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United States Patent [19] Mills et al.

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[54] WRIST-WORN ECG MONITOR

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[73] Assignee: **Instromedix, Inc.**, Hillsboro, Oreg.

[21] Appl. No.: **2,161**

[22] Filed: **Jan. 7, 1993**

Related U.S. Application Data

[62] Division of Ser. No. 816,389, Dec. 26, 1991, Pat. No. 5,289,824.

[51] Int. Cl.⁵ **A61B 5/0402**

[52] U.S. Cl. **128/696; 128/904**

[58] Field of Search 128/696, 670, 710, 903, 128/904, 690

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[57] ABSTRACT

A compact, lightweight wrist-worn cardiac data and event monitor having dry skin electrodes integral with the monitor's housing is disclosed. Preferably, the skin electrodes are made of titanium nitride-plated stainless steel and form inner, wrist-contacting, and outer, other hand's palm-contactable regions of the housing. Chronometric and other multiple functions are provided to increase the functional density of the monitor by partitioning and very-large-scale-integrating the circuitry, which includes signal detection; data conversion, storage, display and telecommunication; and external push-button controls operable by the patient's other hand. In accordance with the preferred embodiment, a telephonic transmitter is integrally included within the housing for remote diagnostic purposes without the need for external connections. By a preferred method of the invention, a simplified digital filter implemented in firmware ensures that only ECG and event data are recorded at the exclusion of noise and motion artifacts. By another preferred method of the invention, a battery life prediction method is used to extend the useful life of the battery and to indicate to the patient when the battery should be replaced. Event data that may be recorded and tele-transmitted along with the ECG data include time-of-day or elapsed time markers, as well as markers or indications of the detection of any pulses produced, for example, by an implanted pacemaker or an implanted cardio-verter/defibrillator monitor (ICDM).

