

(12) INNOVATION PATENT
(19) AUSTRALIAN PATENT OFFICE

(11) Application No. **AU 2021101650 A4**

- (54) Title
One-way mud scrapping device for reciprocating lifting driven by track rope of underground water sump
- (51) International Patent Classification(s)
E02F 5/28 (2006.01) **E21F 16/00** (2006.01)
- (21) Application No: **2021101650** (22) Date of Filing: **2021.03.30**
- (45) Publication Date: **2021.05.20**
(45) Publication Journal Date: **2021.05.20**
(45) Granted Journal Date: **2021.05.20**
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ABSTRACT

An one-way mud scrapping device for reciprocating lifting driven by track rope of underground water sump is composed of hydraulic winch, wire rope tensioning vehicle, reciprocating mud scrapping mechanism, suspension light rail track, monorail trolley, rope returning device and cylinder brake at both ends. The light rail track is installed on the roof of the water sump by hanging type, and the monorail trolley is connected with the reciprocating mud scrapping mechanism. The mud scrapping plate on the mud scrapping mechanism is used to unidirectional clean up the sludge at the bottom of the water sump, and the slime is scraped to one end of the entrance of the water sump, and then the slurry pump and other equipment are used to eliminate it. The cylinder brake is installed at both ends of the track to realize the braking of the two ends of the track of the monorail trolley. The driving device of the invention is arranged outside the water sump, and the power of the wire rope is used to realize the upward and downward movement of the scraper. There is no electrical equipment in the water sump, which is suitable for the environment with explosive dangerous gases, so as to achieve the effect of underground water sump without cleaning and ensure the safe use of coal mine water sump.

FIGURES

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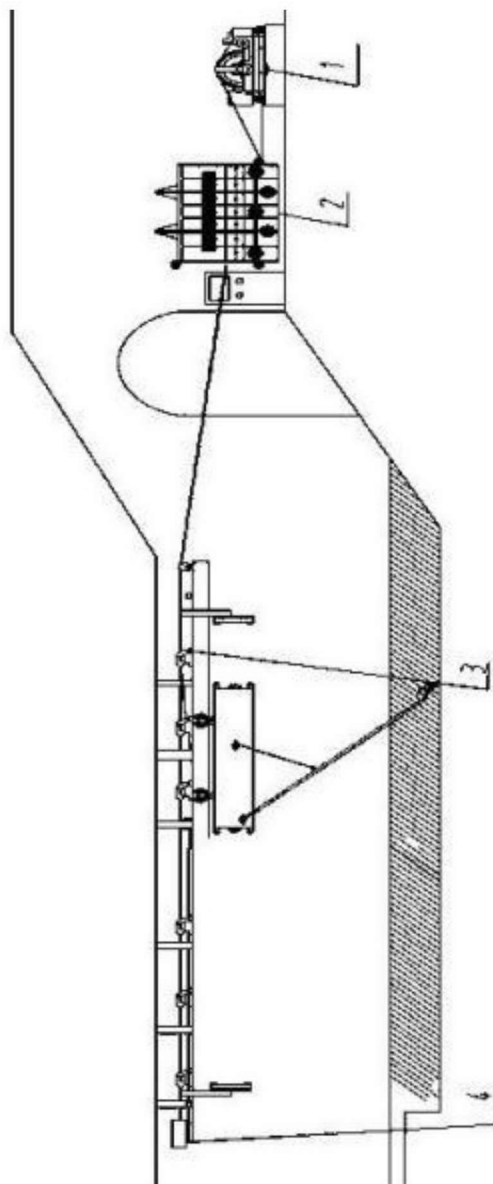


Figure 1

One-way mud scrapping device for reciprocating lifting driven by track rope of underground water sump

TECHNICAL FIELD

The invention relates to a coal mine underground water sump dredging equipment, in particular to an one-way mud scrapping device for reciprocating lifting driven by track rope of underground water sump, which changes the traditional water sump cleaning method to achieve the effect of underground water sump cleaning without digging, and belongs to the field of coal mine water sump cleaning technology.

BACKGROUND

In the process of coal mine construction and production, mine water is produced at all times. The water sump is the place where the drainage wastewater of mine water is stored, and there will be many mud and coal slimes in the water sump. Long-term storage will increase the water level of the water sump and reduce the safety of the coal mine water sump. Therefore, the mud cleaning of the water sump is a key link in the safety guarantee of the mine. Coal mine water sump cleaning equipment is an efficient and stable equipment to deal with the mud of the water sump. Because the water sump is hundreds of meters below the ground, it is closely combined with coal mining, mining and transportation. Therefore, the cleaning of the water sump is not simply cleaning the mud, but combined with the cleaning, processing and transportation of coal slime and other links to work together to form a complete and efficient system. During the working period of the water sump, the domestic coal mines can not clean up the mud in the water sump. Once the rainy

season comes, the water sump is not allowed to stop working, and the mud in the water sump is too much, resulting in the reduction of the safety factor of the coal mine water sump, which will increase the risk of coal miners and their property safety.

The invention patent of "*Method and equipment for continuous cleaning of central water sump in underground coal mine without stopping water*" with the public number CN104728310A, which adopts coal sludge sedimentation experiment to determine the sedimentation length of central water sump in underground coal mine, and then adopts mud scrapping mechanism at the bottom of the water sump through the track installation method, as well as transferring the power wire rope and guiding wheel set module, the reciprocating motion cannot organize the coal mud to gather in the same direction because the mud scrapping mechanism has been below the water surface during the reciprocating motion.

The invention patent of CN171210683203.4, "*Continuous automatic dredging system under the water body of underground oversized water sump*", has an explosion-proof mobile mud collection device for the mud scrapping mechanism, which includes a mud collection trolley and a transmission work platform, and the control platform and the work platform use a motor drive device to drive the chain to make the work platform move forward. The control platform and the working platform use the motor drive device to drive the chain, so that the working platform moves forward, and the control mode is realized by the automatic operation mode to start and stop each part, which is not widely applicable because the equipment is too big and not easily suitable for the coal mine water warehouse environment.

The invention patent No. CN103669538 discloses *A rope-driven monorail crane system*, including winch, wire rope tensioner, tail device, suspension track, train set, wire rope and tail wheel. This system is powered by winch, tensioned by the tension device, and retracted by the cab and rope storage device set on the frame. Multiple sets of cable limiting components are fixedly connected with the suspension track. The tail cable of the return rope wheel installed in the rail device passes through the power system and tension device. For a certain range of slope, monorail crane plays an important role in the safe production process. Because of the inherent reliable braking performance of monorail crane, it is generally applicable to the coal mine transportation system, but it cannot be applied to the requirement of coal slurry transportation or cleaning in the water tank.

In the previous patents and papers, commonly studied are based on the design in the case of water bunker shutdown, the use of water bunker cleaning equipment to clean the silt at the bottom of the water bunker, or set to track at the bottom of the water bunker. In the water bunker cycle reciprocally moving mud scrapping device, or the use of coal sludge cleaning equipment to clean the sludge of the water bunker after the water bunker shutdown will cause the water bunker to stop running, its program manual labor intensity, also suitable for coal mine water bunker environment, the use of too much electrical equipment in the water bunker there is a certain problem of safety risks; or the system studied can not be effectively applied to the environment at the bottom of the water bunker, its applicability is not wide enough.

