Aug. 28, 1923. 1,465,933

C. DEDIC

ARTIFICIAL HAND

Filed March 28, 1921 3 Sheets-Sheet 1

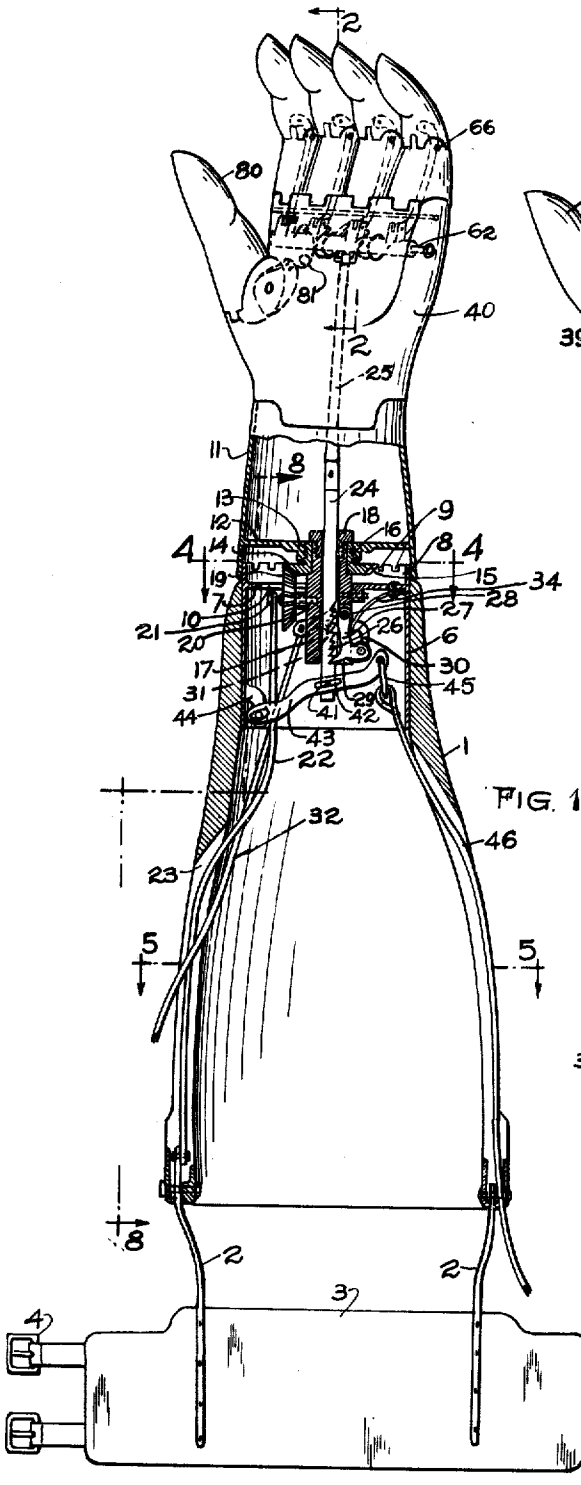


FIG. 1.

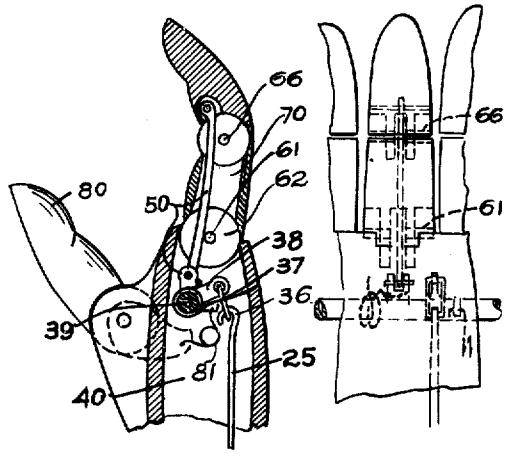


FIG. 2.

