A "MODIFICATION" OF A RECIPROCAL WRIST EXTENSION FINGER FLEXION ORTHOSIS

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Patients afflicted with spinal cord lesions or injuries of the C-7 level often lose the activity of intrinsic hand muscles and the long flexor muscles acting about the wrist. When wrist extensor muscles with good strength are available, the patient often can get useful prehension of the first and second digits against the opposed thumb. Functional application of a modification of the Bisgrove type reciprocal wrist extension finger orthosis ¹ can be used for this purpose. This device will provide flexion of the fingers at the meta-carpophalangeal joint when the wrist is extended from a partially flexed position. The degree of digital flexion power obtained is dependent upon residual extension strength.

Blue prints and pictures in Figures 1-6 give a detailed view of the parts of the device, their assembly and application. Figure 1 shows a schematic perspective of the orthosis. Figure 2 shows the parts to scale with representative measurements for application to an adult. These measurements must be individualized. Some modification of the orthosis may be required with each application; for example, it is necessary to stabilize the thumb in opposition to the fingers with a crutch if the patient does not have an opponens muscle function.



Fig. 1—Reciprocal wrist extension; Finger Flexion Orthosis.

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Fig. 2A—Hinge Detail

Fig. 2—Parts List: Reciprocal Wrist Extension Orthosis, Parts A-1, Note all parts made of 072-24 S. T. Aluminum unless otherwise shown. All measurements are for the viewer to gain a size perspective only.















Fig. 2H—Thumb Piece Detail



Fig. 2 I-Finger Extension Holder MARCH, 1960

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Fig. 2G—Hand Piece Detail

Figure 3 shows the configuration of a typical patient's hand so that the prominence of the extensor carpi radialis can be visualized. Figure 4 demonstrates prehension when the wrist is extended. Figure 5 shows over-all grasp when the wrist is in a flexed position. Figure 6 demonstrates the orthosis in actual use by a patient.



Fig. 3



Fig. 4

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Fig. 5



Fig. 6

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Construction

The material used for construction of the orthosis is aluminum .072 -2024 St. bar. This material is light and relatively easy to form over compound curves and yet it is rigid enough to serve supportive and mechanical purposes. The reciprocating rod and joint rivets are made from stainless steel. The parts for the finger section are made from stainless steel sheet metal .035 type 304.

Special attention must be given to the form and fitting of the hand piece which is designed to provide the basic features of an opponens orthosis, namely; support of the metacarpal arch and opposition of the thumb to the fingers. Precise locations of the fulcrum point of the wrist joint and metacarpophalangeal joint of the index finger are very critical. The length of the reciprocating rod connecting the wrist part and finger sections must be adjusted in length for the desired prehension in respect to the degree of suitable wrist extension that can be obtained. The orthosis must be individualized to the size and shape of the hand.

The fine wool felt obtained from discarded hats can be cleaned and provides an excellent lining for the orthosis because of its softness and durability. A good grade of cement (for example, Barge cement) will hold the felt lining in place and this eliminates riveting.

The device is anodized after final fitting. Anodizing the aluminum, especially for functional upper extremity equipment, serves several purposes. It preserves the device from deterioration caused by perspiration and eliminates the black smear on clothes and skin from the surface oxidation that is always associated with the use of aluminum.² The cosmetic appearance of any orthotic equipment is important to the individual using the device. The patient may have to accept permanent handicap so the equipment designed to aid him in his daily activities often becomes a part of him. On account of this, simplicity in the design is an important factor and if this is associated with other desirable features such as light weight and inconspicuous appearance, the device's acceptance and usage may be encouraged eventually. Women, particularly, appreciate the beauty of color and are less apt to discard or disguise an anodized device. The cost of anodizing is relatively small compared to the cosmetic gain and the other features described above.

The extensor muscles may tire rather quickly after the orthosis is first applied and used but this problem will gradually disappear as the patient gains coordination and strength in this new use of the residual extensors for effective prehension.

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