SUMMARY

The specific technical problem to be solved by the invention is to improve the defects of the existing structure of the mud scrapping device of the underground water sump, adopt no electrical setting in the water sump to meet the explosion-proof requirement of the underground coal mine, adopt the continuous operation structure of the mud scrapping mechanism, and combine the driving technology and characteristics of the rope traction monorail crane to provide one-way mud scrapping device for reciprocating lifting driven by track rope of underground water sump.

The invention is realized by adopting the following technical scheme.

A one-way mud scrapping device for reciprocating lifting driven by track rope of underground water sump, including hydraulic winch 1, wire rope tensioning vehicle 2, reciprocating mud scrapping mechanism 3 and return rope device 4; Its characteristic is as follows:

The reciprocating mud scrapping mechanism adopts a monorail trolley to be installed on a suspension light rail track and can slide left and right, and two ends of the monorail trolley are respectively provided with a pair of limiting wheels to limit the movement of the monorail trolley in the transverse direction and determine the running direction of the monorail trolley; the monorail trolley and the frame are hinged with each other through a connecting seat which is connected with the frame together. The monorail trolley is connected with the mud scrapping frame reliably and has good stability.

The reciprocating mud scrapping mechanism is set between the first cylinder brake and the second cylinder brake which are distributed at both ends of the roadway, the monorail trolley and the frame are hinged together by the monorail crane connecting seat,

and the frame is connected to the mud scrapping plate by the rotating shaft; The upper end of the scraper is hinged by the adjustable positioning connecting rod and the rotating shaft; The hanging ring screw is installed at the middle position on both sides; The lifting wire rope is hinged on the hanging ring screw; The wire rope wheel moves up and down by lifting the wire rope and lifting the hanging ring screw; The lower end of the scrapping plate is connected with a mud scrapping rake; And a pair of walking wheels is installed on the mud scrapping rake (14); The reciprocating mud scrapping mechanism can realize braking at both ends, and has a simple structure, which can effectively reduce the risk of explosion accident in coal mine water sump.

The hydraulic winch is used as a power source to drive the wire rope and frame of the whole system to move forward or backward, and the wire rope tensioning vehicle is used in cooperation with the winch.

In the above scheme, the reciprocating scrapping mechanism is driven by front and rear driving wire ropes. The wire ropes are oriented by a guide wheel set to facilitate stress and guidance. The wire ropes are connected with a driving rack to transmit power and torque through the cooperation of the driving gear and the driving rack. The speed is increased and the torque is reduced through a backstop spur gear speed increaser, and the transmission speed and torque of the output shaft are finally transmitted to the wire rope pulley, thus lifting the scrapping rake. The guide wheel base for installing the guide wheel set is installed on the frame through bolt positioning connection.

In the above scheme, the frame is connected by square steel welding positioning, with lower and upper bottom plates, first and second side plates at the front and rear, and no side plates at the left and right ends, so that the front drive wire rope and rear drive wire rope

can extend from the two ends without side plates and make corresponding actions. The upper bottom plate is positioned and connected to the whole frame, and the four lower bottom plates are positioned and connected to the frame by welding, and play the function of supporting all the internal overall structure; the frame as the main structure support, the first side plate and the second side plate are installed on both sides of the frame by welding positioning connection, and two pairs of bearings with diamond seat will output shaft and drive shaft by positioning connection to fix the first side plate and the second side plate.

The position of the scrapping plate and the frame can be determined by the positioning hole on the positioning connecting rod, which can adjust the whole length of the scrapping plate and adjust the angle between the scrapping plate and the horizontal position.

The rotating shaft is connected with the scrapping plate to move up and down through a positioning connecting rod, and the included angle between the lifting angle and the horizontal plane is from 7 degrees to 40 degrees; and the walking wheel on the scraper harrow is driven to follow along with the reciprocating scrapping mechanism in the water sump roadway, and prevents the scraper harrow from contacting the ground.

In the above scheme, the driving part of the frame adopts the structural design of wire rope traction gear rack, and the front driving wire rope and the rear driving wire rope used for driving both ends limit the traction position and direction of the wire rope by determining the traction direction of the wire rope; One end of the front driving wire rope and the rear driving wire rope are fixed on the driving rack for installation. The installation base of the driving rack is composed of channel steel, adjusting base plate, linear guide rail and linear slide block set. The spring pressure brake, the channel steel connecting lower

bottom plate is composed of inclined gasket bolt set, and the edge of the rack is connected with a stop rod by welding.

In the above scheme, the linear slider assemblies are uniformly distributed and installed under the driving rack, and can move on the linear guide rail with a fixed stroke. The rack is linearly engaged with the driving gear, which is coaxial with the input shaft of the backstop spur gear speed increaser, the output shaft is installed on the side plates on both sides through bearings with diamond seats, and the outermost connector is the driving wire rope pulley, which can realize the lifting of the mud scrapping plate.

The spring pressure brake is installed under the driving rack and consists of a rotating block, a spring brake base, a spring assembly, a braking finger, a spring strut and a stop block, wherein the spring strut, the spring assembly and the brake finger are assembled together and rotate around the stop block, and the stop block limits the stop rod. When it is necessary to scrape mud, the roller of the two-way backstop is not limited, and the mud scrapping mechanism is lowered by its own weight; When mud scrapping is not needed, the rollers of the two-way backstop are reversely limited, the wire rope drives to lift the mud scrapping mechanism, and the spring brake will be used for locking to ensure that the mud scrapping mechanism will not fall off when the reciprocating mud scrapping mechanism moves to the right end due to its own weight.

Preferably, the core of the reciprocating unidirectional mud scrapping part of the present invention is a speed increaser, which is a bidirectional backstop applied to the input shaft. In the above scheme, there are two brakes at both ends of the operating system, which are fixed at two terminal positions of the water tank and divided into a first brake and a second brake. Two guide shafts are installed on the brake positioning block, which are used

together with the cylinder mounting base. The front end nut of the cylinder is clamped between the cylinder driving end platen and the cylinder driving end top plate, and the brakes brake Its braking mechanism is simple, stable and reliable, which can overcome the unstable situation driven by a single wire rope, make the mud scrapping mechanism in the water sump more compact and simple, and realize the functions of braking, lifting and lowering of the mud scrapping mechanism with the driving part of the reciprocating mud scrapping mechanism.

The hydraulic winch and the rope return device are used as power sources to drive the wire ropes of the whole system to move forward or backward, and the wire rope tensioning vehicle is used in cooperation with the winch, so that all the wire ropes on the system can be tensioned on the wire rope tensioning vehicle, so that the system runs smoothly and the driving safety of the whole system is ensured.

The rotating speed of the hydraulic winch is 12r/min, the moving speed of the monorail crane is 2.4m/min, and the daily average cleaning amount of sludge in the water sump can reach 50-100m³.

