US 20190374202A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2019/0374202 A1**

Chen (43) **Pub. Date: Dec. 12, 2019**

(54) **ULTRASOUND PROBE**

(71) Applicant: **QISDA CORPORATION**, Taoyuan City (TW)

(72) Inventor: **Chu-Chiang Chen**, Taoyuan City (TW)

(21) Appl. No.: **16/409,847**

(22) Filed: **May 12, 2019**

(30) **Foreign Application Priority Data**

Jun. 7, 2018 (TW) 107119631

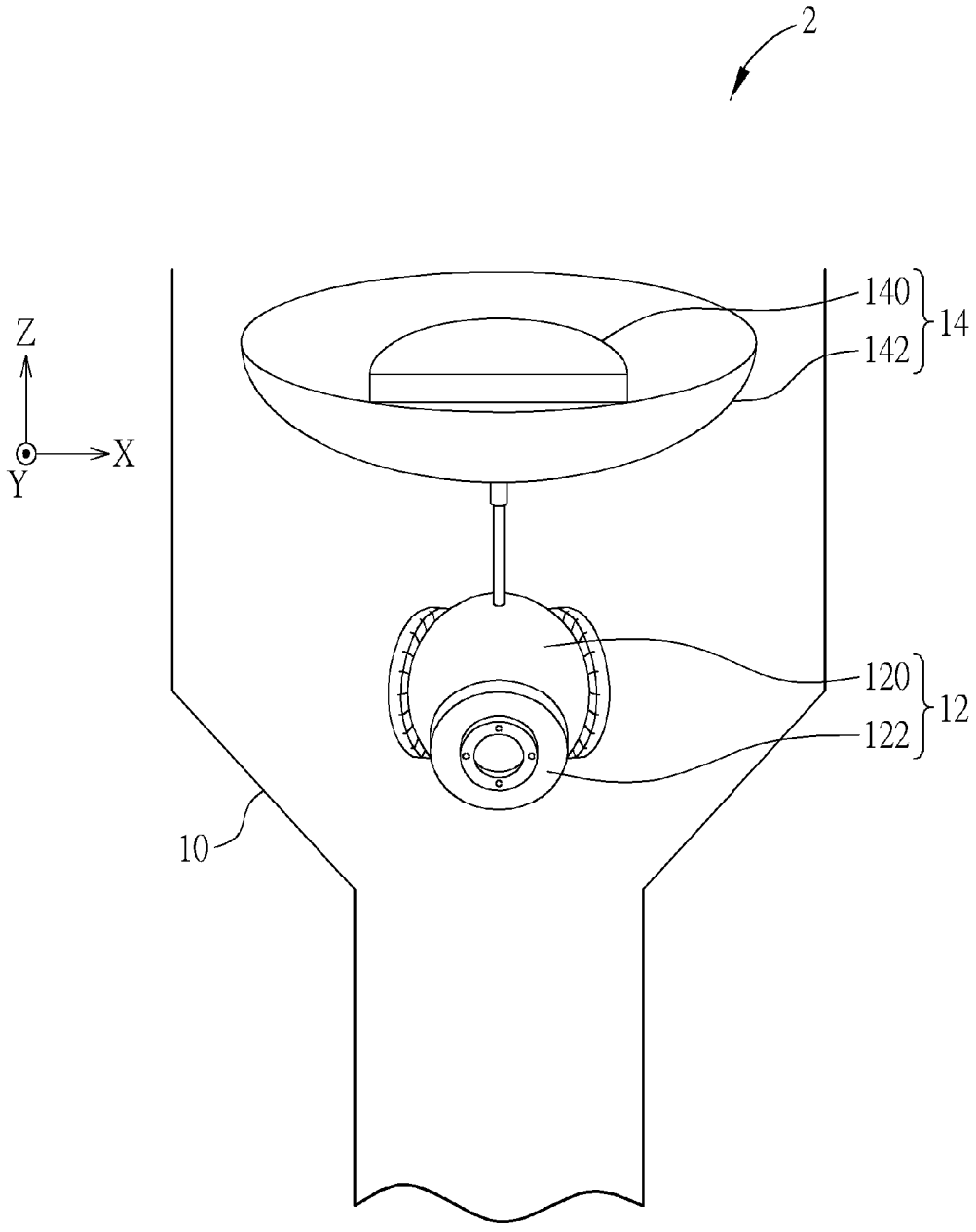
Publication Classification

(51) **Int. Cl.**
A61B 8/00 (2006.01)

