Feb. 24, 1953 D. B. BECKER 2,629,107

ARTIFICIAL HAND LOCKING MECHANISM

Filed Feb. 21, 1951 2 SHEETS—SHEET 1

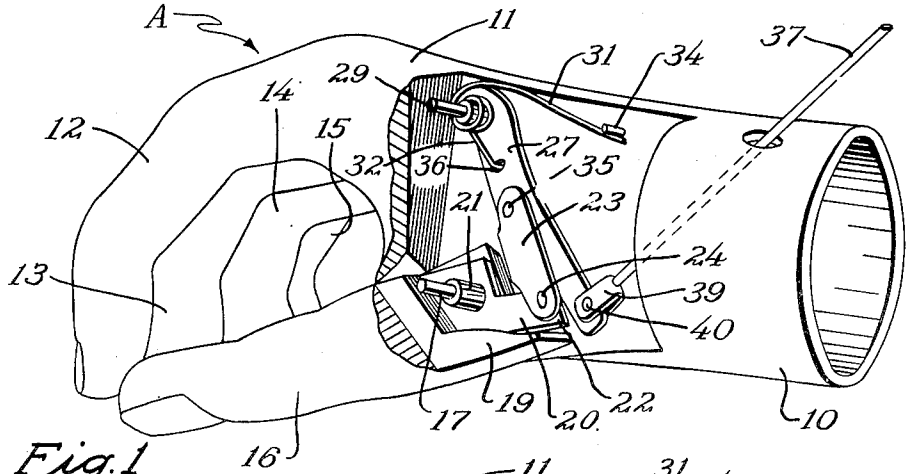

Fig. 1

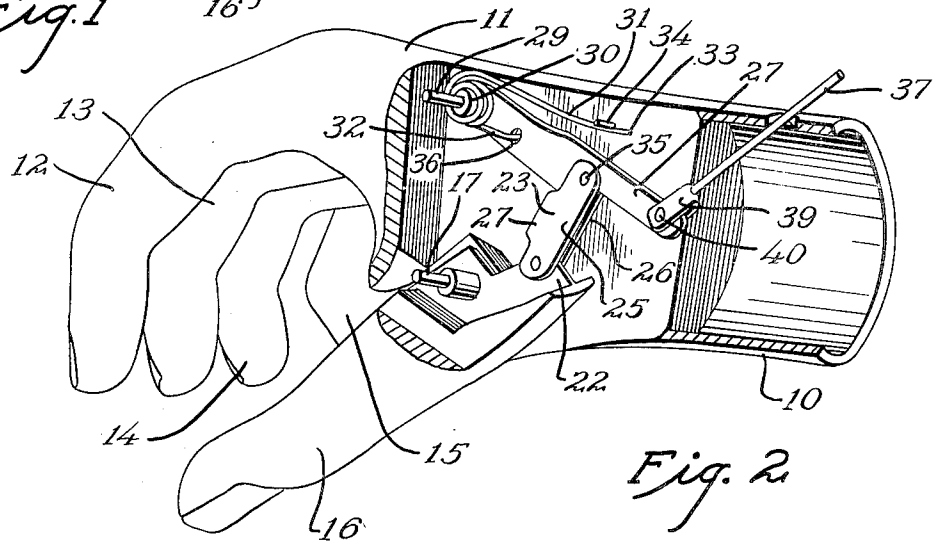

Fig. 2

INVENTOR

Daniel B. Becker

BY Robert M. Dunning

ATTORNEY

Feb. 24, 1953 D. B. BECKER 2,629,107

ARTIFICIAL HAND LOCKING MECHANISM

Filed Feb. 21, 1951 2 SHEETS—SHEET 2

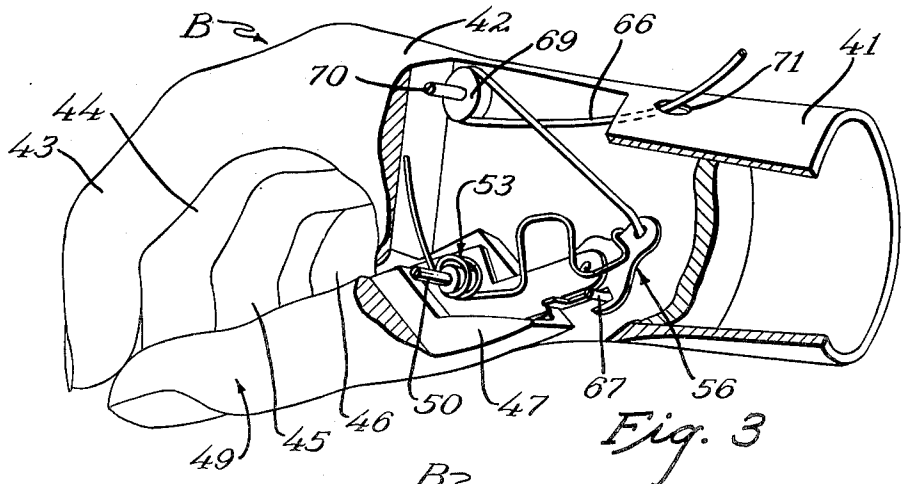

Fig. 3

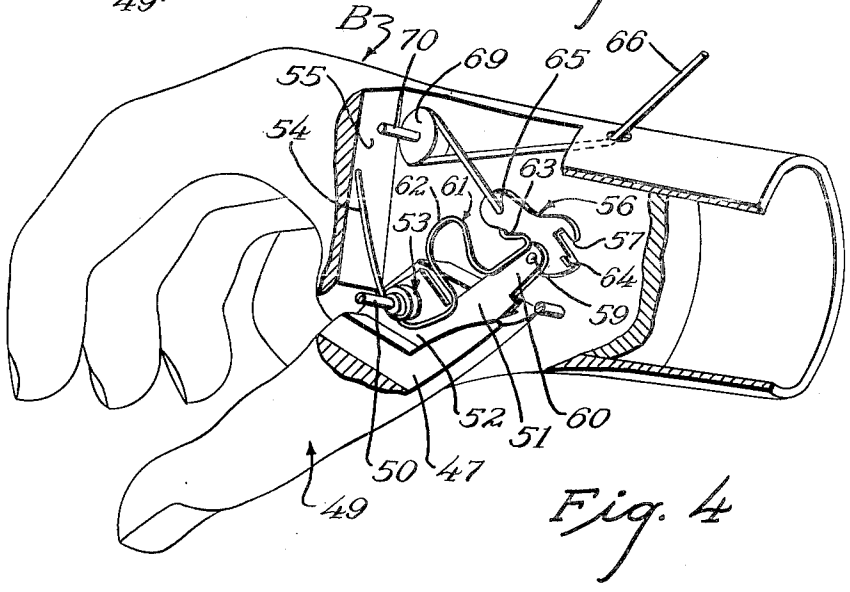

Fig. 4

INVENTOR

Daniel B. Becker

BY Robert M. Dunning

ATTORNEY

Patented Feb. 24, 1953 2,629,107

UNITED STATES PATENT OFFICE

2,629,107

ARTIFICIAL HAND LOCKING MECHANISM

Daniel B. Becker, St. Paul, Minn.

Application February 21, 1951, Serial No. 212,080

3 Claims. (Cl. 3—12.7)

1

My invention relates to an improvement in artificial hand and deals particularly with a locking mechanism for holding the hand in closed position.

Artificial hands are often constructed with the fingers of the hand in a semi-closed position. The fingers are usually rigidly secured to the body of the hand. A thumb is pivotally supported by the hand body for movement toward or away from one or more of the curved fingers. As a result the hand may be used for carrying various articles engaged between the thumb and the body of the hand.

I have found that when such a hand is used for carrying relatively heavy articles, such as suit cases, brief cases, and the like, there is a tendency for the thumb to pivot away from the fingers and permit the article carried to drop. The thumb is usually held in closed position by spring tension. If an extremely strong spring is used for holding the thumb in closed position, considerable effort is required to pivot the thumb into open position. Furthermore, this strong spring pressure has a tendency to exert undue force upon certain objects being held. However, if a relatively light spring is used, the thumb may be pivoted away from the fingers by the weight of an object being lifted.

