



(51) International Patent Classification:
A61B 34/20 (2016.01)

(21) International Application Number:
PCT/US2019/029141

(22) International Filing Date:
25 April 2019 (25.04.2019)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
15/963,444 26 April 2018 (26.04.2018) US

(71) Applicant: **MEDTRONIC NAVIGATION, INC.**
[US/US]; 826 Coal Creek Circle, Coal Creek Corporate Center One, Louisville, Colorado 80027 (US).

(72) Inventors: **RONEN, Shai**; 855 W. Dillon Rd., Apt. D303, Louisville, Colorado 80027 (US). **BZOSTEK, Andrew**; 260 Monares Lane, Erie, Colorado 80516 (US). **JACOBSSEN, Brad**; 2840 Prince Circle, Erie, Colorado 80516 (US). **WALD, Andrew**; 1843 Niagara St., Denver, Colorado 80221 (US).

(74) Agent: **WARNER, Richard W.** et al.; HARNESS, DICK-EY & PIERCE, P.L.C., P. O. Box 828, Bloomfield Hills, Michigan 48303 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).



WO 2019/210065 A3

(54) Title: POSITION DETERMINATION SYSTEM AND METHOD

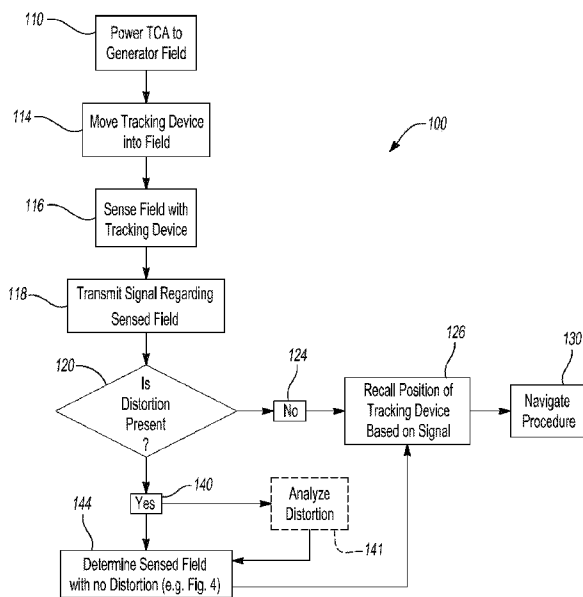


Fig-2

(57) Abstract: Disclosed is a system to track a member in a volume. The system comprises a transmitter operable to generate an electro-magnetic field at a plurality of frequencies; a tracking device having at least a first sensor configured to sense the field at each frequency of the plurality of frequencies; a transmission system to transmit a signal regarding the sensed field at each of the frequencies; a processor system configured to: receive the signal, evaluate the received signal to determine if an interference is present, if an interference is determined to be present (i) evaluate a model of a flux including two or more circuits, (ii) determine a distortion free flux based on the modeled flux extrapolated to zero frequency and (iii) output the determined distortion free flux, and determine a position of the tracking device based on a distortion free field determined based on the determined distortion free flux. The system may be used to perform a procedure on a subject. The procedure may be any appropriate procedure. The navigation system may be used to account for the distortive effects of various conductive objects positioned near the subject on which the procedure is performed.

Declarations under Rule 4.17:

- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

Published:

- *with international search report (Art. 21(3))*
- *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))*

(88) Date of publication of the international search report:

19 December 2019 (19.12.2019)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2019/029141

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.: 11-20
because they relate to subject matter not required to be searched by this Authority, namely:
see FURTHER INFORMATION sheet PCT/ISA/210
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 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.:
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.

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2019/029141

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61B34/20
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)
A61B

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, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 891 895 A1 (BIOSENSE WEBSTER INC [US]) 27 February 2008 (2008-02-27) figures 1-4 paragraphs [0010], [0023] - [0029], [0037] - [0051], [0054] claim 11	1-10
A	EP 1 776 923 A1 (BIOSENSE WEBSTER INC [US]) 25 April 2007 (2007-04-25) figures 1, 4, 5 paragraphs [0049] - [0060]	1-10
A	US 2007/244666 A1 (LI DUN A [US] ET AL) 18 October 2007 (2007-10-18) figures 2-4 paragraphs [0032] - [0065]	1-10
	-/--	

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 another 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 6 November 2019	Date of mailing of the international search report 18/11/2019
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 Schleich, Florian

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2019/029141

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>DOS SANTOS CASSIA C CHAPETTI ET AL: "Nonlinear modeling of magnetic materials for electromagnetic devices simulation", 2017 IEEE XXIV INTERNATIONAL CONFERENCE ON ELECTRONICS, ELECTRICAL ENGINEERING AND COMPUTING (INTERCON), IEEE, 15 August 2017 (2017-08-15), pages 1-4, XP033232425, DOI: 10.1109/INTERCON.2017.8079714 [retrieved on 2017-10-20] abstract page 3</p> <p style="text-align: center;">-----</p>	1-10

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/US2019/029141

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1891895	A1	27-02-2008	AT 459291 T 15-03-2010
		AU 2007207882 A1	06-03-2008
		BR PI0703121 A	08-04-2008
		CA 2598135 A1	21-02-2008
		CN 101129264 A	27-02-2008
		EP 1891895 A1	27-02-2008
		IL 185365 A	31-03-2011
		JP 5052994 B2	17-10-2012
		JP 2008058307 A	13-03-2008
		KR 20080017275 A	26-02-2008
		US 2008125646 A1	29-05-2008
EP 1776923	A1	25-04-2007	AT 555722 T 15-05-2012
		AU 2006230683 A1	03-05-2007
		BR PI0604302 A	21-08-2007
		CA 2564556 A1	19-04-2007
		CN 1951325 A	25-04-2007
		EP 1776923 A1	25-04-2007
		IL 178176 A	28-02-2013
		JP 2007163462 A	28-06-2007
		KR 20070042872 A	24-04-2007
		US 2007085528 A1	19-04-2007
US 2007244666	A1	18-10-2007	CN 101078768 A 28-11-2007
		FR 2899963 A1	19-10-2007
		US 2007244666 A1	18-10-2007

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.1

Claims Nos.: 11-20

Claims 11-20 relate to subject-matter mentioned in Rule 39.1(iv) PCT, namely to a method for treatment of the human or animal body by surgery. The methods of claims 11 and 20 comprises the step of "tracking a member in a volume", which implies at least two different positions of at least one entity to be tracked (see par. [0018],[0019]). It is clear from the description (see par. [0019]), that movements of the at least one entity to be tracked occurring inside of the human body are also encompassed by said "tracking". Hence, said step is considered to be of invasive nature and therefore surgical. Said surgical step lends the entire methods a surgical character. Under terms of Rule 43bis PCT, Articles 35(3) and 34(4)(a)(i) PCT and Rule 67.1(iv) PCT an International Searching Authority is not required to carry out an examination of such claims.