

WIRE CUTTING MACHINE AND CONTROL METHOD THEREFOR

FIELD

[00001] The present disclosure relates to the technical field of wire cutting, and specifically provides a wire cutting machine and a control method therefor.

BACKGROUND

[00002] A wire cutting machine is a device that uses a cutting wire (such as a diamond wire, which is usually a steel cutting wire with micro diamond particles embedded on the surface) to perform cutting operations such as cutting, squaring and slicing on workpieces to be processed made of hard and brittle materials (such as silicon rods (including monocrystalline silicon rods, polycrystalline silicon ingots, etc.), sapphire rods, magnetic rods, semiconductor rods, etc.).

[00003] Taking the wire cutting machine being a slicer which performs a slicing operation on photovoltaic silicon rods (referred to as silicon rods for short) as an example, it directly slices the silicon rods through a diamond wire wound around a cutting mechanism. Generally, the wire cutting machine mainly includes three main cutting rollers (including two upper rollers and one lower roller) distributed in an inverted triangle shape. The main cutting rollers are processed to have dense annular grooves. By densely winding the diamond wire around the positions corresponding to the annular grooves, a wire mesh that can continuously cut multiple positions of the silicon rods can be formed. Based on this, by reciprocating the diamond wire between the cutting mechanism and other structures such as winding/unwinding rollers, the diamond wire located between the two upper main cutting rollers can slice the silicon rod that approaches the cutting mechanism with the help of a feeding mechanism.

[00004] Referring to FIG. 1, a schematic structural view of a slicer in an existing example is shown. As shown in FIG. 1, in this example, the diamond wire of the existing slicer is located between wire rollers 01 of the left and right winding/unwinding mechanisms. The cutting mechanism of the slicer typically includes two or three main rollers (in this example, there are three main rollers, namely, a first main roller 021 located in the upper left position, a second main roller 022 located in the upper right position, and

a third main roller 023 located in a lower position). Correspondingly, the existing slicer typically includes at least six guide wheels (with three guide wheels on each side). Taking the left side as an example, the three guide wheels are wiring wheel 03, tension wheel 04, and reversing wheel 05 respectively. Based on this structure, a winding path of the slicer is as follows: the wire roller on the left side (taking this wire roller being an unwinding roller (at this time, the wire roller on the right side is a winding roller) as an example; obviously, the function of the wire roller can be switched between the winding roller and the unwinding roller. For example, assuming that the wire roller on the left side is the winding roller, the wire roller on the right side will be switched to the unwinding roller accordingly) → the wiring wheel, the tension wheel and the reversing wheel on the left side → the third main roller → the second main roller → the first main roller → the third main roller (forming a wire mesh through multiple times of winding) → the reversing wheel, the tension wheel and the wiring wheel on the right side → the wire roller on the right side.

[00005] On this basis, the inventor intends to propose a product form that reduces the number of guide wheels. This is because the product form that reduces the number of guide wheels can not only lower the user's investment cost in guide wheel consumables and the like, but also can reduce the distance of the diamond wire from the main rollers to the wire rollers. On this basis, it is expected to reduce the negative impact of additional tension caused by factors such as the inertia of the guide wheels, frictional resistance, bending stress of the diamond wire when wound around the guide wheels, and torsional stress of the diamond wire caused by the imperfect coplanarity between the guide wheels during the operation of the diamond wire, thereby improving the cutting quality of the slicer. Obviously, this has great significance for the future ultra-thin and high-speed application of slicers.

[00006] However, how to still ensure the operational reliability and cutting quality of the slicer is a technical problem that must be faced when proposing a product form that reduces the number of guide wheels.

SUMMARY

[00007] The overall structure of the present disclosure aims to at least partially solve the above technical problem, specifically, to solve the technical problem of how to

ensure the operational reliability and cutting quality of the slicer as much as possible when proposing a product form that reduces the number of guide wheels. Specifically, it aims to solve the layout problems that exist in the wiring assembly and tension mechanism when forming a wire saw unit.

[00008] It should be particularly noted that considering the overall logic of the application documents, the current background art only provides a new type of wire cutting machine to which the layout of the wiring assembly and tension mechanism of the present disclosure for forming a wire saw unit can be applied. Obviously, the layout of the wiring assembly and tension mechanism of the present disclosure for forming the wire saw unit is not limited to this scenario. In other words, as long as the wire cutting machine has a wire saw unit that includes the wiring assembly and the tension mechanism (such as the traditional six-guide-wheel structure mentioned in the background art or any other structure), adopting the layout of the wiring assembly and tension mechanism of the present disclosure for forming the wire saw unit can at least partially solve the problems in terms of layout and cleanliness, etc.

[00009] In view of this, the present disclosure provides a wire cutting machine, which includes a winding chamber and a wire saw unit, where the wire saw unit includes a winding assembly, and the winding assembly includes a winding/unwinding mechanism and a tension mechanism; the winding/unwinding mechanism includes: a winding/unwinding roller assembly including a rotatable winding/unwinding roller; and a wiring assembly which is capable of driving the winding/unwinding roller to move in its axial direction; where the tension mechanism includes: a tension wheel; and a driving component connected to the tension wheel, where the tension wheel is at least capable of rotating based on the torque provided by the driving component; one side of the wiring assembly that is away from the winding/unwinding roller assembly is arranged on a side wall of the winding chamber; and/or the tension mechanism is arranged on a top wall of the winding chamber. By placing the wiring assembly on the side wall of the winding chamber and/or suspending the tension mechanism at the top, the layout of the winding assembly is optimized to some extent. Preferably, the wire saw unit includes a cutting mechanism, which is arranged between the winding/unwinding roller and the tension wheel, so that a cutting wire unwound from the cutting mechanism is guided to the tension wheel, or a cutting wire unwound from the tension wheel is guided to the cutting

mechanism, thereby allowing the cutting wire to reciprocate between the winding/unwinding mechanism, the tension mechanism, and the cutting mechanism. For example, the tension wheel is provided with a tension wire groove, which corresponds to a target cutting wire groove on the main cutting roller of the cutting mechanism (which includes at least two main cutting rollers, such as two or three), so that the cutting wire unwound from the target cutting wire groove is guided to the tension wire groove, or the cutting wire wound from the tension wire groove is guided to the target cutting wire groove. In this way, the present disclosure provides a wire cutting machine that saves the number of guide wheels. Specifically, a wire cutting machine with a two-guide-wheel structure including two tension wheels on the left and right sides is provided by omitting a pair of steering wheels and a pair of wiring wheels in the six-guide-wheel structure. In the above solution, since the traditional reversing mechanism is no longer required between the tension mechanism and the cutting mechanism, on one hand, the number of components and maintenance times are reduced, thus reducing installation complexity while also being advantageous for reducing self-weight; on the other hand, since the cutting wire no longer passes through the reversing wheel, the number of wire wheels that the cutting wire passes through is reduced, overcoming the problem of low tension stability caused by factors such as the coplanarity of the wire wheels, the moment of inertia of the wire wheel, and the rotational resistance of the wire wheel in traditional solutions. As a result, the fluctuation amplitude of the cutting wire tension is reduced, thereby reducing the additional tension of the cutting wire, increasing the tension that the tension mechanism can apply to cutting, improving the cutting ability of the cutting wire, and enhancing the stability of the wire mesh tension, so that the tension of the cutting wire can meet the cutting requirements, the cutting quality and efficiency can be ensured, and thus the yield and production efficiency of the wire cutting machine can be improved, thus meeting the requirements of thinning the cutting wire, reducing silicon loss, and improving the utilization rate of silicon rods.

BRIEF DESCRIPTION OF DRAWINGS

[00010] Hereinafter, taking the workpiece to be processed being a silicon rod to be cut (hereinafter referred to as a silicon rod for short) and the wire cutting machine being a slicer as an example, preferred embodiments of the present disclosure will be described with reference to the accompanying drawings. In the accompanying drawings, FIG. 1 shows a schematic structural view of a slicer in an existing example; FIG. 2 shows a first

schematic structural view of a slicer according to an embodiment of the present disclosure, which illustrates a wire saw unit; FIG. 3 shows a second schematic structural view of the slicer according to an embodiment of the present disclosure, which illustrates a frame, an electric control cabinet, a liquid circuit overall cutting mechanism, a feeding mechanism, etc.; FIG. 4 shows a third schematic structural view of the slicer according to an embodiment of the present disclosure, which illustrates the layout of a cutting chamber and a winding chamber of the slicer; FIG. 5 shows a fourth schematic structural view of the slicer according to an embodiment of the present disclosure, which illustrates the layout of the wire saw unit; FIG. 6 shows a first schematic structural view of a winding assembly of the slicer according to an embodiment of the present disclosure, which illustrates two sets of winding assemblies in two winding chambers; FIG. 7 shows a second schematic structural view of the winding assembly of the slicer according to an embodiment of the present disclosure, which illustrates a winding/unwinding mechanism in the winding assembly; FIG. 8 shows a third schematic structural view of the winding assembly of the slicer according to an embodiment of the present disclosure, which illustrates a winding wheel assembly; FIG. 9 shows a fourth schematic structural view of the winding assembly of the slicer according to an embodiment of the present disclosure, which illustrates a schematic (exploded) structural view of an accordion-like connection adapter; FIG. 10 shows a fifth schematic structural view of the winding assembly of the slicer according to an embodiment of the present disclosure, which illustrates an assembly method of a wiring assembly in which a wiring shield is included; FIG. 11 shows a sixth schematic structural view of the winding assembly of the slicer according to an embodiment of the present disclosure, which illustrates an assembly method of the wiring assembly in which a wiring shield is not included; FIG. 12 shows a seventh schematic structural view of the winding assembly of the slicer according to an embodiment of the present disclosure, which illustrates a winding/unwinding roller assembly installation seat in the winding wheel assembly; FIG. 13 shows an eighth schematic structural view of the winding assembly of the slicer according to an embodiment of the present disclosure, which illustrates a schematic structural view of a blocking sleeve assembly; FIG. 14 shows a ninth schematic structural view of the winding assembly of the slicer according to an embodiment of the present disclosure, which illustrates a tension mechanism and a wire passing mechanism in the winding assembly; FIG. 15 shows a tenth schematic structural view of the winding assembly of the slicer according to an embodiment of the present disclosure, which

