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Amano et al.

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(54) **EXERCISE WORKOUT SUPPORT DEVICE**

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( * ) Notice: This patent issued on a continued prosecution application filed under 37 CFR 1.53(d), and is subject to the twenty year patent term provisions of 35 U.S.C. 154(a)(2).

Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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(51) **Int. Cl.**$^7$ ...................................................... **A61B 5/00**
(52) **U.S. Cl.** ........................... **600/531**; 600/529; 600/503
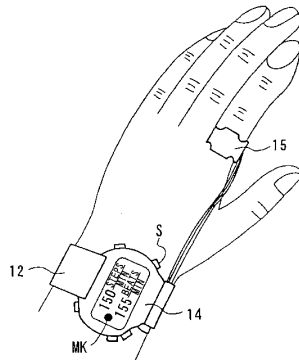(58) **Field of Search** ................................... 600/300–301, 600/481–485, 500–503, 529–538; 128/897–899

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(57)                **ABSTRACT**

A device is provided, which is capable of determining the maximum oxygen uptake quantity without the restriction of a large device or requiring troublesome operations to be carried out. The device displays the upper and lower limit values for the pulse rate corresponding to an appropriate exercise intensity, and realizes in a wireless manner by means of optical communications the sending and receiving of information such as pulse wave signals to and from an information processing device which processes pulse wave information. The device is provided with a pulse wave detector **101** for detecting the test subject s pulse waveform; an FFT processor **103** for determining the test subject s heartbeat rate from the pulse waveform; a body motion detector **104** for detecting body motion when the test subject is running; an FFT processor **106** for determining the pitch from body motion during running by the test subject; exercise intensity calculator **108** for determining pitch, the test subject s stride, and the exercise intensity from body motion during running; and a nomogram recorder **109** for recording the relationship indicated by an Astrand-Ryhming nomogram, and determining the maximum oxygen uptake quantity from the heart rate and exercise intensity. The obtained maximum oxygen uptake quantity is divided by the test subject s body weight, to calculate the maximum oxygen uptake quantity per unit body weight. Next, the maximum oxygen uptake quantity and pulse according to sex are determined, and the pulse rate is multiplied by the upper and lower limit value coefficients, to determine the upper limit value UL and the lower limit value LL for the pulse rate.