A feature of the present invention lies in the provision of a hand having a series of fingers attached thereto and including a pivotally supported thumb movable toward or away from one or more of the fingers. This thumb is operated by a mechanism which locks the thumb in closed position so that the thumb can not be pivoted away from the fingers of the hand by the weight of an object held by the hand. With such an arrangement, relatively heavy objects may be carried by the hand without danger that the weight of the object will pivot the thumb into open position.

A feature of the present invention lies in the provision of a linkage for holding the thumb in closed position so that pressure against the thumb can not pivot the thumb. This linkage may be readily operated by the usual means for pivoting the thumb when desired. As a result a much lighter spring may be used to urge the thumb toward closed position, minimizing the effort necessary to pivot the thumb manually and permitting the thumb to be used to hold objects between the thumb and fingers without exerting undue pressure thereupon.

These and other objects and novel features of my invention will be more clearly and fully set forth in the following specification and claims.

In the drawings forming a part of my specification:

Figure 1 is a perspective view of an artificial hand, a portion of the hand body being broken away to disclose the internal mechanism for actuating the thumb.

2

Figure 2 is a view similar to Figure 1 showing the thumb in a different pivotal position.

Figure 3 is a perspective view of a modified form of hand showing a somewhat different mechanism for locking the thumb in closed position.

