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United States Patent [19]

Raymond et al.

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[54] **HEALTH MONITORING SYSTEM**

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[51] Int. Cl.^{6} **A61B 5/0402**
[52] U.S. Cl. **128/700**; 128/710
[58] Field of Search 128/696, 710, 128/700; 364/413.06, 413.03

[56] **References Cited**

U.S. PATENT DOCUMENTS

D. 247,251	2/1978	Napoli	D24/17
4,262,632	4/1981	Hanton et al.	119/1
4,353,375	10/1982	Colburn et al.	128/782
4,367,752	1/1983	Jimenez et al.	
4,543,955	10/1985	Schroeppel	128/635
4,566,461	1/1986	Lubell et al.	128/668
4,592,018	5/1986	Wiegman	365/63
4,686,624	8/1987	Blum et al.	364/415
4,803,625	2/1989	Fu et al.	364/413
4,844,076	7/1989	Lesho et al.	128/736
4,883,063	11/1989	Bernard et al.	128/670
4,909,260	3/1990	Salem et al.	128/721
4,966,154	10/1990	Cooper et al.	
4,974,601	12/1990	Tranjan et al.	128/696
4,987,897	1/1991	Funke	128/419
5,002,064	3/1991	Allain et al.	128/710
5,063,937	11/1991	Ezenwa et al.	128/723
5,078,134	1/1992	Heilman et al.	128/421
5,111,818	5/1992	Suzuki et al.	128/644
5,113,859	5/1992	Funke	128/419
5,128,552	7/1992	Fang et al.	307/66
5,131,390	7/1992	Sakaguchi et al.	128/632
5,137,345	8/1992	Waldorf et al.	351/206
5,181,519	1/1993	Bible	128/704
5,197,489	3/1993	Conlan	128/782
5,199,439	4/1993	Zimmerman et al.	128/670

(List continued on next page.)

FOREIGN PATENT DOCUMENTS

0299667	1/1989	European Pat. Off. .
2686497	6/1991	France .
8802237	4/1988	WIPO .
8905116	6/1989	WIPO .
9401040	1/1994	WIPO .
9413198	6/1994	WIPO .
9424929	11/1994	WIPO .

OTHER PUBLICATIONS

G. Wiesspeiner, W Xu, *Multichannel Ambulatory Monitoring of Circulation Related Biosignals*, Institute of Biomedical Engineering, pp. 457–460, 1992.

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[57] **ABSTRACT**

A health monitoring system which tracks the state of health of a patient and compiles a chronological health history of the patient uses a multiparametric monitor which periodically and automatically measures and records a plurality of physiological data from sensors in contact with the patient's body. The data collected is not specifically related to a particular medical condition but, instead, provides the information necessary to derive patterns which are characteristic of healthy patients as well as those who are ill. The data collected is periodically uploaded to a database in which it is stored along with similar health histories for other patients. The monitor is preferably self-contained in a chest strap which is located on the patient's torso, and makes use of a controller which controls sampling of the desired data and storage of the data to a local memory device pending uploading to the database. The more voluminous data collected is reduced and compressed prior to storage in the local memory device. Preferably, much of the monitor circuitry is run intermittently to conserve power. The monitor data is supplemented with subjective data (such as psychological and environmental conditions) collected from the patient using a handheld data input device which runs a program to solicit information from the patient. The subjective data collected is chronologically aligned with the monitor data in the database such that the health history of a patient includes both objective and subjective medical data.

