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Detection probe, transmission device, and detection instrument

Abstract

A detection probe, a transmission device, and a detection instrument. The detection probe includes a housing defining a receiving space, a detection mechanism disposed on an end of the housing and configured to perform a detection function, a drive mechanism disposed in the receiving space and configured to output power, a rope transmission mechanism disposed in the receiving space and including a rope connected to the driving mechanism and the detection mechanism respectively and a reversing assembly including at least two reversing pulley groups arranged along an extension path of the rope, and a gear transmission mechanism disposed in the receiving space and connected to the driving mechanism and the rope transmission mechanism respectively, so as to receive the power output by the driving mechanism and transmit the power to the rope transmission mechanism.

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Background/Summary

CROSS REFERENCE TO RELATED APPLICATIONS (1) The present disclosure is a continuation of International Patent Application No. PCT/CN2021/082438, filed Mar. 23, 2021, the contents of which are herein incorporated by reference in their entireties.

TECHNICAL FIELD

(1) The present disclosure relates to the field of medical instruments, in particular to a detection probe, a transmission device, and a detection instrument.

BACKGROUND

(2) A detection probe used for medical detecting, such as an ultrasonic probe, may emit ultrasonic signal for detection through an acoustic head assembly and receive an ultrasonic signal including detection information, and a detection result is obtained through analysis.

(3) In practical applications, in order to improve accuracy and comprehensiveness of the detection result, the acoustic head assembly may be driven to oscillate to detect different parts. However, due to factors such as structural and spatial limitations, etc., the requirement for a transmission mechanism configured to transmit driving force to the acoustic head assembly becomes higher and higher.

SUMMARY OF THE DISCLOSURE

(4) According to a first aspect of the embodiments of the present disclosure, a detection probe is provided. The detection probe includes: a housing, defining a receiving space; a detection mechanism, disposed on an end of the housing and configured to perform a detection function; a driving mechanism, disposed in the receiving space and configured to output power; a rope transmission mechanism, disposed in the receiving space and including: a rope, connected to the driving mechanism and the detection mechanism respectively, and configured to receive the power output by the driving mechanism, transmit the power to the detection mechanism, and drive the detection mechanism to move; and a reversing assembly, including at least two reversing pulley groups arranged along an extension path of the rope, where the rope sequentially bypasses the two reversing pulley groups, and a transmission direction is changed under an action of the two reversing pulley groups; and a gear transmission mechanism, disposed in the receiving space and connected to the driving mechanism and the rope transmission mechanism respectively, so as to receive the power output by the driving mechanism and transmit the power to the rope transmission mechanism.

(5) According to a second aspect of the embodiments of the present disclosure, a transmission device is provided and applied to a detection probe. The detection probe includes a detection mechanism and a driving mechanism. The transmission device includes: a rope transmission mechanism, including: a rope, connected to the driving mechanism and the detection mechanism respectively, and configured to receive the power output by the driving mechanism, transmit the power to the detection mechanism, and drive the detection mechanism to move; and a reversing assembly, including at least two reversing pulley groups arranged along an extension path of the rope, where the rope sequentially bypasses the two reversing pulley groups, and a transmission direction is changed under an action of the two reversing pulley groups.

(6) According to a third aspect of the embodiments of the present disclosure, a detection instrument is provided. The detection instrument includes a host and a detection probe. The detection probe includes: a housing, defining a receiving space; a detection mechanism, disposed on an end of the housing and configured to perform a detection function; a driving mechanism, disposed in the receiving space and configured to output power; a rope transmission mechanism, disposed in the receiving space and including: a rope, connected to the driving mechanism and the detection mechanism respectively, and configured to receive the power output by the driving mechanism, transmit the power to the detection mechanism, and drive the detection mechanism to move; and a reversing assembly, including at least two reversing pulley groups arranged along an extension path of the rope, where the rope sequentially bypasses the two reversing pulley groups, and a transmission direction is changed under an action of the two reversing pulley groups; and a gear transmission mechanism, disposed in the receiving space and connected to the driving mechanism and the rope transmission mechanism respectively, so as to receive the power output by the driving

mechanism and transmit the power to the rope transmission mechanism. The host is respectively connected to the detection mechanism and the driving mechanism of the detection probe, such that the driving mechanism is controlled to output the power, and the detection mechanism is controlled to perform the detection function.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

(1) To illustrate technical solutions more clearly in the embodiments of the present disclosure or in the related art, the drawings used for description of some embodiments or the related art will be briefly described. It is obvious that the drawings in the following description only illustrate some embodiments of the present disclosure, and those skilled in the art, without creative work, can also obtain other drawings based on these drawings.

(2) FIG. **1** is a schematic structural view of a detection instrument according to some embodiments of the present disclosure.

(3) FIG. **2** is a schematic partial structural view of a detection probe according to some embodiments of the present disclosure.

(4) FIG. **3** is a schematic partial structural view of the detection probe according to some embodiments of present disclosure.

(5) FIG. **4** is a schematic exploded view of a detection mechanism of the detection probe according to some embodiments of the present disclosure.

(6) FIG. **5** is a schematic structural view of a transmission mechanism and a driving mechanism of the detection probe according to some embodiments of the present disclosure.

(7) FIG. **6** is a schematic structural view of the transmission mechanism and the driving mechanism of the detection probe according to some embodiments of present disclosure.

(8) FIG. **7** is a schematic structural view of the transmission mechanism and the driving mechanism of the detection probe according to some embodiments of present disclosure.

(9) FIG. **8** is a partially exploded schematic structural view of the detection probe according to some embodiments of present disclosure.

(10) FIG. **9** is a partially exploded schematic structural view of the detection probe according to some embodiments of present disclosure.

(11) FIG. **10** is a schematic partial structural view of a rope transmission mechanism of the detection probe according to some embodiments of present disclosure.

(12) FIG. **11** is a schematic partial structural view of the rope transmission mechanism of the detection probe according to some embodiments of present disclosure.

(13) FIG. **12** is a schematic partial structural view of the rope transmission mechanism of the detection probe according to some embodiments of present disclosure.

DETAILED DESCRIPTION

(14) In order to make the purpose, technical solutions, and technical effects in the embodiments of the present disclosure more clearly, the present disclosure is described in further detail below by referring to the accompanying drawings and embodiments. It should be understood that specific embodiments described herein are intended to explain the present disclosure only and are not intended to limit the present disclosure. An embodiment or a feature of the present disclosure may be combined with some other embodiments of the present disclosure and/or some other features without conflict.

(15) A detection instrument is provided by some embodiments of the present disclosure. The detection instrument may be configured to inspect a body surface and/or an internal body tissue, so as to obtain an inspection result. Of course, in some application scenarios, the detection instrument may also be configured to inspect an animal body, which is not limited herein.

