



(11) **EP 1 676 531 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
07.05.2008 Bulletin 2008/19

(51) Int Cl.:
A61B 8/00 ^(2006.01) **G10K 11/35** ^(2006.01)
A61B 8/13 ^(2006.01) **G01S 15/89** ^(2006.01)
F16H 57/12 ^(2006.01) **F16H 7/14** ^(2006.01)
F16H 19/00 ^(2006.01) **H02K 7/10** ^(2006.01)

(21) Application number: **05020641.6**

(22) Date of filing: **22.09.2005**

(54) **Device for pivoting an ultrasound element assembly of a probe in an ultrasonic diagnosis apparatus**

Gerät zum Schwenken einer Ultraschallwandler-Vorrichtung im Untersuchungskopf eines diagnostischen Ultraschallgeräts

Appareil pour pivoter un ensemble d'élément ultrason d'une sonde dans un dispositif d'ultrason de diagnostic

(84) Designated Contracting States:
DE FR IT

(30) Priority: **29.12.2004 KR 2004115713**

(43) Date of publication of application:
05.07.2006 Bulletin 2006/27

(73) Proprietor: **MEDISON CO., LTD.**
Kangwon-do 250-870 (KR)

(72) Inventor: **Kim, Seong Rae**
Dongan-gu
Anyang-si
Gyeonggi-do 431-792 (KR)

(74) Representative: **Lorenz, Werner et al**
Lorenz & Kollegen
Patent- und Rechtsanwaltskanzlei
Alte Ulmer Strasse 2
89522 Heidenheim (DE)

(56) References cited:
EP-A- 1 208 800 **US-A- 4 106 492**
US-A- 4 231 373 **US-A- 4 930 515**
US-A- 5 771 896

• **PATENT ABSTRACTS OF JAPAN** vol. 018, no. 210 (E-1537), 14 April 1994 (1994-04-14) & JP 06 006953 A (FUJI ELECTRIC CO LTD), 14 January 1994 (1994-01-14)

EP 1 676 531 B1

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description

[0001] The present invention generally relates to an ultrasonic diagnosis apparatus, and more particularly to an ultrasound probe for use in an ultrasonic diagnostic apparatus.

[0002] An ultrasonic diagnosis apparatus is a medical equipment for obtaining an ultrasound image of a target region in an object so as to provide clinical information of the target region, such as lesion or neoplasm information of internal organs, fetus information and the like. Typically, the ultrasonic diagnosis apparatus comprises at least one probe having an ultrasound element assembly for radiating the ultrasonic wave to the target region and receiving the echo signal reflected from the target region. Recently, to obtain more accurate diagnosis, there have been developed techniques for acquiring a 3-dimensional (3D) ultrasound image by pivoting the ultrasound element assembly of the probe. US-A-5 771 896 discloses an ultrasound probe according to the preamble of claim 1.

[0003] Japanese Patent Application Publication No. 2002-153464 discloses a prior art probe of a 3D ultrasonic diagnosis apparatus, which will be described with reference to Figs. 1A and 1B. Fig. 1A is a partial cross-sectional view showing an inner structure of a prior art probe for acquiring a 3D ultrasound image. Fig. 1B is a side view showing a power transmitting structure of a prior art probe.

[0004] As shown in the drawings, a prior art probe 1 comprises a case 10 having an opened top and a cover 12, which is coupled to the opened top of the case 10 and is adapted to contact an object to be examined (e.g., a body of a patient). A base 20 is contained in the case 10. A transducer 30 for supporting an ultrasound element assembly (not shown) is pivotably mounted to the base 20 by a pivot shaft 32. A driving motor 40 for generating power necessary for pivoting the transducer 30 and means for transmitting the power from the motor 40 to the pivot shaft 32 are mounted to the base 20.

[0005] The pivot shaft 32 is arranged horizontally and is rotatably coupled to the base 20 by bearings 34 at both ends of the shaft 32. Preferably, the driving motor 40 is a step motor and is mounted to an outer surface of the base 20. A driving shaft 42 of the motor 40 is inserted horizontally into the base 20 and supported by a bearing 44 at its end.

[0006] In order to transmit the power from the motor 40 to the pivot shaft 32, a driving pulley 46 is coupled to the driving shaft 42 for rotation with the shaft 42. A driven pulley 48 is coupled to the pivot shaft 32 for rotation with the shaft 32. The driving pulley 46 and the driven pulley 48 are arranged in alignment with each other and are connected by a driving belt 49. Preferably, the driving belt 49 is a flat strip having a rectangular cross-section.

[0007] When the driving pulley 46 rotates in a direction of arrow *A* depicted in Fig. 1B by the operation of the driving motor 40, the driven pulley 48 also rotates in a direction of arrow *A* by the driving belt 49. On the contrary,

when the driving pulley 46 rotates in a direction of arrow *B*, the driven pulley 48 rotates in a direction of arrow *B* by the driving belt 49. Accordingly, the pivot shaft 32, to which the driven pulley 48 is coupled, and the transducer 30 supporting the ultrasound element assembly can be pivoted within a predetermined angle.

[0008] However, during the pivoting operation, the pulleys and the belt may slip, which hinders the driving force of the motor from being transmitted perfectly to the transducer. Further, since the operational vibration of the motor directly affects the transducer through the belt, the ultrasonic wave is radiated irregularly and the 3D ultrasound image may not be optimal. Thus, the image quality is degraded, which causes an erroneous diagnosis.

[0009] Also, the driving belt may get loosened due to the repeated operations, which makes it impossible to conduct the precise pivoting of the transducer. Although an additional belt tensioning means may be provided in the probe to solve this problem, the limited size of the probe imposes many limitations upon installing the belt tensioning means.

[0010] It is an object of the present invention to provide a device for pivoting an ultrasound element assembly of a probe, which transmits perfectly the driving force of a motor to an ultrasound element assembly, thereby achieving a high image quality.

[0011] In accordance with an aspect of the present invention, there is provided an ultrasound probe for use in an ultrasonic diagnostic apparatus According to claim 1.

[0012] The elastic member is a torsion coil spring. The torsion coil spring has bending portions at its both ends, the bending portions being exposed outside the housing and the second ends of the wire ropes being hitched respectively by the bending portions. The pair of wire ropes are arranged to cross with each other.

[0013] A speed reduction means is provided between the driving motor and the wire rope assembly. The speed reduction means includes: a driving pulley, which is coupled to the driving shaft of the driving motor; a driven pulley, which is fixed to the base; a timing belt, which is wound around the driving pulley and the driven pulley; and a driven shaft, one end of which is fixed to the driven pulley and the other end of which is fixed to the housing of the wire rope assembly.

[0014] A motor fixing plate is coupled to the driving motor (near the driving shaft of the driving motor) for fixing the driving motor to the base. The motor fixing plate has means for adjusting a tension of the timing belt by adjusting the distance between the driving pulley and the driven pulley.

