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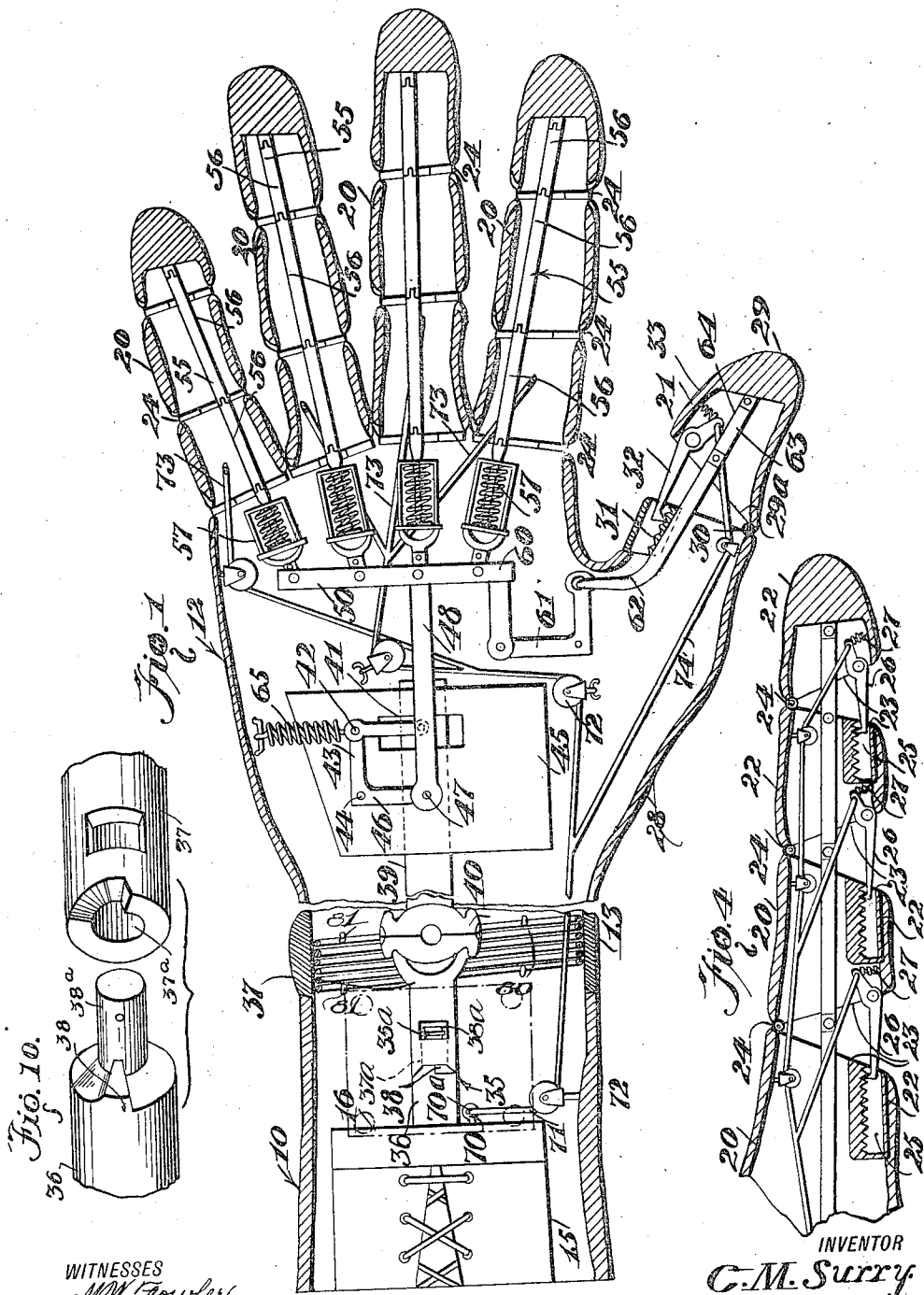
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C. M. SURRY

