



US006796305B1

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

(10) **Patent No.:** **US 6,796,305 B1**
(45) **Date of Patent:** **Sep. 28, 2004**

(54) **VENTILATOR MONITOR SYSTEM AND METHOD OF USING SAME**

(75) Inventors: **Michael J. Banner**, Alachua, FL (US);
Paul B. Blanch, Alachua, FL (US);
Neil R. Euliano, Gainesville, FL (US);
Jose C. Principe, Gainesville, FL (US)

(73) Assignee: **University of Florida Research Foundation, Inc.**, Gainesville, FL (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 234 days.

(21) Appl. No.: **09/608,200**

(22) Filed: **Jun. 30, 2000**

Related U.S. Application Data

(60) Provisional application No. 60/141,735, filed on Jun. 30, 1999.

(51) **Int. Cl.**⁷ **A61M 16/00**

(52) **U.S. Cl.** **128/204.21; 128/204.18; 128/204.23; 128/925**

(58) **Field of Search** **128/204.18, 204.21, 128/204.23, 920, 924, 925, 915; 706/924**

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,595,226 A	7/1971	Newcombe	128/142.2
4,537,190 A	8/1985	Caillot et al.	128/204.22
4,565,194 A	1/1986	Weerda et al.	128/204.23
4,813,431 A	3/1989	Brown	128/748
4,986,268 A	1/1991	Tehrani	128/204.22
4,990,894 A	2/1991	Loescher et al.	340/573
5,107,831 A	4/1992	Halpern et al.	128/204.26
5,161,525 A	11/1992	Kimm et al.	128/204.26
5,307,795 A	5/1994	Whitwam et al.	128/204.25
5,316,009 A	5/1994	Yamada	128/716
5,320,093 A *	6/1994	Raemer	128/203.12
5,331,995 A	7/1994	Westfall et al.	137/8
5,335,650 A	8/1994	Shaffer et al.	128/200.24

5,339,818 A	8/1994	Baker et al.	128/677
5,365,922 A	11/1994	Raemer	128/204.23
5,402,796 A	4/1995	Packer et al.	128/719
5,429,123 A	7/1995	Shaffer et al.	128/204.23
5,546,935 A	8/1996	Champeau	128/205.23
5,549,106 A	8/1996	Gruenke et al.	128/204.23

(List continued on next page.)

FOREIGN PATENT DOCUMENTS

DE	44 10 508 A1	9/1994
EP	0 082 041 A1	6/1983
EP	0 504 725 A2	9/1992
WO	WO 91/03979	4/1991
WO	WO 95/164 B4	6/1995

Primary Examiner—Henry Bennett

Assistant Examiner—Mital Patel

(74) *Attorney, Agent, or Firm*—Saliwanchik, Lloyd & Saliwanchik

(57) **ABSTRACT**

The present invention provides a system and method for monitoring the ventilation support provided by a ventilator that is supplying a breathing gas to a patient via a breathing circuit that is in fluid communication with the lungs of the patient. The ventilator has a plurality of selectable ventilator setting controls governing the supply of ventilation support from the ventilator, each setting control selectable to a level setting. The ventilator support monitor system preferably receives at least one ventilator setting parameter signal, each ventilator setting parameter signal indicative of the level settings of one ventilator setting control, monitors a plurality of sensors, each sensor producing an output signal indicative of a measured ventilation support parameter, to determine the sufficiency of the ventilation support received by the patient, and determines the desired level settings of the ventilator setting controls in response to the received ventilator setting parameter signal and the output signals. The ventilator support monitor system preferably utilizes a trainable neural network to determine the desired level settings of the ventilator setting controls.

12 Claims, 9 Drawing Sheets

