



US008177720B2

(12) **United States Patent**  
**Nanba et al.**

(10) **Patent No.:** **US 8,177,720 B2**  
(45) **Date of Patent:** **May 15, 2012**

(54) **APPARATUS FOR DETECTING VITAL FUNCTIONS, CONTROL UNIT AND PULSE WAVE SENSOR**

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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 1342 days.

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(21) Appl. No.: **11/802,607**

(22) Filed: **May 24, 2007**

(65) **Prior Publication Data**

US 2007/0282227 A1 Dec. 6, 2007

(30) **Foreign Application Priority Data**

May 31, 2006 (JP) ..... 2006-152354

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(51) **Int. Cl.**

**A61B 5/02** (2006.01)

(52) **U.S. Cl.** ..... **600/483; 600/484**

(58) **Field of Classification Search** ..... **600/483, 600/486, 500-504**

See application file for complete search history.

(57) **ABSTRACT**

An apparatus for detecting vital functions has a pulse wave sensor attachable to a body and a control unit. The control unit checks if amplitude of pulse wave signals produced from the pulse wave sensor varies. The control unit further checks if a large change in the amplitude during a systolic phase of a pulse wave corresponding to the systolic phase of the heart. If a first large change in the amplitude during a diastolic phase of a pulse wave corresponding to the diastolic phase of the heart, it is highly probable that a motion artifact has occurred. Therefore, a motion artifact flag is set. Next, it is checked if the amplitude in the next diastole is changing by more than 30%. if it is presumed that the occurrence of cough is highly probable, a cough flag is set. if it is neither the motion artifact nor the cough, then a yawn flag is set.

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**26 Claims, 10 Drawing Sheets**

