Piston Fire Rescue Robot Arm Design Specification

Introduction to the Work

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Abstract. At present, there is no research and development of personalized escape and rescue mechanical products based on arm loads. Firstly, according to the complex and diverse actual situation, the functions of the arm-mounted multi-functional robot arm and the mechanism and device required to realize the squat function are determined; then, the two-dimensional design and three-dimensional modeling of the overall structure and main components are carried out. Finally, considering the various factors, the arm-mounted multi-functional mechanical arm that combines the advantages of the rope-type bionic mechanical gripper is designed. The arm-mounted multifunctional mechanical arm can be used for self-help, help or rescue in sudden disasters such as earthquakes and fires. The article proposes a new type of piston fire rescue robot arm. When the house collapses in rescue, it can not only serve as a rescue bracket, but also prevent danger and obstacles caused by wall collapse. It can also be used as a broken window tool. Smoke; can also help rescuers to enhance their mobility and support, save time for rescue, is a very practical rescue mechanical design.

1. The Piston Fire Rescue Robotic Arm is a purely mechanical fire rescue field rescue application

The arm is further extended by the handle, and the arm is further controlled to achieve the purpose of grasping. At the same time, two springs are placed at the handle. When the handle is not subjected to
force, the handle will automatically return to the original position, and the handle is retracted. Back, the hand will automatically reset;

While the device has a telescopic device, it took time to carry, on-site rescue, clean up some of the obstacles blocking the way of high temperature or high altitude to clear obstacles and dangers to the rescue to provide a more reliable support, but can be caught combustion of distance Take and extinguish, improve the rescue efficiency;

The whole organization adopts high temperature resistant materials, and does not use electronic component control. It avoids the influence of high temperature on the mechanism and can exert its maximum effect. The mechanism design takes into account the damage. The solid and hard raw materials can be transmitted from the ruins through the mechanical arm. Material or clear obstacles from extremely small spaces to convey information;

When the rescue collapses, it can be used as a rescue bracket to prevent the danger and obstacles caused by the collapse of the wall. It can also be used as a window breaking tool to ventilate and smoke.

Many on-site rescuers have been weakened by long-term lack of oxygen, which has brought great difficulties to the rescue of lifeguards. The rescue robot can help the rescuers to enhance their mobility and support, save time for rescue, and the device is not easily damaged. Low loss, wide application range and low cost;

2. Development background and significance

Background:
The robotic arm is a device with the function of grasping and moving the workpiece. It is a new type of device developed in mechanization. The manipulator can replace dangerous work for human beings, reduce dangerous damage and improve labor efficiency. The wider application, the role of fire rescue has also played a crucial role. In the current stage of fire rescue, there are often channels blocked at the fire site. Some burning high-temperature obstacles hinder the rescue of firefighters. The passage is blocked and the smoke is difficult. When the automatic smoke-exhausting facilities are damaged, it is difficult to smoke. There will also be accidents such as wall collapse or high-altitude dangerous objects falling, such as sudden suddenness, complicated disposal process, huge damage, and difficult prevention and control.

Significance:
The Piston Fire Rescue Robotic Arm is a purely mechanical fire rescue field application with the ability to grab and move workpieces.

The manipulator can replace the human beings to complete the dangerous work. At the current stage of fire rescue, it solves the channel blockage that often occurs at the fire site, cleans up some high-temperature obstacles that block the road or clears the danger of falling dangerous objects at high altitude, and provides relief for the rescue. More reliable support;

It is also possible to carry out the grabbing and extinction of the burning materials from a long distance, improve the rescue efficiency, transfer materials from the ruins or clear obstacles from extremely narrow spaces, and transmit information;

Resolving the reduced ability of the rescuers on the scene due to long-term lack of oxygen, the rescue robot can help the rescuers enhance their mobility and support, saving time for rescue. When the automatic smoke exhaust facilities are damaged, it is possible to solve the accidents such as difficulty in exhausting smoke and wall collapse, and respond to some sudden and severe ills.

3. Design plan

3.1. Piston structure

The piston mechanism includes: a telescopic sleeve, a telescopic rod located inside the telescopic sleeve, and a grip portion connected to one end of the telescopic rod, one end of the telescopic rod is connected to the grip portion through the lower wall, and the grip portion and the lower wall are
further disposed Compression spring; internal tensioning device for the rod, easy to work in the rescue, clearing air obstacles

3.2. Handle structure
The handle comprises: a side wall on both sides and an upper wall and a lower wall respectively connected to the side wall, the main body of the side wall is provided with a slideway, and two hard springs are respectively disposed on two sides of the gripping portion to realize automatic resetting. It is easy to operate during the rescue process and is also convenient for the robot arm to work;

Figure 1. Handheld mechanism

4. Mechanical claw structurea
Mechanical claw fixedly connected to the telescopic rod by a claw support, wherein each of the claws is also connected to the telescopic sleeve via a claw link;

By adding a rotating system to the robot, 360° omnidirectional movement can be achieved, which makes the robot movement more flexible;

By attaching a material with a large frictional force to the inner wall of the mechanical claw, the mechanical claw can be firmly grasped to prevent the middle claw from falling off;

The precise design of the position of the manipulator reduces the travel of the arm and shortens the size of the arm;

Figure 2. Grasp up the mechanism
5. Working principle and performance analysis
The Piston Fire Rescue Robotic Arm is a purely mechanical fire rescue field rescue application. The arm is further extended by the handle, and the arm is further controlled to achieve the purpose of grasping. At the same time, two springs are placed at the handle. When the handle is not subjected to force, the handle will automatically return to the original position, and the handle is retracted. Back, the hand will automatically reset;

At the same time, the device is equipped with a telescopic device, which is used for carrying and carrying out on-site rescue. It cleans up some high-temperature obstacles that block the road or clears high-altitude obstacles and dangers, provides more reliable support for rescue, and can also capture the burning objects from a long distance. Take and extinguish, improve the rescue efficiency;

The whole organization adopts high temperature resistant materials, and does not use electronic component control. It avoids the influence of high temperature on the mechanism and can exert its maximum effect. The mechanism design takes into account the damage. The solid and hard raw materials can be transmitted from the ruins through the mechanical arm. Material or clear obstacles from extremely small spaces to convey information;

When the rescue collapses, it can be used as a rescue bracket to prevent the danger and obstacles caused by the collapse of the wall. It can also be used as a window breaking tool to ventilate and smoke.

Many on-site rescuers have been weakened by long-term lack of oxygen, which has brought great difficulties to the rescue of lifeguards. The rescue robot can help the rescuers to enhance their mobility and support, save time for rescue, and the device is not easily damaged. Low loss, wide application range and low cost;

6. Innovations and applications
1) Pure mechanical firefighting Field rescue application mechanism avoids the impact of high temperature on the mechanism;
2) 4 claws are hinged on the claw support, and the inner wall is provided with a material with a large frictional force;
3) The grip portion is placed between the upper wall and the lower wall, and the two sides of the grip portion are placed in the slide rail and can move up and down along the slide rail;
4) 2 compression springs, respectively placed on both sides of the telescopic rod, automatically returning the automatic reset of the handle;
5) It is equipped with a telescopic device to achieve high-altitude work;
6) The whole organization adopts high temperature resistant and hard materials, and does not use electronic component control, which avoids the influence of high temperature on the mechanism;
7) The robot can increase the setting of the rotating system to achieve 360° omnidirectional movement;
8) reduce the movement stroke of the arm and shorten the size of the arm;
9) It has strong practical application and can be used as a support, ventilation tool, etc. in the actual scene.

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