(52) **U.S. Cl.**
CPC ***A61B 8/4444*** (2013.01); ***A61B 8/4281*** (2013.01)

(57) **ABSTRACT**

An ultrasound probe includes a casing, a multi-axis rotating mechanism, and an ultrasound imaging and treating module. The multi-axis rotating mechanism is disposed in the casing. The ultrasound imaging and treating module is disposed in the casing and connected to the multi-axis rotating mechanism. The multi-axis rotating mechanism drives the ultrasound imaging and treating module to rotate. The ultrasound imaging and treating module generates an ultrasound image and selectively treats a portion corresponding to the ultrasound image.



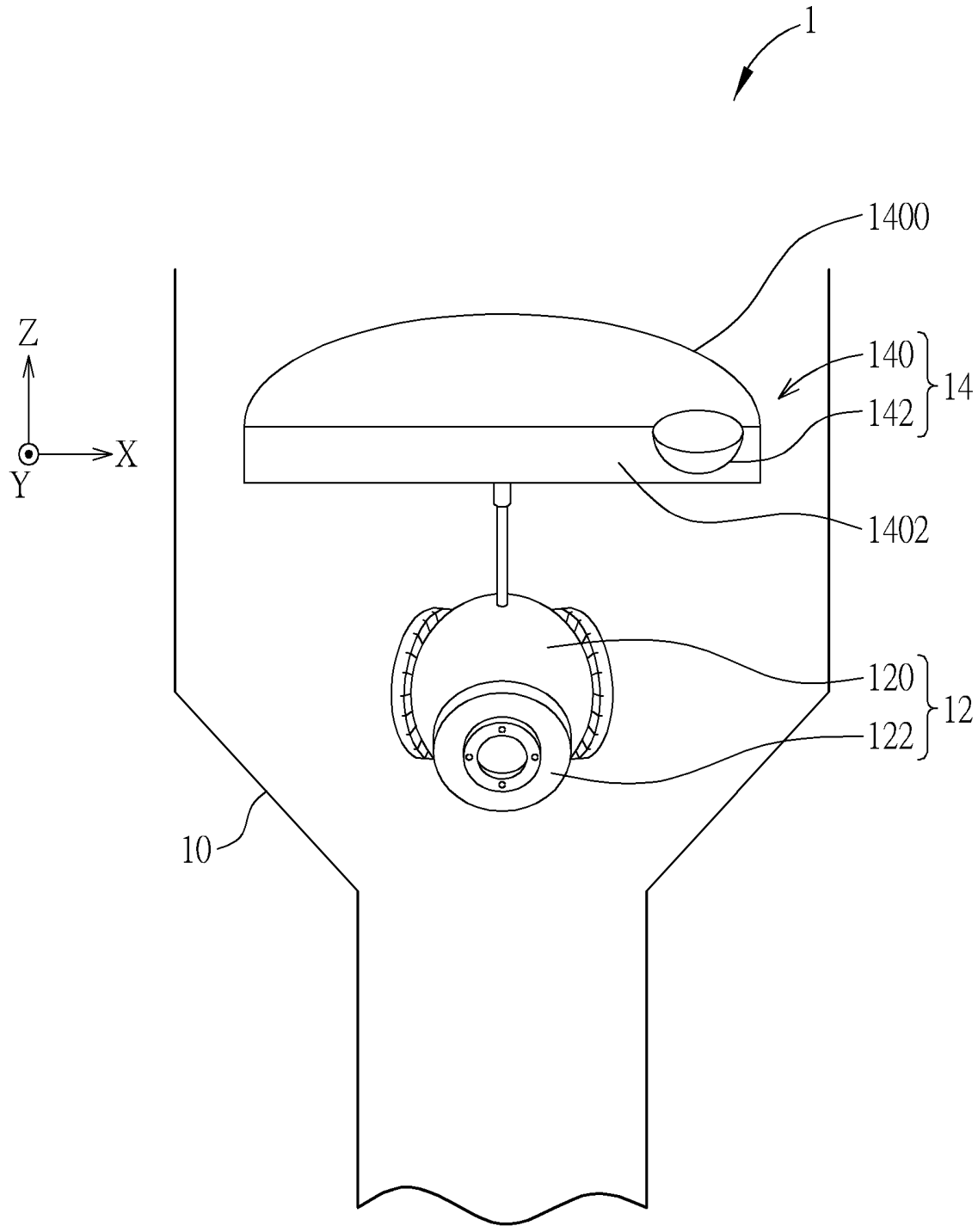


FIG. 1

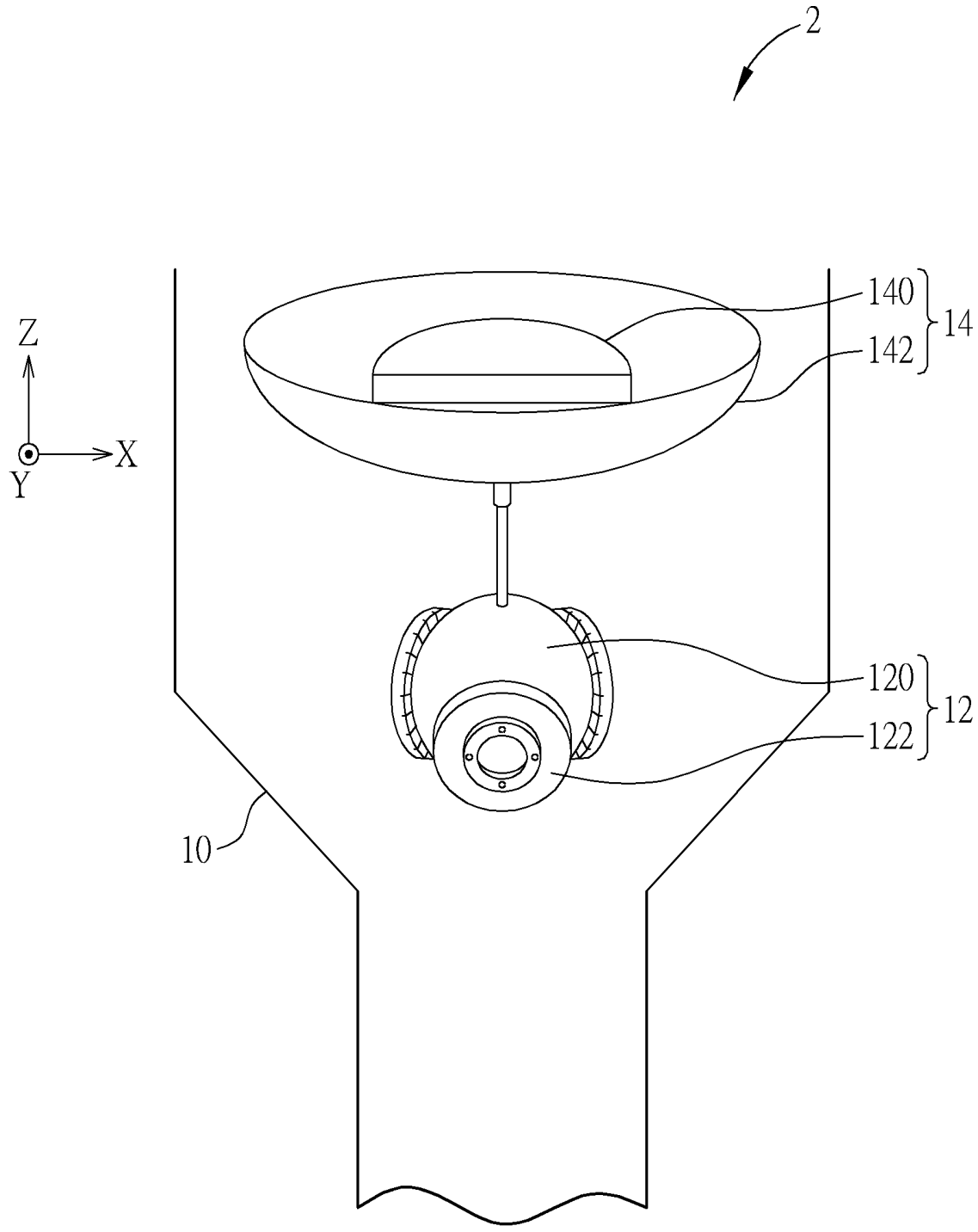


FIG. 2

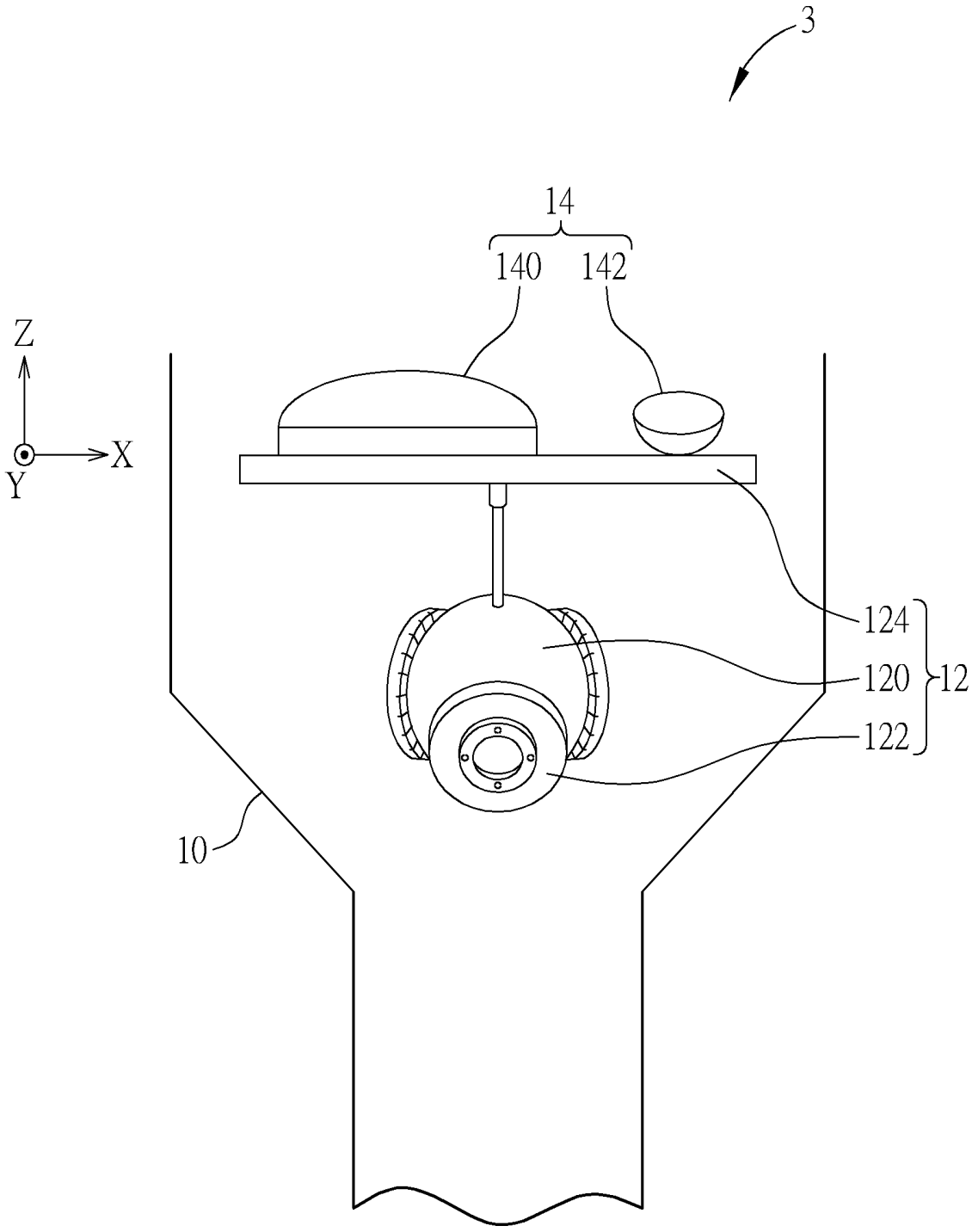


FIG. 3

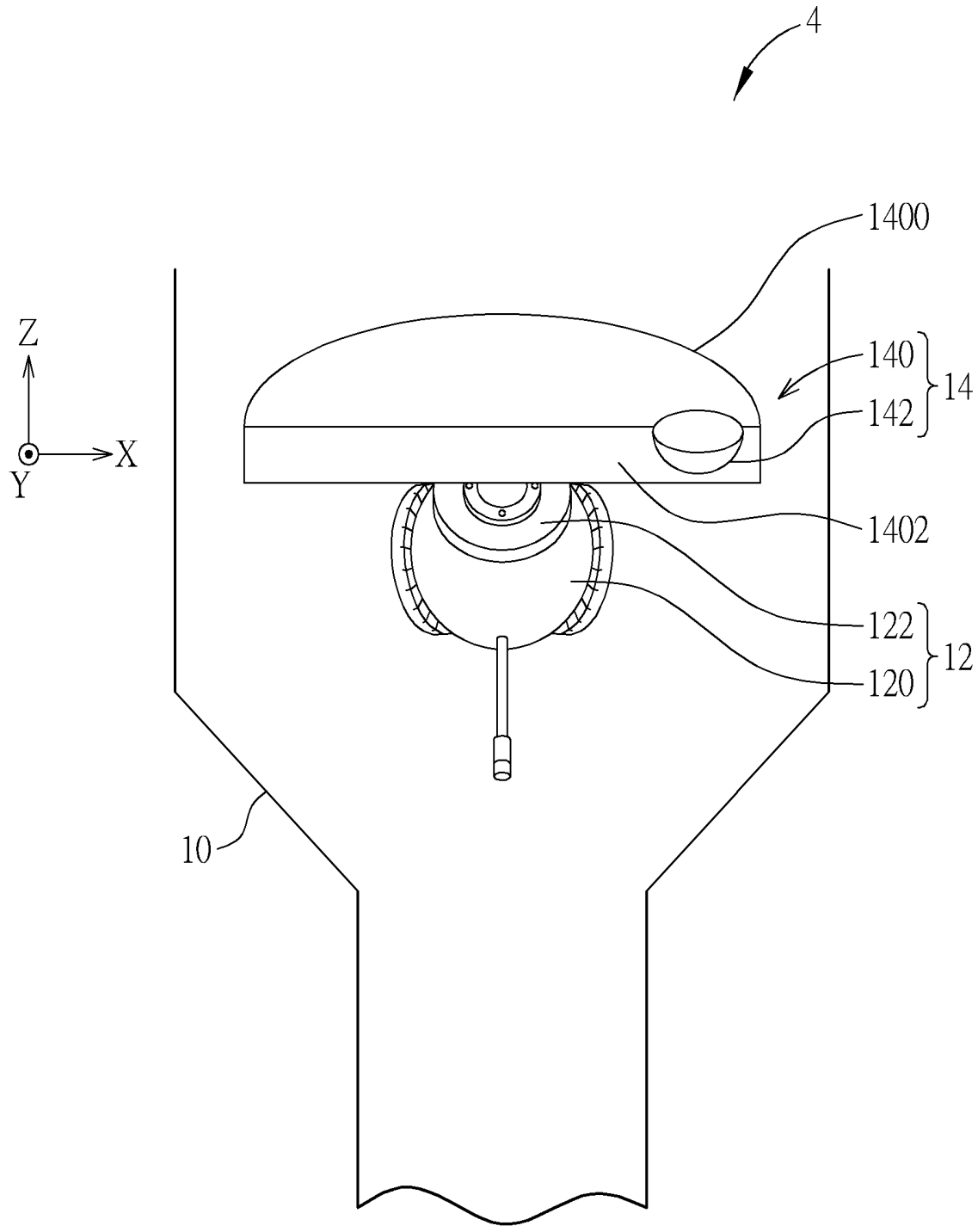


FIG. 4

ULTRASOUND PROBE

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The invention relates to an ultrasound probe and, more particularly, to an ultrasound probe capable of performing diagnosis and treatment simultaneously when an ultrasound image is generated.

2. Description of the Prior Art

[0002] Since ultrasound scanning equipment does not destroy material structure and cell, the ultrasound scanning equipment is in widespread use for the field of material and clinical diagnosis. In general, a doctor may use an ultrasound probe to perform ultrasound scanning for a portion for inspection, so as to generate an ultrasound image of the portion. When the doctor determines that a nidus exists in the ultrasound image, the doctor has to use an individual treating tool to treat the nidus. At this time, the nidus may disappear from the ultrasound image due to vibration of the ultrasound probe, such that the doctor needs to perform ultrasound scanning for the portion again. In other words, since the doctor cannot perform diagnosis and treatment simultaneously when the ultrasound image is generated, medical efficiency is reduced.