**15 Claims, 47 Drawing Sheets**

FIG. 1

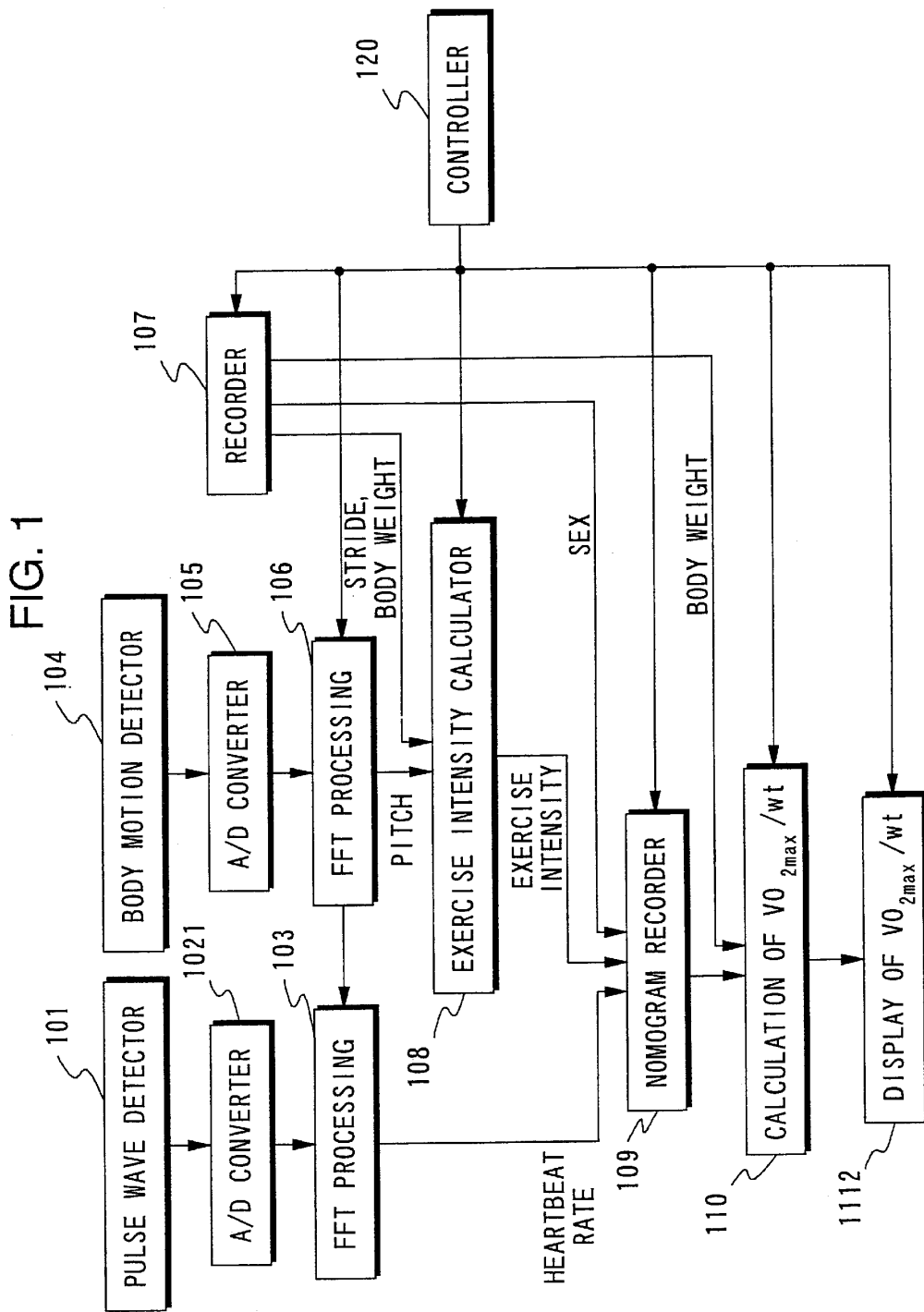