Figure 4 is a perspective view similar to Figure 3 showing the operating parts in a different relative position.

The hand body A may be of any desired shape and is shown as including a wrist portion 10 designed for attachment to the arm or to an artificial arm section. The wrist portion 10 merges to form the hand body which is illustrated in general by the numeral 11. A series of fingers 12, 13, 14 and 15 are secured to the hand body, these fingers usually being rigidly attached thereto.

A thumb 16 is pivotally connected to the hand body by means of a pivot shaft 17. In the drawings a portion of this pivot shaft 17 is shown projecting beyond the pivoted portion of the thumb. In actual practice the thumb 16 is provided with a flat relatively narrow end 19 which fits into a slot in the hand body and the projecting portion of the pivot 17 is embedded in the portion of the hand body overlying the flattened thumb extremity 19.

An anchoring plate 20 is attached to the thumb and embedded thereinto to form an integral part thereof. A sleeve 21 is attached to the plate 20 to form an integral part thereof. The pivot 17 extends through the sleeve 21 so as to form a bearing for the thumb. The plate 20 is recessed into the flattened portion 19 of the thumb and the sleeve 21 extends flush with the flattened area of the thumb portion 19.

The plate 20 projects beyond the thumb as indicated at 22. A link 23 is pivotally connected to the plate end 22 at 24. As indicated in Figure 2 of the drawings, the link 23 in actual practice comprises a pair of link sides 25 and 26 connected by a short connecting portion 27. The link portions 25 and 26 extend on opposite sides of the plate extension 22 so as to form a firm connection therewith.

An operating lever 27 is pivotally connected to the hand body by means of a pivot 29. The pivot 29 preferably pivots within a sleeve 30 attached to the lever 27. A spring 31 also encircles the pivot 29 and sleeve 30. One end 32 of the spring 31 is anchored to the lever 27, at 36. The other end 33 of the spring 31 is anchored to the hand body by engagement with a stop 34 or by engagement with the hollow interior of the hand body. The spring 31 acts to urge the lever 27 in a clockwise direction as viewed in Figures 1 and 2.

The link 23 is connected to the lever 27 at 35.

The operating cord 37 is provided with a terminal clip 39 which straddles the lever 27 and is pivotally connected thereto at 40. Thus a pull upon the operating cord 37 may pivot the lever 27.

In the operation of my artificial hand, the cord 37 is fastened to a shoulder harness or any other suitable operating means. When a pull is exerted upon the cord 37, the lever 27 is pivoted in a counter-clockwise direction as viewed in the figures. This action causes the link 23 to pivot the thumb 16 about its pivot 17. In Figure 2 of the drawings the thumb is shown pivoted away from the finger 12 by counter-clockwise movement of the lever 27. Movement in this direction is resisted by the spring 31.

When the pulling force is released the spring 31 will swing the lever 27 in a clockwise direction. This motion acts through the link 23 to pivot the thumb 16 against the end of the finger 12. As the thumb swings into closed position shown in Figure 1, the sides 25 and 26 of the link 23 straddle the lever 27 until the pivot 24 connecting the link 23 to the thumb 16 moves into alignment or substantial alignment with the pivots 29 and 35. If desired the lever 27 may be curved sufficiently so that the pivot 35 actually passes dead center position between the pivots 24 and 29.

It will be seen that when the link 23 is in the position illustrated in Figure 1 of the drawings, force against the thumb can not pivot the thumb into open position. Force against the thumb 16 from the inner side thereof tending to swing the thumb toward the position in Figure 2 is directly resisted by the link 32 and the lever 27. If the pivot 35 is past dead center position, such a force against the thumb tends to swing the lever 37 in a clockwise direction and the connection between the link 23 and the lever 27 is such that no such further clockwise movement of the lever can occur. If the pivot 35 is directly between the pivots 24 and 29, the force is transmitted directly to the link and lever and their pivotal connections. Even if the pivot 35 is slightly short of dead center position, the force necessary to actuate the lever will be so great that no ordinary force can pivot the thumb. At the same time, however, the leverage acts very favorably when the thumb is operated by its cord, the leverage decreasing the force often required to pivot the thumb.

In Figures 3 and 4 of the drawings I disclose a modified form of construction which accomplishes a similar result. This modified form of construction is extremely effective in holding the thumb in locked position but usually requires a change in direction of the operating cord.

The hand B may be similar in form to the hand A. The hand B includes a wrist portion 41 which merges into the hand body 42 to which a series of fingers 43, 44, 45 and 46 are attached. The hand body is slotted to accommodate the flattened end 47 of the thumb 49. The thumb 49 is pivotally connected to the hand body by means of a transverse pivot 50.

