

Technical Note:

Golf Club Holding Devices For Upper Limb Amputees

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ABSTRACT

A device for playing golf by an upper limb amputee will be described. Medline search as far back as 1966 reveals that such a device has never been described in the biomedical literature. The device is interchangeable with a hook or hand, fits into a standard prosthetic arm and can be used by a right or left above elbow or below elbow amputee. The device is inexpensive and can be readily made in a machine shop.

INTRODUCTION

The game of golf requires the player to swing a club downwardly through an arc in order to strike a golf ball sitting on a tee or lying on the ground. While it is possible to successfully swing a golf club using one hand, for the average person greater accuracy and power are obtained by holding the club grip with both hands, and employing both arms in the back stroke, the down or power stroke, and the follow-through. For the able-bodied average player the making of a golf swing with both arms and both hands is a natural act that requires practice and excellent coordination for consistently good results.

However, where a person has lost one hand or part of the arm, until now there has been no practical device reported in the prosthetic literature to allow the person a normal two-handed golf swing. Such amputees, in some instances, may have developed considerable skill in swinging a club with their one remaining hand, but

their inability to offer the coordination and power of a two-handed stroke has left them handicapped as opposed to an able-bodied player.

There is thus a need for a prosthetic device that can be used by the average golfer, handicapped by the loss of one hand or part of the arm, a device that will allow such a golfer to make a relatively normal golf swing. The prosthetic device described here and developed by one of our amputees is intended to satisfy the need of many patients with arm amputations.

DESIGN DESCRIPTION

The device is made of brass pipe, steel, and polyurethane rubber, and has three main parts. (Fig. 1 and 2)

A. *The Distal Portion or the Head (Fig. 1-A and Fig. 3)*—A piece of metal pipe, such as brass, 2-1/4" x 1" with 1/8" thick wall (A-1) is brazed onto a solid piece of steel (A-2) at an angle of 10°. The opening of the metal pipe is tapered with a steel plug so that at its proximal end it is slightly larger in diameter than at its distal end to accommodate the tapered grip of the golf club. One side of the pipe is cut open longitudinally to allow an opening 5/8" in width for placement of the golf club into the device. A thumb screw (A-3) is installed through the head to lock the golf club in place and prevent it from twisting while playing golf.

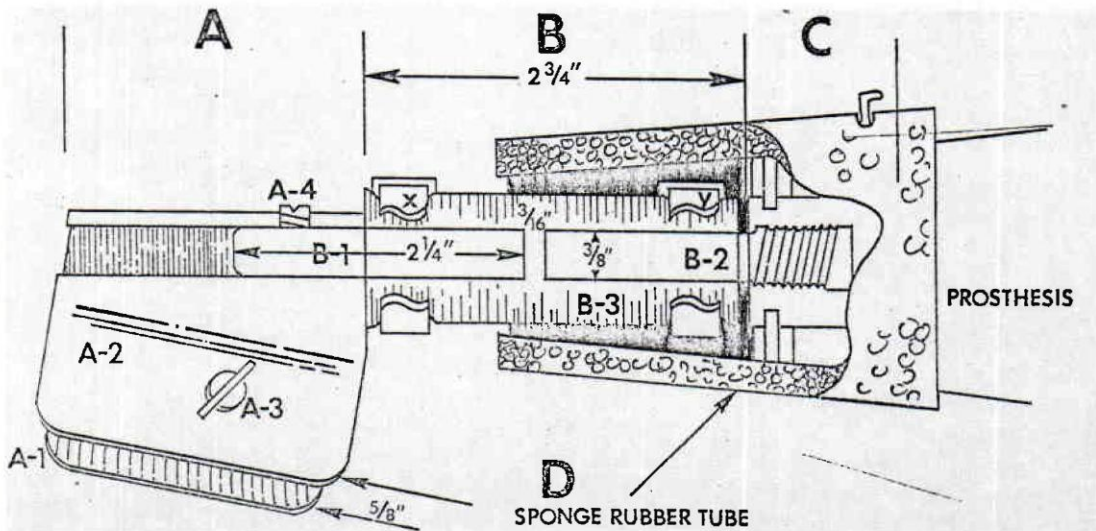


Fig. 1. Diagrammatic representation of the various components of the prosthetic device.

