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Eckerle et al.

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[54] PULSE RATE SENSOR SYSTEM

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4,239,048	12/1980	Steuer	128/666
4,307,728	12/1981	Walton	128/687
4,353,372	10/1982	Ayer	128/640
4,409,983	10/1983	Albert	128/690
4,456,959	6/1984	Hirano et al.	364/417
4,646,749	3/1987	Berger et al.	128/678
4,667,680	5/1987	Ellis	128/672
4,712,179	12/1987	Heimer	364/417
4,735,213	4/1988	Shirasaki	128/681
4,799,491	1/1989	Eckerle	128/672
4,802,488	2/1989	Eckerle	128/672
4,836,213	6/1989	Wenzel et al.	128/672

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[21] Appl. No.: **502,028**

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[22] Filed: **Mar. 30, 1990**

[51] Int. Cl.⁵ **A61B 5/02**

[57] ABSTRACT

[52] U.S. Cl. **128/690; 128/672**

A pulse rate sensor system is packaged in a wristwatch sized assembly and is worn by the user to provide an accurate determination of pulse rate. A tonometer sensor is provided to detect heartbeat pressure waves produced by a superficial artery. A microcomputer manipulates the unprocessed tonometer sensor element signals using multiple algorithms to determine an accurate pulse rate.

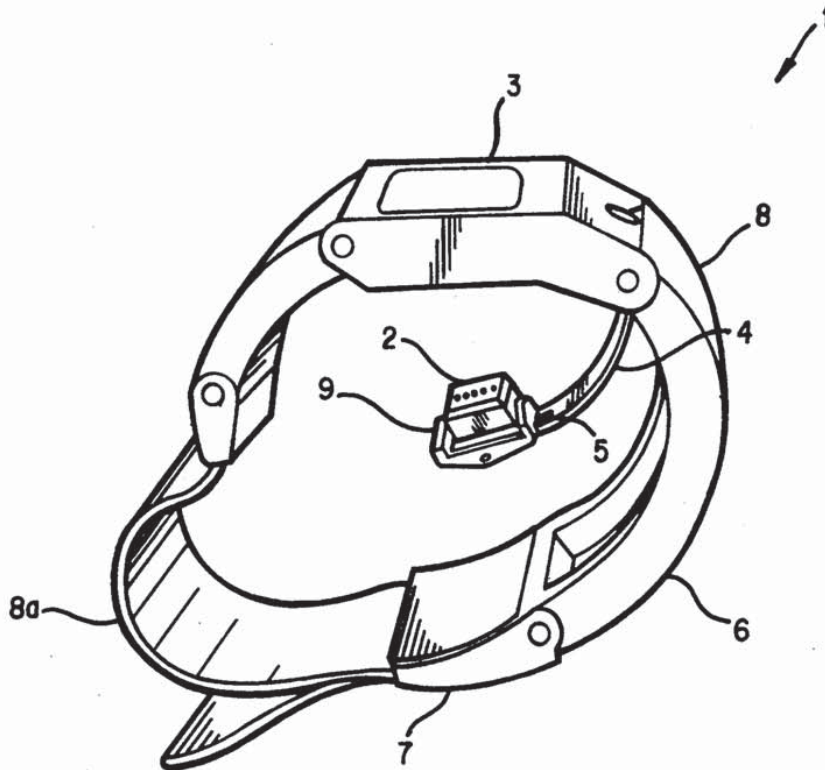
[58] Field of Search 128/687, 722, 699, 689, 128/677, 681, 683, 690

[56] References Cited

U.S. PATENT DOCUMENTS

3,999,537	12/1976	Noiles	128/687
4,058,118	11/1977	Stupay et al.	128/2.05 T
4,086,916	5/1978	Freeman et al.	128/690
4,181,134	1/1980	Mason et al.	128/689
4,202,350	5/1980	Walton	128/690

