

EXHIBIT 2129



US006081742A

United States Patent [19]

Amano et al.

[11] **Patent Number:** **6,081,742**[45] **Date of Patent:** **Jun. 27, 2000**[54] **ORGANISM STATE MEASURING DEVICE
AND RELAXATION INSTRUCTING DEVICE**[75] Inventors: **Kazuhiko Amano**, Suwa; **Kazuo Uebaba**, Yokohama; **Hitoshi Ishiyama**, Toride, all of Japan[73] Assignee: **Seiko Epson Corporation**, Tokyo, Japan[21] Appl. No.: **09/068,755**[22] PCT Filed: **Sep. 4, 1997**[86] PCT No.: **PCT/JP97/03108**§ 371 Date: **Aug. 4, 1998**§ 102(e) Date: **Aug. 4, 1998**[87] PCT Pub. No.: **WO98/10699**PCT Pub. Date: **Mar. 19, 1998**[30] **Foreign Application Priority Data**

Sep. 10, 1996 [JP] Japan 8-239608

[51] **Int. Cl.⁷** **A61B 5/04**[52] **U.S. Cl.** **600/513; 600/484**[58] **Field of Search** 600/483, 484, 600/513[56] **References Cited****U.S. PATENT DOCUMENTS**

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Primary Examiner—William E. Kamm*Assistant Examiner*—Carl H. Layno*Attorney, Agent, or Firm*—Eric B. Janofsky[57] **ABSTRACT**

Devices are known for measuring a subject's respiratory rate based on the subject's pulse wave or level of electrocardiogram. When the subject is exercising or carrying out daily activities, however, an electromyogram becomes imposed on the cardiogram waveform, so that a body motion component is superimposed on the pulse wave. This leads to an incorrect measured result. To overcome this drawback, a portable portion in the form of a wristwatch worn by the subject and a personal computer comprising device main body **330** are provided. A photoelectric pulse wave sensor is attached to the base of the subject's finger, and the pulse waveform is measured. An acceleration sensor is provided to the portable portion, and employed to detect the subject's body motion spectrum. Device main body **330** performs a window function on the pulse wave, and removes the acceleration component, so that the body motion spectrum is removed from the frequency spectrum of the pulse wave. Using the obtained result, the respiratory rate and change rate of the respiratory rate are generated.

