



US006527729B1

(12) **United States Patent**
Turcott

(10) **Patent No.:** **US 6,527,729 B1**
(45) **Date of Patent:** **Mar. 4, 2003**

(54) **METHOD FOR MONITORING PATIENT USING ACOUSTIC SENSOR**

(75) Inventor: **Robert Turcott**, Mountain View, CA (US)

(73) Assignee: **Pacesetter, Inc.**, Sunnyvale, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 129 days.

4,446,873 A	*	5/1984	Groch et al.	600/528
4,763,646 A		8/1988	Lekholm	128/419 PG
4,905,706 A	*	3/1990	Duff et al.	600/514
4,989,611 A	*	2/1991	Zanetti et al.	600/508
5,042,497 A		8/1991	Shapland	128/696
5,168,869 A		12/1992	Chirife	128/419 PG
5,404,877 A		4/1995	Nolan et al.	128/671
5,554,177 A		9/1996	Kieval et al.	607/17
5,862,805 A		1/1999	Nitzan	128/898
5,935,081 A		8/1999	Kadhiresan	600/513

(21) Appl. No.: **09/689,270**

(22) Filed: **Oct. 11, 2000**

* cited by examiner

Related U.S. Application Data

(63) Continuation-in-part of application No. 09/543,394, filed on Apr. 5, 2000, which is a continuation-in-part of application No. 09/467,298, filed on Dec. 17, 1999, which is a continuation-in-part of application No. 09/438,017, filed on Nov. 10, 1999, now Pat. No. 6,409,675.

(51) **Int. Cl.**⁷ **A61B 5/04**

(52) **U.S. Cl.** **600/528**

(58) **Field of Search** 600/508, 514, 600/528

Primary Examiner—Carl Layno

(74) *Attorney, Agent, or Firm*—Steven M. Mitchell

(57) **ABSTRACT**

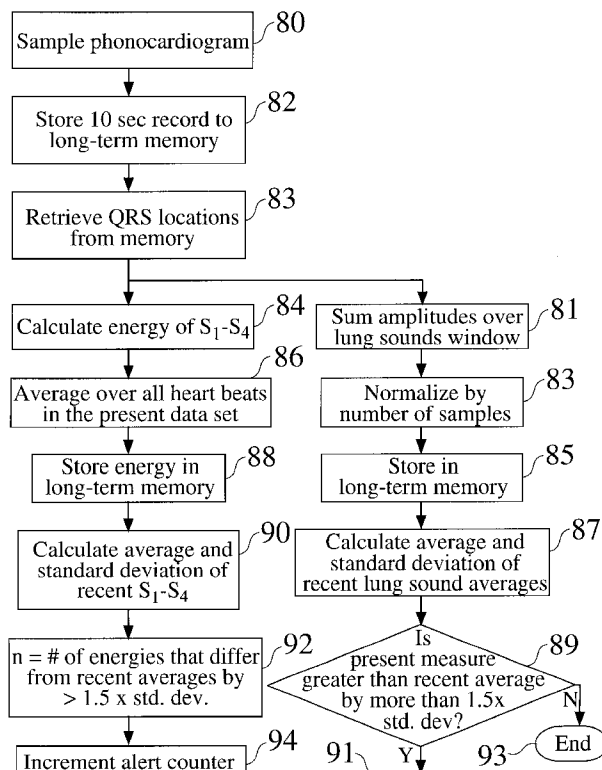
A method for monitoring the progression of the disease of a heart failure patient is provided. An implantable or other ambulatory monitor senses acoustic signals including heart and lung sounds within the patient. Significant changes in the energy content of either the heart or lung sounds is indicative of a heart failure exacerbation. This information may be used to warn the patient or healthcare providers of changes in the patient's condition warranting attention.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,985,121 A 10/1976 Hellenbrand 128/2 K