3 Claims, 6 Drawing Sheets

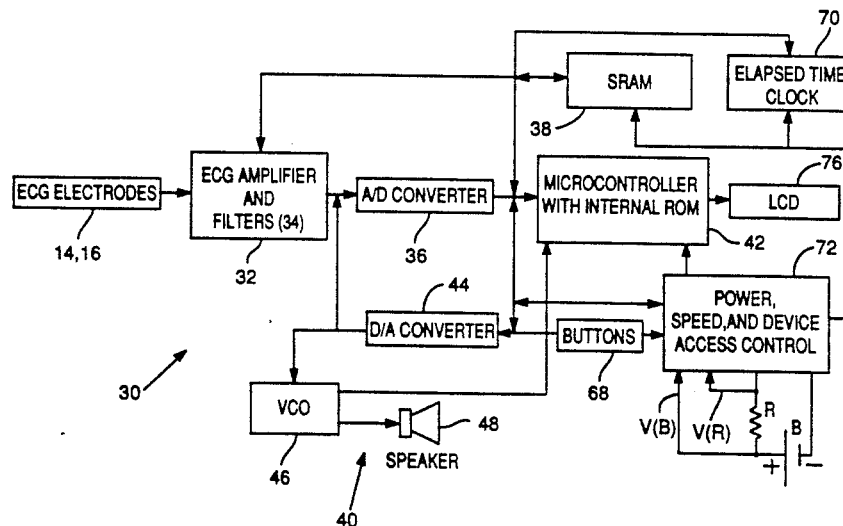


FIG. 1

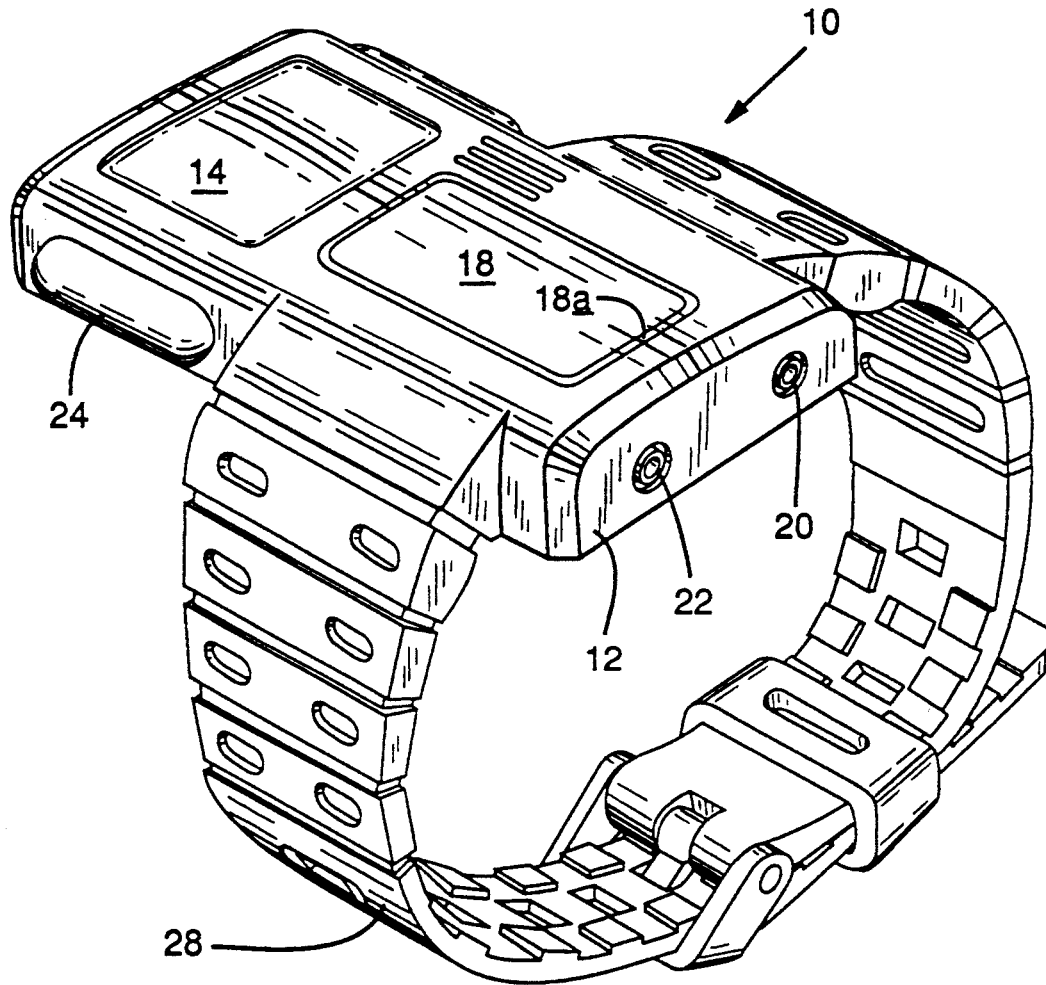


FIG. 3B