(16) As shown in FIG. **1**, in an embodiment, the detection instrument may include a detection probe **1000** and a host **2000**. The detection probe **1000** may be connected to the host **2000** via a wired/wireless way, so as to detect a part of the human body to be detected under the control of the host **2000**.
(17) In some embodiments, the detection probe **1000** may be a three dimensional (hereinafter 3D) mechanical probe, a four dimensional (hereinafter 4D) mechanical probe, etc., that is, an ultrasonic probe with a 3D/4D imaging function. Under the signal control of the host **2000**, the detection probe **1000** may transmit an ultrasonic signal to human tissues and receive an echo signal with information of the human tissues. The host **2000** images the human tissues by processing the echo signal of the detection probe **1000**, Thus, a 3D/4D image of the human tissues may be constructed for medical analysis, such as using the 3D/4D mechanical probe for gynecological examination or the like.
(18) Of course, the detection probe **1000** may also be used for other purposes, such as sending electrical stimulation to the human tissues, performing physical massage, etc., under the signal control of the host **2000**, which is not limited herein.
(19) In an embodiment, as shown in FIG. **2** and FIG. **3**, the detection probe **1000** may include a housing **100**, a detection mechanism **200**, a transmission device **300**, a driving mechanism **400**, a tail sleeve assembly **500**, a mounting assembly **600**, etc. The transmission device **300** may be connected to the driving mechanism **400** and the detection mechanism **200**, respectively. The host **2000** may be connected to the driving mechanism **400** and the detection mechanism **200** via the tail sleeve component **500**. The host **2000** may control an operation of the driving mechanism **400** to drive the transmission device **300** to drive the detection mechanism **200** to move. The detection mechanism **200** may feed back detected information to the host **2000** for analysis and processing, and a detection result is obtained.
(20) Of course, in other embodiments, the detection probe **1000** may include more or less structures than the above-mentioned structures, which may be selected according to actual needs, and is not limited herein.
(21) In some embodiments, the housing **100** defines a receiving space **110**. An opening **120** is defined on an end of the housing **100**, and the opening **120** is in communication with the receiving space **110**. The receiving space **110** is configured to receive at least part of an internal structure of the detection probe **1000**, so as to provide support and protection for the internal structure.
(22) In some embodiments, the housing **100** may be an integral structure, or may be formed by assembling a plurality of different parts respectively. In an embodiment, the housing **100** may include an extension portion **130** and a handheld portion **140**. The extension portion **130** and the handheld portion **140** are connected to each other to form the housing **100**. In some embodiments, the extension portion **130** may be connected to the handheld portion **140** by at least one of pasting by using adhesive, setting a specific connection structure for snapping, buckling, etc., which is not limited herein.
(23) Accordingly, the extension portion **130** and the handheld portion **140** correspond to an extension area **111** and a receiving area **112** of the receiving space **110**, respectively. That is, the extension portion **130** may correspond to the extension area **111**, and the handheld portion **140** corresponds to the receiving area **112**. The transmission device **300** and the driving mechanism **400** may be received correspondingly in the extension area **111** and the receiving area **112**, respectively. That is, the transmission device **300** may be received correspondingly in the extension area **111**, and the driving mechanism **400** may be received correspondingly in the receiving area **112**. It should be noted that in this embodiment, a corresponding relationship between various areas of the receiving space **110** and various functional mechanisms is not strictly limited. For example, in some application scenarios, the transmission device **300** may be partially received in the extension area **111**, and partially received in the receiving area **112**, which may be designed according to actual needs.

(24) In some embodiments, a shape, a size, etc. of each part of the housing **100** may be jointly determined according to its own function, and the shape, the size, the function, etc., of the internal structure included in the corresponding area of the receiving space **110**.
(25) It should be noted that, in an embodiment, the detection probe **1000** may be extended into the human body cavity to detect internal tissue of the human body. During an operation, the detection mechanism **200** is disposed on a head, an operator holds the handheld portion **140**, and extends the detection mechanism **200** into the body through the extension of the extension portion **130** to perform the detection function. In addition, the tail sleeve assembly **500** is disposed outside the human body, and thus it is convenient for the corresponding functional mechanisms of each part to perform a corresponding function.
(26) In some embodiments, as shown in FIG. **4**, the detection mechanism **200** may include an acoustic window **210**, a transducer **220**, an assembly base **230**, and a bearing bracket **240**.
(27) The transducer **220** may be connected to the host **2000**. Based on the control signal transmitted by the host **2000**, the transducer **220** may emit ultrasonic waves configured as a detection signal to human tissues to be detected, and may receive a feedback signal carrying detection information.
(28) The acoustic window **210** may have ultrasonic penetrability and be arranged on a periphery of the transducer **220**. In some embodiments, the acoustic window **210** may be arranged on the opening **120** disposed on an end of the housing **100**, and may be covered outside of the transducer **220**, the assembly base **230**, and the bearing bracket **240**. It should be noted that in practical applications, coupling fluid configured for ultrasonic transmission may be filled between the acoustic window **210** and the transducer **220**, thereby achieving the transmission of the ultrasonic detection signal and the reception of the feedback signal with the cooperation of the transducer **220**, the coupling fluid, and the acoustic window **210**.
(29) An assembly position **231** is defined on the assembly base **230**. The assembly position **231** may be configured to accommodate the above-mentioned transducer **220**, and the transducer **220** may be arranged on the assembly base **230**. In some embodiments, the transducer **220** may be bonded to the assembly position **231** by using adhesive, such as epoxy adhesive, etc. In addition, an assembly groove **232** is defined on each of two sides of the assembly base **230**. The assembly groove **232** may be configured to arrange some components of the transmission device **300**, thereby achieving connection with the transmission device **300**.
(30) The bearing bracket **240** may be configured to support the assembly base **230**, thereby supporting the transducer **220**. In some embodiments, the bearing bracket **240** may be a ring bracket, such as a circular bracket, a square annular bracket, etc. In some embodiments, a shape of the bearing bracket **240** may match a shape of an inner sidewall disposed on the opening **120** of the housing **100**, and the bearing bracket **240** may be arranged on the inner sidewall of the housing **100** at the opening **120**.
(31) The bearing bracket **240** may further include two concave-arc bearing tables **241**. Each of the two concave-arc bearing tables **241** may have a concave-arc bearing surface. In some embodiments, the assembly base **230** may further include two cylindrical bosses **233** located on two sides of the assembly base **230**. Each of the two cylindrical bosses **233** may have an arc-shaped side surface and is configured to be movably supported on the corresponding concave-arc bearing surface of the bearing bracket **240**, such that the two cylindrical bosses **233** may oscillate under the support of the concave-arc bearing table **241**, and thus when the assembly base **230** is received to a force applied by the transmission device **300**, the transducer **220** may be driven to reciprocatingly oscillate in a certain direction.
(32) In some embodiments, as shown in FIG. **3** and FIGS. **5-11**, the transmission device **300** may include a gear transmission mechanism **320**, a rope transmission mechanism **330**, etc.
(33) In some embodiments, the gear rotation mechanism **320** may be connected to the driving mechanism **400** and the rope transmission mechanism **330**, respectively, such that the power output by the driving mechanism **400** is received and transmitted to the rope transmission mechanism **330**.

The rope transmission mechanism **330** is further connected to the detection mechanism **200**, and when receiving the power transmitted by the gear transmission mechanism **320**, the rope transmission mechanism **330** may drive the detection mechanism **200** to move, thereby realizing the detection.

(34) The transmission device **300** may be arranged in the receiving space **110** via the mounting assembly **600**. In some embodiments, the transmission device **300** may be arranged on the inner sidewall of the housing **100**. In some embodiments, the mounting assembly **600** may include a mounting base **610**, a sealing member **620**, a support frame **630**, a first shaft **640**, a second shaft **650**, etc. In some application scenarios, the first shaft **640** or the second shaft **650** may also be referred to as a support shaft, which is not limited herein.

(35) The mounting base **610** may be arranged on the housing **100** and surrounded by the inner sidewall of the housing **100**. In some embodiments, the mounting base **610** may be arranged on an end of the extension portion **130** close to the handheld portion **140**, and may be bonded by means of adhesive to achieve installation, or installed by means of clamping, interference fit, or the like. In some embodiments, at least part of the appearance of the mounting base **610** may also match a shape of the inner sidewall of the housing **100** at a mounting location, such that a connection between the mounting base **610** and the inner sidewall of the housing **100** is sealed, and thus separating the extension area **111** of the receiving space **110** from the receiving area **112**.

(36) In some embodiments, the mounting base **610** defines a mounting hole **611** penetrating the mounting base **610**. The extension area **111** and the receiving area **112** disposed on the two sides of the mounting base **610** may be in communication with each other via the mounting hole **611**. In some embodiments, the sealing member **620** may be arranged in the mounting hole **611**.

(37) The support frame **630** may be connected to a side of the mounting base **610** facing the rope transmission mechanism **330**, and may extend along a direction substantially perpendicular to and away from a main surface of the mounting base **610**.

(38) The first shaft **640** and the second shaft **650** may be connected to and arranged on the support frame **630**, and may be spaced apart from each other. In some embodiments, two ends of the first shaft **640** and the second shaft **650** may be fixedly connected to the support frame, and the first shaft **640** and the second shaft **650** may be arranged in parallel with each other. In some embodiments, the first shaft **640** and the second shaft **650** may be further parallel to the main surface of the mounting base **610**, which is not limited herein.

