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(54) DEVICE FOR LOCALIZING AN OBJECT IN A TURBID MEDIUM

VORRICHTUNG ZUR LOKALISIERUNG EINES OBJEKTES IN EINEM TRÜBEN MEDIUM

DISPOSITIF DE LOCALISATION DESTINE A LOCALISER UN OBJET DANS UN MILIEU TROUBLE

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(56) References cited:
WO-A-88/01151
WO-A-96/20638
WO-A-98/42248
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Description

[0001] The invention relates to a device for imaging the interior of a turbid medium, which device includes

- a holder which has an open side bounded by an edge portion, encloses a measuring volume and is arranged to receive a matching liquid and the turbid medium,
- a light source for irradiating the turbid medium and the matching liquid,
- a photodetector for measuring a part of the light transported through the turbid medium and the matching liquid, and
- a control unit for reconstructing an image of the interior of the turbid medium on the basis of the measured intensities.

[0002] In the context of the present patent application the term light is to be understood to mean electromagnetic radiation of a wavelength in the range of from 400 to 1400 nm. Furthermore, a turbid medium is to be understood to mean a substance consisting of a material having a high light scattering coefficient. Examples in this respect are an Intralipid solution or biological tissue. Furthermore, an attenuation coefficient is to be understood to mean the inverse diffuse absorption distance κ which is given by $\kappa = \sqrt{3\mu_a\mu'_s}$, where μ'_s represents the reduced scattering coefficient and μ_a represents the absorption coefficient. The use of an optical medium to couple optical radiation into biological tissue is known form the international application **WO96/20638**

[0003] A device of the kind set forth is known from the patent application **WO 99/03394**. Such a device could be used for in vivo examinations for detecting the presence of any tumors in breast tissue of a human or animal female. To this end, the turbid medium, in this case being, for example, a part of the breast of the female to be examined, is immersed in the matching liquid in the holder. The holder also includes a first number of light sources and a second number of photodetectors which are distributed across the wall of the holder. The matching liquid provides optical coupling between the part of the breast to be imaged and the light sources and the photodetectors, respectively, in the holder. Furthermore, the optical parameters of the matching liquid, such as the reduced scattering coefficient μ'_s and the absorption coefficient μ_a, are approximately equal to those of the part of the breast to be imaged. Furthermore, the matching liquid prevents optical short-circuiting between the light sources and the photodetectors. In the context of the present patent application an optical short-circuit is to be understood to mean a light path between one of the light sources and one of the photodetectors in the holder which does not extend through the part of the breast in the holder. Finally, the matching liquid counteracts boundary effects in the reconstructed image; such effects are caused by the difference in optical contrast between the interior of the breast tissue and the remaining space in the holder. In order to measure the intensities, alternately one of the light sources irradiates the part of the breast to be imaged and the photodetectors measure a part of the light transported through the part of the breast to be imaged. These measurements are repeated until the part to be imaged has been irradiated by all light sources present in the holder. The results of the measurements are stored in a memory of the control unit. The control unit subsequently reconstructs the image of the interior of the part of the breast to be imaged from the measured intensity measurements.

[0004] It is a drawback of the known device that artefacts, for example contrast spots, are liable to occur in the reconstructed image of the part of the breast to be imaged. As a result, it is impossible to observe contrast differences which are possibly caused by the presence of a tumor which is small in comparison with such a contrast spot. The image may also provide a false indication of a tumor in the part of the breast where no tumor is found after other diagnostic examinations.

[0005] It is an object of the device according to the invention to counteract the occurrence of said artefacts in the reconstructed image. To this end, the device according to the invention is characterized in that it is provided with an elastically deformable sealing ring which is provided on the edge portion of the holder. The invention is based on the recognition of the fact that one possible cause of said artefacts resides in the fact that the part of the turbid medium to be imaged often is not completely immersed in the matching liquid. Air is trapped in locations in the holder which do not contain matching liquid and in which the turbid medium does not directly contact the holder. Consequently, the desired optical coupling is not realized between the light sources and the part of the turbid medium to be imaged and/or between the part of the turbid medium to be imaged and the photodetectors. For example, when the turbid medium is a breast of a female to be examined, it occurs that the dimensions of the part of the breast to be imaged are smaller than the part to be imaged of an average breast for which the fixed holder has been designed, so that a large free space is liable to occur to the left or to the right of the breast in the fixed holder. This also gives rise to a large boundary with air present outside the holder, near the upper openings of the photodetectors. A further possibility is that the positioning of the breast in the holder removes matching liquid from the holder so that an air gap is formed or an air bubble is trapped. Furthermore, it may be that during the measurement a small amount of matching liquid is transported out of the holder due to motion of the body to be examined. By providing the elastically deformable sealing ring on the edge portion of the holder, the holder can be made to adjoin exactly the surface around the breast of the body to be examined. The elastically deformable sealing ring thus counteracts the escape of the liquid from the holder. It is a further advantage of the sealing ring that the level of the matching

liquid can be increased so that the distance between the photodetectors near the edge portion in the holder and the surface of the matching liquid is increased. It is a further advantage that respiratory effects are precluded. As a result of the described advantages, said artefacts are reduced and the reproducibility of the reconstructed images is enhanced so that they are better suited for diagnostic purposes. That is, as the artefacts are reduced, the diagnostic quality is improved.