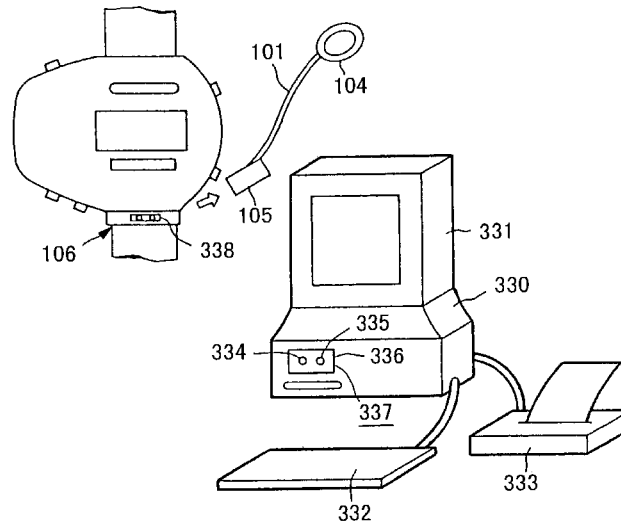
18 Claims, 24 Drawing Sheets

FIG. 1

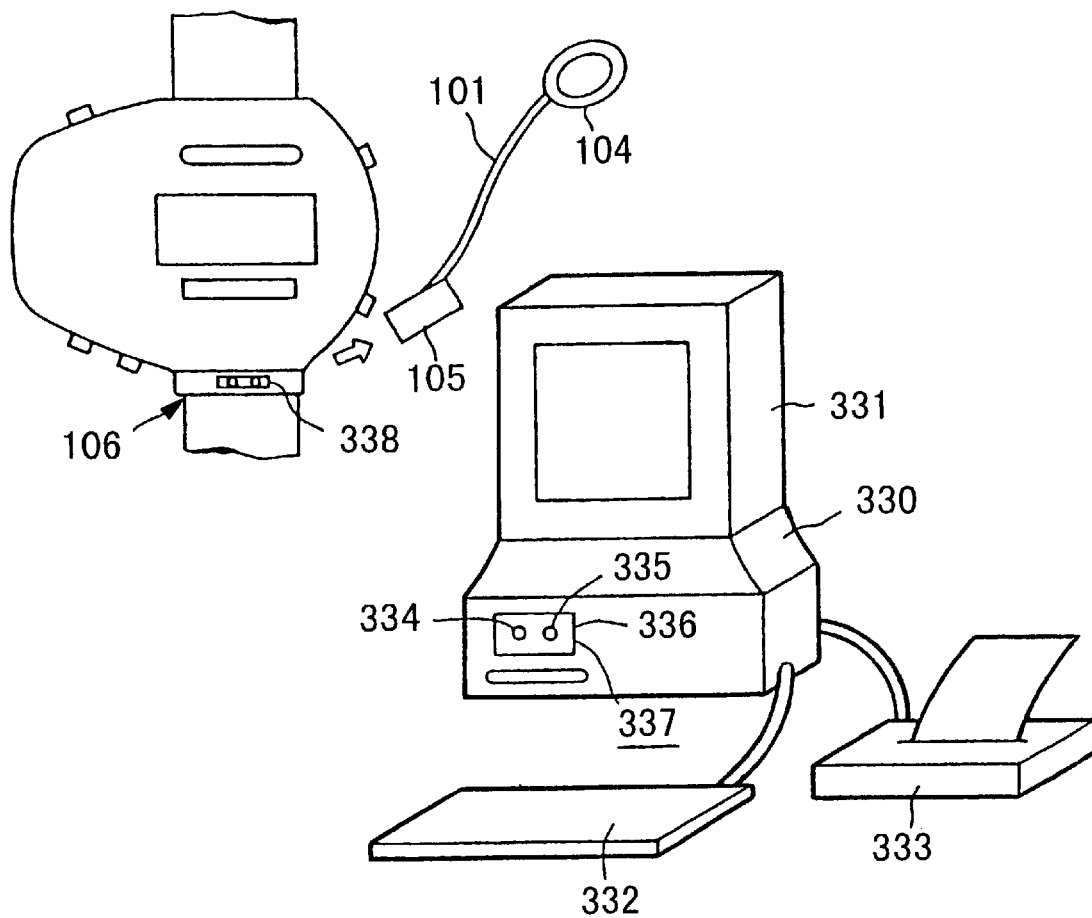


FIG. 2

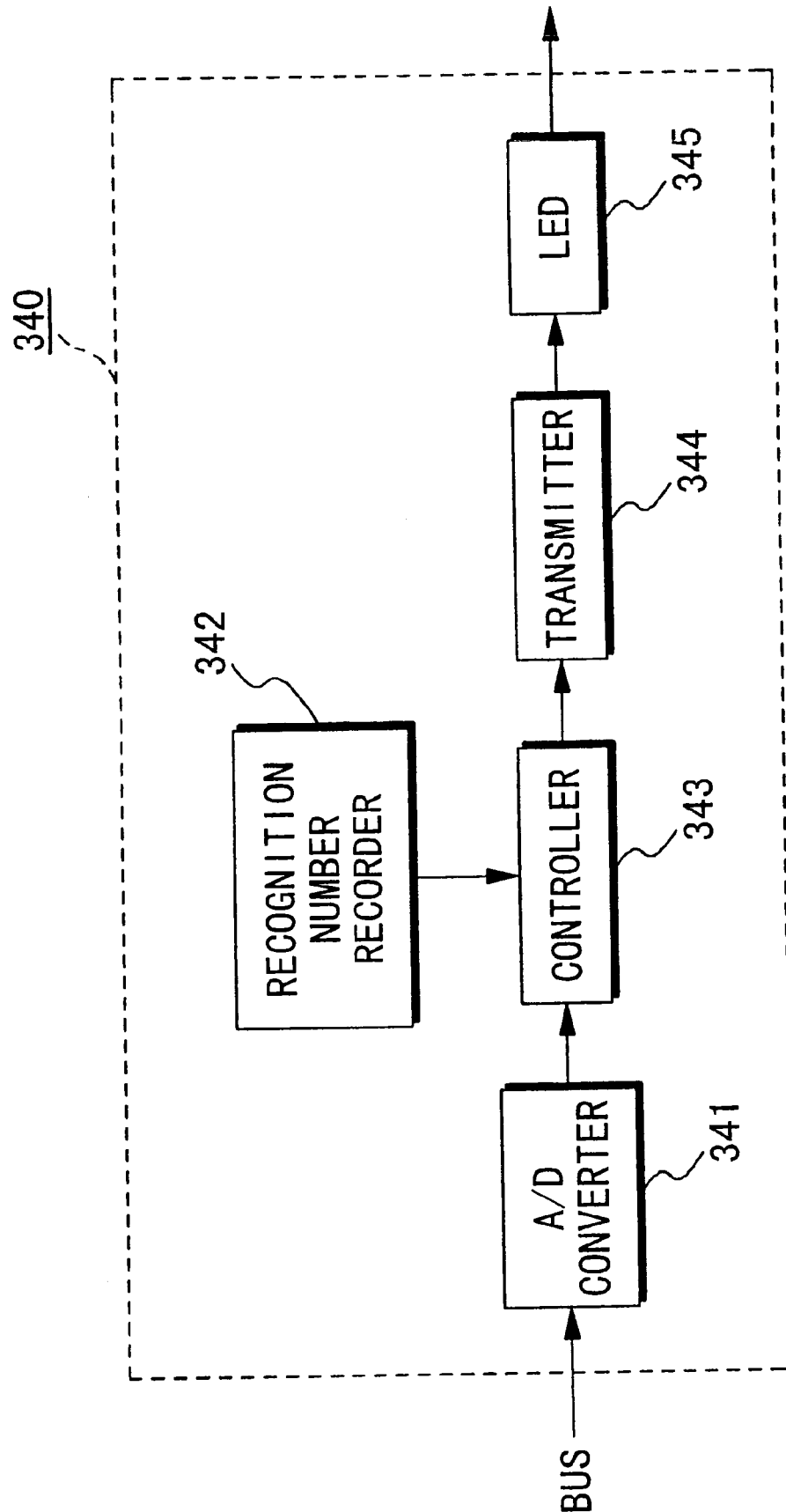