[0015] The means for adjusting the tension of the timing belt includes: at least one through-hole, through which a bolt is fastened to fix the motor fixing plate to the base; extending portions, which extend vertically from the motor fixing plate; bending portions, which are formed horizontally at the tips of the respective extending portions; and bolt-holes, which are formed vertically at the bending portions. As bolts are tightened through the bolt-

holes toward the base, a front end of each bolt moves to be in contact with the base and a reactional force against the movement of the bolt is applied to the motor fixing plate, thereby causing the driving pulley to move away from the driven pulley.

[0016] The above and other objects and features of the present invention will become apparent from the following description of preferred embodiments given in conjunction with the accompanying drawings, in which:

Fig. 1A is a partial cross-sectional view showing an inner structure of a prior art probe of a 3D ultrasonic diagnosis apparatus;

Fig. 1B is a side view showing a power transmitting structure of a prior art probe;

Fig. 2 is a perspective view showing an outer appearance of a probe in an ultrasonic diagnosis apparatus in accordance with the present invention;

Fig. 3 is a perspective view showing an inner structure of a probe in accordance with the present invention;

Fig. 4 is a perspective view showing a device for pivoting an ultrasound element assembly of a probe in accordance with the present invention;

Fig. 5 is an exploded perspective view showing a motor fixing structure;

Fig. 6 is an exploded perspective view showing a wire rope assembly;

Fig. 7 is a side view showing a connecting structure of a transducer and a wire rope assembly; and

Figs. 8A and 8B are side views showing the operations of a device for pivoting an ultrasound element assembly of a probe.

[0017] Figs. 2 and 3 are perspective views showing an outer appearance and an inner structure of a probe in an ultrasonic diagnosis apparatus in accordance with the present invention. Fig. 4 is a perspective view showing a device for pivoting an ultrasound element assembly of the probe.

[0018] As shown in the drawings, a probe 100 comprises a case 110 having an opened top and a cover 112, which is coupled to the top of the case 110 and is adapted to contact an object to be examined (e.g., a body of a patient). A base 120 is contained in the case 110. An ultrasound element assembly 130 and a transducer 132 for supporting the ultrasound element assembly are pivotably mounted to the base 120. A driving motor 140 for generating power for pivoting the ultrasound element assembly 130 and means for transmitting the power from the motor 40 to the ultrasound element assembly 130 are mounted to the base 120. Preferably, the driving motor 140 is a step motor. This is because the step motor is low in cost and highly reliable, as well as having high torque at low speeds and a simple, rugged construction that operates in almost any environment.

[0019] At both ends of the transducer 132 are provided circular holders 134 having pivot shafts 136. A C-shaped

wire holder 138 is mounted to one of the pivot shafts 136. One end of each wire rope 172 and 174 is fixed to the wire holder 138, which will be described later. Two opposing shaft holders 122 for supporting the pivot shafts 136 of the transducer holders 134 are formed at the upper edge of the base 120. Bearings 124 for enabling the rotation of the pivot shaft 136 are mounted to the shaft holders 122.

[0020] Motor mounting brackets 126 and a receiving part 128, in which a wire rope assembly 160 is contained, are formed integrally at the outer bottom surface of the base 120. Connectors 139a and a PCB (Printed Circuit Board) 139b are mounted to the bottom of the base 120 so as to transmit signals from the ultrasound element assembly 130 to a control unit installed in a main body of the ultrasonic diagnosis apparatus (not shown) through cables (not shown).

[0021] A base supporting member 180 is coupled to the outer bottom surface of the receiving part 128 for supporting and shielding the receiving part 128 of the base 120. A tube 182 for injecting an ultrasound-permeable liquid into the base 120 and the cover 112 is provided at the base supporting member 180. A support plate 184 is mounted under the driving motor 140 and the base supporting member 180 in order to support them. A cable guide member 186 for surrounding the cables extending from the PCB 139b to outside the probe is mounted under the support plate 184.

[0022] As shown in Figs. 4 and 5, the driving motor 140 is disposed such that its driving shaft 142 is directed in the opposite direction to the wire rope assembly 160. A driving pulley 144 is coupled to the front end of the driving shaft 142 of the motor 140. A driven pulley 146 is located above the driving pulley 144. These pulleys 144 and 146 are connected by a timing belt 148 to cooperate with each other. Teeth are formed at the pulleys 144 and 146 and the timing belt 148 so as to prevent any slip therebetween. A driven shaft 149 is fixed to the center of the driven pulley 146 at its one end so as to be rotated together with the driven pulley 146. The other end of the driven shaft 149 is introduced into the receiving part 128 of the base 120 and is coupled to a hub 166 of the wire rope assembly 160. The driving pulley 144 and the driven pulley 146 have predetermined diameters for an adequate speed reduction ratio for pivoting the ultrasound element assembly 130 and the transducer 132. Reference numeral 147 denotes a support plate, to which an end of the driven shaft 149 is coupled. A bearing (not shown) is interposed between the driven shaft 149 and the support plate 147. The support plate 147 is screw-coupled to the outer bottom surface of the base 120 and defines the positions of the driven pulley 146 and the driven shaft 149.

[0023] A motor fixing plate 150 for fixing the motor 140 to the base 120 is rectangle in cross-section. The motor fixing plate 150 has first through-holes 152, through which bolts are fastened, to connect the motor 140. The motor fixing plate 150 further has second through-holes

154, through which bolts are fastened to fix the motor fixing plate 150 to the motor fixing brackets 126 of the base 120. A pair of extending portions 156 extends vertically from the upper edge of the motor fixing plate 150. Bending portions 158 are formed horizontally at the tips of the respective extending portions 156 and are directed away from each other. The bending portions 158 have bolt-holes 158a, which are formed vertically.

[0024] First, the motor fixing plate 150 is coupled to the motor 140 by tightening the bolts through the first through-holes 152. Then, the motor fixing plate 150 is coupled to the motor fixing brackets 126 of the base 120 by tightening the bolts through the second through-holes 154 of the plate 150 and the bolt-holes 126a of the brackets 126. The support plate 147 for supporting the driven pulley 146 is fixed to the outer bottom surface of the base 120 by using bolts. The timing belt 148 is wound around the driving pulley 144 and the driven pulley 146. Bolts 159 are inserted through the bolt-holes 158a formed at the bending portions 158 of the motor fixing plate 150. Then, as the bolts 159 are tightened toward the outer bottom surface of the base 120 (upward in Fig. 5), the front end of each bolt 159 moves to be placed in contact with the outer bottom surface of the base 120. The reactional force against the movement of the bolt 159 is applied to the motor fixing plate 150. Accordingly, the motor fixing plate 150 and the motor 140 gradually move away from the outer bottom surface of the base 120 (downward in Fig. 5). Thus, the driving pulley 144 also moves away from the driven pulley 146 fixed to the base 120. In order to enable the motor fixing plate 150 to move up and down with respect to the base 120, the second through-holes 154 of the motor fixing plate 150 have a slot-shape, which is long in a vertical direction. By adjusting the distance between the driving pulley 144 and the driven pulley 146 by the above procedure, the tension of the timing belt 148 can be adjusted easily.

