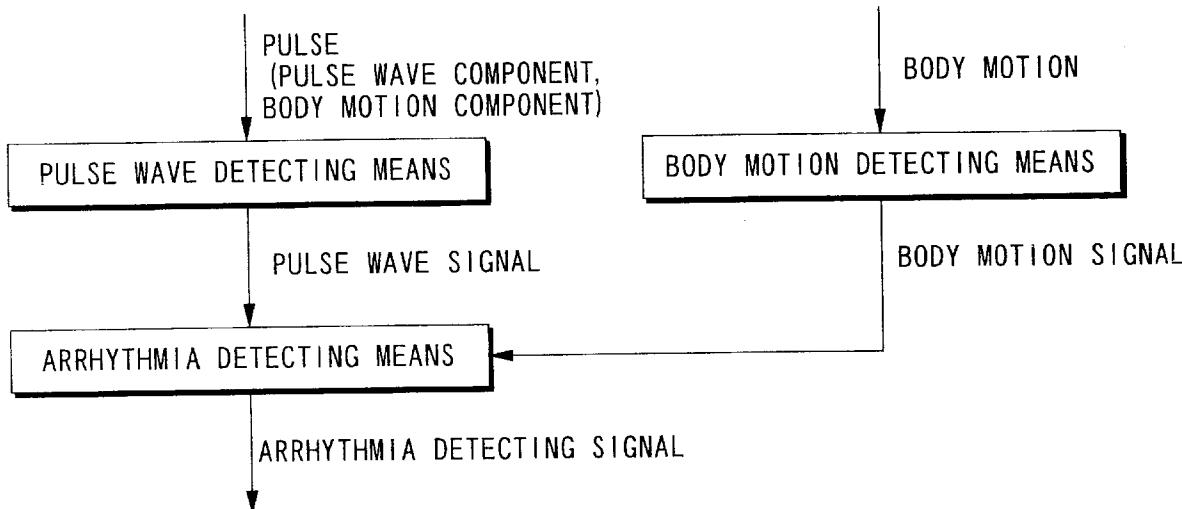


FIG. 1

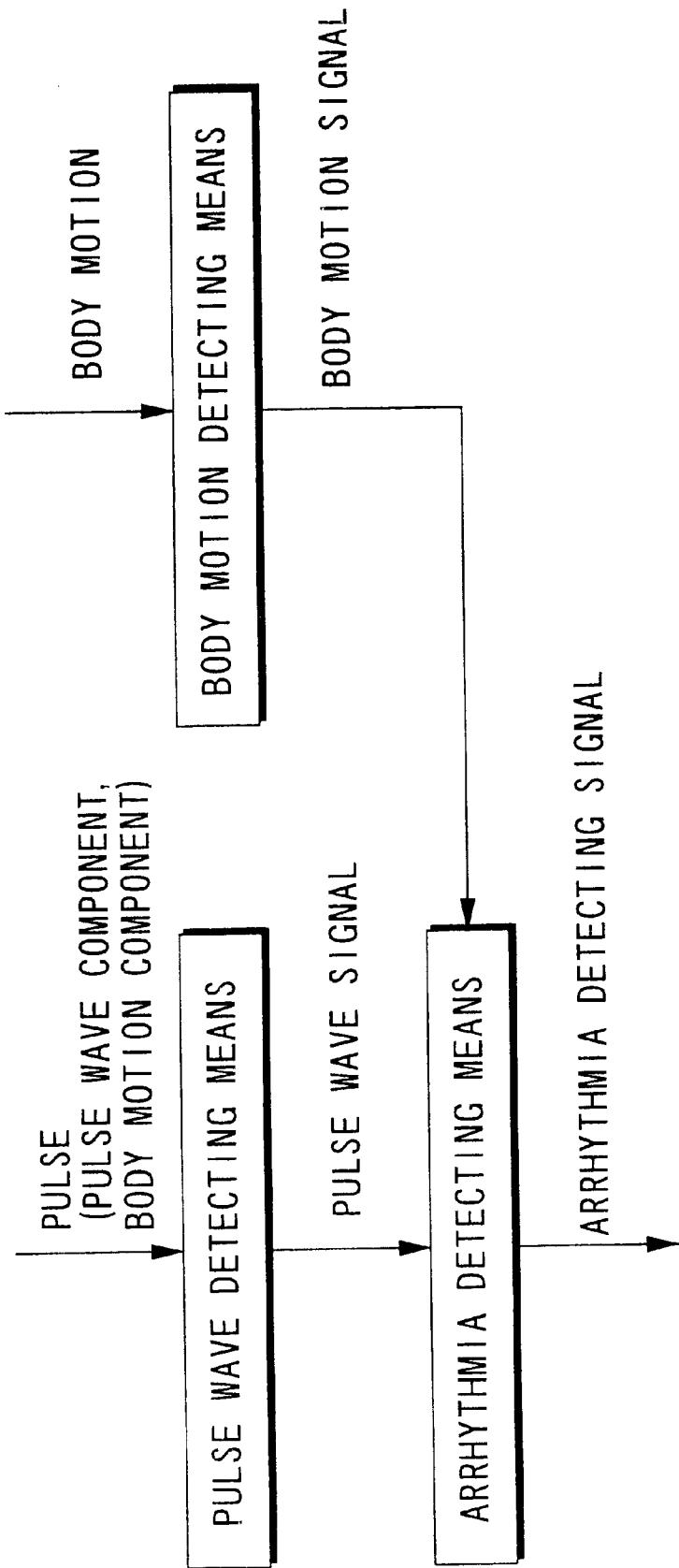