SUMMARY OF THE INVENTION

[0003] An objective of the invention is to provide an ultrasound probe capable of performing diagnosis and treatment simultaneously when an ultrasound image is generated, so as to solve the aforesaid problems.

[0004] According to an embodiment of the invention, an ultrasound probe comprises a casing, a multi-axis rotating mechanism, and an ultrasound imaging and treating module. The multi-axis rotating mechanism is disposed in the casing. The ultrasound imaging and treating module is disposed in the casing and connected to the multi-axis rotating mechanism. The multi-axis rotating mechanism drives the ultrasound imaging and treating module to rotate. The ultrasound imaging and treating module generates an ultrasound image and selectively treats a portion corresponding to the ultrasound image.

[0005] As mentioned in the above, the invention connects the ultrasound imaging and treating module to the multi-axis rotating mechanism and utilizes the multi-axis rotating mechanism to drive the ultrasound imaging and treating module to rotate, so as to perform ultrasound scanning for a portion for inspection and then generate an ultrasound image of the portion. When a doctor determines that a nidus exists in the ultrasound image, the doctor may immediately use the ultrasound imaging and treating module to treat the portion (i.e. nidus) corresponding to the ultrasound image. Accordingly, the invention can perform diagnosis and treatment simultaneously when an ultrasound image is generated, so as to enhance medical efficiency.

[0006] These and other objectives of the present invention will no doubt become obvious to those of ordinary skill in the art after reading the following detailed description of the preferred embodiment that is illustrated in the various figures and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] FIG. **1** is a schematic view illustrating an ultrasound probe according to an embodiment of the invention.

[0008] FIG. **2** is a schematic view illustrating an ultrasound probe according to another embodiment of the invention.

[0009] FIG. **3** is a schematic view illustrating an ultrasound probe according to another embodiment of the invention.

[0010] FIG. **4** is a schematic view illustrating an ultrasound probe according to another embodiment of the invention.

DETAILED DESCRIPTION

[0011] Referring to FIG. **1**, FIG. **1** is a schematic view illustrating an ultrasound probe **1** according to an embodiment of the invention. As shown in FIG. **1**, the ultrasound probe **1** comprises a casing **10**, a multi-axis rotating mechanism **12**, and an ultrasound imaging and treating module **14**. The multi-axis rotating mechanism **12** is disposed in the casing **10**. The ultrasound imaging and treating module **14** is disposed in the casing **10** and connected to the multi-axis rotating mechanism **12**. The multi-axis rotating mechanism **12** is configured to drive the ultrasound imaging and treating module **14** to rotate. In general, the ultrasound probe **1** may be further equipped with some necessary hardware or software components for specific purposes, such as a controller, a circuit board, a memory, etc., and it depends on practical applications.

[0012] In this embodiment, the multi-axis rotating mechanism **12** comprises a spherical rotor **120** and a stator **122**, wherein one of the spherical rotor **120** and the stator **122** may be fixed to the casing **10**, and the ultrasound imaging and treating module **14** may be connected to another one of the spherical rotor **120** and the stator **122**. As the embodiment shown in FIG. **1**, the stator **122** is fixed to the casing **10** and the ultrasound imaging and treating module **14** is connected to the spherical rotor **120**. Accordingly, when the spherical rotor **120** rotates with respect to the stator **122**, the spherical rotor **120** drives the ultrasound imaging and treating module **14** to rotate. For further illustration, the spherical rotor **120** may rotate with respect to the stator **122** around X-axis, Y-axis, and/or Z-axis, so as to drive the ultrasound imaging and treating module **14** to rotate around X-axis, Y-axis, and/or Z-axis. It should be noted that the stator **122** may be fixed to the casing **10** by screw, welding, engagement, adhesion, rivet, or other fixing manners according to practical applications. In practical applications, an ultrasound conductive medium, a water bag, or a transparent protection cover (not shown) may be disposed on a front end of the casing **10**, so as to cover the ultrasound imaging and treating module **14**.