A plate 51 is embedded into the thumb 49 and securely attached thereto for movement in unison therewith. A sleeve 52 projects from the plate 51 and is firmly attached thereto. This sleeve 52 acts as a bearing for the thumb and the pivot 50 extends through the sleeve to pivotally support the thumb. A spring 53 encircles the sleeve 52 and is provided with one end 54 which bears against the hand body. The drawings show the spring end 54 engaging against an end wall 55 of an internal chamber of the hand within which the thumb actuating mechanism is located.

A latch 56 including a notched portion 57 is pivotally connected at 59 to the projecting end 60 of the plate 51. An end 61 of the spring 53 is looped as indicated at 62 and is provided with an off-set end 63 which engages against the latch 56. The spring 53 tends to rotate the latch 56 in a clockwise direction relative to the plate 51 as viewed in the drawings. A stop 64 on the latch 56 limits pivotal movement of the latch relative to the plate. The latch 56 is apertured as indicated at 65 and the operating cord 66 is anchored to the latch through this aperture 65.

A pin 67 is provided on the hand body beneath the pivot 59 connecting the plate 51 with the latch 56. This pin 67 is engaged by the latch 56 in closed position of the thumb 49. The operating cord 66 extends over the pulley 69 pivotally supported on a pivot 70 and then through a suitable aperture 71, in the wrist portion 41 of the hand. A pull upon the operating cord 66 may act to both release the latch and pivot the thumb in a manner which will now be described. The hand B is normally in the position illustrated in Figure 3 of the drawings, with the latch 56 pivoted in the manner illustrated by the spring 53, and with the notch 57 of the latch engaging the latch keeper pin 67. When a longitudinal pull is exerted upon the operating cord 66, the latch 56 pivots in a counter-clockwise direction until the anchorage point of the cord with the latch aligns with the pivotal connection 59 between the latch and the plate 51. In other words, the thumb 49 remains in closed position until the latch plate 56 pivots about its connecting pivot 59 sufficiently to release the notch 57 in the latch from the keeper pin 67. Further pull upon the operating cord 66 then acts through the latch to swing the thumb 49 about its pivot 50 into the position illustrated in Figure 4 of the drawings.

When the force against the cord is released, a reverse action takes place. The thumb 49 swings into closed position and the spring 53 then swings the latch 56 about its pivot 59 until the latch notch 57 engages the keeper pin 67. External force against the thumb tending to swing the thumb into open position causes the latch 56 to engage against the keeper pin 67 and to prevent outward pivotal movement of the thumb. The notch is so located that pivotal movement of the thumb tends to engage the latch even more firmly with the keeper pin. However, the latch may readily be released manually in the manner previously described.

In accordance with the patent statutes, I have described the principles of construction and operation of my artificial hand construction, and while I have endeavored to set forth the best embodiments thereof, I desire to have it understood that obvious changes may be made within the scope of the following claims without departing from the spirit of my invention.

I claim:

1. An artificial hand construction including a hand body, fingers mounted thereupon, a thumb, pivot joint means carried by said hand body and pivotally supporting said thumb for movement toward and away from said fingers, a lever, a lever pivot joint means carried by said hand body and pivotally supporting one end of said lever, a link element, respective pivot means connecting one end of said link element to said thumb

and the other end thereof to said lever, said lever pivot joint means and said respective link element pivot means being in substantial alignment with each other when said thumb is in engagement with one of said fingers, and cord means connected with said lever for actuating the same.

2. An artificial hand construction including a hand body, fingers mounted thereupon, thumb means pivotally connected to said hand body, a lever pivotally connected to said hand body, link means, respective pivot means connecting said link means with said thumb means and said lever, the portions of said lever and link means residing between the pivotal connection for said lever and the pivot means for said thumb means being substantially normal to the axis of said thumb means when said thumb means is in engagement with one of said fingers, and cord means connected to said lever, said lever having an angled extension to which said cord means is attached.

3. An artificial hand construction including a hand body, fingers mounted thereupon, thumb means having a pivotal connection with said hand body for movement of said thumb means to and from said fingers, articulated means for actuating said thumb means comprising a lever pivotally connected to said hand body and link means pivotally connected adjacent its ends to said

thumb means and said lever, the pivotal connections of said lever and link means having substantially a straight line relation when the distal end of said thumb means resides next to one of said fingers, means biasing said thumb means toward one of said fingers, and cord means connected to said lever, whereby an initial pull on said cord means will upset said straight line relation and further pull causes a progressively greater movement of the distal end of said thumb means away from the fingers as said link means is moved into a straight line relation with said thumb means.

DANIEL B. BECKER.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,362,156	Trautman	Dec. 14, 1920
1,695,952	Dorrance	Dec. 18, 1928
1,929,541	Trautman	Oct. 10, 1933
2,494,460	Trautman	Jan. 10, 1950

FOREIGN PATENTS

Number	Country	Date
120,933	Great Britain	Dec. 2, 1918