illustrates an adjustment assembly in the tension mechanism; FIG. 16 shows an eleventh schematic structural view of the winding assembly of the slicer according to an embodiment of the present disclosure, which illustrates a three-dimensional schematic view of a movement adjustment assembly in the adjustment assembly; FIG. 17 shows a twelfth schematic structural view of the winding assembly of the slicer according to an embodiment of the present disclosure, which illustrates a cross-sectional schematic view of the movement adjustment assembly in the adjustment assembly; FIG. 18 shows a schematic structural view of a wire passing plate in the wire passing mechanism of the winding assembly of the slicer according to an embodiment of the present disclosure, which illustrates an air inlet, a wire passing groove, an air outlet, etc.; FIG. 19 shows a first schematic structural view of a sealing assembly of the slicer according to an embodiment of the present disclosure, which illustrates the layout of the sealing assembly on a step surface of a lower frame; FIG. 20 shows a second schematic structural view of the sealing assembly of the slicer according to an embodiment of the present disclosure, which illustrates a water blocking component and a flexible shielding component in the sealing assembly; FIG. 21 shows a third schematic structural view of the sealing assembly of the slicer according to an embodiment of the present disclosure, which illustrates a pressing component, a pressing support component, the water blocking component, the flexible shielding component, a bottom baffle, a shielding plate and the like in the sealing assembly; FIG. 22 shows a schematic structural view of the tension mechanism of the slicer in the existing example; FIG. 23 is a schematic diagram showing the working principle of the tension mechanism of the slicer in the existing example; FIG. 24 shows a first schematic structural view of the tension mechanism in the slicer according to an embodiment of the present disclosure, which also illustrates the wire passing mechanism, winding/unwinding rollers, etc.; FIG. 25 shows a second schematic structural view of the tension mechanism in the slicer according to an embodiment of the present disclosure, with the wire passing mechanism, a tension motor and the like omitted in the figure; FIG. 26 shows a third schematic structural view of the tension mechanism in the slicer according to an embodiment of the present disclosure, which illustrates a tension swing rod; FIG. 27 shows a fourth schematic structural view of the tension mechanism in the slicer according to an embodiment of the present disclosure, which illustrates a rotating arm; FIG. 28 shows a fifth schematic structural view of the tension mechanism in the slicer according to an embodiment of the present disclosure, which illustrates two rotational damping assemblies

arranged on the rotating arm; FIG. 29 shows a sixth schematic structural view of the tension mechanism in the slicer according to an embodiment of the present disclosure, which illustrates a schematic exploded view of the rotational damping assembly; FIG. 30 shows a seventh schematic structural view of the tension mechanism in the slicer according to an embodiment of the present disclosure, which illustrates a schematic structural view of a counterweight assembly; FIG. 31 is a first schematic view showing the state of a swing movement assembly of the slicer according to an embodiment of the present disclosure; FIG. 32 is a second schematic view showing the state of the swing movement assembly of the slicer according to an embodiment of the present disclosure; FIG. 33 is a third schematic view showing the state of the swing movement assembly of the slicer according to an embodiment of the present disclosure; FIG. 34 is a first schematic view showing the state of a deflection movement assembly of the slicer according to an embodiment of the present disclosure; and FIG. 35 is a second schematic view showing the state of the deflection movement assembly of the slicer according to an embodiment of the present disclosure.

DETAILED DESCRIPTION

[00011] Preferred embodiments of the present disclosure will be described below with reference to the accompanying drawings. It should be understood by those skilled in the art that these embodiments are only used to explain the technical principles of the present disclosure, and are not intended to limit the scope of protection of the present disclosure. For example, although this embodiment is explained with reference to the combination of a first axis (tension swing axis) and a second axis (tension deflection axis), it is obvious that those skilled in the art can flexibly adjust it according to actual needs, such as omitting the tension deflection axis, adopting other solutions instead of the tension deflection axis, etc. In addition, without affecting the operational reliability of the slicer, the movement corresponding to the tension swing axis and the movement corresponding to the tension deflection axis can be synthesized to meet the requirements of ensuring tension stability and timely correction; for example, the tension swing axis and the tension deflection axis are not limited to being perpendicular to each other. In addition, without introducing sealing structures such as movable sealing component, sealing strip, flexible sealing component, water blocking component, etc., actually, the construction of the chamber can substantively solve the technical problems corresponding to the sealing

assembly to a certain extent. Therefore, those skilled in the art can adopt a combination of one or more of multiple elements in the sealing assembly, or add other sealing structures on the basis of a combination of one or more of the multiple elements.

[00012] It should be noted that in the description of the present disclosure, directional or positional relationships indicated by terms such as “center”, “upper”, “lower”, “left”, “right”, “vertical”, “horizontal”, “inner” and “outer” are based on the directional or positional relationships shown in the drawings. They are merely used for the convenience of description, and do not indicate or imply that the device or element involved must have a specific orientation, or be configured or operated in a specific orientation, and therefore they should not be construed as limiting the present disclosure. In addition, terms “first” and “second” are used for descriptive purpose only, and should not be construed as indicating or implying relative importance.

[00013] In addition, it should also be noted that in the description of the present disclosure, unless otherwise clearly specified and defined, terms “install”, “arrange” and “connect” should be understood in a broad sense; for example, the connection may be a fixed connection, or a detachable connection, or an integral connection; it may be a direct connection, or an indirect connection implemented through an intermediate medium, or it may be an internal communication between two elements. For those skilled in the art, the specific meaning of the above terms in the present disclosure can be understood according to specific situations.

[00014] In addition, in order to better illustrate the present disclosure, numerous specific details are provided in the following specific embodiments. It should be understood by those skilled in the art that the present disclosure can also be implemented without certain specific details. In some examples, the principles of slicers, which are well known to those skilled in the art, are not described in detail, with the purpose of highlighting the main concepts of the present disclosure.

[00015] There are three structural forms of the wire cutting machine: cutting machine, square cutter, and slicer. Taking the workpiece to be processed being a silicon rod as an example, the cutting machine is mainly used to cut longer silicon rods into shorter ones (such as those with a circular cross section, abbreviated as round rods). Specifically, a silicon rod is cut into multiple segments by cutting along a radial direction of the silicon

rod. The square cutter is mainly used to cut round rods into silicon rods with a rectangular cross section, such as a square cross section (referred to as square rods; if the square rods in this stage have not been ground, they can usually be referred to as rough rods). Specifically, the round rods are cut into square rods by cutting along an axial direction of the silicon rods to remove the edge skin of the round rods. The slicer is mainly used to densely and continuously cut square rods meeting precision standard (if the square rods in this stage have been ground and processed, they are usually referred to as finished rods) through multi-wire cutting to obtain thin slices for use. The present disclosure is mainly described using an example in which the wire cutting machine is a slicer which uses as a cutting wire to form a wire mesh. The slicer of the present disclosure will be described below with reference to all or some of FIGS. 1 to 35.

[00016] Referring mainly to FIGS. 2 to 5, in a possible embodiment, the slicer 100 mainly includes a slicer body, a feeding mechanism 17, and a wire saw unit. The feeding mechanism is mainly used to carry a silicon rod which is the workpiece to be processed, and provide vertical feed movement to the silicon rod so that the silicon rod can approach a diamond wire mesh wound on a cutting mechanism for slicing operation on the silicon rod. The wire saw unit mainly includes a cutting mechanism 3 provided in a cutting chamber and two winding assemblies respectively provided in two winding chambers located on the left and right sides below the cutting chamber. The winding assemblies and the cutting mechanism together form a feeding mechanism for a wire mesh that can continuously cut the silicon rod. The winding assembly mainly includes a winding/unwinding mechanism 2 (which can also be referred to as a wiring movement assembly) and a tension mechanism 4 (which can also be referred to as a tension wheel movement assembly), which are mainly responsible for the unwinding, winding, wiring, and tension control of the diamond wire, etc. In this example, the winding assemblies are provided as a whole in the winding chambers formed by a lower frame.

[00017] In a possible embodiment, the slicer body includes a frame; for example, the frame includes an upper frame 11 located above and a lower frame 12 located below, which are separately arranged and connected to each other (such as through bolts). The upper frame 11 and the lower frame 12 can be mated and installed to form the cutting chamber, which serves as an installation carrier for related components such as an automatic flushing assembly, a spray assembly, a cutting mechanism, a fragment box

assembly, a wire breakage detection assembly, a sealing assembly, etc. A cutting mechanism for winding the diamond wire mesh is installed in the cutting chamber, and the lower frame cooperates with the main body of the slicer below two sides of the cutting chamber to form one winding chamber respectively. The winding assembly is arranged in the winding chamber.

[00018] In a possible embodiment, the feeding mechanism 17 includes a clamping device capable of clamping the silicon rod and a driving transmission device capable of driving the feeding mechanism to approach the cutting mechanism. It can be understood that any feasible feeding mechanism in the art can be adopted according to actual needs. For example, the clamping device includes a clamping head, a power cylinder (such as a pneumatic cylinder, a hydraulic cylinder, an electric cylinder, etc.), a disc spring, etc. Taking the power cylinder being a hydraulic cylinder as an example, when feeding, the hydraulic cylinder is filled with oil, and the disc spring compresses the clamping head to be in a relaxed state. At this point, the silicon rod carried on a crystal holder can be delivered to a position corresponding to the feeding mechanism. When the feeding is completed, the hydraulic oil in the hydraulic cylinder flows back, the disc spring switches to its natural state, and the clamping head clamps the crystal holder upward, so that the silicon rod can be stably located in the position corresponding to the feeding mechanism to ensure the reliability of the slicing operation. For example, the driving transmission device is connected to a feeding base of the feeding mechanism through four sets of linear guide rails to ensure the stability of the ascending/descending movement.

[00019] In a possible embodiment, similar to the structure in FIG. 1, the cutting mechanism 3 includes a first main cutting roller 31, a second main cutting roller 32, and a third main cutting roller 33 that are distributed in an inverted triangle shape. The main cutting rollers 31 and 32 are located above the third main cutting roller 33, and the wheelbase between the two main cutting rollers located above can be adjusted. The winding assembly includes a winding/unwinding mechanism 2 and a tension mechanism 4. Observing a winding/unwinding path of the diamond wire, the tension mechanism 4 is located between the cutting mechanism 3 and the winding/unwinding mechanism 2, and a winding/unwinding roller of the winding/unwinding mechanism is lower than a tension wheel of the tension mechanism on the same side. In this way, silicon slices can be obtained by cutting the silicon rod through the reciprocating movement of the diamond

wire between the two winding/unwinding rollers, the tension wheels on the corresponding sides, and the cutting mechanism. Specifically, the diamond wire unwound from the winding/unwinding roller executing the “unwinding” function is guided by the tension wheel on the corresponding side to the cutting mechanism composed of the main cutting rollers (31, 32, 33), and then guided by the other tension wheel to the winding/unwinding roller executing the “winding” function. The winding/unwinding rollers on the two sides alternately perform winding and unwinding. Based on this, the downward moving silicon rod 10 can be cut by the wire mesh of the diamond wire 9 moving between the main cutting rollers (31, 32) located above. In addition, the wire saw unit also includes two wire passing mechanisms 5 corresponding to the two tension mechanisms 4. One end of the wire passing mechanism is fixedly connected to the tension mechanism on the corresponding side, while the other end extends into the cutting chamber of the slicer. The wire passing mechanism 5 includes a wire passing plate 51 and a routing groove 52 provided on the wire passing plate and capable of freely accommodating the diamond wire. Taking the winding/unwinding roller being the unwinding roller as an example, the diamond wire on the winding/unwinding roller is wound around the tension wheel and then enters the cutting chamber of the slicer through the routing groove 52.

