Oct. 8, 1946. P. A. REBERS 2,408,880

ARTIFICIAL HAND

Filed April 28, 1943 2 Sheets-Sheet 1

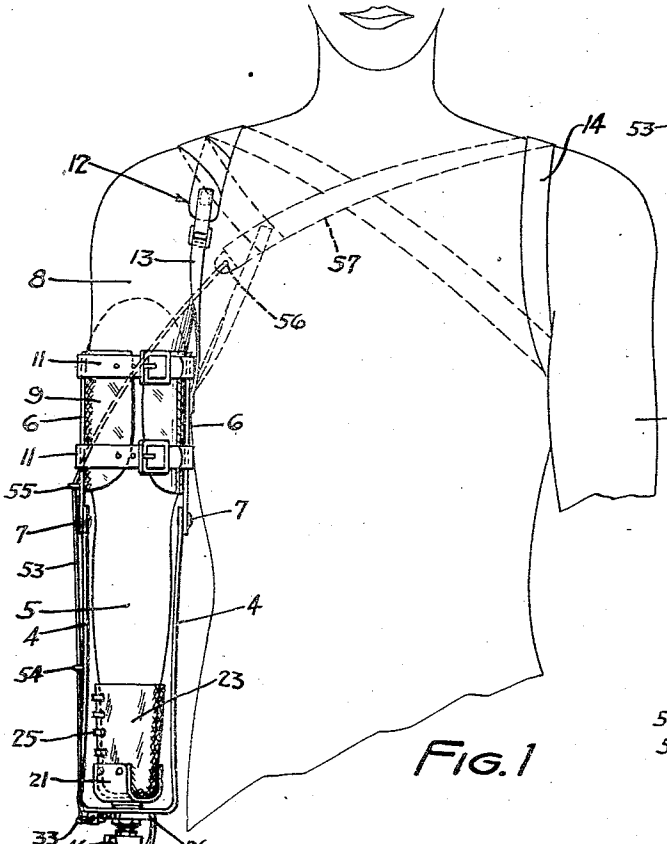


FIG. 1

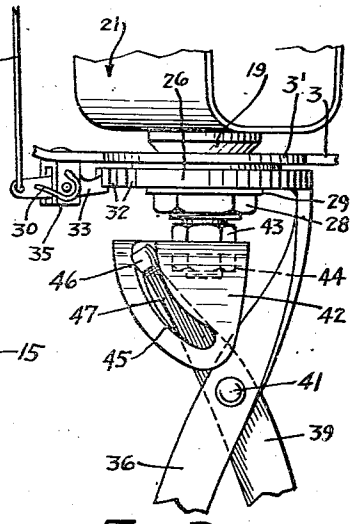


FIG. 2

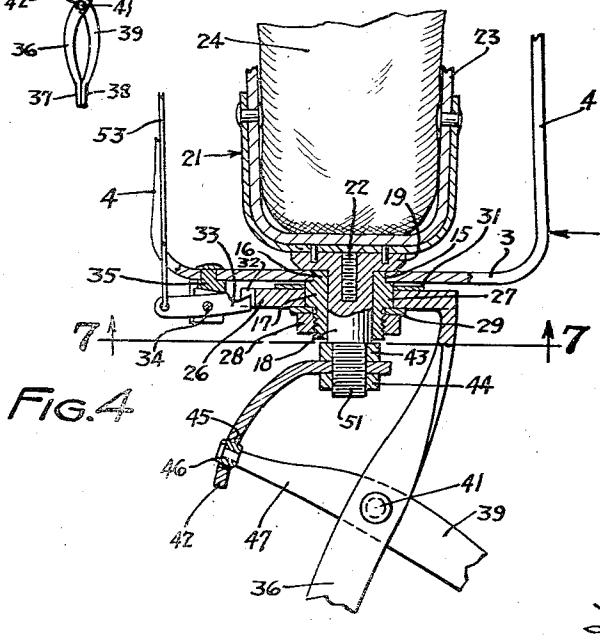


FIG. 4

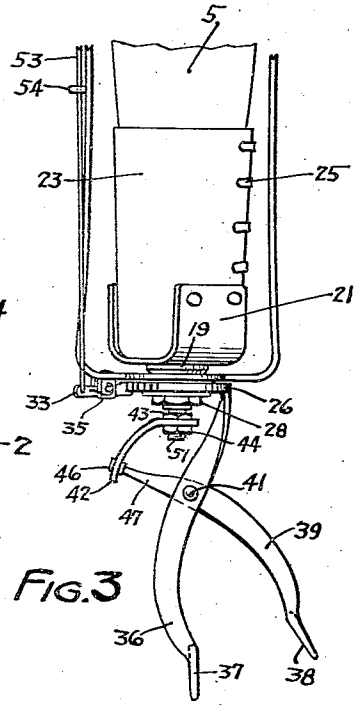


FIG. 3

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Oct. 8, 1946. P. A. REBERS 2,403,880

