
Research and analysis of split hydraulic tunnel drill

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Abstract

The coal mine tunnel drill is the main equipment of the underground gas drainage hole construction. The 3200s horizontal drilling machine in this paper adopts the full hydraulic split type structure, can drill with low speed, large torque and large caliber hole, and can realize the electrodeless speed regulation of the executing device. However, with the progress of fully mechanized coal mining technology and the need of underground operation, modern drilling rig should have the characteristics of high efficiency, energy saving, environmental protection, easy operation and so on. Based on the original drilling rig, this paper makes research and analysis.

Keywords

Coal mine, Gas drainage, Drill, Modern drilling rig.

1. Introduction

With the development of science and technology and the need of modern mine production, scientific and technological innovation is the new power to promote the development of mining machinery. Facing the new century, mining machinery will develop towards the direction of large-scale, intelligent and multi-functional. Geological disasters such as high gas, gas outburst and underground water are often encountered in the process of underground coal mine operation, which leads to the decrease of construction speed, the delay of construction period, the low economic benefit and even the serious threat to people's life and safety. If the drilling work of the complex geological conditions mentioned above can be done well in advance, the accidents will be reduced and the production efficiency will be improved. In the coal mine exploration, the hydraulic tunnel drill is the core equipment. It is suitable for underground coal seam gas drainage and drainage hole, tunneling hole, coal seam water injection hole, injection fire extinguishing hole and other engineering geological exploration. Therefore, it is still of great practical significance to summarize and study the existing structure and hydraulic system of tunnel drilling rig, and to make local structure improvement and new design to improve its performance [1].

2. Structure Composition and Research of Drilling Rig

With the advancement of science and technology, the application of industrial production automation equipment has become more and more extensive. Among them, the manipulator is the product of ever-increasing production technology, and is an important technology formed by the combination of modern production and application of science and technology [2]. The application of industrial robots has reduced the labor intensity, improved the precision of product processing, and reduced the risk of production by manual operation, especially in the production of some dangerous industries, such as the production of toxic substances in chemical production; nuclear power plants, etc, where there are radioactive materials; in the production environment where there are flammable and violent dangerous production occasions, it is very suitable to use robots for production.

The manipulator's driving methods include pneumatic transmission, hydraulic transmission, electric transmission and mechanical transmission. The widely used air pressure technology uses compressed air as the medium, and has the characteristics of rapid action, stability, reliability, simple structure, light weight, small size, energy saving, and long working life, especially for applications that are easy to control, easy to maintain, and free of environmental pollution, pneumatics are often the first choice for robotic drive systems.

3. Basic Structure Principle of 3-Split Full Hydraulic Tunnel Drill

3.1 Main engine

The main engine is mainly composed of rotary device, feed device, frame, gripper, and the common bolt connection is adopted between the parts, which can be easily installed and disassembled. see Fig. 1.