[0006] A special embodiment of the device according to the invention is characterized in that the sealing ring contains polyurethane (PUR) of a density in a range of from 0.01 to 0.4 kg/l. PUR is a material allowing economical manufacture of the sealing ring in large numbers. For this density the PUR has properties such that the sealing ring can be almost completely compressed under the weight of the body to be examined.

[0007] A further embodiment of the device according to the invention is characterized in that the sealing ring contains an internal chamber which extends along at least a part of the circumference of the sealing ring.

[0008] A further embodiment of the device according to the invention is characterized in that the internal chamber contains a gas. The elasticity of the sealing ring can be adapted to the weight of the body to be examined by filling the internal chamber with a gas or a mixture of gases, for example air.

[0009] A further embodiment of the device according to the invention is characterized in that the internal chamber is connected to a rigid pressure vessel. The sealing ring is connected to the rigid pressure vessel, for example via a tube. The rigid pressure vessel acts as a buffer volume, so that the pressure in the chamber of the sealing ring remains approximately constant even when the sealing ring is compressed. The pressure in the pressure vessel is then, for example 100 hPa higher than the atmospheric pressure.

[0010] A further embodiment of the device according to the invention is characterized in that the sealing ring is made of a material containing latex or silicon.

[0011] Another embodiment of the device according to the invention is characterized in that a diffuse reflector is provided on a side of the sealing ring which faces the measuring volume of the holder. A high diffusion reflection is advantageous in counteracting artefacts in the reconstructed image. The diffuse reflector can be provided, for example by coating the sealing ring with a lacquer on a titanium dioxide base.

[0012] A further embodiment of the device according to the invention is characterized in that the sealing ring is provided with an adapter ring for attaching the sealing ring to the edge portion of the holder.

[0013] A further embodiment yet of the device according to the invention is characterized in that the device includes a reservoir for storing matching liquid and a pump which is connected between the reservoir and the holder in order to adjust the level of the matching liquid to be received by the holder. An escaped quantity of liquid can be replenished by supplying matching liquid by means of the pump. The quantity of matching liquid pumped into the holder amounts to, for example 100 ml/minute.

[0014] The above and other, more detailed aspects of the invention are apparent from and will be elucidated, by way of example, with reference to the drawing.

[0015] In the drawing:

Fig. 1 shows a device for performing measurements on a part of the breast to be imaged,
Fig. 2 is a sectional view of the holder containing the matching liquid and a part of the breast to be imaged,
Fig. 3 is a sectional view of the first embodiment of the sealing ring provided with an adapter ring,
Fig. 4 is a plan view of the first embodiment of the sealing ring,
Fig. 5 is a side elevation of the first embodiment of the sealing ring, and
Fig. 6 shows a second embodiment of the sealing ring.

[0016] Fig. 1 shows an embodiment of an optical mammography device 1 which is known per se. Even though the device is described, by way of example, as a mammography device, it can also be used for the examination of other parts of a human or animal body. The device described herein is intended for the localization of inhomogeneities in in vivo breast tissue of a part of a breast of a human body. A malignant tumor is an example of such an inhomogeneity. The device according to the invention is arranged to image such anomalies when they are still very small, so that a carcinoma can be detected at an early stage. However, such detection takes place without exposing the patient to the risks of examination by means of ionizing radiation, for example X-rays.

[0017] The device 1 includes a first plurality of N measuring light sources 14-21, a second plurality of M photodetectors 38-45, and a holder 13. The measuring light sources are mounted in the wall of the holder 13 in positions r_i, where i = 1 ... N. The M photodetectors 38-45 are optically coupled to photodetector openings 22-29 in positions r_j in the holder 13, where j = 1 ... M. The numbers N and M are fixed and are valued, for example between 64 and 256. In practice these numbers equal 256 for N as well as M. In Fig. 1 the number of measuring light sources 14-21 and the number of photodetector openings 22-29 are chosen to be equal to eight for the sake of simplicity. The device 1 also includes a light source 2, a first optical light conductor 3, a multiple optical switch 4 and a plurality of optical conductors 5-12. The multiple optical switch 4 connects the light source 1, via the first optical conductor 3 and a second optical conductor, to one of the light-transmitting openings 14-21 in the wall of the holder 13, said openings constituting the measuring light sources. The light source 2 used is, for example a semiconductor laser with a wavelength of 810 nm. The measuring device 1 also includes a third plurality of op-

tical conductors 30-37, a selection unit 39, an analog-to-digital converter 40, and a control device 41. The third optical conductors 30-37 are connected, via photodetector openings 22-29 in the wall of the holder 13, to the corresponding number of photodetectors 38-45. The exits of the photodetectors 38-45 are connected, via the selection unit 46, to the analog-to-digital converter 47. The output of the analog-to-digital converter is connected to an input of the control unit 48, for example a microcomputer.