ARTIFICIAL HAND

Filed April 28, 1943 2 Sheets-Sheet 2

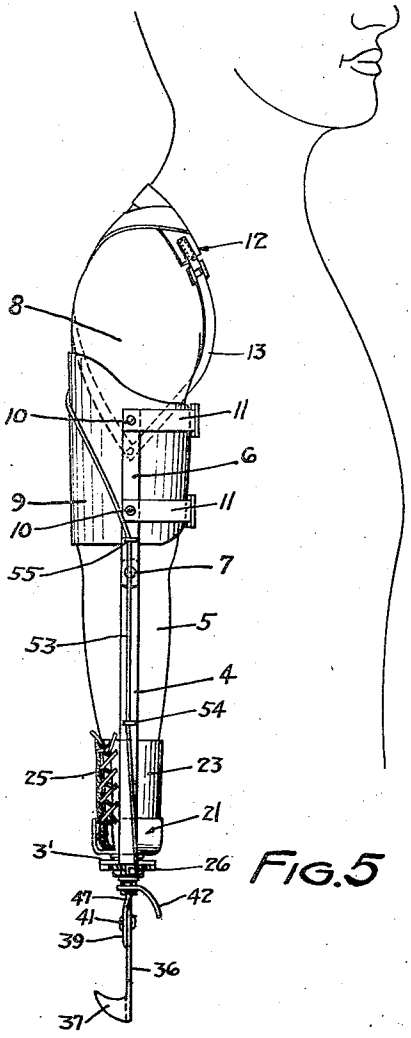


FIG. 5

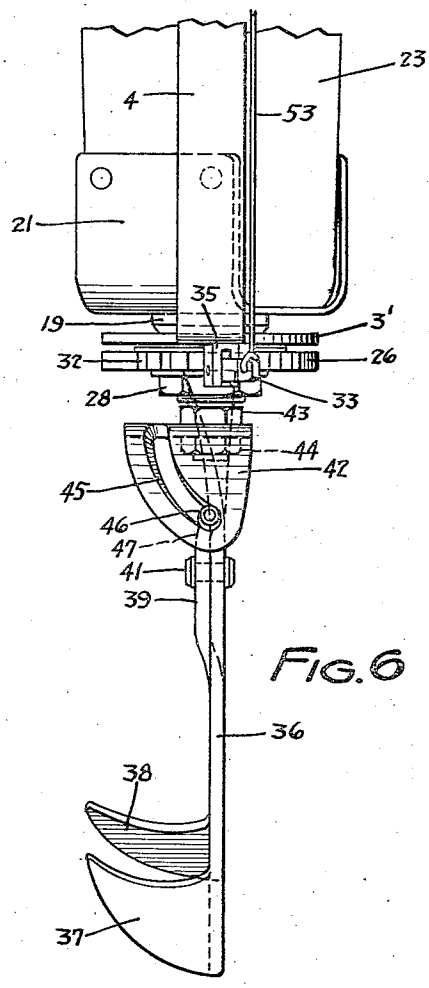


FIG. 6

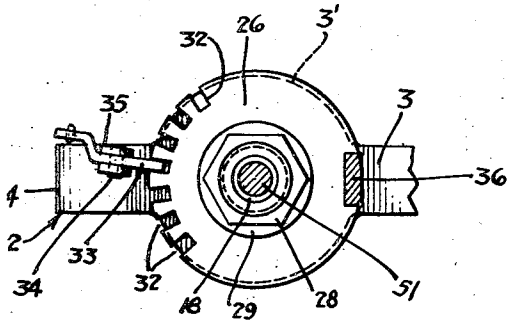


FIG. 7

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UNITED STATES PATENT OFFICE

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ARTIFICIAL HAND

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5 Claims. (Cl. 3—12)

1

This invention relates to new and useful improvements in artificial limbs and more particularly to artificial hands.

An object of the present invention is to provide an artificial hand having means for operatively attaching it to the stump of the forearm and to the upper arm in such a manner that the operation of the fingers of the hand may be accurately and conveniently controlled by a slight movement of the arm.

A further object is to provide an artificial hand comprising a fixed finger member, and a relatively movable finger member having means for operating it to move it towards or away from the fixed finger, as when picking up articles or releasing them, and means being provided whereby the plane of the fixed and movable fingers may be rotatively adjusted with respect to the supporting member of the apparatus by a simple movement of the operator's arm, whereby the fingers may readily and conveniently be positioned to pick up various articles without the necessity of the wearer using his other or good hand, as is common with various devices of this general type now in use.

A further and more specific object is to provide an artificial hand comprising a U-shaped supporting member having a bearing at its lower end for rotatively receiving a shaft having a sleeve secured to one end thereof adapted to receive and be secured to the stump of the forearm, said supporting member having strap-like bars or legs disposed at opposite sides of the forearm, and having sections pivoted to the upper ends thereof in alignment with the elbow, said upper ends having means for securing them to the upper arm thereby to operatively secure the device to the wearer's arm, and a finger member being mounted for rotary adjustment on said bearing, and having a relatively movable finger member pivoted thereto, and means being provided whereby the rotary adjustment of said fingers with respect to the supporting member may be accomplished by a combined movement of the wearer's forearm and shoulder.

