

# EXHIBIT 2129



US006081742A

# United States Patent [19]

[11] Patent Number: **6,081,742**

Amano et al.

[45] Date of Patent: **Jun. 27, 2000**

[54] ORGANISM STATE MEASURING DEVICE AND RELAXATION INSTRUCTING DEVICE	52-39983	3/1977	Japan .
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	4-51912	5/1992	Japan .
[75] Inventors: Kazuhiko Amano, Suwa; Kazuo Uebaba, Yokohama; Hitoshi Ishiyama, Toride, all of Japan	4-136207	12/1992	Japan .
	4-348761	12/1992	Japan .
	5-37420	2/1993	Japan .
	5-76501	3/1993	Japan .
[73] Assignee: Seiko Epson Corporation, Tokyo, Japan	5-200001	8/1993	Japan .
	5-200004	8/1993	Japan .
	6-142082	5/1994	Japan .
[21] Appl. No.: 09/068,755	6-22325	6/1994	Japan .
[22] PCT Filed: Sep. 4, 1997	7-88092	4/1995	Japan .
[86] PCT No.: PCT/JP97/03108	60-109633	7/1995	Japan .
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§ 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.<sup>7</sup> ..... A61B 5/04

[52] U.S. Cl. .... 600/513; 600/484

[58] Field of Search ..... 600/483, 484, 600/513

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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

