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29 August 2024 (29.08.2024)

(54) Title: ELECTRICAL CONNECTORS FOR IMPLANTABLE DEVICES

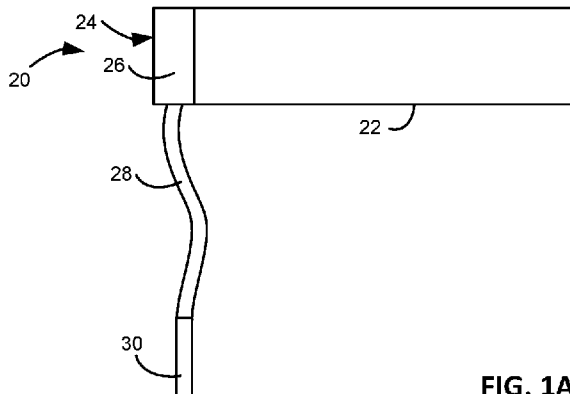


FIG. 1A

(57) Abstract: An implantable medical device includes a first element and a second element. The second element is electrically connected to the first element via an electrical connector. The second element includes at least one conductive element.



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**INTERNATIONAL SEARCH REPORT**

International application No  
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**A. CLASSIFICATION OF SUBJECT MATTER**  
 INV. A61N1/05                      A61N1/36                      A61N1/375  
 ADD.

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**

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

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

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 106 669 032 A (BEIJING PINS MEDICAL CO LTD) 17 May 2017 (2017-05-17) abstract; figure 1 paragraphs [0001], [0006] - [0014], [0016] - [0037]	1-4, 19
X	US 2007/100386 A1 (TRONNES CAROLE A [US] ET AL) 3 May 2007 (2007-05-03) abstract; figures 1-12 paragraphs [0001], [0003] - [0006], [0011] - [0023], [0028] - [0033], [0037] - [0049], [0054] - [0056], [0059] - [0061], [0064], [0066]	1, 3-5, 19, 30, 31

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	"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
"E" earlier application or patent but published on or after the international filing date	"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
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"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
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search  <b>22 July 2024</b>	Date of mailing of the international search report  <b>01/08/2024</b>
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Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer  <b>Molina Silvestre, A</b>
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## INTERNATIONAL SEARCH REPORT

International application No

PCT/US2023/085728

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>US 8 162 684 B1 (SOCHOR JERZY ROMAN [US]) 24 April 2012 (2012-04-24)</p> <p>abstract figures 1, 2 column 1, lines 23-26 column 3, lines 50-59 column 3, lines 61-66 column 10, line 16 - column 13, line 18 figures 5-10 column 4, lines 8-23 column 13, line 20 - column 14, line 45 -----</p>	<p>1, 3-19, 22-28, 30-44</p>
X	<p>US 7 736 191 B1 (SOCHOR JERZY ROMAN [US]) 15 June 2010 (2010-06-15)</p> <p>abstract; figures 1-6 column 2, line 53 - column 3, line 15 column 3, lines 43-59 column 5, line 45 - column 9, line 4 -----</p>	<p>1, 3-7, 19, 30, 31</p>
A	<p>US 2012/089203 A1 (SHAFFER RYAN [US]) 12 April 2012 (2012-04-12)</p> <p>the whole document -----</p>	<p>1-19, 22-28, 30-44</p>
A	<p>US 8 140 163 B1 (DAGLOW TERRY D [US] ET AL) 20 March 2012 (2012-03-20)</p> <p>the whole document -----</p>	<p>1-19, 22-28, 30-44</p>
A	<p>US 2022/311173 A1 (VANDENBURG JOSEPH [US] ET AL) 29 September 2022 (2022-09-29)</p> <p>the whole document -----</p>	<p>1-19, 22-28, 30-44</p>

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US2023/085728

## 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.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
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:

**see additional sheet**

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 fees, this Authority did not invite payment of additional fees.
  