FIG. 3.

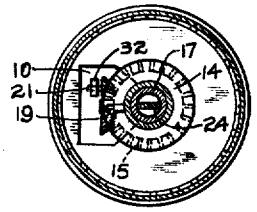


FIG. 4.

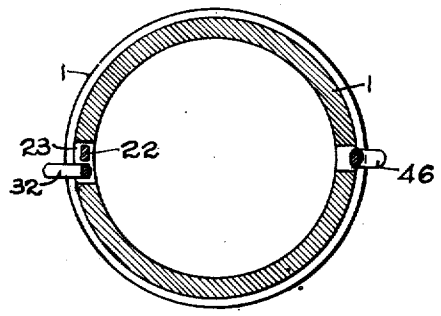


FIG. 5.

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Aug. 28, 1923. 1,465,933

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ARTIFICIAL HAND

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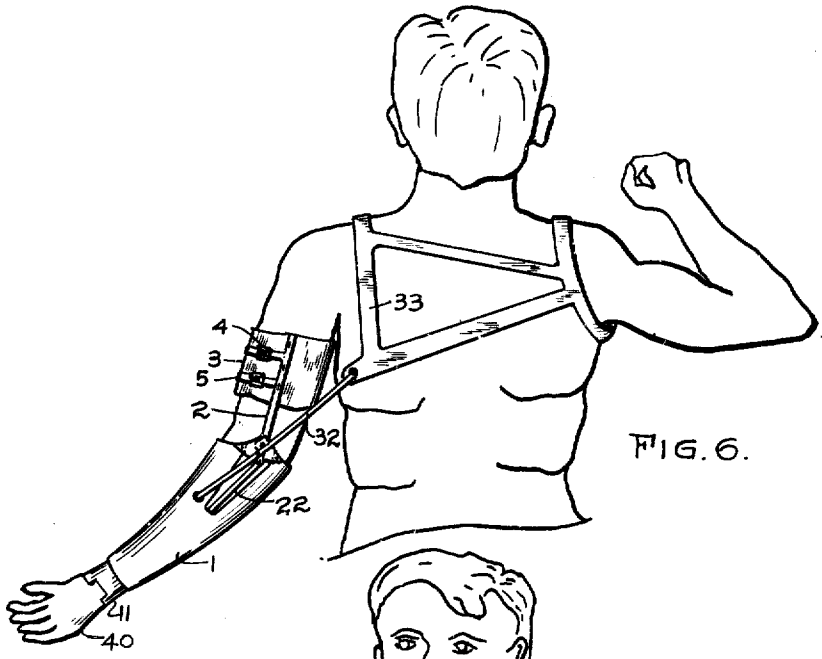


FIG. 6.