42 Claims, 21 Drawing Sheets



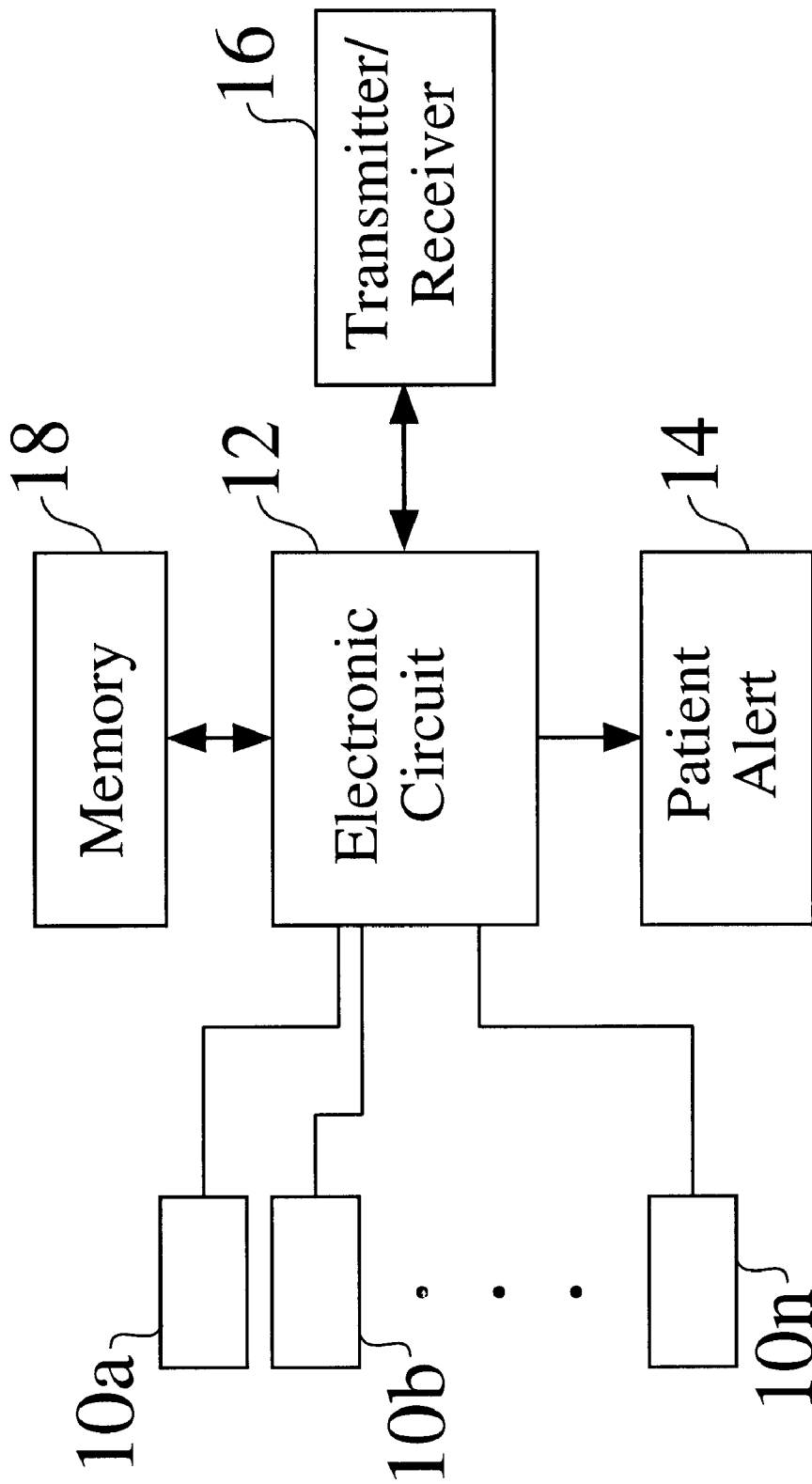


Fig. 1

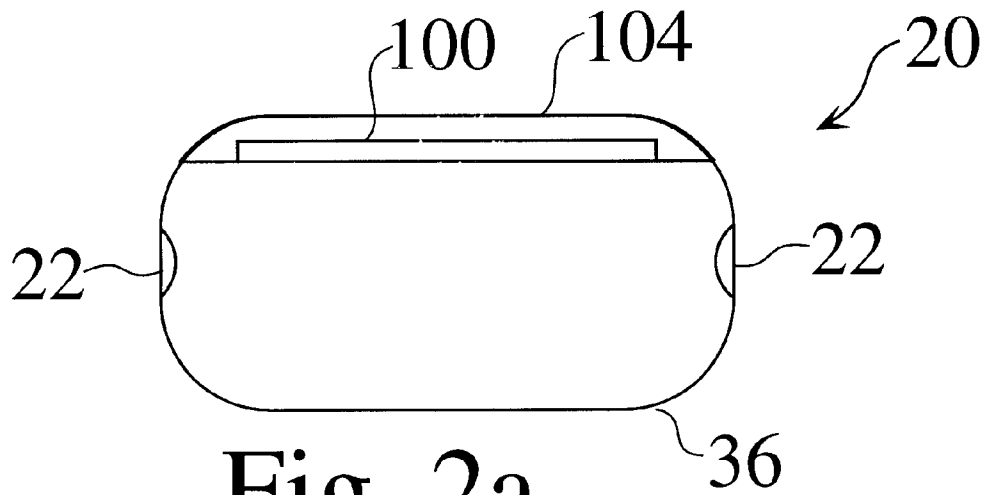


Fig. 2a

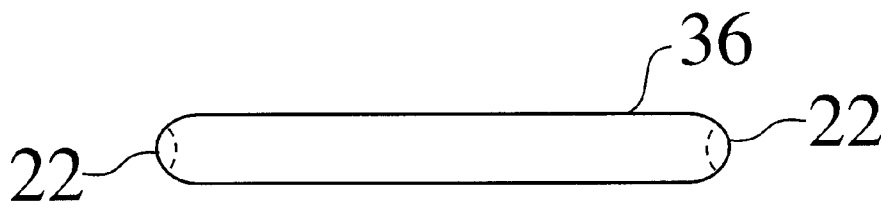


