(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 062 534 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
**16.04.2014 Bulletin 2014/16**

(21) Application number: **07807021.6**

(22) Date of filing: **10.09.2007**

(51) Int Cl.:
***A61B 8/14*** *(2006.01)* ***G01S 7/52*** *(2006.01)*
***G01S 15/89*** *(2006.01)*

(86) International application number:
**PCT/JP2007/067612**

(87) International publication number:
**WO 2008/032685 (20.03.2008 Gazette 2008/12)**

(54) **ULTRASONOGRAPHIC DEVICE**

ULTRASCHALLGERÄT

DISPOSITIF À ULTRASONS

(84) Designated Contracting States:
**DE GB IT**

(30) Priority: **11.09.2006 JP 2006245223**

(43) Date of publication of application:
**27.05.2009 Bulletin 2009/22**

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(56) References cited:
**WO-A1-2004/021041**
**JP-A- 59 118 142**
**JP-A- 2000 139 906**
**JP-A- 2004 195 024**
**JP-A- 2005 185 333**
**US-A1- 2003 045 795**
**US-A1- 2005 228 280**
**US-B1- 6 468 216**
**US-B1- 6 544 175**

- **DOYLE M. ET AL.: 'Block Regional Interpolation Scheme for k-Space (BRISK): A Rapid Cardiac Imaging Technique' MAGNETIC RESONANCE IN MEDICINE vol. 33, no. 2, February 1995, pages 163 - 170, XP000482942**



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## Description

### Technical Field

**[0001]** This invention relates to an ultrasonic diagnostic apparatus for scanning a region of interest at high speed and other regions at low speed.

### Background Art

**[0002]** As shown in FIGs. 5A and 5B, a conventional ultrasonic diagnostic apparatus is configured so as to perform drive control of a two-dimensional array probe 1 formed by arranging a plurality of ultrasonic elements two-dimensionally so as to intermittently perform three-dimensional scanning of a target with the two-dimensional array probe. In an interval of three-dimensional scanning T3 performed intermittently, two-dimensional scanning T2 is performed at a scanning rate higher than the scanning rate at the three-dimensional scanning time and a three-dimensional image is formed based on a method obtained by the three-dimensional scanning and a two-dimensional image is formed based on a method obtained by the two-dimensional scanning (for example, refer to patent document 1).

**[0003]** Patent document 1: Japanese Patent Laid-Open No. 2000-139906 (paragraphs 0009 and 0010 and FIGs. 2 and 4)

### Disclosure of the Invention

### Problems to be Solved by the Invention

**[0004]** However, in the conventional ultrasonic diagnostic apparatus, there is a problem in that two-dimensional (main) scanning cannot be performed while three-dimensional (sub) scanning is performed.

**[0005]** The invention is embodied for solving the problem in the related art and it is an object of the invention to provide an ultrasonic diagnostic apparatus that can perform main scanning in a main scan region while performing subscanning in a subscan region and performs the main scanning of the main scan region of a region of interest at high speed and the subscanning of the subscan region of other regions at low speed. Means For Solving the Problems

**[0006]** An ultrasonic diagnostic apparatus of the invention as defined in claim 1 is provided.

**[0007]** According to the invention, main scanning of the main scan region can be performed while subscanning of the subscan region is performed, and the main scanning of the main scan region of the region of interest can be performed at high speed and the subscanning of the subscan region of other regions can be performed at lower speeds.

**[0008]** The ultrasonic diagnostic apparatus of the invention has the configuration wherein in the whole scan region made up of the main scan region and the subscan region, the main scan region is main-scanned at equal time intervals regardless of where the main scan region is placed in the whole scan region.

**[0009]** According to the configuration, if the tissue in the main scan region displaces on the time base, it becomes easy to keep track of the time displacement.

**[0010]** Further, the ultrasonic diagnostic apparatus of the invention has the configuration wherein the scan region spreads to a two-dimensional or three-dimensional region and a plurality of scan regions exist.

**[0011]** According to the configuration, when the region of interest exists in a plurality of two-dimensional or three-dimensional regions, the scanning rate of the main scan region of the region of interest can be increased.

**[0012]** Further, the ultrasonic diagnostic apparatus of the invention has the configuration wherein the plurality of scan regions cross each other.

**[0013]** According to the configuration, if a plurality of scan regions cross each other, the scanning rate of the main scan region of the region of interest can be increased.

**[0014]** Further, the ultrasonic diagnostic apparatus of the invention has the configuration wherein the number of irradiation times with a transmission ultrasonic beam per unit time is made different in the subscan region.

**[0015]** According to the configuration, the subscanning rate of the region of comparatively high interest in the subscan region can be increased.

**[0016]** Further, the ultrasonic diagnostic apparatus of the invention has the configuration wherein it has a scan converter for updating a display image in real time upon each completion of transmission ultrasonic beam scanning made up of the main scanning of the main scan region multiple times and the subscanning of the subscan region in the scan region, and the scan converter can set different persistence in the main scan region and the subscan region.