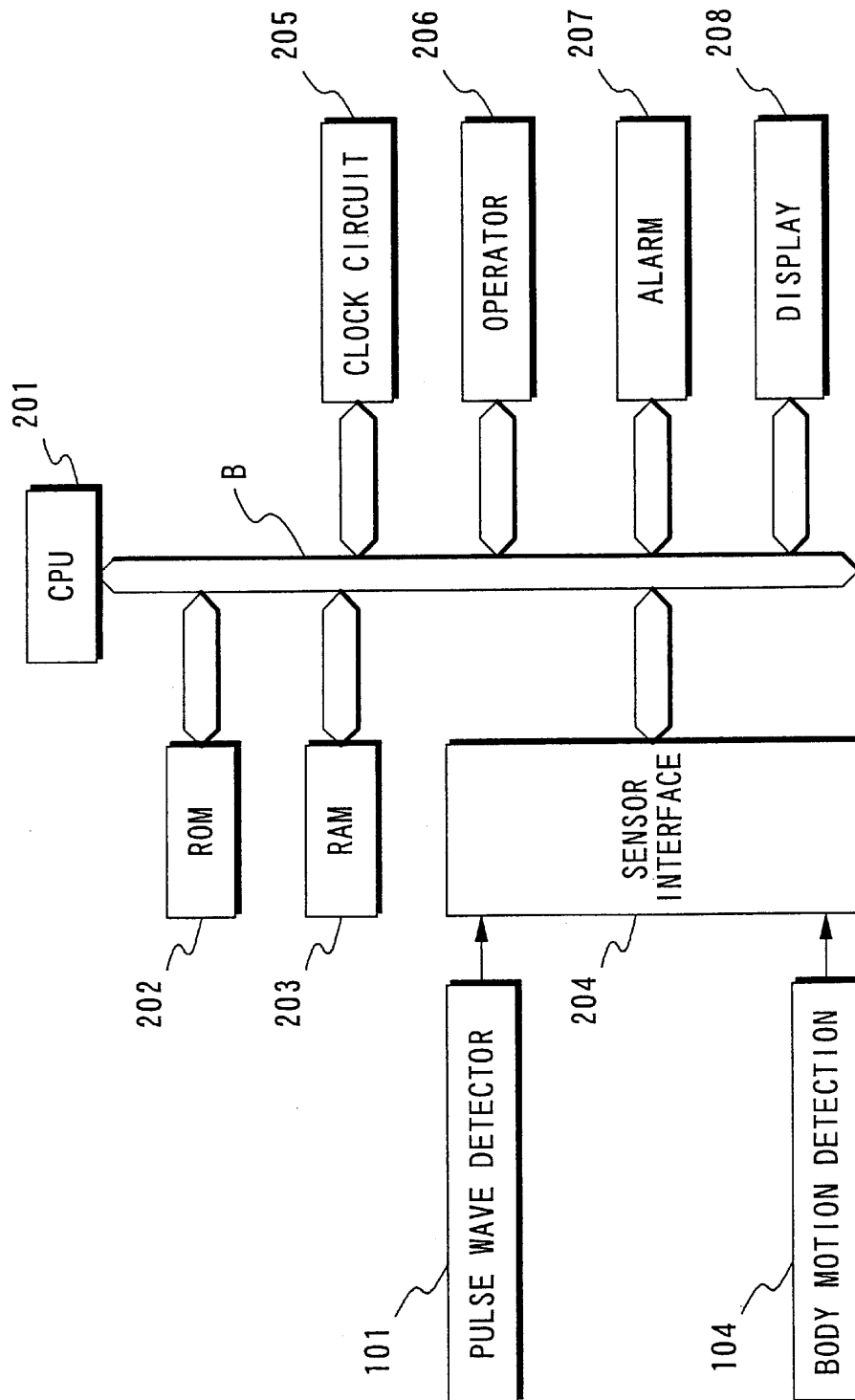FIG. 2