Fig. 2b

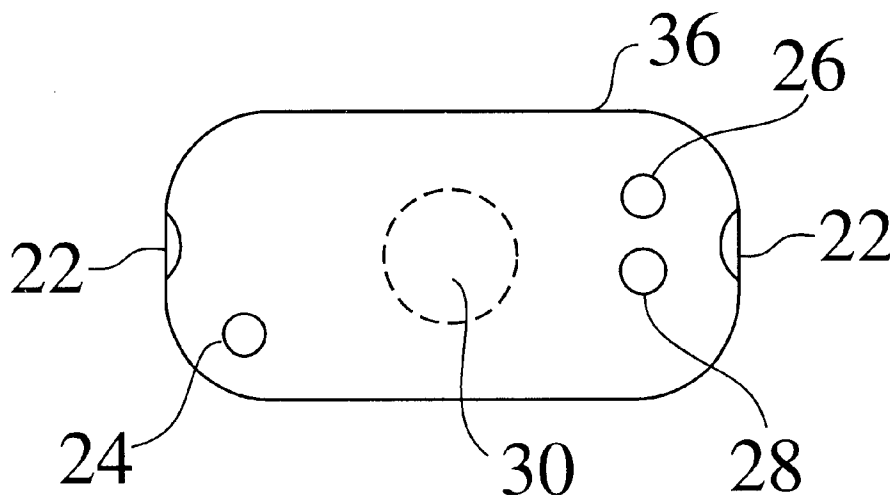
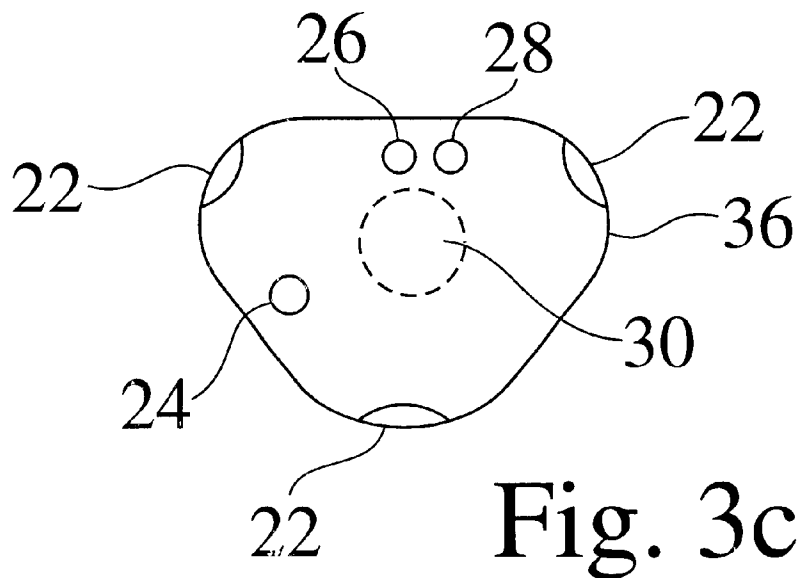
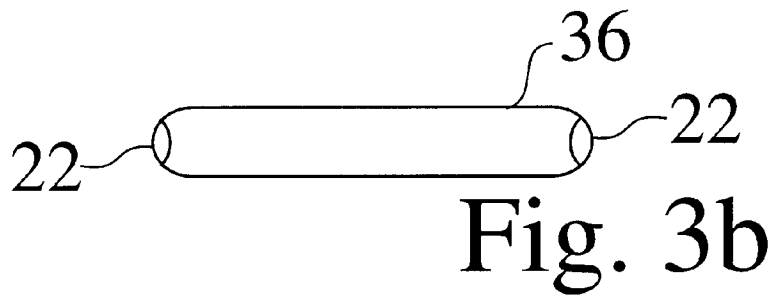
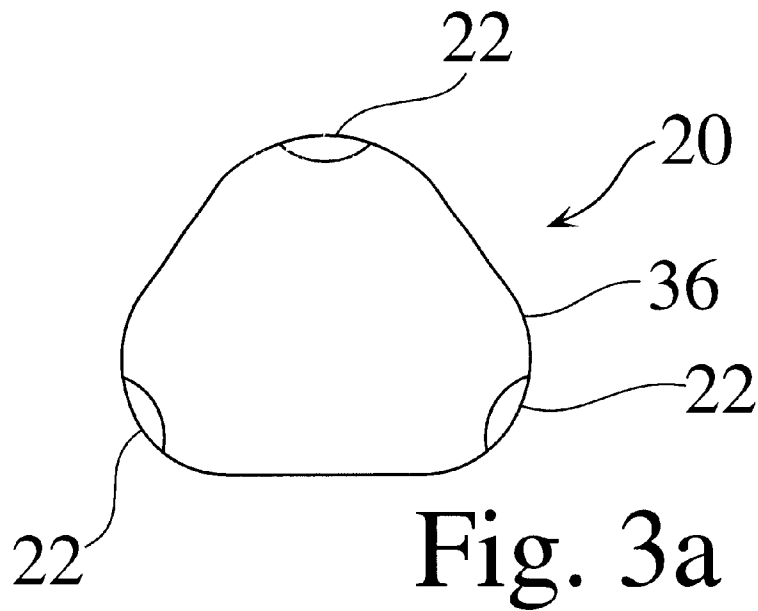