Other objects of the invention reside in the simple and inexpensive construction of the device, as a whole, whereby it may be manufactured in quantity production at small cost; in the provision of an artificial hand having means for readily and conveniently mounting it upon the arm of the wearer, and whereby the co-acting fingers of the device may be conveniently manipulated to pick up or release various articles by rotary movement of the forearm with

2

respect to the supporting means; and in the unique mounting of the co-acting fingers upon the supporting member, whereby said fingers may be readily rotatively adjusted with respect to the supporting member by a movement of the arm, thereby to facilitate positioning the fingers with respect to an article or to the work to be accomplished.

Other objects of the invention will appear from the following description and accompanying drawings and will be pointed out in the annexed claims.

In the accompanying drawings there has been disclosed a structure designed to carry out the various objects of the invention, but it is to be understood that the invention is not confined to the exact features shown as various changes may be made within the scope of the claims which follow.

In the drawings:

Figure 1 is a front view of the device showing it mounted on an arm;

Figure 2 is an enlarged detail view showing the unique mounting of the finger members upon the lower end of the support;

Figure 3 is a view showing the forearm receiving sleeve rotated in a direction to open or separate the fingers;

Figure 4 is a detail sectional view on a relatively larger scale, to more clearly illustrate the mounting for the fingers upon the lower end of the supporting member;

Figure 5 is a side view of Figure 1;

Figure 6 is an enlarged detail sectional view showing the cam actuated to open or separate the fingers; and

Figure 7 is a view substantially on the line 7—7 of Figure 4, showing the mounting of the dog for locking the fixed finger in adjusted position.