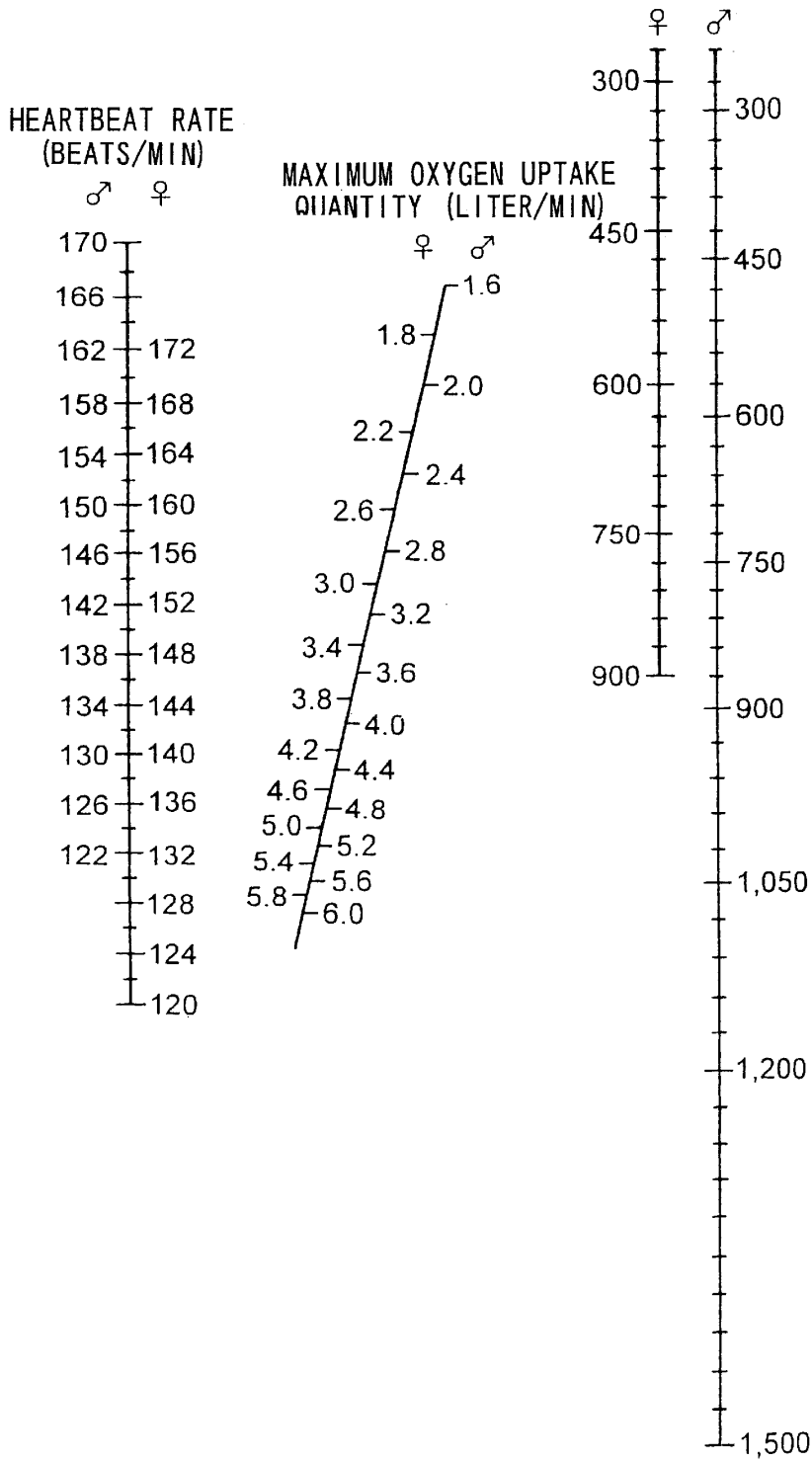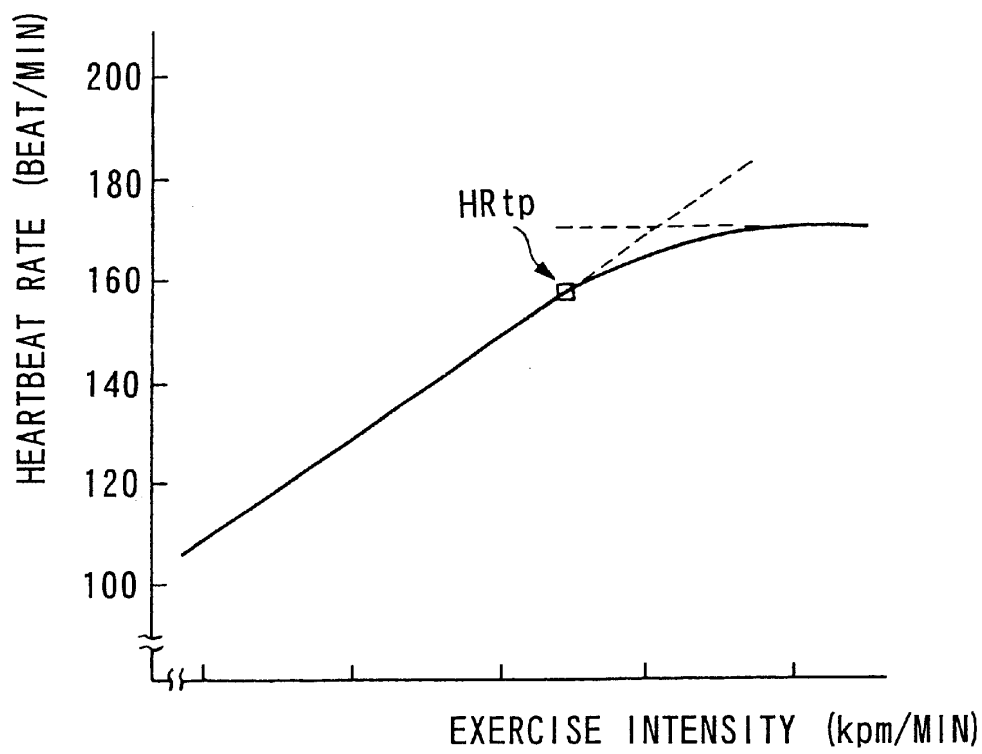FIG. 3   EXERCISE INTENSITY (kpm/MIN)

# FIG. 4

# DOCKET ALARM

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