US007627358B2

(12) **United States Patent**
Finneran et al.

(10) **Patent No.: US 7,627,358 B2**
(45) **Date of Patent: *Dec. 1, 2009**

(54) **EMG ELECTRODE APPARATUS AND POSITIONING SYSTEM**

(75) Inventors: **Mark T. Finneran**, Wooster, OH (US); **Kathryn E. Alexander**, Columbus, OH (US); **B. Russell Alexander**, Columbus, OH (US); **Charles E. Wickham, Jr.**, Glenford, OH (US); **Richard L. Hitchcock**, Grove City, PA (US); **Scott D. Howard**, Galloway, OH (US)

(73) Assignee: **SpineMatrix, Inc.**, Akron, OH (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **12/106,903**

(22) Filed: **Apr. 21, 2008**

(65) **Prior Publication Data**

US 2008/0208030 A1 Aug. 28, 2008

Related U.S. Application Data

(60) Continuation of application No. 11/551,294, filed on Oct. 20, 2006, now Pat. No. 7,363,069, which is a division of application No. 11/231,025, filed on Sep. 20, 2005, now Pat. No. 7,127,279, which is a division of application No. 10/641,709, filed on Aug. 15, 2003, now Pat. No. 6,973,344, which is a division of application No. 09/806,632, filed as application No. PCT/US99/23033 on Oct. 4, 1999, now Pat. No. 6,745,062.

(60) Provisional application No. 60/103,105, filed on Oct. 5, 1998.

(51) **Int. Cl.**
A61B 5/0492 (2006.01)

(52) **U.S. Cl.** **600/393**; 600/382; 600/391; 600/392; 600/546

(58) **Field of Classification Search** 600/391–393
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,387,608	A	6/1968	Figar
3,612,061	A	10/1971	Collins et al.
3,774,592	A	11/1973	Lahr
3,848,608	A	11/1974	Leonard
4,082,086	A	4/1978	Page et al.
4,583,549	A	4/1986	Manoli
4,763,660	A	8/1988	Kroll et al.

(Continued)

Primary Examiner—Lee S Cohen
(74) *Attorney, Agent, or Firm*—Christopher L. Parmelee; Walker & Jocke

(57) **ABSTRACT**

A system for detecting and analyzing electrical activity in the anatomy of an organism underlying an electrode array provides signals corresponding to electrical activity adjacent each electrode. Such signals are correlated to the underlying anatomy of the organism and representative outputs presented through various types of output devices. Such outputs may include variations in coloration or other qualities in correspondence with representations of underlying anatomical structures. The system includes electrode structures and methods for producing and attaching electrode arrays to the organism. The exemplary form of the invention is used in connection with the diagnosis of muscle activity in the lower lumbar regions of humans. Levels of muscle activity detected are analyzed by correlation with the muscular structures underlying the electrode array. Forms of the invention may be used in other applications.

13 Claims, 35 Drawing Sheets