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United States Patent [19]

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Erickson et al.

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- [54] APPARATUS FOR DISCRIMINATION OF STABLE AND UNSTABLE VENTRICULAR TACHYCARDIA AND FOR TREATMENT THEREOF
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- [73] Assignee: Medtronic, Inc., Minneapolis, Minn.
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- [22] Filed: Mar. 1, 1991
- [51] Int. Cl.⁵ A61N 1/39
- [52] U.S. Cl. 128/419 D
- [58] Field of Search 128/419 D, 419 PG
- [56] **References Cited**

U.S. PATENT DOCUMENTS

- Re. 27,757 3/1987 Mirowski .
- 3,737,579 6/1973 Bolduc .
- 4,114,628 9/1978 Rizk .
- 4,240,442 12/1980 Andresen et al. .
- 4,291,699 9/1981 Geddes et al. .
- 4,375,817 3/1983 Engle et al. .
- 4,384,585 5/1983 Zipes .
- 4,523,595 6/1985 Zibell .
- 4,548,209 10/1985 Wielders et al. .
- 4,577,633 3/1986 Berkovits et al. .
- 4,587,970 5/1986 Holley et al. .
- 4,693,253 9/1987 Adams .
- 4,726,380 2/1988 Vollmann et al. .
- 4,750,495 6/1988 Moore et al. .
- 4,774,950 10/1988 Cohen .
- 4,800,883 1/1989 Winstrom .
- 4,817,634 4/1989 Holleman et al. .
- 4,819,643 4/1989 Menken .
- 4,830,006 5/1989 Haluska et al. .
- 4,880,004 11/1989 Baker, Jr. et al. .
- 4,880,005 11/1989 Pless et al. .
- 4,949,719 8/1990 Pless et al. .
- 4,953,551 9/1990 Mehra et al. .
- 4,967,748 11/1990 Cohen .
- 4,967,749 11/1990 Cohen .

matic and Completely Implanted System", Transactions American Society for Artificial Internal Organs, 16:207 1970, by Schuder et al.

"Automatic Implantable Cardioverter-Defibrillator Structural Characteristics", PACE, vol. 7, Nov.-Dec. 1984, Part II, pp. 1331-1334, by Mower et al.

"Reliable R-Wave Detection from Ambulatory Subjects", by Thakor, Biomed Sci Instrum 14:67-72, 1978.

"Relationship Between Right Atrial and Mixed Venous Oxygen Saturation and Heart Rate During Exercise in Normal Subjects and Patients with Cardiac Disease" by a French et al.

Primary Examiner—William E. Kamm
 Attorney, Agent, or Firm—Reed A. Duthler; Harold R. Patton

