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(71) Applicant: **DALHOUSIE UNIVERSITY** [CA/CA]; 1344 Summer Street, Suite 207, Halifax, Nova Scotia B3H 4R2 (CA).

(72) Inventors: **SAPP, Jr., John Lewis**; 1683 Vernon Street, Halifax, Nova Scotia B3H 3M9 (CA). **HORACEK, Bohumil Milan**; 28 Birchview Drive, Halifax, Nova Scotia B3P 1G4 (CA).

(74) Agents: **MACEK, Alan** et al.; 20 Queen St. West, 32nd Floor, Toronto, Ontario M5H 3R3 (CA).

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Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

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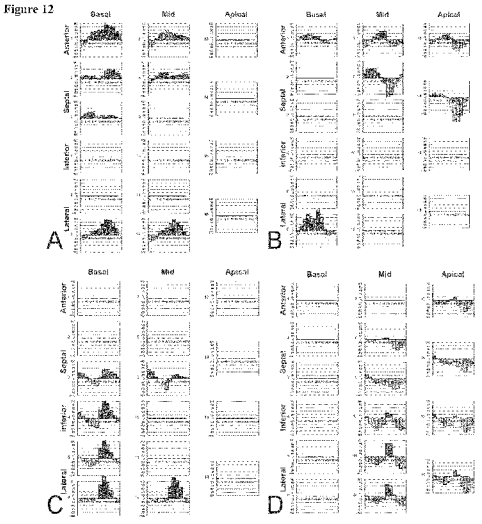
— *with international search report (Art. 21(3))*

— *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:
20 November 2014

(54) Title: COMPUTER-AIDED LOCALIZATION OF SITE OF ORIGIN OF CARDIAC ACTIVATION WITH DISCRIMINATOR LEADS

Figure 12



(57) Abstract: A method for quantifying, during pacemapping, a comparison of a BSPM of interest to a pace site BSPM. The method may include receiving at a computing device a plurality of ECG signals from an acquisition system. The pace site BSPM may be calculated using the plurality of ECG signals. The BSPM of interest may be compared to the pace site BSPM, by: retrieving the BSPM of interest from memory accessible by the computing device; and, calculating one or more comparison metrics for the BSPM of interest as compared to the pace site BSPM. An indication of similarity between the BSPM of interest and the pace site BSPM based on the comparison metric calculated may be displayed on a user interface in communication with the computing device.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CA2014/050050

A. CLASSIFICATION OF SUBJECT MATTER
IPC: ***A61B 5/0402*** (2006.01), ***A61B 5/00*** (2006.01), ***G06F 19/00*** (2011.01)

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)
IPC: ***A61B 5/0402*** (2006.01), ***A61B 5/00*** (2006.01), ***G06F 19/00*** (2011.01)

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

Electronic database(s) consulted during the international search (name of database(s) and, where practicable, search terms used)
TotalPatent, Canadian Patent Database (Intellect), World Wide Web. Keywords: ecg, electrocardiogra*, bspm, body surface potential map, template, integral, lead, average, activation, segment

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2012/174660, SAPP et al., 27 December 2012 (27-12-2012) *See: entire document.	1-6
A	CA2 841 388, WODLINGER et al., 10 January 2013 (10-01-2013) *See: entire document.	1-6
A	GERSTENFELD et al. "Quantitative comparison of spontaneous and paced 12-lead electrocardiogram during right ventricular outflow tract ventricular tachycardia", J. Am. Coll. Cardiol., Vol. 41, No. 11: pg. 2046-53, 06-2003 *See: entire document.	1-6
A	MACLEOD et al. "Validation of an Electrocariographic Inverse Solution using Percutaneous Transluminal Coronary Angioplasty", Annual International Conference of the IEEE Engineering in Medicine and Biology Society, Vol. 12, No. 2: pg. 633-4, 1990 *See: entire document.	1-6

☐ 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 29 May 2014 (29.05.2014)	Date of mailing of the international search report 03 October 2014 (03-10-2014)
Name and mailing address of the ISA/CA Canadian Intellectual Property Office Place du Portage I, C114 - 1st Floor, Box PCT 50 Victoria Street Gatineau, Quebec K1A 0C9 Facsimile No.: 001-819-953-2476	Authorized officer Bryon Braymore (819) 934-6753

Box No. II **Observations where certain claims were found unsearchable (Continuation of item 2 of the 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. ☐ Claim Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claim 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. ☐ Claim 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 extra sheet on Page 5.

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 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 claim 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 claim Nos.: 1-6

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.

Continuation of Box. No. III on Page 2.

Claims 1-8 are directed to a plurality of alleged inventions as follows:

Group A - Claims 1-6 are directed to localizing an activation site of origin to a heart segment by comparing a BSPM generated from ECG signals having a particular lead condition with a BSPM template subset having the same lead condition and stored as an average of all pacing sites within an associated segment of the heart; and
Group B - Claims 7 and 8 are directed to localizing an activation site of origin to a heart segment by retrieving a plurality of general coefficient parameters relating a location of an activation site to integrals of ECG signals obtained from a plurality of patients including applying a linear regression with an intercept to the integrals and the location of the pacing site to obtain a plurality of general coefficient parameters, applying the general coefficient parameters to integrals of ECG signals obtained from a patient and displaying the location of an estimated activation site on a model of a heart.

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CA2014/050050

Patent Document Cited in Search Report	Publication Date	Patent Family Member(s)	Publication Date
WO2012174660A1	27 December 2012 (27-12-2012)	AU2012272491A1	23 January 2014 (23-01-2014)
		CA2840011A1	27 December 2012 (27-12-2012)
CA2841388A1	10 January 2013 (10-01-2013)	CA2841388A1	10 January 2013 (10-01-2013)
		WO2013006713A2	10 January 2013 (10-01-2013)
		WO2013006713A3	21 March 2013 (21-03-2013)