36 Claims, 9 Drawing Sheets



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APL1047

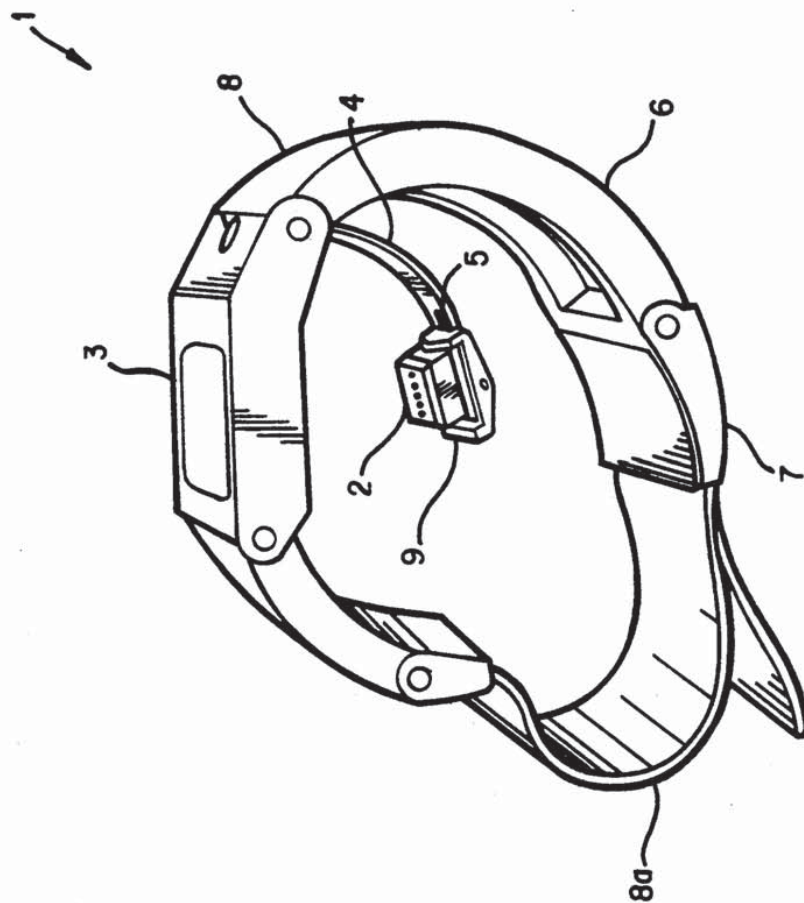


FIG. 1

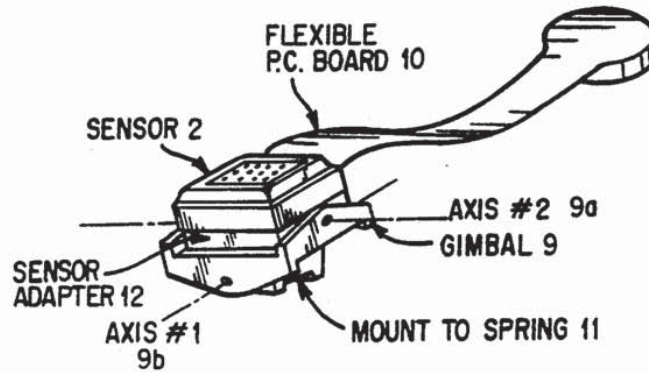
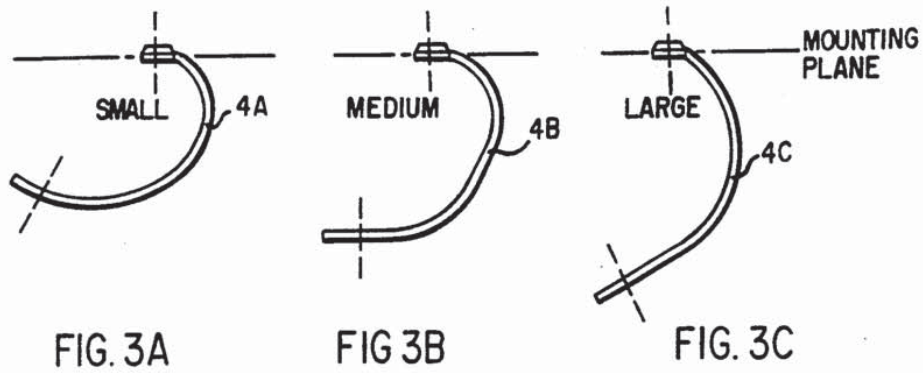