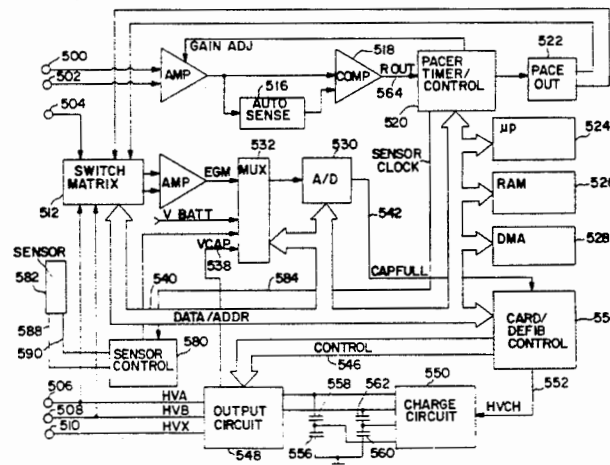
[57] ABSTRACT

A method and apparatus for discriminating between stable and unstable ventricular tachycardias based on a measurement of oxygen saturation. Reference values for average oxygen saturation level and of the pulsatile characteristic of the oxygen saturation level are taken while a patient is in a resting condition. Measurements of oxygen saturation are also taken in response to the detection of a high heart rate, and are compared to the reference measurements to discriminate between stable and unstable ventricular tachyarrhythmias. An unstable tachyarrhythmia is diagnosed if a tachycardia is diagnosed and the current oxygen saturation level is similar to the reference average oxygen saturation level or if the oxygen saturation as presently measured displays a decreased pulsatile characteristic as compared to the reference measurements. The discriminator is intended for use in conjunction with or as part of an automated cardioverter of the type capable of delivering differing therapies for termination of stable and unstable ventricular tachyarrhythmias, such as antitachycardia pacing, cardioversion and defibrillation.

