

Feb. 24, 1953

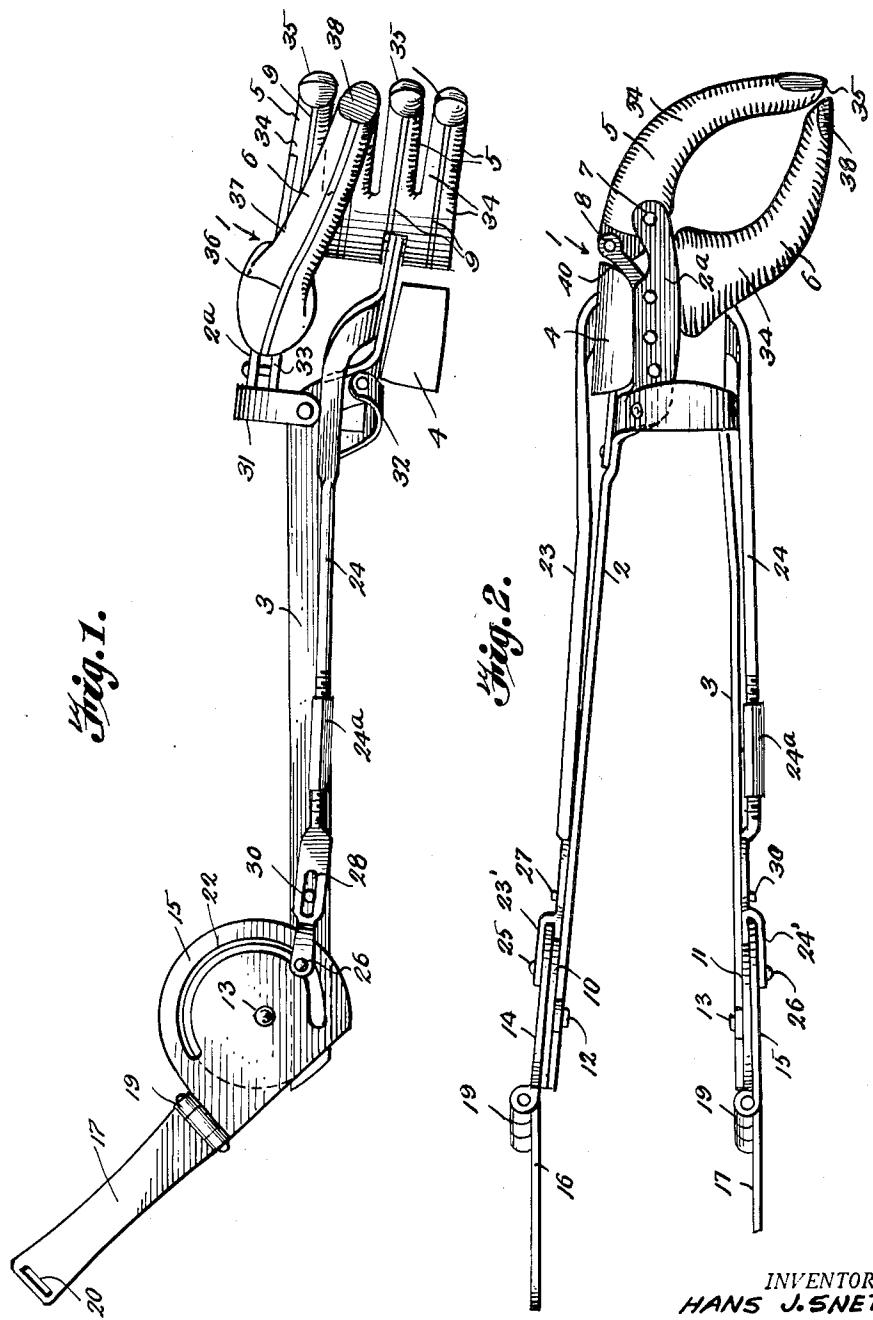
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2,629,106

ARTIFICIAL HAND

Filed March 5, 1951

4 Sheets-Sheet 1



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Fig. 3.