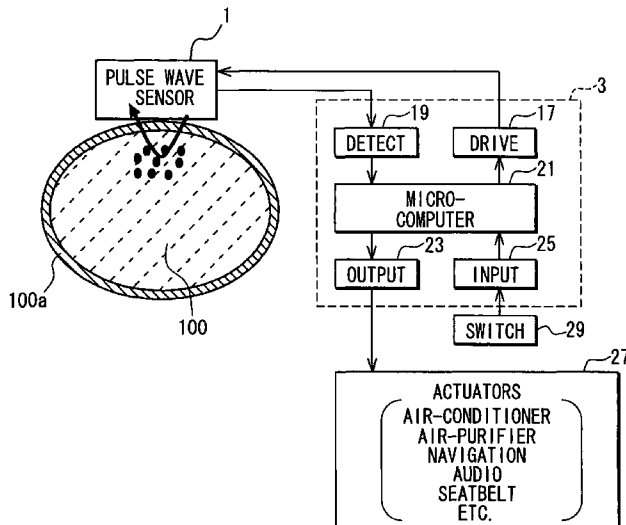


FIG. 1A

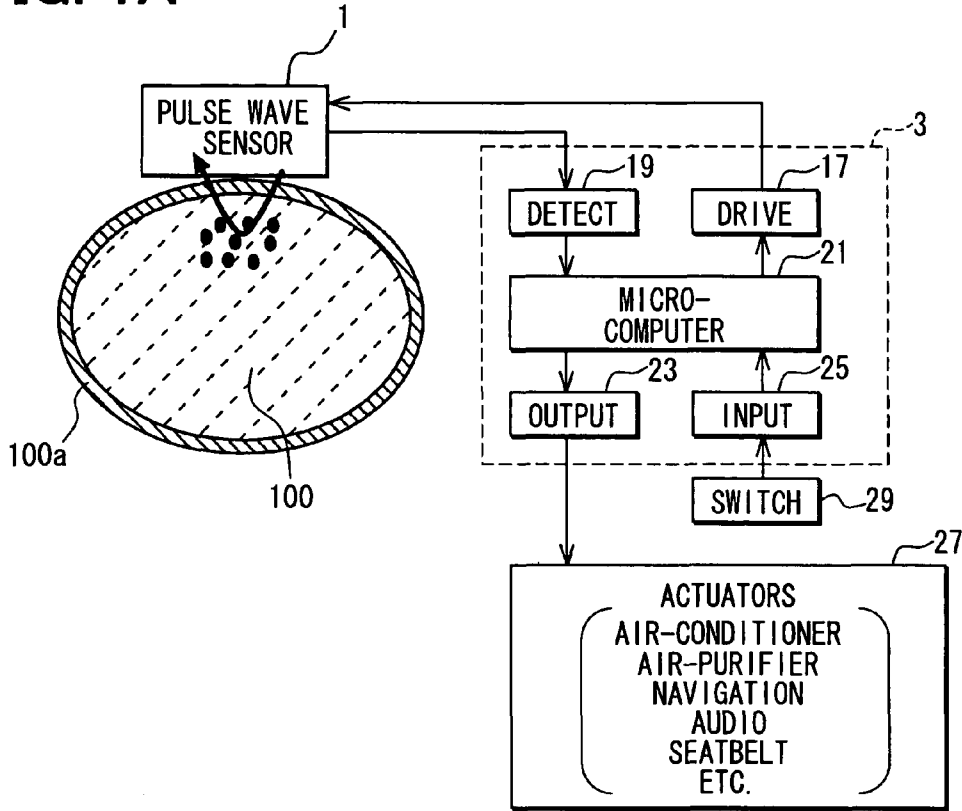
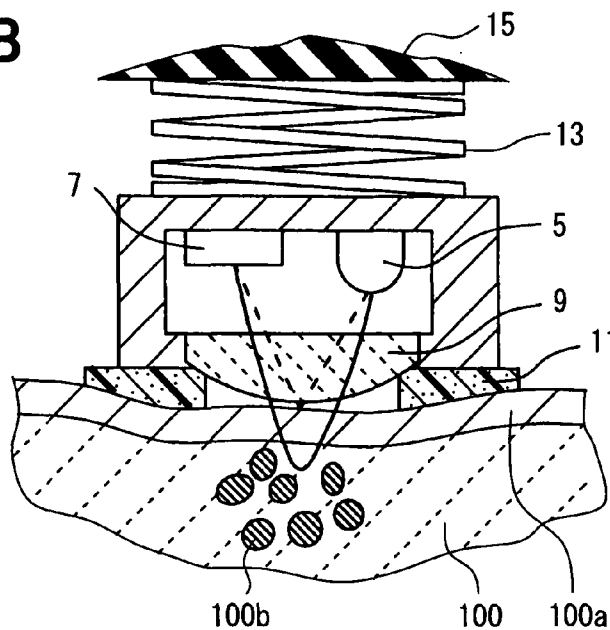
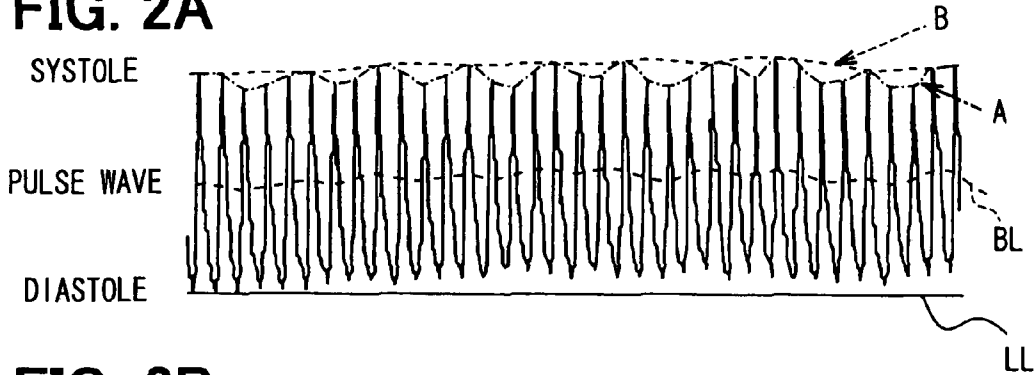


