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# **INNOVATIONS TECHNOLOGIES IN SCIENCE AND PRACTICE**

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## **ANALYSIS OF CRAWLER ROBOTS**

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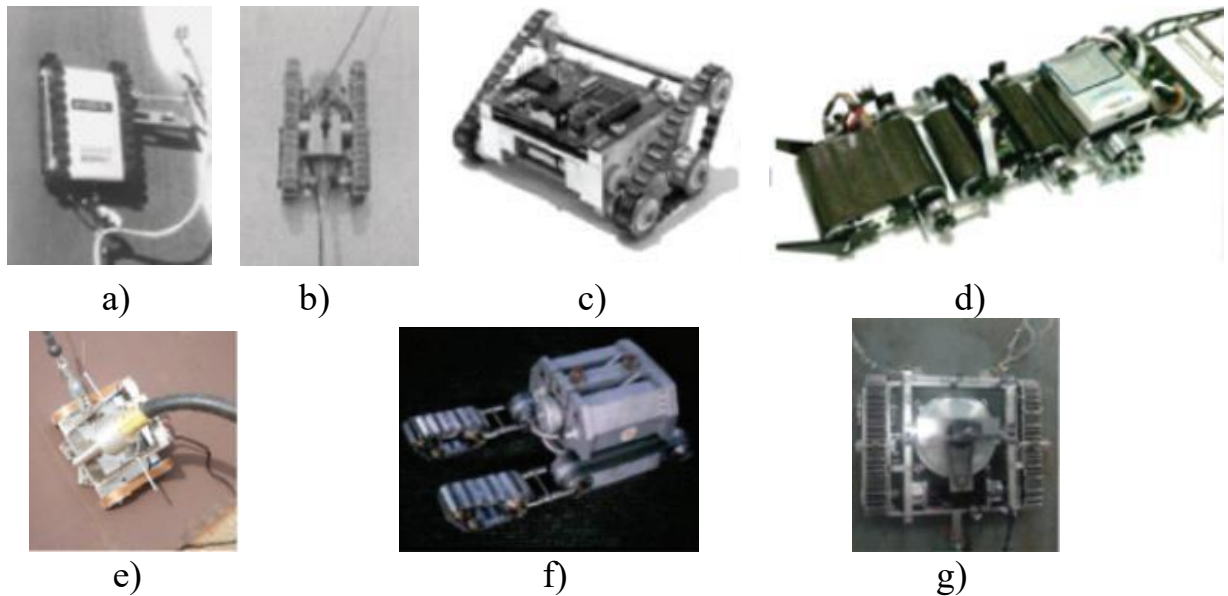
During the study of robots and their various applications, robots began to adopt the abilities of animals. In this paper, an analysis of tracked robots will be carried out.

Very often the robots intended for difficult pass conditions are equipped with a caterpillar platform. Crawler robots have a fairly simple structure to create and manage. Their passability directly depends not only on the design of the robot, but also on the terrain on the tracks, as well as the area of their contact with the obstacle. Thus, some models based on tracked engines may have increased passability (if necessary, to protect against deep immersion in the movement area), while others will not be able to overcome large, in terms of their size, obstacles.

Crawler robots, using permanent magnets as a clamp, have a very good contact of the area with the robot contact area. In fig. 1 shows systems that use crawler belts and magnets to move.

A robot developed by a team from Dalhousie University (Halifax, Canada) and Three Gorges University (Yichang, PR China) (Fig. 1, a), and a robot from Shanghai Jiaotong University, Shanghai, PR China) (Fig. 1, b) are designed to inspect large steel tanks, and the Tripillar robot (Fig. 1, c), created at the Federal Polytechnic School of Lausanne (École polytechnique fédérale de Lausanne, Lausanne, Switzerland), is small in size and has magnets at once and on a caterpillar tape, and on the case created for inspection of an internal surface of coal coppers.