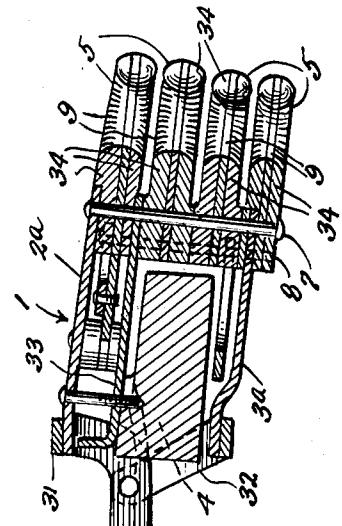


Fig. 4.

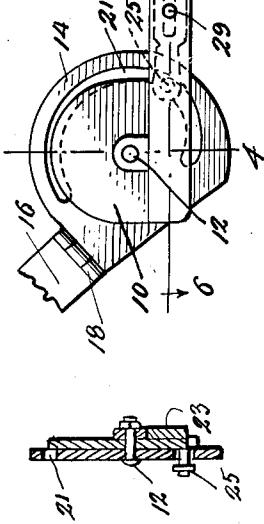
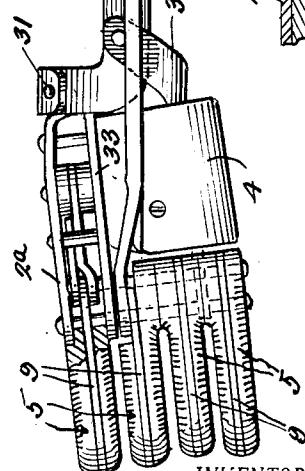
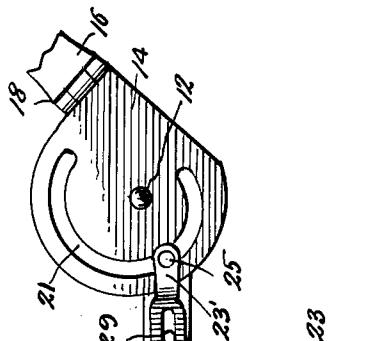


Fig. 5.



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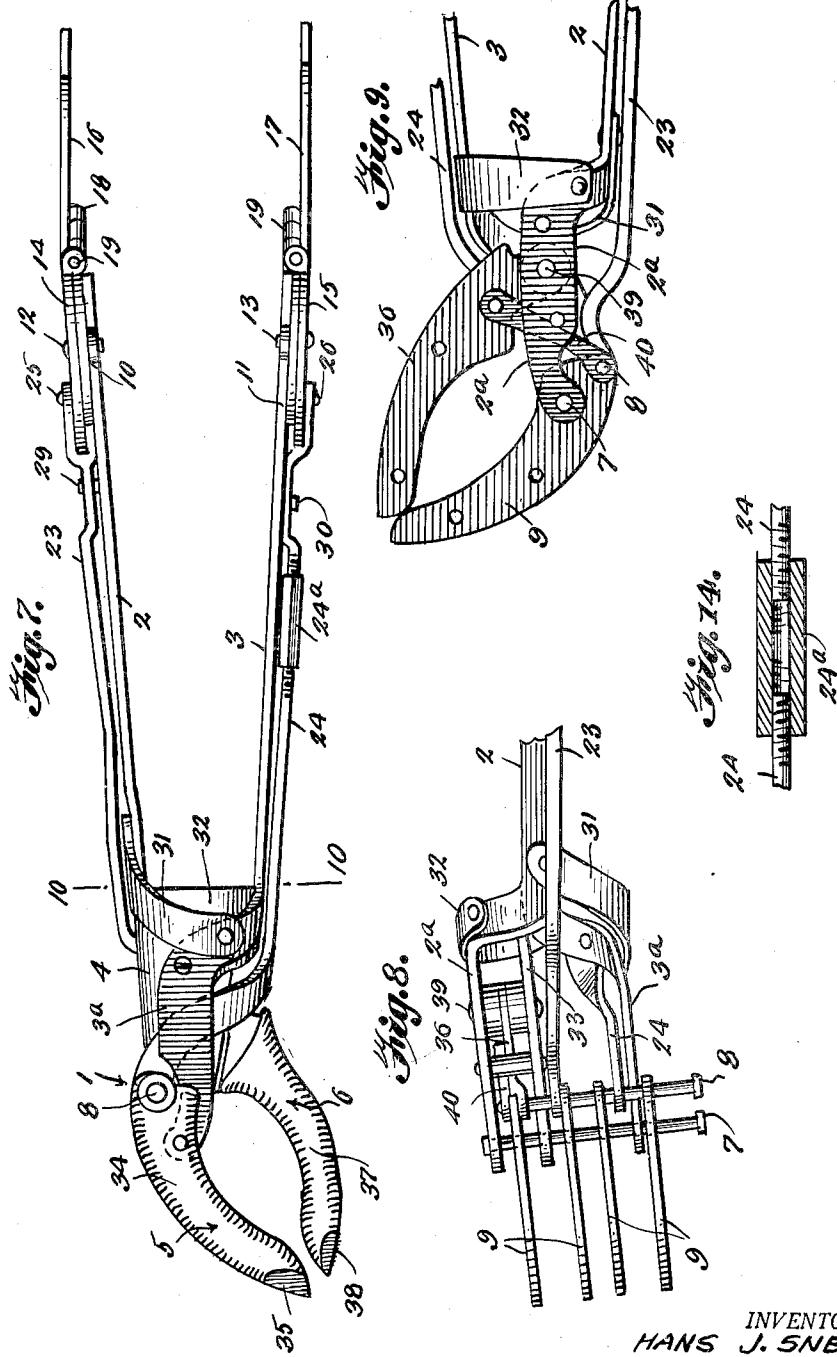
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4 Sheets-Sheet 3