FIG. 2

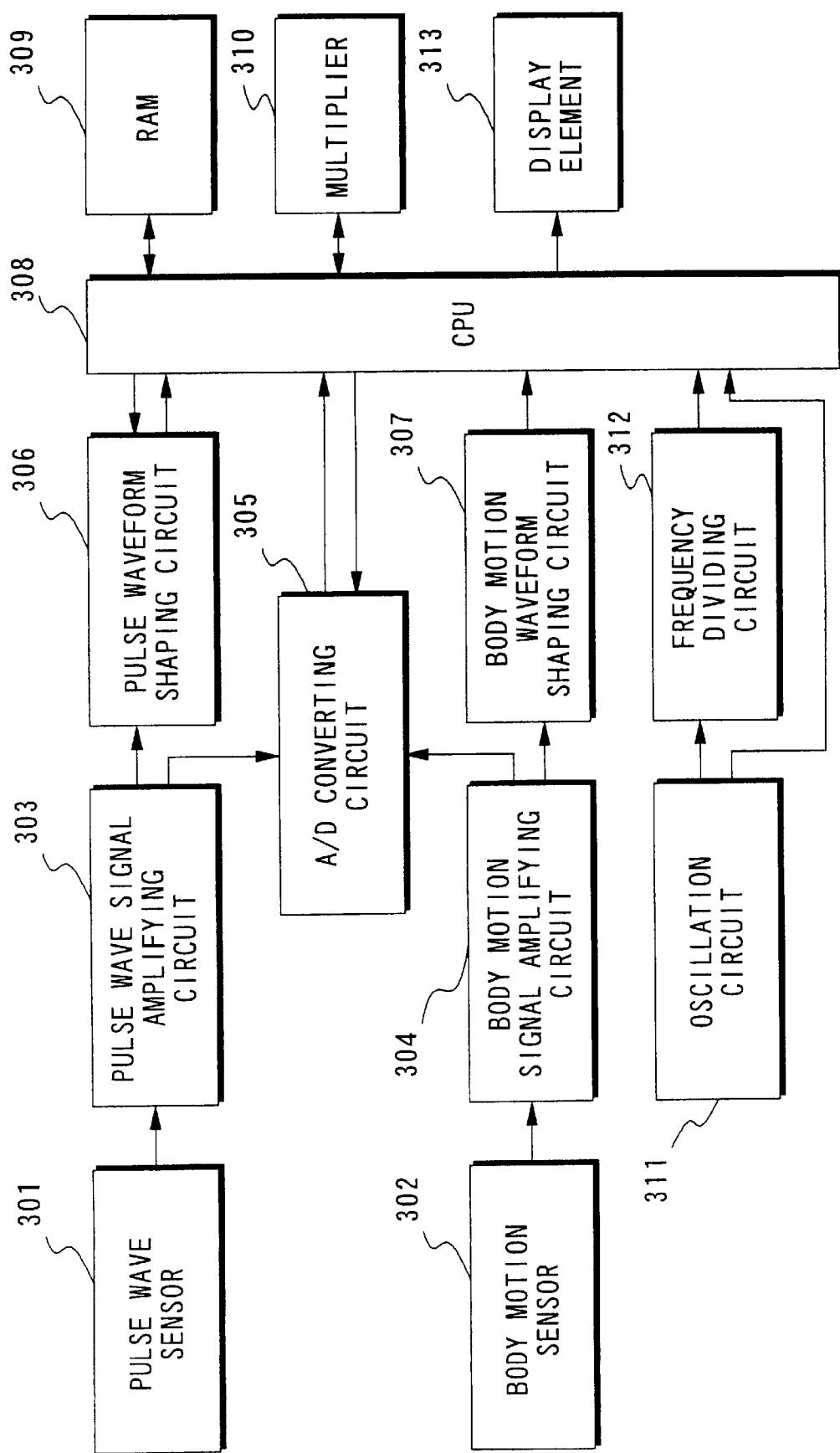


FIG. 3