[00020] In a possible embodiment, a drainage port is provided at the bottom of the routing groove to facilitate timely drainage and discharge of cutting liquid thrown out by the diamond wire during high-speed running, effectively avoiding accumulation of the cutting liquid on the wire passing plate.

[00021] Referring mainly to FIG. 18, in a possible embodiment, multiple air outlets 53 are provided on a groove wall of the routing groove of the wire passing plate, and a blowing assembly is configured for the air outlets. The blowing assembly blows air into the routing groove through the air outlets, so that the cutting liquid on the diamond wire can be blown off, effectively preventing the diamond wire from bringing the cutting liquid into the winding chamber. For example, the blowing assembly is arranged at an end (or near the end) of the wire passing plate in the length direction of the routing groove, and an air inlet 54 is provided. There are multiple channels between the air inlet and the aforementioned multiple air outlets. The airflow generated by the blowing assembly reaches the air outlets through the multiple channels and then blows into the routing groove, thereby blowing off the cutting liquid on the diamond wire contained in the routing groove.

In this example, the channel includes an air inflow channel that extends from the air inlet in the length direction of the routing groove. Multiple air outflow channels are formed between different positions of the air inflow channel and the multiple air outlets. In this example, the air outflow channels are channels inclined roughly in a width direction of the routing groove; for example, they are inclined from the outer side toward the middle in a direction closer to the cutting chamber.

[00022] Referring mainly to FIGS. 6 to 13, in a possible embodiment, the winding/unwinding mechanism 2 in the winding assembly mainly includes a winding/unwinding roller assembly 21 and a wiring assembly 22. The winding/unwinding roller assembly is mainly used to rotate the winding/unwinding roller at high speed to complete the wire-wrapping function including winding and unwinding (forming a reciprocating wire saw), and the wiring assembly is mainly used to drive the winding/unwinding roller assembly to reciprocate in an axis direction of the winding/unwinding roller to achieve the wiring function and thus ensure an uniform arrangement of the diamond wire on the winding/unwinding roller (in traditional winding/unwinding mechanisms, the winding/unwinding roller is mainly driven by a driving motor to rotate around its axis without axial movement, that is, it only has the wire-wrapping function and does not have the wiring/correction function). Adapting to the cutting chamber located above and the winding chambers located below, the winding assembly in the present disclosure is located below the cutting mechanism, and the tension mechanism of the winding/unwinding roller assembly adopts a vertical layout. Taking the unwinding of the winding/unwinding roller assembly as an example, the diamond wire from the winding/unwinding roller assembly is directly wound onto the cutting mechanism through the tension mechanism and the wire passing mechanism located above it. Compared with the wire saw unit with a six-guide-wheel structure, the routing path is greatly optimized.

[00023] In a possible embodiment, the winding/unwinding roller assembly 21 mainly includes a winding/unwinding roller 211, a winding/unwinding roller motor 212, and a winding/unwinding roller assembly installation seat 213. The winding/unwinding roller motor is provided on the winding/unwinding roller assembly installation seat, and the winding/unwinding roller can rotate under the driving of the winding/unwinding roller

motor, so that the diamond wire can be wound or unwound on the winding/unwinding roller to complete the winding/unwinding action.

[00024] In a specific example, the winding/unwinding roller motor is a servo motor, and a power output shaft of the servo motor is connected to the winding/unwinding roller for power transmission. The winding/unwinding roller is provided with a blocking sleeve assembly; for example, the blocking sleeve assembly 214 mainly includes a wire wheel screw 2141, a hole elastic retaining ring 2142, a block 2143, disc springs 2144 (the number is two), an I-shaped wheel blocking sleeve 2145, a support sleeve 2146, an expansion sleeve 2147, and an adapter flange 2148. The two disc springs are respectively installed on the I-shaped wheel blocking sleeve and the block in opposite directions to provide a certain pre-tightening force for the I-shaped wheel blocking sleeve and the adapter flange. The hole elastic retaining ring is installed in a groove of the I-shaped wheel blocking sleeve to mainly fix the block and prevent it from falling off. The expansion sleeve is arranged on an inner wall of the adapter flange through interference fit. The adapter flange is clamped in a groove of the servo motor, which is equivalent to fixing the expansion sleeve to the servo motor. The wire wheel screw is coupled to internal and external threads before being fixed on the servo motor. The pre-tightening force acting on the winding/unwinding roller can be controlled through the thread engagement on the wire wheel screw. It can be understood that the various parts that apply the pre-tightening force should be fixed together as much as possible to ensure that the servo motor can drive the overall rotation when it rotates. The winding/unwinding roller is located between the adapter flange and the I-shaped wheel blocking sleeve, and is fixed to a driven shaft through the adapter flange; the middle part of the winding/unwinding roller passes through the wire wheel screw. The surface of the wire roller has a coating layer and is processed to have dense annular grooves for winding the diamond wire.

[00025] In a possible embodiment, the winding/unwinding roller assembly installation seat 213 includes a winding/unwinding roller assembly installation seat substrate 2131; for example, the winding/unwinding roller assembly installation seat substrate has an approximately annular structure. The adapter flange 2148 in the aforementioned blocking sleeve assembly is arranged at one end of the annular structure in its axial direction (referred to as a first substrate portion 21311, which is a left side

portion of the annular portion in this example), and thus supports the position of the winding/unwinding roller near the end.

[00026] For example, a support portion 2132 extends from the bottom of the winding/unwinding roller assembly installation seat substrate 2131 in the axial direction. For example, the support portion 2132 can be a structure that is fixedly connected to or integrally formed with a winding/unwinding roller guard plate 2171 described below, and it is mainly used to support the axial portion of the winding/unwinding roller from below. The other end of the annular structure in its axial direction (referred to as a second substrate portion 21312, which is a right side portion of the annular portion in this example) is fixedly connected to a winding/unwinding roller motor shield; the winding/unwinding roller motor shield includes a winding/unwinding roller motor installation seat 2121, and the winding/unwinding roller motor is fixed inside the winding/unwinding roller motor installation seat. A nut seat is installed on the winding/unwinding roller motor installation seat, and it is fixedly connected to a nut of the wiring assembly, so that the wiring assembly can drive the winding/unwinding roller assembly arranged on it to move in the axial direction. Correspondingly, a winding/unwinding roller motor seat guard plate 2122 can be arranged on the winding/unwinding roller motor installation seat, and it is mainly used to ensure the waterproof and dustproof functions of the winding/unwinding roller motor and the internal precision components of the wiring assembly connected to the winding/unwinding roller motor. The winding/unwinding roller motor seat guard plate includes multiple thin plates arranged on the winding/unwinding roller motor installation seat having the annular structure. Moreover, through such an arrangement, the winding/unwinding roller motor can be wired, connected to pipes, and maintained through an opening on the winding/unwinding roller motor installation seat by removing the winding/unwinding roller motor seat guard plate.

[00027] For example, a vertical installation portion 2133 extends axially from a side portion of the winding/unwinding roller assembly installation seat substrate that is near the wiring assembly, and it is mainly used to cooperate with an accordion-like connection adapter 215 described below to construct an installation space that is adapted to a □-shaped accordion-like shield.

[00028] It can be seen that in the winding/unwinding roller assembly installation seat in this example, the winding/unwinding roller assembly installation seat substrate 2131 having the annular structure has supporting functions at both ends along its axis. The first substrate portion 21311 is directly used to support the adapter flange 2148, while the second substrate portion 21312 is used to fix the winding/unwinding roller motor installation seat 2121 having a supporting function. In this way, the self-weight of the second substrate portion 21312 can be reduced by cutting and thinning. For example, in this example, the second substrate portion is thinned in its axial direction. Moreover, a reinforcement structure 2134 such as reinforcement rib can be provided at a position corresponding to the second substrate portion, so as to achieve the lightest weight possible while ensuring the rigidity. Since both ends of the winding/unwinding roller are fixed, the winding/unwinding roller can also have good support stability, especially in case of high wire speed operating conditions.

[00029] In a possible embodiment, the winding/unwinding roller assembly further includes the accordion-like connection adapter 215, which is installed on the winding/unwinding roller assembly installation seat of the winding/unwinding roller assembly and forms a □-shaped sealing structure with the installation portion 2132 of the winding/unwinding roller assembly installation seat, and the sealing structure is a part of a wiring protection assembly. The wiring protection assembly also includes two □-shaped accordion-like shields 225; through the combination of the two (the □-shaped sealing structure and the □-shaped accordion-like shields), a relatively sealed working environment can be provided for the internal structures of the wiring assembly such as a screw and nut mechanism, and a slider and guide rail assembly, thus effectively blocking water vapor, silicon powder, and other dirty media from contaminating precision components inside the wiring assembly, and effectively extending the service life of the device.

[00030] In a possible embodiment, one end of a wiring slide seat is provided with a wiring motor 222, and the other end is provided with a wiring end shield 227 which is fixedly connected to a winding/unwinding front support seat by means of screws or other fasteners. For example, the winding/unwinding front support seat is fixedly connected to the frame, thus achieving the fixation of the wiring slide seat on the frame, that is, the

wiring slide seat is fixed to the frame through the wiring end shield. One of the two □-shaped accordion-like shields 225 is installed between the wiring motor 222 and one axial end (in the axial direction) of the aforementioned □-shaped sealing structure, and the other of the two □-shaped accordion-like shields 225 is installed between the wiring end shield 227 and the other end of the aforementioned □-shaped sealing structure. In this way, a complete protection assembly can be formed through the combination of the two □-shaped accordion-like shields 225 and one □-shaped sealing structure. In addition, a protection cover can also be provided for components such as the wiring motor to prevent silicon powder, water vapor and the like from entering the interior of the wiring motor. For example, the wiring end shields each have a step surface, which allows the accordion-like shields to be more evenly arranged in the area between the two step surfaces. In this example, the winding/unwinding mechanism is also provided with a drag chain to install related pipelines, cables, etc.