**[0017]** According to the configuration, the scanning speed of the transmission ultrasonic beam in the scan region and the image update speed of a display can be matched with each other.

**[0018]** Further, the ultrasonic diagnostic apparatus of the invention has the configuration a marker is displayed on a boundary between the main scan region and the subscan region.

**[0019]** According to the configuration, the boundary between the main scan region and the subscan region can be clearly identified.

### Advantages of the Invention

**[0020]** The invention can provide the ultrasonic diagnostic apparatus having the advantage that it can perform main scanning of the main scan region between subscanning of one subscan region and subscanning of another subscan region, can continue the main scanning of the main scan region of the region of interest, and can perform the main scanning of the region of interest at

high speed and subscanning of other regions at low speed by providing the configuration wherein the scan region is divided into the main scan region and the subscan region and the subscan region is divided into the small regions and the main scanning of the main scan region is performed between subscanning of one small region and subscanning of another small region.

Brief Description of the Drawings

**[0021]**

FIG. 1 is a drawing to show an outline of scanning of an ultrasonic diagnostic apparatus according to a first example and scanning timings.

FIG. 2 is a drawing to show an outline of scanning of an ultrasonic diagnostic apparatus according to a second example, a scan region, and scanning timings.

FIG. 3 is a drawing to show an outline of scanning of an ultrasonic diagnostic apparatus according to the embodiment of the invention and scanning timings.

FIG. 4 is a block diagram of a display section of an ultrasonic diagnostic apparatus according to a third example and is a drawing to show scanning timings.

FIG. 5 is a drawing to show an outline of scanning of a conventional ultrasonic diagnostic apparatus and scanning timings.

Description of Reference Numerals

**[0022]**

| | |
|---|---|
| 1 | Two-dimensional array probe |
| Am | Main scan region |
| As1 | Small region |
| As2 | Small region |
| As3 | Small region |
| As4 | Small region |
| 2 | Scan converter |
| 3 | Display section |
| 4 | Memory |

Best Mode for Carrying out the Invention

**[0023]** An ultrasonic diagnostic apparatus according to the embodiment of the invention and comparative examples will be discussed below with the accompanying drawings:

**[0024]** FIG. 1A shows an outline of scanning in the ultrasonic diagnostic apparatus according to a first example and FIG. 1B shows scanning timings.

**[0025]** In FIG. 1A, a two-dimensional array probe 1 formed by arranging a plurality of ultrasonic elements two-dimensionally transmits an ultrasonic beam to a three-dimensional region and receives a reflected signal. The ultrasonic beam scans a region on a pyramid, and the scan region is divided into a main scan region Am of a region of interest and a subscan region. The subscan region is divided into small regions As1, As2, As3, and As4. In FIG. 1B, the main scanning time of the main scan region Am is indicated as Tm, the subscanning time of the small region As1 is indicated as Ts1, the subscanning time of the small region As2 is indicated as Ts2, the subscanning time of the small region As3 is indicated as Ts3, and the subscanning time of the small region As4 is indicated as Ts4.

**[0026]** The operation of the ultrasonic diagnostic apparatus configured as described above will be discussed with FIGs. 1A and 1B.

**[0027]** To begin with, the small region As1 is subscanned at the time Ts1. Next, the main scan region Am is main-scanned at the time Tm. Next, the small region As2 is subscanned at the time Ts2. Next, the main scan region Am is main-scanned at the time Tm. Next, the small region As3 is subscanned at the time Ts3. Next, the main scan region Am is main-scanned at the time Tm. Next, the small region As4 is subscanned at the time Ts4. Next, the main scan region Am is main-scanned at the time Tm. Scanning the scan region is completed in a time Tc1. Thus, while the whole scan region is scanned once, the main scan region Am of the region of interest can be main-scanned four times. Also in a time Tc2, scanning is performed in a similar manner. Thus, it is also made possible to main-scan the main scan region Am of the region of interest at equal intervals during the scan region is scanned.

**[0028]** The scan region is divided into the main scan region Am of the region of interest and the subscan region and the subscan region is divided into the small regions As1, As2, As3, and As4, whereby the main scan region Am of the region of interest can be main-scanned multiple times while the whole scan region is scanned once. It is also made possible to main-scan the main scan region Am of the region of interest at equal intervals during the scan region is scanned, and if the tissue in the main scan region displaces on the time base, it becomes easy to keep track of the time displacement.

**[0029]** Next, FIG. 2A shows an outline of scanning in an ultrasonic diagnostic apparatus according to a second example, FIG. 2B shows scan regions, and FIG. 2C shows scanning timings.