FIG. 2



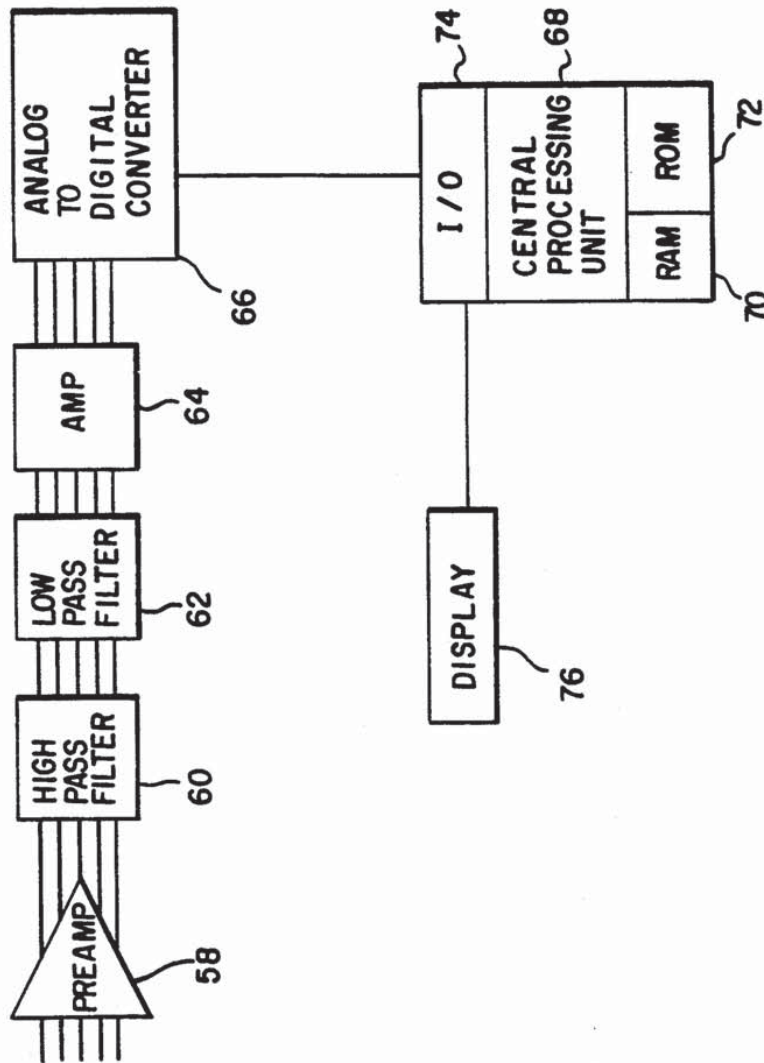


FIG. 4

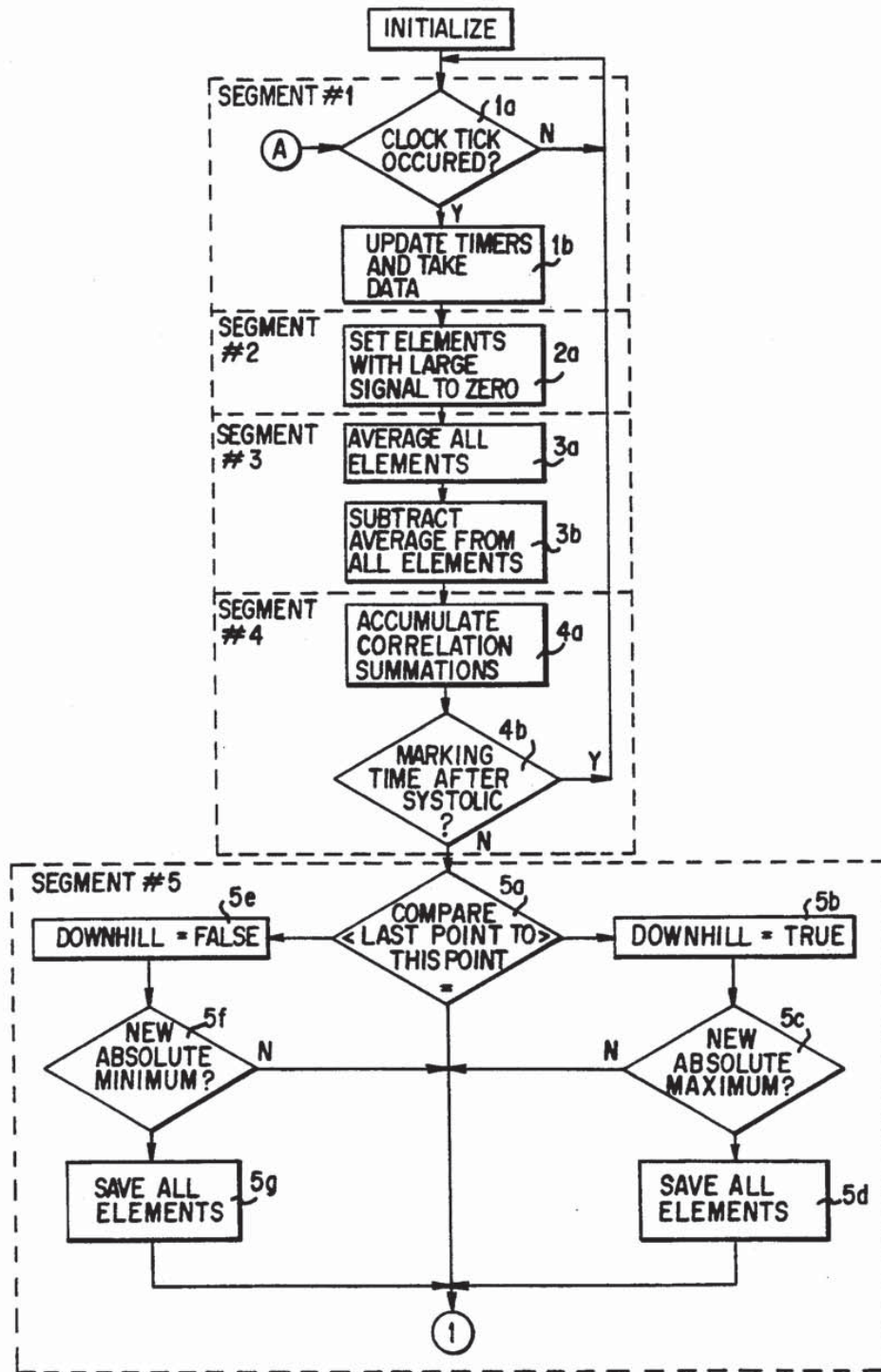


FIG. 5A

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