(39) The mounting base **610**, the support frame **630**, the first shaft **640**, and the second shaft **650** may be independent structures respectively, and may be connected together by means of bonding, clamping, screwing, plugging, etc. In some embodiments, the mounting base **610**, the support frame **630**, the first shaft **640**, and the second shaft **650** may also be an integral structure in whole or in part, which is not limited herein.

(40) In some embodiments, the gear transmission mechanism **320** and the rope transmission mechanism **330** may be arranged on the inner sidewall of the housing **100** via the mounting assembly **600** on a side of the extension area **111**.

(41) The gear transmission mechanism **320** may have various forms, as long as the gear transmission mechanism **320** may transmit the power output by the driving mechanism **400** to the rope transmission mechanism **330**.

(42) In an embodiment, as further shown in FIG. **3**, FIG. **5** and FIG. **8**, the gear transmission mechanism **320** may include a driving shaft **321***a*, a driving gear **322***a*, a driven gear **323***a*, a driven shaft **324***a*, a first bearing **325***a*, a shaft coupling **326***a*, etc.

(43) One end of the driving shaft **321***a* is disposed on the extension area **111**, and the other end of the driving shaft **321***a* passes through the mounting hole **611** of the mounting base **610** and enters the receiving area **112**, and is connected to the shaft coupling **326***a*. In this way, the other end of the driving shaft **321***a* is connected to an output end of the driving mechanism **400** via the shaft coupling **326***a*, such that the driving mechanism **400** may drive the driving shaft **321***a* to rotate.

(44) In some embodiments, the first bearing **325***a* may be sleeved on a periphery of the driving shaft **321***a* and may be arranged in the mounting hole **611**, so as to support the rotation of the driving shaft **321***a*. The sealing member **620** may be an oil seal, such as a skeleton oil seal or the like. In some embodiments, the sealing member **620** may be sleeved on the periphery of the driving shaft **321***a* and arranged in the mounting hole **611**, and configured to seal the mounting hole **611**, thereby further separating the extension area **111** from the receiving area **112**.
(45) The driving gear **322***a* is arranged on an end of the driving shaft **321***a* disposed on the extension area **111**, and is driven to rotate synchronously with the driving shaft **321***a* by the driving mechanism **400**. It should be noted that the driving gear **322***a* and the driving shaft **321***a* may be independent structures and connected to each other in a certain way. In some embodiments, the driving gear **322***a* and the driving shaft **321***a* may also be an integrated structure, that is, the driving shaft **321***a* and the driving gear **322***a* together form a gear shaft, which may be selected according to actual needs.
(46) The driven gear **323***a* is engaged with the driving gear **322***a*, and rotates with the driving gear **322***a*. The driving gear **322***a* and the driven gear **323***a* may be cylindrical gears that are arranged in parallel along an axial direction. In practical applications, the driving gear **322***a* and the driven gear **323***a* with appropriate numbers of teeth may be selected according to the needs. For example, the number of teeth of the driven gear **323***a* may be greater than that of the driving gear **322***a*, such that it may achieve deceleration motion through gear transmission and amplify transmitted power, thereby increasing a torque which is configured to drive the transducer **220** to oscillate. In addition, since the larger the output torque of the driving mechanism **400**, the larger the volume and weight, the setting of the above-mentioned gear transmission mechanism **320** may also increase the oscillate torque of the transducer **220** without increasing the volume and weight of the driving mechanism **400**, thereby improving the portability of the detection probe **1000**.
(47) In some embodiments, the driven shaft **324***a* is respectively connected to the driven gear **323***a* and an input end of the rope transmission mechanism **330**, so as to rotate synchronously with the driven gear **323***a*, and to cause the input end of the rope transmission mechanism **330** to move under the drive of the driven shaft **324***a*.
(48) In some embodiments, the mounting assembly **600** may further include the mounting shaft **660**. The mounting shaft **660** may be connected to and arranged on the side of the mounting base **610** facing the gear transmission mechanism **320**, and may extend along a direction substantially perpendicular to and away from a main surface of the mounting base **610**. The mounting shaft **660** and the support frame **630** may be arranged on the same side of the mounting base **610** and spaced apart from each other.
(49) In some embodiments, the driven shaft **324***a* may be a hollow shaft, inserted in a center of driven gear **323***a*, and sleeved on a periphery of mounting shaft **660**, such that the driven shaft **324***a* may be driven to rotate around the mounting shaft **660** by the driven gear **323***a*.
(50) In some embodiments, as further shown in FIG. **3**, FIG. **6**, and FIG. **9**, the gear transmission mechanism **320** may be in a form of a planetary gear transmission. In some embodiments, the gear transmission mechanism **320** may include a sun gear **321***b*, a ring gear **322***b*, a plurality of planetary gears **323***b*, a planetary carrier **324***b*, a second bearing **325***b*, and the like.
(51) The output end of the driving mechanism **400** passes through the mounting hole **611** of the mounting base **610** from the receiving area **112**, enters the extension area **111**, and is connected to the sun gear **321***b*. In addition, the output end of the driving mechanism **400** is configured as a rotatory shaft of the sun gear **321***b* and drives the sun gear **321***b* to rotate. The second bearing **325***b* may be sleeved on a periphery of the output end of the driving mechanism **400** and arranged in the mounting hole **611**, so as to support the rotation of the output end of the driving mechanism **400**. The sealing element **620** may be an oil seal, such as a skeleton oil seal or the like. In some embodiments, the sealing member **620** may be sleeved on the periphery of the output end of the driving mechanism **400** and arranged in the mounting hole **611**, and configured to seal the

mounting hole **611**, thereby further separating the extension area **111** from the receiving area **112**.
(52) The ring gear **322***b* may be arranged on the mounting base **610**, sleeved on the periphery of the sun gear **321***b*, arranged coaxially with the sun gear **321***b*, and spaced apart from the sun gear **321***b*. The number of teeth and a size of the ring gear **322***b* may be designed according to actual needs.
(53) The number of the planetary gears **323***b* may also be designed according to actual needs. In the embodiment, the number of the planetary gears **323***b* may be three. The three planetary gears **323***b* are arranged between the sun gear **321***b* and the ring gear **322***b*, and spaced apart from each other. One side of each of the plurality of planetary gears **323***b* is engaged with the sun gear **321***b*, and the other side of the each of the plurality of planetary gears **323***b* is engaged with an inner side of the ring gear **322***b*, such that the each of the plurality of planetary gears **323***b* may rotate in the ring gear **322***b* with the sun gear **321***b*.
(54) The planetary carrier **324***b* may be connected to a side of the each of the plurality of planetary gears **323***b* away from the mounting base **610**, and driven to rotate coaxially with the sun gear **321***b* by the planetary gear **323***b*. The planetary carrier **324***b* may be further connected to the input end of the rope driving mechanism **330**, thereby outputting the power received by the sun gear **321***b* to the input end of the rope driving mechanism **330**, and thus the input end of the rope driving mechanism **330** is driven to move.
(55) For two above-mentioned implementation methods of the gear transmission mechanism **320**, in a first method, the driving gear **322***a* and the driven gear **323***a* may both be cylindrical gears, which have a high power transmission reliability, a high transmission efficiency (i.e., reaching more than 0.99), a long gear life, a simple and compact structure, and a simple operation and maintenance. For a second planetary transmission method, it has a compact structure, a small size, a light weight, a large transmission ratio, a good coaxiality, and a high transmission efficiency. In practical applications, either of the two methods may be selected according to the needs, or the combination of the two methods may be used, which is not limited herein.
(56) In some embodiments, as further shown in FIGS. **5**-**6** and FIGS. **10**-**11**, the rope transmission mechanism **330** may include a rope pulley **331**, a rope **332**, a reversing assembly **333**, a tensioning assembly **334**, and a stabilizing pulley group **335**, etc.
(57) The rope pulley **331** may be connected to an output end of the gear transmission mechanism **320** and rotate with the output end of the gear transmission mechanism **320**. The rope **332** is wound on the periphery of the rope pulley **331** and connected to the assembly base **230** of the detection mechanism **200** via the reversing assembly **333** and the tensioning assembly **334**, thereby driving the transducer **220** arranged on the assembly base **230** to oscillate.
(58) In some embodiments, two ends of the rope **332** are respectively arranged in the corresponding assembly grooves **232** of the assembly base **230** in one-to-one correspondence.
(59) In some embodiments, a guiding groove **3311** may be further defined on the periphery of the rope pulley **331**. The guiding groove **3311** may surround the periphery of the rope pulley **331** and be recessed. The rope **332** may be wound in the guiding groove **3311**, thereby maintaining synchronous motion with the rope pulley **331**.
(60) In some embodiments, for the above-mentioned first method of the gear transmission mechanism **320**, as shown in FIGS. **5** and **8**, the driven shaft **324***a* is configured as the output end of the gear transmission mechanism **320**, and the rope pulley **331** may be sleeved on a periphery of the driven shaft **324***a* and synchronously rotate accordingly. In the embodiment, the driven shaft **324***a* is not only configured as the driven shaft of the driven gear **323***a*, but also configured as the driving shaft of the rope pulley **331**.
(61) In an application scenario, the rope pulley **331** is integrally connected to an end of the driven shaft **324***a*, and the driven shaft **324***a* is connected to the driven gear **323***a* in a split mode. Of course, in other application scenarios, the driven shaft **324***a* may also be integrated with the driven gear **323***a*, and connected to the rope pulley **331** in a split mode, which is not limited herein.
(62) For the above-mentioned second method of the gear transmission mechanism **320**, as shown in