[0013] In this embodiment, the ultrasound imaging and treating module **14** comprises an ultrasound imaging unit **140** and a treating unit **142**. As shown in FIG. **1**, the ultrasound imaging unit **140** is connected to the spherical rotor **120** of the multi-axis rotating mechanism **12** and the treating unit **142** is connected to the ultrasound imaging unit **140**. The ultrasound imaging unit **140** comprises an imaging region **1400** and a non-imaging region **1402**. The ultrasound imaging unit **140** performs ultrasound scanning for a portion for inspection through the imaging region **1400**, so as to generate an ultrasound image. Accordingly, the invention

may connect the treating unit **142** to the non-imaging region **1402** (e.g. edge) of the ultrasound imaging unit **140**, so as to prevent the imaging region **1400** of the ultrasound imaging unit **140** from being blocked by the treating unit **142**.

[0014] When a doctor uses the ultrasound probe **1** to perform ultrasound scanning for a portion for inspection, the doctor may control the spherical rotor **120** of the multi-axis rotating mechanism **12** to rotate, so as to drive the ultrasound imaging and treating module **14** to rotate. At the same time, the ultrasound imaging unit **140** may perform ultrasound scanning for the portion through the imaging region **1400**, so as to generate an ultrasound image. In this embodiment, an imaging range of the ultrasound imaging unit **140** covers a treating range of the treating unit **142**. Therefore, when the doctor determines that a nidus exists in the ultrasound image, the doctor may immediately use the ultrasound imaging and treating module **14** to treat the portion (i.e. nidus) corresponding to the ultrasound image. In other words, the invention may use the ultrasound imaging and treating module **14** to generate an ultrasound image and use the ultrasound imaging and treating module **14** to selectively treat a portion corresponding to the ultrasound image when a nidus exists in the ultrasound image. Accordingly, the invention can perform diagnosis and treatment simultaneously when an ultrasound image is generated, so as to enhance medical efficiency. In practical applications, the ultrasound imaging unit **140** may be an ultrasound sensor and the treating unit **142** may be an ultrasound generating unit (e.g. high-intensity focused ultrasound (HIFU)), a puncture needle, or an electrosurgical unit, and it depends on practical applications.

[0015] Referring to FIG. **2**, FIG. **2** is a schematic view illustrating an ultrasound probe **2** according to another embodiment of the invention. The main difference between the ultrasound probe **2** and the aforesaid ultrasound probe **1** is that the ultrasound probe **2** connects the treating unit **142** of the ultrasound imaging and treating module **14** to the spherical rotor **120** of the multi-axis rotating mechanism **12** and connects the ultrasound imaging unit **140** of the ultrasound imaging and treating module **14** to the treating unit **142**. Accordingly, when the spherical rotor **120** rotates with respect to the stator **122**, the spherical rotor **120** drives the ultrasound imaging and treating module **14** to rotate.

[0016] Referring to FIG. **3**, FIG. **3** is a schematic view illustrating an ultrasound probe **3** according to another embodiment of the invention. The main difference between the ultrasound probe **3** and the aforesaid ultrasound probe **1** is that the multi-axis rotating mechanism **12** of the ultrasound probe **3** comprises a support base **124**, as shown in FIG. **3**. In this embodiment, the support base **124** may be connected to the spherical rotor **120**, and the ultrasound imaging unit **140** and the treating unit **142** of the ultrasound imaging and treating module **14** are connected to the support base **124**. Accordingly, when the spherical rotor **120** rotates with respect to the stator **122**, the spherical rotor **120** drives the support base **124** and the ultrasound imaging and treating module **14** to rotate.

[0017] Referring to FIG. **4**, FIG. **4** is a schematic view illustrating an ultrasound probe **4** according to another embodiment of the invention. The main difference between the ultrasound probe **4** and the aforesaid ultrasound probe **1** is that the ultrasound probe **4** fixes the spherical rotor **120** of the multi-axis rotating mechanism **12** to the casing **10**, such that the stator **122** may rotate with respect to the spherical rotor **120**. As shown in FIG. **4**, the ultrasound imaging and treating module **14** is connected to the stator **122** of the multi-axis rotating mechanism **12**. Accordingly, when the stator **122** rotates with respect to the spherical rotor **120**, the stator **122** drives the ultrasound imaging and treating module **14** to rotate. It should be noted that the spherical rotor **120** may be fixed to the casing **10** by screw, welding, engagement, adhesion, rivet, or other fixing manners according to practical applications. Furthermore, the treating unit **142** shown in FIG. **2** or the support base **124** shown in FIG. **3** may also be connected to the stator **122** of the multi-axis rotating mechanism **12** shown in FIG. **4** according to practical applications.