The novel artificial hand herein disclosed is shown comprising a U-shaped supporting member, generally designated by the numeral 2, comprising a central connecting portion 3 and spaced side legs 4. The spaced side legs 4 extend upwardly along the inner and outer sides of the forearm 5, and have upper sections 6 pivotally connected thereto by pivots 7, as best shown in Figures 1 and 5. The axes of the pivots 7 are aligned with the elbow joint, as clearly illustrated in Figures 1 and 5 to permit free bending of the elbow. The upper sections 6—6 are adapted to be secured to the upper arm 8 by a suitable jacket 9 to which they may be secured by such means as rivets 10. The jacket 9 is adapted to encircle the arm, and has straps 11 for strapping it to

the wearer's arm, as is more or less common in the art.

To prevent the jacket 9 from sliding down on the wearer's arm, a suitable harness, generally designated by the numeral 12, is provided. This harness has a strap 13 connecting it to the inner section 6 of the supporting member. The opposite side of the harness 12 is shown having a strap 14 engaging the opposite arm 15 of the wearer whereby the harness is supported on the shoulders in such a manner that the strap 13 connecting the harness to the upper inner section 6 of the supporting member 2 will always retain the jacket 9 in proper position upon the upper arm of the wearer.

The connecting portion 3 of the supporting member 2 is preferably formed with an enlarged central portion 3', as shown in Figure 7. An opening 15 is provided in the enlarged central portion 3' adapted to receive the reduced portion 16 of a bearing member 17, and whereby the bearing may be fixedly secured in the opening 15 of the connecting portion 3 of the supporting member 2, as will be understood by reference to Figure 4.

A short shaft 18 is rotatably received in the bearing 17 and is shown provided at its upper end with a flange 19 to which a U-shaped member 21 is secured by such means as a screw 22. The U-shaped member 21 provides a support for a sleeve 23 adapted to receive the stump 24 of the forearm 5, as clearly illustrated in Figures 1 and 4. The wall of the sleeve 23 has an elongated opening provided with suitable lacings 25, whereby the sleeve may be snugly fitted to the stump, as will readily be understood by reference to Figures 1 and 5.

A plate 26, preferably circular in configuration, is rotatably mounted on the enlarged portion 27 of the bearing 17, and is retained thereon by a lock nut 28 and washer 29. A suitable spacing washer 31 may be interposed between the enlarged central portion 3' of the supporting member 2 and the plate 26, as best shown in Figure 4.

The plate 26 is provided with a series of peripheral notches 32 adapted to receive one end of a dog 33, shown pivoted at 34 to a suitable stud 35 which may be suitably secured to the connecting portion 3 of the supporting member 2, as shown in Figures 4 and 7. The dog 33 has a spring 30, as shown in Figure 2, for constantly urging it into engagement with one of the notches 32 in the plate 26.

A finger member 36 has one end fixedly secured to the plate 26 and is provided with a gripping head or claw 37 adapted to co-act with a similarly shaped head or claw 38 provided on a relatively movable finger member 39. The movable finger member 39 is pivoted to the fixed finger 36 by a pivot 41. Because of the fixed finger 36 being carried directly by the rotatively adjustable plate 26, the fixed finger may be relatively rotated about the axis of the shaft 18 without imparting rotation to said shaft.

A cam plate 42 is fixedly secured to the lower end of the shaft 18 by suitable lock nuts 43 and 44. The cam plate 42 has an arcuately formed cam slot 45 therein adapted to receive an antifriction roller 46 provided on the upper or short end 47 of the finger 39. The cam slot 45 is so shaped with respect to the swinging movement of the roller 46 that the roller will substantially follow the cam, when the cam is relatively rotated by rotation of the shaft 18, as when the forearm 5 is relatively rotated with respect to the supporting member 2. The cam plate 42 is adjustably

secured to the threaded end portion 51 of the shaft 18 by the lock nuts 43 and 44. By reference to Figure 4 it will be noted that the circular plate 26 to which the fixed finger 36 is secured, is normally locked against rotary movement as a result of the dog 33 being engaged with one of the peripheral notches 32 in the plate 26.