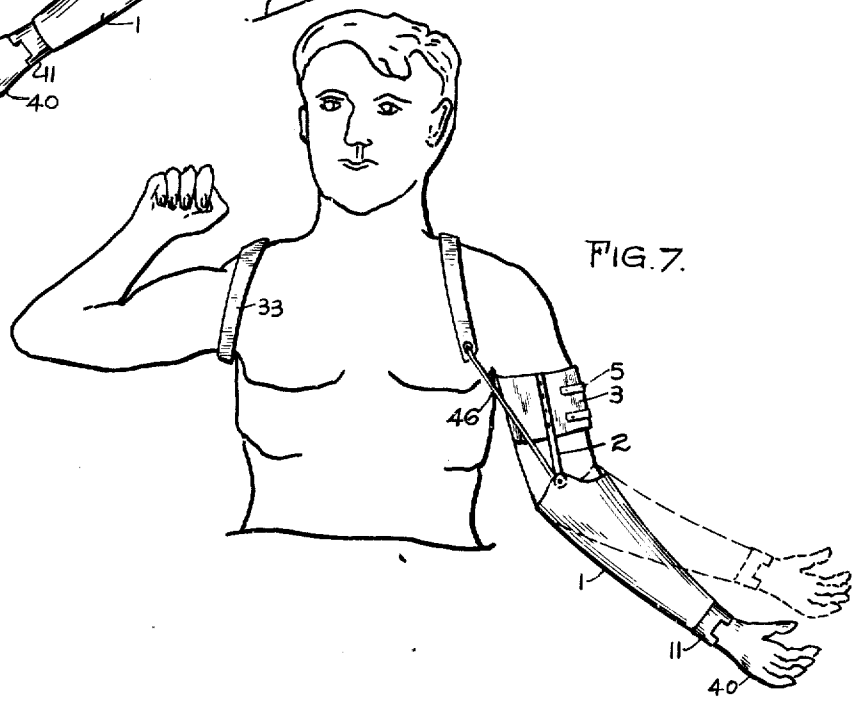


FIG. 7.

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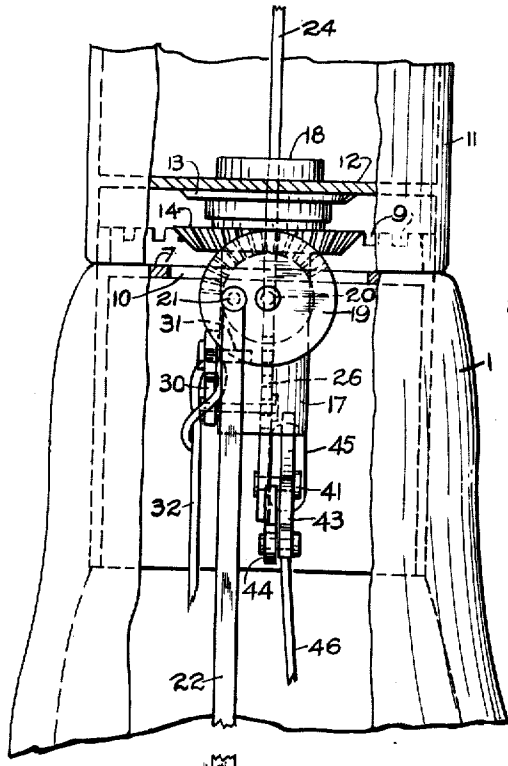
1,465,933

C. DEDIC

ARTIFICIAL HAND

Filed March 28, 1921

3 Sheets-Sheet 3



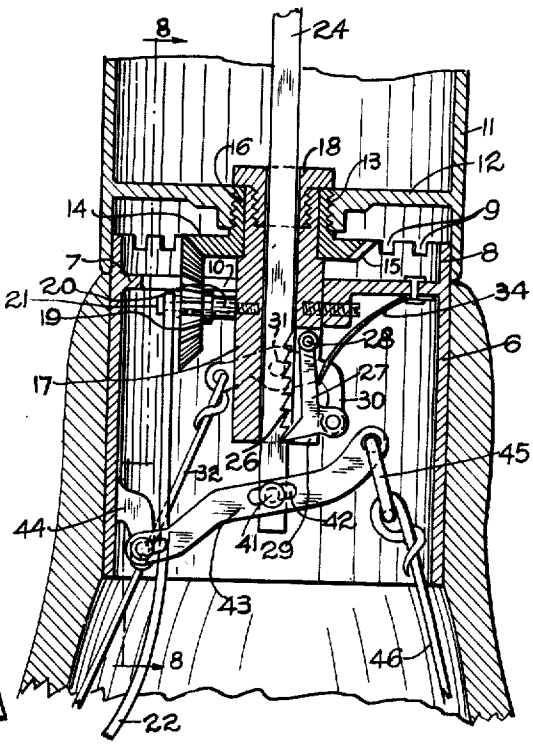


FIG. 9.