Compared with the prior art, the patent application has the following advantages and effects:

The invention designs and manufactures a scraper driven by rope traction. The mechanism uses a wire rope to drag a rack to drive a gear to input torque, and the output shaft drives a lifting wire rope pulley to lift the scraper. When the stroke starts, the backstop is released, the brake is locked, and the driving wire rope will lower the scrapping plate. After the brake is released, the reciprocating scraper runs to the left end as a whole, and the scrapping rake is placed at an appropriate angle to clean the sludge at the bottom of the

water sump, reaching the first brake after reaching the leftmost end. The mechanism adopts pure mechanical design, which can output linear motion into rotation at an appropriate position and achieve the automatic lifting function of the scraper.

Secondly, the invention is designed to clean the coal slime at the bottom of the coal mine water sump by combining the auxiliary equipment of the coal mine rope traction monorail crane and the mud scrapping mechanism, which has the advantages of being adaptable to the complex and changeable environment of the water sump roadway, having a wide application range, being able to stop braking in time and ensuring the operation safety of the mud scrapping mechanism.

Finally, that invention provide a set of continuous operation mode of the water sump without stop working. The mechanism adopts a monorail crane and its auxiliary devices which are installed on the rock wall at the top of the water sump, and the monorail crane is connected with a reciprocating mud scrapping mechanism, and the reciprocating mud scrapping machine drives a mud scrapping mechanism to clean mud at the bottom of the water sump back and forth in one direction, and concentrates coal slime at one end of the water sump, and adopts coal slime cleaning equipment to clean the coal slime. The reciprocating cleaning equipment for the underground water sump adopts the passive driving device of the underground water sump, which is driven by a steel wire rope to reduce the safety risk of coal mines.

BRIEF DESCRIPTION OF THE FIGURES

Fig. 1 is a structural diagram of a passive reciprocating mud scrapping mechanism system based on underground water sump rope traction.

Fig. 2 is a schematic diagram of the installation structure of the whole mud scrapping device and moving parts of the present invention.

Fig. 3 is a view of the integral connection three-dimensional mechanism of the mud scrapping device of the present invention.

Fig. 4 is a three-dimensional view of the internal structure of the driving device of the mud scrapping mechanism of the present invention.

Fig. 5 is a plan view of the internal structure of the driving device of the mud scrapping mechanism of the present invention.

Fig. 6 is a three-dimensional view of the frame structure of the mud scrapping mechanism of the present invention.

Fig. 7 is a three-dimensional view of the cylinder brake separation of the present invention.

Fig. 8 is a three-dimensional view of the cylinder brake wedging of the present invention.

Fig. 9 is a three-dimensional view of the spring pressure brake of the present invention.

Labels: 1: hydraulic winch; 2: wire rope tensioning car; 3: reciprocating mud scrapping mechanism; 4: rope return device; 5: anchor assembly; 6: top of roadway; 7: suspension light rail track; 8: first cylinder brake; 9: connecting base of monorail crane; 10: positioning connecting rod; 11: hoisting wire rope; 12: eyebolt; 13: walking wheel; 14: mud scraping rake; 15: second cylinder brake; 16: frame; 17: monorail trolley; 18: trolley wheels; 19: mud scrapping plate; 20: driving rack; 21: driving gear; 22: output shaft; 23: straight gear speed increaser of backstop; 24: adjusting plate; 25: stop lever; 26: rear drive

wire rope; 27: guide wheel set; 28: front drive wire rope; 29: guide wheel base; 30: rotating shaft; 31: bearing with diamond seat; 32: linear guide rail; 33: wire rope pulley; 34: linear slider assembly; 35: Spring pressure brake; 36: Channel steel; 37: First side plate; 38: square steel; 39: second side plate; 40: lower bottom plate; 41: upper bottom plate; 42: brake positioning block; 43: cylinder mounting base; 44: guide shaft; 45: pressure plate of cylinder driving end; 46: brake pad; 47: brake connecting lug; 48: standard cylinder; 49: brake lever of brake; 50: top plate of cylinder driving end; 51: rotating block; 52: spring brake base; 53: spring device assembly; 54: brake finger; 55: spring strut; 56: limiting block.

DESCRIPTION OF THE INVENTION

The invention relate to a one-way mud scrapping device driven by a hanging rail type rope of an underground water sump, which comprises a hydraulic winch, a steel wire rope tensioning car, a reciprocating mud scraping mechanism and a rope return device as shown in figure 1. The reciprocating mud scraping mechanism adopts a monorail trolley to be installed on a suspension light rail track and can slide left and right, and a pair of limiting wheels are respectively arranged at both ends of the interior to limit the movement of the monorail trolley in the transverse direction to determine the running direction of the monorail trolley, and the monorail trolley is hinged with the frame through a connecting seat which is connected with the frame together; The reciprocating mud scraping mechanism is characterized in that a first cylinder brake and a second cylinder brake are distributed at two ends of a roadway, a monorail trolley is hinged with a frame through a monorail crane connecting base, and the frame is connected with a mud scrapping plate

through a rotating shaft; The upper end of the scrapping plate is hinged with the rotating shaft by an adjustable positioning connecting rod, the middle position is provided with an eyebolt near both ends, the lifting wire rope is hinged on the eyebolt, the wire rope wheel lifts the traveling wheel to move up and down through the lifting wire rope, the lowermost end of the scrapping plate is connected with a scraper harrow, and a pair of traveling wheels are arranged on the scraper harrow.

The principle of that embodiment of the invention is as follow: a reciprocating mud scrapping mechanism is installed on a suspension light rail track through a monorail trolley, so that the reciprocating mud scrapping mechanism can move back and forth at both ends of the light rail track; brake are arranged at both ends of a water bin to brake the reciprocating mud scraping mechanism at both ends; a steel wire rope on the reciprocating mud scraping mechanism is lifted by driving a gear rack, a speed increaser and a steel wire pulley; and finally, the steel wire rope drives a mud scraping rake to move up and down.

It should be noted that, in the embodiment of the present invention, "connection" should be understood as a broad sense, which can be hinged or bolted, and two parts can be connected internally, directly or through other intermediaries. For professionals in the field, the appeal terms should be understood by reference according to specific conditions.

The specific embodiments of the present invention will be further explained with reference to the accompanying drawings.

Referring to Fig. 1-Fig. 2, according to the installation structure of reciprocating mud scrapping mechanism, it is specifically described as follows: firstly, the suspension light rail 7 is installed on the roadway of water storehouse; the upper end of anchor rod assembly 3 is inserted into the roadway top 6 for fixing; the lower end of anchor rod assembly 3 is

positioned and connected for fixing; the anchor rod assembly is connected with the suspension light rail 7, and the front and rear end rails are fixedly connected; then, the hydraulic winch 1, rope return device 4 and wire rope tensioning vehicle 2 are placed in the pump room or workshop outside the water storehouse. The hydraulic winch 1, the rope return device 4 and the wire rope tensioner 2 can adopt the winch and the wire rope tensioner in the ground track tractor system at present, or refer to the structure of the endless rope winch and the wire rope tensioner in the patent of China Patent Publication No. CN1093831C and titled "*Continuous Tractor*"; The suspended light rail track 7 can refer to the suspended light rail track in CN103669538A, the composition of its front-rear connection mode and the installation method of the track main body, or refer to the standard of the track suspended track in the book "*Monorail Suspension System Scheme Design*".

