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M. KEROPIAN

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ORTHOPEDIC BRACE FOR THE HAND

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Fig. 1.

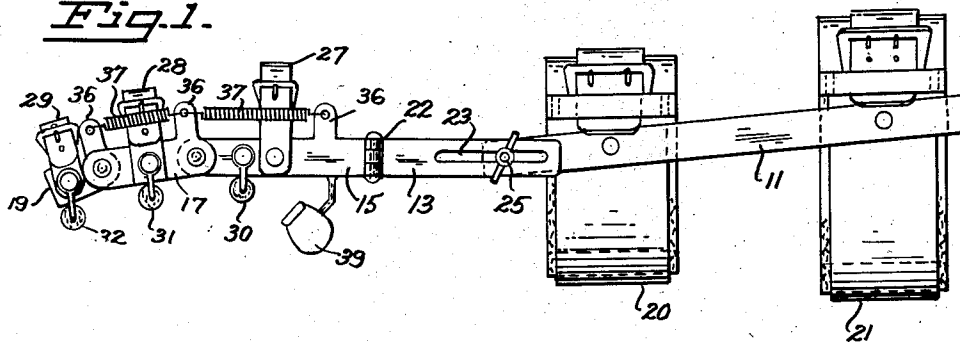


Fig. 2.

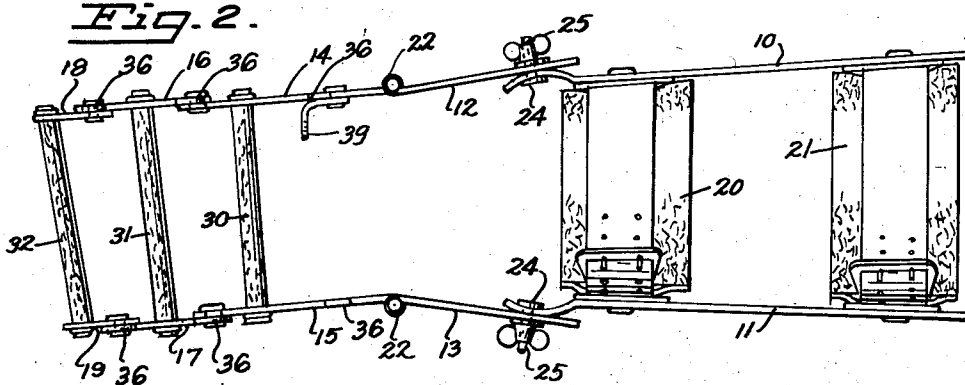


Fig. 4.

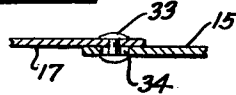


Fig. 3.

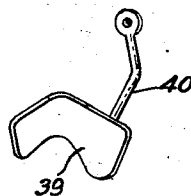
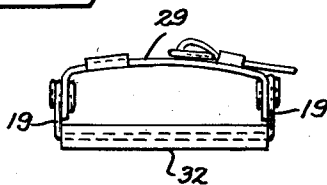


Fig. 5.

INVENTOR.
MICHAEL KEROPIAN

BY

Charles M. Fayer
ATTORNEY

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ORTHOPEDIC BRACE FOR THE HAND

Michael Keropian, San Francisco, Calif.

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4 Claims. (Cl. 128—77)

This invention relates to orthopedic braces and particularly to a brace or support for the human hand in cases where some of the hand and forearm muscles are weak or entirely ineffective as may be caused for example by poliomyelitis.

Accepted therapy for paralysis of some kinds includes supporting the afflicted part in a manner to enable and encourage its use. When a member such as the forearm and hand is so effected, various muscles may be ineffective so that it is impossible for the afflicted person in some cases to open the hand or in other cases to close the hand. Similarly with other muscles effected, the hand tends to turn inwardly or outwardly at the wrist. Thus an orthopedic brace designed for general use must be adaptable to various disabilities and to corrections of various degrees.

It is, therefore, the object of the present invention to provide an orthopedic brace for the hand with means for permitting universal adjustment at the wrist and with means for applying variable tension for either opening or closing of the hand.

Further and more specific objects and advantages of the invention are made apparent in the following description wherein the invention is described in detail by reference to the accompanying drawings.

In the drawings:

Fig. 1 is a view in side elevation of an orthopedic brace embodying the present invention,

Fig. 2 is a plan view of the brace shown in Fig. 1 with parts removed for clarity of illustration,

Fig. 3 is a view in front elevation of the finger area of the brace,

Fig. 4 is a fragmentary detail in section illustrating a hinge connection employed in the brace, and

Fig. 5 is a perspective view of a thumb support which forms a part of the brace.

To facilitate an understanding of the brace disclosed in the drawings and of the manner in which it cooperates with the human hand, the following terms and expressions are used for descriptive purposes.

The forearm is that portion of the arm which includes the radius and ulna and the wrist is the area occupied by the carpal bones. The term hand is employed as descriptive of the metacarpal area only and comprises a palm, a back and inner side from which the thumb extends and an opposite or outer side. The fingers of which the bones are phalanges are divided into sections which hinge at the knuckles and these sections will be referred to as proximal, medial and distal.

