Feb. 10, 1931. A. PECORELLA 1,792,183

ARTIFICIAL LIMB

Original Filed Aug. 29, 1927 2 Sheets-Sheet 1

Fig. 1.

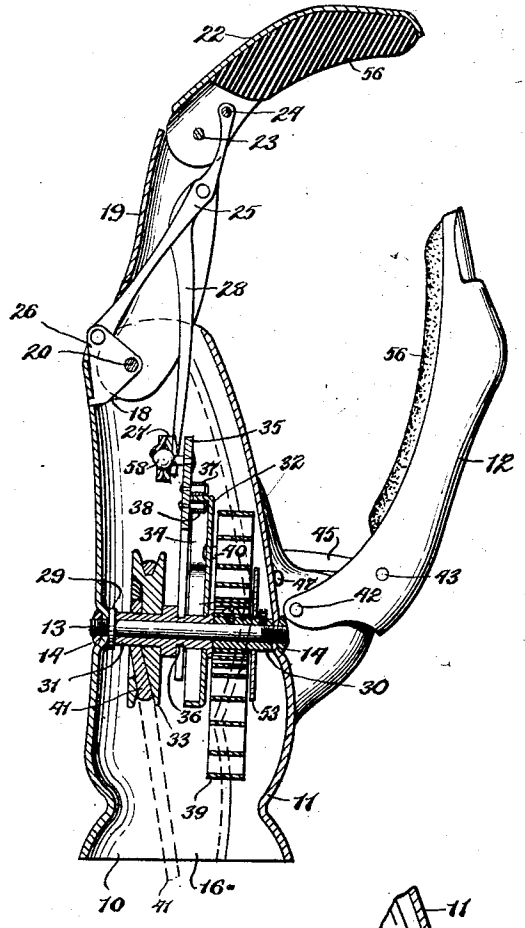


Fig. 3.

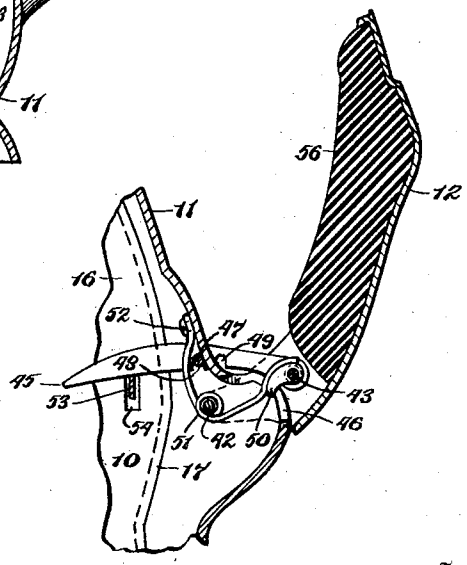
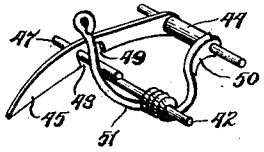


Fig. 4.



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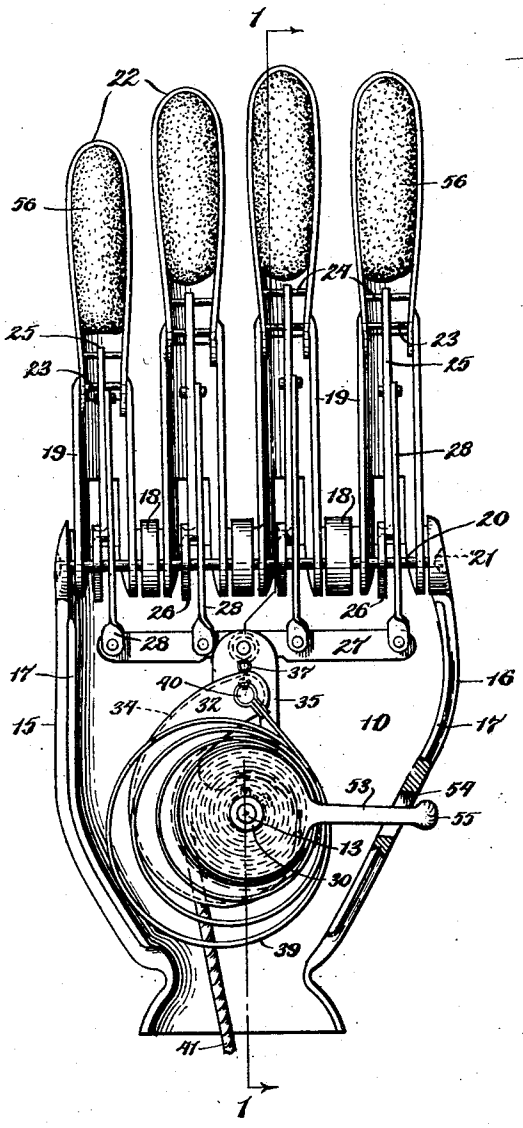
Attorneys