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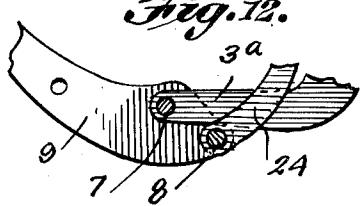
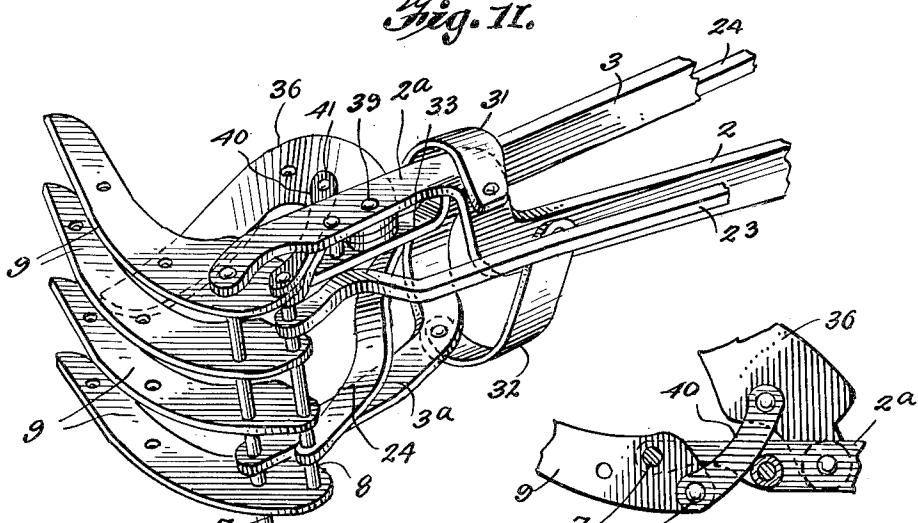
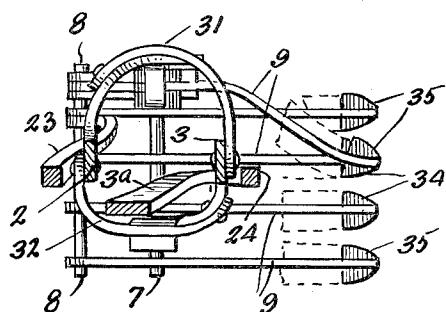
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Filed March 5, 1951

4 Sheets-Sheet 4



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ARTIFICIAL HAND

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3 Claims. (Cl. 3—12.6)

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This invention relates to an artificial hand and it is one object to provide an artificial hand which may be applied to an arm amputated below the elbow and firmly held in place, the arm-engaging portion of the artificial hand being of such construction that a person may bend his arm at the elbow without interference by arm engaging members which extend from the hand along opposite sides of the arm.