[00031] Preferably, an accordion-like shield support structure 226 can be installed above the wiring slide seat and/or on the front side of the wiring slide seat, and it is for example a strip-like structure, so as to prevent the accordion-like shield from sinking due to gravity and rubbing against the linear guide rail. The accordion-like shield support structure can also be multiple block structures arranged at intervals.

[00032] In a possible embodiment, the accordion-like connection adapter 215 includes a vertically arranged wiring shield 2151 and two rear shield installation plates respectively arranged on upper and lower protrusions of the wiring shield, which are referred to as a first rear shield installation plate 2152 and a second rear shield installation plate 2153 respectively. The connection between the rear shield installation plate located above and the upper protrusion of the wiring shield can be fixed using screws for facilitating disassembly, while the rear shield installation plate located below is assembled with the lower protrusion of the wiring shield only by fitting without installation. The reason for this arrangement is that the □-shaped sealing structure formed by the installation of the installation portion 2132 of the winding/unwinding roller assembly installation seat, the wiring shield 2151 and the two rear shield installation plates can be mated with the □-shaped accordion-like shields to achieve the best protection function. However, in a case where the rear wiring shield 2151 is not assembled, the assembly will

be more convenient and simpler. Moreover, for the above-mentioned wiring protection assembly, when the □-shaped accordion-like shields on both sides are assembled, the position itself, which corresponds to the wiring shield in the wiring protection assembly, is located on a back side of the wiring assembly. In fact, even if without the wiring shield 2151 on the rear side (the rear side of the accordion-like connection adapter is an open side), the probability of silicon powder, water vapor and the like entering the interior of the wiring assembly through this open side is relatively low. Therefore, in a case where the wiring shield in the □-shaped sealing structure is removed, although the sealing is no longer full circumferential sealing, the silicon powder, water vapor and the like entering the interior of the wiring assembly are very little. Therefore, from the perspective of protection, whether the wiring shield is reserved or not has little impact on the operation of the device. By disconnecting the wiring shield 2151 from the second rear shield installation plate 2153 located below and retaining the assembly relationship, the wiring shield 2151 can be installed or removed according to actual needs. Specifically, the first rear shield installation plate 2152 located above can be operated by the operator and therefore can be reserved, while the connection position between the second rear shield installation plate 2153 located below and the wiring shield 2151 is a position that cannot be reached by the operator or is difficult for the operator to reach. Therefore, through such an arrangement, the operator can flexibly choose whether to reserve the wiring shield 2151 according to the actual situation.

[00033] In this example, the winding/unwinding roller assembly also includes a stop pin 216. When disassembling the wire roller in the winding/unwinding roller assembly, the stop pin is inserted into a reserved hole above the servo motor; after the stop pin is clamped, the wire wheel screw is unscrewed to disassemble the wire roller. When the stop pin is removed, a proximity switch of the stop pin will sound an alarm and the shutdown equipment cannot be operated, thus improving the safety protection index of the whole machine.

[00034] In a possible embodiment, the winding/unwinding roller assembly 21 further includes a winding/unwinding roller support assembly 217, which is mainly used to support the winding/unwinding roller in the winding/unwinding roller assembly when replacing the winding/unwinding roller. The winding/unwinding roller support assembly

includes the above-mentioned winding/unwinding roller guard plate 2171 fixedly connected to a winding/unwinding roller motor support, and two winding/unwinding roller support rods 2172 arranged on the winding/unwinding roller guard plate in the axial direction of the winding/unwinding roller. A lower part of the winding/unwinding roller is supported between the two winding/unwinding roller support rods. At least one of the two winding/unwinding roller support rods is arranged on the winding/unwinding roller guard plate in a position adjustable manner, so as to be compatible with winding/unwinding rollers of different specifications (diameters) through changes in the relative position between the two winding/unwinding roller support rods.

[00035] In a possible embodiment, the winding/unwinding roller support rods 2172 are arranged on the winding/unwinding roller guard plate through winding/unwinding roller support blocks 2173. Installation positions of the winding/unwinding roller support blocks can be adjusted. For example, there are multiple installation positions on the winding/unwinding roller guard plate, and the winding/unwinding roller support blocks can be installed in any of the multiple installation positions. For example, multiple installation holes are provided on the winding/unwinding roller guard plate, and the winding/unwinding roller support blocks can be installed at different positions on the winding/unwinding roller guard plate through the cooperation of fasteners such as screws and the installation holes. Based on this, it can be compatible with winding/unwinding rollers of different diameters. For example, when the distance between the two winding/unwinding roller support rods is small, it is suitable for them to support winding/unwinding rollers with a small diameter, and when the distance is large, it is suitable for them to support winding/unwinding rollers with a large diameter. In a specific example, each winding/unwinding roller support rod has two installation positions, and the cooperation of two pairs of winding/unwinding roller support rods can meet the need of material replacement support for different models of winding/unwinding rollers (such as winding/unwinding roller 268 and winding/unwinding roller 242).

[00036] It can be understood that the specific form and number of installation positions can be determined by those skilled in the art according to actual needs. In addition, the two winding/unwinding roller support rods can be both adjusted, or only one of them can be adjusted. Moreover, in addition to the adjustment method of matching the winding/unwinding roller support blocks with different installation positions, the position

between the two winding/unwinding roller support rods can also be adjusted through the movement of the winding/unwinding roller support rods. For example, the two winding/unwinding roller support rods are arranged on the winding/unwinding roller guard plate in a way of sliding close to/away from each other. In this way, the sliding movement of the winding/unwinding roller support rods enables them to match with winding/unwinding rollers of different diameters.

[00037] In a possible embodiment, the wiring assembly 22 includes a wiring slide seat 221, on which a wiring driving transmission mechanism that can drive the wire roller assembly to move is provided. In this example, the wiring driving transmission mechanism includes a wiring motor 222 and a screw and nut mechanism 223. The motor drives the screw and nut mechanism to achieve the movement of the winding/unwinding roller assembly in a wide range. Preferably, a guide rail slider assembly 224 can be added on the basis of driving transmission to ensure the reliability of movement through the auxiliary cooperation between the linear guide rail and the slider. Obviously, those skilled in the art can use appropriate driving transmission methods according to actual needs to achieve the movement of the winding/unwinding roller assembly, such as a combination of a power cylinder, a linear module, a motor, and a rack and pinion mechanism, etc.

[00038] In a possible embodiment, the slicer 100 further includes an electric control cabinet 14, a liquid circuit assembly 15, and a cantilever box 16. The electric control cabinet is mainly used to arrange an electrical assembly of the slicer, and the liquid circuit assembly mainly includes a cutting liquid supply assembly, a cutting liquid filtration assembly, and a heat exchange system, etc. For example, the slicer is provided with two electric control cabinets, and the bottom and top of the electric control cabinets are respectively fixed to a liquid circuit frame of the liquid circuit assembly by fasteners such as screws. There is an interconnection channel between the two electric control cabinets at a position near the top to facilitate communication connection between the two electric control cabinets and line incoming of electrical components, etc. Pipe inlet/outlet of the liquid circuit assembly can generate recycled water, pure water, and factory cooling water. A portion of the factory recycled water is used to flush the cutting chamber, and another portion is used to flush residual silicon powder and the like in a liquid supply cylinder. The pure water is mainly used as a source for preparing a cutting liquid in the liquid supply cylinder according to the ratio (a pure cutting liquid is stored in a cutting

liquid storage trolley and needs to be mixed with water according to the ratio to prepare the cutting liquid. The prepared cutting liquid is delivered through the liquid supply cylinder to a filter barrel and finally used for cutting spray, tool return spray, etc.). The cutting liquid supply assembly is mainly used to prepare the cutting liquid according to the ratio in a liquid storage cylinder and drive it to circulate in pipelines, that is, it is mainly used to achieve storage and circulation of the cutting liquid. The cutting liquid filtration assembly is mainly used to filter the silicon mud in the cutting liquid in one or multiple stages to reduce the influence of impurities on the cutting effect. The heat exchange system is mainly used to provide the cutting liquid to the high-speed rotating main cutting rollers, assemblies/components that need to be cooled inside the electric control cabinets and the like through external and internal circulation, in order to achieve corresponding filtering and cooling functions. The external circulation heat exchange is usually used to filter and cool the cutting liquid used for cutting/spraying, which comes from a pipeline pump. The cooling water includes two streams, and is mainly used to achieve the corresponding cooling function through communication with external/internal circulation heat exchangers of the heat exchange system. The cantilever box is mainly used to configure a movable interactive module for the slicer (such as a part that only includes a display function and/or an interactive part that can perform parameter settings and other operations). In this example, the cutting chamber of the slicer is located in an upper position on the front side of the slicer, and both sides of the cutting chamber are provided with one winding chamber below respectively. The liquid circuit assembly is divided into two parts, which are located on the rear side of the slicer separately. There are two electric control cabinets, which are respectively located above the two parts of the liquid circuit assembly.

[00039] During the slicing operation of the slicer on the silicon rod, the diamond wire mesh needs to move back and forth between the cutting chamber and the winding chambers. Due to the large amount of water mist generated by the wire mesh in the cutting chamber during cutting and flushing operations, assuming that the water mist enters the winding chambers through the position of the wire passing mechanism, it will cause dirt in the winding chambers (because the water mist usually contains silicon powder produced by cutting). If the water flow rate is high, the water may also flow out to the outside of the slicer; at this point, it needs to be cleaned by corresponding working personnel. Therefore,

it is very necessary to carry out waterproof sealing for this position. Specifically, good waterproof sealing performance for this position can not only reduce the protection requirement rating for components inside the winding chambers, but also can effectively reduce the possibility of manual labor intervention.

[00040] In a possible embodiment, the lower frame of the frame is provided with a sealing assembly 7 at a position corresponding to the cutting chamber near the tension mechanism; for example, one sealing assembly 7 is provided at each of the positions corresponding to the two tension mechanisms respectively.