OTHER PUBLICATIONS

"Experimental Ventricular Defibrillation with an Auto-

20 Claims, 7 Drawing Sheets



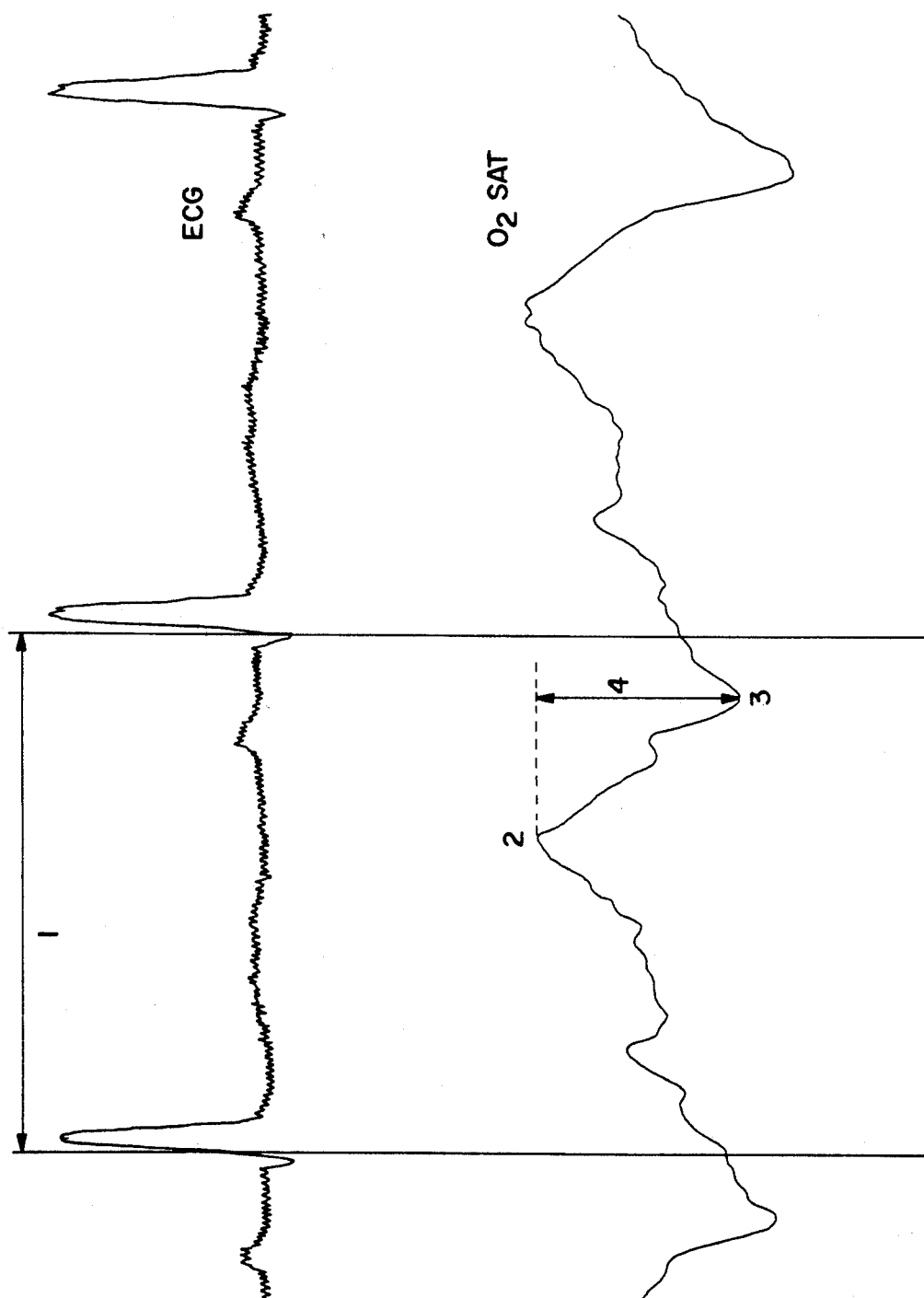


FIG. 1

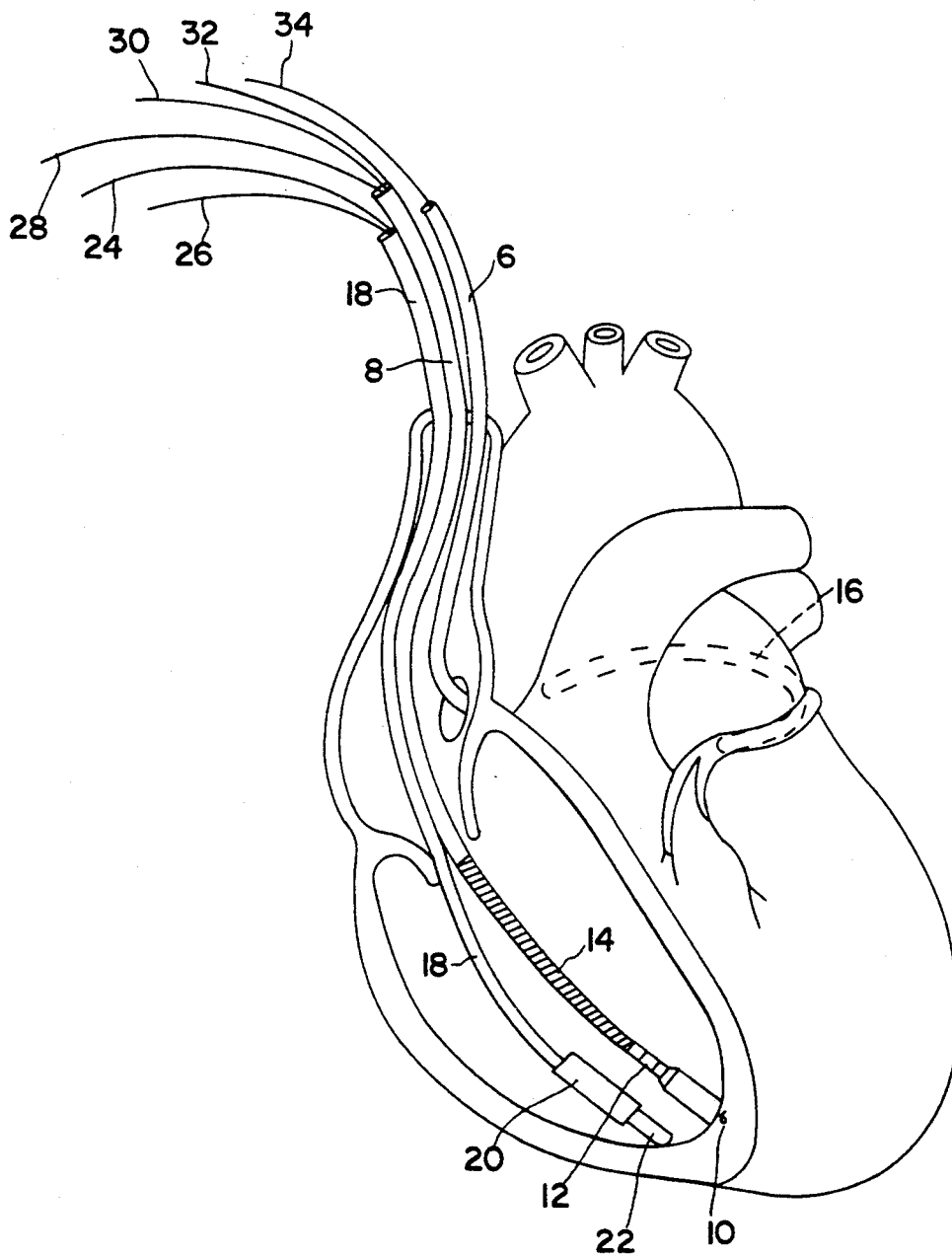
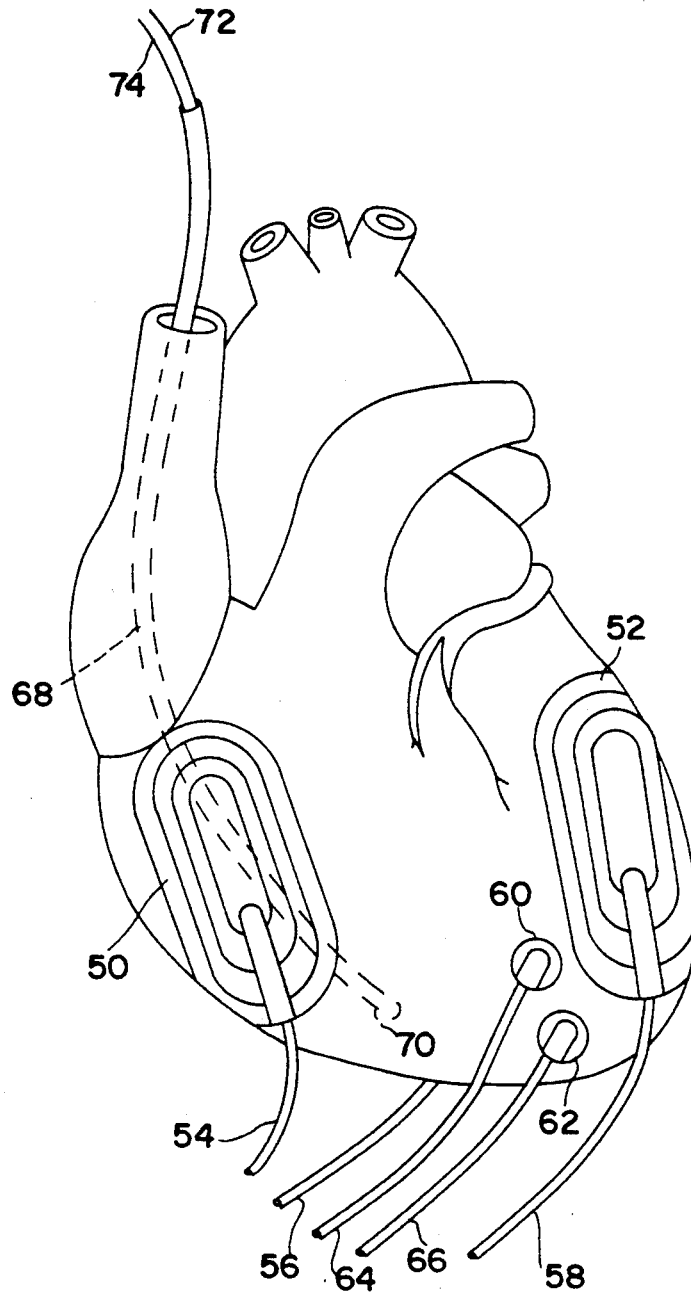