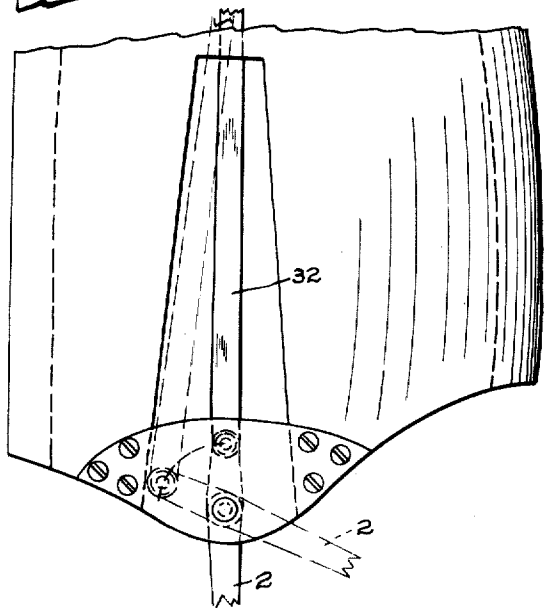


FIG. 8.

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Patented Aug. 28, 1923. 1,465,933

UNITED STATES PATENT OFFICE.

CHARLES DEDIC, OF CHIPPEWA FALLS, WISCONSIN.

ARTIFICIAL HAND.

Application filed March 28, 1921. Serial No. 456,077.

To all whom it may concern:

Be it known that I, CHARLES DEDIC, a citizen of the Republic of Czechoslovakia, residing at Chippewa Falls, in the county of Chippewa and State of Wisconsin, have invented a new and useful Improvement in Artificial Hands, of which the following is a specification.

This invention relates to improvements in artificial hands.

It is an object of the invention to provide in a device of the character mentioned means for locking parts of the artificial fingers in a predetermined relation with respect to the palm of the artificial hand, and to combine with the means for releasing the lock a device for adjusting these finger portions to different relations.

It is also an object of the invention to use the artificial thumb for effecting an adjustment of finger portions with respect to the thumb or palm of the hand, thereby permitting the user to close the hand by pressing the back of the thumb against some rigid support.

The invention also has the object of automatically causing the hand to open automatically upon release of the closing means.

It is in general an object of the invention to provide a device of this character which combines large flexibility and capacity of adjustment with a reduction in the number of parts so as to simplify the structure and to render the manufacture of the article possible under economical conditions.

With these and other objects in view, which will become apparent from a perusal of the appended specification and the claims, the invention is described in the following and illustrated in the accompanying drawings, in which:

Fig. 1 is partly a sectional view and partly a perspective front elevation of the hand combined with the hollow stump by which it is secured to the forearm;

Fig. 2 is a sectional detail view of a finger and actuating mechanism therefor, taken on line 2—2 of Fig. 1;

Fig. 3 is a front elevation of a finger and adjacent portions;

Figs. 4 and 5 are sectional views on lines 4—4 and 5—5, respectively, of Fig. 1;

Figs. 6 and 7 are rear and front views of the harness which serves for controlling the adjusting mechanism of the fingers, showing the harness in use, and

Figs. 8 and 9 are side elevation and section respectively of the mechanism for permitting turning of the wrist and moving the fingers on a larger scale.

A stump sleeve 1, made of suitable light weight material and adapted to surround a part of the forearm of the wearer, is connected at its rear edge by a plurality of short tension elements 2, to a strap 3. This strap is equipped with buckle fastening members 4 and 5, respectively, whereby the stump sleeve 1 may be held in proper position through the attachment of the strap 3 to the upper arm above the elbow.

The front portion of this sleeve, which, in its outer appearance may be shaped somewhat like a natural arm, supports a cylindrical cup or container 6 which carries parts of the locking and adjusting mechanism for the fingers. The container 6 has a projecting flange 8 which is provided with indentations or slots 9 extending inwardly from the forward end, so as to enhance the resiliency of this projecting part. The container is furthermore provided with a transverse wall or bottom, which has an opening 10 in its central portion.