[0018] The holder 13 is arranged to receive the part of the breast to be imaged and also a matching liquid. In order to perform intensity measurements wherefrom an image of the interior of a part of a breast of a female to be examined is reconstructed, the part of the breast of the female to be examined is immersed in matching liquid in the holder. The matching liquid serves inter alia to couple the light from the measuring light sources into the breast tissue. An example of a matching liquid is an Intralipid solution whose attenuation coefficient κ_1 corresponds to a predetermined mean attenuation coefficient of the breast tissue. The control unit 48 subsequently performs intensity measurements for each measuring light source/photodetector pair (i,j), where i = 1 ... 256 and j = 1 ... 256. The measured intensities are stored in a memory of the control unit 48. The control unit 48 subsequently reconstructs an image of the interior of the part of the breast of the female to be examined. A monitor 49 subsequently displays the reconstructed image. An example of an iterative method for reconstructing an image of the interior of the part of the breast to be examined is known from the cited patent application WO 99/03394.

[0019] The positioning of the part of the breast to be imaged in the holder and the fitting of the elastic sealing ring on the edge portion at the open side of the holder will be described in detail hereinafter with reference to Fig. 2.

[0020] Fig. 2 is a sectional view of the holder 13 and the part 202 of the breast of the female to be examined which is to be accommodated therein, and also a sectional view of a first embodiment 203 of the sealing ring. Fig. 2 also shows the optical conductors 5-12, 30-37, the matching liquid 201, and a connection 200 for a liquid pump. The first embodiment 203 of the sealing ring is arranged on an edge portion 204 at the open side of the holder 13 so that the sealing ring seals the part 202 of the breast to be imaged and the matching liquid 201 in the holder 13. The first embodiment 203 of the sealing ring is made of an elastic material, for example polyurethane foam of a density in a range of from 0.01 to 0.4 kg/l. For example, the density is 0.3 kg/l. Another feasible elastic material is, for example polyether. The first embodiment 203 of the sealing ring thus has elastic properties such that it can be compressed substantially completely under the weight of the body to be examined. Furthermore, the first embodiment 203 of the sealing ring is preferably shaped as a saddle, the diameter of the first embodiment of the sealing ring in the no-load state being different in two different locations along a symmetry axis of the sealing ring. This difference amounts to, for example 10 mm. During the positioning in the holder 13 of the part 202 of the breast of the female to be imaged, the first embodiment 203 of the sealing ring is arranged on the holder in such a manner that the part of the first embodiment 203 of the sealing ring which has the smallest diameter points in the direction of the feet of the female to be examined.

[0021] The first embodiment 203 of the sealing ring is attached, in a preferably watertight manner, to the edge portion 204 at the open side of the holder 13. Furthermore, in order to facilitate replacement of the first embodiment 203 of the sealing ring, it is preferably provided with an adapter ring. Fig. 3 shows an example of a first sealing ring with an adapter ring.

[0022] Fig. 3 is a sectional view of the holder 13 with the edge portion 204, a first sealing ring 203 and an adapter ring 205. Fig. 3 also shows a duct 206 which is provided in the edge portion 204 of the holder 14 and via which escaped matching liquid can be conducted, for example, to the reservoir 52 (shown in Fig. 1). The adapter ring 205 can be made of, for example PVC or polypropylene, for example by deep drawing. The thickness of the sheet material is in a range of from 0.1 mm to 0.4 mm and amounts to, for example 0.25 mm.

[0023] Fig. 4 is a first sectional view of a saddle-shaped first embodiment 203 of the sealing ring. The diameter L1 of the inner side of the sealing ring amounts to, for example 130 mm. The diameter L2 of the sealing ring amounts to, for example 20 mm.

[0024] Fig. 5 is a side elevation of a saddle-shaped first embodiment 203 of the sealing ring. In the no-load condition the largest thickness D1 of the first embodiment of the sealing ring amounts to, for example 30 mm and the smallest thickness D2 of the first embodiment of the sealing ring amounts to, for example 20 mm.

