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(88) Date of publication of the international search report:
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(54) Title: ULTRASONIC TRANSDUCER SYSTEM

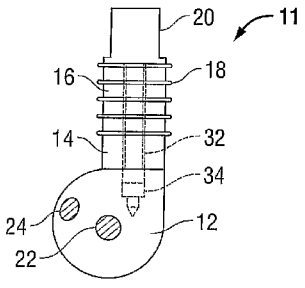

FIG. 1B

(57) Abstract: A transducer stack (10) comprises rings (16) of piezo-electric ceramic alternating with metal electrodes (18) along a threaded central shaft (32) extending from a titanium back plate (20). A spacer element (14) threaded on to the shaft (32) holds the ceramic rings (16) and electrodes (18) in compression against the back plate (20). The transducer stack (10) is mountable eccentrically to a horn (12) of an ultrasonically-vibratable tool, away from an axis of an elongate waveguide (56) extending from the horn (12). The transducer stack (10) may vibrate in a flexural mode perpendicular to the waveguide (56), generating torsional mode ultrasonic vibrations in the horn (12) and waveguide (56), or in a flexural mode parallel to the waveguide (56), generating longitudinal mode ultrasonic vibrations in the horn (12) and waveguide (56).

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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
INV. A61B17/32 B06B1/00 B06B3/00 B06B1/06
ADD. A61B17/22

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 B06B A61F

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 A	US 5 180 363 A (IDEMOTO MORITO [JP] ET AL) 19 January 1993 (1993-01-19) column 2, line 29 - column 4, line 11; figures 1-21 column 4, line 36 - line 65 column 6, line 23 - column 8, line 41	1-7, 32-35 8-9
X	US 5 728 130 A (ISHIKAWA MANABU [JP] ET AL) 17 March 1998 (1998-03-17) column 5, line 26 - column 6, line 51; figures 1,2,13,18-24, column 10, line 15 - line 50 column 12, line 13 - column 13, line 47	1-9, 32-35
X	WO 00/00096 A1 (ALCON LAB INC [US]) 6 January 2000 (2000-01-06) page 2, line 10 - page 4, line 31; figures 1-4	1-9, 31-35

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[X] Further documents are listed in the continuation of Box C. [X] 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

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Date of the actual completion of the international search	Date of mailing of the international search report
2 December 2009	19/02/2010
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 Neef, Tatjana

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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	US 2003/045887 A1 (SAKURAI TOMOHISA [JP] ET AL) 6 March 2003 (2003-03-06) paragraph [0014] - paragraph [0021]; figures 1-11 paragraph [0053] - paragraph [0065] paragraph [0087] - paragraph [0091] paragraph [0104] - paragraph [0108]	1-9, 32-35
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X	WO 01/32087 A1 (PALADINO JOSIP [HR]; STIMAC TIHOMIR [HR]) 10 May 2001 (2001-05-10)	1-7, 32-35
A	page 7, paragraph 1 - page 9, paragraph 1; figures 1,2	8-9
X	US 5 897 569 A (KELLOGG SCOTT [US] ET AL) 27 April 1999 (1999-04-27)	1-7, 32-35
A	column 4, line 53 - column 7, line 29	8-9
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A	paragraph [0033] - paragraph [0037]; figures 1-4,9,10 paragraph [0045]	8-9
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A	US 4 922 902 A (WUCHINICH DAVID G [US] ET AL) 8 May 1990 (1990-05-08) column 4, line 13 - column 12, line 59; figures 1,5 column 14, line 45 - column 18, line 67	1-9, 32-35
A	EP 0 970 660 A (ETHICON ENDO SURGERY INC [US]) 12 January 2000 (2000-01-12) paragraph [0004]; figures 1-9 paragraph [0015] - paragraph [0039]	1-9, 32-35

INTERNATIONAL SEARCH REPORT

International application No.
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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.:

1-9, 32-35

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: 1-9, 32-35

Transducer stack adapted to generate ultrasonic vibrations, and method of producing the same, stack comprises alternating arrangement of piezo-electric elements and laminar electrodes, fastened together between back plate means and spacer means, mountable to an ultrasonically vibratable tool and the stack being operable to produce a plurality of ultrasonic- frequency vibrational modes, flexural modes in two substantially orthogonal planes

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2. claims: 1, 10-14, 32, 36-40

Transducer stack adapted to generate ultrasonic vibrations, and method of producing the same, stack comprises alternating arrangement of piezo-electric elements and laminar electrodes, fastened together between back plate means and spacer means, mountable to an ultrasonically vibratable tool, wherein transducer stack is tunable

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3. claims: 15-31

Ultrasonically vibratable tool means comprising an ultrasonic horn having waveguide means extending thereforem and a transducer stack mounted to the horn eccentrically to a longitudinal axis of the waveguide; the transducer stack with alternating arrangement of piezo-electric elements and laminar electrodes, fastened together between back plate means and spacer means,

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
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