The cuff 11 of the artificial hand is adapted to be placed over the yielding projecting portion 8 of the container 6, and is then held in place owing to the resiliency of this part. The cuff 11 is furthermore provided with a transverse wall 12, having a reinforced central portion, through which a tapped opening 13 extends. A gear wheel 14, having teeth projecting from the lower face, as indicated at 15, has a hub 16 which is provided with an external thread to engage the internal thread of the opening 13. The hub of the bevel gear 14 surrounds an extension 17^A of a stem 17 which projects rotatably through the said hub. The stem 17 is held against axial displacement in one direction with respect to the gear wheel 14 by a shoulder at one end of the extension and against axial displacement in the other direction by a bushing 18 which has an external thread whereby it is introduced into the tapped rear end of the extension, the flange of this bushing, however, being large enough to overlap the end surface of the hub of the gear wheel 14. A rotary movement of the cuff 10 may be effected, therefore, without rotating the stem 17. For the purpose of holding the cuff against rotation a small bevel gear 19 is in engagement with

the teeth 15 of the gear 14. This bevel gear is mounted on a pin 20 which is fixed to the stem 17, as shown in Fig. 1, and a pin 21 connected with the bevel may be moved to permit rotation of the hand with respect to the sleeve 1. The pin may be moved by means of a member 22, which is united with one of the members 2 and which is located in a slot 23 of the sleeve.

An axial bore in the stem 17 receives a bar 24 which is slidably secured therein and which is connected at the forward end with a rod 25. The rear portion of the rod 24 has ratchet teeth 26 which are engageable by a pawl 27 pivotally secured on a pin 28 in an axial slot 29 of the stem 17. A projection on the pawl is pivotally connected with a curved link 30 which is secured to the stem at 31 and the other end of this link is provided with an eye in which the end of a string 32 is held by means of a knot, or the like. This string extends from the releasing hook 30 to the rear portion of the harness 33, as shown in Fig. 6, whereby, upon suitable movement of the trunk or shoulder of the wearer of the string 32 may be placed under tension and the holding pawl 27 may be released. This pawl is normally forced, however, into engagement with the ratchet teeth by a leaf spring 34 secured at one end to the wall 7 of the cup 6 and pressing with its other end upon the pawl 27.

The rod 25, which is secured to the front end of the bar 24, terminates in a hook 36 in movable connection with a link 37 which is at its other end movably secured to an arm 38 projecting from a tubular shaft or sleeve 44, loosely mounted on a rod 39, which passes through the portion of the hand 40 underneath the palm surface and which is located adjacent the root of the fingers.

The rear end of the bar 24 is provided with a transverse pin 41 which projects into the slot 42 of a lever 43, pivotally secured to the bracket 44′ of the cup 6. The free end of this lever has a link 45 through which it is connected with a string 46 which leads to the front part of the harness 33, opposite that point to which the string 32 is secured. It is obvious, therefore, that upon actuation of these strings, successively effected by a shoulder movement of the harness, the pawl 27 may first be withdrawn from locking engagement with the bar 24 and that then the bar itself may be moved longitudinally in a predetermined direction depending upon the kind of shoulder movement of the harness.

The tubular shaft which traverses the interior or cavity of the body of the hand is surrounded by one or two relatively strong springs having one end anchored to the tubular shaft and the other end secured to the inner surface of the wall of the hand. The tension springs, therefore, will have the tendency of imparting to this tubular shaft permanent movement to return it to a normal position if this tubular shaft should have been rotated about the fixed traversing shaft through the actuation of the rod and the link connected therewith.