**[0030]** In FIG. 2A, a plurality of scan regions exist as scan regions R1 and R2. The scan regions R1 and R2 cross each other. In FIG. 2B, the scan region R1 is divided into a main scan region Am and a subscan region and the subscan region is divided into small scan regions As1 and As2. The scan region R2 is divided into a main scan region am and a subscan region and the subscan region is divided into small scan regions as1 and as2. In FIG. 2C, the main scanning time of the main scan region Am is indicated as Tm, the subscanning time of the small region As1 is indicated as Ts1, the subscanning time of the small region As2 is indicated as Ts2, the main scanning time of the main scan region am is indicated as tm,

the subscanning time of the small region as1 is indicated as ts1, and the subscanning time of the small region as2 is indicated as ts2.

**[0031]** The operation of the ultrasonic diagnostic apparatus configured as described above will be discussed with FIGs. 2B and 2C.

**[0032]** To begin with, the small region As1 is subscanned at the time Ts1. Next, the main scan region Am is main-scanned at the time Tm. Next, the small region As2 is subscanned at the time Ts2. Next, the main scan region Am is main-scanned at the time Tm. Scanning the scan region R1 is thus completed. Next, the small region as1 is subscanned at the time ts1. Next, the main scan region am is main-scanned at the time tm. Next, the small region as2 is subscanned at the time ts2. Next, the main scan region am is main-scanned at the time tm. Scanning the scan region R2 is thus completed. Thus, while the scan regions R1 and R2 are scanned each once in a time Tc1, the main scan regions Am and am of regions of interest can be main-scanned twice. Also in a time Tc2, scanning is performed in a similar manner. In FIG. 2C, the main scan regions are main-scanned in the order of Am, Am, am, and am, but can also be main-scanned in the order of Am, am, Am, and am. Thus, it is also made possible to main-scan the main scan regions Am and am of the regions of interest at equal intervals.

**[0033]** A plurality of scan regions exist as the scan regions R1 and R2, the scan regions R1 and R2 cross each other, the scan region R1 is divided into the main scan region Am and the subscan region, the subscan region is divided into the small scan regions As1 and As2, the scan region R2 is divided into the main scan region am and the subscan region, and the subscan region is divided into the small scan regions as1 and as2, whereby the main scan regions Am and am of the regions of interest can be main-scanned twice while the scan regions R1 and R2 are scanned each once.

**[0034]** Next, FIG. 3A shows an outline of scanning in an ultrasonic diagnostic apparatus according to the embodiment of the invention and FIG. 3B shows scanning timings.

**[0035]** In FIG. 3A, a scan region R1 is divided into a main scan region Am and a subscan region and the subscan region is divided into small scan regions As1, As2, and As3. In FIG. 3B, the main scanning time of the main scan region Am is indicated as Tm, the subscanning time of the small region As1 is indicated as Ts1, the subscanning time of the small region As2 is indicated as Ts2, and the subscanning time of the small region As3 is indicated as Ts3.

**[0036]** The operation of the ultrasonic diagnostic apparatus configured as described above will be discussed with FIG. 3B.

**[0037]** To begin with, the small region As1 is subscanned at the time Ts1. Next, the main scan region Am is main-scanned at the time Tm. Next, the small region As2 is subscanned at the time Ts2. Next, the main scan region Am is main-scanned at the time Tm. Next, the small region As1 is subscanned at the time Ts1. Next, the main scan region Am is main-scanned at the time Tm. Next, the small region As2 is subscanned at the time Ts2. Next, the main scan region Am is main-scanned at the time Tm. Next, the small region As3 is subscanned at the time Ts3. Next, the main scan region Am is main-scanned at the time Tm. Scanning the scan region R1 is completed in a time Tc1. Thus, while the scan region R1 is scanned once, the main scan region Am of a region of interest can be main-scanned four times and further the number of irradiation times with a transmission ultrasonic beam per unit time is made different in the subscan region, whereby the small scan regions As1 and As2 of the subscan region can be subscanned each twice and the small scan region As3 of the subscan region can be subscanned once. Also in a time Tc2, scanning is performed in a similar manner. Thus, the subscanning rate of the region of comparatively high interest in the subscan region can be increased.

**[0038]** As described above, according to the ultrasonic diagnostic apparatus of the embodiment of the invention, the number of irradiation times with a transmission ultrasonic beam per unit time is made different in the subscan region, whereby the subscanning rate of each of the small scan regions As1 andAs2 of comparatively high interest in the subscan region can be made higher than that of the small scan region As3 of the subscan region.

**[0039]** FIG. 4A shows blocks including a display section of an ultrasonic diagnostic apparatus according to a third example and FIG. 4B shows scanning timings.

