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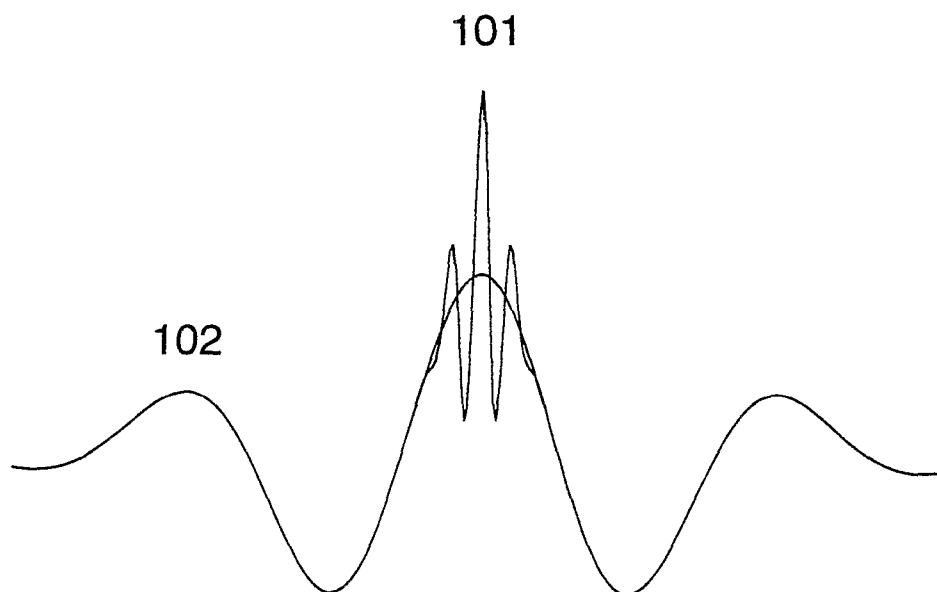
- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.
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- (88) Date of publication of the international search report:
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[Continued on next page]

(54) Title: DUAL FREQUENCY BAND ULTRASOUND TRANSDUCER ARRAYS



(57) Abstract: Ultrasound probes that transmits/receives ultrasound pulses with frequencies both in a low frequency (LF) and a high frequency (HF) band, where the radiation surfaces of said HF and LF bands at least have a common region. Several solutions for transmission (and reception) of LF and HF pulses through the same radiation surface are given. The arrays and elements can be of a general type, for example linear phased or switched arrays, or annular arrays or elements with division in both azimuth and elevation direction, like a 1.5D, a 1.75D and a full 2D array. The LF and HF element division and array apertures can also be different.

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

International application No
PCT/NO2006/000285A. CLASSIFICATION OF SUBJECT MATTER
INV. B06B1/06

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)
B06B H01L H04R

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 practical, 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	JP 2005 103193 A (HITACHI MEDICAL CORP; JIKEI UNIV SCHOOL OF MEDICINE) 21 April 2005 (2005-04-21) abstract; figure 1 -----	1-6
X	JP 05 277102 A (MATSUSHITA ELECTRIC IND CO LTD) 26 October 1993 (1993-10-26) abstract; figure 1 -----	1-6
A	JP 04 273699 A (TOKYO SHIBAURA ELECTRIC CO) 29 September 1992 (1992-09-29) abstract; figure 2 -----	1-6
A	WO 2004/007098 A (EAGLE ULTRASOUND AS [NO]; ANGELSEN BJOERN A J [NO]; JOHANSEN TONNI F []) 22 January 2004 (2004-01-22) page 7, line 28 - line 31 page 10, line 43 - line 51 ----- -/--	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 document but published on or after the international filing date
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- *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.
- *Z* document member of the same patent family

Date of the actual completion of the international search

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Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

International application No
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	MCLEAN J ET AL: "CMUTs with dual electrode structure for improved transmit and receive performance" ULTRASONICS SYMPOSIUM, 2004 IEEE MONTREAL, CANADA 23-27 AUG. 2004, PISCATAWAY, NJ, USA, IEEE, 23 August 2004 (2004-08-23), pages 501-504, XP010783993 ISBN: 0-7803-8412-1	10,12
A	page 501, right-hand column; figure 1 page 504, left-hand column; figure 8	7
P,X	WO 2005/120355 A (OLYMPUS CORP [JP]; ADACHI HIDEO [JP]; OMURA MASAYOSHI [JP]; MIZUNUMA A) 22 December 2005 (2005-12-22) abstract; figure 1	10,12
X	US 2004/012307 A1 (FUKUDA HIROSHI [JP] ET AL) 22 January 2004 (2004-01-22) paragraph [0024]; figure 2 paragraph [0032] - paragraph [0038]; figure 8	14-17
X	JP 02 251754 A (HITACHI CONSTRUCTION MACHINERY) 9 October 1990 (1990-10-09) abstract; figures 1,2	14-19
X	JP 2002 336248 A (ALOKA CO LTD) 26 November 2002 (2002-11-26) abstract; figure 1	14,15,17

INTERNATIONAL SEARCH REPORT

International application No.
PCT/N02006/000285

Box 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 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 fee, this Authority did not invite payment of any additional fee.
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.
- 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: 1-6

Ultrasound array with LF and HF piezolayers separated by an acoustic isolation section.

2. claims: 7-13

Ultrasound array with LF and HF sections, one of which is made of cmut/pmut transduction membranes.

3. claims: 14, 16 (when dependent on claim 14), 17 (alternatives a) or b))

Ultrasound array with LF and HF sections, the outer boundary of the LF section being outside the outer boundary of the HF section.

4. claims: 15, 16 (when dependent on claim 15), 17 (alternatives c) or d)), 18, 19

Ultrasound array with LF and HF sections, the region around the center of the HF section being without active LF elements.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/N02006/000285

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