This tubular shaft also is equipped with several crank arms 50, each of which terminates in a bifurcated portion. Each of these crank arms is approximately in alignment with the axis of the finger joints, movably secured to the palm of the hand by means of rods 61. The finger joints, as will be seen from Fig. 3, have at their lower ends spaced disk like projections 62, through which are passed the aligned pins 66, whereby these joints are secured to the body of the hand. At the opposite ends the finger joints have arcuate recesses for the reception of similar circular projections which extend from the lower end of the finger tips into these recesses to permit a pivotal movement of the finger tips about these supporting pins. The finger tips themselves, therefore, are movably secured to the other joints of the fingers, which last named joints may be held by friction in any position to which they have been adjusted. Each of the lower joints of the fingers has a passage or canal for a rod 70, which is secured at its rear end to the crank arms of the tubular shaft by being inserted between the prongs of the bifurcated portions of these arms while the free end of these rods is secured by a pin to the tip portion of the finger. It will, therefore, be obvious that upon rotation of the tubular shaft the crank arms are swung about the axis of the shaft and that the finger tips will be moved with respect to the other joints and with respect to the body of the hand. This rotary movement of the tubular shaft is produced by longitudinal displacement of the bar which passes through the cuff and stem, so that the hand may be closed through a movement of the shoulder, transmitted through the harness and strings to the mechanism of the hand.

The thumb 80 also is pivotally mounted in relation to the fingers similar to the arrangement of the thumb of a natural hand with respect to the fingers and an extension secured to the thumb and projecting into the cavity of the hand is connected by a spring 81 with another crank arm projecting from the tubular shaft, whereby upon rotation of the tubular shaft a movement also is transmitted through the yielding connection through the thumb, turning said thumb about its point of support in direction towards the fingers. This movement of the thumb towards the fingers and of the fingers to closing position, takes place simultaneously.

It is, furthermore, obvious that the rotation of the tubular shaft may also be produced by swinging the thumb about its pivotal support. The wearer, therefore, may press the back of the thumb against some rigid support, as for instance, the top surface of a table, to move said thumb in direction towards the palm surface of the hand, thereby transmitting a rotary movement to the tubular shaft and causing the links 70 to turn the tips of the fingers about their pivotal points on the other joints of the fingers and thereby produce a closing movement of the hand without utilizing the connection between the closing mechanism and the harness attached to the body of the wearer.

In this closing movement, produced by the oscillation of the thumb, the bar 18 may be shifted axially under the locking pawl, as this pawl only will prevent movement in a predetermined direction. If it is then desired to open the hand again the locking pawl may be swung to release position for the bar by means of the harness and the springs connected with the tubular shaft and with the palm of the hand will have the tendency to turn the tubular shaft now in the opposite direction, thereby opening the fingers and moving the thumb outwardly and at the same time displacing the bar rearwardly.

I claim:

1. The combination with an artificial arm comprising a forearm having means for attaching same to a stump of a natural arm, a rotatable adjustable wrist portion attached to said forearm, and a hand portion attached to said wrist portion, of an axially disposed reciprocable rod through the wrist portion for opening and closing the fingers, means whereby said rod is reciprocated in one direction by an action of the wearer's body, a contractile spring for operating said rod in the opposite direction, means for automatically locking said rod in the position acquired by the action of the wearer's body, and means for releasing said locking means by an action of the wearer's body, substantially as described.

2. The combination with an artificial arm comprising a forearm having means for attaching same to a stump of a natural arm, a rotatable adjustable wrist portion attached to said forearm, and a hand portion attached to said wrist portion, of an axially disposed reciprocable rod through the wrist portion for opening and closing the fingers, means whereby said rod is reciprocated in one direction by an action of the wearer's body, a contractile spring for operating said rod in the opposite direction, means for automatically locking said rod in the position acquired by the action of the wearer's body, means for releasing said locking means by an action of the wearer's body, means for rotating said hand and wrist portion about said reciprocable rod, and manually adjustable locking means for holding said wrist and hand portions in any desired rotative position.

In witness whereof, I have hereunto subscribed my name this 22d day of March, 1921.

CHARLES DEDIC.