As shown in Fig. 3 to Fig. 5, the reciprocating scrapping mechanism 3 is driven by a front driving wire rope 28 and a rear driving wire rope 26. The wire ropes are oriented by a guide wheel set 27 to facilitate stress and guidance. The wire ropes are connected with a driving rack 20, which transmits power and torque through the cooperation of the driving gear 20 and the driving rack 21, increases the rotation speed and reduces the torque through a backstop spur gear speed increaser 23, and finally transmits the transmission speed and torque of the output shaft 22 to a wire rope wheel 33, thereby lifting the scrapping rake 14. The guide wheel base 29 for installing the guide wheel set 27 is installed on the frame 16 through bolt positioning connection. The wire rope drives are respectively located at both ends of the frame 16, and cooperate with the frame 16 and the monorail trolley 17 to move back and forth. The monorail trolley 17 is hung on the suspension light rail track 7, symmetrically arranged at both ends, and directly connected with the monorail crane base

9 through the positioning connection holes on the monorail trolley 17. There are four monorail crane bases in two pairs, and each pair is directly symmetrically installed on the monorail trolley 17. The monorail trolley 17 is provided with a limiting wheel to limit the left and right swing of the monorail trolley 17, and the limiting wheel is positioned at the lower end of the suspended light rail track 7. When driving, the front driving wire rope 31 is paid out by the hydraulic winch 1, the tension of the front driving wire rope 28 is determined by the wire rope tensioning vehicle 2, and then the reciprocating mud scrapping mechanism 3 is driven to run by the guide wheel set 27; The front driving wire rope 31 extends out from the left end of the frame, and then the connecting strip is located at the right end of the running system when the whole mud scrapping mechanism 3 is located at the right end of the frame, and the mud scrapping plate is not lowered because the driving rack 20 is also located at the right end of the frame.

As an implementation, the monorail trolley 17 is installed in such a way that the monorail trolley 17 can press the suspension light rail track 7 under the gravity of the whole suspension device, so that no additional power device is needed, and the trolley wheels 18 can roll on the suspended light rail track 7 by friction.

As shown in Fig. 3, the positions of the scrapping plate 19 and the frame 16 can be determined by the positioning holes on the positioning link 10, which can adjust the overall length of the scrapping plate and adjust the angle between the scrapping plate 4 and the horizontal position. The rotating shaft 30 is connected with the scrapping plate 19 through the positioning connecting rod 10, and the scrapping plate 19 moves up and down around the rotating shaft 30 in a proper range, and the angle formed by the scrapping plate and the horizontal position ranges from 7 to 40 degrees. The traveling wheel 13 on the scrapping

rake 14 can walk along with the reciprocating scraper mechanism 3 in the water sump roadway, and prevent the scrapping rake 14 from directly contacting the ground. The scrapping plate 19 is welded by square steel and angle steel, and has an open upper end. The scrapping plate 19 integrally rotates around the rotating shaft 30 on the frame 16, and the rotating shaft 30 is installed on the side plates at both ends of the frame 16 by bearings 31 with diamond seats.

As an implementation mode, the suspension light rail track 7 is an I-shaped guide rail, and the upper end of the I-shaped track is provided with a connecting lug matched with the anchor rod assembly 5, while the bottom end is provided with an embedded groove and a matching block used for connecting I-shaped materials to form a buckle form, and the anchor rod assembly 5 is connected with the connecting lug at the upper end of the I-shaped track and installed on the top of the water storage roadway 6, so that the suspension light rail track 7 can be connected in front and back.

As shown in Fig. 4 to Fig. 5, the front driving wire rope 28 and the rear driving wire rope 26 used for driving two ends limit the pulling position and direction of the wire ropes by determining the pulling direction of the wire ropes, and one end of the front driving wire rope 28 and the rear driving wire rope 26 are fixed on the driving rack 20 for installation, and the installation base of the driving rack 20 is composed of a channel steel 36, an adjusting base plate 24, a linear guide rail 32 and a linear slider group 26, and the spring pressure brake 35 is connected with the lower bottom plate 40. The edge of the rack is connected with a stop rod 25 by welding; The front drive wire rope 28 and the rear drive wire rope 26 are connected with the drive rack 20 in the middle, and the other end of the front drive wire rope 28 passes through the guide wheel set 27. The same applies to the

rear drive wire rope 26. As the guide and bearing part of the wire rope, the wire rope can pass between its hub and the locating pin shaft, and can be pulled and translated on the rubber outer ring of the guide wheel set 27.

As an implementation, the linear slider assemblies 34 and the linear guide rails 32 are installed on the adjustment pad 24 on the channel steel 36, which is connected to the base mounting plate of the frame 16 by using oblique gaskets. There are four linear slider assemblies 34, which can stably bear the load of gear rack meshing on their guide rails. The linear slider assemblies 34 are uniformly distributed and installed under the driving racks 20, and can move on the linear guide rails 32 with fixed stroke.

As shown in Fig. 6, the frame 16 is welded by square steel 38. The frame 16 is composed of a frame welded by square steel and steel plates. Positioning holes are formed on the square steel 38 at the front and rear ends of the frame to respectively position and connect the guide wheel base 29 and the monorail crane connecting base 9.

As shown in Fig. 7 to Fig. 8, the first cylinder brake 8 and the second cylinder brake 15 are provided with a cylinder mounting base 43 in the middle of the brake positioning block 46, and the mounting nut at the other end of the piston rod on the standard cylinder 48 is pressed between the cylinder driving end top plate 49 and the driving end pressure plate 45. when the standard cylinder 48 is driven forward, the guide shaft 44 plays a role in positioning and guiding the standard cylinder 48 and the cylinder driving top plate 49. The brake connecting lug 47 is welded and installed on the frame 16, and is connected with the brake block 46 on the cylinder brake after the wire rope pulls the frame 16 to the designated position of the water bin; The brake lever 50 of the brake pushes forward under the action of the standard cylinder 48, and then is connected with the brake block 46, and

the whole cylinder brake can brake the reciprocating mud scraping mechanism 3 at this time.

As shown in Fig. 9, the spring pressure brake 35 is installed on the bottom plate of the frame 16, the spring brake base 52 is connected with the bottom plate by bolts, and the rotating block 51 is used in cooperation with the limiting block 56, so that the spring assembly 53, the spring strut 55 installed on the rotating block 51 and the braking finger 54 can rotate around the rotating block 51 at a certain angle. When the gravity of the scraper plate 19 and the pulling force brought by the wire rope are transmitted to the rack and pinion, the stop rod 25 on the driving rack 20 is forced to act on the spring pressure brake 35, and the spring brake 35 can be opened when its pressure is greater than the opening pressure of the brake finger 54 on the spring brake 35. At this time, the stop rod 25 can pass through the spring brake, and the scraper plate 19 can also be lowered to clean the sludge at the bottom of the water tank. When the reciprocating mud scraper mechanism 3 is located at both ends of the water bin, the stopper rod 25 is only affected by the gravity of the mud scraper plate 19, and the pressure caused by it cannot open the spring brake 35, and then the mud scraper plate will not be lowered.