17 Claims, 27 Drawing Sheets

PAIN: LOCATION OF PAIN

□ SELECT AN AREA THAT HURTS
208
204
L
R
○ FRONT ○ REAR
(INTENSITY) OF PAIN AT THIS SITE NOW
NONE
MAX
0
206
10
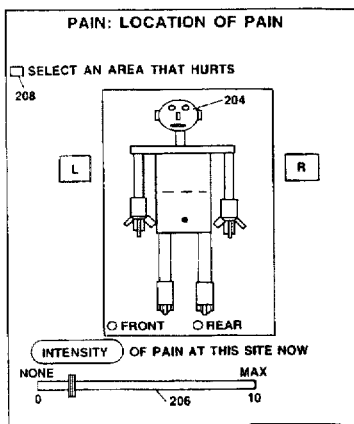
U.S. PATENT DOCUMENTS

|			
5,213,106	5/1993	Lerner	128/696
5,213,555	5/1993	Hood et al.	482/57
5,218,969	6/1993	Bredesen et al.	128/710
5,222,503	6/1993	Ives et al.	128/731
5,226,424	7/1993	Bible	128/696
5,226,539	7/1993	Cheng	206/534
5,228,450	7/1993	Sellers	128/711
5,253,654	10/1993	Thomas et al.	128/779
5,261,441	11/1993	Butterfield et al.	128/672
5,271,405	12/1993	Boyer et al.	128/672
5,275,159	1/1994	Griebel	128/633
5,280,429	1/1994	Withers	364/413
5,289,824	3/1994	Milss et al.	128/696