[0025] As shown in Fig. 6, the wire rope assembly 160 includes a torsion coil spring 162, a housing 164, a hub 166 and a pair of wire ropes 172 and 174. The torsion coil spring 162 has U-shaped hook portions 162a and 162b at its both ends. The housing 164 is formed in a cylindrical shape and contains the torsion coil spring 162. The hub 166 is inserted into the housing 164 so that the torsion coil spring 162 is disposed around the hub 166. One end of each wire rope 172 and 174 is fixed to the wire holder 138, while the other end is hitched by the hook portions 162a and 162b of the torsion coil spring 162.

[0026] The housing 164 has openings 165, through which the hook portions 162a and 162b of the torsion coil spring 162 are exposed outside the housing 164. The hub 166 has an inserting hole 167 at its center, into which an end of the driven shaft 149 is fitted. The hub 166 is securely fixed in the housing 164 by tightening the bolts 168 through the wall of the housing 164 to be placed in contact with the outer surface of the hub 166.

[0027] First tying pieces 173a and 175a are coupled

to first ends of the wire ropes 172 and 174, respectively. The wire holder 138 is provided with slits 138a, which allow the wire ropes 172 and 174 to pass through, but restrict the first tying pieces 173a and 175a to pass through (see Fig. 4). Second tying pieces 173b and 175b are coupled to second ends of the wire ropes 172 and 174 so as to form knot portions 172a and 174a. The first tying pieces 173a and 175a and the second tying pieces 173b and 175b have one or more holes (not shown), through which the wire ropes 172 and 174 pass. After passing the end portions of the wire ropes 172 and 174 through the holes of the tying pieces 173a, 175a, 173b and 175b, an external force is applied to the tying pieces 173a, 175a, 173b and 175b to crush them for preventing the wire ropes 172 and 174 from being separated from the tying pieces 173a, 175a, 173b and 175b. Preferably, the tying pieces 173a, 175a, 173b and 175b are made from a soft metallic material, which is easily deformed by the external force.

[0028] As shown in Fig. 7, the first tying pieces 173a and 175a are caught in the wire holder 138, and the wire ropes 172 and 174 pass through the slits 138a of the wire holder 138. Then, the wire ropes 172 and 174 extend toward the wire rope assembly 160 and cross each other in an about 8-shape, and the knot portions 172a and 174a are respectively hitched by the hook portions 162a and 162b of the torsion coil spring 162. More specifically, the wire rope 172, the first end of which is caught in the left side of the housing 164 of the wire rope assembly 160. Then, the wire rope 172 further extends toward the left side of the housing 164 along the outer circumference of the housing 164, and the knot portion 172a of the second end of the wire rope 172 is hitched by the left hook portion 162a of the torsion coil spring 162. In the same manner, the wire rope 174, the first end of which is caught in the right side of the wire holder 138, extends toward the left side of the housing 164 of the wire rope assembly 160. The wire rope 174 further extends toward the right side of the housing 164 along the outer circumference of the housing 164, and the knot portion 174a of the second end of the wire rope 174 is hitched by the right hook portion 162b of the torsion coil spring 162. By forming such an 8-shaped arrangement of the wire ropes 172 and 174, both hook portions 162a and 162b of the torsion coil spring 162 are deformed from first positions (illustrated by dotted lines) to second positions (illustrated by real lines). Therefore, the restoring force of the torsion coil spring 162 is applied evenly to the two wire ropes 172 and 174, thereby making the tensions of the wire ropes 172 and 174 uniform.

[0029] Hereinafter, the operational effect of the device for pivoting the ultrasound element assembly of the probe in accordance with the present invention will be described with reference to Figs. 5, 8A and 8B.

[0030] First, before pivoting the ultrasound element assembly 130 for obtaining a 3D ultrasound image, the ultrasound element assembly 130 should be located in a

prescribed initial position (typically, the middle position). To this end, the probe 100 transmits the signal of the present position of the ultrasound element assembly 130 to the control unit installed in the main body of the ultrasonic diagnosis apparatus. In response to the signal of the present position of the ultrasound element assembly 130, the control unit controls the device for pivoting the ultrasound element assembly 130 to move the same to the initial position. In this embodiment of the present invention, means for controlling the position of the ultrasound element assembly 130 includes a permanent magnet (not shown) mounted to the transducer 132 and a hall sensor (not shown) mounted to the base 120 for sensing the magnet. Since the device and method for controlling the position of the ultrasound element assembly by using the hall sensor and the magnet are already well known in the art, the explanation thereof is omitted.

[0031] After controlling to move the ultrasound element assembly 130 to the initial position, if the driving motor 140 operates to rotate the driving pulley 144, the driven pulley 146 and the driving shaft 149 in a direction of arrow A shown in Fig. 5, then the hub 166 and the housing 164 of the wire rope assembly 160 are also rotated in a direction of arrow A shown in Fig. 8A. At the same time, the torsion coil spring 162, which is located around the hub 166 inside the housing 164, is rotated together with the housing 164. Accordingly, the transducer 132 and the ultrasound element assembly 130 are pivoted in a direction of arrow A by two wire ropes 172 and 174, both ends of which are connected to the hook portions 162a and 162b of the torsion coil spring 162 and to the wire holder 138.

[0032] On the contrary, if the driving motor 140 operates to rotate the driving pulley 144, the driven pulley 146 and the driving shaft 149 in a direction of arrow B shown in Fig. 5, then the transducer 132 and the ultrasound element assembly 130 are pivoted in a direction of arrow B shown in Fig. 8B by the above power transmitting structure.

[0033] As described above, since the driving pulley and the driven pulley are tooth-engaged with the timing belt and the tension of the wire ropes are maintained uniformly by the torsion coil spring, no slip occurs between these power transmitting elements. Thus, the driving force of the motor can be converted perfectly into the pivoting force of the ultrasound element assembly. Therefore, radiating the ultrasonic wave is regular and the process of obtaining the 3D ultrasound image can be performed smoothly and continuously, thereby increasing the image quality and reducing an error in diagnosis.

[0034] Also, although the wire ropes themselves may get loosened due to repeated operations, the tension of the wire ropes are maintained uniform and unchanged by the restoring force of the torsion coil spring, thereby enhancing the operational stability and reliability.

Claims

1. An ultrasound probe (100) for use in an ultrasonic diagnostic apparatus, the probe comprising an ultrasound element assembly (130), a base (120) supporting the ultrasound element assembly (130) and a device for pivoting an ultrasound element assembly (130), wherein the pivoting device comprises:

a pivot shaft (136) rotatably coupled to the base (120) and supporting the ultrasound element assembly (130);
 a wire holder (138) coupled to the pivot shaft (136);
 a driving motor (140) mounted to the base (120) and having a driving shaft (142); and
 a wire rope assembly (160) including a housing (164) connected to the driving shaft (142) of the driving motor (140) so as to be rotated therewith, a torsion coil spring (162), and a pair of wire ropes (172, 174),

wherein a first end of each wire rope (172, 174) is connected to the wire holder (138) and a second end of each wire rope (172, 174) is connected to the torsion coil spring (162), and

characterized in that

the torsion coil spring (162) is provided in the housing (164) and has bending portions (162a, 162b) at its both ends, the bending portions (162a, 162b) being exposed outside the housing (164), and the second ends of the wire ropes (172, 174) are hitched respectively by the bending portions (162a, 162b).

