

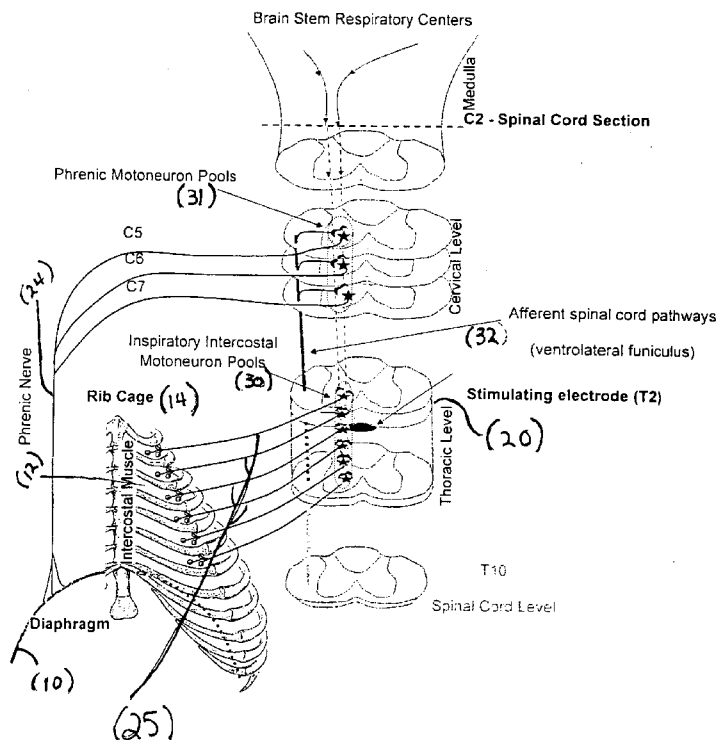


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land, Ohio 44145 (US).
- (81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,
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DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT,
HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP,
KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD,
ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI,
NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD,
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ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV,
MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM,

[Continued on next page]

(54) Title: RESPIRATORY MUSCLE ACTIVATION BY SPINAL CORD STIMULATION



(57) Abstract: A method of electrically stimulating the inspiratory muscles in a subject is provided. The method includes positioning one or more electrodes at one or more levels of the upper thoracic spinal cord of the subject and operating the electrode to deliver high frequency electrical stimulation to the spinal cord tracts at the level or levels. The high frequency electrical stimulation of the spinal cord results in the coordinated activation of the diaphragm, intercostal muscles, and accessory muscles in the subject to effect artificial ventilation in the subject.

WO 2010/083059 A3



TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

Published:

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4 November 2010

A. CLASSIFICATION OF SUBJECT MATTER*A61N 1/06(2006.01)i, A61B 18/00(2006.01)i*

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A61N 1/06; A61N 1/22; A61N 1/36; H05G 00/00; A61N 1/00; A61N 1/365

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS(KIPO internal) & Keywords: inspiratory, expiratory, activate, muscle, spinal cord, electric, generator, electrode, stimulation, radio frequency, pulse, periodic

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5999855 A (ANTHONY F. DIMARCO) 07 December 1999 See claims 1-12, column 7, line 19 - column 8, line 42, figures 12, 14-16	39-44
X	US 5058584 A (IVAN BOURGEOIS) 22 October 1991 See claim 1, column 2, lines 30 - 58, abstract, figures 1-5	39-44
A	US 4830008 A (JEFFREY A. MEER) 16 May 1989 See claims 12-14, abstract, figure 6	39-44
A	US 5540732 A (ROY L. TESTERMAN) 30 July 1996 See claim 7, abstract, figures 5-7	39-44
A	US 2004-0088015 A1 (DAVID A. CASAVANT et al.) 06 May 2004 See claims 22-24, abstract, figures 1, 2 and 5	39-44

 Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

06 SEPTEMBER 2010 (06.09.2010)

Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2010/000123

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5999855 A	07.12.1999	US 5999855A A	07.12.1999
US 5058584 A	22.10.1991	EP 0546024 A1	16.06.1993
		EP 0546024 B1	09.11.1994
		JP 02-929316 B2	21.05.1999
		JP 2929316 B2	03.08.1999
		WO 92-04075 A1	19.03.1992
US 4830008 A	16.05.1989	US 4830008A A	16.05.1989
US 5540732 A	30.07.1996	EP 0702977 A2	27.03.1996
		EP 0702977 A3	19.03.1997
		EP 0702977 B1	19.03.2003
		JP 08-224318 A	03.09.1996
		JP 3733555 B2	11.01.2006
US 2004-0088015 A1	06.05.2004	CA 2501948-A1	21.05.2004
		EP 1572293 A1	14.09.2005
		US 7277757 B2	02.10.2007
		WO 2004-041354 A1	21.05.2004
		WO 2004-041354 A8	07.04.2005

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.: 1-38
because they relate to subject matter not required to be searched by this Authority, namely:
Claims 1-38 pertain to methods for treatment of human body by therapy and thus relate to a subject matter which this International Searching Authority is not required to search under Article 17(2)(a)(i) and Rule 39.1(iv) PCT.
2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.