The above is only a preferred embodiment of the present invention, and is not intended to limit the protection direction of the present invention. Any modifications, equivalent substitutions and improvements made within the spirit and principles of the present invention are included in the protection scope of the present invention.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A one-way mud scrapping device for reciprocating lifting driven by track rope of underground water sump, including hydraulic winch (1), wire rope tensioning vehicle (2), reciprocating mud scrapping mechanism (3) and return rope device (4); Its characteristic is as follows:

The reciprocating mud scrapping mechanism (3) adopts a monorail trolley (17) mounted on a suspension light rail track (7) to slide left and right, and a pair of limiting wheels are respectively arranged on the monorail trolley (17) to limit the movement of the monorail trolley (17) in the transverse direction and control the running direction of the monorail trolley (17), the monorail trolley (17) and the frame (16) are hinged with each other through a monorail crane connecting base (9), and the monorail crane connecting base (9) is connected with the frame (16);

The reciprocating mud scrapping mechanism (3) is set between the first cylinder brake (8) and the second cylinder brake (15) which are distributed at both ends of the roadway, the monorail trolley (17) and the frame (16) are hinged together by the monorail crane connecting seat (9), and the frame (16) is connected to the mud scrapping plate (19) by the rotating shaft (30); The upper end of the scraper (19) is hinged by the adjustable positioning connecting rod (10) and the rotating shaft (30); The hanging ring screw (12) is installed at the middle position on both sides; The lifting wire rope (11) is hinged on the hanging ring screw (12); The wire rope wheel (33) moves up and down by lifting the wire rope (11) and lifting the hanging ring screw (12); The lower end of the scrapping plate (19) is connected with a mud scrapping rake (14); And a pair of walking wheels (13) is installed on the mud scrapping rake (14);

The reciprocating mud scrapping mechanism (3) is driven by traction of a front driving wire rope (28) and a rear driving wire rope (26), the wire rope is oriented by a guide wheel set (27) so as to be stressed and guided along the track direction of the I-beam, the wire rope is connected with a driving rack (20), transmits power and torque through the cooperation of the driving gear (21) and the driving rack (20), and increases speed through a straight gear of a backstop. A guide wheel base (29) of the guide wheel set (27) is installed on the frame (16) through bolt positioning connection; A first side plate (37) and a second side plate (39) are installed and fixed by positioning connection between the transmission shaft (22) and the transmission shaft (30), and driving devices such as a winch are arranged outside the water sump;

The frame (16) is composed of square steel (38) which is welded, positioned and connected, and is provided with a lower bottom plate (40) and an upper bottom plate (41) up and down, and a first side plate (37) and a second side plate (39) in front and back, so that the front driving wire rope (28) and the rear driving wire rope (26) extend from both ends, and the upper bottom plate (41) is positioned and connected to the whole frame; The frame (16) is the main structural support, the first side plate (37) and the second side plate (39) are installed on both sides of the frame (16) by welding and positioning connection, and two pairs of bearings (31) with diamond seats drive the output shaft (driving the reciprocating lifting unidirectional mud scrapping plate; The positions of the scrapping plate (19) and the frame (16) are adjusted through the positioning hole of the positioning connecting rod (10); And the whole length of the scrapping plate (19) and the angle between the scrapping plate (19) and the horizontal position are adjusted.

2. According to the one-way mud scrapping device for reciprocating lifting driven by track rope of underground water sump mentioned in claim 1, its characteristics are as follows: The driving part of the frame (16) is the structure of wire rope traction gear rack; The front drive wire rope (28) and the rear drive wire rope (26) at both ends of the drive are to limit the traction position and direction of the wire rope by determining the traction direction of the wire rope; One end of the front drive wire rope (28) and the rear drive wire rope (26) is fixed on the drive rack (20) for installation; The installation base of the drive rack (20) is composed of groove steel (36), adjusting pad (24), linear guide rail (32) and linear slider group (26); The spring pressure brake (35) and the channel steel (36) are connected with the lower bottom plate (40), and a stop rod (25) is fixedly connected with the rack edge.

3. According to the one-way mud scrapping device for reciprocating lifting driven by track rope of underground water sump mentioned of claim 2, the spring pressure brake (35) is installed below the driving rack (20), which is composed of a rotating block (51), a spring brake base (52), a spring device component (53), a brake finger (54), a spring pressure rod (55) and a limit block (56). The spring brake base (52) is installed on the bottom plate (40). The spring pressure rod (55) is assembled with the spring device component (53) and the brake finger (54), and rotates around the limit block (56), and the limit block (56) restricts the stop rod (25).

4. According to the one-way mud scrapping device for reciprocating lifting driven by track rope of underground water sump mentioned of claim 1, which is characterized in that the bottom end of the driving rack (20) is uniformly distributed with linear slider assembly (34), and a fixed stroke is set on the linear guide rail (32). The driving rack (20) and the

driving gear (21) are linearly engaged. The driving gear (21) is coaxial with the input shaft of the rectilinear gear reducer (23), and the output shaft (22) is installed on the two sides of the side plate through the diamond seat bearing (31). The outer end connector drives the wire rope gear (33) to realize the lifting of the scrapping plates (4).

5. According to the one-way mud scrapping device for reciprocating lifting driven by track rope of underground water sump mentioned in claim 1, which is characterized in that the rotating shaft (30) is connected with the scrapping plate (19) through the positioning connecting rod (10) to move up and down, and the included angle between the lifting angle and the horizontal plane is 7-40 degrees. The walking wheel (13) on the scrapping rake (14) is driven by the reciprocating scrapping mechanism (3) in the water silo roadway, and prevents the scrapping plate (14) from contacting the ground.

6. According to the one-way mud scrapping device for reciprocating lifting driven by track rope of underground water sump of claim 1, which is characterized in that two brakes are arranged at two ends of the running system of the reciprocating mud scrapping mechanism (3) and fixed at two terminal positions of the water sump, which are divided into a first brake (8) and a second brake (15), and two guide shafts (44) are mounted on the brake positioning block (42) in cooperation with the cylinder mounting base (43). The nut at the front end of the cylinder (47) is clamped between the cylinder driving end pressure plate (45) and the cylinder driving end top plate (50), the brake lever (49) of the brake is matched with the brake block (50), and the brake connecting lug (47) is installed on the frame (16).

7. According to claim 1, the one-way mud scrapping device for reciprocating lifting driven by track rope of underground water sump is characterized in that the rotating speed

of the hydraulic winch (1) is 12r/min; The moving speed of the monorail trolley (17) is 2.4m/min; The daily average cleaning amount of the mud scrapping plate (19) is 50-100m³.