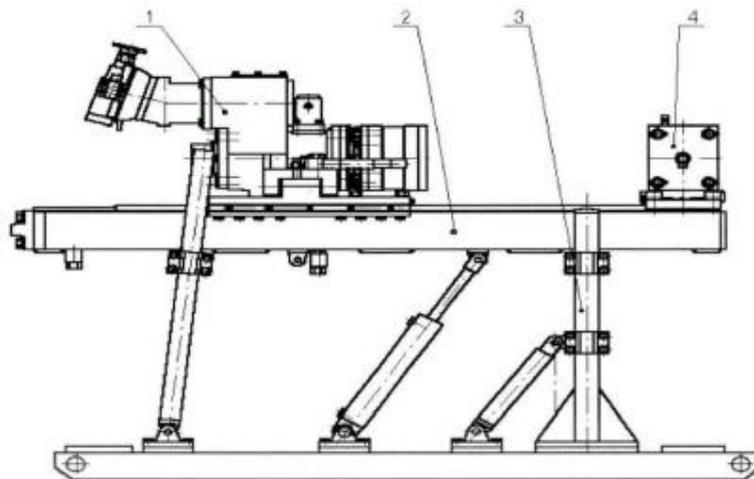


Fig. 1 Main engine

3.2 Gyroscope

The gyroscope consists of variable motor, gear reducer and cylinder chuck. Liquid oil driving variable horse achieve, drive gear reducer, after two stages of deceleration, and then drive the spindle and liquid chuck, the domain will eventually realize the return transfer of drilling machine move. The speed of the gyroscope can be controlled by adjusting the displacement of the variable: 1. The main shaft adopts the through hole structure, and the gyroscope is installed in the feed the fuselage of the drag plate with the aid of the feed Shantou red along the fuselage guide track reciprocating motion, to drill its feed or pull up, turn the device is equipped with several lateral devices. Adopt elastic-yellow clamping hydraulic loose perspiration type regular closed chuck, when liquid 1 rainbow can't get liquid jade oil, borrow assist the elasticity of yellow itself, push the clamp ring, make the kava automatic alignment, thus automatically clamp the drill, ensure the regular drilling, but also used for lifting drilling tools, strong lifting, etc.

3.3 Feed Device

Feed device is mainly produced liquid fast rainbow propulsion. The tail of the rainbow is fixed through the fuselage, and the body piston is connected to the trailing plate. The extension of the oil rainbow piston rod drives the trailers and gyrators to move the fuselage along the guide rail in a reciprocating straight line. Adopt the turning box structure to connect the rotary device with the trailing plate, one side fastens the trailing plate and the rotator with the pin shaft, the other side connects the rotator and the trailing plate with the twisted bolt to unload the coarse diameter drilling tool, loosen the bolt, and then move the rotator to the other side of the pin shaft, Avoid the hole. The feed fuselage is fastened to the column of the frame and the crossbeam of the support rod by locking the slips.

3.4 Body Frame

The rack is used to install the feed unit and the rotary part of the fixed rig. The frame consists of a pillar, a climbing pedestal, a support rod, and support oil rainbow and other components. The feed device on the rack can be turned around and installed to adjust the borehole inclination by supporting the oil red. Satisfied with multi-directional drilling. Support traitors adopt a two-section structure, according to the need to cooperate with the use. Using the climbing pedestal to carry the drill the machine is mounted on the base wood.

3.5 Retainer

The drilling rig is clamped by a disc spring and the hydraulic loosening normally closed gripper is fixed at the front end of the feed device fuselage. The drill pipe in the hole is clamped and used in conjunction with the rotary device to realize the mechanical automatic catalpol drill pipe and reduce the labor intensity. Gripper the he slips are placed on the shingles, and the axial position of the slips is limited by the upper and lower pins. Circumferential direction against the kava seat a pair of flat keys is fixed. By pulling out the two pins, the slips can be removed in the direction of the flat key, and the through hole of the gripper can pass through a coarse diameter drill pipe.

3.6 Operating Table

The joystick is the control device of drilling rig, which is composed of control valve block, pressure gauge and pipe fittings. The combined operation realizes the rotary, feed, pull-out, chuck and gripper of the drilling rig. There are variable horses on the joystick turn, support oil siphon, feed pull up and pull down drill pipe function conversion, gripper function conversion, secondary oil chestnut function turn change six operating handles [3]. Low pressure drilling, pressure overflowing, back pressure, back pressure four adjustment handwheel and indicating main oil five pressure gauges, such as millet pressure, pull up pressure, feed pressure, oil return pressure and auxiliary oil chestnut system pressure. Neatly and with signs indicating the connecting direction and the tubing connection. Install the control valve in the frame of the console. Adopt type buckle the combination of the high pressure hose and the self sealing quick connector is suitable for installing the oil pipe, which has good sealing performance and is easy to disassemble.

