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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, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, 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.

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[Continued on next page]

(54) **Title:** METHOD AND APPARATUS FOR AUTOMATED ULTRASONIC DOPPLER ANGLE AND FLOW VELOCITY ESTIMATION

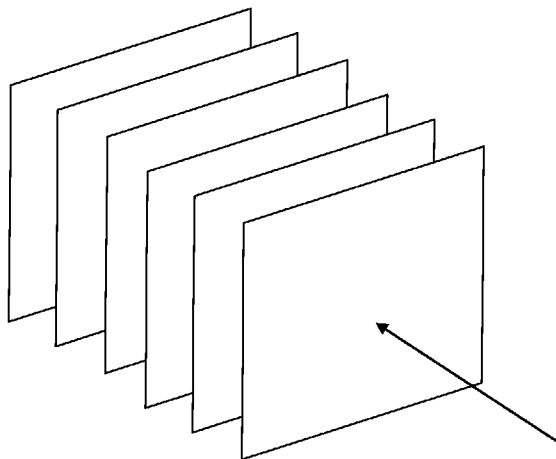


Fig. 6a

(57) **Abstract:** Disclosed is an ultrasound device for measuring blood flow velocity in a blood vessel of a subject without imaging functionality in the device. The measurement depends upon reflections of a collimated beam of ultrasound from a subject's body part. Received electrical signals representative of the reflected ultrasound energy is used for generating a representation of blood flow at a plurality of predetermined locations in the volume and calculating a first blood flow velocity at each of the locations. The representation of flow is used for delineating the blood flow in the blood vessel in the volume. An angle calculating unit calculates the Doppler angle between the direction of the radiated collimated beam in the delineated blood flow at each point. A velocity calculator calculates a second blood flow velocity at the plurality of points based on the calculated first velocities and the calculated angle at the point.



Declarations under Rule 4.17:

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

— *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))*

Published:

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INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2012/053315

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61B8/06
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.
A	US 5 555 886 A (WENG LEE [US] ET AL) 17 September 1996 (1996-09-17) the whole document -----	1-3
A	US 5 701 898 A (ADAM DAN R [IL] ET AL) 30 December 1997 (1997-12-30) abstract -----	1-3
A	US 2009/306513 A1 (SRINIVASAN SESHADRI [US] ET AL) 10 December 2009 (2009-12-10) abstract -----	1-3
A	EP 1 977 694 A1 (MEDISON CO LTD [KR]) 8 October 2008 (2008-10-08) paragraphs [0016], [0017] -----	1-3

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

10 October 2012

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25/01/2013

Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2012/053315

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5555886	A	17-09-1996	NONE

US 5701898	A	30-12-1997	NONE

US 2009306513	A1	10-12-2009	NONE

EP 1977694	A1	08-10-2008	EP 1977694 A1 08-10-2008
			JP 2008253784 A 23-10-2008
			KR 20080090888 A 09-10-2008
			US 2008249411 A1 09-10-2008

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2012/053315

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.:

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.:

1-3

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: 1-3

Ultrasound device for measuring blood flow velocity in a blood vessel of a subject.

2. claims: 4-7

Method for determining a Doppler angle for Doppler blood velocimetry of a body part of a subject.