[00041] In a possible embodiment, the sealing assembly 7 includes a sealing substrate 71, which includes a side surface portion 711 and a top surface portion 712 that are integrally formed (or fixedly connected). In this example, the frame in a cutting area has a step surface 13 at that position, and the sealing assembly 7 is arranged on an inner side of the step surface. The side surface portion 711, the top surface portion 712, and the step surface of the frame in the cutting area enclose to form a chamber capable of collecting the cutting liquid from the cutting chamber. An outer movement port 713 (exposed to the outside of the cutting chamber, i.e., close to the cutting chamber) is provided on the side surface portion 711 of the substrate as a first movement port, and an inner movement port 714 (not directly exposed to the outside of the cutting chamber, i.e., away from the cutting chamber and close to the tension mechanism) is provided on a vertical portion of the step surface as a second movement port. The wire passing mechanism 5 can extend to the cutting chamber through the inner movement port and the outer movement port, and can move within an area defined by the two (a wire passing area) to ensure the reciprocating movement of the diamond wire between the cutting chamber and the winding chambers. The sealing assembly includes a pressing assembly configured on the substrate at a position corresponding to the inner movement port. The pressing assembly is mainly used to press the wire passing mechanism at the position corresponding to the inner movement port to ensure the sealing effect on the wire passing mechanism and the chamber at the position corresponding to the inner movement port.

[00042] Referring mainly to FIGS. 19 to 21, in a possible embodiment, the pressing assembly includes a pair of opposing pressing parts 7151 arranged on upper and lower sides of the outer movement port respectively, and the wire passing mechanism is

clamped between the two to form a sealing structure that can effectively reduce/prevent entry of water vapor from the cutting chamber into the winding chambers.

[00043] In a possible embodiment, the two pressing parts are respectively provided with a pressing support component, so that the pressing support components 7152 can provide a force to the corresponding pressing parts that can make the pressing parts approach each other in opposite directions to ensure the pressing effect. The pressing support components can be elastic parts, telescopic movable parts (such as moving plates, etc.), etc. In this example, the pressing parts are sealing strips, which are provided on the substrate through the pressing support components on the corresponding sides. Obviously, the pressing parts can also adopt other structural forms such as pressing rollers with cushioning materials/structures on the surface. As mentioned earlier, since the diamond wire passes through the wire groove of the wire passing plate, the arrangement of the sealing strips will not affect the reciprocating movement of the diamond wire between the cutting chamber and the winding chambers.

[00044] In a possible embodiment, the sealing assembly includes a movable sealing component, which is arranged on the substrate in a posture adjustable manner at a position corresponding to the top surface portion. During the slicing operation of the diamond wire mesh, the movable sealing component is in a posture that can block the outer movement port to a certain extent. In case of no slicing operation, the posture of the sealing component can be selectively changed and adjusted; for example, it can be folded to a certain degree to facilitate corresponding installation operations, etc.

[00045] In this example, the movable sealing component is a water blocking component 716 (such as a flip cover, etc.), which is arranged on the substrate in a pivotable manner at a position corresponding to the top surface portion. A lap joined structure (such as a lap joined plate, a lap joined block, a lap joined seat, etc.) extends from the top surface portion in a direction closer to the outer movement port, so that the water blocking component can ensure its posture stability through its cooperation with the lap joined structure when flipped in place. Based on this, during the slicing operation of the diamond wire mesh, the water blocking component is flipped toward the side closer to the outer movement port, and in the flipped state, the water blocking component forms a blocking brim at the position corresponding to the outer movement port. In case of no slicing

operation, the water blocking component can be flipped toward the side away from the outer movement port, so that the side surface portion including the outer movement port is completely exposed inside the cutting chamber. It can be understood that those skilled in the art can determine the specific implementation of the pivotal connection according to actual needs, such as through the combination of a rotating shaft and an installation bracket, the combination of a shaft and a shaft sleeve, etc.

[00046] Obviously, the description of the specific form of the water blocking component and the corresponding posture adjustment method is only exemplary. Those skilled in the art can choose a reasonable adjustment method according to actual needs, such as the extending and retracting/pushing and pulling of the water blocking component in the movement direction of the diamond wire or in a direction having an angle with the movement direction (such as being perpendicular to the movement direction), the rotation of the water blocking component along an outer surface of the top surface portion, etc. In addition, the states of the water blocking component corresponding to the slicing operation and the non-slicing operation can also be flexibly adjusted according to actual needs. For example, if the water blocking component can extend and retract in the movement direction of the diamond wire, the state corresponding to the non-slicing operation can be fully retracted, partially retracted, or having no significant difference from the state corresponding to the slicing operation.

[00047] In a possible embodiment, the top surface portion is a structure inclined downward from right to left (such as a sloping surface, a curved surface, etc.), so that the cutting liquid in the cutting chamber can flow down along the top surface portion in a timely manner, thereby avoiding deposition of silicon mud on the top surface portion. A drainage port is provided on a transverse portion of the step surface (at a position corresponding to the bottom of the chamber), and a drainage pipeline can be configured for the drainage port (such as on the outer side of the bottom of the chamber) to timely discharge the cutting liquid in the chamber. In addition, a flow guide plate is configured at a position near the drainage port in the chamber to timely guide the cutting liquid entering the chamber to the area near the discharge port.

[00048] In a possible embodiment, a cleaning port and an observation port can be provided on the top surface portion. The cleaning port is mainly used to clean the silicon

mud deposited in the chamber during regular maintenance of the slicer, and the observation port mainly serves to facilitate operators in observing the condition of the diamond wire in the wire passing mechanism, the routing after breakage of the diamond wire, etc. For example, a cleaning port cover plate and an observation port cover plate are respectively arranged at positions corresponding to the cleaning port and the observation port on the top surface portion. Due to the low frequency of use of the cleaning port, the cleaning port cover plate can be screwed onto the top surface portion, so that the cleaning port cover plate can be removed from the top surface portion when cleaning is needed. The frequency of use of the observation port is relatively high, so the observation port cover plate is arranged on the top surface portion in a pivotable manner so that it can be opened/closed in a timely manner.

[00049] In a possible embodiment, a flexible shielding component 717 such as a silicone pad or silicone plate can be configured on the vertical portion of the step surface 13 at a position corresponding to the inner movement port 714. In this way, a sealing curtain can be formed at the position of the chamber corresponding to the inner movement port. Due to the flexible structure of the silicone pad, a partial area of the sealing curtain can be lifted up to allow the wire passing mechanism to pass through/move normally, while other parts can block the inner movement port and provide a certain sealing effect. Assuming the aforementioned sealing strip is referred to as a first line of defense, the flexible shielding component can be referred to as a second line of defense. In order to ensure the sealing effect, a pressing mechanism such as a pressing wheel can be added to the flexible shielding component. In this way, during the process of lifting up the flexible shielding component, the free side of the flexible shielding component is pressed tightly by the pressing wheel to ensure that the flexible shielding component obtains a better sealing effect as much as possible when lifted up.

[00050] In a possible embodiment, a bottom baffle 718 can be arranged on the vertical portion of the step surface at a position near the bottom. The cutting liquid containing silicon powder/mud in the chamber will flow back into the cutting chamber along a reflux groove (not shown) provided on the lower frame after reaching the bottom of the chamber. For example, a shielding plate 7181 can extend from a position on the bottom baffle 718 that corresponds to the reflux groove (roughly aligned with the reflux groove and located above it) in the direction close to the cutting chamber. The shielding

plate is mainly used to shield the cutting liquid splashed out from the reflux groove in the cutting chamber. The shielding plate is a structure in which the reflux groove is inclined downward from the direction close to a front movement port to the direction close to a rear movement port, and the shielding plate can be a sloping plate, a curved plate, or a combination of them, etc.

[00051] It can be seen that in the sealing assembly of the present disclosure, the cutting liquid thrown out of the diamond wire mesh in the cutting chamber can be temporarily collected in the chamber constructed by the substrate and the frame, effectively preventing the silicon mud and the like in the cutting liquid thrown out of the cutting area from falling onto structures such as the tension wheel of the tension mechanism and the wire roller of the winding/unwinding mechanism, and thus avoiding the problem of the slicing efficiency of the slicer being affected or even the risk of diamond wire breakage caused by this. By adding a sealing compression strip on the outer movement port, a first line of defense against cutting wire splashing can be established, and by adding a sealing compression strip on the inner movement port, a second line of defense against cutting wire splashing can be established. By configuring a movable sealing component that can be flipped on the top surface portion of the substrate, the cutting liquid can be blocked by shielding from splashing to the position corresponding to the outer movement port. By providing a waterproof baffle, it can be effectively ensured that the cutting liquid reaching the bottom of the chamber can flow back to the cutting chamber in a timely manner and the occurrence of splashing can be effectively prevented.

[00052] Compared with the existing slicers with a six-guide-wheel structure mentioned in the background art, the wiring wheel and the reversing wheel are omitted in the structure of the slicer in the embodiment, and the slicer is improved to have a two-guide-wheel structure. Based on this structure, it is still assumed that the wire roller on the left side is the winding roller (at this time, the wire roller on the right side is the unwinding roller), and the winding path of the slicer is: the wire roller on the left side → the tension wheel on the left side → the third main roller → the second main roller → the first main roller → the third main roller (forming a wire mesh through multiple times of winding) → the tension wheel on the right side → the wire roller on the right side. The completed winding path passes through only two guide wheels. In order to ensure the reliability of

the slicer, the functions corresponding to the traditional wiring wheel and reversing wheel still need to be retained. In the present disclosure, it is mainly achieved by improving the winding assembly including the tension mechanism.

[00053] In other words, by setting the winding assembly, the number of guide wheels of the slicer is reduced to only two on each side, minimizing the number of guide wheels and reducing the cost of consumables related to the guide wheels. More importantly, this optimized solution can greatly reduce control interference and inertia loss, and has the advantages of convenient wiring operation, and low operational resistance to the wire mesh, so that the wire mesh can better meet the requirement for high-speed operation. On this basis, it is expected to achieve high-speed synchronous operation of the diamond wire, which can effectively solve the problem of wire mesh shaking commonly found in wire cutting machines during high-speed operation, thereby improving the cutting stability of the slicer, ensuring low wire breakage rate of the slicer, and improving the cutting quality of the slicer.

[00054] The winding/unwinding mechanism in the winding assembly has been described earlier; in the following, the tension mechanism and relevant improvements thereof will be mainly elaborated.