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FIGURES

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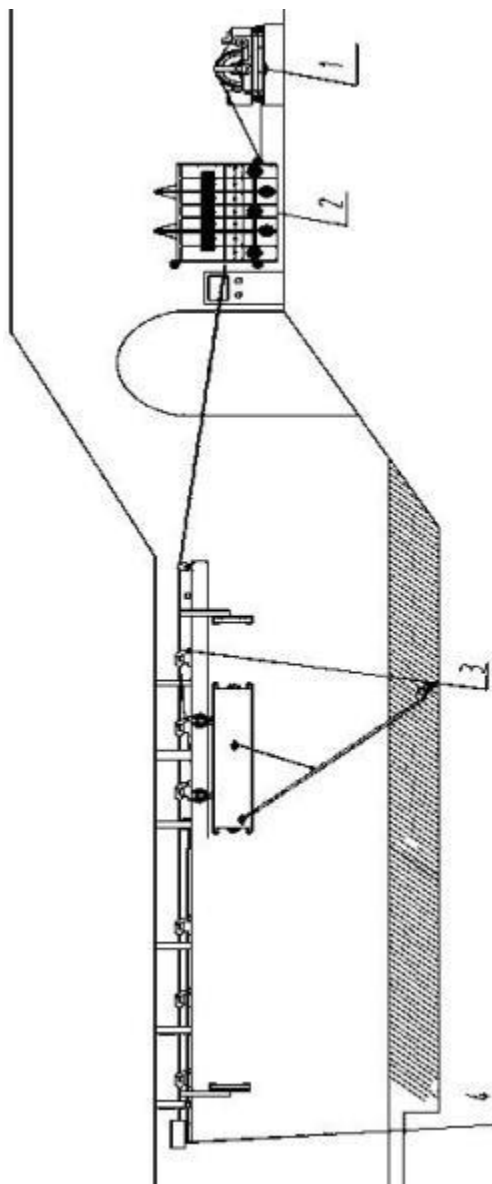