Another object of the invention is to provide an artificial hand having fingers of such construction that when a person wearing the hand bends his arm at the elbow the thumb and fingers of the artificial hand will move in a closing direction and thus permit a glass, pencil, or other article to be grasped and held until the arm is moved in a straightening direction which causes the thumb and fingers to move towards an extended position.

Another object of the invention is to provide an artificial hand wherein movement of the fingers and thumb in opening and closing directions is controlled by strips or rods extending longitudinally of side bars extending rearwardly from the hand, the said strips being shifted longitudinally by cams forming portions of hinged connections between the side bars and companion bars which are secured against opposite side portions of a person's upper arm.

Another object of the invention is to provide an artificial hand which may be entirely formed of metal and wood or other suitable material and is enclosed in leather so that it will resemble a natural hand, the thumb and fingers terminating in plates representing finger nails.

The invention is illustrated in the accompanying drawings wherein:

Fig. 1 is a side view of the improved artificial hand.

Fig. 2 is a view looking down upon Figure 1.

Fig. 3 is a view showing the artificial hand partially in longitudinal section and partially in elevation.

Fig. 4 is a sectional view through the joint of the mounting bars at one side of the artificial hand taken along the line 4—4 of Figure 3.

Fig. 5 is a side elevation looking at the opposite side of the artificial hand from that shown in Figure 1.

Fig. 6 is a fragmentary sectional view taken along the line 6—6 of Figure 3.

Fig. 7 is a bottom plan view of Figure 5.

Fig. 8 is a view looking at the inner side of the hand with the wooden portions removed.

Fig. 9 is a view looking down upon Figure 8.

Fig. 10 is a transverse sectional view taken along the line 10—10 of Figure 7.

Fig. 11 is a perspective view of the hand with wooden elements removed.

Fig. 12 is a fragmentary view of the first finger and operating members therefore.

Fig. 13 is a fragmentary view showing portions of the thumb and the first finger and actuating means therefore.

Fig. 14 is a fragmentary view showing a turn buckle connection for portions of the operating rod for the thumb.

This improved artificial hand is intended to be applied to a person's arm which has been amputated at the wrist or between the wrist and the elbow and consists of a hand 1 which is held in place against the arm by bars 2 and 3 extending along opposite sides of the arm. The hand has a body portion 4 formed of wood, plastic, or other suitable material and forming the back and palm portions of the hand. The fingers 5 and the thumb 6 are pivotally mounted at their rear or inner ends and mechanism is provided for causing them to have pivotal movement in opening and closing directions when the person wearing the artificial hand moves his arms at the elbow. The fingers and the thumb are spaced from the body portion 4 sufficiently to permit movement relative to the body portion and in advance of the body portion are rods 7 and 8 with which plates or strips 9 forming portions of the fingers are pivotally connected. The bars 2 and 3 extend longitudinally of the hand at opposite sides thereof and project rearwardly therefrom, the length of these side bars being such that they will extend to the elbow joint of a person's arm. At their rear ends, the side bars carry semi-circular hinge plates 10 and 11 which are welded or otherwise firmly secured to the bars and carry pins 12 and 13 which pass through companion hinge plates 14 and 15 and pivotally mount the same. Strips 16 and 17 are pivoted to the hinge plates 14 and 15 by hinges 18 and 19 for tilting movement transversely thereof to folded and extended positions, and these strips are formed with a slot 20 for receiving straps by means of which the bars are to be secured along opposite sides of a person's upper arm. Therefore when a person wearing the false hand moves his arm at the elbow the hinge plates 14 and 15 will be held stationary and the companion hinge plates 10 and 11 turned, the side bars 2 and 3 and the hand having a natural swinging movement relative to the upper arm. Slots 21 and 22 are formed circumfer-