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ARTIFICIAL LIMB

Original Filed Aug. 29, 1927 2 Sheets-Sheet 2

Fig. 2.



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1,792,183

UNITED STATES PATENT OFFICE

ALBERTO PECORELLA, OF BUFFALO, NEW YORK

ARTIFICIAL LIMB

Application filed August 29, 1927, Serial No. 216,023. Renewed December 4, 1929.

This invention relates to an artificial limb and more particularly to a limb which is designed to replace the wrist and hand of a person.

The principal object of this invention is to provide such a limb which is simple and durable in construction and operation, is inexpensive of construction and is capable of being readily and quickly adjusted to different positions and capable of reliably holding articles of different shapes.

In the accompanying drawings:

Figure 1 is a vertical section taken on line 1—1, Fig. 2, and showing the hand in a partially closed position.

Figure 2 is a front elevation of the limb showing the plate carrying the thumb removed and the fingers in a fully opened position.

Figure 3 is a fragmentary longitudinal section through the thumb.

Figure 4 is a perspective view of a portion of the thumb adjusting mechanism.

Similar reference numerals refer to like parts in each of the several views.

In its general organization, this invention comprises four jointed fingers and a thumb pivotally mounted on a metal palm spring means for closing fingers, a cord operating to extend said fingers, a ratchet mechanism for holding the thumb in three different positions and means for releasing said ratchet mechanism.

The several parts of the artificial limb are preferably made of metal and include a palm composed of a rear section 10 which is shaped to conform to the shape of the back of the hand of a person and carries the articulated fingers, and a front section 11 which is shaped to conform to the inner side of the hand of a person and carries the thumb 12. These two sections 10 and 11 are joined by a spindle 13 which is arranged perpendicularly to the plane of the palm and is threaded at its opposite ends, nuts 14 being applied to the ends of this spindle and forming a tie bolt which holds the sections together. The nuts are preferably sunk below the surface of the palm so that the palm presents a smooth surface. To maintain the sections in their proper relative position, the sides 15, 16 of the rear palm section 10 are preferably provided on their inner sides with flanges 17 which engage the inner sides of the front or inner palm section 11 and prevent its lateral displacement.

Partitions 18 are formed on the inner side of the rear palm section 10 at the upper end thereof and together with the sides 15, 16 of this section, form the supports for the jointed fingers which are arranged between these partitions. Inasmuch as all of the fingers and the linkage for operating the same are substantially identical in construction, the following description of one will apply to each of the fingers.

The numeral 19 represents a hollow inner or rear finger section which is pivotally connected at its inner or rear end with the palm so as to be capable of swinging inwardly and outwardly relative thereto, this pivotal connection being preferably effected by a pivot rod 20 extending through the inner parts of the several finger sections and supported throughout its length by the sides 15 and 16 of the rear palm section and the partitions 18, therebetween. This rod is preferably held in place by counter sunk nuts 21 so as to be readily removable.

The numeral 22 represents the outer finger section of each finger and preferably conforms in shape to the second and third finger section of a hand. This outer or front finger section is mounted on a transverse pin 23, which is arranged adjacent the knuckle of the fingers so that this outer finger section can be folded outwardly and inwardly relative to the inner finger section and the palm. The knuckle formed by the two finger sections is formed to simulate the knuckle of a hand in all positions of the fingers.