2. The ultrasound probe as recited in Claim 1, wherein the pair of wire ropes (172, 174) are arranged to cross with each other.

3. The ultrasound probe as recited in Claim 1, wherein the driving motor (140) is a step motor.

4. The ultrasound probe as recited in Claim 1, wherein the pivoting device further comprises a speed reduction means provided between the driving motor (140) and the wire rope assembly (160), the speed reduction means including a driving pulley (144) coupled to the driving shaft (142) of the driving motor (140), a driven pulley (146) fixed to the base (120), a timing belt (148) wound around the driving pulley (144) and the driven pulley (146), and a driven shaft (149), one end of which is fixed to the driven pulley (146) and the other end of which is fixed to the housing (164) of the wire rope assembly (160).

5. The ultrasound probe as recited in Claim 4, wherein teeth are formed at the driving pulley (144), the driven pulley (146) and the timing belt (148) so that they

are tooth-engaged with each other.

6. The ultrasound probe as recited in Claim 4, wherein a motor fixing plate (150) is coupled to the driving motor (140) near the driving shaft (142) of the driving motor (140) for fixing the driving motor (140) to the base (120), and the motor fixing plate (150) has means for adjusting a tension of the timing belt (148) by adjusting the distance between the driving pulley (144) and the driven pulley (146).
7. The ultrasound probe as recited in Claim 6, wherein the means for adjusting the tension of the timing belt (148) includes at least one through-hole (154), through which a bolt is fastened to fix the motor fixing plate (150) to the base (120), extending portions (156) extending vertically from the motor fixing plate (150), bending portions (158) formed horizontally at the tips of the respective extending portions (156), and bolt-holes (158a) formed vertically at the bending portions (158), whereby as bolts (159) are tightened through the bolt-holes (158a) toward the base (120), a front end of each bolt (159) moves to be in contact with the base (120) and a reactional force against the movement of the bolt (159) is applied to the motor fixing plate (150), thereby causing the driving pulley (144) to move away from the driven pulley (146).
8. The ultrasound probe as recited in Claim 7, wherein the through-hole (154) has a slot-shape, which is long in a vertical direction.

Patentansprüche

1. Ultraschallkopf (100) zur Verwendung in einem diagnostischen Ultraschallgerät, wobei der Kopf eine Ultraschallwandleranordnung (130), einen die Ultraschallwandleranordnung (130) haltenden Grundkörper (120) und eine Vorrichtung zum Schwenken der Ultraschallwandleranordnung (130) aufweist, wobei die Schwenkvorrichtung Folgendes aufweist:
- eine Drehwelle (136), welche drehbar mit dem Grundkörper (120) verbunden ist und die Ultraschallwandleranordnung (130) trägt;
- einen Kabelhalter (138), der mit der Drehwelle (136) verbunden ist;
- einen Antriebsmotor (140), der an dem Grundkörper (120) angebracht ist und eine Antriebswelle (142) aufweist; und
- eine Drahtseilanordnung (160), welche ein Gehäuse (164), das mit der Antriebswelle (142) des Antriebsmotors (140) verbunden ist, um mit derselben drehbar zu sein, eine Torsionsschraubenfeder (162) und ein Paar Drahtseile (172,174) aufweist,
- wobei ein erstes Ende jedes Drahtseils (172,174) mit dem Kabelhalter (138) und ein zweites Ende jedes Drahtseils (172,174) mit der Torsionsschraubenfeder (162) verbunden ist,
- dadurch gekennzeichnet, dass**
- die Torsionsschraubenfeder (162) in dem Gehäuse (164) angeordnet ist und gebogene Abschnitte (162a, 162b) an ihren beiden Enden aufweist, wobei die gebogenen Abschnitte (162a,162b) sich nach außerhalb des Gehäuses (164) erstrecken, und wobei die zweiten Enden der Drahtseile (172,174) jeweils durch die gebogenen Abschnitte (162a,162b) eingehakt sind.
2. Ultraschallkopf nach Anspruch 1, wobei das Paar der Drahtseile (172,174) so angeordnet ist, dass sie einander kreuzen.
3. Ultraschallkopf nach Anspruch 1, wobei der Antriebsmotor ein Schrittmotor ist.
4. Ultraschallkopf nach Anspruch 1, wobei die Schwenkvorrichtung des weiteren eine Untersezungseinrichtung aufweist, welche zwischen dem Antriebsmotor (140) und der Drahtseilanordnung (160) vorgesehen ist,
- wobei die Untersezungseinrichtung eine Antriebsriemenscheibe (144) aufweist, welche mit der Antriebswelle (142) des Antriebsmotors (140) verbunden ist,
- eine angetriebene Riemenscheibe (146), welche an dem Grundkörper (120) angebracht ist, einen Zahnriemen (148), der um die Antriebsriemenscheibe (144) und die angetriebene Riemenscheibe (146) gewunden ist, und
- eine angetriebene Welle (149), von welcher ein Ende an der angetriebenen Riemenscheibe (146) und das andere Ende an dem Gehäuse (164) der Drahtseilanordnung (160) angebracht ist.
5. Ultraschallkopf nach Anspruch 4, wobei an der Antriebsriemenscheibe (144), der angetriebenen Riemenscheibe (146) und dem Zahnriemen (148) Zähne gebildet sind, so dass sie über die Zähne miteinander in Eingriff sind.
6. Ultraschallkopf nach Anspruch 1, wobei eine Motorbefestigungsplatte (150) an den Antriebsmotor (140) in der Nähe der Antriebswelle (142) des Antriebsmotors (140) angebracht ist, um den Antriebsmotor (140) an dem Grundkörper (120) anzubringen, und die Motorbefestigungsplatte (150) eine Einrichtung zum Einstellen einer Spannung des Zahnriemens (148) durch Einstellen des Abstands zwischen der Antriebsriemenscheibe (144) und der angetriebe-

nen Riemenscheibe (146) aufweist.

7. Ultraschallkopf nach Anspruch 6, wobei die Einrichtung zum Einstellen der Spannung des Zahnriemens (148) wenigstens eine Durchgangsbohrung (154), durch welche ein Bolzen befestigt ist, um die Motorbefestigungsplatte (150) an dem Grundkörper (120) anzubringen, Erstreckungsabschnitte (156), welche sich von der Motorbefestigungsplatte (150) vertikal erstrecken, Biegeabschnitte (158), welche horizontal an den Spitzen der entsprechenden Erstreckungsbereiche (156) ausgebildet sind, und Bolzenlöcher (158a) aufweist, welche vertikal an den Biegeabschnitten (158) gebildet sind, wobei wenn Bolzen (159) durch die Bolzenlöcher (158a) in Richtung des Grundkörpers (120) angezogen sind, ein vorderes Ende jedes Bolzens (159) sich so bewegt, dass er in Kontakt mit dem Grundkörper (120) kommt und eine Reaktionskraft gegen die Bewegung des Bolzens (159) auf die Motorbefestigungsplatte (150) aufgebracht wird, wodurch bewirkt wird, dass sich die Antriebsriemenscheibe (144) von der angetriebenen Riemenscheibe (146) weg bewegt.
8. Ultraschallkopf nach Anspruch 7, wobei die Durchgangsbohrung (154) eine Schlitzform aufweist, welche in einer vertikalen Richtung lang ist.