FIGS. **6** and **9**, the planetary carrier **324***b* is configured as the output end of the gear transmission mechanism **320** and is connected to the rope pulley **331**. In some embodiments, the planetary carrier **324***b* may be connected to a center of the rope pulley **331** and drive the rope pulley **331** to rotate synchronously and coaxially. In an application scenario, the rope pulley **331** may be connected to an end of the planetary carrier **324***b* away from the planetary carrier **323***b*, and is integrated with the planetary carrier **324***b*. Of course, in other application scenarios, the rope pulley **331** and the planetary carrier **324***b* may also be separate structures, which is not limited herein.

(63) It should be noted that the reciprocating oscillation of the transducer **220** is driven by the driving mechanism **400**. However, in some application scenarios, due to factors such as structural and spatial limitations, a driving direction of the output end of the driving mechanism **400** is not consistent with an oscillate direction required by the transducer **220**. Therefore, the transmission device **300** may be designed to change a direction of power transmission during a transmission process, such that the transmission direction of the output end of the rope transmission mechanism **330** is consistent with the oscillate direction required by the transducer **220**. In some embodiments, a structure that changes the transmission direction may be arranged on the gear transmission mechanism **340**, or arranged on the rope transmission mechanism **330**, or arranged on both the gear transmission mechanism **340** and the rope transmission mechanism **330**.

(64) In the embodiment, the reversing assembly **333** may be arranged between the rope pulley **331** and the detection mechanism **200** along an extension path of the rope **332**. During the transmission process, a transmission direction of the rope **332** is changed, such that it may be possible to ensure that a transmission direction of two ends of the rope **332** connecting the assembly base **230** is consistent with a movement direction required by the detection mechanism **200**.

(65) In some embodiments, the reversing assembly **333** may include a first reversing pulley group including two first reversing pulleys **3331** and a second reversing pulley group including two second reversing pulleys **3332**. The two first reversing pulleys **3331** may be rotated and sleeved on a periphery of the first shaft **640**, respectively, and are spaced apart from each other. The two second reversing pulleys **3332** may be rotated and sleeved on a periphery of the second shaft **650**, respectively, and are spaced apart from each other.

(66) Of course, in other embodiments, the reversing pulley assembly **333** may further include more reversing pulley groups, such as three groups, four groups, five groups, etc., which may be selected according to actual needs and is not limited herein.

(67) In some embodiments, along the extension path, each of two sides of the rope **332** is sequentially wound on a corresponding periphery of each of the first reversing pulley **3331** and the second reversing pulley **3332** in a staggered mode. The transmission direction is changed under an action of the first reversing pulley **3331** and the second reversing pulley **3332**.

(68) In some embodiments, the tensioning assembly **334** may be arranged between the rope pulley **331** and the detection mechanism **200** along the extension path of the rope **332**. In some embodiments, the tensioning assembly **334** may apply a force to the rope **332** at a location between the two reversing pulley groups, such that the rope **332** may be in a tensioned state, thereby enabling the rope transmission mechanism **330** to drive the transducer **220** to oscillate smoothly. In this way, it may be possible to enable the detection probe **1000** to perform smooth scanning and detection, thereby improving the accuracy of the detection result.

(69) In some embodiments, the tensioning assembly **334** may include a tensioning adjusting seat **3341**, a tensioning pulley **3343**, and a force applying member **3344**.

(70) The tensioning adjustment base **3341** may be rotatably sleeved on the periphery of the first shaft **640**, such that when the tensioning adjustment base **3341** is under force, the tensioning adjustment base **3341** may rotate around the first shaft **640** for adjustment, and thus the tensioning adjustment base **3341** is in a balanced state.

(71) In some embodiments, the tensioning adjustment base **3341** may be sleeved on the periphery of the first shaft **640** between two first reversing pulleys **3331**, as shown in FIG. **10**. Alternatively,

the tensioning adjustment base **3341** may be sleeved on the periphery of the first shaft **640** on two sides of two first reversing pulleys **3331**, as shown in FIG. **11**. The present disclosure is not limited herein.

(72) In some embodiments, the number of tensioning pulleys **3343** may be one or more. When the number of tensioning pulleys **3343** is one, a shape of the tensioning pulley **3343** may be a long column, and two accommodating grooves are defined on a surface of the tensioning pulley **3343**. The two accommodating grooves are axially arranged and surrounding the tensioning pulley **3343**. The two sides of the rope **332** may be wound on the periphery of the tensioning pulley **3343** by being respectively wound in the corresponding accommodating grooves.

(73) In the embodiment, the number of tensioning pulleys **3343** is two, and one accommodating groove is defined on a surface of each of the two tensioning pulleys **3343** and wound on the corresponding tensioning pulley **3343**. The two sides of the rope **332** may be wound on the periphery of the tensioning pulley **3343** by being respectively wound in the corresponding accommodating grooves. That is, one of the two sides of the rope **332** may be wound on the periphery of the tensioning pulley **3343** by being respectively wound in the one of corresponding accommodating grooves, and the other one of the two sides of the rope **332** may be wound on the periphery of the tensioning pulley **3343** by being respectively wound in the other one of corresponding accommodating grooves. The two tensioning pulleys **3343** may be spaced apart from each other and are rotatably connected to the tensioning adjustment base **3341**.

(74) The force applying member **3344** may be configured to apply tensioning adjustment force to the tensioning adjustment base **3341**, such that the tensioning adjustment base **3341** rotates around the first shaft **640**, and applies force to the rope **332** via the two tensioning pulleys **3343**, and thus the rope **332** may be in the tensioned state.

(75) In an embodiment, after the rope **332** bypasses the rope pulley **331**, the two ends of the rope **332** may be further wound on the corresponding periphery of each of the first reversing pulley **3331**, the tensioning pulley **3343** and the second reversing pulley **3332** in sequence, and thus the rope **332** is connected to the transducer **220**. In this way, on the one hand, the transmission direction is changed via the first reversing pulley **3331** and the second reversing pulley **3332** to meet the requirements. On the other hand, under the action of the tensioning pulley **3343**, the rope **332** is in the tensioned state, and thus the oscillation of the transducer **220** may performed smoothly.

(76) A specific structure of the tensioning assembly **334** may be in various forms, as long as the structure may make the rope **332** in the tensioned state.

(77) In an embodiment, as further shown in FIG. **6** and FIG. **10**, the tensioning adjustment base **3341** may include a first adjusting arm **33411**, a second adjusting arm **33412**, a first tensioning pulley shaft **33413**, and a connecting rod **33414**.

