Oct. 26, 1954 G. M. MOTIS 2,692,390

WRIST FLEXION UNIT

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Fig. 1

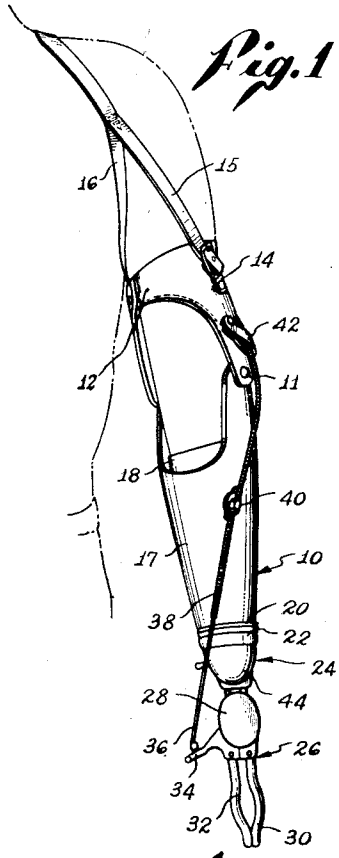


Fig. 2

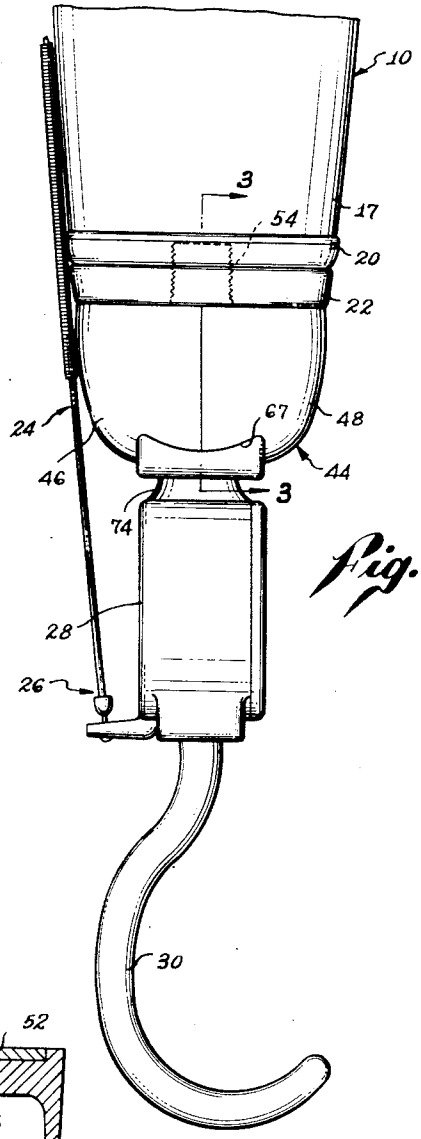
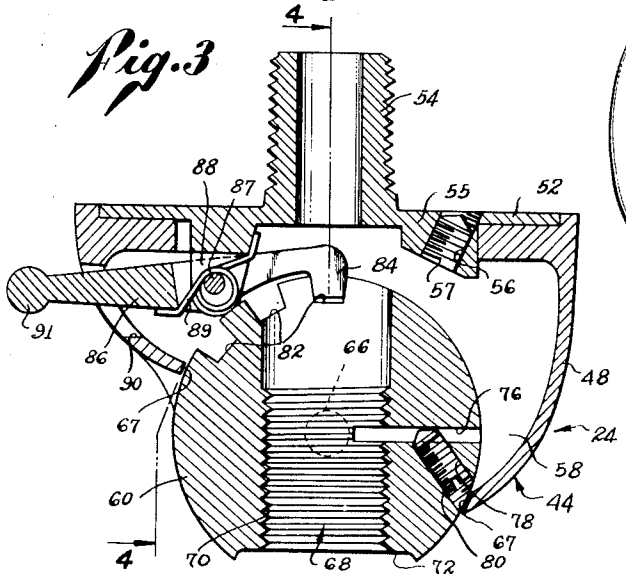


Fig. 3



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WRIST FLEXION UNIT

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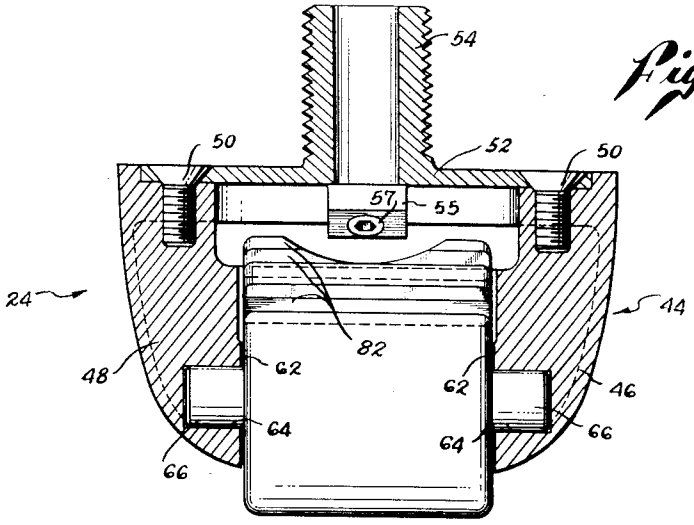