Above and in front of the pin 23 connecting the two finger sections, is a second transverse pin 24 to which is pivotally secured a link 25. The other end of this link is pivotally connected with a triangular anchoring member 26 which is secured to the pivot rod 20 and is confined between the sides of the finger. One face of this triangular member bears against the inner face of the palm and

it is thereby held against turning. The length of the several links 25 is proportioned to secure a natural opening and closing of the hand when they are simultaneously forced upwardly or downwardly.

Within the palm is arranged a transverse bar 27 to which are pivotally connected four links 28 each of which pivotally connects at its upper end with the central part of the corresponding link 25. It, therefore, follows that when this transverse bar is moved upwardly or downwardly, a corresponding opening and closing movement of the fingers is effected.

The opening and closing of the fingers is effected by means which preferably are constructed as follows:

Rotatably mounted on the spindle 13 and retained in position thereon by a fixed collar 29 and an adjustable collar 30, is a sleeve 31 which carries a cam 32 and a wheel 33, these members being secured to the sleeve in any suitable manner. This cam 32 is of snail form and includes a cam rim 34 which projects towards the wheel 33. A bifurcated longitudinally movable bar 35 is pivotally connected at its upper end to the central part of the transverse bar 27 and at its lower end is arranged between the cam and the wheel with its legs straddling the sleeve 31, the sleeve being preferably provided with a reduced portion 36 so as to properly guide the bifurcated bar in its movement. The pivotal connection between the bifurcated bar 35 and the transverse bar 27 is preferably a universal connection such as a ball and socket connection 58 so as to permit free movement of the parts. On its front side this bifurcated bar carries two rollers 37 and 38 which engage opposite sides of the cam rim 34 of the cam so that upon oscillating the cam the bifurcated bar 35 is moved up or down, thereby effecting a corresponding movement of the transverse bar 27 and articulating the fingers. The fingers are normally held in their closed position by a coil spring 39 which is arranged in front of the cam, its inner end being fixed to the spindle 13 in any suitable manner, and its outer end being secured to a pin 40 on the salient part of the cam. The spring 39 tends constantly to turn said cam to the position in which its receding portion engages the lower roller 38 and thereby tends to keep the fist closed.

To move the cam against the resistance of the spring and thereby cause the cam rim to engage the upper roller 37 and open the fingers, the wheel 33 is provided with a channeled rim on which a cord 41 is adapted to be wound. This cord may be secured to the wheel in any suitable manner, and is wound upon the wheel by the spring whenever the cord is released and the fingers permitted to close. Therefore, when it is desired to open the fingers for grasping an object, the cord is drawn outwardly, the open fingers placed about the object and the cord released, thereby permitting the fingers, under the influence of the cam and spring to grasp the object. This cord may be attached to a harness (not shown) by which its movement is controlled through movement of the shoulders of the wearer in a manner well known in the art.

The hollow thumb 12 is mounted on a pin 42 on the front palm section and is preferably arranged to swing in the same plane and contact with the end of the index finger so that objects such as coins, pins etc., can be readily picked up. Within the base portion of the thumb is arranged a transverse pin 43 which carries a sleeve 44. To this sleeve is secured a latch 45 which projects through an opening 46 in the front palm section over a pin or catch 47 mounted on this palm section. This latch is provided with two recesses 48 and 49 which are disposed so as to ride over the catch pin 47 when the thumb is moved inwardly but prevent return movement of the thumb. By the provision of these two notches the thumb may be adjusted to a fully open position in which neither of the notches engage the catch 47, a half closed position or a fully closed position.

To hold the latch against the catch and also to exert an outward pressure against the thumb so that upon raising the latch, the thumb will open, a depending finger or tail piece 50 is secured to the sleeve 44 and is pressed downwardly and outwardly by a spring 51. This spring is secured to the inner side of the front palm section by a rivet 52 or otherwise, is coiled about the pivot pin 42 which pivotally supports the thumb and the free end of this spring bears against the rear side of the tail piece 50. By this means, a single spring is employed to hold the latch against the catch and also to move the thumb outwardly when the latch is released.

The latch is released by a lever 53 which is pivotally supported at its front end on the adjustable collar 30 in front of the coil spring 39 and projects outwardly through a slot 54 provided in the thumb side of the rear palm section 10. This lever is provided with a knob 55 for convenient manipulation and is arranged under the rear or outer end of the latch 45 so that upon raising this lever, the latch is moved upwardly and disengaged from the catch pin and the thumb thereby opens under the influence of the spring 51.

