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Park et al.

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(54) **PORTABLE BIOMETRIC MONITORING DEVICES AND METHODS OF OPERATING SAME**

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(51) **Int. Cl.**
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(52) **U.S. Cl.**
CPC **A61B 5/0002** (2013.01); **A61B 5/02416** (2013.01); **A61B 5/02427** (2013.01);
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Primary Examiner — George Bugg

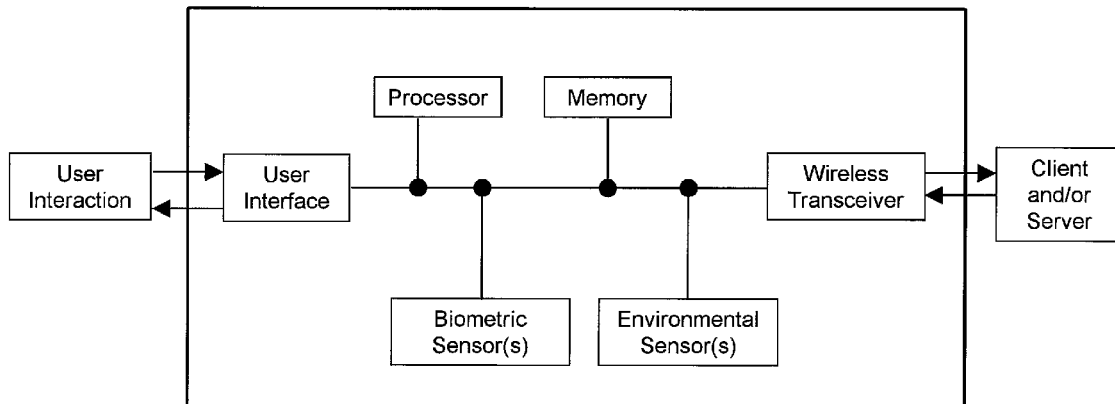
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(57) **ABSTRACT**

The present inventions, in one aspect, are directed to portable biometric monitoring device including a housing having a physical size and shape that is adapted to couple to the user's body, at least one band to secure the monitoring device to the user, a physiological sensor, disposed in the housing, to generate data which is representative of a physiological condition of the user data. The physiological sensor may include a light source to generate and output light having at least a first wavelength, and a photodetector to detect scattered light (e.g., from the user). A light pipe is disposed in the housing and optically coupled to the light source directs/transmits light therefrom along a predetermined path to an outer surface of the housing. Processing circuitry calculates a heart rate of the user using data which is representative of the scattered light.

20 Claims, 30 Drawing Sheets



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 CPC A61B 5/11; A61B 5/1123; A61B 5/4812; A61B 5/681; H04W 4/027; H04W 4/008; H04L 67/12
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 See application file for complete search history.

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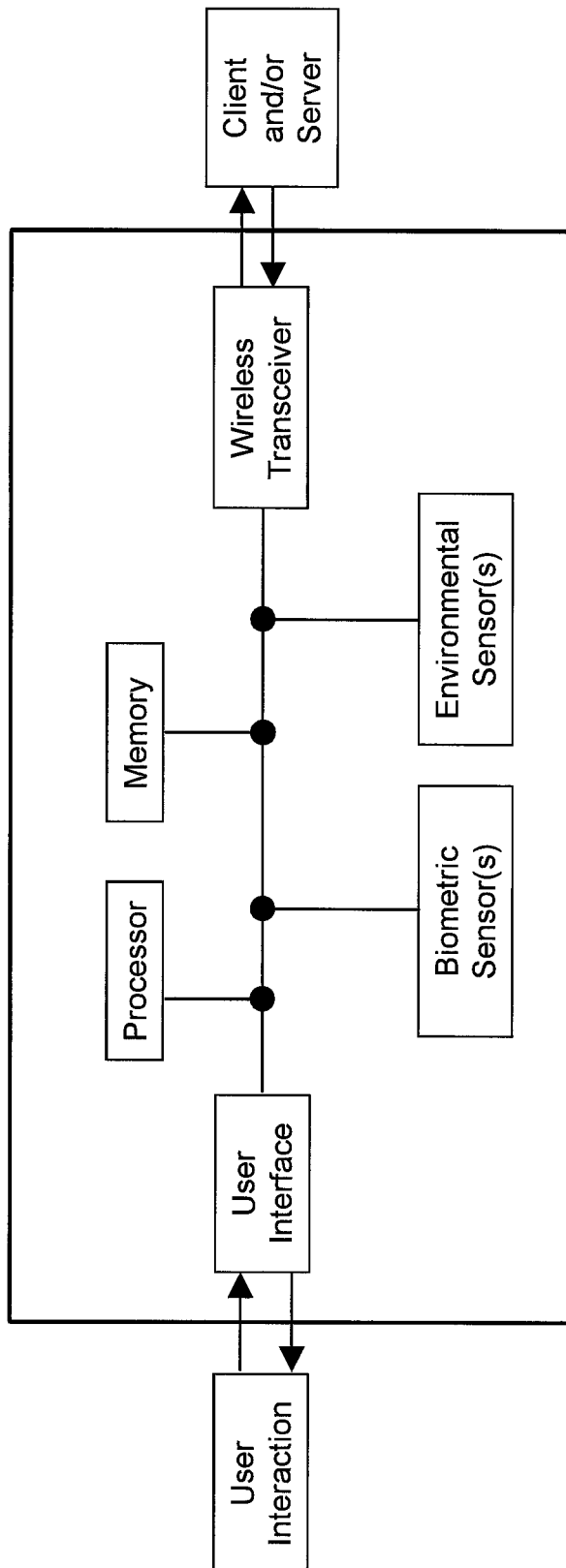