ARTIFICIAL BODY MEMBER

Filed Oct. 26, 1922

3 Sheets-Sheet 1



WITNESSES
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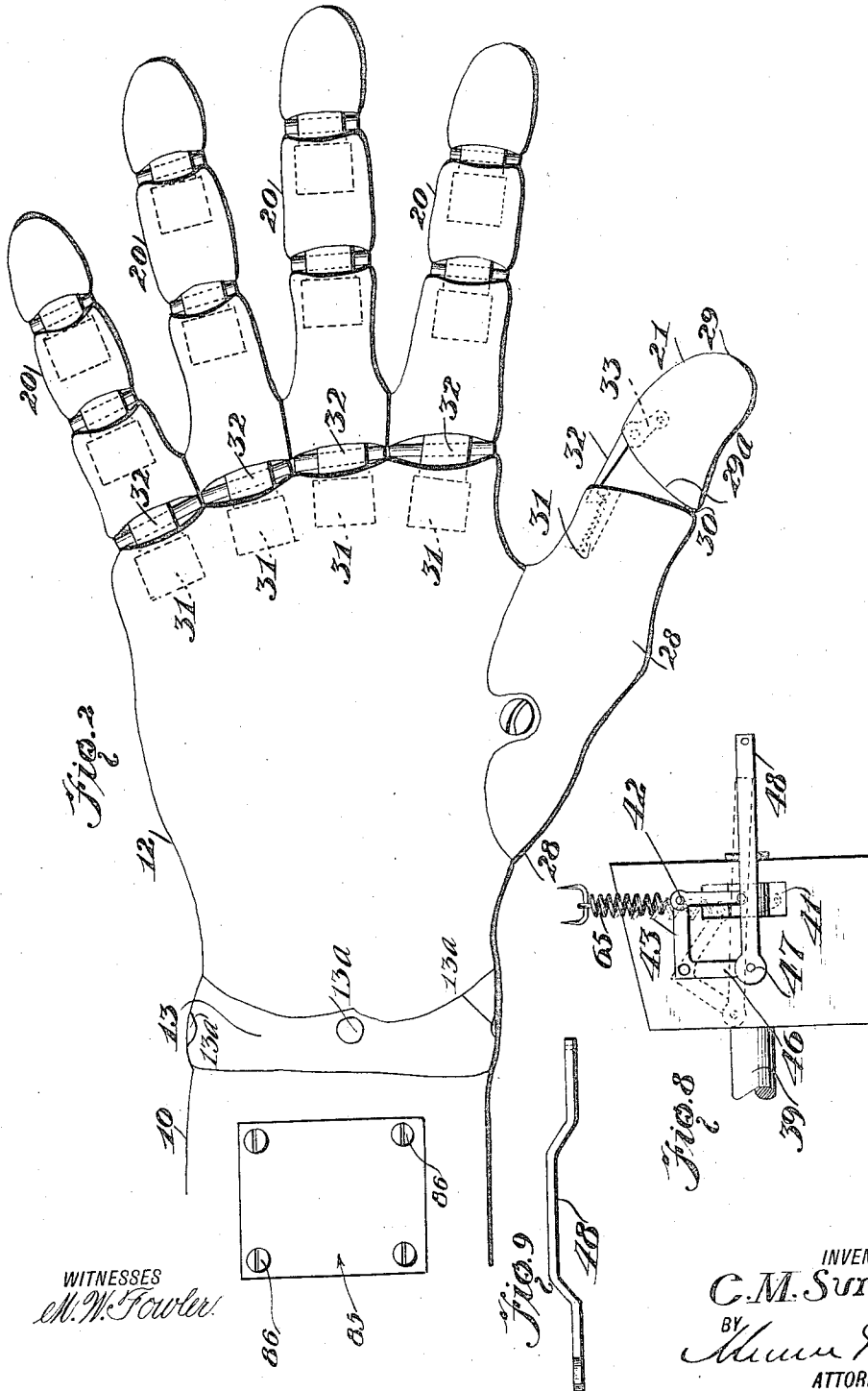
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3 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE.