**[0040]** In FIG. 4A, a reception signal from a two-dimensional array resonator is converted into an image signal in a scan converter 2. The image signal of the scan converter 2 is stored in memory 4. The image signal of the scan converter 2 is displayed on a display section 3. A scan region R1 is displayed on the display section 3. The scan region R1 is divided into a main scan region Am and a subscan region and the subscan region is divided into small scan regions As1 and As2. A marker 4 is displayed on each boundary between the main scan region Am and the subscan region, namely, the boundary between the main scan region Am and the small scan region As1 and the boundary between the main scan region Am and the small scan region As2. In FIG. 4B, the main scanning time of the main scan region Am is indicated as Tm, the subscanning time of the small region As1 is indicated as Ts1, and the subscanning time of the small region As2 is indicated as Ts2.

**[0041]** The operation of the ultrasonic diagnostic apparatus configured as described above will be discussed with FIGs. 4A and 4B.

**[0042]** To begin with, the small region As1 is subscanned at the time Ts1. Next, the main scan region Am is main-scanned at the time Tm. Next, the small region As2 is subscanned at the time Ts2. Next, the main scan region Am is main-scanned at the time Tm. Thus, the main scan region Am of a region of interest can be main-scanned twice while the whole scan region is scanned

once. Also in a time Tc2, scanning is performed in a similar manner. The image data at the time Ts1, the image data at the time Tm, and the image data at the time Ts2 form an image frame F1. Likewise, the image data at the time Ts2, the image data at the time Tm, and the image data at the time Ts1 form an image frame F2. Frames F3, F4, and F5 are formed in such a manner. The formed frames are stored in the memory 4. On the other hand, the display section produces display at the intervals of the times Tc1 and Tc2. The frames F1, F3, and F5 are displayed in real time in scanning the region R1. However, since all frames are stored in the memory 4, if the image read speed from the memory 4 is decreased, all image frames can be displayed on the display section 3.

**[0043]** In the scan converter 2, persistence (afterimage effect) can also be given to an image Vm in the main scan region Am and images Vs1 and Vs2 in the small regions As1 and As2 of the subscan region. In this case, comparatively strong persistence may be given to the main scan region because the number of main scanning times per unit time is large, and comparatively weak persistence may be given to the subscan region because the number of subscanning times per unit time is small. Alternatively, if the tissue in the main scan region displaces largely on the time base, comparatively weak persistence may be given to the main scan region and comparatively strong persistence may be given to the subscan region.

**[0044]** The scan converter is provided for updating the display image in real time upon each completion of transmission ultrasonic beam scanning made up of the main scanning of the main scan region multiple times and the subscanning of the subscan region in the scan region, whereby the scanning speed of the transmission ultrasonic beam in the scan region and the image update speed of the display can be matched with each other.

**[0045]** Further, the image persistence corresponding to the main scan region is made different from the image persistence corresponding to the subscan region, whereby image display suited for high-speed displacement of the tissue in the region of interest of the main scan region and low-speed displacement of the tissue in the subscan region can be produced.

**[0046]** In the embodiment described above, if both the main scan region and the subscan region are obtained by two-dimensional scanning and the two-dimensional scanning faces are on the same plane, the probe 1 may be a one-dimensional array.

Industrial Applicability

**[0047]** As described above, the scan region is divided into the main scan region and the subscan region and the subscan region is divided into the small regions and main scanning of the main scan region is performed between subscanning of one small region and subscanning of another small region, whereby the ultrasonic diagnostic apparatus according to the invention has the advantage that main scanning of the main scan region can be performed between subscanning of one subscan region and subscanning of another subscan region and the main scanning of the main scan region of the region of interest can be continued, and is useful as an ultrasonic diagnostic apparatus for scanning the region of interest at high speed and other regions at low speed or the like.

## Claims

1. An ultrasonic diagnostic apparatus, configured such that, a scan region (R1) is divided into a main scan region (Am) and a subscan region and the subscan region is divided into a first, a second and a third small scan region (As1, As2 and As3), and the main scan region (Am) and the subscan region are made up of two-dimensional scan regions or three-dimensional scan regions and main scanning of the main scan region is performed between subscanning of one of the small regions and subscanning of another one of the small regions,
wherein in the whole scan region (R1) made up of the main scan region (Am) and the subscan region, the main scan region (Am) is main-scanned at equal time intervals,
**characterised in that**
the subscanning rates of the first (As1) and second (As2) small scan region in the subscan region are higher than that of the third small scan region (As3) of the subscan region.

2. The ultrasonic diagnostic apparatus as claimed in claim 1 wherein the scan regions can cross each other.

3. The ultrasonic diagnostic apparatus as claimed in any of claims 1 to 2 having a scan converter (2) for updating a display image in real time upon each completion of transmission ultrasonic beam scanning made up of the main scanning of the main scan region multiple times and the subscanning of the subscan region in the scan region, wherein the scan converter (2) can set different persistence in the main scan region (Am) and the subscan region.

4. The ultrasonic diagnostic apparatus as claimed in any of claims 1 to 3 wherein a marker (4) is displayed on a boundary between the main scan region (Am) and the subscan region.