[0025] A second embodiment of the sealing ring according to the invention is made of a material which contains, for example latex or a silicon rubber. This second embodiment is preferably provided with an internal chamber. This chamber preferably extends along the circumference of the sealing ring. The chamber is capable of containing a quantity of gas or a mixture of gases, for example air. In order to adapt the elasticity of this embodiment of the sealing ring, the chamber can also be connected to a rigid pressure vessel. The volume of the pressure vessel is preferably much greater than the volume of the chamber. The elasticity of the sealing ring can in that case be adjusted by variation of the quantity of gas present in the sealing ring, so that the ring can be substantially completely compressed under the weight of the body to be examined. This embodiment of the sealing ring according to the invention will be described in detail hereinafter with reference to Fig. 6. Fig. 6 shows a second sealing ring 303, a tube 301, a valve 302, a pressure vessel 304 and a chamber 305. The chamber 305 in the second sealing ring 303 is connected to the

pressure vessel 304 via the tube 301 and the valve 302. Via the valve 302, the overpressure in the chamber 305 in the second sealing ring 303 is adjusted to, for example approximately 100 hPa. As a result, the second sealing ring 303 has an elasticity such that it is substantially completely compressed under the weight of the body to be examined. The second embodiment 303 of the sealing ring is also arranged on the edge portion 204 of the holder 13, so that this sealing ring also seals the part 202 of the breast to be imaged and the matching liquid 201 in the holder 13. In order to simplify the replacement of the second embodiment of the sealing ring, it can also be provided with an adapter ring. For example, this adapter ring is of the type used for the first embodiment of the sealing ring. Instead of filling the internal chamber with air, it can also be filled with a liquid. The rigid pressure vessel should in that case be replaced by an expansion vessel.

[0026] In order to avoid artefacts in the reconstruction, furthermore, the inner side of the holder and the side of the two embodiments of the sealing rings 203, 303 which faces the holder may be provided with a diffuse reflector, for example by application of a lacquer containing titanium dioxide. The surface of the sealing ring outside the holder is preferably painted black, so that as little as possible ambient light can penetrate the measuring space within the holder.

[0027] A liquid pump can be used so as to replenish any matching liquid escaping from the holder. Fig. 1 shows a liquid pump 50 and a reservoir 52 for matching liquid. The inlet 53 of the liquid pump is connected to the reservoir 52 and an outlet 51 of the liquid pump is connected to the opening in the lower side of the holder 13. A flow of for example 100 ml per minute suffices to replace the escaping matching liquid. It is a further advantage that any air bubbles trapped between the part of the breast to be imaged and the inner wall of the holder can then be filled up with the supplied matching liquid. Furthermore, the level of the matching liquid is raised in comparison with that in a known device without sealing ring. Such a raised level of the matching liquid will be elucidated with reference to Fig. 2. Raising the level of the liquid increases the distance between the surface 210 of the matching liquid 201 and the respective openings for the optical conductors 5, 9, 30, 35 connected to the selection unit 4 or the photodetectors 38, 45. This also counteracts artefacts in the reconstructed image.

Claims

1. A device (1) for imaging the interior of a turbid medium, which device includes

   - a holder (13) to hold the turbid medium surrounded by a matching fluid
   - a light source (14-21) for irradiating the turbid medium and the matching liquid,
   - a photodetector (38-45) for measuring a part of the light transported through the turbid medium and the matching liquid, and
   - a control unit(48) for reconstructing an image of the interior of the turbid medium on the basis of the measured intensities,

   characterized in that

   - the holder encloses a measuring volume to receive the matching liquid and the turbid medium so that at least part of the turbid medium is immersed in the matching liquid,
   - the holder has an open side bounded by an edge portion, the open side providing access to the measuring volume and
   - an elastically deformable sealing ring (203,303) is provided on the edge portion of the holder to seal the part of the turbid medium to be imaged and the matching liquid in the holder.

2. A device as claimed in Claim 1, wherein the sealing ring contains polyurethane (PUR) of a density in a range of from 0.01 to 0.4 kg/l.

3. A device as claimed in Claim 1, wherein the sealing ring contains an internal chamber which extends along at least a part of the circumference of the sealing ring.

4. A device as claimed in Claim 3, wherein the internal chamber contains a gas.

5. A device as claimed in Claim 4, wherein the internal chamber is connected to a rigid pressure vessel.

6. A device as claimed in Claim 3, wherein the sealing ring is made of a material containing latex or silicon.

7. A device as claimed in Claim 1, wherein a diffuse reflector is provided on a side of the sealing ring which faces the measuring volume of the device.

8. A device as claimed in Claim 1, wherein the sealing ring is provided with an adapter ring for attaching the sealing ring to the edge portion of the holder.

9. A device as claimed in Claim 1, wherein there are included a reservoir for storing matching liquid and a pump which is connected between the reservoir and the holder in order to adjust the level of the matching liquid to be received by the holder.