Referring now to Figs. 1 and 2 of the drawings the brace is shown as comprising a pair of articulated bars designed to be disposed one on the inner side and one on the outer side of the forearm and hand. The bars are made up of forearm sections 10 and 11, wrist sections 12 and 13, hand sections 14 and 15, proximal finger sections 16 and 17, and sections 18 and 19 which cooperate with the medial portions of the fingers. The distal ends of the fingers are left free for use. The forearm portion of the

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brace is provided with two straps 20 and 21 which are secured to the bars and arranged to encircle the forearm so that they may be buckled in place to hold the forearm sections 10 and 11 relatively immovably on opposite sides of the forearm. The wrist sections 12 and 13 are connected with the forearm sections in a manner to provide for universal freedom of articulation so that the position of the hand relative to the forearm may be sustained at any desired angle. This is accomplished by the combination of hinges 22 connecting the wrist and hand portions of the bars and by slots 23 in the wrist sections which embrace threaded pins 24 carried by the forward ends of the forearm sections and having means, here illustrated as wing nuts 25, for clamping the wrist and forearm sections firmly together in any desired position of adjustment. With the connections just described, the hand sections may be swung inwardly or outwardly about the hinges 22. As the long slots 23 permit free sliding movement of the wrist sections with respect to the forearm sections, the slots 23 and pins 24 also provide what is in effect a hinge permitting the hand to be raised or lowered with respect to the forearm and to oppose its tendency to move in an opposite direction because of muscular deficiencies.

In order to provide for articulation of the fingers so that the hand may be put to useful service and also to prevent the fingers from either opening or closing due to muscular deficiencies, the hand and fingers are supported between their respective sections of the brace bars by straps 27, 28 and 29 and by rigid supports 30, 31 and 32. The palm of the hand rests on the support 31 while the strap 27 is buckled across the back of the hand. Similarly the proximal sections of the fingers rest on the bar 31 while the strap 28 is buckled across the back of these sections and the medial sections of the fingers rest on the support 32 with the strap 29 passing over the backs of these sections.

All of the hand and finger portions of the bars are pivotally connected as by pins one of which is shown at 33 in Fig. 4. One or the other of the connected elements has an elongated slot 34 through which the pin extends to permit limited sliding movement as the pivotal movement takes place. This is desirable because the knuckles are not arranged in a straight line across the hand and fingers so the portions of the main supporting bars are longer toward the inner or thumb side of the hand than they are on the outer side with the result that the hinge pins 33 are not in alignment and some sliding action is required to permit free flexibility. If in any case it is desirable to hold any of these connections in a rigid position, the pins 33 may be used as rivets or nuts and bolts may be substituted for them.

The supports 30, 31 and 32 are in a form of heavy wire connected as by rivets to the main articulated portions of the bar between which they extend and are preferably wrapped with a soft padding material as shown. In fact all of the straps and the articulated parts are preferably padded where they come in contact with the skin but since this is a conventional expedient, the padding has not been shown in the drawing in places where it might confuse the illustration or the mechanical parts of the device.

Each of the hand sections and finger sections, 14 to 19, inclusive, is provided with an upstanding ear or spring anchor such as shown at 36 and springs 37 extend between these anchors for the purpose of urging the brace and the hand to an open position. This, of course, is for a case in which the hand tends to close as a result of muscular deficiencies. If the muscular deficiencies are such that the hand cannot be closed, the position of the springs 37 is reversed. That is the anchors 36 will extend downwardly from the several positions illustrated

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rather than upwardly. As an alternative, the springs or in fact rubber bands in some cases may be connected between the members 30, 31 and 32 which then serve as anchors for the resilient means which tend to close the hand.

A thumb support is illustrated at 39 in Figs. 1, 2 and 5 as carried by a bracket 40 riveted or otherwise suitably secured to the hand bar 14. The bracket 40 may be bent to vary the position of the thumb support and the support which is itself a plate of substantially right angular shape may be reversed in position to oppose the tendency of the thumb to turn inwardly or outwardly as the case may be. In either event, the ultimate position of the thumb in the brace is intended to be such that it will meet with the distal ends of the fingers as the hand is closed enabling the wearer of the brace to grasp objects and thus encouraging the use of the hand in the performance of its normal functions.

Because of the universal wrist connection in the brace of the present invention, a hand which is useless because of its tendency to turn in one direction or another may be held in a normal useful position with freedom of the thumb and fingers to cooperate in a grasping action. Thus some of the functional capacity is restored to an otherwise useless limb.

I claim:

1. An orthopedic hand brace which comprises articulated members adapted to parallel the sides of the fingers, hand and forearm, transverse parts connecting opposite pairs of the finger and hand members, means on the brace to secure the forearm members to the forearm, and universally adjustable connecting means between the forearm members and the hand members.

2. An orthopedic hand brace which comprises articulated members adapted to parallel the sides of the fingers, hand and forearm, transverse parts connecting opposite pairs of the finger and hand members, means on the brace to secure the forearm members to the forearm, a combination hinged and sliding connection between the forearm members and the hand members, and means on the brace to secure the sliding connection in any position of adjustment.

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3. An orthopedic hand brace which comprises pivotally connected articulated bars adapted to parallel opposite sides of the hand and fingers, means extending transversely between said bars to connect them in pairs to the hand and fingers so as to permit grasping action, resilient means between adjacent bars to oppose an abnormal tendency in grasping motion, a thumb support extending from one of the bars to hold the thumb in its grasp cooperating position relative to the fingers, and means attached to the bars adapted to support the brace on the forearm.

4. An orthopedic hand brace which comprises pivotally connected articulated bars adapted to parallel opposite sides of the hand and fingers, means extending transversely between said bars to connect them in pairs to the hand and fingers so as to permit grasping action, resilient means between adjacent bars to oppose an abnormal tendency in grasping motion, a thumb support extending from one of the bars to hold the thumb in its grasp cooperating position relative to the fingers, means attached to the bars adapted to support the brace on the forearm, and connections between the supporting means and brace adjustable to correct deflection of the hand at the wrist.

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