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# United States Patent [19]

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**Eckerle et al.**

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[54] **PULSE RATE SENSOR SYSTEM**

[75] **Inventors:** Joseph S. Eckerle, Redwood City; Dale W. Ploeger, San Francisco; Steven T. Holmes, Palo Alto; Thomas P. Low, Woodside; Rudolf Elbrecht, Los Altos; Philip R. Jeuck, III, Menlo Park; Ronald E. Pelrine, Menlo Park; Victor T. Newton, Jr., Menlo Park, all of Calif.

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[73] **Assignee:** Colin Electronics Co., Ltd., Aichi, Japan

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

[51] **Int. Cl.<sup>5</sup>** ..... A61B 5/02

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

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

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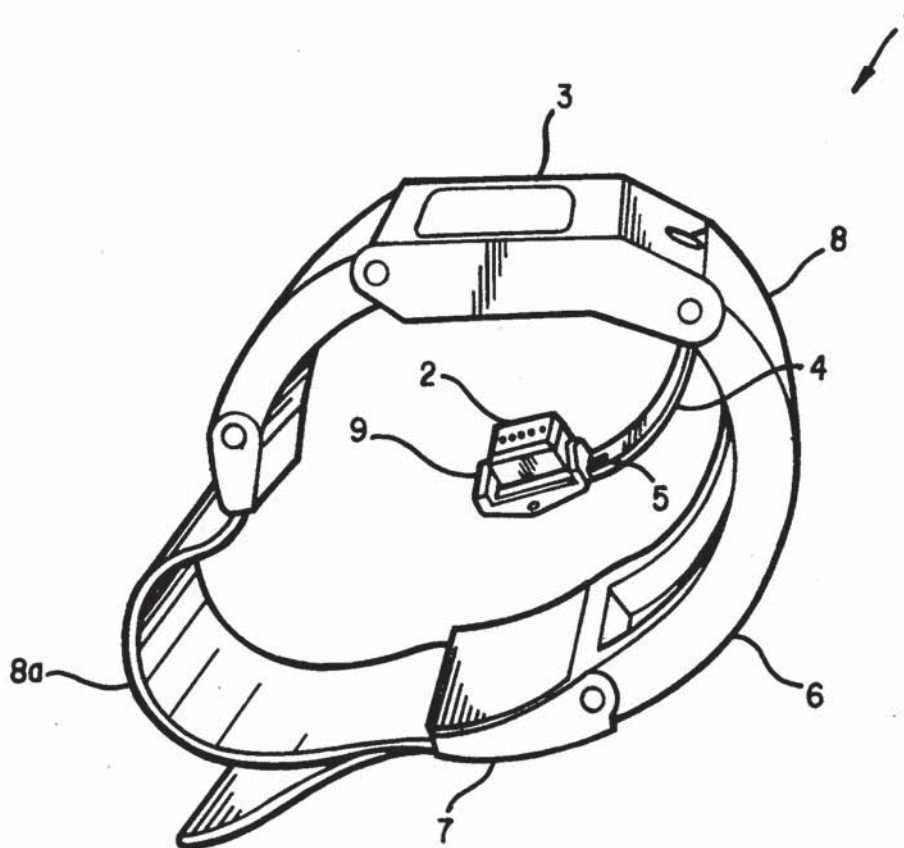
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*Primary Examiner*—Lee S. Cohen  
*Assistant Examiner*—Marianne H. Parker  
*Attorney, Agent, or Firm*—Oliff & Berridge

[57] **ABSTRACT**

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.