To render the hand more natural and also to provide cushioning means at the tips of the fingers, sponge rubber inserts 56 are preferably provided at the outer ends of the fingers.

As a whole, this invention is very simple, considering the function which it performs, it is relatively inexpensive to manufacture,

is durable, readily and accurately performs its functions, and is not liable to get out of order with constant use.

I claim as my invention:

1. An artificial limb comprising a palm, a plurality of fingers pivotally mounted on said palm, a transverse bar arranged in said palm, rigid links pivotally connecting said bar and fingers whereby upon moving said bar lengthwise of said palm said fingers are articulated, a rigid guided member pivotally secured to the central part of said bar, cam means for moving said rigid guided member to reciprocate said bar, spring means yieldingly holding said cam means in one extreme position and means for moving said cam means in the opposite direction.

2. An artificial limb comprising a palm, a plurality of fingers pivotally mounted on said palm, a transverse bar arranged in said palm, links pivotally connecting said bar and fingers whereby upon moving said bar said fingers are articulated, a member pivotally secured to the central part of said bar, means providing opposed shoulders on one side of said member, a cam arranged in said palm and including a cam rim arranged between said shoulders whereby upon oscillating said cam, said member is actuated to articulate said fingers, a spring cooperating with said cam to yieldingly hold it in one extreme position and means for moving said cam against the resistance of said spring.

3. An artificial limb comprising a palm, a plurality of fingers pivotally mounted on said palm, a transverse bar arranged in said palm, links pivotally connecting said bar and fingers whereby upon moving said bar, said fingers are articulated, a longitudinally movable bar pivotally secured to the central part of said transverse bar, means for guiding said bar, a pair of rollers provided on said bar, a cam member arranged in said palm and including a cam rim arranged between said rollers whereby upon oscillating said cam, said longitudinally movable bar is actuated to articulate said fingers, a spring cooperating with said cam to yieldingly hold it in one extreme position and means for moving said cam against the resistance of said spring.

4. An artificial limb comprising a palm, a plurality of fingers pivotally mounted on said palm, a transverse bar arranged in said palm, links pivotally connecting said bar and fingers whereby upon moving said bar said fingers are articulated, a spindle arranged in said palm perpendicularly to the plane thereof, a longitudinally movable bar pivotally secured to the central part of said transverse bar and provided with a slot receiving said spindle, a cam mounted on said spindle and cooperating with said longitudinally movable bar to articulate said fingers, a spring carried by said spindle and yieldingly holding said cam in one position, and means for moving said cam against the resistance of said spring.

5. An artificial limb comprising a palm, a plurality of fingers pivotally mounted on said palm, a transverse bar arranged in said palm, links pivotally connecting said bar and fingers whereby upon moving said bar, said fingers are articulated, a spindle arranged in said palm perpendicularly to the plane thereof, a longitudinally movable bar pivotally secured to the central part of said transverse bar and provided with a slot receiving said spindle, a sleeve mounted on said spindle, a cam fixed on said sleeve and cooperating with said longitudinally movable bar to articulate said fingers, a coiled spring carried by said shaft and secured at one end to said cam to yieldingly hold said cam in one position and means carried by said shaft for moving said cam against the resistance of said spring.

6. An artificial limb comprising a palm, a plurality of fingers pivotally mounted on said palm, a transverse bar arranged in said palm, links pivotally connecting said bar and fingers whereby upon moving said bar, said fingers are articulated, a spindle arranged in said palm perpendicularly to the plane thereof, a longitudinally movable bar pivotally secured to the central part of said transverse bar and provided with a slot receiving said spindle, a sleeve mounted on said spindle, a cam fixed on said sleeve and cooperating with said longitudinally movable bar to articulate said fingers, a coiled spring carried by said shaft and secured at one end to said cam to yieldingly hold said cam in one position and means carried by said shaft for moving said cam against the resistance of said spring, comprising a wheel fixed to said sleeve, and a cord secured to said wheel and adapted to be wound on the periphery thereof.