Fig. 4

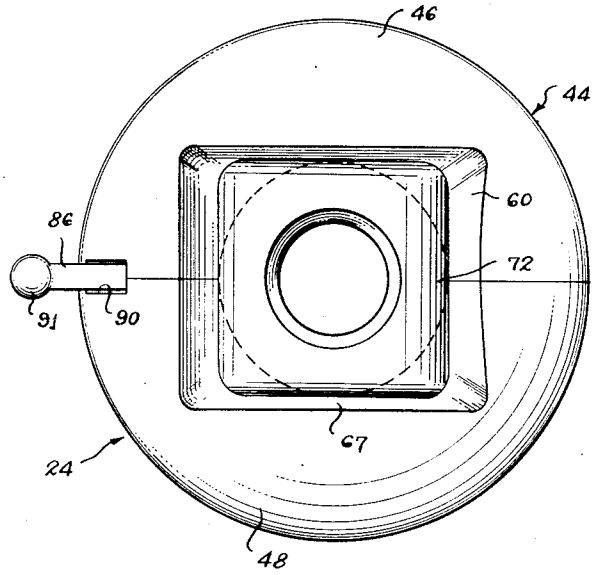


Fig. 5

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WRIST FLEXION UNIT

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Application October 22, 1952, Serial No. 316,230

4 Claims. (Cl. 3—12.4)

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The present invention relates generally to artificial arms, and more particularly to a new and improved wrist unit providing flexion and extension movement of the hook or other terminal device.

The primary object of the invention is to provide a wrist unit having flexion and extension movement, that is compact, light in weight, and smoothly rounded and faired into the forearm, with a minimum of protuberances and no sharp corners to catch on the clothing. This last-named feature is of considerable importance to the amputee, who is constantly faced with the problem of getting his arm into and out of coat and shirt sleeves without damaging his clothing.

A further object is to provide a wrist flexion unit of the class described wherein the hook may be positively locked in any one of a plurality of flexed positions, and in which the locking action is effected by means of a short, spring-pressed lever projecting laterally from the housing. This arrangement is particularly useful for the bilateral amputee, as it enables him to unlock the wrist by merely pressing the housing against the body or any other convenient object, and does not require the use of another hand. The unit is self-locking when released.

Another object is to provide a wrist flexion unit wherein the mechanism is fully enclosed to exclude dirt and to prevent the clothing from becoming tangled therein.

Still another object of the invention is to provide a wrist flexion unit that is simple and rugged in construction, inexpensive to manufacture, unobtrusive and attractive in appearance, and self-compensating for wear, so that the mechanism remains tight throughout its useful life.

These objects are achieved by providing the unit with a generally hemispherical shell housing that is mounted on and smoothly faired into the end of the forearm member. Pivotally supported within the housing and projecting through a slot in the outer end thereof is a generally circular rocker, to which the hook or other terminal device is attached. The rocker is provided on its periphery with a plurality of angularly spaced tapered notches, which are engageable by a tapered tooth on a locking lever. The locking lever is pivoted in the housing, and the end opposite the tooth projects through a slot in the side of the housing. A spring presses the lever to engage the tooth in one of the notches on the rocker, and the hook is thus locked in the desired angular position. To release the lock, the projecting end of the lever is pressed against the

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body to overcome the pressure of the spring and lift the tooth out of its seat, after which the rocker and its attached hook can be turned to a new position of flexion or extension.

Other objects and advantages of the invention will become apparent to those skilled in the art upon consideration of the following detailed description of the preferred embodiment thereof, reference being had to the accompanying drawings, wherein:

Figure 1 is a front elevational view of an artificial arm having a wrist flexion unit embodying the principles of my invention mounted thereon;

Figure 2 is an enlarged side elevational view of the outer end of the arm and the wrist flexion unit;

Figure 3 is a cross sectional view through the wrist unit, taken along the line 3—3 in Figure 2;

Figure 4 is a section taken at 4—4 in Figure 3, with the rocker shown in elevation; and

Figure 5 is an elevational view of the wrist unit, as seen from the end.

The invention is illustratively shown on a below-elbow arm, although it will be understood that it is equally applicable to an above-elbow arm. In Figure 1 of the drawings, the arm is seen to comprise a forearm 10, which is connected by elbow hinges 11 to a leather cuff 12 that is wrapped around the upper arm of the amputee. Strap loops 14 are secured to opposite sides of the cuff 12, and are buckled to harness straps 15 and 16, which pass up over the amputee's shoulder to hold the arm in place.

