

PROSTHESES

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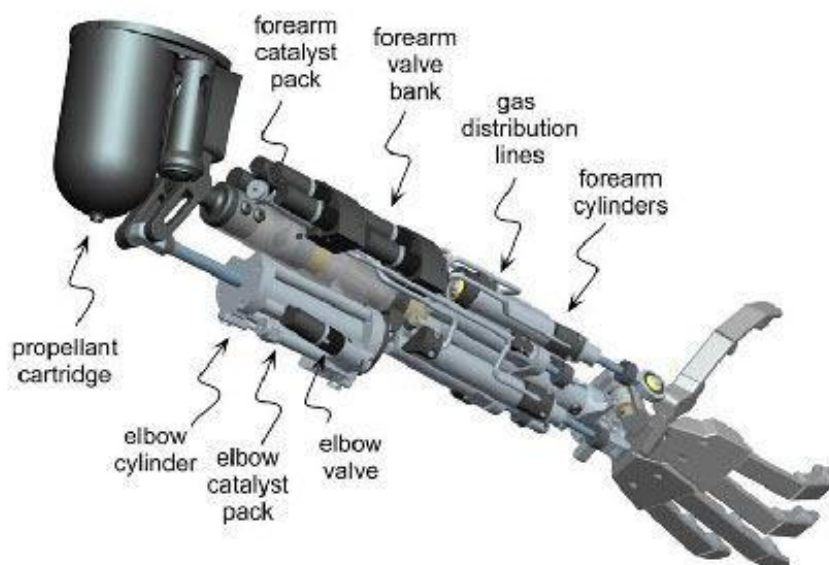
The problem of people who lost or cannot use their parts of body anymore has always existed. The main problem is how to make people's life more comfortable.

Prostheses are mechanical devices that work with human muscle, skeleton, and nervous systems to assist or restore motor control. The first prostheses were elementary. For example, in Egypt a wooden arm fastened to the body of a cunning system of leather straps was found. When a possessor bent the left leg at the knee or moved a healthy hand, a wooden limb bent at the elbow, or rotated.

Prosthesis mechanism was improved over time.

Almost until the end of the XX century, prostheses were attached to the human body only mechanically and could bend the "joints" with hand commands. A forearm or shoulder brace of the leather sleeves with reinforcement which was attached to the appropriate professional tools – pliers, rings, hooks etc was proposed for a worker who lost his hand at that time. Of course, it wasn't enough.

Now science has more complicated mechanic prostheses. New artificial limbs work on little engines. Picture 1 shows one of them.



Pic. 1 – Modern mechanic prosthesis worked on engine

Its working principle is more complicated than the previous model. The propellant cartridge contains the pressurized monopropellant. The liquid is routed through two flexible lines across the elbow joint and into two catalyst packs: one for the elbow and one for the forearm. The catalyst increases the effective volume of the propellant by 1000 times. The propellant doesn't flow continuously but is controlled and routed by the servo valves just downstream. By rotating to different positions, a servo valve routes the gas to one side or the other of a gas cylinder, pushing the piston up or down. The entire operation is computer controlled, based on force and motion feedback from the joints.

More recently, a new direction called biomechatronics appeared. This is connection nervous system with robotics. It produces new type of prosthesis called bionic. Its work is based on the fact that the brain continues to send signals to the nerves of not existing arms. Sensors located on the prosthesis receive these signals and convert them into mechanical motion.

The biggest problem is high cost of it (\$40 thousand – \$6 millions). The cheapest bionic prosthesis is I-Limb made by Touch Bionic Company. It is the first implant introduced into mass production.

The latest implants can feel texture and in some experiments even the temperature of the surface.

All in all, data analysis has shown that Bionic prostheses are being developed now. Prostheses are getting new functions and their possibilities are being expanded all the time.

List of references:

- 1 <http://www.vanderbilt.edu>
- 2 <http://www.touchbionics.com>
- 3 <http://www.medportal.ru>
- 4 <http://www.vanderbilt.edu/exploration/stories/bionicarm>