Revendications

1. Sonde à ultrasons (100) servant dans un appareil de diagnostic par ultrasons, comprenant un assemblage d'éléments pour ultrasons (130), une base (120) recevant l'assemblage d'éléments pour ultrasons (130) et un dispositif pour faire pivoter un assemblage d'éléments pour ultrasons (130), dans laquelle le dispositif pivotant comprend :

un arbre pivot (136) couplé de façon rotative à la base (120) et recevant l'assemblage d'éléments pour ultrasons (130),
un support de câble (138) couplé à l'arbre pivot (136),
un moteur d'entraînement (140) monté sur la base (120) et pourvu d'un arbre d'entraînement (142), et
un assemblage de câbles (160) comprenant un boîtier (164) relié à l'arbre d'entraînement (142) du moteur d'entraînement (140) afin qu'il tourne avec lui, un ressort de torsion hélicoïdal (162) et une paire de câbles (172, 174),

dans lequel une première extrémité de chaque câble (172, 174) est reliée au support de câble (138) et une seconde extrémité de chaque câble (172, 174)

est reliée au ressort de torsion hélicoïdal (162), et **caractérisée en ce que**

- le ressort de torsion hélicoïdal (162) est disposé dans le boîtier (164) et comporte des parties pliées (162a, 162b) à chacune de ses extrémités, lesdites parties pliées (162a, 162b) sortant à l'extérieur du boîtier (164), et les secondes extrémités des câbles (172, 174) sont accrochées aux parties pliées respectives (162a, 162b).
2. Sonde à ultrasons telle que définie dans la revendication 1, dans laquelle la paire de câbles (172, 174) est agencée pour qu'ils se croisent.
3. Sonde à ultrasons telle que définie dans la revendication 1, dans laquelle le moteur d'entraînement (140) est un moteur pas-à-pas.
4. Sonde à ultrasons telle que définie dans la revendication 1, dans laquelle le dispositif pivotant comprend en outre des moyens de réduction de la vitesse ménagés entre le moteur d'entraînement (140) et l'assemblage de câbles (160), les moyens de réduction de la vitesse comprenant une poulie d'entraînement (144) couplée à l'arbre d'entraînement (142) du moteur d'entraînement (140), une poulie entraînée (146) fixée à la base (120), une courroie de synchronisation (148) enroulée autour de la poulie d'entraînement (144) et de la poulie entraînée (146), et un arbre entraîné (149) dont une extrémité est fixée à la poulie entraînée (146) et l'autre extrémité est fixée au boîtier (164) de l'assemblage de câbles (160).
5. Sonde à ultrasons telle que définie dans la revendication 4, dans laquelle des dents sont formées sur la poulie d'entraînement (144), la poulie entraînée (146) et la courroie de synchronisation (148) afin de former une liaison dentée entre eux.
6. Sonde à ultrasons telle que définie dans la revendication 4, dans laquelle une plaque de montage du moteur (150) est couplée au moteur d'entraînement (140) près de l'arbre d'entraînement (142) du moteur d'entraînement (140) pour fixer le moteur (140) à la base (120), et la plaque de montage du moteur (150) est pourvue de moyens pour régler une tension de la courroie de synchronisation (148) en réglant la distance entre la poulie d'entraînement (144) et la poulie entraînée (146).
7. Sonde à ultrasons telle que définie dans la revendication 6, dans laquelle les moyens pour régler la tension de la courroie de synchronisation (148) comprennent au moins un trou traversant (154) à travers

lequel un boulon est attaché pour fixer la plaque de montage du moteur (150) à la base (120), des parties d'extension (156) s'étendant verticalement à partir de la plaque de montage du moteur (150),
des parties pliées (158) formées horizontalement aux extrémités de chacune des parties d'extension (156), et
des trous pour boulons (158a) formés verticalement sur les parties pliées (158),
de telle manière que lorsque les boulons (159) sont resserrés dans les trous de boulon (158a) vers la base (120), une partie avant de chaque boulon (159) se déplace pour entrer en contact avec la base (120) et une force de réaction s'opposant au mouvement du boulon (159) est appliquée à la plaque de montage du moteur (150), provoquant ainsi l'éloignement de la poulie d'entraînement (144) de la poulie entraînée (146).

8. Sonde à ultrasons telle que définie dans la revendication 7, dans laquelle le trou traversant (154) a la forme d'une fente dont la longueur est dirigée dans la direction verticale.

25

30

35

40

45

50

55

Fig. 1A
(Prior Art)

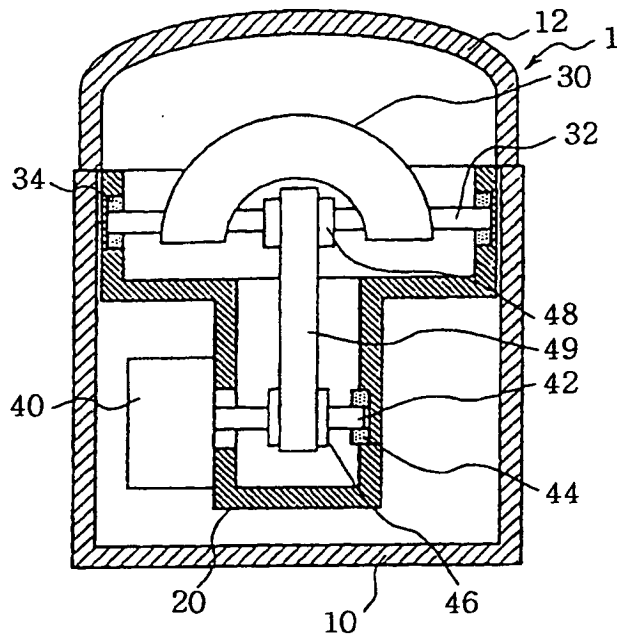


Fig. 1B
(Prior Art)