Fig. 2c



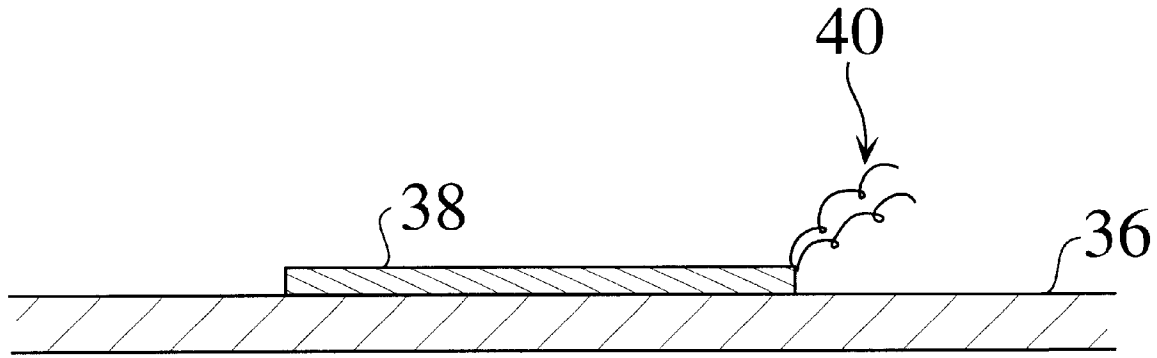


Fig. 4a

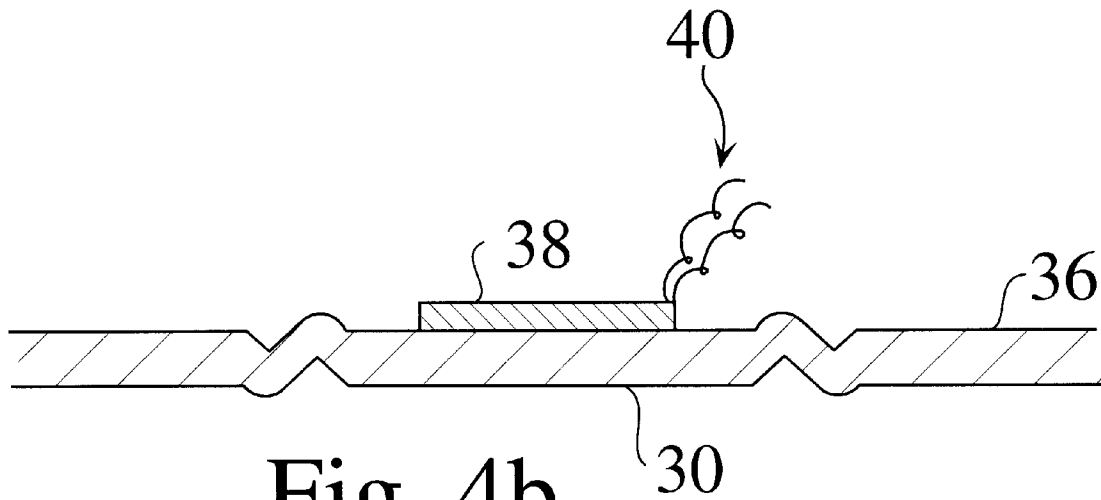


Fig. 4b

Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.