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.:  
**1 - 19, 22 - 28, 30 - 44**
  
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.

## FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

## 1. claims: 1-5, 19, 30, 31

An implantable medical device comprising: a first element and a second element electrically connected to the first element, the second element comprising at least one conductive element, wherein the first element is for implantation within a head and neck or pectoral region to apply the electrical stimulation to an upper airway patency related tissue via the second element, further wherein the first element comprises circuitry, and wherein the at least one conductive element is in communication with the circuitry, further wherein the second element comprises: a lead including a proximal portion connected to the first element and a distal portion spaced apart from the first element, wherein the proximal portion is removably connectable to the first element.

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## 2. claims: 6-18, 22-28, 32-44

An implantable medical device comprising: a first element and a second element electrically connected to the first element, the second element comprising at least one conductive element, wherein the first element is for implantation within a head and neck or pectoral region to apply the electrical stimulation to an upper airway patency related tissue via the second element, further wherein the first element comprises circuitry, and wherein the at least one conductive element is in communication with the circuitry, further wherein the second element comprises: a lead including a proximal portion connected to the first element and a distal portion spaced apart from the first element, wherein the proximal portion is not necessarily removably connectable to the first element, the first element comprising a feedthrough post extending through a housing or a feedthrough post and an amorphous compliant contact.

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## 3. claim: 20

An implantable medical device comprising: a first element and a second element electrically connected to the first element, the second element comprising at least one conductive element, wherein the first element is for implantation within a head and neck or pectoral region to apply the electrical stimulation to an upper airway patency related tissue via the second element, further wherein the first element comprises circuitry, and wherein the at least one conductive element is in communication with the circuitry, further wherein the second element comprises: a lead including a proximal portion connected to the first

## FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

element and a distal portion spaced apart from the first element, wherein the proximal portion is not necessarily removably connectable to the first element, wherein the distal portion of the lead comprises an electrical connector comprising the at least one conductive element.

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## 4. claims: 21, 45-52

An implantable medical device comprising: a first element and a second element electrically connected to the first element, the second element comprising at least one conductive element, wherein the first element is for implantation within a head and neck or pectoral region to apply the electrical stimulation to an upper airway patency related tissue via the second element, further wherein the first element comprises circuitry, and wherein the at least one conductive element is in communication with the circuitry, further wherein the second element comprises: a lead including a proximal portion connected to the first element and a distal portion spaced apart from the first element, wherein the proximal portion is not necessarily removably connectable to the first element, wherein the at least one conductive element comprises a plurality of conductive elements spaced apart from the first element.

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## 5. claim: 29

An implantable medical device comprising: a first element and a second element electrically connected to the first element, the second element comprising at least one conductive element, wherein the first element is for implantation within a head and neck or pectoral region to apply the electrical stimulation to an upper airway patency related tissue via the second element, further wherein the first element comprises circuitry, and wherein the at least one conductive element is in communication with the circuitry, further wherein the second element comprises: a lead including a proximal portion connected to the first element and a distal portion spaced apart from the first element, wherein the proximal portion is not necessarily removably connectable to the first element, wherein the proximal portion extends perpendicular to a long axis of the first element.

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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
CN 106669032	A	17-05-2017	NONE
-----			
US 2007100386	A1	03-05-2007	US 2007100386 A1 03-05-2007
			US 2010035453 A1 11-02-2010
-----			
US 8162684	B1	24-04-2012	NONE
-----			
US 7736191	B1	15-06-2010	NONE
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US 2012089203	A1	12-04-2012	DE 102011054296 A1 12-04-2012
			DE 202011051572 U1 19-01-2012
			GB 2484578 A 18-04-2012
			US 2012089203 A1 12-04-2012
-----			
US 8140163	B1	20-03-2012	NONE
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US 2022311173	A1	29-09-2022	US 2022311173 A1 29-09-2022
			US 2023208071 A1 29-06-2023
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