[00055] Reference is made to FIGS. 22 and 23, in which FIG. 22 shows a schematic structural view of the tension mechanism of the slicer in the existing example, and FIG. 23 is a schematic diagram showing the working principle of the tension mechanism of the slicer in the existing example. As shown in FIGS. 22 and 23, the tension mechanism in the existing example mainly includes a tension wheel 04 and its driving transmission mechanism. The driving transmission mechanism mainly includes a tension motor (the existing example) 041 and a tension swing rod (the existing example) 042 (for ease of description, the components of the existing example are described using different reference signs from the present disclosure). The tension motor that outputs a constant torque can balance an initial tension value of the diamond wire. In this way, when the tension on the diamond wire changes, the change of tension on the diamond wire can be buffered by the left and right swinging of the tension swing rod (around a tension swing axis), thereby keeping the tension on the diamond wire in a relatively stable state. Specifically, during the operation of the tension mechanism, the tension motor

continuously outputs a constant torque. Taking the diamond wire being wound to the left as an example, due to the presence of the constant torque M output by the tension motor, the tension wheel is subjected to a force F to the right (constant torque M /length of the tension swing rod), and the diamond wire wound around the tension wheel generates a pulling force to the left (denoted as F_1 and F_2 respectively). When the rotational speed of the main cutting roller matches the rotational speed of the wire roller (achieving an equilibrium state), $F_1+F_2=F$. Therefore, the tension swing rod will not swing (it is located at zero position). When the rotational speed of the main cutting roller does not match the rotational speed of the wire roller, there will be a situation where the resultant force of F_1 and F_2 is different from F . At this point, if $F_1+F_2>F$, the tension swing rod swings to the left, and if $F_1+F_2<F$, the tension swing rod swings to the right, buffering the change of tension on the diamond wire. At this point, an encoder on the tension motor will capture and recognize the posture of the tension swing rod swinging to the left/right. Based on this, the tension on the diamond wire can be balanced by adjusting the rotational speed of the wire roller, thereby restoring the tension swing rod to the zero position.

[00056] Referring mainly to FIGS. 14 to 17 and 24 to 30, in a possible embodiment, the tension mechanism 4 mainly includes a tension wheel assembly, a connection assembly, and an adjustment assembly. The tension wheel assembly includes a tension wheel 41 and a tension motor 42. The connection assembly includes a tension swing rod 43 as a first connection component located below and a rotating arm 44 as a second connection component located above. The tension motor 42 is arranged on a tension motor seat 421. The tension mechanism also includes an adapter plate, which is mainly used to fix the tension motor seat and other structures to a corresponding moving unit to achieve the movement of the tension mechanism or fix the tension mechanism to the slicer. A power output shaft of the tension motor is connected to the tension swing rod, and the tension swing rod is rotatably connected to the rotating arm. The tension wheel is pivotably arranged on the rotating arm, so that the tension wheel can freely rotate relative to the rotating arm under the driving of the diamond wire, ensuring the reciprocating movement of the diamond wire. The adjustment assembly mainly include a movement adjustment assembly 46 and a height adjustment assembly. According to the wiring length of the diamond wire mesh, the wire entry and exit positions of the diamond wire mesh may vary. The movement adjustment assembly is mainly used to adjust the position of the

tension wheel based on the wire entry and exit positions, thereby ensuring the accuracy of the wire entry and exit positions of the diamond wire mesh. The position adjustment of the tension wheel assembly can be achieved by the movement adjustment assembly 46 through a linear module 463. Obviously, those skilled in the art can use any driving transmission mechanism that can achieve the linear movement as the implementation module of the present disclosure, such as the combination of a motor and a screw and nut mechanism, the combination of a motor and a rack and pinion mechanism, etc. If the main cutting roller of the cutting mechanism in the cutting chamber needs to be replaced with a different diameter specification, it will affect the height of the diamond wire at the wire entry and exit positions. The height adjustment assembly is used to adjust the height of the tension wheel assembly to adjust the wire passing position and ensure the accuracy of routing of the diamond wire. The height adjustment assembly includes an adjustment pad 47, and the height of the wire passing position can be adjusted by replacing the adjustment pad.

[00057] In this way, based on the constant torque provided by the tension motor, when the tension of the diamond wire changes, the tension wheel will swing around the tension swing axis. When the tension wheel is subjected to force due to the skewing of the diamond wire in the wire groove, the tension wheel will drive the rotating arm to rotate relative to the tension swing rod around a tension deflection axis corresponding to the rotating arm, so that the rotation can reduce the friction between the diamond wire and a groove wall of the wire groove of the tension wheel caused by the skewing of the diamond wire, and thus reduce the probability of risks such as diamond wire wear, diamond wire detachment, and diamond wire breakage caused by the friction between the diamond wire and the groove wall of the tension wheel, which is advantageous for improving the cutting quality of the slicer. In this example, the tension swing axis roughly coincides with the axis of the power output shaft of the tension motor, and the tension deflection axis roughly coincides with the rotational axis around which the rotating arm rotates relative to the tension swing rod. The tension swing axis and the tension deflection axis are roughly perpendicular to each other, and the tension swing axis is located below the tension deflection axis.

[00058] In a possible embodiment, the tension swing rod 43 is approximately a fork-shaped structure and includes a swing rod substrate 430 that extends approximately vertically, as well as a first branch 431 and a second branch 432 that extend upward and

outward from an upper end of the swing rod substrate. In this example, both the first branch and the second branch are rod-shaped structures and are approximately symmetrically distributed with respect to the vertical direction. Vertical ends are provided on or extend from upper ends of the first/second branches of the rod-shaped structures, so that an installation space is formed between the two ends. The two ends are respectively machined to have a hole 434 as a first rotating structure, and the rotating arm rotates relative to the tension swing rod by means of the assembly relationship in the installation space.

[00059] In this example, an installation hole and a key slot are machined on the swing rod substrate at a lower end of the tension swing rod 43, so that the tension swing rod can be directly connected to the power output shaft of the tension motor 42 through key connection. A small slit is machined above the installation hole and a screw is installed on the side (in a thickness direction of the slit). In this way, the reliability of the connection between the tension swing rod and the power output shaft of the tension motor can be ensured. In addition, the tension motor installation seat is provided with two limiting structures 433 (such as limiting rubber rings) on both sides of the substrate to limit the swing range of the tension swing rod. In addition, a detection switch is installed on the tension motor installation seat, and it is mainly used to detect the left and right limit positions when the tension wheel is driven to move by the movement adjustment assembly.

[00060] It can be understood that the descriptions of the above structural form of the tension swing rod, the way in which the tension motor is fixed to it, and the form of the first rotating structure thereof for rotatable connection with the rotating arm are only exemplary. Those skilled in the art can flexibly adjust the corresponding structure according to actual needs. For example, the first/second branch is a curved arm, a plate-shaped structure, etc., and the first rotating structure is a shaft, a sleeve, etc.

[00061] In a possible embodiment, the rotating arm 44 is roughly a T-shaped structure and includes a first rotating arm 441 that is rotatably connected to the first/second branch, and a second rotating arm 442 that is integrally formed with the first rotating arm and extends vertically. The first rotating arm 441 includes a rotating arm body 4411 that is horizontally arranged, and extended portions 4412 that extend from both ends of the rotating arm body. The extended portions are provided with cylindrical structures 4413 as second rotating structures, and the tension wheel is pivotally arranged at a lower end of

the second rotating arm. By inserting the cylindrical structures into the above-mentioned holes that serve as the first rotating structures, a rotatable connection can be achieved between the two through rotating support components such as bearings. As mentioned earlier, such a rotatable connection is only an exemplary description. Those skilled in the art can flexibly adjust the structure used to achieve the rotatable connection according to actual needs, such as through the cooperation between an installation shaft and an installation bracket with a pair of opposing installation plates.

[00062] In a possible embodiment, a rotational damping assembly may be provided between the first rotating structure and the second rotating structure to prevent phenomena such as instantaneous rapid rotation of the rotating arm, thereby ensuring smooth rotation. For example, the principle of a rotational damper is that a damping liquid with certain fluidity can flow between different spaces. When the rotational speed of the rotating arm is gentle, the damping liquid can flow normally between different spaces (such as through damping holes). When the rotational speed of the rotating arm suddenly increases, due to the hysteresis of the flow of damping liquid, it will hinder the relative movement between the components related to different spaces, effectively suppressing the rapid rotation of the tension wheel.

[00063] In a possible embodiment, taking the right side as an example, the rotational damping assembly 6 mainly includes a damping guide rail 61, a bearing (such as a deep groove ball bearing in this example) 62, and an end cover 63. A circular hole is machined on the damping guide rail, and the damping guide rail is fixed to the cylindrical structure of the rotating arm (taking the cylindrical structure on the right side as an example, it can be referred to as a right small shaft) by a screw 64 and the like, so as to press the inner ring of the bearing 63 (such as a deep groove ball bearing in this example), playing an axial positioning role. The right small shaft has a groove 65; silicon powder, water vapor and the like will fall into the groove, and will fall off on their own with the rotation of the rotating arm and the right small shaft. Preferably, in the present disclosure, a groove bottom of the groove is located radially inward of a slit 66 (a left slit in the figure) between the outer ring of the bearing and the inner ring of the bearing, and the slit can communicate the external environment of the bearing with a bearing chamber of the bearing. According to the orientation shown in the figure, the groove is roughly vertically arranged while the slit is roughly horizontally arranged, so the directions of the two are roughly perpendicular

to each other. In this way, since the groove bottom of the groove is lower, after silicon powder, water vapor and the like fall into the groove bottom of the groove, the groove wall can block the silicon powder, water vapor and the like that have already fallen into the groove bottom from entering the bearing chamber of the bearing through the slit, thereby ensuring the cleanliness of the bearing. The slit on the other side of the bearing chamber (the right slit in the figure) is shielded by the end cover 63. In addition, the left and right sides of the rotational damping assembly are respectively provided with a blocking cover 67 and a pressure ring, which can provide certain sealing protection. Corresponding to the end cover on the rotational damping assembly arranged on the right small shaft, the rotational damping assembly arranged on the left small shaft uses a water blocking plate to shield the slit in the bearing chamber.

[00064] It can be understood that the above-mentioned rotational damping assembly is only an exemplary description. Those skilled in the art can adopt any form of rotational damping assembly according to actual needs, such as purchasing any form of rotational damper on the market and directly installing it.

[00065] In this example, a main body portion of the first rotating arm is a straight arm extending horizontally, and the second rotating arm is a straight arm extending vertically. Therefore, in this example, the tension swing axis is approximately collinear with the diamond wire in the wire passing mechanism and the wire groove of the tension wheel in the ideal state.