Figure 1

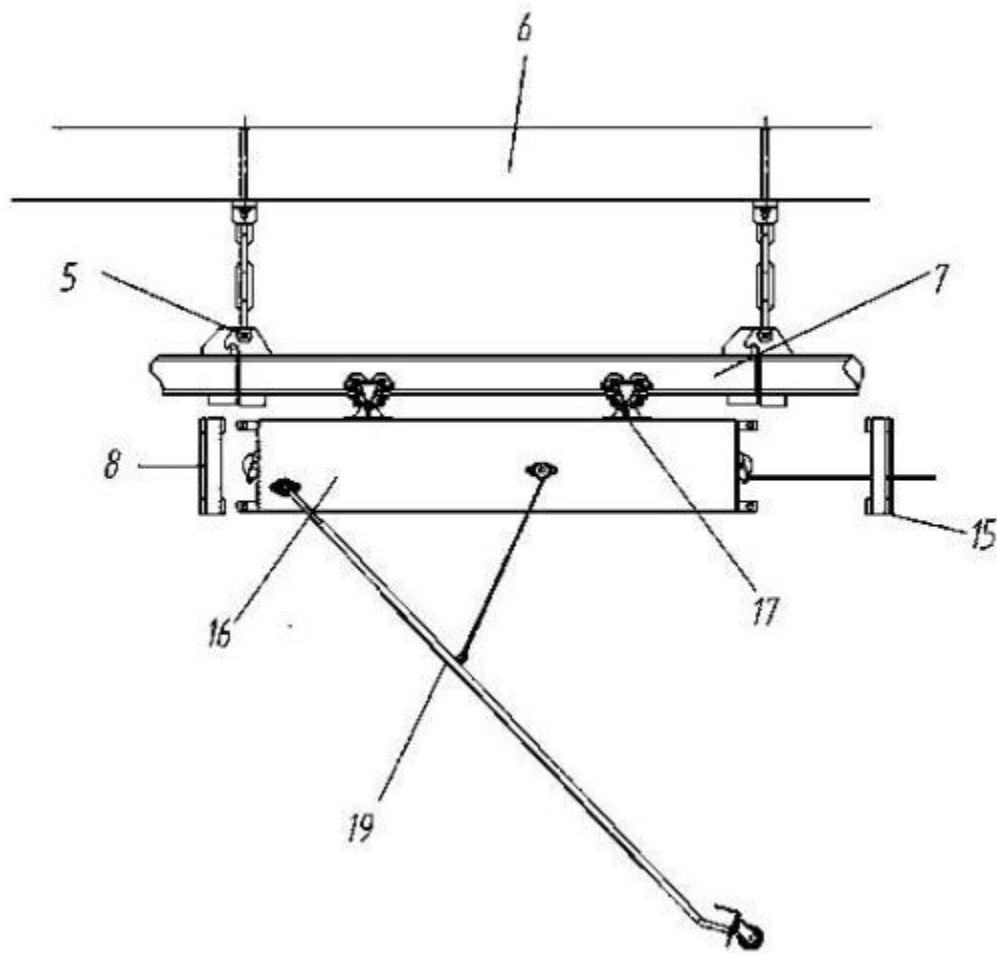


Figure 2

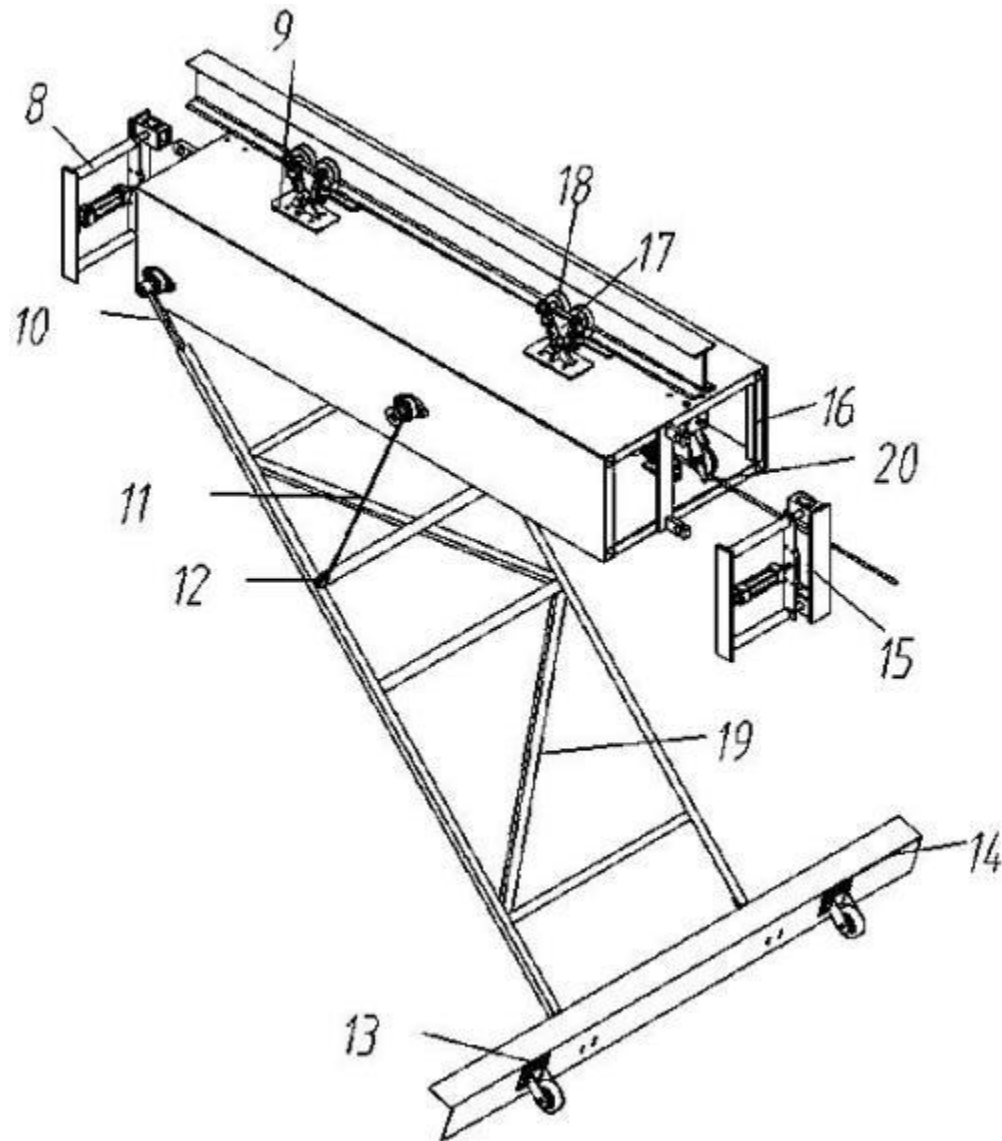


Figure 3

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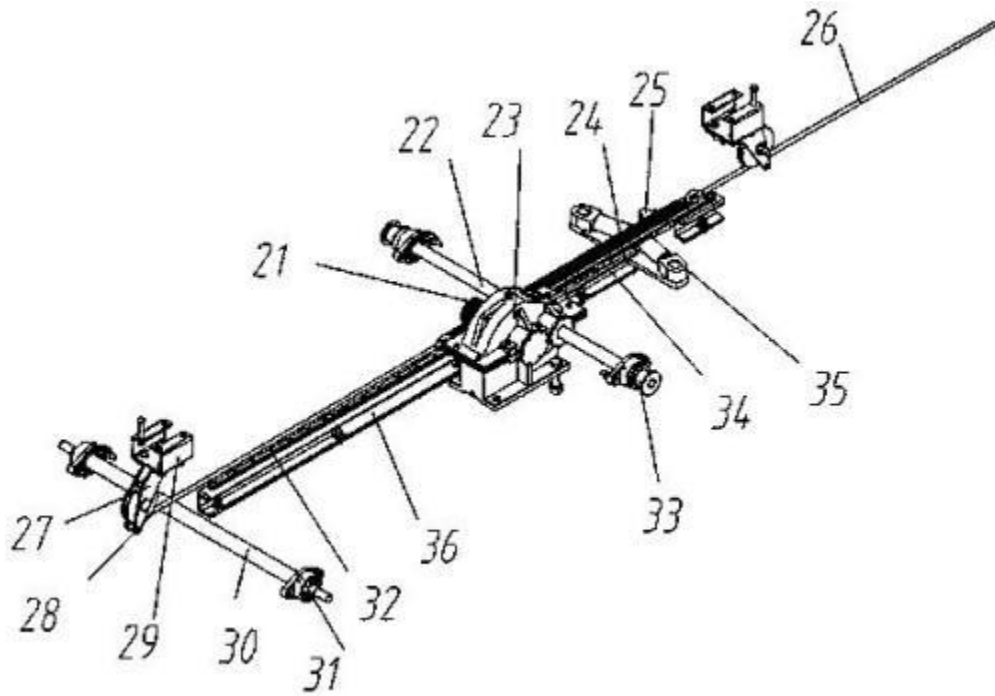


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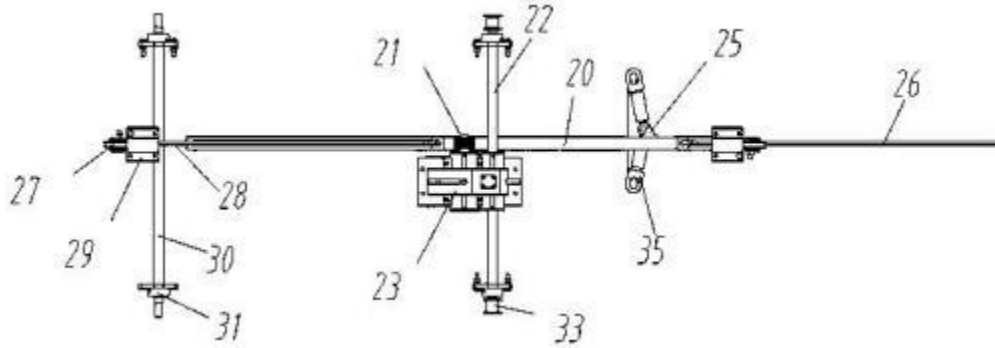


Figure 5

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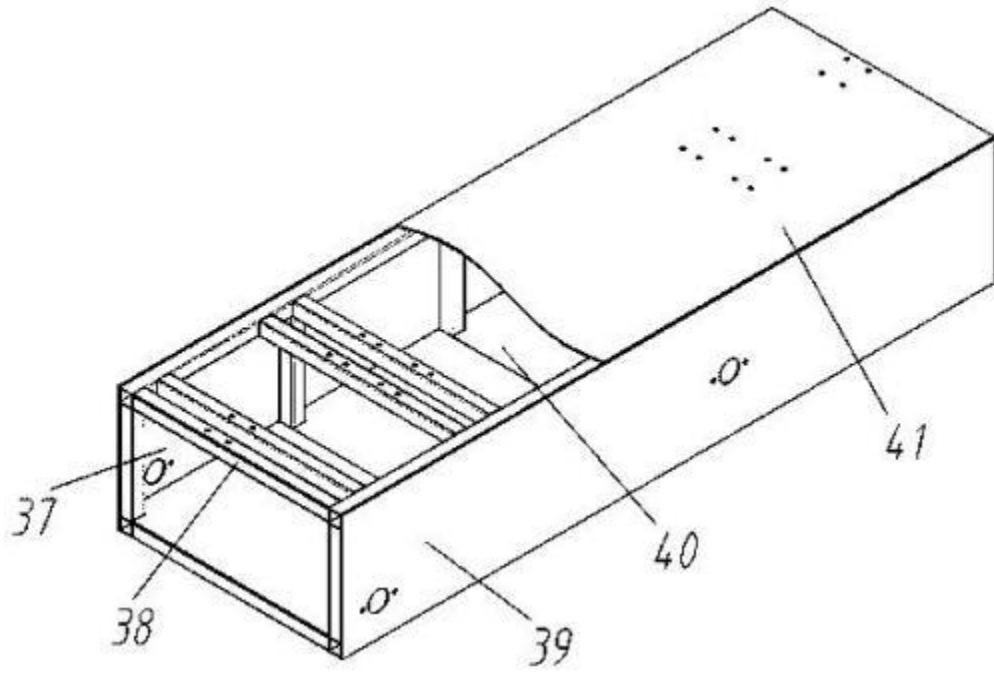