**36 Claims, 9 Drawing Sheets**



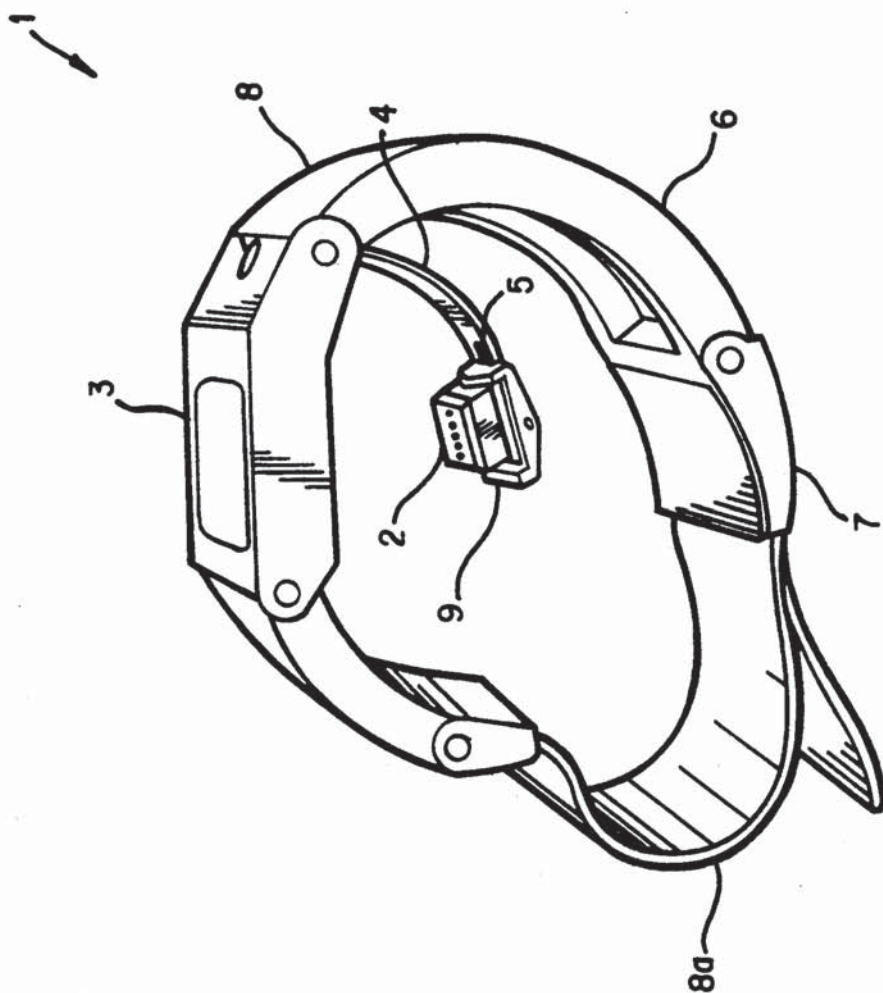


FIG. 1

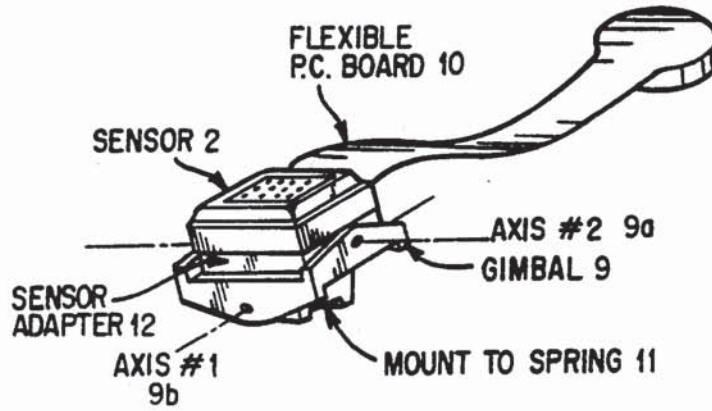


FIG. 2