[00066] In a possible embodiment, the movement adjustment assembly 46 mainly includes a substrate, and a linear module serving as a driving transmission component and connected to the tension wheel assembly for transmission. The substrate includes a connection plate 461 located at the top, and a cover 462 as a protection component. The linear module 463 is arranged on the connection plate and accommodated in an installation space formed by the connection plate and the cover, effectively preventing silicon powder, cutting liquid and the like from entering it. The substrate also includes a support plate 464. In this example, the support plate has an extended end, and the protection component has a strip-shaped opening 465 below it. The extended end of the support plate extends into the installation space through the opening and is installed to a slider of the linear module. A sealing structure can be provided on the protection

component at a position corresponding to the opening to prevent silicon powder, cutting liquid and the like from entering the installation space through the opening. For example, the sealing structure includes pressure plates with silicone installed on both sides of the opening respectively, and the pressure plates tightly press the support plate to reduce the slit at the opening. In this example, the movement adjustment assembly is installed as a whole on the top wall of the winding chamber. In addition to the arrangement of the sealing structure, since the opening is located at the bottom of the cover, it is also difficult for impurities such as silicon powder themselves to enter the installation space under the action of gravity. Therefore, the layout of the structure also enhances the sealing effect of the movement adjustment assembly. The traditional movement adjustment assembly is installed on the side wall of the winding chamber, and the position of the opening is also on the side, so there is a problem of impurities easily entering the installation space. For example, a drag chain 466 is also provided on the substrate for arranging pipes and wires of the movement adjustment assembly.

[00067] In a possible embodiment, the tension mechanism and the wire passing mechanism are installed in a modular manner, so that the tension mechanism and the wire passing mechanism can be assembled separately as a component on the outside, and then the overall module can be installed in the winding chamber of the slicer to significantly accelerate the assembly progress.

[00068] In a possible embodiment, a structure for facilitating a modular assembly of the tension mechanism and the wire passing mechanism is as follows: the wire passing mechanism is provided with a vertical plate 55 along the end of the routing groove, the tension motor of the tension wheel assembly is installed on the tension motor seat, and the bottom of the vertical plate is installed on the side of the tension motor seat. In this way, after the wire passing mechanism 5 is installed onto the tension wheel assembly, the assembly is then installed as a whole onto the support plate of the movement adjustment assembly, with the aforementioned adjustment pad 47 arranged between the two for adjusting the height of the wire passing position. For example, all relevant connections are implemented using screws.

[00069] Referring mainly to FIGS. 4 and 5, in the slicer of the present disclosure, the upper frame 11 and the lower frame 12 form the cutting chamber located above. The

lower frame forms one winding chamber on each side below the cutting chamber respectively. The wire saw unit includes one cutting mechanism 3 located in the cutting chamber and two sets of winding assemblies located in the two winding chambers.

[00070] In a possible embodiment, based on the modular installation described above, the tension mechanism and the wire passing mechanism are installed as a whole at the top of the lower frame. Specifically, the connection plate at the top is installed to the top of the lower frame, achieving a suspended installation of the tension mechanism and the wire passing mechanism. Moreover, in this example, the tension wheel assembly is an inverted structure in which the tension wheel 41 and the swing arm 44 are located above the tension swing rod 43, and the tension motor 42 is located at the bottom. In addition, since the opening in the aforementioned movement adjustment assembly is located at the bottom, the installation of the tension mechanism and the wire passing mechanism corresponding to the modular structure can also be referred to as an inverted installation.

[00071] In a possible embodiment, the wire roller assembly in the winding/unwinding mechanism is located below the tension mechanism to ensure its smooth transition with the tension wheel. At the same time, the wiring assembly in the winding/unwinding mechanism is placed on the side of the lower frame. In this way, the installation of the winding/unwinding mechanism in the winding chamber is achieved through a combination of the installation of the wiring assembly on the side wall and the installation of the wire roller assembly at the bottom.

[00072] In a preferred embodiment, the cutting mechanism of the wire saw unit is installed in the cutting chamber located above, while the winding assembly is installed in the winding chamber below the side. In the winding assembly, the tension mechanism including the wire passing mechanism is installed on the top wall of the winding chamber, while the winding/unwinding roller assembly and the wiring assembly of the winding/unwinding mechanism are installed on the top wall and bottom of the winding chamber respectively. This layout was developed by the inventor after repeated comparison, analysis, and testing. After debugging, this layout has a higher space utilization rate while ensuring the reliability of the wire saw unit, making the layout more reasonable.

[00073] In order to ensure that the center of gravity of the swing structure (the rotating arm, etc., excluding the tension wheel) containing the tension wheel during the swinging process can fall onto the tension deflection axis and therefore avoid the phenomenon of the diamond wire moving of the groove and partial wear caused by this, a counterweight assembly is configured for the tension mechanism.

[00074] In a possible embodiment, the counterweight assembly 8 includes a counterweight bracket 81, a counterweight block 82, a counterweight rod 83, and an adjustment screw 84. The counterweight bracket is roughly a zigzag structure, and the counterweight block is installed on a horizontal part on the left side of the counterweight bracket through the counterweight rod and can move in a length direction of the counterweight rod (such as through threaded connection). The adjustment screw is arranged on a horizontal part on the right side of the counterweight bracket. Based on this structure, after the position of the counterweight block on the counterweight rod is adjusted, the center of gravity of the swing structure is adjusted by fine-tuning the adjustment screw to ensure that the center of gravity of the swing structure always falls onto the tension swing axis, avoiding the phenomenon of the diamond wire moving of the groove and partial wear.

[00075] It can be understood that the descriptions of the structural form (which is a roughly cylindrical structure), number (one), installation method/installation position of the above-mentioned counterweight block on the counterweight bracket, the movement forms that can be generated by it, and the structures/mechanisms thereof used to generate corresponding movements are only exemplary. Those skilled in the art can flexibly adjust them according to actual needs. For example, there may be multiple counterweight blocks, and the relative positions between the multiple counterweight blocks can be flexibly adjusted.

[00076] In addition, weight reduction treatment can be carried out on related structures such as the tension swing rod by machining a weight reduction groove to reduce the mass of the tension wheel during swinging.

[00077] Based on the above structure, the combination of structures related to the tension swing axis in the tension mechanism can be referred to as a swing movement assembly. The swing movement assembly is mainly responsible for buffering the tension

changes on the diamond wire based on the constant torque output by the tension motor. The function of the swing movement assembly will be explained below with reference to FIGS. 31 to 33.

[00078] Referring to FIG. 31, when the rotational speed of the main cutting roller of the cutting mechanism 3 of the slicer matches the rotational speed of the winding/unwinding roller 211, the substrate of the tension swing rod is roughly in the vertical direction, and the tension wheel is in the ideal position at this point. Referring to FIG. 32, when the torque generated by the tension of the diamond wire 9 is smaller than the torque of the tension motor 212, the tension swing rod 43 is pulled by the tension motor 212 to swing toward the side away from the diamond wire, thereby increasing the tension on the diamond wire through this swinging trend. As shown in FIG. 33, when the torque generated by the tension of the diamond wire 9 is larger than the torque of the tension motor 42, the tension swing rod is pulled by the diamond wire to swing and rotate toward the side close to the diamond wire, thereby reducing the tension on the diamond wire through this swinging trend. Through such cycles, the tension on the diamond wire can be maintained within a stable range.

[00079] Based on the above structure, the combination of structures related to the tension deflection axis in the tension mechanism 4 can be referred to as a deflection movement assembly. The deflection movement assembly mainly offsets the skewing phenomenon to at least some extent through the deflection movement of the diamond wire and related structures along the tension deflection axis when the diamond wire is skewed in the wire groove of the tension wheel, and thus reduces or avoids the risk of wire breakage caused by the friction between the diamond wire and the wire groove of the tension wheel. The function of the deflection movement assembly will be explained below with reference to FIGS. 34 to 35.

[00080] Referring to FIG. 34, in the ideal state where the diamond wire 9 entering (or leaving) the wire groove of the tension wheel 41 is not skewed, the diamond wire entering the wire groove of the tension wheel 41 from the winding/unwinding roller 211 is distributed vertically, and the diamond wire is in the plane where the wire groove is located. Referring to FIG. 35, when the diamond wire entering (or leaving) the wire groove of the tension wheel 41 is skewed (the diamond wire deviates from the plane where the

center of the wire groove of the tension wheel is located), the tension wheel will be subjected to force due to the skewing of the diamond wire, so that the tension wheel (and the rotating arm) produces a certain amount of swing around the tension deflection axis. Based on this, the degree of wear between the diamond wire and the wire groove of the tension wheel can be reduced, thereby reducing the probability of diamond wire breakage and other phenomena. In addition, based on this swing, the probability of phenomena such as the diamond wire moving out of the wire groove can also be effectively reduced. Meanwhile, in a case where the skewing phenomenon has already occurred, the specific degree of skewing can be determined through detection components such as range sensors, and the degree of skewing can be described by the angle and direction of the swing. Based on this, the tension wheel can be corrected back to the ideal position shown in FIG. 34 through corresponding corrective measures (such as adjusting wiring parameters and moving the winding/unwinding roller in its axis direction).

[00081] It can be seen that in the tension mechanism of the present disclosure, by configuring a structure for the tension mechanism that enables the tension mechanism to swing around the tension swing axis and in combination with the rotational and axial movements of the winding/unwinding roller in the winding/unwinding mechanism, it is expected to reliably achieve the slicing operation of the slicer and ensure the cutting quality of the slicing operation only through the combination of the winding/unwinding mechanism, the tension mechanism and the cutting mechanism on the basis of omitting the wiring wheel and the reversing wheel in the traditional slicers having a six-guide-wheel structure. By providing the sealing assembly, the reliability of the cutting operation can be ensured from multiple dimensions. In addition, it is expected to optimize the layout of the winding assembly in the winding chamber by arranging the wiring assembly on the side wall of the winding chamber, arranging the tension mechanism on the top wall of the winding chamber, and arranging the winding/unwinding roller assembly at the bottom of the winding chamber, etc. In addition, the reliability of the cutting operation can be further ensured on the basis of adding structures related to the tension deflection axis.

[00082] Hitherto, the technical solutions of the present disclosure have been described in connection with the preferred embodiments shown in the accompanying drawings, but it is easily understood by those skilled in the art that the scope of protection of the present disclosure is obviously not limited to these specific embodiments. Without

deviating from the principle of the present disclosure, those skilled in the art can make equivalent changes or replacements to relevant technical features, and all the technical solutions after these changes or replacements will fall within the scope of protection of the present disclosure.

CLAIMS

1. A wire cutting machine, comprising a winding chamber, characterized in that the wire cutting machine comprises a wire saw unit, wherein the wire saw unit comprises a winding assembly, and the winding assembly comprises a winding/unwinding mechanism and a tension mechanism; wherein the winding/unwinding mechanism comprises: a winding/unwinding roller assembly comprising a rotatable winding/unwinding roller; and a wiring assembly which is capable of driving the winding/unwinding roller to move in its axial direction; wherein the tension mechanism comprises: a tension wheel; and a driving component connected to the tension wheel, wherein the tension wheel is at least capable of rotating based on the torque provided by the driving component; wherein one side of the wiring assembly that is away from the winding/unwinding roller assembly is arranged on a side wall of the winding chamber; and/or the tension mechanism is arranged on a top wall of the winding chamber; and/or the winding/unwinding roller assembly is arranged at the bottom of the winding chamber.