3.7 Pump Station

Pump station is the hydraulic power source of drilling rig. It is composed of main and auxiliary oil pump, cooler, explosion-proof motor, oil filter, oil tank, base and other components [4]. The motor drives the main and auxiliary oil millet work through the coupling, inhales the low pressure oil from the oil tank and discharges the high pressure sleeve liquid through the oil pump. Then the pipeline controls the flow direction of the oil through the operating table, thus driving the normal operation of the various actuators of the rig. see Fig. 2.

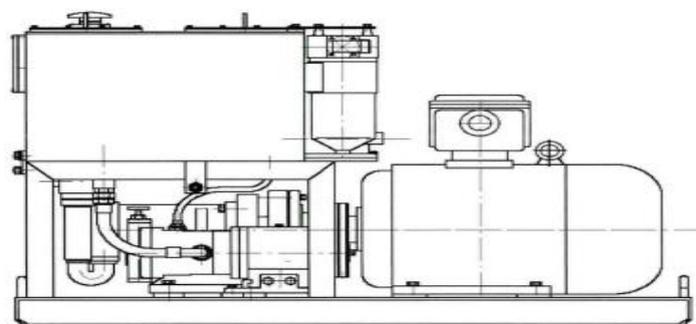


Fig. 2 Pump station

4. Hydraulic System Circuit Design

According to different functions, the hydraulic system of drilling rig is mainly divided into rotary system, drilling system, auxiliary stable angle adjustment system, crawler walking system and mud pump control system 5 parts. The system adopts double pump open circuit design, in which the main

and auxiliary pumps adopt the load sensitive control formula and constant pressure variable control mode to realize the system energy saving goal respectively. The main pump is used to provide pressure oil for the quick action of the rotary system and the drilling system and the crawler walking system. The auxiliary pump is used to provide pressure oil for the slow motion and various auxiliary functions of the drilling system. The rotary system mainly provides the rotary power for the revolving device, and the different work can be realized with the drilling system. Condition of construction. Drilling system mainly provides feeding force and lifting force required for drilling operation. Through drilling system. The pressure regulation and speed regulation of the feed action are realized, and the pressure and decompression drilling is realized according to the site construction requirements. The design of mud pump control system is completely independent of other functional systems, and the pump car realizes the concrete control and operation, so it is completely free from the influence of various functional systems of drilling rig, and the field operation is more stable and reliable [5].see Fig.3.

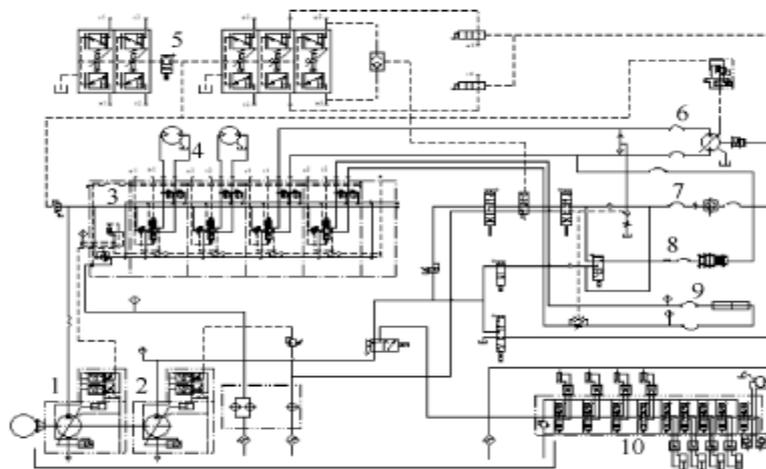


Fig. 3 Drilling rig hydraulic system

5. Conclusion

Tunnel drilling rig is an important mining machinery equipment suitable for underground gas drainage. This paper deals with the performance of drilling rig. In order to improve the utilization efficiency of hydraulic circuit, the load-sensitive hydraulic technology is used in drilling rig. The output characteristic of hydraulic system adapts to the load characteristic of drilling rig, which can improve the working efficiency and reduce the energy loss.

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