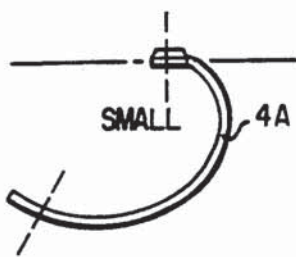


FIG. 3A

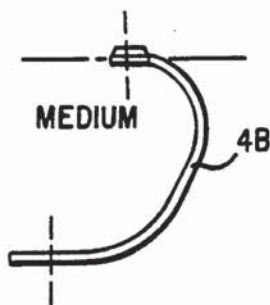


FIG. 3B

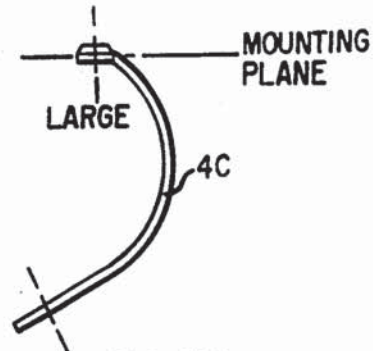


FIG. 3C

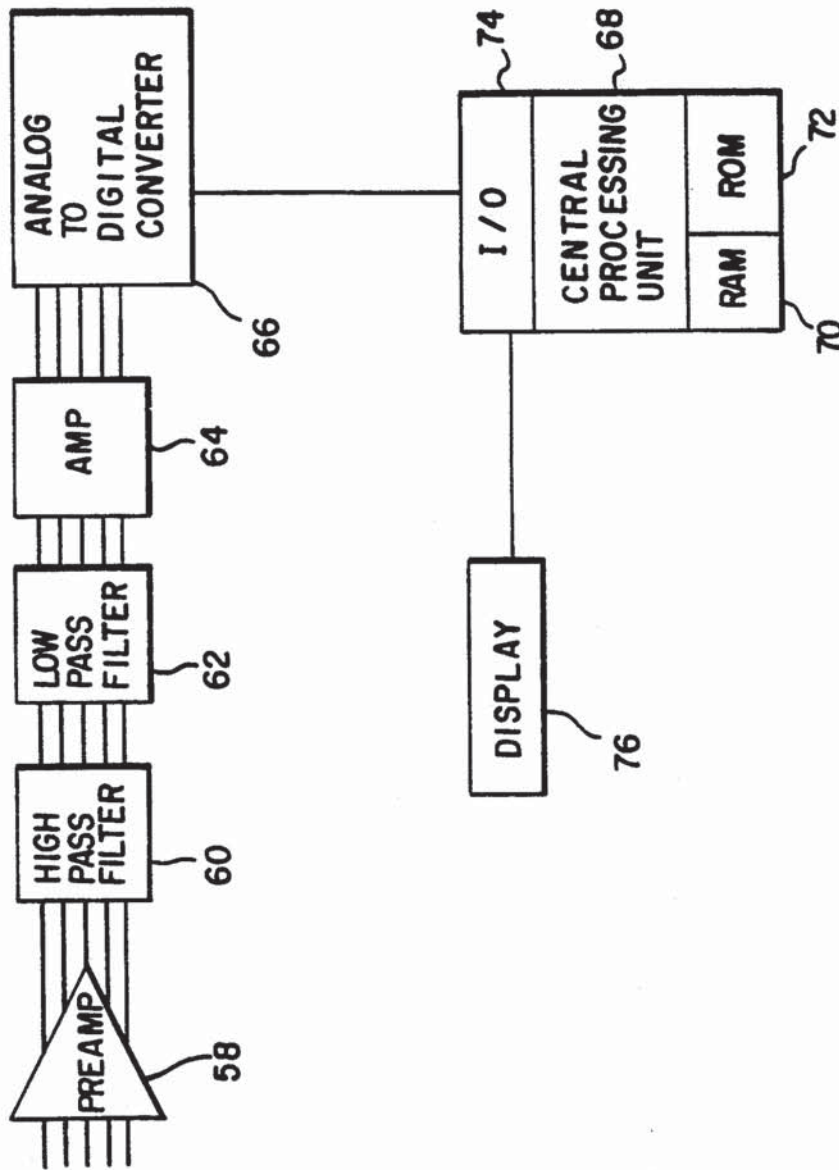


FIG. 4

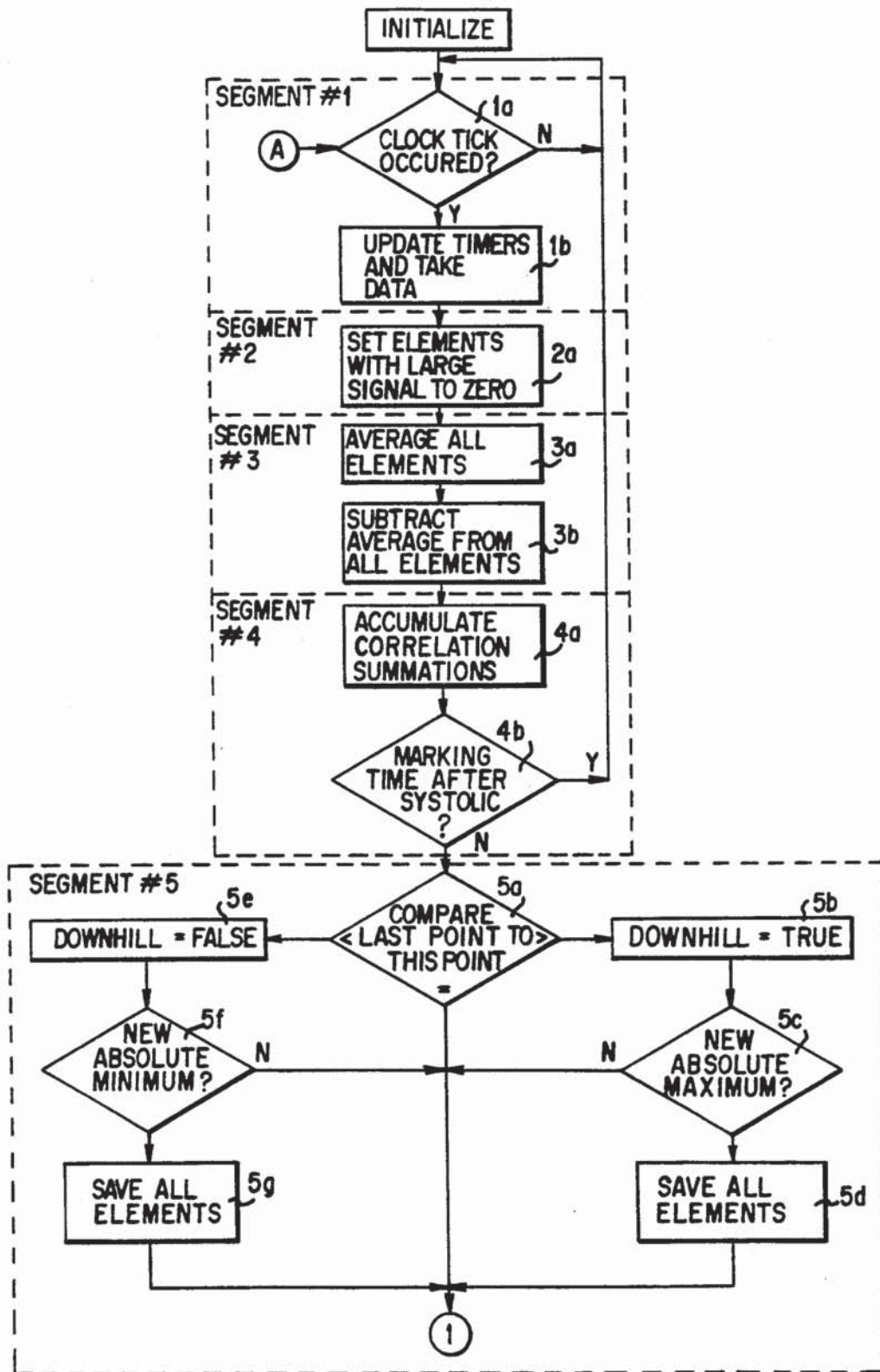


FIG. 5A



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