Patentansprüche

1. Vorrichtung (1) zur Abbildung des Inneren eines trüben Mediums, wobei die Vorrichtung Folgendes umfasst:

- einen Halter mit einer durch einen Randbereich begrenzten offenen Seite, der ein Messvolumen umschließt und dafür eingerichtet ist, eine Anpassungsflüssigkeit und das trübe Medium aufzunehmen,
- eine Lichtquelle zum Bestrahlen des trüben Mediums und der Anpassungsflüssigkeit,
- einen Fotodetektor, um einen Teil des Lichts zu messen, das durch das trübe Medium und die Anpassungsflüssigkeit transportiert wird, und
- eine Steuereinheit, um ein Bild des Inneren des trüben Mediums auf der Grundlage der gemessenen Intensitäten zu rekonstruieren,

dadurch gekennzeichnet, dass

- der Halter ein Messvolumen umschließt, um die Anpassungsflüssigkeit und das trübe Medium aufzunehmen, so dass mindestens ein Teil des trüben Mediums in die Anpassungsflüssigkeit getaucht wird,
- der Halter eine offene Seite hat, die von einem Randbereich begrenzt ist, wobei die offene Seite Zugang zum Messvolumen gewährt, und
- ein elastisch verformbarer Dichtungsring (203, 303) am Randbereich des Halters angebracht ist, um den abzubildenden Teil des trüben Mediums und die Anpassungsflüssigkeit im Halter abzudichten.

2. Vorrichtung nach Anspruch 1, wobei der Dichtungsring Polyurethan (PUR) mit einer Dichte im Bereich von 0,01 bis 0,4 kg/ 1 enthält.

3. Vorrichtung nach Anspruch 1, wobei der Dichtungsring eine innere Kammer enthält, die mindestens an einem Teil des Umfangs des Dichtungsrings entlang verläuft.

4. Vorrichtung nach Anspruch 3, wobei die innere Kammer ein Gas enthält.

5. Vorrichtung nach Anspruch 4, wobei die innere Kammer mit einem steifen Druckbehälter verbunden ist.

6. Vorrichtung nach Anspruch 3, wobei der Dichtungsring aus einem Material besteht, das Latex oder Silikon enthält.

7. Vorrichtung nach Anspruch 1, wobei eine dem Messvolumen der Vorrichtung gegenüber liegende Seite des Dichtungsrings mit einem diffusen Reflektor versehen ist.

8. Vorrichtung nach Anspruch 1, wobei der Dichtungsring mit einem Adapterring versehen ist, um den Dichtungsring an dem Randbereich des Halters zu befestigen.

9. Vorrichtung nach Anspruch 1, wobei die Vorrichtung ein Reservoir zum Aufnehmen von Anpassungsflüssigkeit umfasst und eine Pumpe, die zwischen dem Reservoir und dem Halter angeordnet ist, um das Niveau der von dem Halter aufzunehmenden Anpassungsflüssigkeit einzustellen.

Revendications

1. Dispositif (1) pour visualiser l'intérieur d'un milieu trouble, lequel dispositif comprend

- un support (13) pour maintenir le milieu trouble entouré d'un liquide d'adaptation,
- une source de lumière (14, 21) pour irradier le milieu trouble et le liquide d'adaptation,
- un photodétecteur (38 à 45) pour mesurer une partie de la lumière transmise à travers le milieu trouble et le liquide d'adaptation, et
- une unité de commande (48) pour reconstruire une image de l'intérieur du milieu trouble sur la base des intensités mesurées,

caractérisé en ce que

- le support délimite un volume de mesure pour recevoir le liquide d'adaptation et le milieu trouble, de façon qu'au moins une partie du milieu trouble soit immergée dans le liquide d'adaptation,
- le support a un côté ouvert limité par une partie formant bord, le côté ouvert procurant un accès au volume de mesure, et
- un anneau d'étanchéité déformable de façon élastique (203, 303) est disposé sur la partie formant bord du support pour, dans le support, joindre de façon étanche la partie du milieu trouble dont une image doit être formée et le liquide d'adaptation.

2. Dispositif selon la revendication 1, dans lequel l'anneau d'étanchéité contient du polyuréthane (PUR) d'une densité dans une plage de 0,01 à 0,4 kg/l.

3. Dispositif selon la revendication 1, dans lequel l'anneau d'étanchéité contient une chambre intérieure qui s'étend le long d'au moins une partie de la circonférence de l'anneau d'étanchéité.

4. Dispositif selon la revendication 3, dans lequel la chambre intérieure contient un gaz.

5. Dispositif selon la revendication 4, dans lequel la chambre intérieure est raccordée à un réservoir sous pression rigide.

6. Dispositif selon la revendication 3, dans lequel l'anneau d'étanchéité est fait en un matériau qui contient du latex ou de la silicone.

7. Dispositif selon la revendication 1, dans lequel un réflecteur diffus est disposé sur un côté de l'anneau d'étanchéité qui fait face au volume de mesure du dispositif.

8. Dispositif selon la revendication 1, dans lequel l'anneau d'étanchéité est pourvu d'un anneau d'adaptation pour fixer l'anneau d'étanchéité à la partie formant bord du support.

9. Dispositif selon la revendication 1, dans lequel sont compris un réservoir pour stocker du liquide d'adaptation et une pompe qui est raccordée entre le réservoir et le support pour ajuster le niveau du liquide d'adaptation à recevoir dans le support.