FIG. 1B



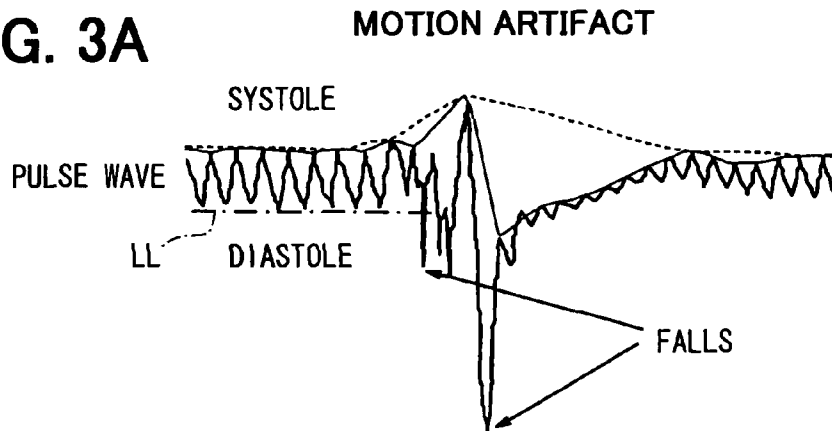
**FIG. 2A**



**FIG. 2B**



**FIG. 3A**



**FIG. 3B**

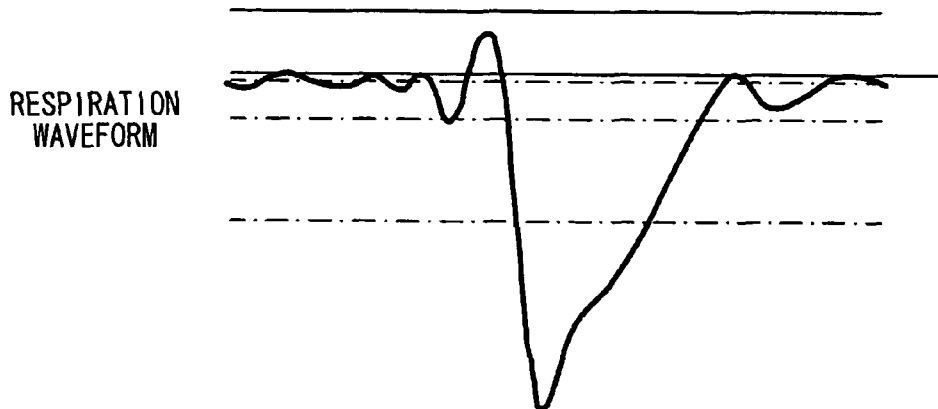


FIG. 4E

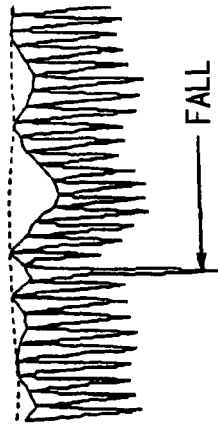


FIG. 4F

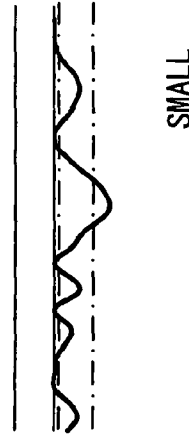


FIG. 4C

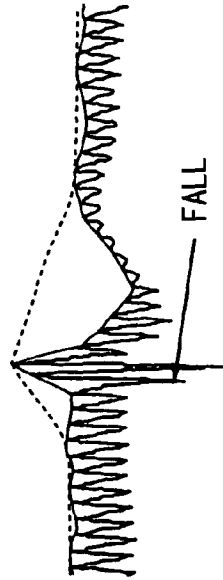