The forearm 10 consists of an outer stationary shell 17 and an inner rotatable shell 18, both of which are preferably formed by laminating several layers of plastic-impregnated cotton stockinet over a plaster form, and then curing or polymerizing the resin in an oven to produce an extremely strong, durable, and light-weight structure. In the process of fabricating the shells 17 and 18, various metal fittings such as the components of the hinges 11 and end cap 20 are embedded in the plastic laminate and become permanently bonded thereto.

A turntable 22 is rotatably mounted on the end cap 20 and is connected to the rotatable inner shell 18 by suitable mechanism (not shown) whereby the turntable is rotated at a stepped-up rate by the shell 18. The mechanism referred to may be of the type shown and described in my copending application, Serial No. 236,787, filed July 14, 1951, now Patent 2,638,604, to which reference may be had.

Mounted on the turntable 22 is the wrist flex-

ion unit of my invention, which is designated in its entirety by the reference numeral 24, and attached to the unit is a hook 26 of the type shown and described in my Patent No. 2,573,351, granted October 30, 1951. The hook 26 consists of a case 28 supporting a stationary finger 30, movable finger 32, and thumb 34. A Bowden cable control wire 36 is attached at one end to the outer end of the thumb 34, and at the other end to the usual shoulder harness, passing upwardly along the arm through a flexible, spring-wound tubular conduit 38. The conduit 38 is anchored to the forearm member 17 by means of a fitting 40, and to the cuff 12 by a similar fitting (not shown), which constrain the conduit against endwise movement. The conduit also passes through a leather loop 42 on the cuff 12 adjacent the elbow, which holds it against the arm. Springs within the case 28 pull the movable finger 32 against the stationary finger, and the hook is opened by exerting a pull on the control cable 36.

The wrist flexion unit 24 comprises a hollow, generally hemispherical housing 44 made up of two halves 46 and 48, which are secured by screws 50 to a circular base plate 52. A threaded stem 54 projects from the outer face of the base plate 52 at the center thereof, and this is screwed into a tapped hole in the turntable 22 to secure the unit thereto. A raised boss 55 is provided on the inner surface of the base plate 52, and extending all the way through at a somewhat slanted angle is a tapped hole 56, within which is a set screw 57. The end of the set screw abuts against the face of the turntable 22, and is tightened up to lock the unit 44 against turning relative to the turntable.

The housing 44 is relatively thin walled, and encloses a chamber 58, within which is disposed a flat-ended, rocker 60 of substantially circular cross-section, preferably substantially cylindrical in general form. Opposed bosses 62 on opposite sides of the chamber are bored at 64 to receive trunnion pins 66 projecting from opposite ends of the rocker. The rocker pivots on the pins 66, and the centerline of the pins is the flexion-extension axis of the wrist. A generally rectangular opening 67 is formed in the outer end of the housing 44, and the edge of the rocker protrudes slightly through this opening to expose a portion of its periphery. Extending diametrically through the rocker is a bore 68 which is threaded at 70 to receive the threaded shank of the hook, and the exposed outer face of the rocker is provided with a flat 72 surrounding the end of the bore, on which the shoulder 74 (Figure 2) of the hook seats.

The rocker is slit diametrically at 76, perpendicular to the axis of the bore 68, to a depth just short of the pins 66. Intersecting the slot at an angle is a tapped hole 78, into which a set screw 80 is screwed. The pointed end of the set screw abuts against the far side of the slot, and when tightened up, spreads the slot slightly to bind the threads 70 on the threads of the stem of the hook. This provides a powerful locking action that prevents the hook from turning in the bore.

Formed in the periphery of the rocker 60 opposite the flat 72 are three angularly spaced notches 82, the sides of which slope downwardly in converging relationship. The notches 82 on one side of the bore 68 are engageable by a tooth 84 projecting at right angles from one end of a lever 86. The sides of the tooth 84 are likewise tapered, and have the same angle as the sides of the notches 82. This tapered seating engagement insures a snug fit of the tooth in the notch, even though the parts may become quite worn, and eliminates development of any looseness as a result of wear.

The lever 86 is pivoted on a pin 87, which is secured at its ends in two laterally spaced ears 88 projecting from the surface of the base plate 52, only one of which can be seen in Figure 3. A torsion spring 89 encircles the pin 87 and bears at one end against the lever 86, the other end being hooked over a shoulder on the base plate. The spring 89 exerts a torsional thrust against the lever, tending to hold the tooth 84 seated in its notch 82, as shown in Figure 3. In this condition, the rocker is positively locked in the selected position, and cannot be displaced until the tooth is unseated. The other end of the lever projects outwardly through a slot 90 in the housing for a short distance, and terminates in a bulbous enlargement 91, presenting smoothly rounded surfaces on all sides that cannot catch on the clothing.