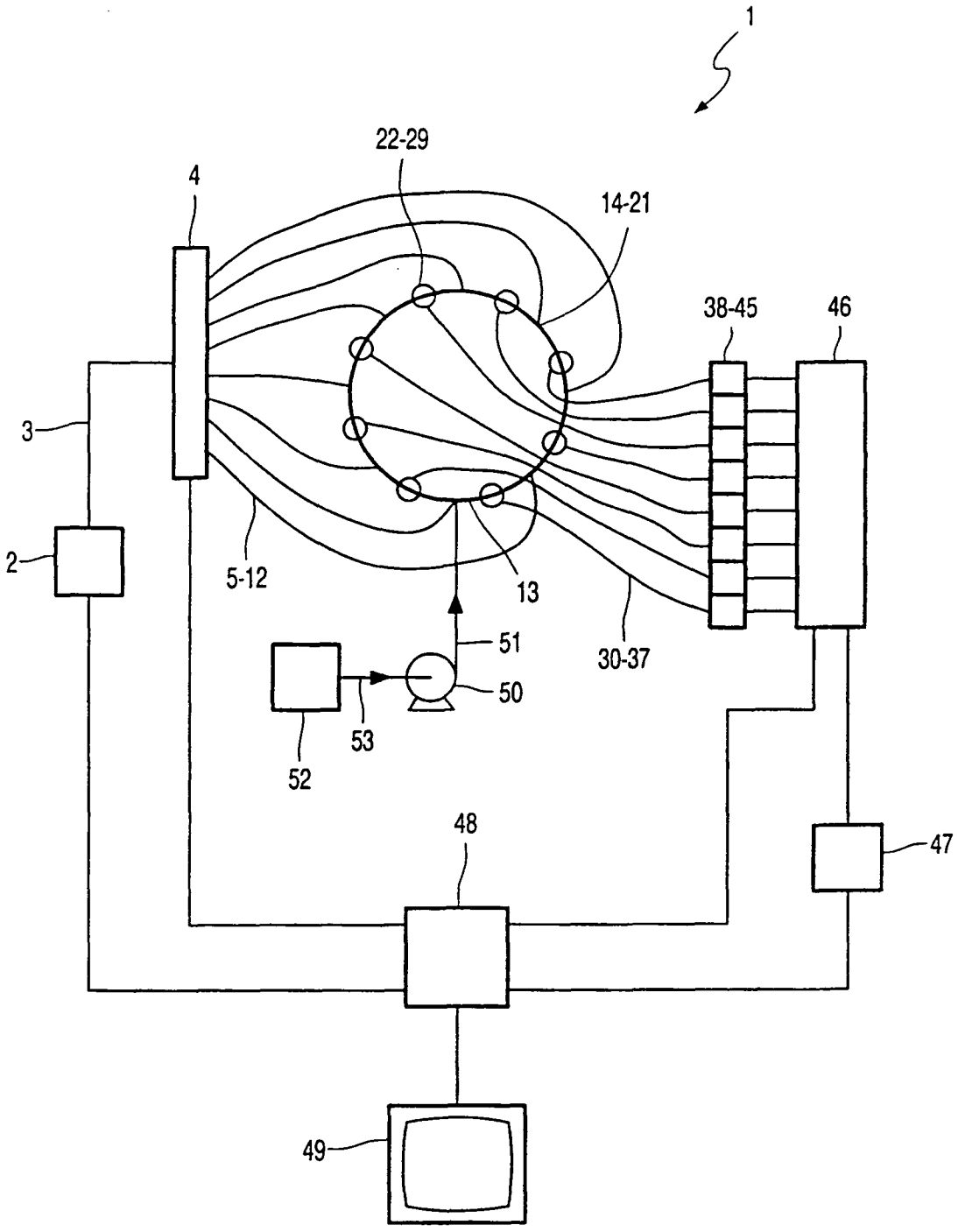
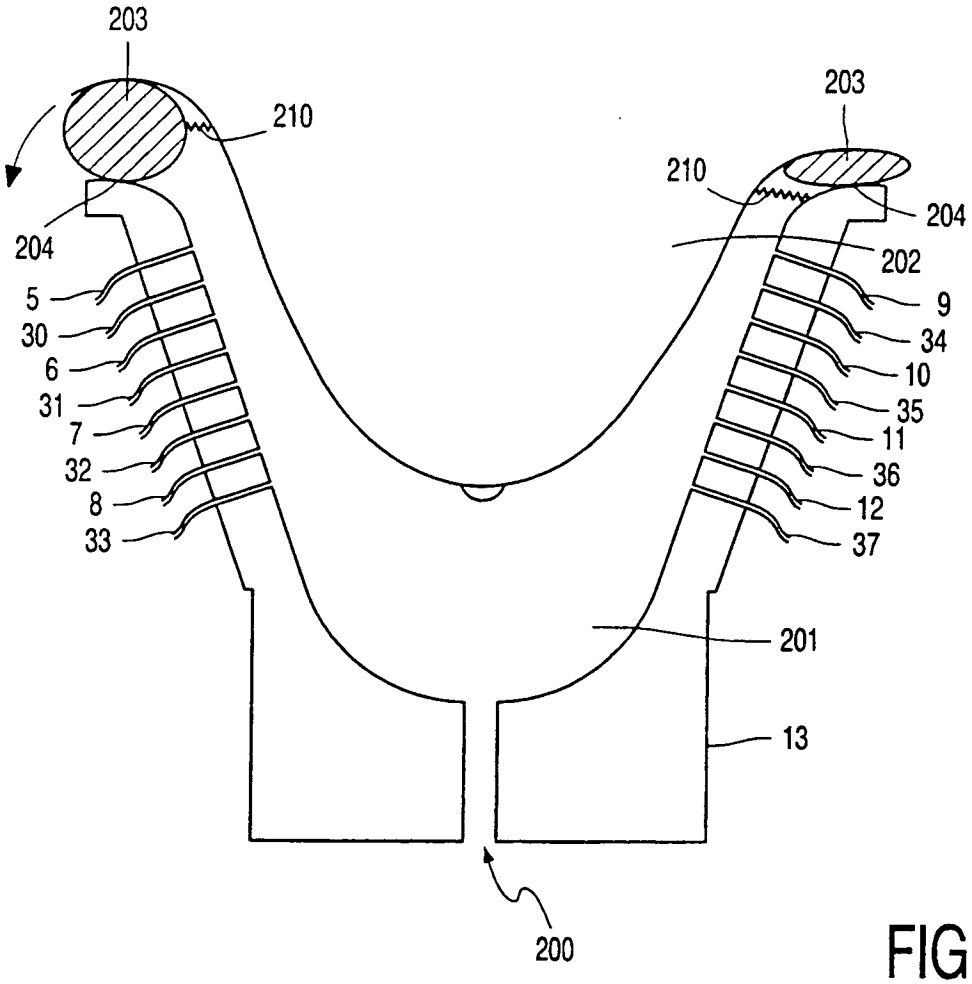