FIG. 1

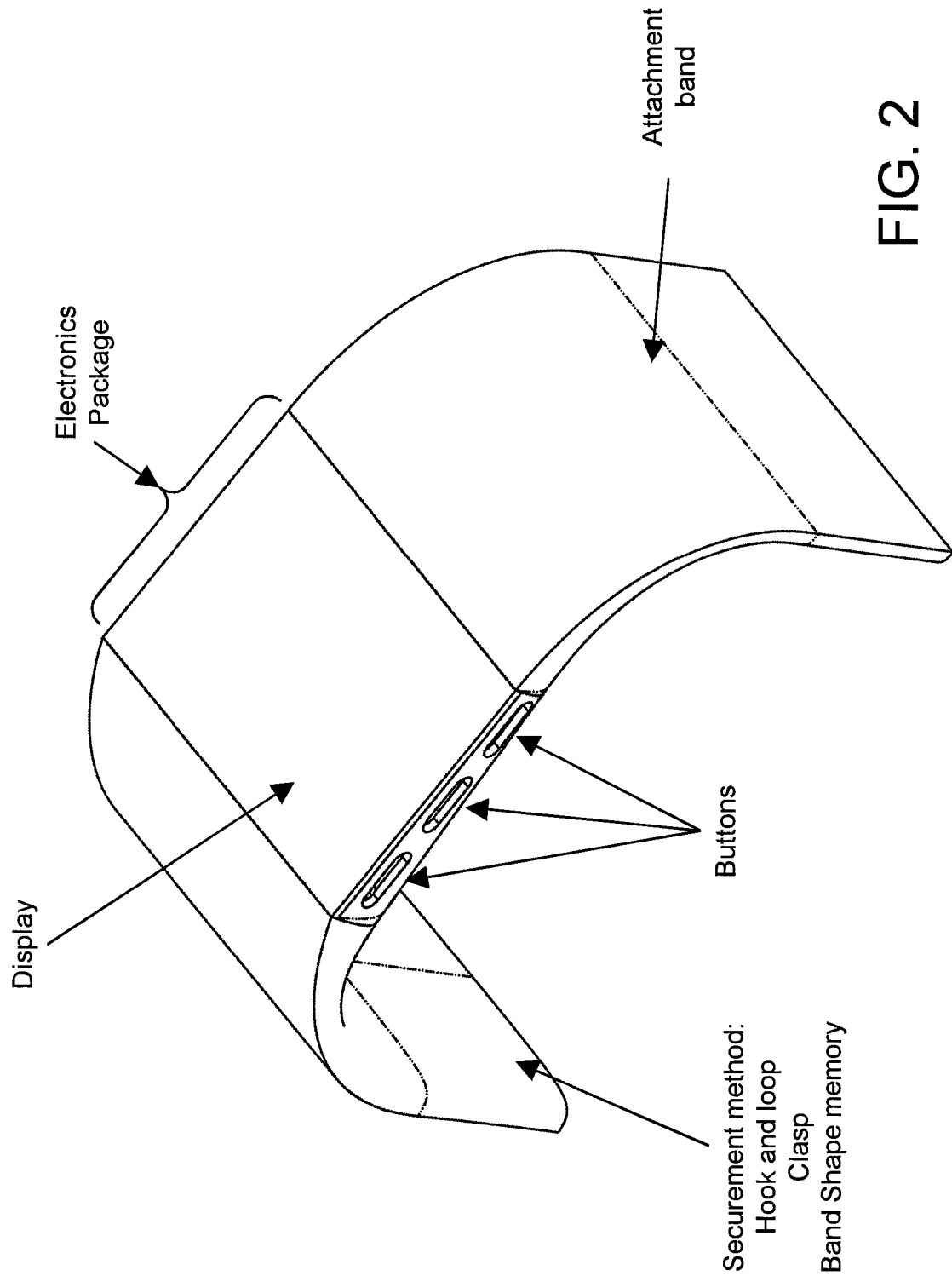


FIG. 2

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