

(19)



(11)

EP 2 158 846 A3

(12)

EUROPEAN PATENT APPLICATION

(88) Date of publication A3:
25.01.2012 Bulletin 2012/04

(51) Int Cl.:
A61B 8/08 (2006.01)

(43) Date of publication A2:
03.03.2010 Bulletin 2010/09

(21) Application number: **09011024.8**

(22) Date of filing: **27.08.2009**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK SM TR
Designated Extension States:
AL BA RS

• **Toshiba Medical Systems Corporation**
Otawara-shi,
Tochigi-ken 324-8550 (JP)

(30) Priority: **29.08.2008 JP 2008222646**

(72) Inventors:
• **Sato, Takeshi**
Otawara-shi
Tochigi 324-8550 (JP)
• **Mine, Yoshitaka**
Otawara-shi
Tochigi 324-8550 (JP)

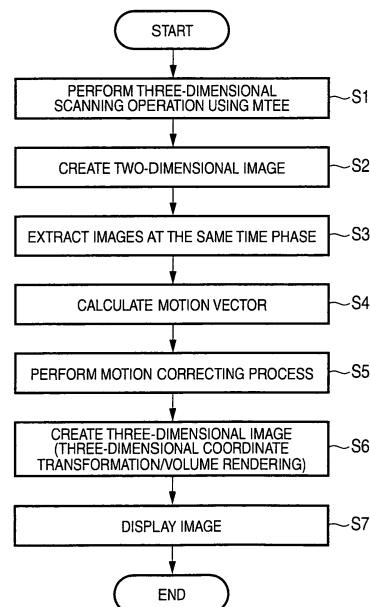
(71) Applicants:
• **Kabushiki Kaisha Toshiba**
Minato-ku,
Tokyo 105-8001 (JP)

(74) Representative: **Kramer - Barske - Schmidtchen**
Landsberger Strasse 300
80687 München (DE)

(54) **Ultrasonic diagnostic apparatus, ultrasonic image processing apparatus, and ultrasonic image processing method**

(57) When scanning a three-dimensional region while rotating a scanning plane about a predetermined axis (rotation axis), an ultrasonic diagnostic apparatus calculates a motion vector of a motion scanning plane (ultrasonic sectional layer) using ultrasonic image data in the rotation axis and corrects a positional mismatch between the scanning planes using the calculated motion vector. The motion vector is calculated and the positional mismatch between the sectional layers, using at least one frame having a cardiac time phase close to the frame of which the motion should be corrected and being spatially close to the frame, in addition to the frames at the same cardiac time phase as the frame of which the motion should be corrected.

FIG. 3



EP 2 158 846 A3



EUROPEAN SEARCH REPORT

Application Number
EP 09 01 1024

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 6 222 948 B1 (HOSSACK JOHN A [US] ET AL) 24 April 2001 (2001-04-24) * columns 4-5 * * figure 6 *	1-3, 10-12	INV. A61B8/08
Y	EP 0 961 135 A1 (TOMTEC IMAGING SYST GMBH [DE]) 1 December 1999 (1999-12-01) * paragraphs [0026] - [0043] * * figures 2, 3, 4, 5, 7 *	2,10,12	
A	EP 1 609 422 A1 (GEN ELECTRONIC COMPANY [US]) 28 December 2005 (2005-12-28) * paragraphs [0008], [0015], [0017] * * figures 2, 3, 4 *	1,3,11	
A	US 2008/146923 A1 (MEJIA CLAUDIO PATRICIO [US] ET AL) 19 June 2008 (2008-06-19) * paragraphs [0038] - [0057] * * figures 2, 5 *	1,3,11	
A	US 2007/232908 A1 (WANG YANWEI [US] ET AL) 4 October 2007 (2007-10-04) * paragraphs [0076], [0086], [0090], [0100] * * figure 1A *	1,3,11	TECHNICAL FIELDS SEARCHED (IPC) A61B G01S G06T
The present search report has been drawn up for all claims			
2	Place of search Berlin	Date of completion of the search 15 December 2011	Examiner Dydenko, Igor
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

EPO FORM 1503 03.82 (P04C01)



EUROPEAN SEARCH REPORT

Application Number
EP 09 01 1024

DOCUMENTS CONSIDERED TO BE RELEVANT				
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)	
A	TASLER M ET AL: "AN AUTOMATIC DATA ACQUISITION SYSTEM FOR 3D RECONSTRUCTION IN ECHOCARDIOGRAPHY", PROCEEDINGS OF THE 8TH. IEEE SYMPOSIUM ON COMPUTER-BASED MEDICAL SYSTEMS. LUBBOCK, JUNE 9 - 10, 1995; [PROCEEDINGS OF THE SYMPOSIUM ON COMPUTER-BASED MEDICAL SYSTEMS], LOS ALAMITOS, IEEE COMP. SOC. PRES, US, vol. SYMP. 8, 9 June 1995 (1995-06-09), pages 299-306, XP000547082, ISBN: 978-0-7803-2945-4 * the whole document *	1,3,11		
X	US 6 364 835 B1 (HOSSACK JOHN A [US] ET AL) 2 April 2002 (2002-04-02) * column 1, line 65 - column 3, line 52 * * figures 1, 5, 9a, 9b *	2,4-8, 10,12		
X	US 6 443 894 B1 (SUMANAWEEERA THILAKA S [US] ET AL) 3 September 2002 (2002-09-03) * column 6, line 51 - column 8, line 42 * * figures 1, 2 *	2,4-10, 12		TECHNICAL FIELDS SEARCHED (IPC)
A	WO 01/10303 A1 (ACUSON [US]) 15 February 2001 (2001-02-15) * page 2, lines 5-16 * * page 5, lines 1-15 * * page 7, line 15 - page 8, line 15 * * figures 1, 3, 5 *	2,10,12		
Y	US 6 558 325 B1 (PANG LINYONG [US] ET AL) 6 May 2003 (2003-05-06) * column 2, lines 11-44 * * column 3, lines 12-61 * * column 6, lines 24-52 * * figures 1, 2 *	2,10,12		
A		4-9		
----- -/--				
The present search report has been drawn up for all claims				
Place of search Berlin		Date of completion of the search 15 December 2011	Examiner Dydenko, Igor	
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document		