## Patentansprüche

1. Eine Ultraschalldiagnosevorrichtung, so konfiguriert, dass ein Abtastbereich (R1) in einen Hauptabtastbereich (Am) und einen Unterabtastbereich unterteilt ist und der Unterabtastbereich in einen ersten,

einen zweiten und einen dritten kleinen Abtastbereich (As1, As2 und As3) unterteilt ist, und der Hauptabtastbereich (Am) aus zweidimensionalen Abtastbereichen oder dreidimensionalen Abtastbereichen besteht und die Hauptabtastung des Hauptabtastbereichs durchgeführt wird zwischen Unterabtastung von einem der kleinen Abtastbereiche und Unterabtastung von einem der anderen kleinen Abtastbereiche,
wobei in dem gesamten Abtastbereich (R1) bestehend aus dem Hauptabtastbereich (Am) und dem Unterabtastbereich, der Hauptabtastbereich (Am) in gleichen Zeitintervallen hauptabgetastet wird,
dadurch charakterisiert, dass
die Unterabtastraten des ersten (As1) und des zweiten (As2) kleinen Abtastbereiches in dem Unterabtastbereich höher sind, als die des dritten kleinen Abtastbereiches (As2) des Unterabtastbereiches.

2. Die Ultraschalldiagnosevorrichtung wie in Anspruch 1 beansprucht, worin sich die Abtastbereiche gegenseitig überschneiden können.

3. Die Ultraschalldiagnosevorrichtung wie in einem der Ansprüche 1 bis 2 beansprucht, einen Abtastumwandler (2) aufweisend, um ein Anzeigenbild aufzufrischen, nach jeder Komplettierung einer Ultraschallstrahlabtastung-transmission, bestehend aus der mehrfachen Hauptabtastung des Hauptabtastbereiches und der Unterabtastung des Unterabtastbereiches des Abtastbereiches, wobei der Abtastumwandler (2) eine verschiedene Persistenz in dem Hauptabtastbereich (Am) und dem Unterabtastbereich setzen kann.

4. Die Ultraschalldiagnosevorrichtung wie in einem der Ansprüche 1 bis 3 beansprucht, worin ein Marker (4) angezeigt wird auf einer Grenze zwischen dem Hauptabtastbereich (Am) und dem Unterabtastbereich.

**Revendications**

1. Appareil de diagnostic par ultrasons configuré de telle sorte qu'une zone de balayage (R1) est divisée en une zone de balayage principal (Am) et une zone de balayage auxiliaire, et la zone de balayage auxiliaire est divisée en une première, une deuxième et une troisième petites zones de balayage (As1, As2 et As3), tout comme la zone de balayage principal (Am) et la zone de balayage auxiliaire sont constituées de zones de balayage en deux dimensions ou de zones de balayage en trois dimensions, et le balayage principal de la zone de balayage principal est effectué entre le balayage auxiliaire d'une des petites zones et le balayage auxiliaire d'une autre des petites zones,
dans lequel, dans la totalité de la zone de balayage (R1), constituée de la zone de balayage principal (Am) et de la zone de balayage auxiliaire, la zone de balayage principal (Am) est balayée principalement à des intervalles de temps égaux,
**caractérisé en ce que**
la vitesse de balayage auxiliaire de la première (As1) et de la seconde (As2) petites zones de balayage dans la zone de balayage auxiliaire est supérieure à celle utilisée pour la troisième petite zone de balayage (As3) de la zone de balayage auxiliaire.

2. Appareil de diagnostic et par ultrasons selon la revendication 1, dans lequel les zones de balayage peuvent se croiser l'une avec l'autre.

3. Appareil de diagnostic par ultrasons selon l'une quelconque des revendications 1 et 2, possédant un convertisseur de balayage (2) permettant de mettre à jour une image à afficher en temps réel à chaque achèvement de transmission d'un balayage avec un faisceau par ultrasons constitué du balayage principal, de multiple fois, de la zone de balayage principal et du balayage auxiliaire de la zone de balayage auxiliaire dans la zone de balayage, dans lequel le convertisseur de balayage (2) peut établir une persistance différente dans la zone de balayage principal (Am) et dans la zone de balayage auxiliaire.

4. Appareil de diagnostic par ultrasons selon l'une quelconque des revendications 1 à 3, dans lequel un marqueur (4) est affiché sur une limite entre la zone de balayage principal (Am) et la zone de balayage auxiliaire.