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tially of the hinge plates 14 and 15. It should be noted that these slots are not circular but each constitutes substantially a portion of an ellipse and one end is closer to the pivot pin than its other end. Therefore the slots form cams which gradually increase in distance from the pivot pins and bars or strips 23 and 24 carrying pins 25 and 26 which pass through the slots will be shifted longitudinally of the side bars and the hand when the bars 2 and 3 are swung about their pivots. A turnbuckle 24a is interposed in the bar 24 in order that it may be shortened or lengthened when necessary. The rear portions of the strips or bars 23 and 24 are formed with longitudinally extending slots 27 and 28 through which pass pins 29 and 30 to limit longitudinal movement of the strips. The pins 25 and 26 are mounted in forks 23' and 24' formed at ends of the strips 23 and 24 and straddling the marginal edge portions of the hinge plates 14 and 15 to prevent the strips from being shifted transversely of the hinge plates and thereby hold the companion hinge plates close to each other during turning movement.

The forward portion of the side bar 2 is bent to form an offset portion 2a extending forwardly at the thumb-side of the hand and the forward portion of the side bar 3 is bent to form a similar offset portion 3a at the opposite side of the hand. Transversely extending curved strips 31 and 32 extend between bars 2 and 3 and form a loop constituting a brace for the wrist portion of hand. Inwardly of and parallel to the end portion 2a is a strip 33 held spaced from 2a by a finger 34 at its rear end. The portions 2a and 33 form forks at the front end of bar 2. Front ends of the two side bars and the strip 33 project forwardly from the back and palm portions of the hand, and in these forwardly protruding ends are formed transverse openings to receive the pins or rods 7 and 8.

The four fingers 5 and the thumb 6 are curved longitudinally in a curvature corresponding to the natural curvature of the fingers and thumb of a person's hand, as shown in Figures 2 and 7. Each finger consists of the metal plate 9 formed of stiff metal and having shapers 34, formed of wood or other suitable material secured to their opposite side faces so that the fingers will conform to the shape of a person's fingers. At their front ends the plates or strips 9 carry transversely disposed plates 35 representing finger nails. The plates or strips 9 gradually increase in width towards their rear ends, as do also the shapers 34 and through these rear portions of the fingers are formed openings to receive the rods 7 and 8 which pivotally mount the fingers and allow the fingers to be tilted about the rod 7 from an opened position to a closed position. The rod 7 is stationary but the rod 8 is movable with the side strips 23 and 24 and when these strips are shifted longitudinally the fingers will be tilted about the rod 7 and moved to the opened and closed positions according to which direction the strips 23 and 24 move.

The thumb is similar in construction to the fingers and has a curved strip or plate 36 carrying shapers 37 and an end plate 38 representing a thumb nail. The shapers 37 have their rear ends spaced from the rear end of the plate 36 and this rear end portion of the plate is pivotally mounted upon a pin 39 extending between the forks formed by the strip 33 and the forward portion 2a of the side bar 2. A link 40 extends diagonally between the forks and has its 75

lower ends pivoted upon the rod 8 and its other end pivotally connected with the plates 36 by a pin 41. Spacers 42 fit about the pin 39 at opposite sides of the plate or strip 36. Front ends 5 of the strips or bars 23 and 24 are pivoted upon the rod 8, and from an inspection of Figures 8 and 11 it will be seen that when the bars 23 and 24 are thrust forwardly by action of the cam plates 14 and 15 the fingers will be tilted towards a closed position and during this closing movement of the fingers pull will be exerted upon the link 40 to cause forward tilting movement or closing movement of the thumb. Since the forward portions of the side bars 2 and 3 bent as shown the hand is disposed in a plane at 90 degrees to the plane of the main portions of the bars 2 and 3 and the rods 23 and 24 and the hand disposed in natural position for grasping a glass of water or the like, and in addition the thumb and fingers have such relation to each other that a pencil or other small object, may be grasped between the thumb and adjacent fingers in the same manner in which such an object would be grasped between the thumb and fingers of a natural hand. A water glass or other large object will be grasped between the thumb and all of the fingers.