The operation of the unit is believed to be self-evident from the foregoing description. As shown in Figure 3, the wrist is locked in the fully extended position, and the hook would project straight out from the forearm. To flex the wrist, the bulbous end 91 of the lever 86 is brushed against the clothing or any other object, rocking the lever counterclockwise against the pressure of the spring 89 to lift the tooth 84 out of its notch. The hook can then be turned to one of the other two positions of adjustment and locked by releasing the lever. While I have shown only three positions of adjustment, it will be understood that any number of positions within space limitations can be used.

Being fully enclosed by the housing, the locking mechanism is protected from dirt and entanglement in clothing. The smoothly rounded surfaces of the unit provide no sharp corners or other projections to catch and damage clothing. The simplicity of the mechanism, together with its rugged construction provides a unit that is inexpensive to manufacture and extremely serviceable.

While I have shown and described in considerable detail what I believe to be the preferred form of my invention, it will be understood that such details are merely illustrative, and that various changes may be made in the shape and arrangement of the several parts without departing from the broad scope of the invention, as defined in the following claims.

I claim:

1. A wrist flexion unit comprising an enclosed hollow housing, a flat-sided, substantially circular rocker disposed within said housing, said rocker being pivoted on its center for swinging movement about the flexion-extension axis, a portion of the periphery of said rocker projecting through an opening in said housing, there being a diametrically extending, tapped hole extending through said rocker from the exposed portion thereof to receive the threaded shank of a terminal device, said rocker being split perpendicular to said tapped hole for a distance of approximately half its diameter, means to spread the sides of said slit so as to cause the threads of said tapped hole to bind on the threads of said threaded shank, said rocker having a plurality of angularly spaced notches provided in the periphery thereof within said housing, a lever disposed within said housing and pivoted thereon

intermediate its ends, said lever having a tooth on one end engageable in said notches to lock said rocker in angularly adjusted position, the other end of said lever projecting through an opening in said housing, and spring means urging said lever into locking engagement with said rocker.

2. A wrist flexion unit comprising a substantially circular base plate, a pair of mating body sections attached to said base plate to form a hollow housing, a substantially cylindrical rocker disposed within said housing, trunnions on opposite ends of said cylindrical rocker, bearing sockets in said body sections receiving said trunnions and supporting said rocker for swinging movement about the flexion-extension axis, a portion of said rocker projecting through an opening in said housing, there being a diametrically extending, tapped hole extending through said rocker from the exposed portion thereof to receive the threaded shank of a terminal device, said rocker being diametrically split for a distance of approximately half its diameter perpendicular to said tapped hole, means to spread the sides of said slit so as to cause the threads of said tapped hole to bind on the threads of said threaded shank, said rocker having a plurality of angularly spaced notches provided in the periphery thereof within said housing, a lever disposed within said housing and pivoted thereon intermediate its ends, said lever having a tooth on one end engageable in said notches to lock said rocker in angularly adjusted position, the other end of said lever projecting through an opening in said housing, and spring means urging said lever into locking engagement with said rocker.

3. A wrist flexion unit comprising an enclosed hollow housing, a flat-sided, substantially circular rocker disposed within said housing, said rocker being pivoted on its center for swinging movement about the flexion-extension axis, a portion of the periphery of said rocker projecting through an opening in said housing, there being a diametrically extending, tapped hole extending through said rocker from the exposed portion thereof to receive the threaded shank of a terminal device, said rocker being split perpendicular to said tapped hole for a distance of approximately half its diameter, a tapped bore extending into said rocker from the periphery of the rocker and intersecting said split, a set screw threaded in said bore extending across said split and engaging the rocker portion on the opposite side of the split so as to spread said split and thereby cause the threads of said tapped hole to bind on the threads of said threaded shank, said rocker having a plurality of angularly spaced notches provided in the periphery thereof within said housing, and lever means pivoted on said housing having a locking portion selectively engageable in said notches.

4. A wrist flexion unit comprising a hollow housing, a rocker of substantially circular cross-section pivotally mounted within said housing on the flexion-extension axis, a portion of the periphery of said rocker projecting through an opening in said housing, there being a diametrically extending, tapped hole extending through said rocker from the exposed portion thereof to receive the threaded shank of a terminal device, said rocker being split perpendicular to said tapped hole for a distance of approximately half its diameter, means to spread the sides of said slit so as to cause the threads of said tapped hole to bind on the threads of said threaded shank, said rocker having a plurality of angularly spaced notches provided in the periphery thereof within said housing, and lever means pivoted on said housing having a locking portion selectively engageable in said notches.

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Number	Name	Date
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2,573,351	Motis	Oct. 30, 1951
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