FIG. 1A

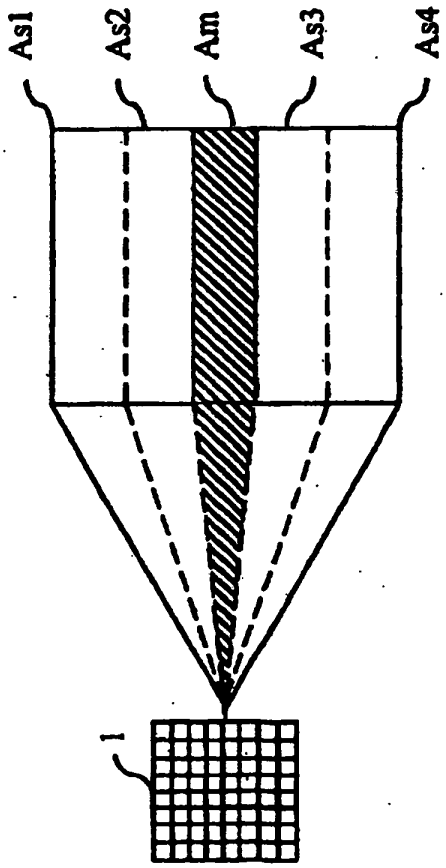

As1
As2
Am
As3
As4
1

FIG. 1B

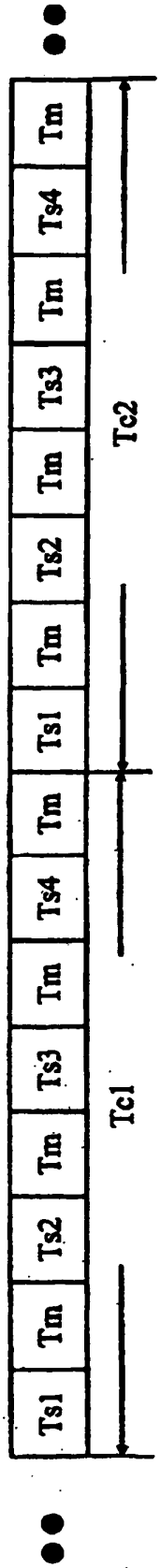

Ts1
Tm
Ts2
Tm
Ts3
Tm
Ts4
Tm
Ts1
Tm
Ts2
Tm
Ts3
Tm
Ts4
Tm
Tc1
Tc2

FIG. 2A

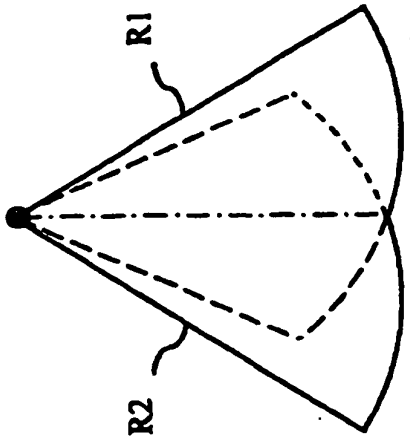



FIG. 2B

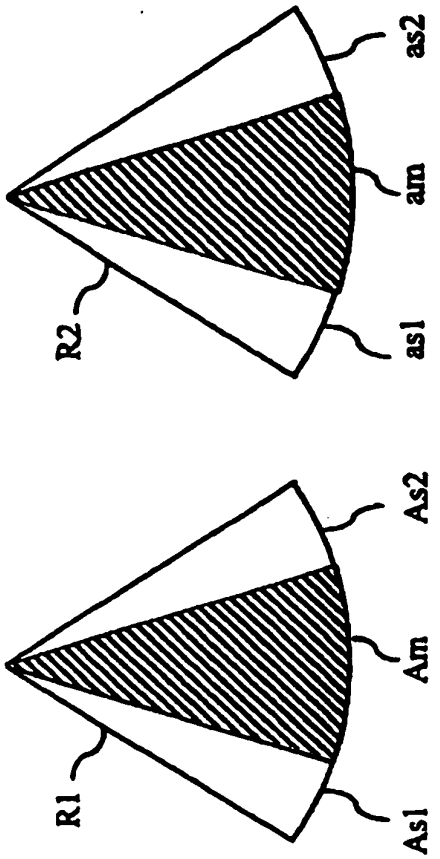



FIG. 2C

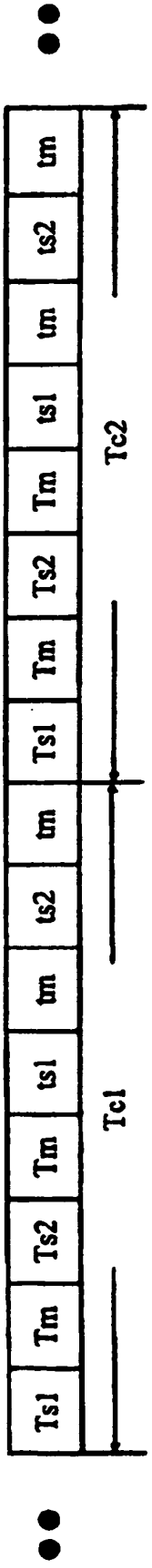


FIG. 3A

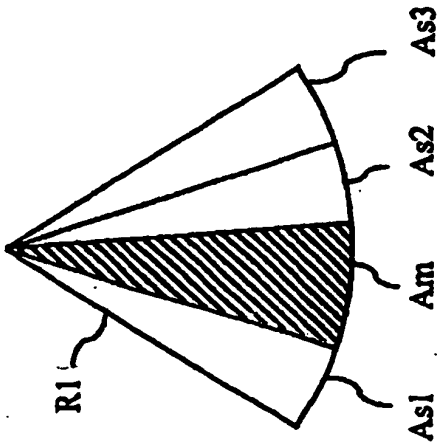

R1
As1
Am
As2
As3

FIG. 3B

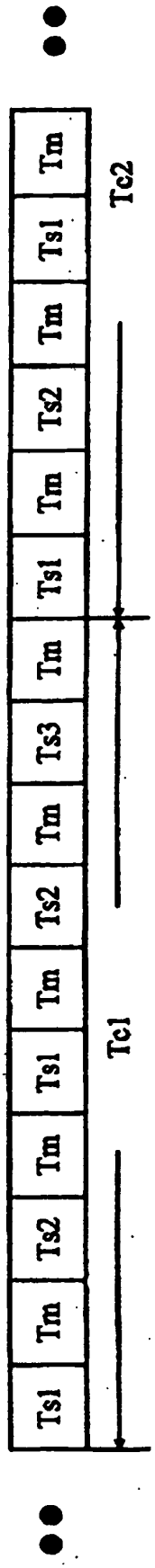

Ts1
Tm
Ts2
Tm
Ts1
Tm
Ts2
Tm
Ts3
Tm
Ts1
Tm
Ts2
Tm
Ts1
Tm
Tc1
Tc2

FIG. 4A

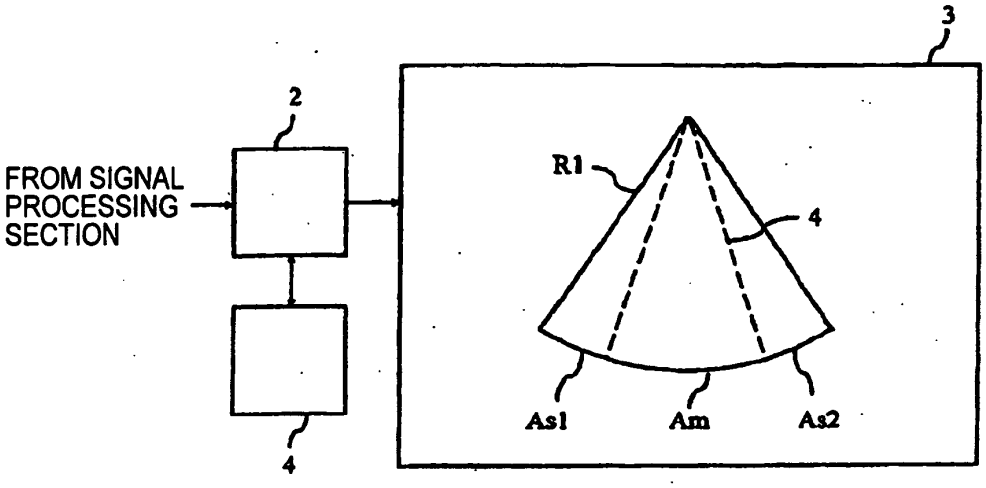

3
2
FROM SIGNAL PROCESSING SECTION
R1
4
As1
Am
As2
4