By reference to Figures 3 and 4, it will be noted that the pivoted finger 39 may be readily and conveniently oscillated with respect to the fixed member 36 by rotation of the cam 42, as when the shaft 18 is rotated by rotary movement of the forearm. When the forearm is rotated in one direction, or from the position shown in Figure 4 to that shown in Figure 3, the fingers 36 and 39 will separate or open up, as shown in Figure 3, whereby they may grip an article. Rotation of the forearm in the opposite direction will move the head or claw 38 of the movable finger 39 into engagement with the head or claw 37 of the fixed finger 36. Thus, it will be seen that the operation of the pivoted finger 39 may be accurately and conveniently controlled by a slight rotary movement of the stump 24 of the wearer's forearm 5.

Another important feature of the invention resides in the means provided for relatively changing the plane of the co-acting fingers 36 and 39 with respect to the supporting member 2, thereby to facilitate positioning the finger claws or terminals 37 and 38 with respect to an object to be picked up, or to the work to be performed by the fingers.

To thus rotatively adjust the angular position of the fingers with respect to the supporting member 2, a cord 53 is shown having one end secured to the dog 33 and passes thru guide loops or eyes 54 and 55 provided respectively on the outer leg 4 of the supporting member 2 and its upper pivoted section 6, as clearly illustrated in Figures 1 and 5. From the guide 55 the cord 53 passes around back of the upper arm 8, and is secured at 56 to one end of a strap 57 of the harness 12. The strap 57 may pass over one of the wearer's shoulders, as clearly illustrated in Figure 1.

The cord 53 is so arranged that when the wearer slightly moves his forearm 5 with respect to his upper arm 8, a pull is exerted on the cord 53 which moves the dog 33 out of locking engagement with the notch plate 26, whereby said plate may be freely rotatably adjusted about the axis of the shaft 18, as will readily be understood by reference to Figures 4 and 6.

In the operation of the novel apparatus herein disclosed, the operation of the finger members 36 and 39 is accomplished entirely by rotary movement of the stump 24 of the forearm. Should the terminal gripping heads or claws 37 and 38 of the fingers 36 and 39, respectively, not be properly positioned with respect to the article to be picked up, or to the work to be performed, the operator may quickly rotate the finger members about the axis of the shaft 18 by a slight combined movement of the forearm and shoulder.

To thus relatively rotate the fingers 36 and 39 with respect to the supporting member 2, a slight pull is exerted on the cord 53 of the dog 33 by a movement of the arm, whereby the dog 33 is moved out of locking engagement with the plate 26, after which the two fingers may readily be rotated about the axis of the shaft 18 as a unit to vary the working angle or plane of the fingers with respect to the supporting member 2. As soon as the fingers have been rotatably adjusted

to the proper angle with respect to the work, the wearer manipulates his arm and/or shoulder in such a manner as to permit the dog again to engage one of the notches 32 in the plate 26, whereby the fingers will be locked against rotary movement with respect to the supporting member 2, as will be understood.

It will thus be noted that the operation of the fingers 36 and 39 is under complete control of the operator's arm at all times, which renders the artificial hand more useful and practical than structures of this general type now in common use.

It will also be noted that the entire apparatus is very simple and inexpensive in construction whereby it may be manufactured in quantity production at small cost which is a highly desirable feature in devices of this general type.

It will be apparent to those skilled in the art that I have accomplished at least the principal objects of my invention, and it will also be apparent to those skilled in the art that the embodiments herein described may be variously changed and modified, without departing from the spirit of the invention, and that the invention is capable of uses and has advantages not herein specifically described; hence it will be appreciated that the herein disclosed embodiments are illustrative only, and that my invention is not limited thereto.