(78) In some embodiments, the first adjusting arm **33411** and the second adjusting arm **33412** may be crosswise connected to each other. In an embodiment, the first adjusting arm **33411** and the second adjusting arm **33412** may be arranged in a “V” shape. The tensioning adjustment base **3341** may be rotatably connected to the first shaft **640** at a connection between the first adjusting arm **33411** and the second adjusting arm **33412**. In some embodiments, the tensioning adjustment base **3341** is rotatably sleeved on the periphery of the first shaft **640** at the connection.

(79) The first tensioning pulley shaft **33413** may be connected to an end of the first adjusting arm **33411** away from the second adjusting arm **33412**. The two tensioner pulleys **3343** may be rotatably sleeved on the first tensioning pulley shaft **33413** respectively, and may be spaced apart from each other.

(80) In some embodiments, the mounting assembly **600** may further include a fixing rod **670** fixedly connected to a support member **680**. The fixing rod **670** may be parallel to and spaced apart from the first shaft **640** and the second shaft **650**.

(81) In some embodiments, the force applying member **3344** may include two stretching elastic

members, one end of each of the stretching elastic members is connected to the fixing rod **670**, and the other end of each of the stretching elastic members is connected to the connecting rod **33414** and configured to apply the tensioning adjustment force to the connecting rod **33414**. In this way, the tensioning adjustment base **3341** rotates around the first rotation shaft **640**, the two tensioning pulleys **3343** adaptively rotate around the first tensioning pulley shaft **33413** and apply the force to the rope **332**, and thus the rope **332** is in the tensioned state.

(82) The two ends of each of the two stretching elastic members may be hooked on the fixing rod **670** and the connecting rod **33414** by means of hooking, respectively. In some embodiments, the two stretching elastic members may be stretching springs.

(83) In some embodiments, as further shown in FIG. **5** and FIG. **11**, the tensioning adjustment base **3341** may include a rotating arm **33415** and a second tensioning pulley shaft **33416**. One end of the rotating arm **33415** is rotatably connected to the first shaft **640**, and the other end of the rotating arm **33415** is connected to the second tensioning pulley shaft **33416**, such that the second tensioning pulley shaft **33416** and the first shaft **640** are spaced apart from each other. The two tensioning pulleys **3343** are rotatably sleeved on the second tensioning pulley shaft **33416**, respectively.

(84) In some embodiments, the mounting assembly **600** further includes a support member **680** connected to the mounting base **610**.

(85) The force applying member **3344** may be a torsional elastic member, and include a torsional elastic portion **33441**, a first support end **33442**, and a second support end **33443**. The torsional elastic portion **33441** may be sleeved on the periphery of the first shaft **640**. The first support end **33442** may be connected to one side of the torsional elastic portion **33441** and abut against the support member **680**. The second support end **33443** may be connected to the other side of the torsional elastic portion **33441** and abut against the second tensioning pulley shaft **33416**. In this way, it may be possible to apply the tensioning adjustment force to the second tensioning pulley shaft **33416** under the elastic force of the torsional elastic portion **33441**, such that the tensioning adjustment base **3341** rotates around the first rotation shaft **640**, the two tensioning pulleys **3343** may adaptively rotate around the first tensioning pulley shaft **33413** and apply the force to the rope **332**, and thus the rope **332** is in the tensioned state.

(86) The components of the tensioning adjustment base **3341** in the above-mentioned embodiments may be independent structures and connected together via a specific connection method, or may also be an overall structure, which is not limited herein.

(87) In some embodiments, as shown in FIG. **12**, the stabilizing pulley group **335** may be arranged between the rope pulley **331** and the reversing assembly **333** along the extension path of the rope **332**. The stabilizing pulley group **335** may include two stabilizing pulleys **3351**.

(88) In some embodiments, the two stabilizing pulleys **3351** may be spaced apart from each other, and a transmission direction of the two stabilizing pulleys **3351** may be consistent with the transmission direction of the rope pulley **331**. In some embodiments, after the rope **332** bypasses the rope pulley **331**, the two sides of the rope **332** may be respectively wound on the corresponding periphery of each of the two stabilizing pulleys **3351** between the two stabilizing pulleys **3351**.

(89) It should be noted that the stabilizing pulley group **335** may play a certain supporting role on a transmission path of the rope **332**, thereby making the transmission of the rope **332** more stable and improving the accuracy of the detection result.

(90) It should be noted that, in some embodiments, the transmission device **300** is not limited to the above-mentioned structure. For example, in an application scenario, the mounting base **610**, the support frame, etc., of the mounting assembly **600** may also be configured as a part of the transmission device **300**. In another application scenario, the transmission device **300** may not include the shaft coupling **326***a*, etc. A structure of the transmission device **300** may be designed according to the actual needs, which is not limited herein.

(91) In some embodiments, as further shown in FIG. **5** and FIG. **7**, the mounting assembly **600** may

further include a mounting bracket **690**. The mounting bracket **690** may be arranged on a side of the mounting base **610** away from the support frame **630**. The driving mechanism **400** may be arranged on the mounting bracket **690**.

(92) In some embodiments, the driving mechanism **400** may be a motor, such as a stepping motor. The driving mechanism **400** may output the power to the gear transmission mechanism **320** via the output end.

(93) In some embodiments, as shown in FIGS. **1**-**3**, the tail sleeve assembly **500** may include a circuit structure for the detecting probe **1000** to operate. The host **2000** may be connected to the detection mechanism **200**, the driving mechanism **400**, etc., of the detection probe **1000** by connecting to the circuit of the tail sleeve assembly **500**, thereby achieving signal control and power and data transmission.

(94) According to a first aspect of the embodiments of the present disclosure, a detection probe is provided. The detection probe includes: a housing, defining a receiving space; a detection mechanism, disposed on an end of the housing and configured to perform a detection function; a driving mechanism, disposed in the receiving space and configured to output power; a rope transmission mechanism, disposed in the receiving space and including: a rope, connected to the driving mechanism and the detection mechanism respectively, and configured to receive the power output by the driving mechanism, transmit the power to the detection mechanism, and drive the detection mechanism to move; and a reversing assembly, including at least two reversing pulley groups arranged along an extension path of the rope, where the rope sequentially bypasses the two reversing pulley groups, and a transmission direction is changed under an action of the two reversing pulley groups; and a gear transmission mechanism, disposed in the receiving space and connected to the driving mechanism and the rope transmission mechanism respectively, so as to receive the power output by the driving mechanism and transmit the power to the rope transmission mechanism.

(95) In some embodiments, the rope transmission mechanism further includes: a tensioning assembly, arranged on the extension path of the rope and configured to apply force to the rope to make the rope in a tensioned state.

(96) In some embodiments, the detection probe further includes a support shaft connected to the housing; and the tensioning assembly includes: a tensioning adjustment base, rotatably connected to the support shaft; a tensioning pulley, rotatably connected to the tensioning adjustment base, where the rope is wound on a periphery of the tensioning pulley, respectively; and a force applying member, configured to apply a tensioning adjustment force to the tensioning adjustment base, such that the tensioning adjustment base rotates around the support shaft, and applies force to the rope through the tensioning pulley to make the rope in the tensioned state.

(97) In some embodiments, the number of the tensioning pulleys is two; and the tensioning adjustment base includes: a first adjusting arm; a second adjusting arm, connected to the first adjusting arm, where the tensioning adjustment base is rotatably connected to the support shaft at a connection between the first adjusting arm and the second adjusting arm; and a first tensioning pulley shaft, connected to an end of the first adjusting arm away from the second adjusting arm, where two tensioning pulleys are rotatably sleeved on the first tensioning pulley shaft, respectively; where the force applying member is connected to an end of the second adjusting arm away from the first adjusting arm, and is configured to apply the tensioning adjustment force to the end of the second adjusting arm away from the first adjusting arm, such that the tensioning adjustment base rotates around the support shaft, the two tensioning pulleys adaptively rotate around the first tensioning pulley shaft and apply force to the rope, and the rope is in the tensioned state.