FIG. 1


203
210
203
210
204
204
202
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9
30
34
6
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31
35
7
11
32
36
8
12
33
37
201
13
200

FIG. 2

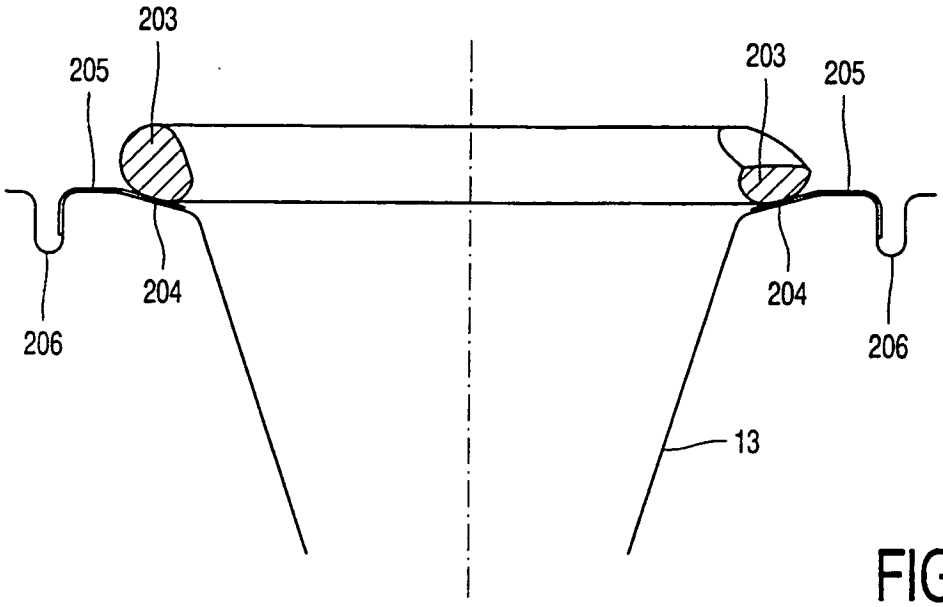
203
205
203
205
204
204
206
206
13

FIG. 3

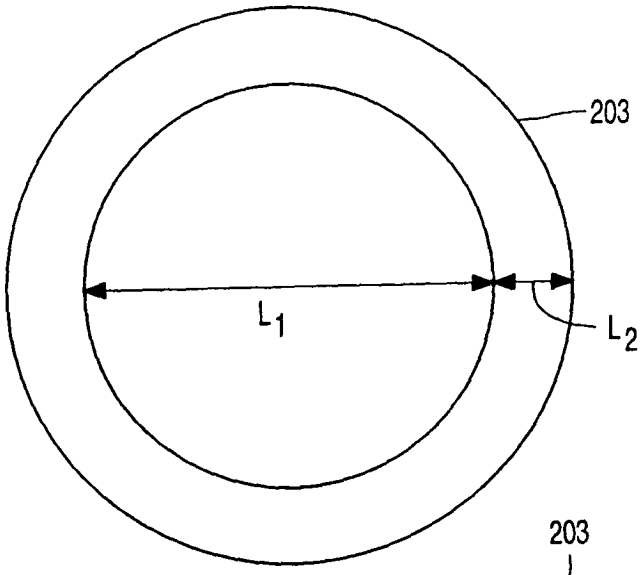

FIG. 4

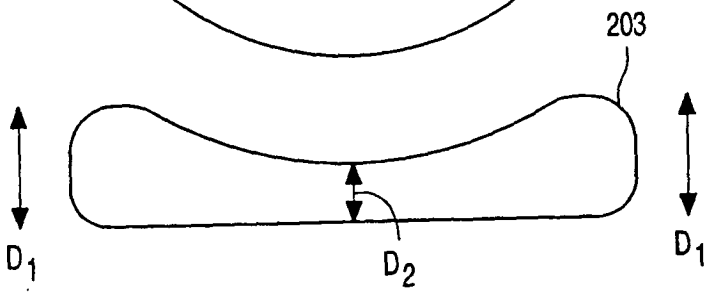

FIG. 5

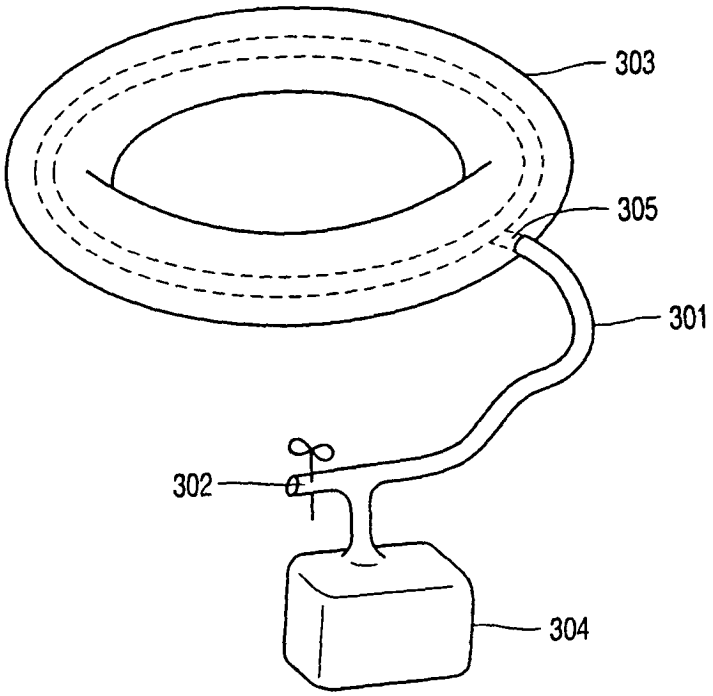

FIG. 6

专利名称(译)	用于在混浊介质中定位对象的设备		
公开(公告)号	EP1079725B1	公开(公告)日	2007-05-23