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- a), b) models of robots designed to inspect large steel tanks;  
c) the layout of the robot is designed to inspect the surface of coal-fired boilers;  
d) the layout of the robot is intended for the delivery of goods in the shipbuilding;  
e) the layout of the robot is designed to clean the hulls of ships;  
f) the layout of the robot is designed to inspect the internal surfaces; tanks with oil products;  
g) the layout of the robot is designed to move on the hull of the ship

Figure 1 – Crawler work [1-3]

A robot developed by a team from Dalhousie University (Halifax, Canada) and Three Gorges University (Yichang, PR China) (Fig. 1, a), and a robot from Shanghai Jiaotong University, Shanghai, PR China) (Fig. 1, b) are designed to inspect large steel tanks, and the Tripillar robot (Fig. 1, c), created at the Federal Polytechnic School of Lausanne (École polytechnique fédérale de Lausanne, Lausanne, Switzerland), is small in size and has magnets at once and on a caterpillar tape, and on the case created for inspection of an internal surface of coal coppers. [4]

The Combot robot, designed to deliver cargo in the shipbuilding industry, was designed by a team from the University of Seoul (Seoul National University, Seoul, ROK), Yeungnam University (Yeungnam University, Gyeongsan, ROK) and Samsung Electronics, Suwon, ROK (Fig. 1, d). It consists of three main modules connected by hinges and a controlled tail; it has a hinged frame and a balancing suspension that allows you to overcome the unevenness of the movement surface, but does not provide the ability to rotate. The Lazaro robot (Fig. 1, e), developed at the Polytechnic University of Cartagena (Universidad politécnica de Cartagena, Cartagena, Spain), is designed for cleaning hulls. It differs from others in that the magnets on its structure are not built into the track, and are located in the lower part of the body.

Neptune robot, designed at Carnegie Mellon University (Pittsburgh, USA) to examine the inner surfaces of petroleum tanks (Fig. 1, e). It uses mechanically shut-off magnets located in the frame of the caterpillar, which reduces the resistance to rotation on horizontal surfaces, as well as reduce the accumulation of ferromagnetic oxides.

The robot was created by a team of experts from the Shenzhen Institute of Advanced Technology (CAS, Shenzhen, PR China), Harbin University of Science and Technology (Harbin University of Science and Technology, Harbin, PR China), China University of Hong Kong (The Chinese University of Hong Kong, Hong Kong) and China Merchants Heavy Industry (Shenzhen) Co. Ltd., designed to move around the hull (Fig. 1, g).

Contact devices of this robot consist of a caterpillar tape and the magnetic blocks fixed on it (fig. 2).

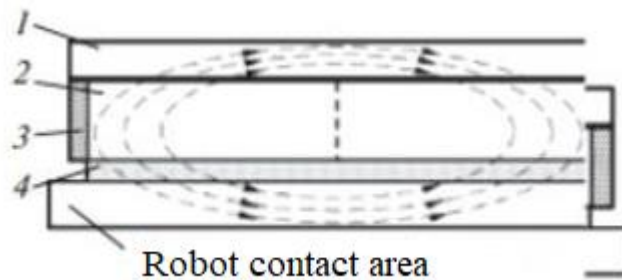


Figure 2 – Robot contact devices [5-8]

The magnetic unit is an aluminum frame (3) with a substrate (1), which is equipped with two permanent magnets (2) and a protective nylon coating (4).

Crawler robots can solve the problem of small area of contact with the moving surface, and are able to overcome considerable obstacles, compared to wheeled. However, as a disadvantage, in structures of this type it is possible to alternately disconnect the magnetic blocks from the moving surface, which will lead to the overturning of the robot. This problem requires an individual solution depending on the purpose of the robot. Most crawler robots also do not have the ability to self-clean contact devices, as this will complicate their design. [9]

Based on the study, it can be concluded that little has been studied about the effect of magnetic hysteresis on the operation of contact devices with permanent magnets, which control the force of magnetic coupling with an electromagnet.

The issues of robot equilibrium on the surface oriented to the horizon at different angles are also insufficiently studied. Studying these issues will help determine the critical modes of operation of vertical movement robots and avoid accidents. [10,11]

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