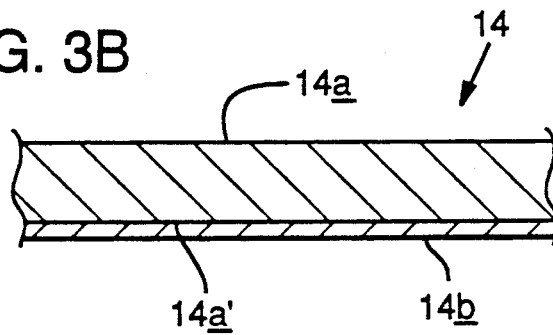
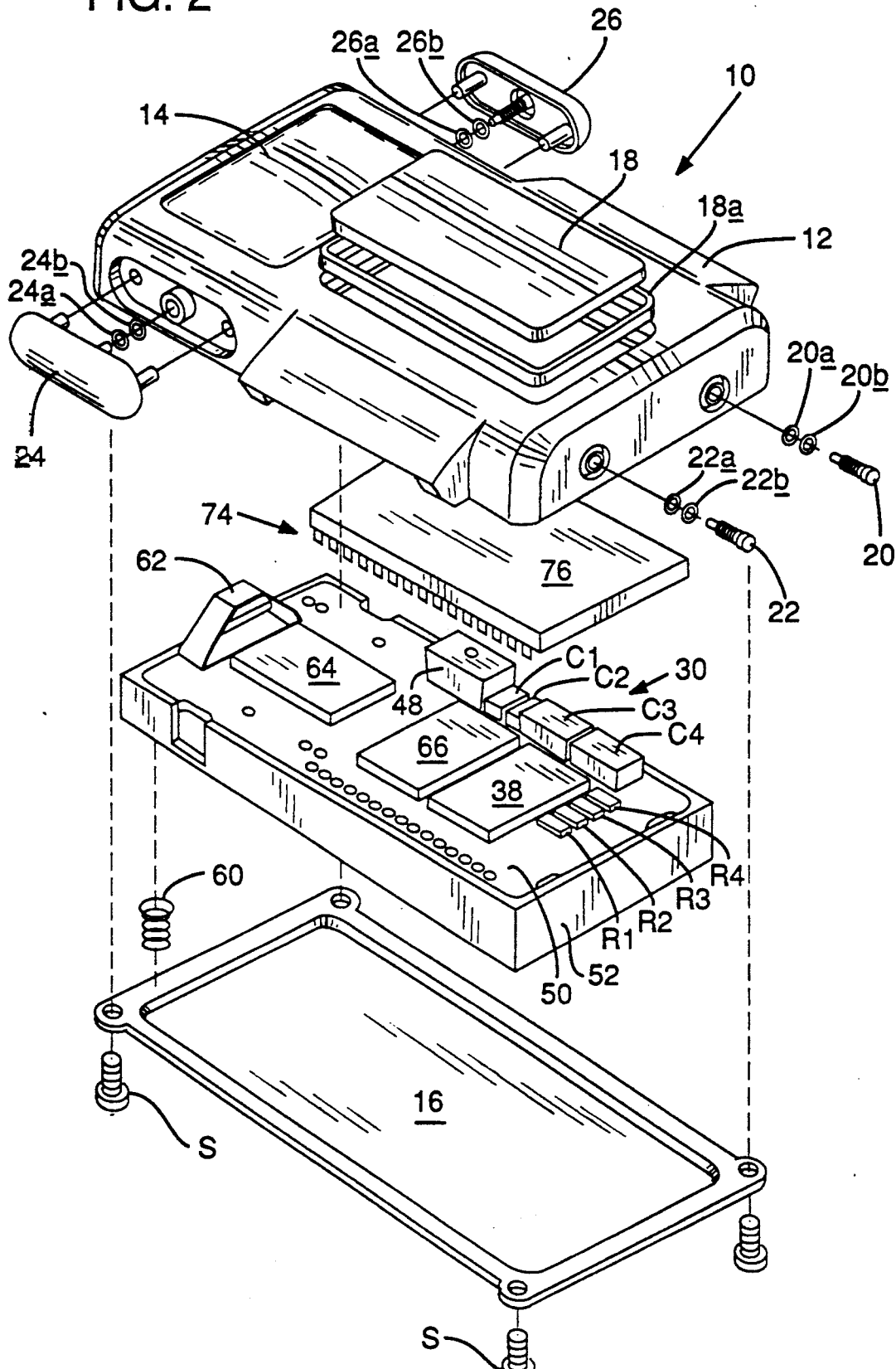
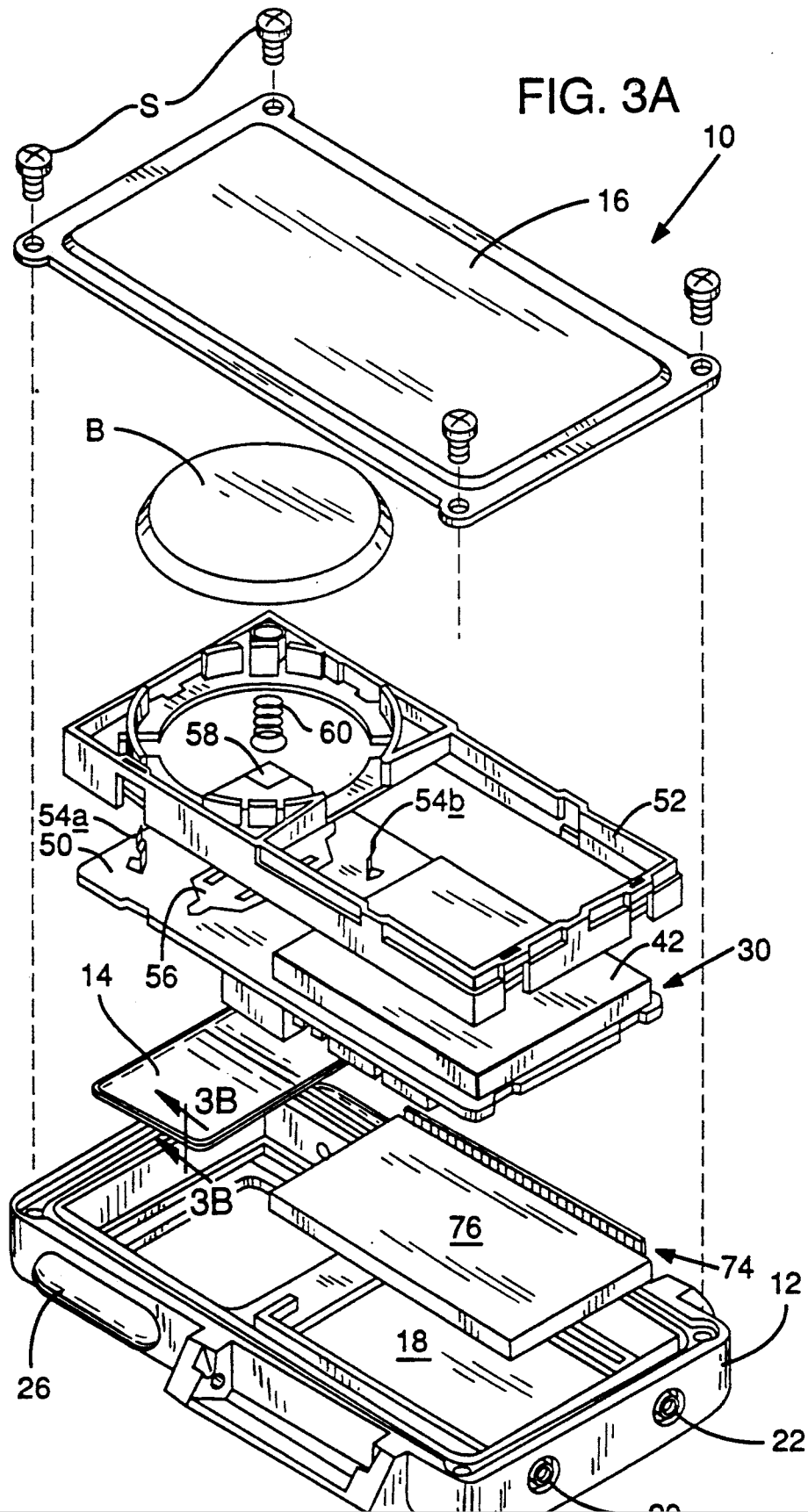