I claim as my invention:

1. In an artificial hand, a supporting member adapted to be secured to an arm above the elbow, a shaft rotatably mounted in the lower end of the support, a sleeve secured to one end of the shaft adapted to receive the stump of the forearm, a notched plate mounted for rotary adjustment about the axis of said shaft, a spring-actuated dog engageable with the notched plate for locking it in adjusted position on the supporting member, a finger member fixed to the plate, a second finger member mounted for pivotal movement on the fixed finger, means for actuating said movable finger upon rotation of said shaft, and a harness supported on the shoulders of the wearer and having an operative connection with said dog whereby the dog may be moved out of locking engagement with the notched plate by movement of the arm and shoulder, thereby to permit the fingers to be rotatively adjusted with respect to the shaft to facilitate positioning the fingers with respect to the article or work to be performed, by rotation of the forearm relative to the support.

2. In a device of the class described, a U-shaped supporting member comprising upper and lower portions pivotally connected together at the elbow of the arm, the upper portion having means for securing it to the upper arm and the lower portion having a bearing secured thereto, a sleeve adapted to receive the stump of the forearm, a shaft secured at one end of said sleeve, said shaft being rotatably mounted in said bearing, a cam secured to the opposite end of the shaft for direct rotation with the shaft, a notched plate mounted for rotary adjustment on said bearing and with respect to said supporting member, a dog mounted on the supporting member and engageable with the notches in said plate to lock the plate in adjusted position on the supporting member, a finger member fixed to the notched plate, a second finger member pivoted to the fixed finger and having one end operatively engaged with said cam and means whereby said dog may be actuated by combined movement of the forearm and shoulder to release the plate whereby the plane of the fingers may be rotatively adjusted with respect to the supporting member by means of a rotary movement of the forearm to facilitate positioning the fingers with respect to the article to be picked up or the work to be performed.

3. In an artificial hand, a supporting member adapted to be secured to an arm above the elbow, a shaft rotatably mounted in the lower end of the support, a sleeve secured to one end of said shaft adapted to receive the stump of the forearm, a cam secured to the opposite end of said shaft for direct rotation therewith, a notched plate mounted for rotary adjustment with respect to said supporting member about the axis of said shaft, a dog mounted on the supporting member and engageable with the notches in said plate to lock the plate in a plurality of adjusted positions on the supporting member, a fixed finger member carried by said plate, a movable finger member pivoted to said fixed finger and carried thereby, said movable finger member having one end operatively engaged with said cam so as to be moved thereby on rotation of said shaft and sleeve, and means for actuating said dog by a combined movement of the forearm and shoulder to release said plate and permit rotary adjustment of said plate through forces applied by a rotary movement of the forearm through said finger members to said plate.

4. In an artificial hand, a supporting member adapted to be secured to an arm above the elbow, a shaft rotatably mounted in the lower end of the support, a sleeve secured to one end of said shaft adapted to receive the stump of the forearm, a cam secured to the opposite end of said shaft for direct rotation therewith, a notched plate mounted for rotary adjustment with respect to said supporting member about the axis of said shaft, a dog mounted on the supporting member and engageable with the notches in said plate to lock the plate in a plurality of adjusted positions on the supporting member, a pair of finger members carried by said plate and mounted for relative pivotal movement, one of said finger members being operatively engaged with said cam so as to be moved thereby on rotation of said shaft and sleeve, and means extending from said dog to a relatively fixed point on the wearer's shoulder for actuating said dog by a combined movement of the forearm and shoulder to release said plate and permit rotary adjustment of said plate through forces applied by a rotary movement of the forearm through and finger members to said plate.

5. The artificial hand of claim 3 further characterized in that said forces for rotatively adjusting the notched plate are transmitted from the forearm through the sleeve to the shaft and cam carried thereby and from said cam through the movable finger to the fixed finger to the plate.

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