(98) In some embodiments, the detection probe further includes a fixing rod connected to the housing, and the tensioning adjustment base further includes a connecting rod arranged at the end of the second adjusting arm away from the first adjusting arm; the force applying member includes two stretching elastic members, one end of each of the stretching elastic members is connected to

the fixing rod, and the other end of each of the stretching elastic members is connected to the connecting rod and configured to apply the tensioning adjustment force to the connecting rod.
(99) In some embodiments, the number of the tensioning pulleys is two; and the tensioning adjustment base includes: a rotating arm, an end of the rotating arm being rotatably connected to the support shaft; and a second tensioning pulley shaft, arranged at an end of the rotating arm away from the support shaft, where two tensioning pulleys are rotatably sleeved on the second tensioning pulley shaft, respectively. The force applying member is connected to the second tensioning pulley shaft and is configured to apply the tensioning adjustment force to the second tensioning pulley shaft, such that the tensioning adjustment base rotates around the support shaft, the two tensioning pulleys adaptively rotate around the second tensioning pulley shaft and apply force to the rope, and the rope is in the tensioned state.
(100) In some embodiments, the detection probe further includes a support member connected to the housing; and the force applying member is a torsional elastic member, and includes: a torsional elastic portion, sleeved around a periphery of the support shaft; a first support end, connected to one side of the torsional elastic portion and abutting against the support member; and a second support end, connected to the other side of the torsional elastic portion, abutting against the second tensioning pulley shaft, and applying the tensioning adjustment force to the second tensioning pulley shaft under an elastic force of the torsional elastic portion.
(101) In some embodiments, the detection probe further includes a first shaft and a second shaft which are connected to the housing and spaced apart from each other; and the two reversing pulley groups include: two first reversing pulleys, rotatably sleeved on a periphery of the first shaft respectively, and spaced apart from each other; and two second reversing pulleys, rotatably sleeved on a periphery of the second shaft respectively, and spaced apart from each other; where along the extension path, the rope is sequentially wound on a corresponding periphery of each of the first reversing pulley and the second reversing pulley in a staggered mode, so as to change the transmission direction.
(102) In some embodiments, the rope transmission mechanism further includes: a rope pulley, where the rope is wound on a periphery of the rope pulley; a stabilizing pulley group, arranged between the rope pulley and the reversing assembly along the extension path of the rope, and including two stabilizing pulleys spaced apart from each other, where two sides of the rope are respectively wound on peripheries of the corresponding stabilizing pulleys between the two stabilizing pulleys.
(103) In some embodiments, the rope transmission mechanism further includes a rope pulley, and the rope is wound on a periphery of the rope pulley; and the gear transmission mechanism includes: a driving shaft, connected to the driving mechanism and rotating under driving of the driving mechanism; a driving gear, arranged on an end of the driving shaft and rotating synchronously with the driving shaft; a driven gear, engaged with the driving gear and rotating with the driving gear; and a driven shaft, connected to the driven gear and the rope pulley respectively, moving synchronously with the driven gear, driving the rope pulley to rotate, and the rope driving the detection mechanism to move with a rotation of the rope pulley.
(104) In some embodiments, the detection probe further includes: a shaft coupling, an end of the shaft coupling being connected to the driving mechanism, and the other end of the shaft coupling being connected to the driving shaft, so as to transmit the power output by the driving mechanism to the driving shaft.
(105) In some embodiments, the rope transmission mechanism further includes a rope pulley, and the rope is wound on a periphery of the rope pulley; and the gear transmission mechanism includes: a sun gear, connected to the driving mechanism and rotating under driving of the driving mechanism; a ring gear, sleeved on a periphery of the sun gear, arranged coaxially with the sun gear, and spaced apart from the sun gear; a plurality of planetary gears, arranged between the sun gear and the ring gear, and spaced apart from each other, where one side of each of the plurality of

planetary gears is engaged with the sun gear, and the other side of each of the plurality of planetary gears is engaged with an inner side of the ring gear, such that the plurality of planetary gears rotate with the sun gear; and a planetary carrier, connected to the plurality of planetary gears and the rope pulley, where the planetary carrier is driven by the plurality of the planetary gears to rotate coaxially with the sun gear, such that the rope pulley is driven to rotate, and the detection mechanism is driven to move with a rotation of the rope pulley by the rope.

(106) In some embodiments, the rope pulley further defines a guiding groove surrounding the periphery and recessed, and the rope is wound in the guiding groove.

(107) In some embodiments, a transmission ratio of the gear transmission mechanism is greater than 1.

(108) In some embodiments, the detection probe further includes a mounting base, arranged on the housing and surrounded by an inner sidewall of the housing, and defining a mounting hole penetrating the mounting base; where the gear transmission mechanism and the rope transmission mechanism are arranged on a side of the mounting base, and the gear transmission mechanism is connected to the driving mechanism via the mounting hole.

(109) In some embodiments, an opening is defined on an end of the housing close to the detection mechanism and is in communication with the receiving space, and the detection mechanism includes: a transducer, configured to emit a detection signal and receive a feedback signal carrying detection information; a bearing bracket, arranged on the opening of the housing, and including two concave-arc bearing tables; an assembly base, defining an assembly position, where the assembly position is configured to assemble the transducer, is connected to the rope, and includes two cylindrical bosses disposed on two sides of the assembly base, and the two cylindrical bosses are movably supported on the corresponding concave-arc bearing tables respectively, such that the transducer is driven to reciprocatingly oscillate under the action of the rope; and an acoustic window, arranged on a periphery of the transducer, the bearing bracket and the assembly base, arranged on the opening of the housing, and configured to be matched with the transducer to emit the detection signal and receive the feedback signal.

(110) In some embodiments, an assembly groove is defined on each of the two sides of the assembly base, and ends of the rope away from the reversing assembly are respectively arranged in the corresponding assembly grooves.

(111) In some embodiments, the receiving space includes an extension area and a receiving area; and the housing includes: an extension portion, corresponding to the extension area, where the rope transmission mechanism is at least partially accommodated in the extension area; and a handheld portion, connected to an end of the extension portion, and corresponding to the receiving area, where the driving mechanism is accommodated in the receiving area.

(112) According to a second aspect of the embodiments of the present disclosure, a transmission device is provided and applied to a detection probe. The detection probe includes a detection mechanism and a driving mechanism. The transmission device includes: a rope transmission mechanism, including: a rope, connected to the driving mechanism and the detection mechanism respectively, and configured to receive the power output by the driving mechanism, transmit the power to the detection mechanism, and drive the detection mechanism to move; and a reversing assembly, including at least two reversing pulley groups arranged along an extension path of the rope, where the rope sequentially bypasses the two reversing pulley groups, and a transmission direction is changed under an action of the two reversing pulley groups.

(113) According to a third aspect of the embodiments of the present disclosure, a detection instrument is provided. The detection instrument includes a host and a detection probe. The detection probe includes: a housing, defining a receiving space; a detection mechanism, disposed on an end of the housing and configured to perform a detection function; a driving mechanism, disposed in the receiving space and configured to output power; a rope transmission mechanism, disposed in the receiving space and including: a rope, connected to the driving mechanism and the

detection mechanism respectively, and configured to receive the power output by the driving mechanism, transmit the power to the detection mechanism, and drive the detection mechanism to move; and a reversing assembly, including at least two reversing pulley groups arranged along an extension path of the rope, where the rope sequentially bypasses the two reversing pulley groups, and a transmission direction is changed under an action of the two reversing pulley groups; and a gear transmission mechanism, disposed in the receiving space and connected to the driving mechanism and the rope transmission mechanism respectively, so as to receive the power output by the driving mechanism and transmit the power to the rope transmission mechanism. The host is respectively connected to the detection mechanism and the driving mechanism of the detection probe, such that the driving mechanism is controlled to output the power, and the detection mechanism is controlled to perform the detection function

(114) The above-mentioned only present embodiments of the present disclosure, but it should not be construed as a limitation on the scope of the present disclosure. According to the technical solutions and the conception of the present disclosure, all equivalent transformations and modifications made within the scope of the claims of the present disclosure by those skilled in the art shall fall within the scope of coverage of the claims of the present disclosure. In addition, although some specific terms are used in the specification, these terms are only for convenience of explanation and should not be construed as a limitation on the present disclosure.

