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(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,

(54) Title: SYSTEMS AND METHODS FOR ASSESSING ABLATION LESIONS

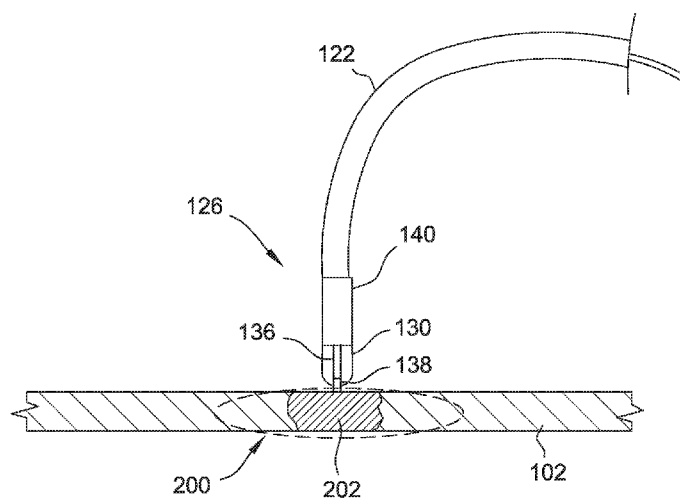


FIG. 2

(57) Abstract: Disclosed herein is a system for assessing ablation lesions. The system includes an ablation catheter configured to ablate a target cardiac tissue site to form an ablation lesion thereon, and a mechanical probe operable to impart mechanical force to the target cardiac tissue site. The mechanical probe includes at least one sensor configured to measure a mechanical response of the target cardiac tissue site to the mechanical force. The system further includes a controller communicatively coupled to the mechanical probe, and configured to determine systolic and diastolic stiffness values of the target cardiac tissue site based on the mechanical response. The controller is further configured to determine a transmural value of the ablation lesion based on the determined systolic and diastolic stiffness values.





OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2020/017532

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.: 14-16
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/US2020/017532

A. CLASSIFICATION OF SUBJECT MATTER INV. A61B18/12 A61B5/00 A61B18/14 A61B90/40 A61B90/00 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	KWIECINSKI WOJCIECH ET AL: "Quantitative evaluation of atrial radio frequency ablation using intracardiac shear-wave elastography", MEDICAL PHYSICS, AIP, MELVILLE, NY, US, [Online] vol. 41, no. 11, 20 October 2014 (2014-10-20), XP012191063, ISSN: 0094-2405, DOI: 10.1118/1.4896820 [retrieved on 2020-05-25]	1-11,13, 17-19
A	Section 1. Introduction - Section 4. Discussion; page 1 - page 10	12,20
A	US 2018/271577 A1 (BHARAT SHYAM [US] ET AL) 27 September 2018 (2018-09-27) paragraph [0052] - paragraph [0060]; figure 6	1-13, 17-20
	----- -/-	
☒ 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 2020		Date of mailing of the international search report 14/09/2020
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 Lindberg, Per

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2020/017532

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2010/113985 A1 (THAPLIYAL HIRA V [US] ET AL) 6 May 2010 (2010-05-06) paragraphs [0094] - [0103]; figure 14 -----	1-13, 17-20
A	US 2016/213282 A1 (LEO GIOVANNI [CH] ET AL) 28 July 2016 (2016-07-28) cited in the application paragraph [0018] - paragraph [0035] -----	1-13, 17-20

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2020/017532

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2018271577 A1	27-09-2018	CN 107427280 A EP 3261549 A2 JP 2018511367 A RU 2017133464 A US 2018271577 A1 WO 2016135584 A2	01-12-2017 03-01-2018 26-04-2018 27-03-2019 27-09-2018 01-09-2016
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US 2016213282 A1	28-07-2016	CA 2703347 A1 CN 101947130 A CN 104605928 A DE 202010018025 U1 EP 2248480 A1 EP 3037055 A1 EP 3329875 A1 JP 5786108 B2 JP 2010259810 A US 2010298826 A1 US 2014194869 A1 US 2016213282 A1	08-11-2010 19-01-2011 13-05-2015 07-11-2013 10-11-2010 29-06-2016 06-06-2018 30-09-2015 18-11-2010 25-11-2010 10-07-2014 28-07-2016

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.1

Claims Nos.: 14-16

Method claim 14 defines a method for treatment of the human or animal body by surgery, because "[...] imparting mechanical force [...] measuring a mechanical response of target tissue [...] determining transmuralility of ablation lesion[...]" is seen as a surgical step performed on a patient, because the description clearly discloses the use of the device on a surgical site comprising ablation of cardiac tissue. Therefore no search has been performed for the subject-matter of this claim and the corresponding dependent claims 15-16 (see Article 17 (2) PCT and Rule 39.1.(iv) PCT) and no written opinion is required for the subject-matter of these method claims (see Rule 43bis.1 and Rule 67.1 (iv) PCT).

Continuation of Box II.2

Method claim 14 defines a method for treatment of the human or animal body by surgery, because "[...] imparting mechanical force [...] measuring a mechanical response of target tissue [...] determining transmuralility of ablation lesion[...]" is seen as a surgical step performed on a patient, because the description clearly discloses the use of the device on a surgical site comprising ablation of cardiac tissue. Therefore no search has been performed for the subject-matter of this claim and the corresponding dependent claims 15-16 (see Article 17 (2) PCT and Rule 39.1.(iv) PCT) and no written opinion is required for the subject-matter of these method claims (see Rule 43bis.1 and Rule 67.1 (iv) PCT)?.