Universal Robot Designed for Movement on Any Cableways

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Cableways are widely used in the world because of their low cost, safety and environmental friendliness. However, they periodically break down and stop, which leads to the need to evacuate people from cabins that have not reached the landing point. Rescue climbers are engaged in this hard work, and they do not have an automated means of transportation to the evacuation zone, which could go around the cabin suspensions, and would be able to move along a cable going uphill. Mounting trolleys and robots designed to conduct inspections of high-voltage transmission lines, which could be adapted for rescue operations on cable cars, are designed to work only on straight sections of the lines and cannot overcome obstacles, branches and move along lines with very sharp rises and downhill. The robots that are used to transport goods on temporary cable cars with a fixed rope have similar limitations. Such roads are built where the construction of technological roads or the use of aviation is unreasonably expensive, takes a lot of time, is dangerous for personnel and causes irreparable damage to the environment. This is especially true when carrying out construction work in reserves. To solve the problem of moving along cable cars and wires of high-voltage transmission lines, we developed a prototype of a robot that can move along cable routes of any configuration with branches, obstacles, turns, steep descents and ascents. The prototype is two extendable arms, at the ends of which there are rope clamps, working on the principle of climbing equipment such as jumar. The clamp developed by us, unlike the climbing one, is able to fix the hand on the rope, both during the ascent and during the descent. When the robot moves along the cableway, his hands, alternately, then converge, then diverge, which resembles the work of scissors. When moving along a rope going upwards, during the divergence of hands, the jumar of the rear clamp is fixed on the rope, and the jumar of the front clamp allows it to slide forward. During the rapprochement of the hands, the front clip is braked, and the back clip at this time slides along the rope. The robot moves forward along the rope. When hitting an obstacle or branching, the robot stops, the back hand detaches from the rope and, by turning the whole structure, is transferred to the rope located behind the obstacle. At the operator’s command from the wireless control panel, the transferred arm is fixed to the rope behind an obstacle. Similarly, the transfer of the other hand begins. When both hands are fixed on a rope behind an obstacle, the robot will continue its progressive movement along the rope. The unique capabilities of our robot make it a universal mechanism for moving building materials along temporary ropeways, for video inspection of high-voltage transmission lines and for rescue operations on permanent ropeways.