申请号	EP2000910777	申请日	2000-03-06
[标]申请(专利权)人(译)	皇家飞利浦电子股份有限公司		
申请(专利权)人(译)	皇家飞利浦电子N.V.		
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摘要(译)

本发明涉及一种用于在混浊介质中定位物体的装置。该装置可用于光学乳房X射线照相术。在光学乳房X线照相术中，待检查的乳房部分的内部被成像。该装置包括用于接收女性乳房的部分（202）的保持器（13）。该支架（13）设有光源（14-21）和光电探测器（38-45）。保持器还包含匹配液体（201），以便在光源（14-21）和乳房的部分（202）之间提供光学耦合，以及乳房的一部分和乳房的部分之间的光学耦合。光电探测器（38-45）。为了获得这样的图像，待检查的女性的乳房的部分（202）定位在保持器（13）中，并且弹性密封环（203）围绕乳房的一部分和上侧放置。持有人。弹性密封环（203）利用匹配的液体（201）改善了支架（13）的填充，从而减少了重建图像中的成像假象。

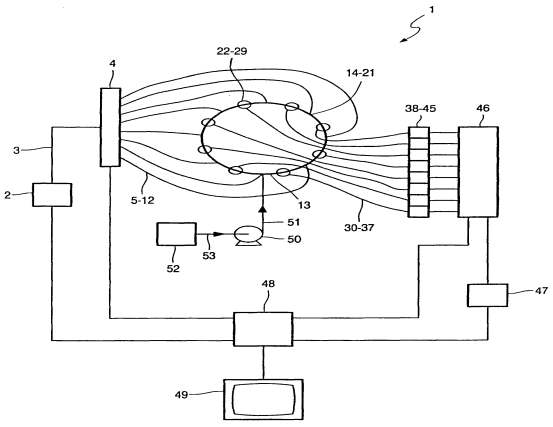

FIG. 1