FIG. 4D

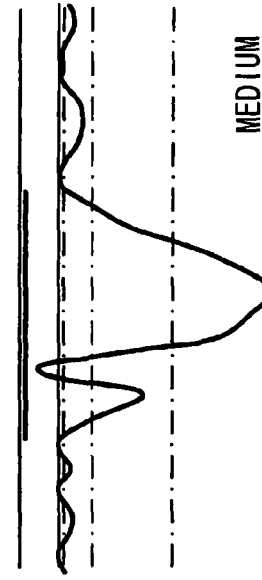


FIG. 4A

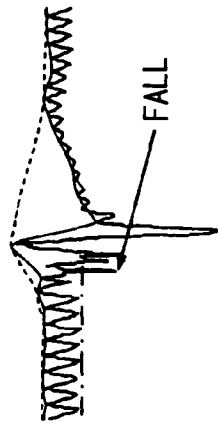
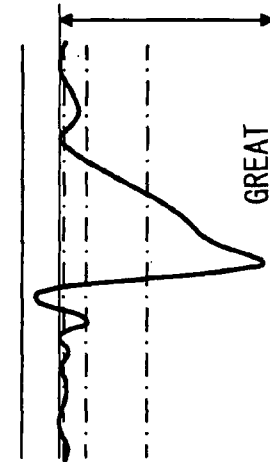
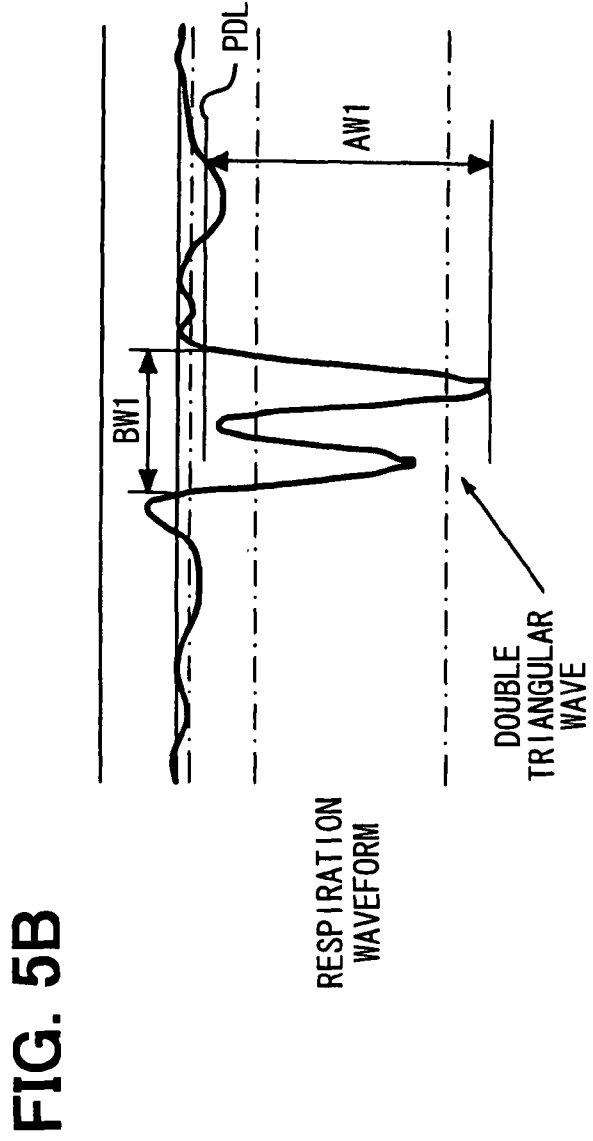
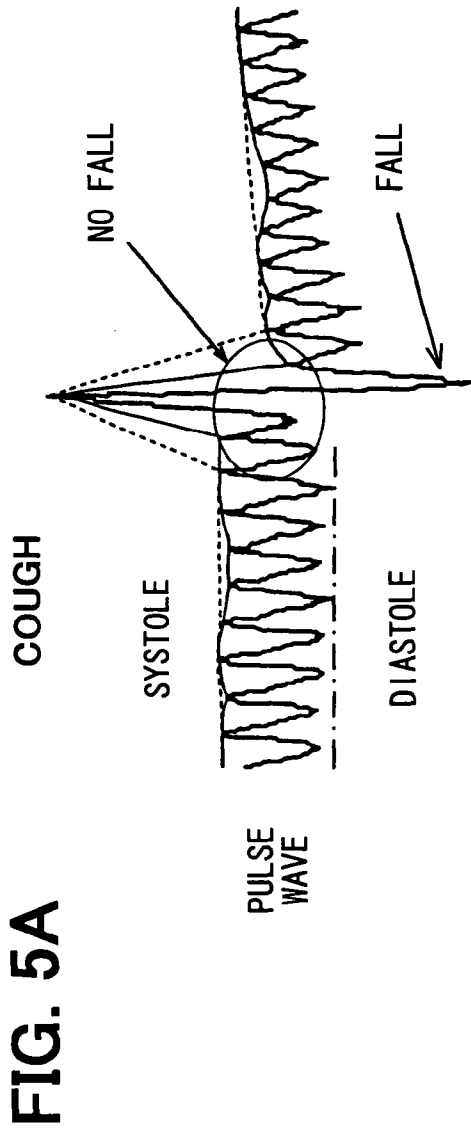


FIG. 4B





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