FIG.2



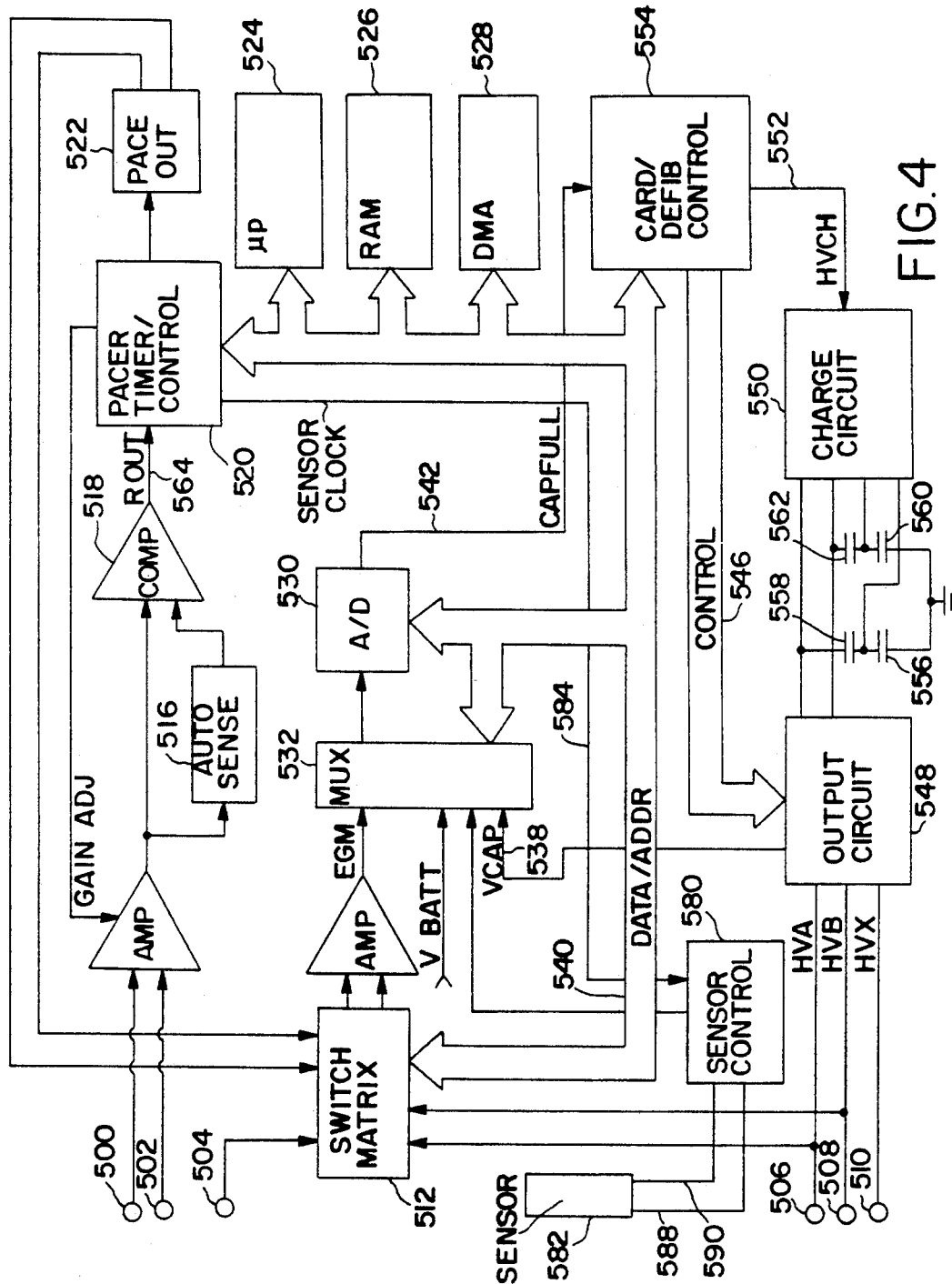


FIG. 4

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