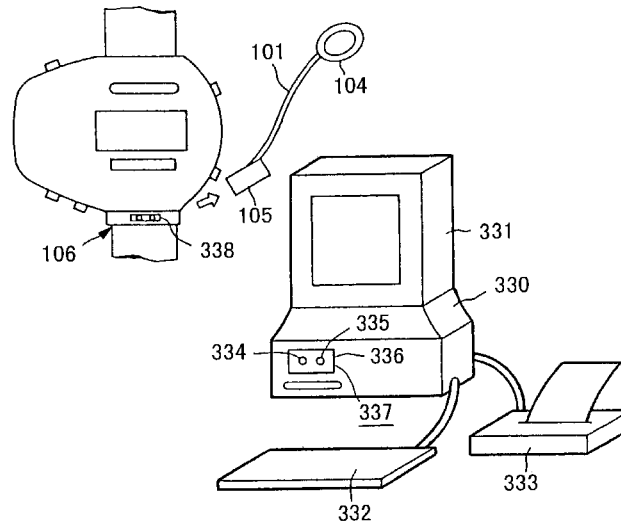


FIG. 1

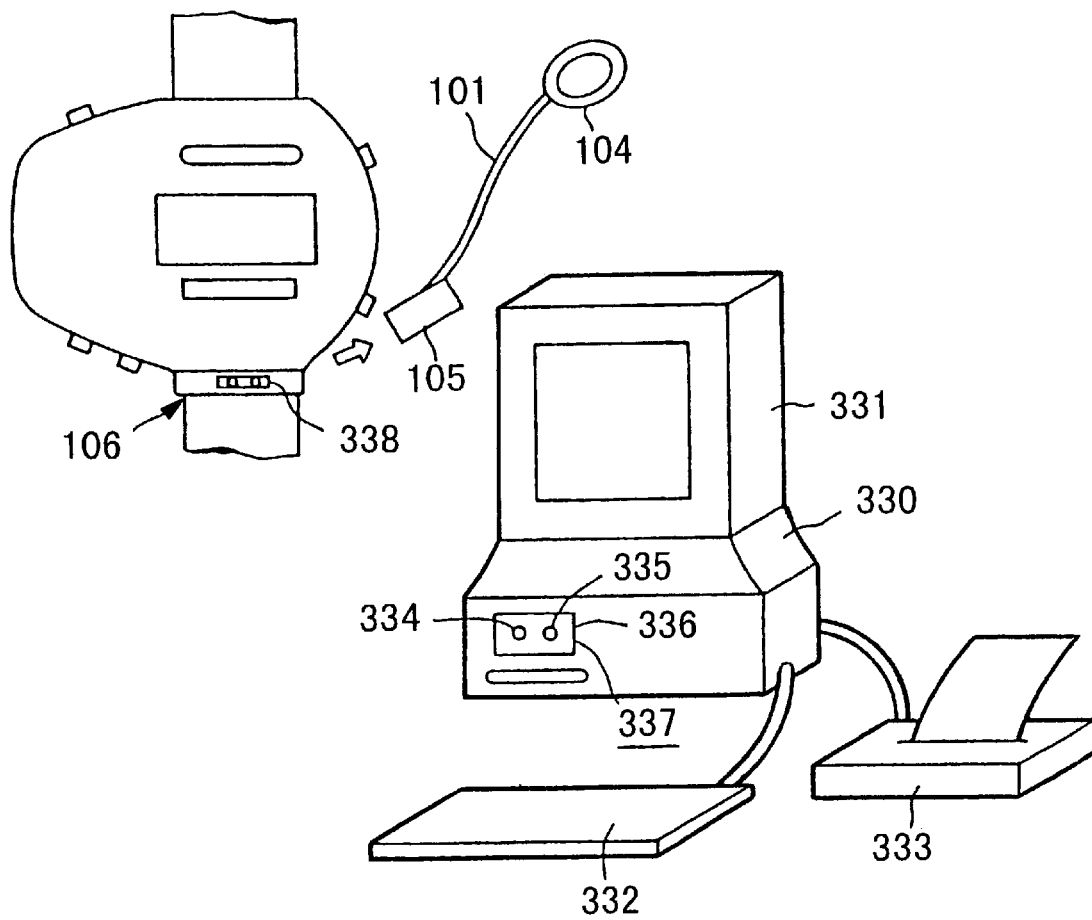


FIG. 2

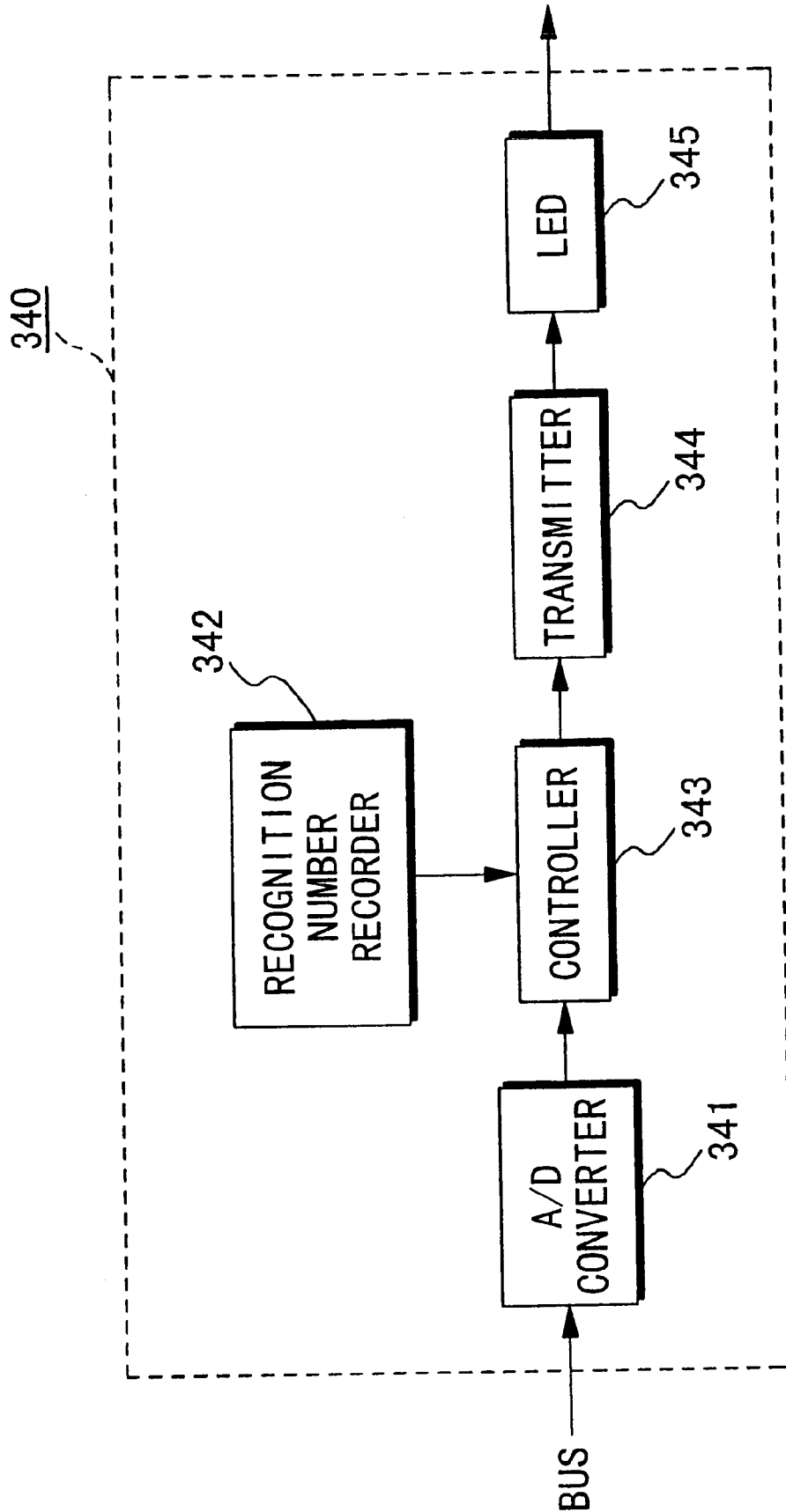


FIG. 3