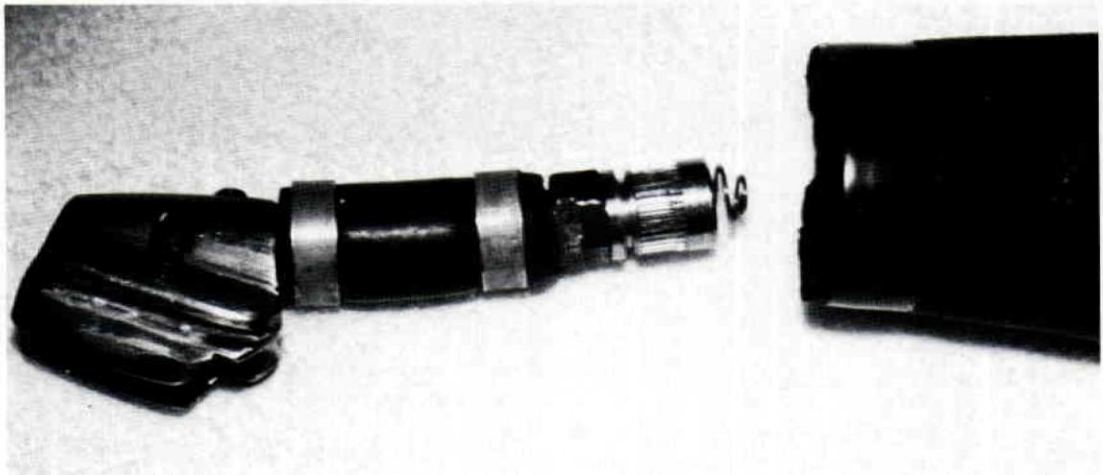


Fig. 2. Assembled device with sponge rubber sleeve.

B. *The Middle Portion or the Wrist* (Fig. 1)—This has semi-rigid structure and consists of two solid steel rods (B-1 and B-2), each $2\frac{1}{4} \times \frac{3}{8}$ inserted tightly inside a polyurethane rubber tube (B-3), which is $2\frac{1}{4}$ long and has an outside diameter of 1" and inside diameter of slightly less than $\frac{3}{8}$ ". The steel rods are held in place inside the rubber tube with two metal clamps, x and y, (Fig. 2). There is a $\frac{3}{16}$ " gap between the two steel rods at the center of the polyurethane rubber tube to allow the necessary wrist movement during

back swing and follow-through while playing golf. The distal rod (B-1) is locked in place through a drill hole in the steel head (A-2) with an Allen set-screw (A-4). The length of the device can be adjusted to suit the amputee by sliding the steel head up or down over the distal steel rod and locking it in place with the set-screw. The proximal steel rod (B-2) is threaded ($\frac{1}{2} \times 20$) at its upper end to accommodate the proximal portion of the device called the wrist insert.



Fig. 3. Prosthetic device locked in place in a below elbow prosthesis.

C. *The Proximal Portion or the Wrist Insert (Figure 1-C)*—This is a standard insert used by prosthetists for an FM quick-change wrist unit. This part of the device allows the amputee its quick attachment and removal from the prosthesis.

In addition to the components described above, a piece of inexpensive sponge rubber tube (Fig. 1-D and Fig. 2) such as the one used for covering air conditioning pipes, measuring $3\frac{1}{4}" \times 1\frac{1}{2}"$ (internal diameter) is used over the proximal portion of the device and the distal portion of the prosthesis as shown in Figure 3 and 4 to protect the sound hand from injury during back swing or follow-through. The upper section of this covering has an opening for the quick release tab installed on the prosthesis.

The prototype described above weighs 15-ounces and will hold any standard size golf club. It is readily interchangeable with a hook or hand and

is easy to install or remove from any standard prosthesis. The device is inexpensive and can be readily made in a machine shop.