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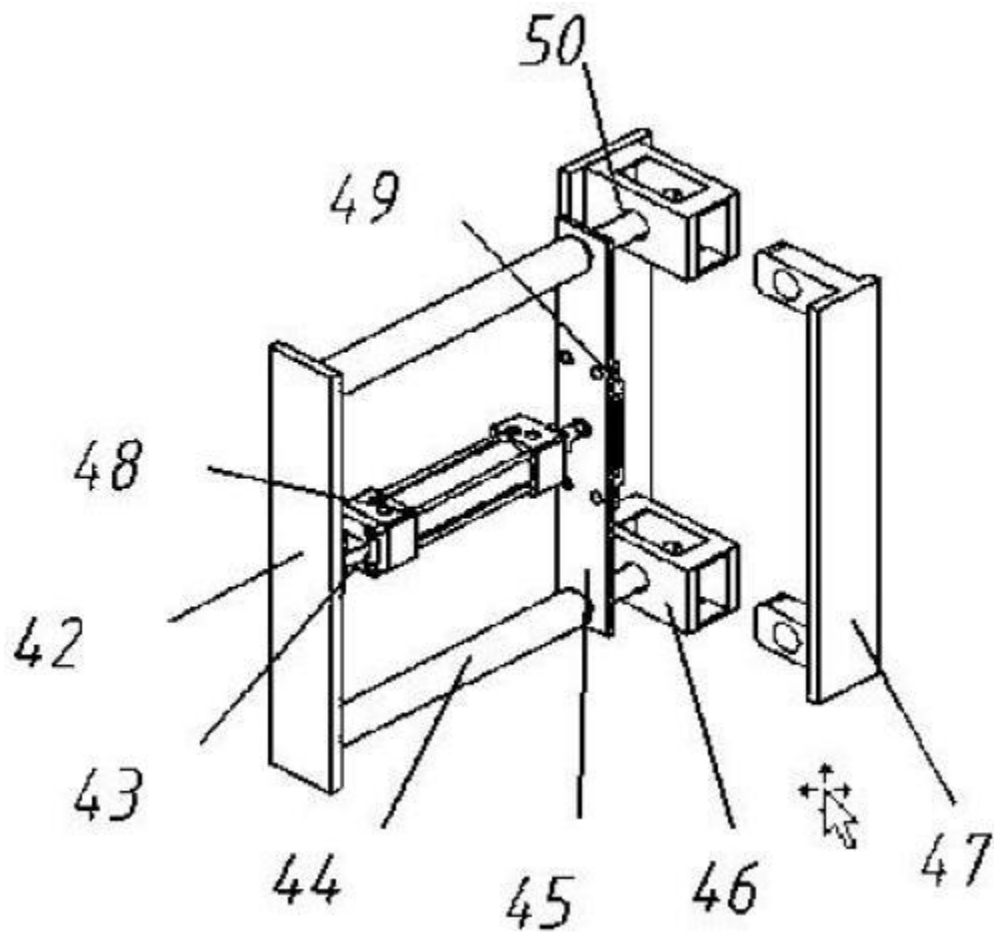


Figure 7

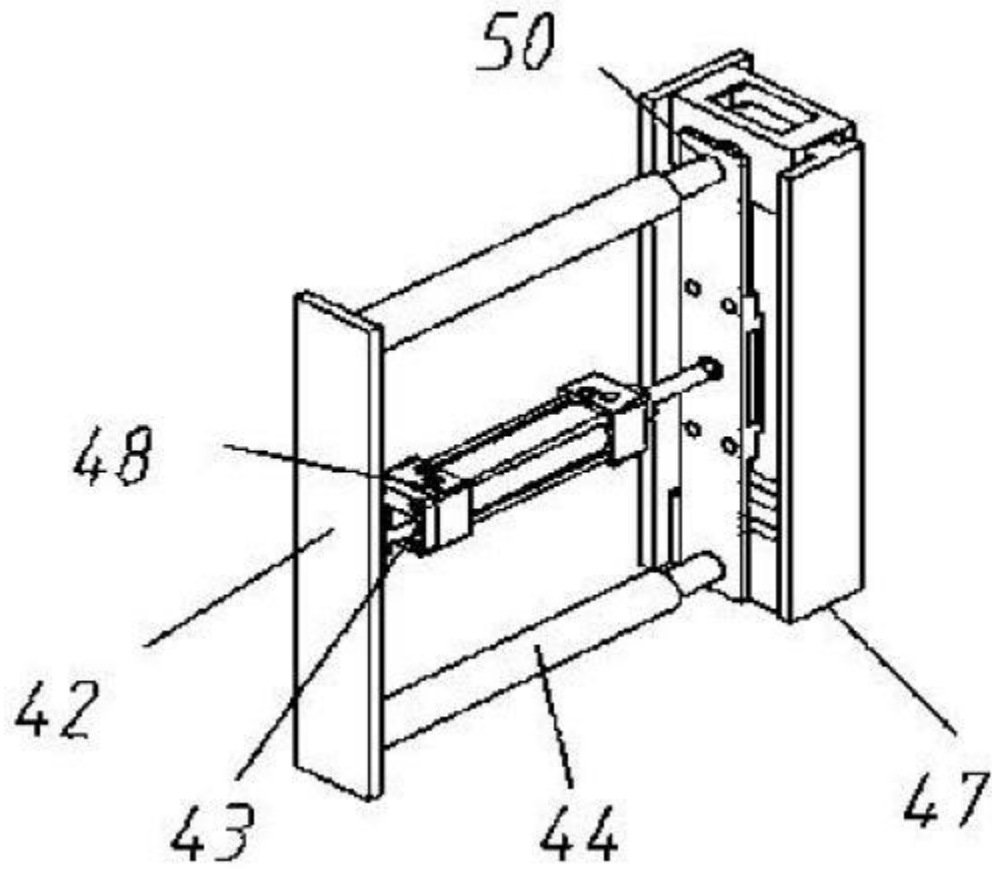


Figure 8

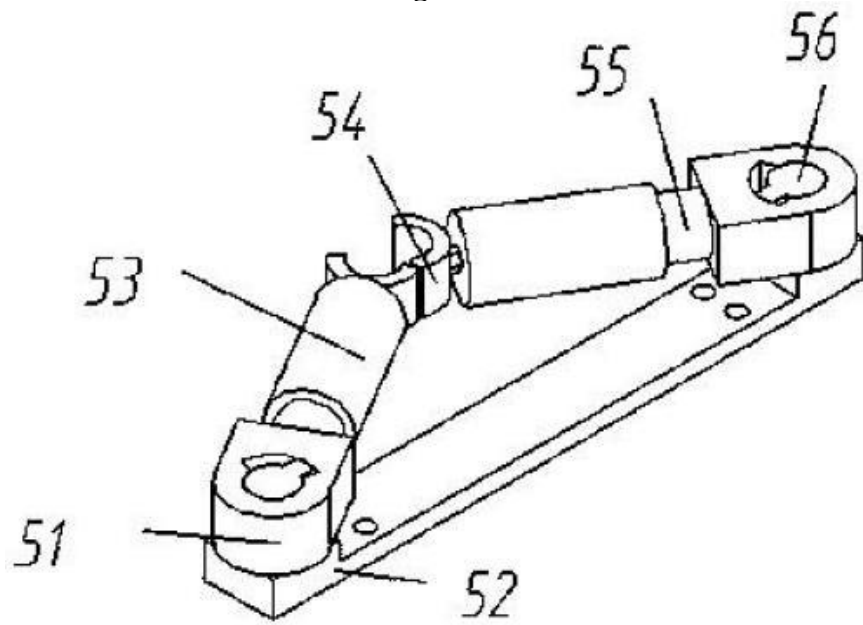


Figure 9