5,307,263	4/1994	Brown	364/413.09
5,447,164	9/1995	Shaya et al.	128/700
5,454,376	10/1995	Stephens et al.	128/644
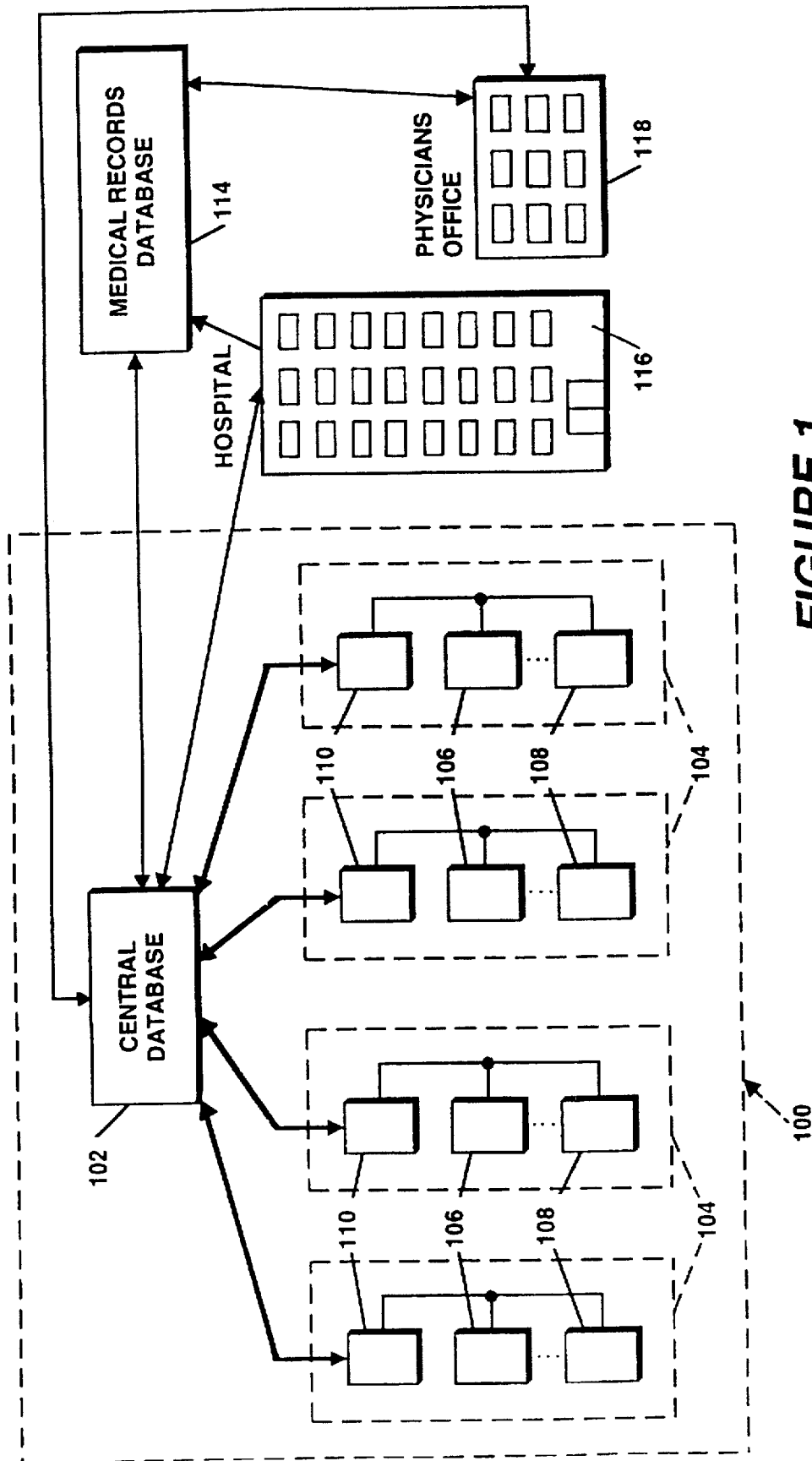
FIGURE 1
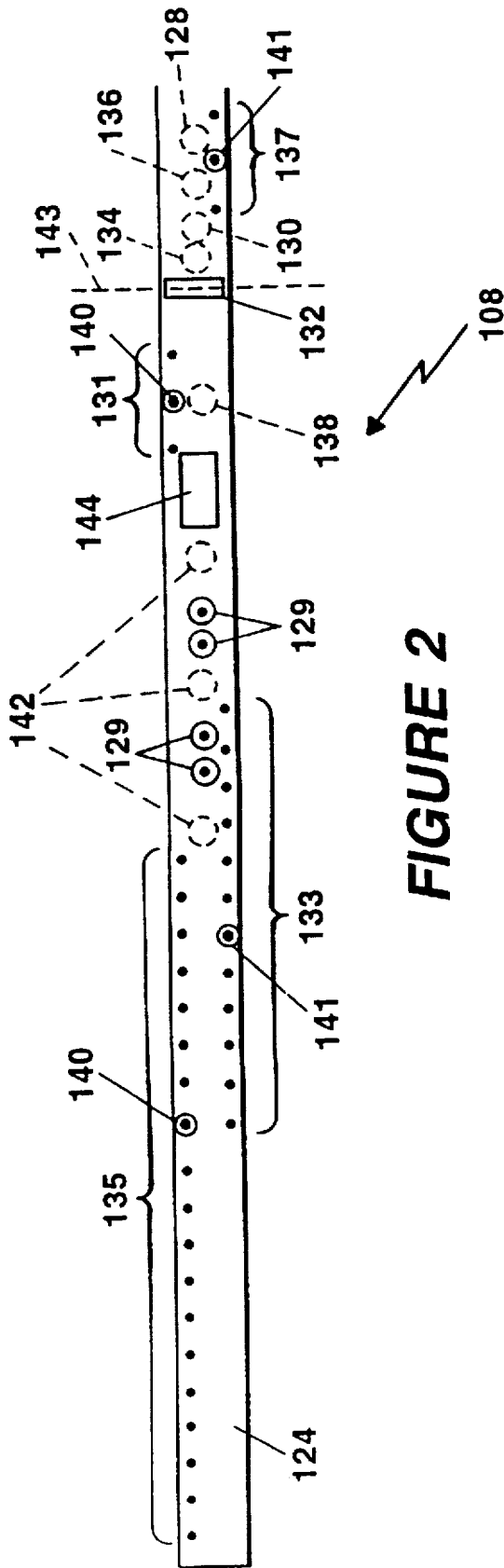
FIGURE 2
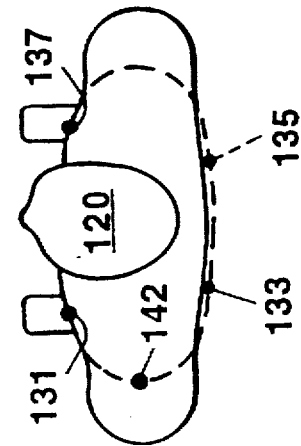
FIGURE 2A
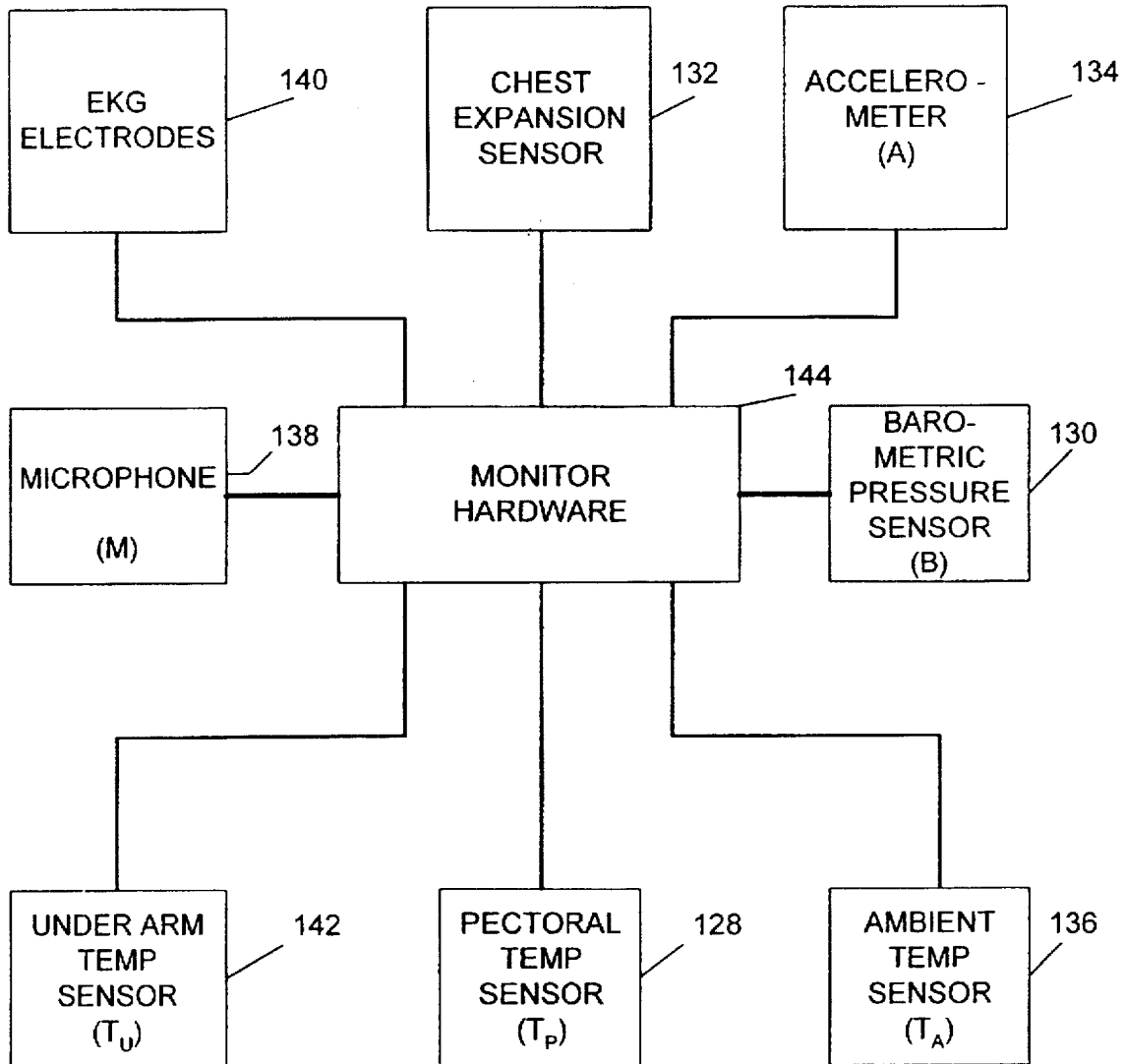
FIGURE 3

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