CYRIL MEREDITH SURRY, OF HAILEYVILLE, OKLAHOMA.

ARTIFICIAL BODY MEMBER.

Application filed October 26, 1922. Serial No. 597,127.

To all whom it may concern:

Be it known that I, CYRIL MEREDITH SURRY, a citizen of the United States, and a resident of Haileyville, in the county of Pittsburg and State of Oklahoma, have invented certain new and useful Improvements in Artificial Body Members, of which the following is a specification.

This invention relates in general to an improvement in artificial body members and more particularly to an improvement in artificial arms and hands.

The object of the invention is to provide an improvement of this character wherein the arm and hand are capable of performing all of the important functions of the human arm and hand and which is at the same time of simple and durable construction, reliable in operation, easy and comparatively inexpensive to manufacture and which closely approximates the appearance of the human hand and arm.

Another object is to provide an improvement of this character wherein the finger members of the hand are so constructed and organized as to be capable of closing around an irregular object with each finger member exerting an individual grip upon the object, the operating means for the finger members being such as to cause them to grip the object to be handled with the desired degree of force and to maintain this grip upon the object without necessitating a continuous strain upon the person using the invention, the fingers being at the same time readily released and disengaged from the object handled.

Another object is to provide an improvement of this character wherein not only the finger members but the thumb members will positively open and close so as to facilitate the gripping and handling of objects of various sizes and contour.

Other objects and advantages of the invention reside in certain novel features of the construction, combination and arrangement of parts which will be hereinafter more fully described and particularly pointed out in the appended claims, reference being had to the accompanying drawings forming part of this specification and in which:

Figure 1 is a view, showing the interior of the hand and fingers and the associated portions of the arm;

Figure 2 is a view in elevation of the inside or palm of the hand, the thumb being broken away and the interior structure thereof being shown for the sake of illustration;

Figure 3 is a similar view of the outside or back of the hand;

Figure 4 is a detailed view, partly in section and partly in elevation illustrating the construction of the finger members;

Figure 5 is a perspective view, illustrating the general construction of the body member;

Figure 6 is a detail view in elevation, illustrating one end of one of the sections of a finger; and

Figures 7, 8 and 9 are detail views.

Figure 10 is a fragmentary detail perspective view of the one way clutch arrangement.

Referring to the drawings, the numeral 10 designates generally the casing or artificial arm proper which is secured upon the upper arm or to the body of the wearer in any approved manner and is connected to the artificial hand member 12 by a wrist portion 13. A stump jacket 15 is laced on the stump of the wearer and is arranged within the artificial arm casing 10. A stump plate 16 is rigidly connected with the stump jacket. Obviously the wearer may, by turning the stump in either direction turn the stump jacket and stump plate in either direction and such movement is independent of and relative to the artificial arm member and the artificial hand member. This movement is taken from the stump plate and is utilized to actuate or effect the opening and closing of the finger members and the thumb members of the artificial hand as will hereinafter more fully appear.

The artificial hand member proper is of course formed and shaped to approximate the appearance of the human hand and includes finger members 20 corresponding to the fingers of the human hand and a thumb member 21 corresponding to the thumb of the human hand.

The finger members 20 while varying in shape and size as in the human hand are of substantially identical construction so a common description will serve for all. As clearly shown in Figure 4, each finger member includes a number of shell like sections 22 of greater length on the outer side of