2. The wire cutting machine according to claim 1, wherein the tension wheel is at least capable of generating a movement around a first axis based on the torque provided by the driving component, the wire saw unit comprises a cutting mechanism, and the cutting mechanism is arranged between the winding/unwinding roller and the tension wheel, so that a cutting wire unwound from the cutting mechanism is guided to the tension wheel, or a cutting wire unwound from the tension wheel is guided to the cutting mechanism, thereby allowing the cutting wire to reciprocate between the winding/unwinding mechanism, the tension mechanism, and the cutting mechanism.

3. The wire cutting machine according to claim 1, wherein the wire cutting machine comprises a frame and a wire passing mechanism, the frame is formed with a cutting chamber, and the wire passing mechanism comprises a wire passing plate; the wire cutting machine comprises a sealing assembly, and the sealing assembly comprises: a sealing substrate, which is provided on the frame and is formed with a chamber capable of collecting a cutting liquid from the cutting chamber, wherein a first movement port and a second movement port are provided on the frame and/or the sealing substrate, and the wire

passing mechanism is capable of penetrating into the cutting chamber through the second movement port and the first movement port; and a pressing assembly, which is arranged at the first movement port and/or the second movement port, wherein the pressing assembly comprises a first pressing component and a second pressing component, the wire passing mechanism passes through a space between the first pressing component and the second pressing component, and the first pressing component and the second pressing component can abut to the wire passing mechanism.

4. The wire cutting machine according to claim 3, wherein the pressing assembly comprises a pressing support component, and the first pressing component and/or the second pressing component are arranged on the sealing substrate through the pressing support component; wherein the pressing support component is arranged on the sealing substrate in a movable or deformable manner; preferably, the pressing assembly is arranged at the first movement port; and/or a flexible shielding component is arranged at the second movement port; preferably, the wire passing plate has a routing groove capable of accommodating the cutting wire, and the first pressing component or the second pressing component abuts to a position of the wire passing mechanism that corresponds to the routing groove.

5. The wire cutting machine according to claim 3, wherein the sealing assembly comprises: a reflux groove, wherein the reflux groove is arranged at the bottom of the chamber, and the cutting liquid entering the chamber can flow back to the cutting chamber through the reflux groove; and a shielding component, wherein the shielding component is arranged on the sealing substrate, and at least a part of the shielding component is located above the reflux groove, so as to shield the cutting liquid splashed out from the reflux groove.

6. The wire cutting machine according to claim 5, wherein the shielding component comprises a shielding component substrate, and a shielding structure extends from a position of the shielding component substrate that corresponds to the reflux groove; preferably, there are multiple shielding structures, and at least some of the multiple

shielding structures have a communication structure therebetween; preferably, the shielding structure is arranged at a position of the sealing substrate that is near the second movement port.

7. The wire cutting machine according to claim 3, wherein the sealing assembly comprises a blocking component, which is arranged at a position of the sealing substrate near the top or arranged above the sealing substrate to block the cutting liquid in the cutting chamber from falling into an area corresponding to the sealing substrate; preferably, the blocking component is arranged at a position of the sealing substrate that is near the first movement port.

8. The wire cutting machine according to claim 7, wherein the blocking component is arranged in a movable manner at a position of the sealing substrate near the top or arranged above the sealing substrate; preferably, the blocking component is arranged at a position of the sealing substrate near the top or arranged above the sealing substrate in such a way that it can be flipped.

9. The wire cutting machine according to claim 3, wherein the sealing substrate comprises a side surface portion and a top surface portion; the side surface portion, the top surface portion and the frame form the chamber; the frame has a step surface at a position corresponding to the sealing assembly, wherein the side surface portion, the top surface portion and the step surface form the chamber.

10. The wire cutting machine according to claim 3, wherein the wire passing plate has a routing groove capable of accommodating the cutting wire, and the wire passing mechanism is provided with a blowing assembly; the routing groove is provided with an air outlet, and the blowing assembly can ventilate the routing groove through the air outlet and thus blow off the cutting liquid on the cutting wire; preferably, the air outlet is arranged at least on a groove wall of the routing groove, and a groove bottom of the routing groove is provided with a drainage port.

11. The wire cutting machine according to claim 1, wherein the wire passing mechanism and the tension mechanism of the wire cutting machine can be connected to each other, so as to install the tension mechanism and the wire passing mechanism in a modular manner to a target position.

12. The wire cutting machine according to claim 2, wherein the tension mechanism comprises a connection assembly, which comprises a first connection component and a second connection component; wherein the first connection component is formed with an installation space, and at least a part of the second connection component is accommodated in the installation space and is rotatably connected with the first connection component, so that under the action of an external force, at least the tension wheel can move around a second axis; wherein the first axis and the second axis are not coplanar and have an angle between them.

13. The wire cutting machine according to claim 12, wherein the first connection component comprises a first branch and a second branch, and the installation space is formed between the first branch and the second branch; preferably, a first rotating structure is arranged or formed on the first branch and/or the second branch, and correspondingly, a second rotating structure corresponding to the first rotating structure is arranged or formed on the second connection component; the first connection component and the second connection component are rotatably connected through the cooperation between the first rotating structure and the second rotating structure; preferably, the tension mechanism is provided with a limiting structure at a position corresponding to the first branch and/or the second branch; preferably, the first branch and the second branch are symmetrically arranged.

14. The wire cutting machine according to claim 13, wherein a rotational damping assembly is provided between the first rotating structure and the second rotating structure, and a groove is formed between the second connection component and the rotational damping assembly; the rotational damping assembly comprises a bearing, and a groove bottom of the groove is located radially inward of a slit between an outer ring of the bearing

and an inner ring of the bearing; preferably, the rotational damping assembly comprises a cover, and one end of the slit that is away from the groove is covered by the cover.

15. The wire cutting machine according to claim 14, wherein the tension wheel has a tension wire groove into which the cutting wire can be wound, and the second axis is in the plane where the wire groove is located, or the second axis is parallel with the plane where the wire groove is located; and wherein first axis and the second axis are perpendicular to each other.

16. The wire cutting machine according to claim 1, wherein the tension mechanism comprises an adjustment assembly, which comprises a movement adjustment assembly and a height adjustment assembly; the movement adjustment assembly can drive the tension wheel to move, so as to adjust wire entry and exit positions of the cutting wire wound on the tension wheel; wherein the tension mechanism is arranged on the top wall of the winding chamber through the adjustment assembly; preferably, the movement adjustment assembly comprises a movement adjustment substrate, and a driving transmission component which is drivingly connected to the tension wheel; wherein the movement adjustment substrate comprises a connection plate at the top, and the tension mechanism is arranged on the top wall of the winding chamber through the connection plate; preferably, the movement adjustment assembly comprises a support component on which the tension wheel is arranged, and the support component is connected to the driving transmission component; preferably, the movement adjustment substrate comprises a protection component; the protection component and the connection plate form an installation space for accommodating the driving transmission component; the protection component has an opening below, and the support component extends into the installation space through the opening and is connected to the driving transmission component; the protection component is provided with a sealing structure at a position corresponding to the opening; the sealing structure comprises pressure plates with buffering structures arranged on both sides of the opening respectively, and portions of the pressure plates that correspond to the buffering structures tightly press the support component to reduce the slit at the opening.

17. The wire cutting machine according to claim 1, wherein the wiring assembly is provided with a wiring protection component, which comprises a connection adapter component; the tension mechanism comprises a driving component installation seat; the connection adapter component and the driving component installation seat form a □-shaped sealing structure that surrounds the wiring assembly in a circumferential direction of the cross section of the wiring assembly; preferably, the wiring protection component comprises an accordion-like shield.

18. The wire cutting machine according to claim 1, wherein the winding/unwinding roller is provided with a winding/unwinding roller support assembly, which comprises at least one winding/unwinding roller support component; the at least one winding/unwinding roller support component is capable of supporting the winding/unwinding roller when replacing the winding/unwinding roller, and the at least one winding/unwinding roller support component can form multiple support spaces capable of supporting the winding/unwinding roller; the at least one winding/unwinding roller support component comprises a first winding/unwinding roller support component and a second winding/unwinding roller support component, and the support spaces are formed between the first winding/unwinding roller support component and the second winding/unwinding roller support component; preferably, the first winding/unwinding roller support component and the second winding/unwinding roller support component are support rods; and/or the first winding/unwinding roller support component and/or the second winding/unwinding roller support component are arranged at the installation positions through support blocks.

19. The wire cutting machine according to claim 1, wherein the winding/unwinding roller assembly further comprises a winding/unwinding roller driving component and a winding/unwinding roller assembly installation seat; at least the winding/unwinding roller driving component is arranged on the winding/unwinding roller assembly installation seat; the winding/unwinding roller assembly installation seat comprises a winding/unwinding roller assembly installation seat substrate, which comprises a first substrate portion and a second substrate portion; the winding/unwinding roller is supported on the first substrate portion, the second substrate portion is provided with a winding/unwinding roller driving

component installation seat, and the winding/unwinding roller driving component is arranged on the winding/unwinding roller driving component installation seat; preferably, the winding/unwinding roller driving component installation seat comprises an installation bracket, and the winding/unwinding roller driving component is accommodated in the installation bracket; the winding/unwinding roller driving component is connected to the wiring assembly, and a cover plate is provided on the installation bracket; preferably, the first substrate portion and/or the second substrate portion are annular structures.

20. A control method for a wire cutting machine, characterized in that the wire cutting machine has a winding chamber and comprises a wire saw unit, wherein the wire saw unit comprises a winding assembly, which comprises a winding/unwinding mechanism and a tension mechanism; the winding/unwinding mechanism comprises a winding/unwinding roller assembly and a wiring assembly, the winding/unwinding roller assembly comprises a winding/unwinding roller, and the tension mechanism comprises a driving component and a tension wheel; and the control method comprises: making the wiring assembly drive the winding/unwinding roller to move in an axial direction of the winding/unwinding roller; and/or operating the driving component so that the tension wheel can at least move around a first axis under the action of the driving component; wherein one side of the wiring assembly that is away from the winding/unwinding roller assembly is arranged on a side wall of the winding chamber; and/or the tension mechanism is arranged on a top wall of the winding chamber; and/or the winding/unwinding roller assembly is arranged at the bottom of the winding chamber.