FIG. 2





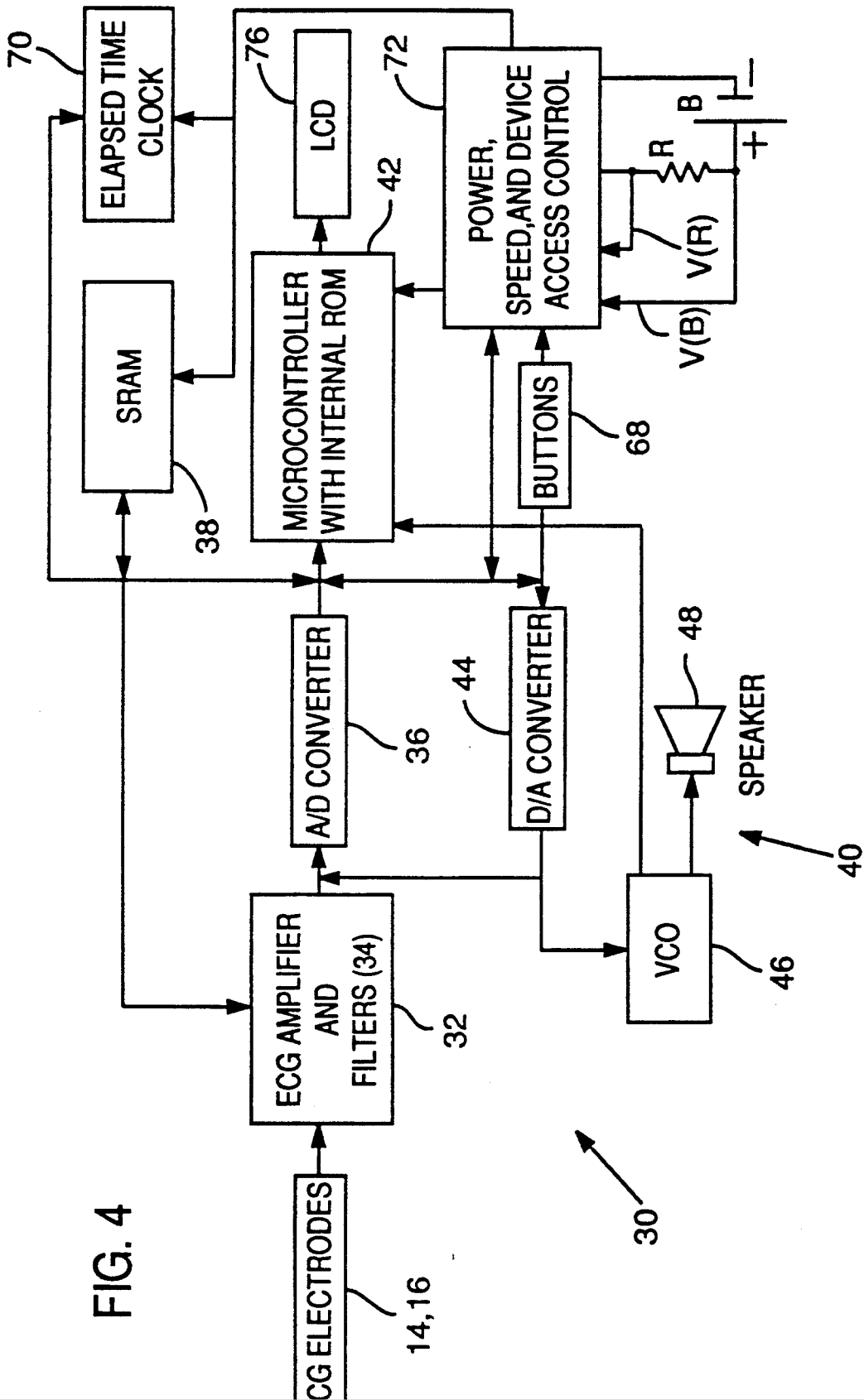


FIG. 4

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