the finger members than on the inner side so that the ends of the shell like sections are inclined, as at 23, leaving the requisite clearance to permit of movement between the sections. The sections 22 are hinged to each other or jointed, as at 24. Thus the sections of the finger members may be moved toward each other as in closing the hand or they may be moved away from each other to open the hand. Each section of each finger member, except the uppermost section has fixed thereto a toothed plate or rack 25, and each section except the innermost has pivotally mounted thereon a pawl 26, the pawl of one section being urged into engagement with the toothed plate or rack 25 of the adjacent section by means of a retractile coil spring 27. The pawls 26 and toothed plates 25 serve to releasably hold the sections of each finger member in any position to which they are adjusted. The thumb member 21 includes a fixed section 28 and a swinging section 29 hingedly connected, as at 30, with the fixed section, the sections 28 and 29 being of shell like construction and the section 29 tapering off as at 29^a to afford the requisite clearance for its inwardly swinging movement. The swinging section 29 is releasably held in adjusted position with respect to the fixed section 28 by means of a toothed plate 31 secured upon the fixed section 28 and a pivoted pawl 32 mounted upon the swinging section 29 and urged into engagement with the toothed plate 31 by a retractile coil spring 33.

As has been previously indicated the fingers are opened and closed by a turning of the stump in either direction. The means for closing the fingers comprises a main rod, designated generally at 35 and including a section 36 rigidly secured at one end to the stump plate 16 and connected at its other end to a section 37 by means of a one way clutch connection 38 the advantage of which will be presently understood. The section 37 of the main rod is coupled to the third section 39 by a universal coupling 40 arranged in the region of the wrist portion so that the provision of the main rod does not impair the flexibility of the hand. The outer end of the section 39 of the main rod carries a lug 41 which serves as a crank and which is slidably and pivotally connected to one end of a link 42, the other end of which is connected to one arm of a bell crank lever 43 pivoted as at 44 to a frame 45 and having its other arm 46 pivotally connected, as at 47, to one end of a connecting rod 48. The link 42, bell crank 43 and connecting rod 48 constitute motion transmission mechanism between the main rod and a cross head 50, the cross head 50 being pivotally connected to the end of the connecting rod

48 which is remote from the bell crank lever 43.

Closing rods 55 are provided and extend through the shell like sections making up the finger members there being one closing rod for each finger member, as shown in the drawings. These closing rods also vary in size, but are of substantially identical construction and each comprises a number of sections 56 pivotally connected to each other. The outermost section of each closing rod is connected with the outermost section of each finger member and a spring connection 57 serves to couple the innermost section of the closing rod with the cross head. As shown in Figure 1 there are four closing rods and four spring connections so that the cross head 50 is adapted to effect closing of all of the fingers. The inwardly swinging section of the thumb member is also closed from the cross head 50, and for this purpose an arm 60 extends rearwardly from the cross head and is pivotally connected to one arm of a bell crank 61, the other arm of which is connected to the offset end of one of the sections 62 of the closing rod 63, the closing rod 63 including a second section 64 which is pivotally connected to the section 62 and is also connected to the inwardly swinging section of the thumb member. A retractile coil spring 65 is provided and is connected at one end to the arm 43 of the bell crank and is connected at its other end to the hand member. This spring tends to urge the parts to such position as to dispose the finger members and the thumb member open.

When the stump is turned to the right, the section 36 of the main rod is also turned to the right, consequently, the other sections of the main rod are turned to the right since the one way clutch arrangement 38 transmits this motion to these other sections. This rotary movement of the main rod is transmitted through the crank lug 41, link 42, bell crank 43 and connecting rod 48 to the cross head 50 and moves this cross head rearwardly. The movement of the cross head is transmitted to the closing rods through the spring connections 57 and the closing rods causing the fingers to be drawn inwardly toward the palm of the hand and across the fingers about the object to be grasped. It is to be noted that all of the fingers are capable of coming into firm gripping engagement with the object to be handled and this irrespective of the irregularities in the contour of the object since the spring connections 57 compensate for these irregularities. It is obvious that the spring connections 57 compensate for these irregularities by virtue of the fact that they may be compressed when the finger members engage the object being handled and their compression permits the cross head to move

rearwardly and exert a pull on the closing rods which have not yet engaged the object in order to bring such closing rods into gripping engagement with the object.