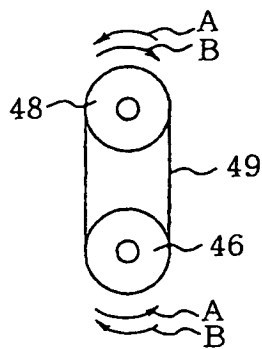


Fig. 2

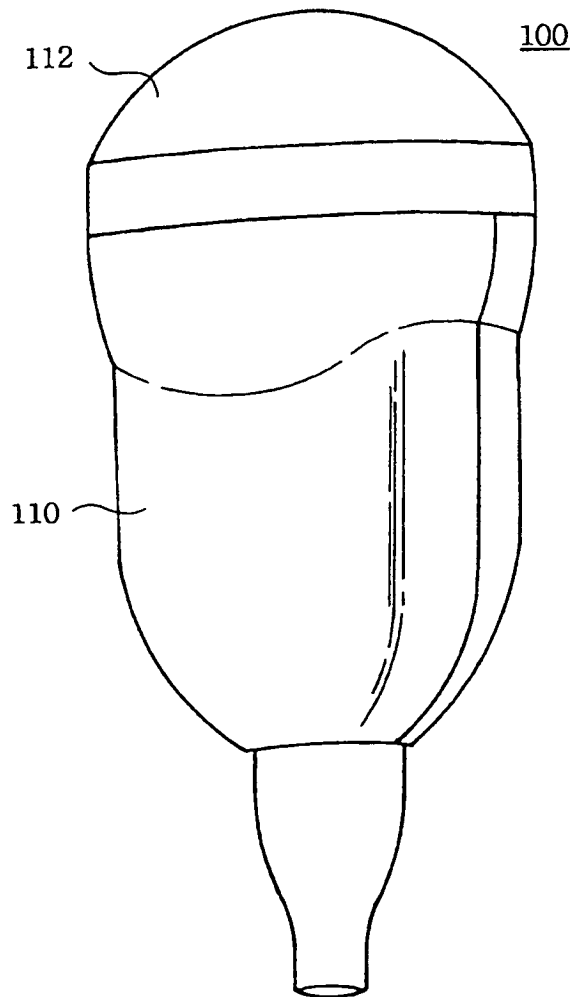


Fig. 3

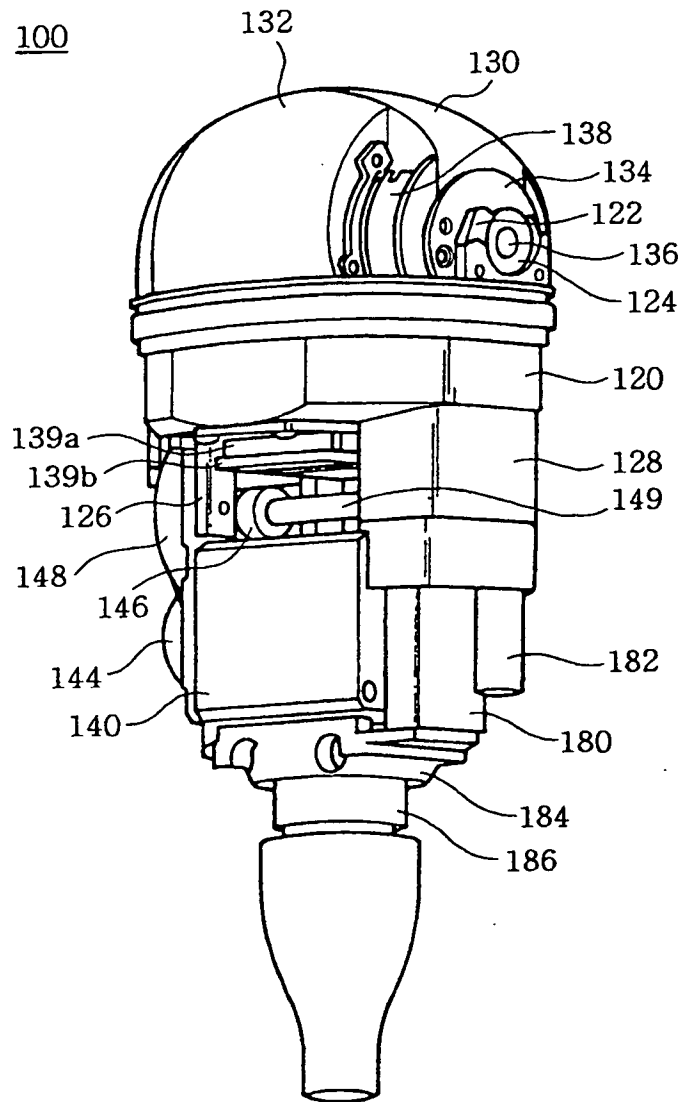


Fig. 4

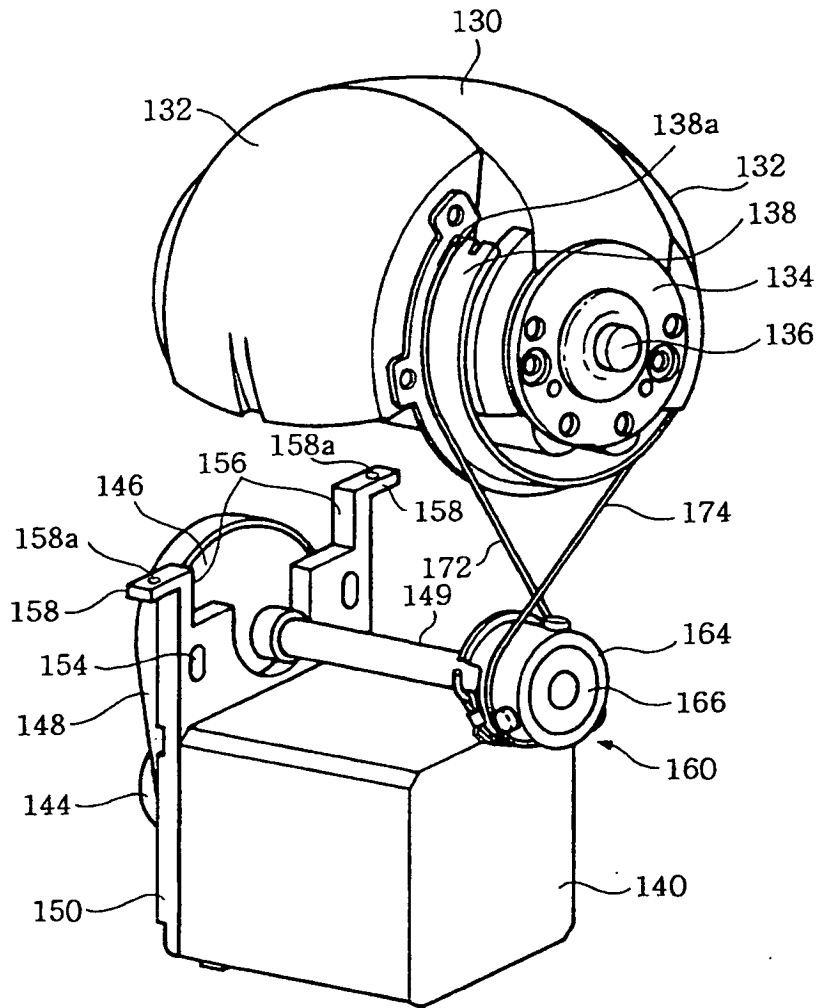


Fig. 5

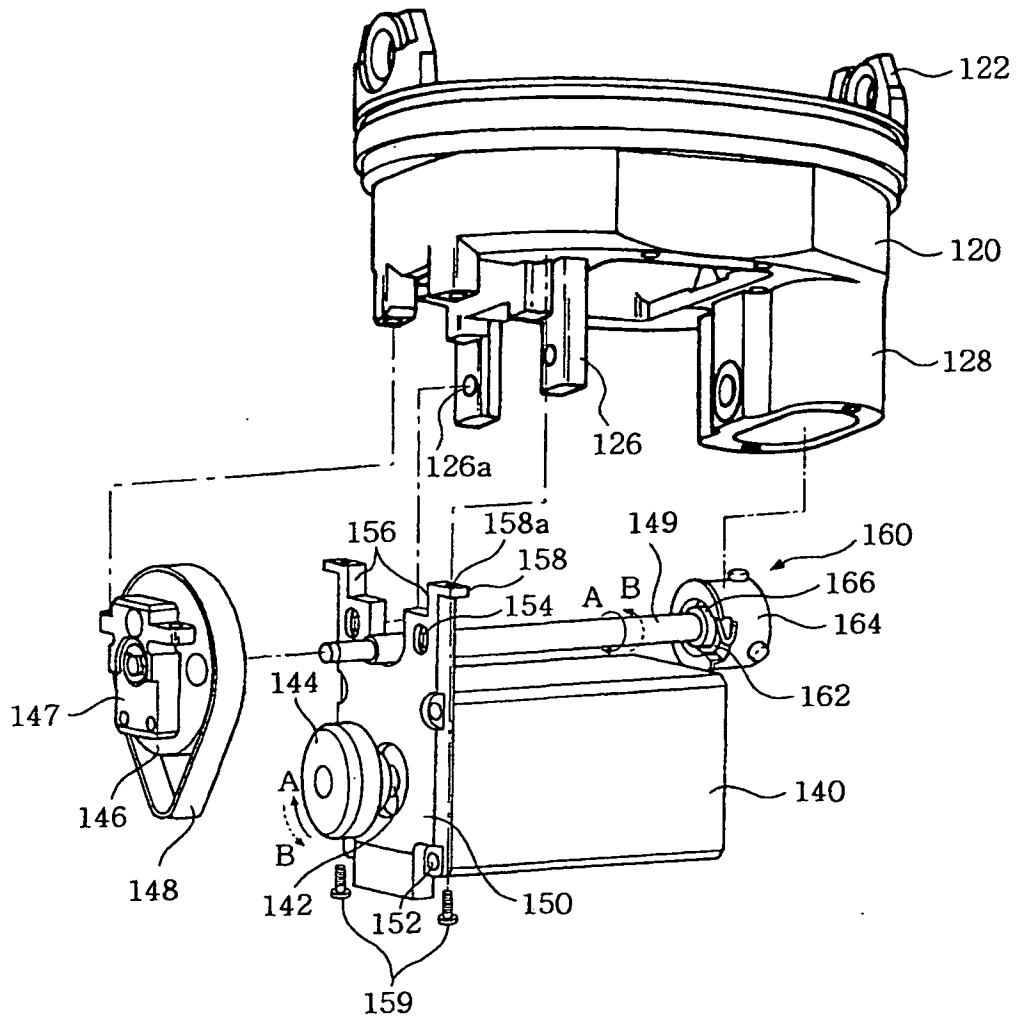


Fig. 6

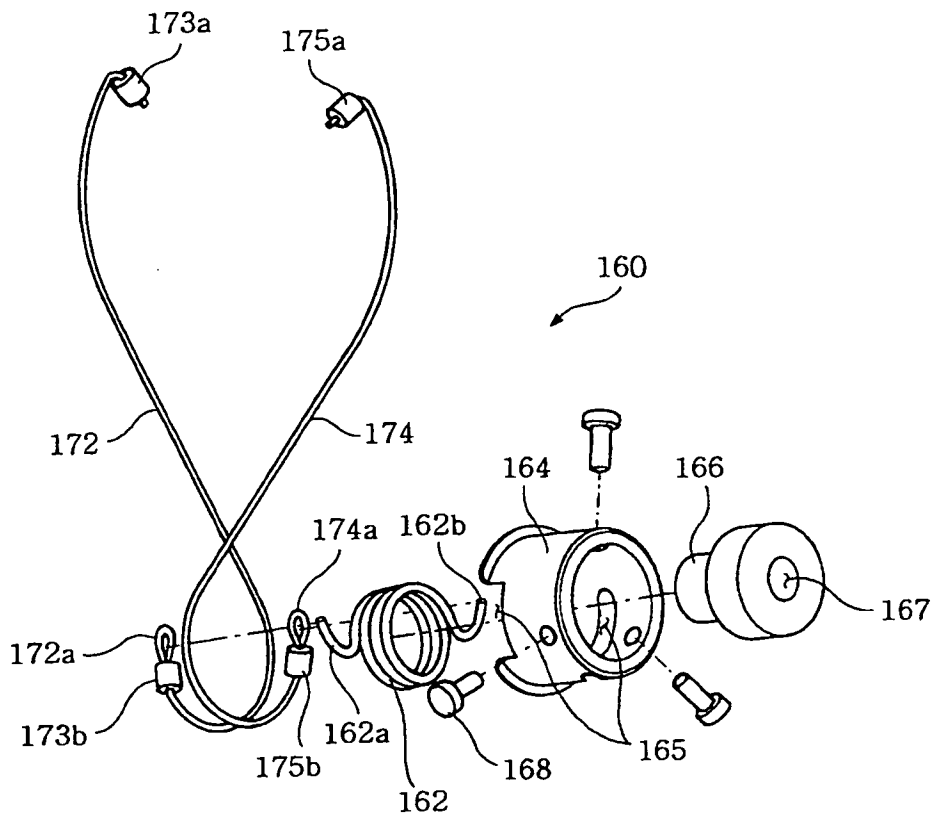


Fig. 7

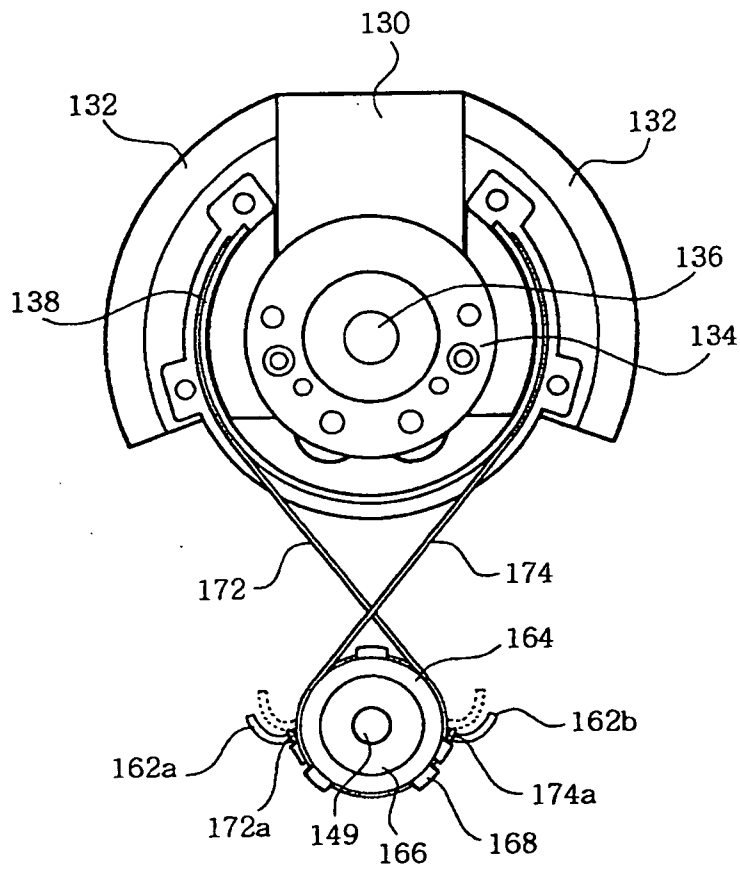


Fig. 8A

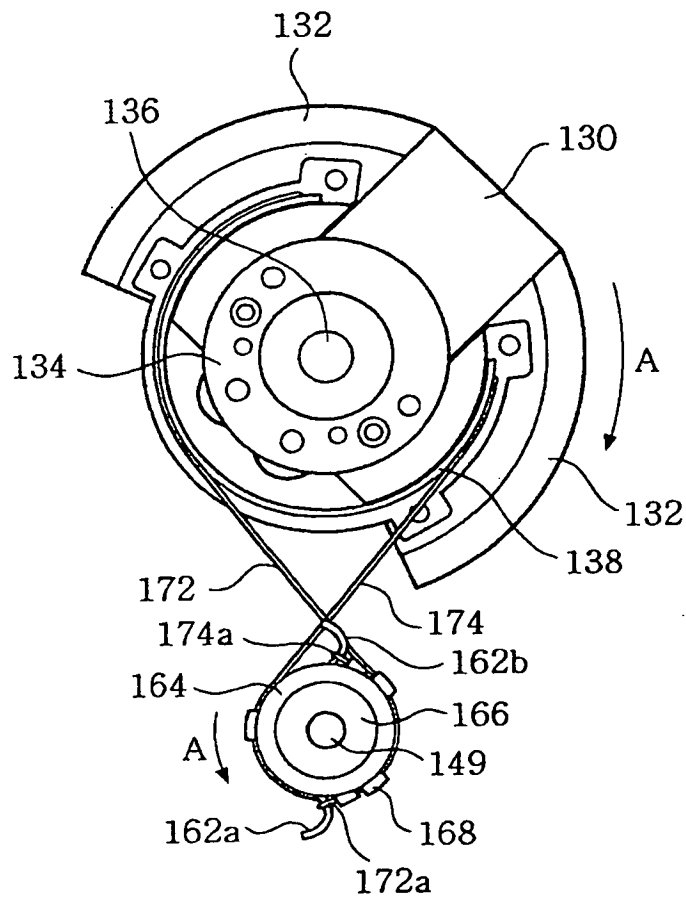
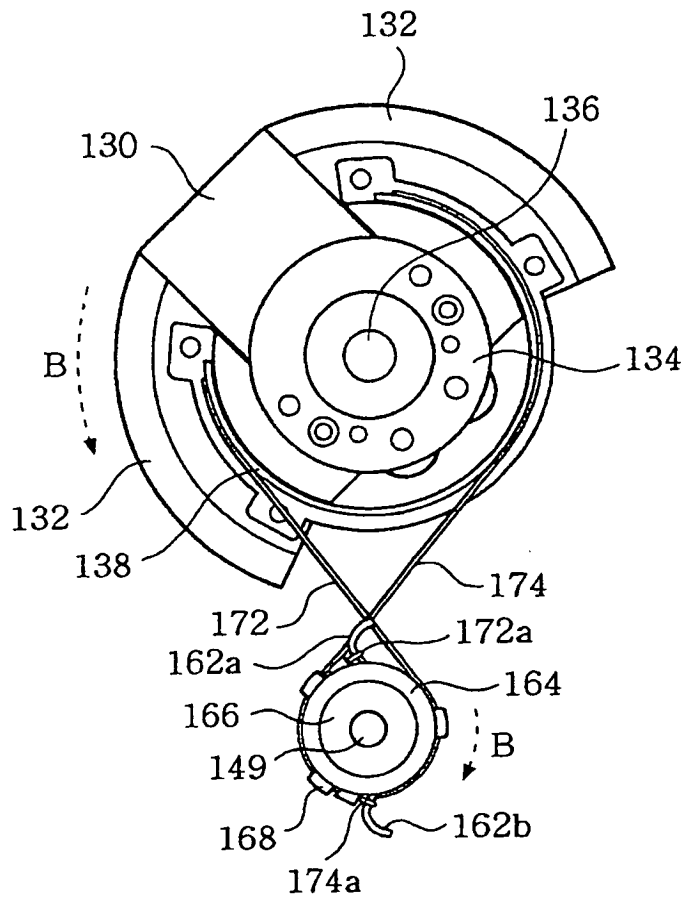


