The bearer shall constantly carry his identity card on his person, even when not on duty at the hospital.

2. *Armlet*

Hospital staff shall wear an armlet bearing the red cross on white ground (Article 38 of the Ist Geneva Convention of August 12, 1949, Bundesgesetzbl. II, 1954, p. 781). The armlet shall be water-resistant and shall bear the official stamp of the competent " Land " authority, which shall issue to the hospital one armlet for every staff member entitled to the protection of Article 20. The hospital shall keep the armlets so that they may be distributed to the personnel at any time. These armlets shall be issued to the staff at the same time as the identity cards.

The armlet shall be worn on the left arm and only on duty. It may be worn on the way between the hospital and home, but only by permanent staff.

*List of Personnel*

The hospital management shall keep an up-to-date list of permanent and temporary staff. This list shall be available for consultation in the hospital at all times.

---

## PROGRESS IN ORTHOPAEDICS

*The review* Monde Combattant *(Paris, Nos. 149-150) has published an interesting article on a prosthesis which has recently been realized. This concerns a hand with electronic fingers which seems to be a real advance in the field of artificial limbs. We therefore think it to be of interest to reproduce below Mr. Branko Kolovic's article, which has appeared in the World Veterans Federation's publication.*

In spite of recent scientific progress, among the major problems remaining unsolved are the restoration of sight to the blind, and the full substitution of a hand. As the eye, the human hand is such a delicate, beautiful and artful mechanism, that so far all attempts to imitate nature have failed. The problem has been attracting researchers and experts all over the world, but no completely adequate substitute has yet been found. The movements of all prosthetic

devices are still rigid and limited. The development of electronic science has stimulated scientists to study its possible application to artificial hands. Such studies are being carried out in several countries : among others, in the Soviet Union, where Professor Aaron Kobrinsky is working on such a device for the Artificial Limb Research Institute ; in Italy, by Professor Gualtiero Horn ; in the United States, at the University of California, Berkeley ; in Great Britain, where three new devices were publicly demonstrated recently at the International Symposium on Biomechanics at the London Youth Science Fortnight. Another study, carried out in Yugoslavia, has reached an advanced stage.

Headed by Dr. Rajko Tomovic, professor at the Electro-technical Faculty of Belgrade, a group of young Yugoslav experts—engineers, physicians, technicians—has tried for some time to construct an artificial hand which would come " as close as possible " to the natural human hand.

The most difficult problem to overcome is the lack of sensory control in artificial hand function. After long and persistent theoretical and practical work and laboratory experiments, the Yugoslav experts constructed an artificial hand with automatic control, which seems to have attained the highest range in this field at the present time. The technical work was done by technicians of the laboratories and workshops of the " Mihailo Pupin " Institute for Automation and Telecommunications in Belgrade.

The idea of the initiator, Professor Tomovic, was to create an artificial hand that could more successfully substitute for the natural one. The movements of fingers of this electronic-automatic device are meant to be the same as those of a real hand : partly voluntary, partly automatic. The resulting model thus differs from all prostheses hitherto known in that it uses not only the voluntary commands of the user, but also his reflexive ones. The new hand therefore should answer, at least partially, the majority of requirements of a natural hand, and furthermore make possible many actions, such as grasping objects of various forms, even by all fingers.

According to the explanations of Dr. Bosko Zotovic and Dr. Petar Arezina, who from the beginning participated in making the prototype of the prosthesis, as indispensable medical con-

sultants, the movements made possible by this artificial hand with automatic control are done automatically in that the reflexive nervous fibres, which convey impulses from the periphery of the human hand, are replaced by special artificial sensations—through sensitive elements placed at appropriate spots of the artificial fingers. At the touch of these elements with the object to be taken, automatically (similar to the natural hand) the electric impulses are conveyed to a special electronic box (instead of the brain cortex with the natural hand). By way of particularly sensitive elements placed at the socket of the stump, voluntary control is possible: the opening and closing of the artificial hand. This voluntary action is done by a minimum contraction of remaining stump muscles which stimulate the sensitive elements in the artificial socket. From there they are conveyed to the electric box, in which by means of electronic logics, definite commands are given electrically to an electro-motor built into the root of the artificial hand.

By their form as well as by their functions, all the fingers resemble the fingers of a normal hand. The thumb is entirely apart.

The hand can be clenched into a fist and pinch. Its weight is one pound. Its user can lift an object as heavy as 30 kg.

This invention has been successfully demonstrated at international meetings outside Yugoslavia. This new hand opens possibilities for performing even finer and more precise movements such as opening a box of matches, taking out the match stick and bringing a cigarette to the mouth etc. However, the device is still at the experimental stage, and another period will be necessary before production on a large scale can start.

In further improvements of the hand—to make this " dead " appliance the component part of the human organism—the rôle of the medical profession will be particularly significant. Since every human being is an individual case, physiologically as well as psychologically, the task of medical experts is as delicate as the technical idea itself. Several of the prototypes to be made in the " Mihailo Pupin " Institute, will be put at the disposal of the Centre for Prosthetics in Belgrade, where, under the supervision of Dr. Zotovic and Dr. Arezina, the examinations and testing with larger groups of arm amputees will be continued. Very important in this future

work is the correct placing of the electric sensitive elements, because the muscles which take part in such an action are different in size and strength with each person.

On the recommendation of Dr. Zotovic, the team is now preparing the construction of a new type of the same model with a more delicate regulation of finger movements, so as to enable the user to adjust his grasp in the course of the movement itself, instead of always completely opening and closing the whole hand. This would give the hand an extraordinary flexibility.

" The Laboratory prototype of this device with automatic control has shown that there is a basis to perfect the prostheses on the basis of automation and electronics ", Professor Tomovic told us. In his opinion, and in the opinion of other Yugoslav experts, international co-operation with other countries and interested organizations and institutions, in view of the improvement of this invention, would be valuable not only for the exchange of experiences, but also with regard to concrete solutions of many questions concerning technical processes, usage of materials and construction of parts.

---

## EDUCATION FOR THE BLIND

Blindness in children sets a number of problems—educational, occupational and psychological—with which all who deal with the blind should be familiar. *Réadaptation* [1] (No. 119, 1965) published a useful special issue on the situation and prospects facing the young blind. Qualified authors contributed articles on such questions as : modern trends in education for the blind ; school organization ; teaching through sensory perception, hand-work and motions ; occupational adaptation and employment ; leisure activities ; welfare legislation ; educational, occupational training and integration institutes ; holiday camps.

The opening article by Pierre Henri, President and founder of the *Groupement des intellectuels aveugles*, traces the broad outline

[1] 10, rue de Sèvres, Paris 7.