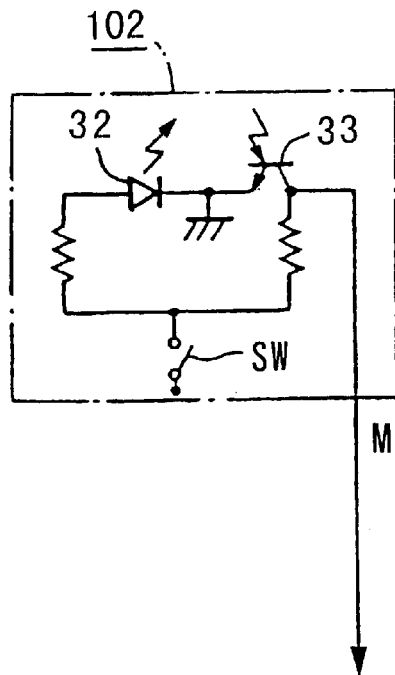
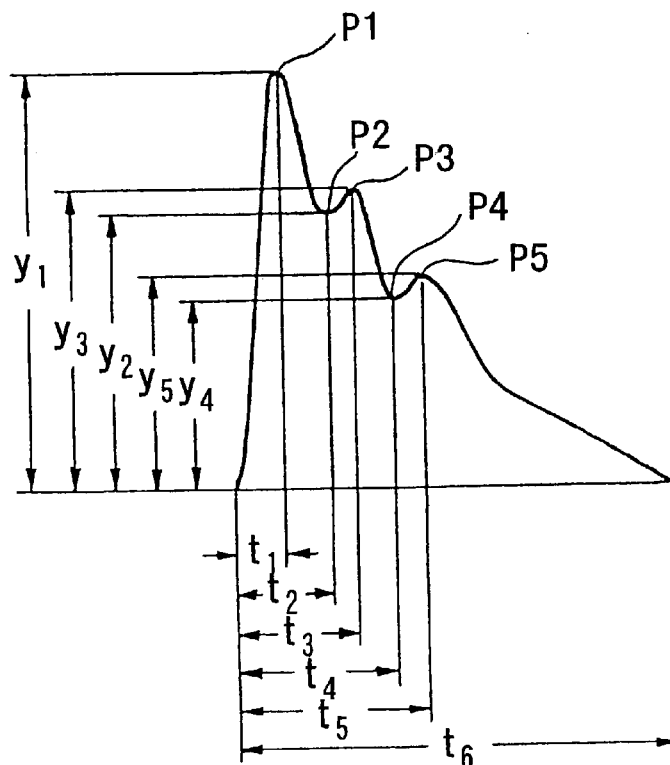


FIG. 4



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