FIG. 3

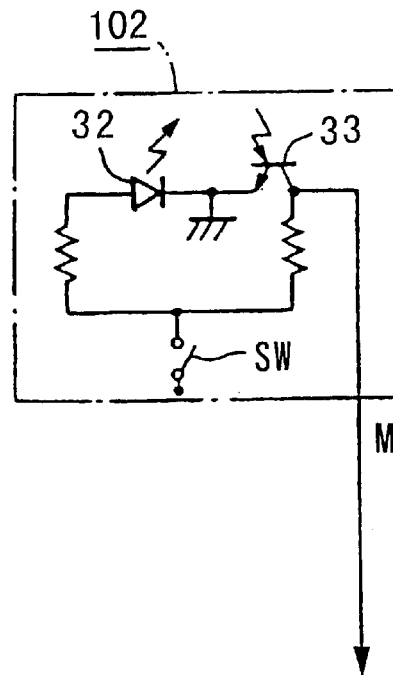
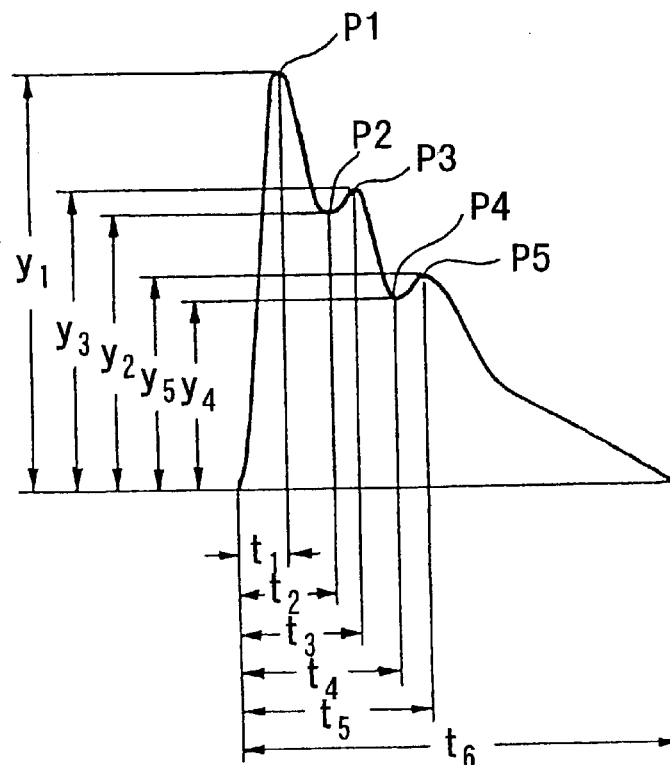


FIG. 4





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