News and Notes

An Artificial Hand with A Sense of Touch

An artificial hand with its own sense of touch developed at the University of Queensland is ready for production.

This follows six years of research including a continued study with Canadian scientists and six months testing on two amputees.

The inventor is Dr. Gerald F. Shannon, a senior lecturer in electrical engineering at the University of Queensland, Brisbane.

Dr. Shannon said the hand, which had been improved since the prototype was made in 1976, could be sold for about £A2000.

The hand, covered with lifelike plastic skin, harnesses the body's natural electrical signals to provide control, a strong grip and-most remarkably-a sense of feel.

The device is compact, weights about the same as an average adult forearm, has no straps or harness, and can be slipped on or off the stump in a few seconds.

Dr. Shannon said that limbs operated by muscle electricity with sensory feed back should become the standard fitting for all amputees.

About 20 years ago scientists realised that the brain's continuing ability to give commands to a non-existant hand, together with the natural electrical potential of the human body, could be combined through electronics to produce a myo-electric (muscle-electric) system of power for artificial limbs.

Myo-electric hands and arms have been produced (mainly in the Federal Republic of Germany after development in the Soviet Union and the United States) and are in limited use throughout the world.

Wearers of the myo-electric limbs complained that the soft rubber hands destroyed the sense of touch that was possible with the older hook system. They said they could tell when the hook had reached an object by the click of metal as it came into contact with, for example, a pencil or doorknob.

With the myo-electric hand, there was no sound of contact and the hand often had a small object from view making it difficult to pick up.

About 10 years ago scientists at the University of New Brunswick in Canada began searching for a sensory feed-back system as a substitute for the absence of natural fingertip feeling so that the brain could be informed when artificial fingers touched and closed on an object.

"It was relatively simple to understand that the brain could give commands to amputated limbs, but for it to receive and relay information instantly from an inanimate object was a different story altogether," Dr. Shannon said.

"In other words, the aim was to provide the artificial hand with a sense of touch."

In 1974 Dr. Shannon went to the University of New Brunswick on 12 months study leave and worked on the problem in conjunction with Canadian scientists.

They fitted minute strain gauges to the artificial fingers so that information about the gripping force of the hand could be conveyed by battery-powered electronic circuits back to sensors on the stump of the amputated arm.

These messages-tiny electrical charges acting on the human skin-varied in frequency with the strength of the grip. Consequently, the brain could tell what the artificial hand was doing.

In August 1974, at the University of New Brunswick, a myo-electric hand with a sensory feedback system was fitted to a Canadian amputee.

"It worked, but there was a lot of streamlining to do, "Dr. Shannon said.

The new myo-electric hand operates only the thumb and first two fingers.

The hand consists of a fibreglass moulded tailor-made hollow forearm which contains the sensors at the stump end and the electronic circuitry and battery, and then the hand.

The hand is made of soft plastic and covered with a glove which can be made to match the wearer's skin texture and colour.

The wearer is able to sense contact by minute electric impulses which cause a sensation on the skin around the stump similar to light painless pin-pricks. When the grip on the object is tight, 10 impulses a second prickle the skin. This frequency gradually becomes less as the grip relaxes, down to the rate of one a second with the lightest touch.