7. An artificial limb comprising a palm, a plurality of fingers pivotally mounted on said palm, a transverse bar arranged in said palm, links pivotally connecting said bar and fingers whereby upon moving said bar, said fingers are articulated, a spindle mounted in said palm perpendicularly to the plane thereof, a sleeve on said spindle, said sleeve being formed to provide a reduced portion, a longitudinally movable bar pivotally secured to the central part of said transverse bar and provided with a slot receiving the reduced portion of said sleeve, a cam fixed to said sleeve and cooperating with said longitudinally movable bar to articulate said fingers, a coiled spring secured at one end to said spindle and at its other end to said cam and yieldingly holding said cam in one position, a wheel fixed to said sleeve, and a cord secured to said wheel and adapted to be wound on the periphery thereof whereby said cam may be turned against the resistance of said spring.

8. An artificial limb comprising a palm, a

plurality of fingers pivotally mounted on said palm, a transverse bar arranged in said palm, links pivotally connecting said fingers and bar whereby upon moving said bar, said fingers are articulated, a spindle mounted in said palm perpendicularly to the plane thereof, a sleeve on said spindle, a bifurcated bar pivotally secured to the central part of said transverse bar and straddling said sleeve, opposed shoulders on said bifurcated bar, a cam fixed to said sleeve and having a cam rim interposed between said shoulders whereby upon oscillating said cam said bifurcated bar is moved to articulate said fingers, a coiled spring fixed to said spindle and secured at its outer end to said cam and yieldingly holding said cam in one extreme position, a wheel fixed to said sleeve and a cord secured to said wheel and adapted to be wound on the periphery thereof whereby said cam may be moved against the resistance of said spring.

9. In an artificial limb, a palm, a thumb pivotally secured to said palm, means for holding said thumb in different positions, and a single spring cooperating with said thumb and holding means to hold said holding means in operative position and to yieldingly hold said thumb in an outwardly extended position.

10. In an artificial limb, a palm, a thumb pivotally secured to said palm, latch means for holding said thumb in different positions relative to said palm, and a single spring bearing against said latch means and yieldingly holding it in operative position and exerting an outward pressure on said thumb, to yieldingly hold said thumb in an outwardly extended position.

11. In an artificial limb, a palm, a thumb pivotally mounted on said palm, a latch pivotally mounted on said thumb and having a notch, a catch on said palm adapted to engage the notch in said latch, a finger operatively connected with said latch and a spring secured to said palm and exerting an outward pressure against said finger, thereby to yieldingly hold said latch in engagement with said catch and said thumb in its outwardly extended position.

12. In an artificial limb, a palm, a pivot pin mounted on said palm, a thumb mounted on said pivot pin, a latch pivotally mounted on said thumb and having a notch on its underside, a catch on said palm adapted to be engaged by said latch, a depending finger operatively connected with said latch, and a spring secured to said palm and bearing against said pivot pin and finger, thereby to yieldingly hold said latch in engagement with said catch and to exert an outward pressure against said thumb.

13. In an artificial limb, a palm, a thumb pivoted on said palm, a spindle mounted in said thumb, a sleeve on said spindle, an inwardly extending latch fixed to said sleeve; a catch on said palm engaged by said latch, a depending finger fixed to said sleeve and a spring secured to said palm and exerting an outward pressure against said finger.

14. In an artificial limb, a palm, a plurality of fingers pivotally mounted on said palm, a spindle arranged in said palm perpendicularly to the plane thereof, means for articulating said fingers carried by said spindle, a thumb pivotally secured to said palm, a latch pivotally mounted on said thumb, a catch mounted on said palm and engaged by said latch, spring means yieldingly holding said latch against said catch and yieldingly holding said thumb in its outwardly extended position and means for releasing said latch comprising a lever pivotally secured to said spindle and adapted to engage and release said latch.

15. An artificial hand comprising a palm, a plurality of fingers pivotally mounted on said palm, a transverse floating bar arranged in said palm, rigid links pivotally connecting said bar and fingers whereby upon moving said bar said fingers are articulated, a rigid member guided for movement longitudinally of said palm, a pivotal connection between the center of said bar and said guided member, spring means for yieldingly holding said guided member in one extreme of its movement and means for moving said guided member in the opposite direction.

In testimony whereof I affix my signature.

ALBERTO PECORELLA.