When this artificial hand is in use it is applied to the forearm from which the hand or the hand 30 and a portion of the forearm has been amputated with the side bars extending rearwardly along the forearm and the strips 16 and 17 secured against opposite sides of the upper arm. The hinge joints between the side bars 2 and 3 and the strips 16 and 17 are located at the elbow so that when a person wearing the artificial hand bends his arm at the elbow the cam plates 14 and 15 will be turned about their pivots and the side strips or bars 23 and 24 moved longitudinally 35 of the side bars 2 and 3. When the side bars or strips 23 and 24 are shifted forwardly by bending the arm at the elbow the fingers are tilted towards a closed position and the thumb tilted towards the fingers for grasping a small or large object between the thumb and the fingers, and after a glass or cup has been grasped the arm may then be swung upwardly at the shoulder and the glass moved into position for drinking from the same. The arm is then swung downwardly 40 until the glass or cup is at rest upon a table and the arm straightened to move the thumb and fingers away from each other to an opened or releasing position. Since the side strip 24 is in the form of front and rear rods connected by a turnbuckle 24a adjustments may be made to cause the thumb to be in proper relation to the first and second fingers for gripping a pencil, pin or other small article when in the closed position. It will be understood that the back and 45 palm portions of the hand and the shapers of the fingers and thumb may be formed of wood, plastic, or other suitable material and that the hand may be encased in a glove or similar covering of thin leather, fabric, rubber, or the like 50 to impart a natural appearance to the hand.

Having thus described the invention, what is claimed is:

1. An artificial hand comprising a body having a portion constituting the back of a hand and a portion constituting the palm of the hand, side bars extending rearwardly from palm and back portions of the body for disposition along opposite sides of a person's forearm, actuating strips extending along the side bars and slidably longitudinally thereof, members adapted to be

secured along sides of a person's arm above the elbow and having front ends pivoted to rear ends of the said side strips and adapted to impart sliding movement to the actuating strips when a person's arm is bent at the elbow, front and rear pins extending transversely of the hand in front of said body and carried respectively by front ends of the side bars and the actuating strips, longitudinally curved fingers pivoted upon the front pin and connected with the rear pin to impart opening and closing movements to the fingers when the side strips are shifted longitudinally, a thumb pivoted to the front end portion of one side bar in rearwardly spaced relation to the fingers, a link extending between and pivotally connected with the first finger and the thumb to impart opening and closing movements to the thumb when the side strips are shifted longitudinally and the fingers moved.

2. An artificial hand comprising inner and outer side bars, the front end portion of the outer side bar being provided with forks, inner and outer side strips slideable along the side bars, means for shifting the side strips longitudinally along the side bars when a person's arm to which the artificial hand is applied is bent at the elbow, a fulcrum pin carried by front ends of the side bars and extending transversely of the hand between the side bars longitudinally curved fingers pivoted upon the fulcrum pin for tilting movement to opened and closed position, a pin carried by the front ends of the side strips and extending between the same transversely of the hand and passing through rear ends of said fingers to tilt the fingers when the side strips are shifted longitudinally, a longitudinally curved thumb having its rear end pivoted between forks of the outer side bar and being lo-

cated back of the forefinger and the second finger and extending forwardly in crossing relation thereto, and a link extending between and pivoted to the first finger and said thumb for tilting the thumb to opened and closed positions in timed relation to movements of the fingers when the strips are shifted longitudinally and the fingers moved.

3. An artificial hand comprising a body, fingers pivotally mounted for movement to opened and closed positions, a thumb pivotally mounted for movement to opened and closed positions, means for imparting opening and closing movements to the thumb and the fingers, the thumb and the fingers each consisting of a single stiff plate extending longitudinally thereof and curved longitudinally and having flat side faces, shaper-blocks mounted against opposite side faces of the plate and having transversely arcuate outer side faces, and a plate forming a finger nail carried by the front end of the longitudinally extending plate with portions projecting from opposite side faces thereof in overlapping relation to front ends of the shapers and having its forward portion projecting forwardly from the shapers and the longitudinal plate.

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