Claims

1. A detection probe, comprising: a housing, defining a receiving space; a detection mechanism, disposed on an end of the housing and configured to perform a detection function; a driving mechanism, disposed in the receiving space and configured to output power; a rope transmission mechanism, disposed in the receiving space and comprising: a rope, connected to the driving mechanism and the detection mechanism respectively, and configured to receive the power output by the driving mechanism, transmit the power to the detection mechanism, and drive the detection mechanism to move; and a reversing assembly, comprising at least two reversing pulley groups arranged along an extension path of the rope, wherein the rope sequentially bypasses the two reversing pulley groups, and a transmission direction is changed under an action of the two reversing pulley groups; and a tensioning assembly, arranged on the extension path of the rope and configured to apply force to the rope to make the rope in a tensioned state; and a gear transmission mechanism, disposed in the receiving space and connected to the driving mechanism and the rope transmission mechanism respectively, so as to receive the power output by the driving mechanism and transmit the power to the rope transmission mechanism; wherein the detection probe further comprises a support shaft connected to the housing; and the tensioning assembly comprises: a tensioning adjustment base, rotatably connected to the support shaft; one or more tensioning pulleys, rotatably connected to the tensioning adjustment base, wherein the rope is wound on a periphery of the tensioning pulley, respectively; and a force applying member, configured to apply a tensioning adjustment force to the tensioning adjustment base, such that the tensioning adjustment base rotates around the support shaft, and applies force to the rope through the tensioning pulley to make the rope in the tensioned state; wherein the detection probe further comprises one of a case I and a case II; in the case I, a number of the one or more tensioning pulleys is two; and the tensioning adjustment base comprises: a first adjusting arm; a second adjusting arm, connected to the first adjusting arm, wherein the tensioning adjustment base is rotatably connected to the support shaft at a connection between the first adjusting arm and the second adjusting arm; and a first tensioning pulley shaft, connected to an end of the first adjusting arm away from the second adjusting arm, wherein two tensioning pulleys are rotatably sleeved on the first tensioning pulley shaft, respectively; wherein the force applying member is connected to an end of the second adjusting arm away from the first adjusting arm, and is configured to apply

the tensioning adjustment force to the end of the second adjusting arm away from the first adjusting arm, such that the tensioning adjustment base rotates around the support shaft, the two tensioning pulleys adaptively rotate around the first tensioning pulley shaft and apply force to the rope, and the rope is in the tensioned state; in the case II, a number of the one or more tensioning pulleys is two; and the tensioning adjustment base comprises: a rotating arm, an end of the rotating arm being rotatably connected to the support shaft; and a second tensioning pulley shaft, arranged at an end of the rotating arm away from the support shaft, wherein two tensioning pulleys are rotatably sleeved on the second tensioning pulley shaft, respectively: wherein the force applying member is connected to the second tensioning pulley shaft and is configured to apply the tensioning adjustment force to the second tensioning pulley shaft, such that the tensioning adjustment base rotates around the support shaft, the two tensioning pulleys adaptively rotate around the second tensioning pulley shaft and apply force to the rope, and the rope is in the tensioned state.

2. The detection probe according to claim 1, wherein in the case II, the detection probe further comprises a support member connected to the housing; and the force applying member is a torsional elastic member, and comprises: a torsional elastic portion, sleeved around a periphery of the support shaft; a first support end, connected to one side of the torsional elastic portion and abutting against the support member; and a second support end, connected to the other side of the torsional elastic portion, abutting against the second tensioning pulley shaft, and applying the tensioning adjustment force to the second tensioning pulley shaft under an elastic force of the torsional elastic portion.

3. The detection probe according to claim 1, wherein the rope transmission mechanism further comprises: a rope pulley, wherein the rope is wound on a periphery of the rope pulley; a stabilizing pulley group, arranged between the rope pulley and the reversing assembly along the extension path of the rope, and comprising two stabilizing pulleys spaced apart from each other, wherein two sides of the rope are respectively wound on peripheries of the corresponding stabilizing pulleys between the two stabilizing pulleys.

4. The detection probe according to claim 1, wherein the rope transmission mechanism further comprises a rope pulley, and the rope is wound on a periphery of the rope pulley; and the gear transmission mechanism comprises: a sun gear, connected to the driving mechanism and rotating under driving of the driving mechanism; a ring gear, sleeved on a periphery of the sun gear, arranged coaxially with the sun gear, and spaced apart from the sun gear; a plurality of planetary gears, arranged between the sun gear and the ring gear, and spaced apart from each other, wherein one side of each of the plurality of planetary gears is engaged with the sun gear, and the other side of each of the plurality of planetary gears is engaged with an inner side of the ring gear, such that the plurality of planetary gears rotate with the sun gear; and a planetary carrier, connected to the plurality of planetary gears and the rope pulley, wherein the planetary carrier is driven by the plurality of the planetary gears to rotate coaxially with the sun gear, such that the rope pulley is driven to rotate, and the detection mechanism is driven to move with a rotation of the rope pulley by the rope.

5. The detection probe according to claim 1, wherein a transmission ratio of the gear transmission mechanism is greater than 1.

6. The detection probe according to claim 1, further comprising: a mounting base, arranged on the housing and surrounded by an inner sidewall of the housing, and defining a mounting hole penetrating the mounting base; wherein the gear transmission mechanism and the rope transmission mechanism are arranged on a side of the mounting base, and the gear transmission mechanism is connected to the driving mechanism via the mounting hole.

7. The detection probe according to claim 1, wherein the receiving space comprises an extension area and a receiving area; and the housing comprises: an extension portion, corresponding to the extension area, wherein the rope transmission mechanism is at least partially accommodated in the extension area; and a handheld portion, connected to an end of the extension portion, and

corresponding to the receiving area, wherein the driving mechanism is accommodated in the receiving area.

8. The detection probe according to claim 1, wherein in the case I, the first adjusting arm and the second adjusting arm are crosswise connected to each other, and the tensioning adjustment base is rotatably sleeved on a periphery of the support shaft at the connection.

9. The detection probe according to claim 1, wherein in the case I, the detection probe further comprises a fixing rod connected to the housing, and the tensioning adjustment base further comprises a connecting rod arranged at the end of the second adjusting arm away from the first adjusting arm; the force applying member comprises two stretching elastic members, one end of each of the stretching elastic members is connected to the fixing rod, and the other end of each of the stretching elastic members is connected to the connecting rod and configured to apply the tensioning adjustment force to the connecting rod.

10. The detection probe according to claim 9, wherein the detection probe further comprises a first shaft and a second shaft which are connected to the housing and spaced apart from each other, and the first shaft and the second shaft are arranged in parallel with each other; and the fixing rod is parallel to and spaced apart from the first shaft and the second shaft.

11. The detection probe according to claim 1, wherein the detection probe further comprises a first shaft and a second shaft which are connected to the housing and spaced apart from each other; and the two reversing pulley groups comprise: two first reversing pulleys, rotatably sleeved on a periphery of the first shaft respectively, and spaced apart from each other; and two second reversing pulleys, rotatably sleeved on a periphery of the second shaft respectively, and spaced apart from each other; wherein along the extension path, the rope is sequentially wound on a corresponding periphery of each of the first reversing pulley and the second reversing pulley in a staggered mode, so as to change the transmission direction.

12. The detection probe according to claim 11, wherein in the case I, the tensioning adjustment base is sleeved on the periphery of the first shaft between the two first reversing pulleys; or wherein in the case II, the tensioning adjustment base is sleeved on the periphery of the first shaft on two sides of two first reversing pulleys.

13. The detection probe according to claim 11, wherein two ends of the rope are further wound on a corresponding periphery of each of the first reversing pulley, the tensioning pulley and the second reversing pulley in sequence.