Fig. 8B



REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 5771896 A [0002]
- JP 2002153464 A [0003]

专利名称(译)	用于在超声诊断设备中旋转探针的超声元件组件的装置		
公开(公告)号	EP1676531B1	公开(公告)日	2008-05-07
申请号	EP2005020641	申请日	2005-09-22
申请(专利权)人(译)	MEDISON CO. , LTD.		
当前申请(专利权)人(译)	MEDISON CO. , LTD.		
[标]发明人	KIM SEONG RAE		
发明人	KIM, SEONG RAE		
IPC分类号	A61B8/00 G10K11/35 A61B8/13 G01S15/89 F16H57/12 F16H7/14 F16H19/00 H02K7/10		
CPC分类号	A61B8/483 A61B8/08 A61B8/4461 F16H19/005 G01S15/8906 G01S15/894 G10K11/355 H02K7/1004		
代理机构(译)	LORENZ , WERNER		
优先权	1020040115713 2004-12-29 KR		
其他公开文献	EP1676531A1		
外部链接	Espacenet		

摘要(译)

本发明涉及一种用于在超声诊断设备中旋转探针的超声元件组件的装置。枢轴可旋转地联接到基座并支撑超声元件组件。线夹连接到枢轴。驱动马达安装在基座上并具有驱动轴。一种钢丝绳组件，包括：壳体，连接到驱动电机的驱动轴以与其一起旋转；弹性构件，设置在壳体中；以及一对钢丝绳，每根钢丝绳的第一端连接到电线保持器每根钢丝绳的第二端连接到弹性件上。

Fig. 1A
(Prior Art)

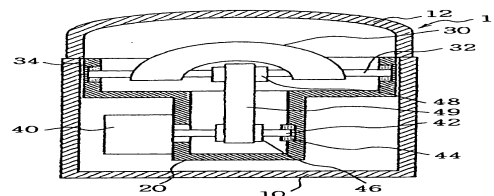


Fig. 1B
(Prior Art)