[0018] As mentioned in the above, the invention connects the ultrasound imaging and treating module to the multi-axis rotating mechanism and utilizes the multi-axis rotating mechanism to drive the ultrasound imaging and treating module to rotate, so as to perform ultrasound scanning for a portion for inspection and then generate an ultrasound image of the portion. When a doctor determines that a nidus exists in the ultrasound image, the doctor may immediately use the ultrasound imaging and treating module to treat the portion (i.e. nidus) corresponding to the ultrasound image. Accordingly, the invention can perform diagnosis and treatment simultaneously when an ultrasound image is generated, so as to enhance medical efficiency.

[0019] Those skilled in the art will readily observe that numerous modifications and alterations of the device and method may be made while retaining the teachings of the invention. Accordingly, the above disclosure should be construed as limited only by the metes and bounds of the appended claims.

What is claimed is:

1. An ultrasound probe comprising:

a casing;

a multi-axis rotating mechanism disposed in the casing; and

an ultrasound imaging and treating module disposed in the casing and connected to the multi-axis rotating mechanism, the multi-axis rotating mechanism driving the ultrasound imaging and treating module to rotate, the ultrasound imaging and treating module generating an ultrasound image and selectively treating a portion corresponding to the ultrasound image.

2. The ultrasound probe of claim **1**, wherein the multi-axis rotating mechanism comprises a spherical rotor and a stator, one of the spherical rotor and the stator is fixed to the casing, and the ultrasound imaging and treating module is connected to another one of the spherical rotor and the stator.

3. The ultrasound probe of claim **1**, wherein the ultrasound imaging and treating module comprises an ultrasound imaging unit and a treating unit, the ultrasound imaging unit is connected to the multi-axis rotating mechanism, and the treating unit is connected to a non-imaging region of the ultrasound imaging unit.

4. The ultrasound probe of claim **3**, wherein an imaging range of the ultrasound imaging unit covers a treating range of the treating unit.

5. The ultrasound probe of claim **3**, wherein the treating unit is an ultrasound generating unit, a puncture needle, or an electrosurgical unit.

6. The ultrasound probe of claim **1**, wherein the ultrasound imaging and treating module comprises an ultrasound imaging unit and a treating unit, the treating unit is con-

nected to the multi-axis rotating mechanism, and the ultrasound imaging unit is connected to the treating unit.

7. The ultrasound probe of claim **6**, wherein an imaging range of the ultrasound imaging unit covers a treating range of the treating unit.

8. The ultrasound probe of claim **6**, wherein the treating unit is an ultrasound generating unit, a puncture needle, or an electrosurgical unit.

9. The ultrasound probe of claim **1**, wherein the ultrasound imaging and treating module comprises an ultrasound imaging unit and a treating unit, the multi-axis rotating mechanism comprises a support base, and the ultrasound imaging unit and the treating unit are connected to the support base.

10. The ultrasound probe of claim **9**, wherein an imaging range of the ultrasound imaging unit covers a treating range of the treating unit.

11. The ultrasound probe of claim **9**, wherein the treating unit is an ultrasound generating unit, a puncture needle, or an electrosurgical unit.

* * * * *

专利名称(译)	超声波探头		
公开(公告)号	US20190374202A1	公开(公告)日	2019-12-12
申请号	US16/409847	申请日	2019-05-12
[标]申请(专利权)人(译)	明基电通股份有限公司		
申请(专利权)人(译)	佳世达科技股份有限公司		
当前申请(专利权)人(译)	佳世达科技股份有限公司		
发明人	CHEN, CHU-CHIANG		
IPC分类号	A61B8/00		
CPC分类号	A61B8/4281 A61B8/4444 A61B8/4461 A61B18/12 A61N7/02 A61N2007/0091 A61N7/00		
优先权	107119631 2018-06-07 TW		
外部链接	Espacenet USPTO		

摘要(译)

一种超声探头，包括壳体，多轴旋转机构以及超声成像处理模块。 多轴旋转机构设置在壳体中。 超声成像处理模块设置在壳体内并连接至多轴旋转机构。 多轴旋转机构带动超声成像处理模块旋转。 超声成像和处理模块生成超声图像并选择性地处理与超声图像相对应的部分。