CONNECTING AND DISCONNECTING THE DEVICE FROM THE PROSTHESIS

The amputee disconnects and removes the hook or hand from the prosthesis and inserts the sponge rubber covering (D) over the distal prosthesis allowing the quick release tab on his prosthesis to project through the opening in the rubber covering as shown in Figure 3. He then inserts the golf device into the prosthesis until the wrist insert unit locks in place. Since the prosthetic cable is not attached to the device, it is left disconnected. The golf club is then inserted into the head of the device through the longitudinal opening (Figure

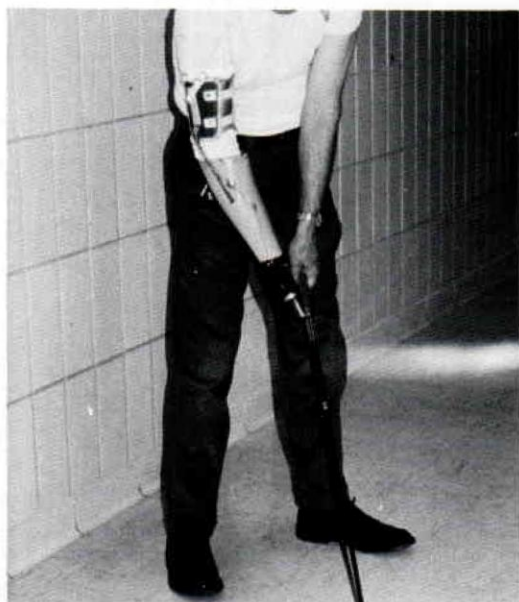


Fig. 4. A below elbow amputee holding the golf club in locked position in the prosthetic device.

1, A-1) and the device is slid up the shaft of the golf club onto the proper grip position and locked in place with the thumb screw. When the golf club is properly held in place, the sponge covering over the distal part of the prosthesis not only allows a comfortable grip of the club with the sound hand, but it protects the sound hand of the amputee from injury during swing (see Fig. 4). This is not a problem for the left arm amputees, as their sound right hand grips the golf club at a position distal to the prosthetic device. One of the most important features of this device is that its wrist unit, which is made of polyurethane rubber tubing with two steel rods in place and separated with a slight gap, is flexible enough to allow the required wrist action during swing of the club, i.e. extension during back swing and flexion with some rotation during follow-through. In order to remove the device from the prosthesis the amputee reverses the procedure.

PROSTHETIC MODIFICATIONS

Most amputees will not require any special modification to their prosthesis to use

the described prosthetic device. However, there are two wrist units on the market which require special mention:

- A. The FM quick-change wrist unit must be installed on the prosthesis with the quick-change tab in an *anterior* rather than medial position. This is necessary because if installed in a medial position the pressure from the sound hand on the quick-change tab could cause the tab to depress, thereby accidentally unlocking and releasing the device during the swing.
- B. The F.W. flexion-friction wrist unit cannot be used with the described device because the control button must be located on the medial aspect of the wrist unit for proper operation of the wrist.

SUMMARY

A prosthetic device for playing golf by an upper extremity amputee is described. Medline search as far back as 1966 revealed that such a device has never been described in the biomedical literature. The device is readily interchangeable with a prosthetic hook or hand and fits into any standard prosthetic arm. It can be used by a right or left handed, above or below elbow amputee to confidently hold any standard size golf club made of any material. The device is inexpensive, weighs less than a pound and can be readily manufactured in a machine shop. One of the most important features of this device is that its wrist unit is flexible enough to allow the necessary wrist movements required to play golf.

ACKNOWLEDGMENT

The authors are very grateful to Mr. Earl Puhl for his valuable comments and for sharing his experience in the use of this device. An application has been filed by Mr. Puhl with the U.S. patent office in Washington, D.C. for patenting this device. Mr. Puhl can be contacted at 3807 S. 18 St., Milwaukee, WI 53221, phone 414-645-2936.

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