2
EPO FORM 1503 03.02 (P04C01)



EUROPEAN SEARCH REPORT

Application Number
EP 09 01 1024

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 2004/006273 A1 (KIM NAM CHUL [KR] ET AL) 8 January 2004 (2004-01-08) * paragraphs [0028] - [0033] * -----	2,10,12	
A	US 6 234 968 B1 (SUMANAWEEERA THILAKA S [US] ET AL) 22 May 2001 (2001-05-22) * column 5, lines 42-58 * * figure 3(c) * -----	1,3,11	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
Place of search Berlin		Date of completion of the search 15 December 2011	Examiner Dydenko, Igor
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03.02 (P04C01)



Application Number

EP 09 01 1024

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

- Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):
- No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

- All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.
- Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:
- None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:
- The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).



**LACK OF UNITY OF INVENTION
SHEET B**

Application Number
EP 09 01 1024

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1, 3, 11(completely); 4-9(partially)

ultrasonic diagnostic apparatus and method for
three-dimensionally scanning while rotating a scanning plane
about a rotation axis, in such a way that the rotation axis
appears on the scanned images

2. claims: 2, 10(completely); 4-9(partially)

ultrasonic diagnostic apparatus having a multi-plane
transesophageal echocardiography probe

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 09 01 1024

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

15-12-2011

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6222948 B1	24-04-2001	US 6222948 B1	24-04-2001
		US 6360027 B1	19-03-2002

EP 0961135 A1	01-12-1999	AT 228252 T	15-12-2002
		DE 69809538 D1	02-01-2003
		DE 69809538 T2	25-09-2003
		EP 0961135 A1	01-12-1999
		JP 2000023984 A	25-01-2000

EP 1609422 A1	28-12-2005	EP 1609422 A1	28-12-2005
		JP 2006006935 A	12-01-2006
		US 2005283078 A1	22-12-2005

US 2008146923 A1	19-06-2008	NONE	

US 2007232908 A1	04-10-2007	US 2007232908 A1	04-10-2007
		WO 2007103737 A2	13-09-2007

US 6364835 B1	02-04-2002	NONE	

US 6443894 B1	03-09-2002	NONE	

WO 0110303 A1	15-02-2001	AU 6105500 A	05-03-2001
		US 6190321 B1	20-02-2001
		US 2002013528 A1	31-01-2002
		WO 0110303 A1	15-02-2001

US 6558325 B1	06-05-2003	NONE	

US 2004006273 A1	08-01-2004	JP 3934080 B2	20-06-2007
		JP 2003325519 A	18-11-2003
		KR 20030088091 A	17-11-2003
		US 2004006273 A1	08-01-2004

US 6234968 B1	22-05-2001	NONE	

专利名称(译)	超声波诊断装置，超声波图像处理装置和超声波图像处理方法		
公开(公告)号	EP2158846A3	公开(公告)日	2012-01-25
申请号	EP2009011024	申请日	2009-08-27
[标]申请(专利权)人(译)	株式会社东芝		
申请(专利权)人(译)	株式会社东芝		
当前申请(专利权)人(译)	株式会社东芝 东芝医疗系统公司		
[标]发明人	SATO TAKESHI MINE YOSHITAKA		
发明人	SATO, TAKESHI MINE, YOSHITAKA		
IPC分类号	A61B8/08		
CPC分类号	A61B8/08 A61B8/06 A61B8/13 A61B8/483 A61B8/488 A61B8/5276 A61B8/54 A61B8/543		
代理机构(译)	KRAMER - HARSH - 施密特陈		
优先权	2008222646 2008-08-29 JP		
其他公开文献	EP2158846A8 EP2158846A2		
外部链接	Espacenet		

摘要(译)

当在围绕预定轴（旋转轴）旋转扫描平面的同时扫描三维区域时，超声诊断设备使用旋转轴上的超声图像数据计算运动扫描平面（超声波截面层）的运动矢量并校正使用计算的运动矢量在扫描平面之间的位置不匹配。计算运动矢量并且使用至少一个帧的心脏时间相位接近于应该校正运动的帧并且在空间上接近帧的截面层之间的位置不匹配，以及在帧处的帧。与应该校正运动的帧相同的心脏时相。

FIG. 3