FIG. 4B

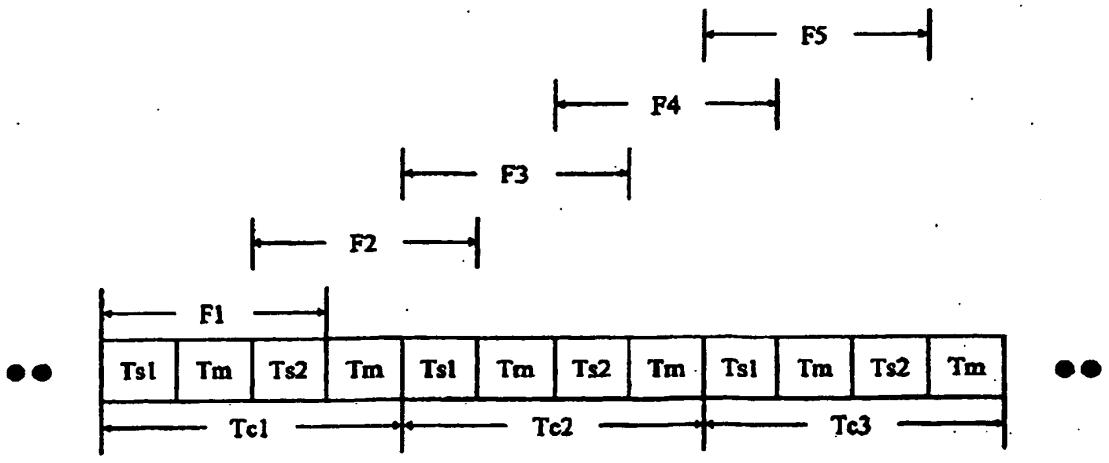

F5
F4
F3
F2
F1
Ts1
Tm
Ts2
Tm
Ts1
Tm
Ts2
Tm
Ts1
Tm
Ts2
Tm
Tc1
Tc2
Tc3

FIG. 5A

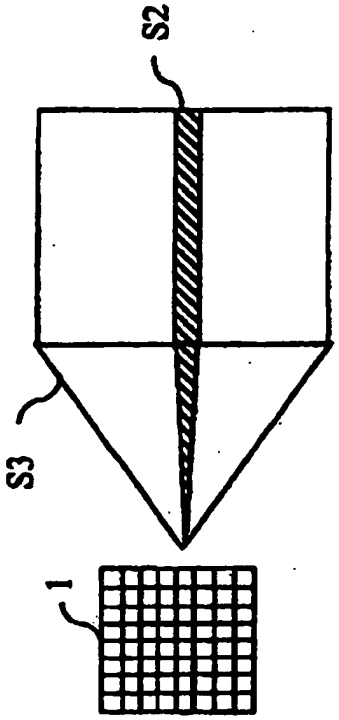
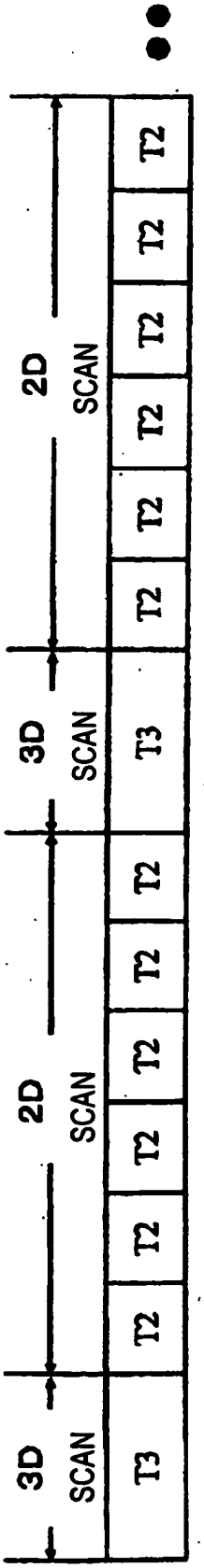

S2
S3
1

FIG. 5B


3D SCAN
T3
2D SCAN
T2
T2
T2
T2
T2
T2
3D SCAN
T3
2D SCAN
T2
T2
T2
T2
T2
T2

## REFERENCES CITED IN THE DESCRIPTION

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### Patent documents cited in the description


- JP 2000139906 A **[0003]**

| | | | |
|---|---|---|---|
| 专利名称(译) | 超声波设备 | | |
| 公开(公告)号 | EP2062534B1 | 公开(公告)日 | 2014-04-16 |
| 申请号 | EP2007807021 | 申请日 | 2007-09-10 |