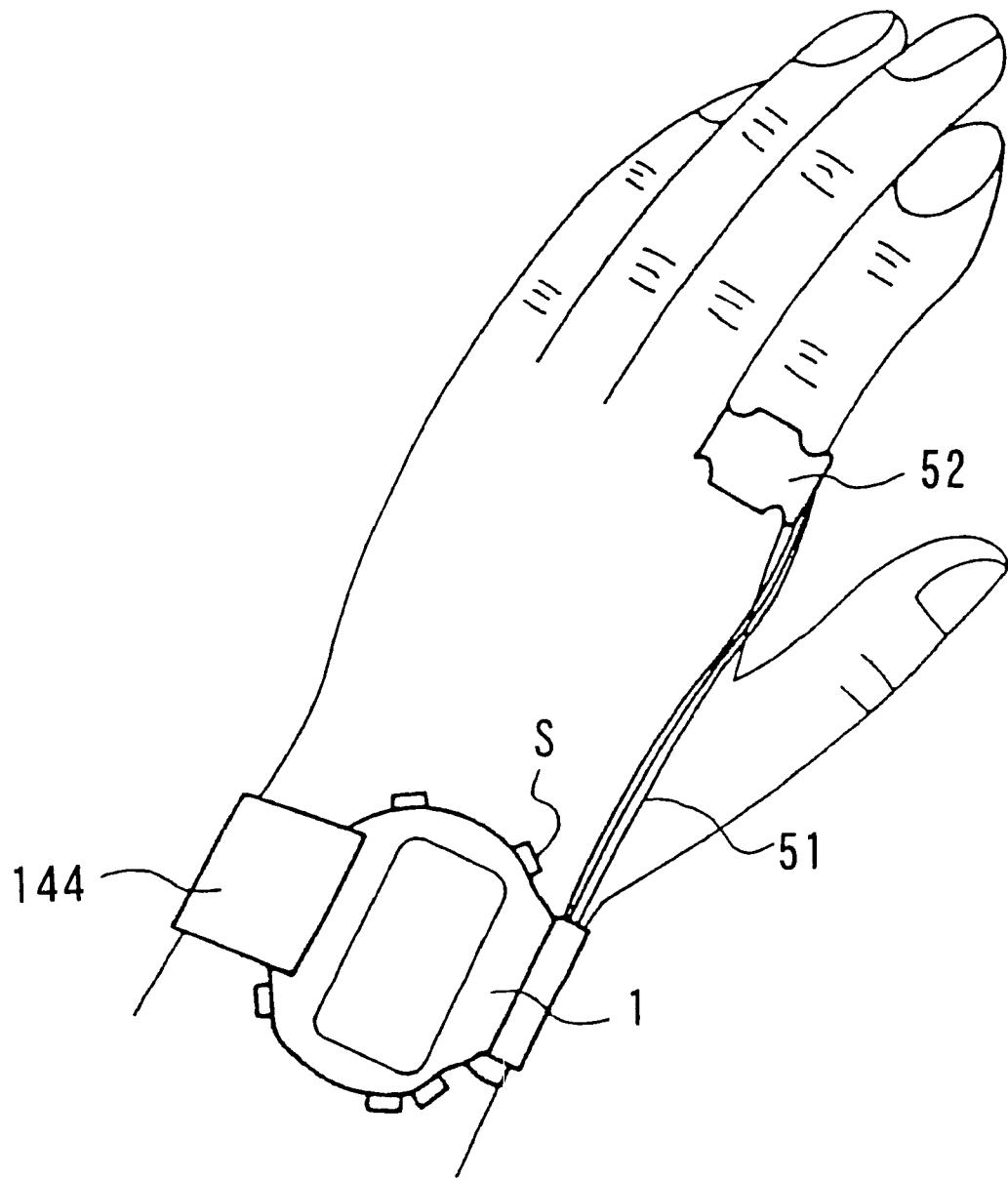
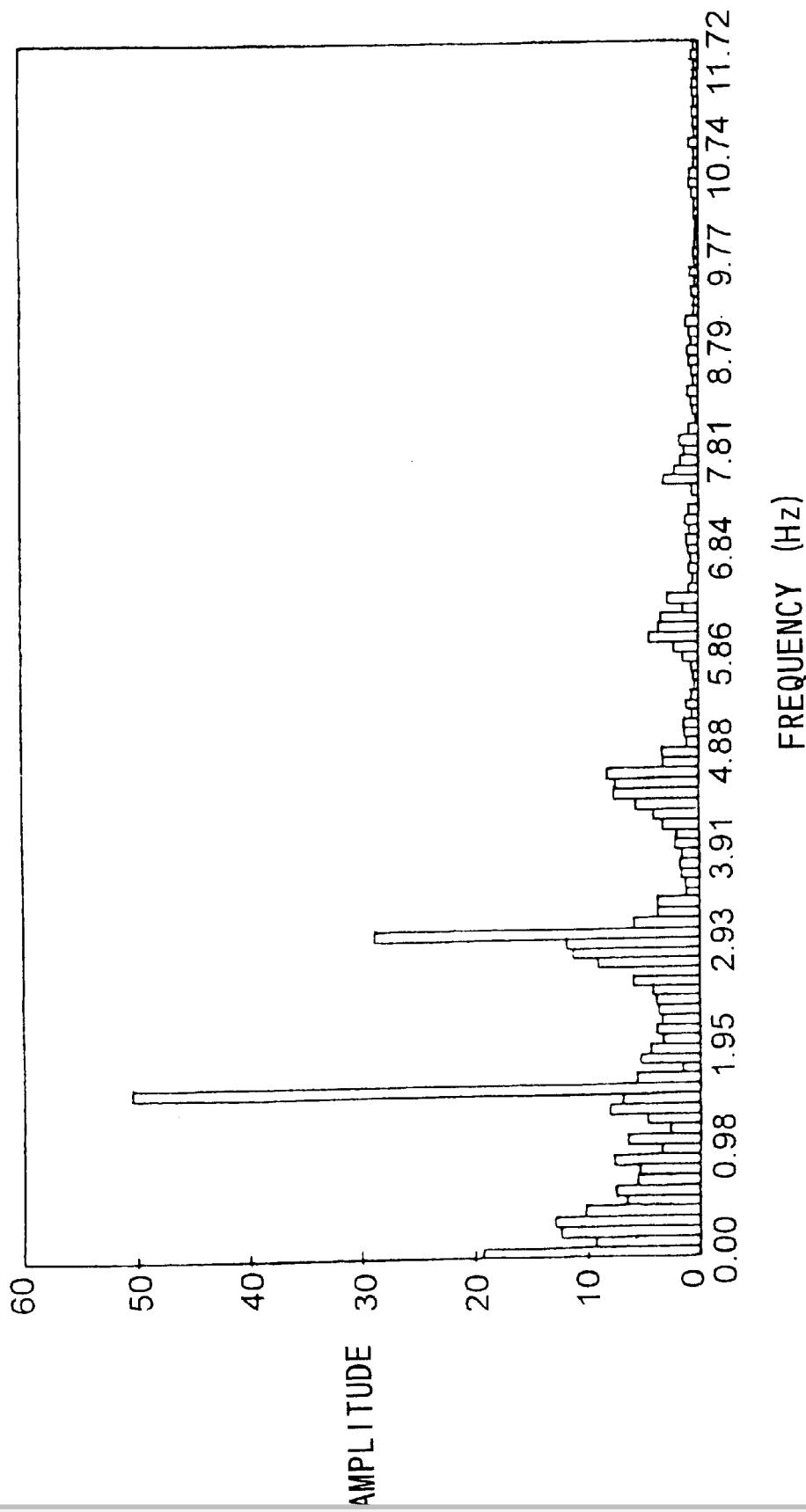


FIG. 4



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