14. The detection probe according to claim 1, wherein the rope transmission mechanism further comprises a rope pulley, and the rope is wound on a periphery of the rope pulley; and the gear transmission mechanism comprises: a driving shaft, connected to the driving mechanism and rotating under driving of the driving mechanism; a driving gear, arranged on an end of the driving shaft and rotating synchronously with the driving shaft; a driven gear, engaged with the driving gear and rotating with the driving gear; and a driven shaft, connected to the driven gear and the rope pulley respectively, moving synchronously with the driven gear, driving the rope pulley to rotate, and the rope driving the detection mechanism to move with a rotation of the rope pulley.

15. The detection probe according to claim 14, further comprising: a shaft coupling, an end of the shaft coupling being connected to the driving mechanism, and the other end of the shaft coupling being connected to the driving shaft, so as to transmit the power output by the driving mechanism to the driving shaft.

16. The detection probe according to claim 14, wherein the rope pulley further defines a guiding groove surrounding the periphery of the rope pulley and recessed, and the rope is wound in the guiding groove.

17. The detection probe according to claim 1, wherein an opening is defined on an end of the housing close to the detection mechanism and is in communication with the receiving space, and the detection mechanism comprises: a transducer, configured to emit a detection signal and receive a feedback signal carrying detection information; a bearing bracket, arranged on the opening of the

housing, and comprising two concave-arc bearing tables; an assembly base, defining an assembly position, wherein the assembly position is configured to assemble the transducer, is connected to the rope, and comprises two cylindrical bosses disposed on two sides of the assembly base, and the two cylindrical bosses are movably supported on the corresponding concave-arc bearing tables respectively, such that the transducer is driven to reciprocatingly oscillate under the action of the rope; and an acoustic window, arranged on a periphery of the transducer, the bearing bracket and the assembly base, arranged on the opening of the housing, and configured to be matched with the transducer to emit the detection signal and receive the feedback signal.

18. The detection probe according to claim 17, wherein an assembly groove is defined on each of the two sides of the assembly base, and ends of the rope away from the reversing assembly are respectively arranged in the corresponding assembly grooves.

19. A transmission device applied to a detection probe, the detection probe comprising a detection mechanism and a driving mechanism, and the transmission device comprising: a rope transmission mechanism, comprising: a rope, connected to the driving mechanism and the detection mechanism respectively, and configured to receive the power output by the driving mechanism, transmit the power to the detection mechanism, and drive the detection mechanism to move; and a reversing assembly, comprising at least two reversing pulley groups arranged along an extension path of the rope, wherein the rope sequentially bypasses the two reversing pulley groups, and a transmission direction is changed under an action of the two reversing pulley groups; and a tensioning assembly, arranged on the extension path of the rope and configured to apply force to the rope to make the rope in a tensioned state; wherein the detection probe further comprises a support shaft connected to the housing and a gear transmission mechanism, and the gear transmission mechanism is disposed in the receiving space and connected to the driving mechanism and the rope transmission mechanism respectively, so as to receive the power output by the driving mechanism and transmit the power to the rope transmission mechanism; wherein the tensioning assembly comprises: a tensioning adjustment base, rotatably connected to the support shaft; one or more tensioning pulleys, rotatably connected to the tensioning adjustment base, wherein the rope is wound on a periphery of the tensioning pulley, respectively; and a force applying member, configured to apply a tensioning adjustment force to the tensioning adjustment base, such that the tensioning adjustment base rotates around the support shaft, and applies force to the rope through the tensioning pulley to make the rope in the tensioned state; wherein the detection probe further comprises one of a case I and a case II; in the case I, a number of the one or more tensioning pulleys is two; and the tensioning adjustment base comprises: a first adjusting arm; a second adjusting arm, connected to the first adjusting arm, wherein the tensioning adjustment base is rotatably connected to the support shaft at a connection between the first adjusting arm and the second adjusting arm; and a first tensioning pulley shaft, connected to an end of the first adjusting arm away from the second adjusting arm, wherein two tensioning pulleys are rotatably sleeved on the first tensioning pulley shaft, respectively; wherein the force applying member is connected to an end of the second adjusting arm away from the first adjusting arm, and is configured to apply the tensioning adjustment force to the end of the second adjusting arm away from the first adjusting arm, such that the tensioning adjustment base rotates around the support shaft, the two tensioning pulleys adaptively rotate around the first tensioning pulley shaft and apply force to the rope, and the rope is in the tensioned state; in the case II, a number of the one or more tensioning pulleys is two; and the tensioning adjustment base comprises: a rotating arm, an end of the rotating arm being rotatably connected to the support shaft; and a second tensioning pulley shaft, arranged at an end of the rotating arm away from the support shaft, wherein two tensioning pulleys are rotatably sleeved on the second tensioning pulley shaft, respectively; wherein the force applying member is connected to the second tensioning pulley shaft and is configured to apply the tensioning adjustment force to the second tensioning pulley shaft, such that the tensioning adjustment base rotates around the support shaft, the two tensioning pulleys adaptively rotate around the second

tensioning pulley shaft and apply force to the rope, and the rope is in the tensioned state.

20. A detection instrument, comprising: a host and a detection probe; wherein the detection probe comprises: a housing, defining a receiving space; a detection mechanism, disposed on an end of the housing and configured to perform a detection function; a driving mechanism, disposed in the receiving space and configured to output power; a rope transmission mechanism, disposed in the receiving space and comprising: a rope, connected to the driving mechanism and the detection mechanism respectively, and configured to receive the power output by the driving mechanism, transmit the power to the detection mechanism, and drive the detection mechanism to move; and a reversing assembly, comprising at least two reversing pulley groups arranged along an extension path of the rope, wherein the rope sequentially bypasses the two reversing pulley groups, and a transmission direction is changed under an action of the two reversing pulley groups; and a tensioning assembly, arranged on the extension path of the rope and configured to apply force to the rope to make the rope in a tensioned state; and a gear transmission mechanism, disposed in the receiving space and connected to the driving mechanism and the rope transmission mechanism respectively, so as to receive the power output by the driving mechanism and transmit the power to the rope transmission mechanism; wherein the detection probe further comprises a support shaft connected to the housing; and the tensioning assembly comprises: a tensioning adjustment base, rotatably connected to the support shaft; one or more tensioning pulleys, rotatably connected to the tensioning adjustment base, wherein the rope is wound on a periphery of the tensioning pulley, respectively; and a force applying member, configured to apply a tensioning adjustment force to the tensioning adjustment base, such that the tensioning adjustment base rotates around the support shaft, and applies force to the rope through the tensioning pulley to make the rope in the tensioned state; wherein the detection probe further comprises one of a case I and a case II; in the case I, a number of the one or more tensioning pulleys is two; and the tensioning adjustment base comprises: a first adjusting arm; a second adjusting arm, connected to the first adjusting arm, wherein the tensioning adjustment base is rotatably connected to the support shaft at a connection between the first adjusting arm and the second adjusting arm; and a first tensioning pulley shaft, connected to an end of the first adjusting arm away from the second adjusting arm, wherein two tensioning pulleys are rotatably sleeved on the first tensioning pulley shaft, respectively; wherein the force applying member is connected to an end of the second adjusting arm away from the first adjusting arm, and is configured to apply the tensioning adjustment force to the end of the second adjusting arm away from the first adjusting arm, such that the tensioning adjustment base rotates around the support shaft, the two tensioning pulleys adaptively rotate around the first tensioning pulley shaft and apply force to the rope, and the rope is in the tensioned state; in the case II, a number of the one or more tensioning pulleys is two; and the tensioning adjustment base comprises: a rotating arm, an end of the rotating arm being rotatably connected to the support shaft; and a second tensioning pulley shaft, arranged at an end of the rotating arm away from the support shaft, wherein two tensioning pulleys are rotatably sleeved on the second tensioning pulley shaft, respectively; wherein the force applying member is connected to the second tensioning pulley shaft and is configured to apply the tensioning adjustment force to the second tensioning pulley shaft, such that the tensioning adjustment base rotates around the support shaft, the two tensioning pulleys adaptively rotate around the second tensioning pulley shaft and apply force to the rope, and the rope is in the tensioned state; wherein the host is respectively connected to the detection mechanism and the driving mechanism of the detection probe, such that the driving mechanism is controlled to output the power, and the detection mechanism is controlled to perform the detection function.