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| IPC分类号 | A61B8/14 G01S7/52 G01S15/89 | | |
| CPC分类号 | A61B8/14 G01S7/52063 G01S7/52073 G01S7/52085 G01S15/8925 G01S15/8993 | | |
| 代理机构(译) | GRÜNECKER，KINKELDEY，STOCKMAIR & SCHWANHÄUSSER | | |
| 优先权 | 2006245223 2006-09-11 JP | | |
| 其他公开文献 | EP2062534A1<br>EP2062534A4 | | |
| 外部链接 | Espacenet | | |


摘要(译)

本发明的目的是提供一种超声诊断设备，其能够以低速扫描感兴趣区域和其他区域。在本发明的超声诊断设备中，通过布置多个超声元件而形成的二维阵列探头1二维地将超声波束发射到三维区域并接收反射信号。超声波束扫描金字塔上的区域，并且扫描区域被划分为感兴趣区域的主扫描区域Am和子扫描区域。子扫描区域分为小区域As1，As2，As3和As4。主扫描区域的主扫描次数大于子扫描区域的副扫描次数。


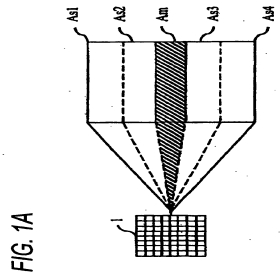


FIG. 1A

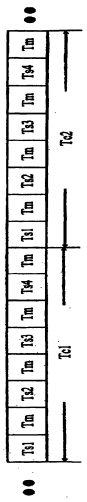


FIG. 1B