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[Continued on next page]

(54) Title: HIGH-RESOLUTION THERMAL IMAGING SYSTEM, APPARATUS, METHOD AND COMPUTER ACCESSIBLE MEDIUM

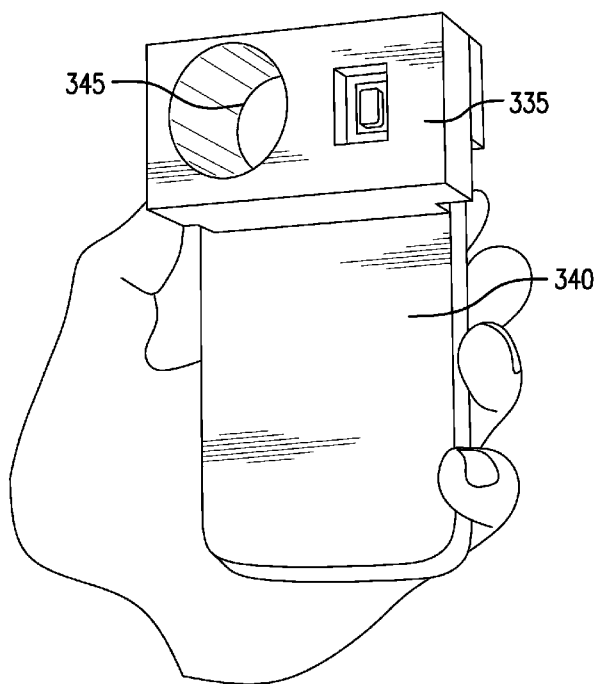


FIG. 3A

(57) Abstract: Exemplary of the present disclosure can include an apparatus for generating thermal imaging information of a biological structure(s), including detector arrangement(s) which can be configured to receive and detect light radiation(s), a determination arrangement(s) which can be configured to determine a position or an orientation of the detector arrangement(s) with respect to the biological structure(s) to generate data, and a computer arrangement configured to generate the thermal imaging information based on the radiation and the data when the detector arrangement(s) is moved. The thermal imaging information can include a 2-dimension temperature map(s) of a portion(s) of the biological structure(s). The thermal imaging information can include a 3-dimension temperature map(s) of a portion(s).





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).

— *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))*

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2 April 2015

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2014/044125

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - G01J 5/10 (2014.01)
CPC - G01J 5/10(2014.11)

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(8) - G01J 5/02, 5/10, 5/00, 5/48; H04N 5/232, 5/33, 5/361, 5/255, 5/365; A61B 5/00, 5/01; G06K 9/00, 9/32; G01K 13/00 (2014.01)
USPC -382/115, 128, 117, 118, 154; 374/121, E13.3; 345/419, 348/E13.014, E13.25, E13.38, E13.72; 607/54

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

CPC - G01J 5/02, 5/10, 5/0022, 2005/0077, 2005/0081, 5/0025; G01K 13/004, H04N 5/23219, 5/33, 5/361, 5/3651; A61B 5/015, G06K 9/3233, 2209/05, 9/00369 (2014.11) (keyword delimited)

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

Orbit, Google Patents, Google Scholar.

Search terms used: thermal, image, infrared, radiation, diagnosis, biological, medical, detect, sensor, position, orientation

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 7,787,663 B2 (HARTLOVE) 31 August 2010 (31.08.2010) entire document	1-2, 4-10 ----- 3, 11-14
Y	US 2013/0116573 A1 (HERMAN) 09 May 2013 (09.05.2013) entire document	3, 11-14
Y	US 2012/0130145 A1 (SABOL et al.) 24 May 2012 (24.05.2012) entire document	13
A	US 2008/0077019 A1 (XIAO et al.) 27 March 2008 (27.03.2008) entire document	1-14
A	US 7,340,293 B2 (MCQUILKIN) 04 March 2008 (04.03.2008) entire document	1-14
A	WO 2012/129657 A1 (BENCH et al.) 04 October 2012 (04.10.2012) entire document	1-14
A	US 2007/0208400 A1 (NADKARNI et al) 06 September 2007 (06.09.2007) entire document	1-14

Further documents are listed in the continuation of Box C.

* Special categories of cited documents:	"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
"A" document defining the general state of the art which is not considered to be of particular relevance	"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
"E" earlier application or patent but published on or after the international filing date	"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
"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)	"&" document member of the same patent family
"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	

Date of the actual completion of the international search 30 December 2014	Date of mailing of the international search report 29 JAN 2015
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Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774
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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2014/044125

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 extra 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 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.:
1-14

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/US2014/044125

Continuation of Box III.

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I, claims 1-14, drawn to an apparatus for generating thermal imaging information of at least one biological structure.
Group II, claims 15-41, drawn to a method and system for determining a diagnosis for at least one biological structure.
Group III, claims 42-53, drawn to an apparatus for obtaining thermal imaging information of at least one biological structure.
Group IV, claims 54-67, drawn to an apparatus for determining a probability or a likelihood of an infection or an inflammation of at least one biological structure.

The inventions listed as Groups I, II, III or IV do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: the special technical feature of the Group I invention: at least one determination arrangement which is configured to determine at least one of a position or an orientation of the at least one detector arrangement with respect to the at least one biological structure to generate data as claimed therein is not present in the invention of Groups II, III or IV. The special technical feature of the Group II invention: receiving first information related to a plurality of images of the at least one biological structure; combining the plurality of images into at least one reference image, wherein the at least one reference image includes thermal imaging information associated with the at least one biological structure as claimed therein is not present in the invention of Groups I, III or IV. The special technical feature of the Group III invention: at least one controller arrangement which is configured to control multiple angles or multiple positions at which the at least one light radiation is received from the at least one biological structure, and detected by the at least one detector arrangement to generate data as claimed therein is not present in the invention of Groups I, II or IV. The special technical feature of the Group IV invention: determine the probability or the likelihood of the infection or the inflammation based on the thermal imaging information as claimed therein is not present in the invention of Groups I, II or III.

Groups I, II, III and IV lack unity of invention because even though the inventions of these groups require the technical feature of at least one detector arrangement which is configured to receive and detect at least one radiation; a computer arrangement configured to generate the thermal imaging information of at least one biological structure based on the radiation, this technical feature is not a special technical feature as it does not make a contribution over the prior art.

Specifically, US 2007/0208400 A1 (NADKARNI et al) 06 September 2007 (06.09.2007) teaches at least one detector arrangement which is configured to receive and detect at least one radiation (simultaneous macrophage detection and delivery of therapeutic laser energy, Para. 49); a computer arrangement configured to generate the thermal imaging information of at least one biological structure based on the radiation (the exemplary OCT imaging of the aorta and iliac arteries may be performed using anatomic landmarks for image registration based on the delivered therapeutic laser energy, Paras. 49 and 56).

Since none of the special technical features of the Group I, II, III or IV inventions are found in more than one of the inventions, unity of invention is lacking.