5 After the finger members have come into gripping engagement with the work they are held in this position by the action of the pawls 26 which engage the toothed plates 25 to effect this purpose. Moreover
10 it is not necessary that the stump of the arm be maintained in the twisted or turned position but the wearer may return the stump to its normal position, the one-way-clutch arrangement 38 permitting this and
15 the pawls 26 and toothed plates 25 holding the fingers in engagement.

As the cross head 50 is moved rearwardly by the turning of the stump to close the fingers in the manner described, the swing-
20 ing section of the thumb is also swung inwardly since the rearward movement of the cross head turns the bell crank 61 and exerts pull upon the closing rod 62 which is effective to move the inwardly swinging section
25 toward the head.

In order to provide for releasing the fingers and the thumb and allow the spring 65 to come into action and disengage them from the object being handled a crank pin
30 70 is eccentrically fixed to the stump plate 16 and is formed with an eye 70^a at its outer end to which one end of a main operating cord 71 is fixed. The main operating cord 71 is trained over pulleys or guard sheaves
35 72 and is connected by branch cords 73 to the pawls 26, as shown in Figures 1 and 4. A branch cord 74 is also connected to the main cord 71 and leads to the pawl 32 of the thumb. The arrangement is such that
40 when the stump is turned to the left the pull will be exerted upon the main operating cord 71 which will be transmitted to the auxiliary or branch operating cords to pull or swing the pawls 26 and 32 away
45 from the toothed plates 25 and 31, respectively, thereby releasing the sections of the finger and thumb members and permitting the spring 65 to swing the sections of the finger members and the section of the thumb
50 member from a closed to an open position.

The wrist portion 13 of the hand is jointed, as at 13^a and includes at its joint a coil spring 80 associated with the coupled section of the joint by clamps 81. This coil
55 spring together with the universal coupling 35 of the main rod give to the wrist limited resilient flexibility.

It is obvious that the hand and arm possessing as it does the capacity for various
60 movements and adjustments enables the wearer to grasp and handle objects of various sizes and contours and closely approximating in appearance and function the human hand.

65 A removable plate or bar 85 is provided

in the arm casing 10 and is detachably secured to the arm casing by screws 86. This removable plate is located adjacent the one way clutch connection 25 which is itself demountable or detachable so that when the
70 plate 85 is removed access may be had to this connection 35. Then when the cotter pin 35^a is removed the reduced extension 38^a of the section 38 may be removed from the socket or axial bore 37^a of the section
75 37 so as to uncouple the main rod and permit of detachment of the arm from the hand casing.

I claim:

1. In an artificial body member, an arm
80 casing, a hand member connected with the arm casing and having finger members, a stump jacket adapted to be laced upon the stump and arranged within the arm casing and adapted to be turned relative to the
85 arm casing and the hand member, means for adjusting and closing the finger members from said stump jacket including a main rod connected to this stump jacket and comprising sections, a certain of said
90 sections being coupled together by a one way clutch arrangement and releasable means for holding the finger members in adjusted position.

2. In an artificial body member, an arm
95 casing, a hand member connected to the arm casing and having finger members comprising a plurality of pivotally connected and shell like sections, a stump jacket adapted to be connected with the stump, a stump
100 plate connected with the stump jacket, a main rod connected with the stump plate, a closing rod for each finger member including a plurality of pivotally connected sections, a cross head, a spring connection between each closing rod and the cross head,
105 motion transmission means between the main rod and the cross head, means for releasably maintaining the sections of the finger members in adjusted position and including
110 toothed plates carried by certain of the sections of the finger members and pivoted pawls carried by the other of said sections and engageable with the toothed plates and springs for urging said pawls in engagement
115 with said toothed plates, and means for disengaging all of said pawls from their plates including a crank pin fixed to the stump plate, a main operating cord connected with the crank pin, and auxiliary cords leading
120 from the main operating cord to the pivoted pawls.

3. In an artificial body member, a hand member having movable finger members and means for moving said finger members to
125 closed position including a cross head, closing rods connected to the finger members and spring connections between the closing rods and the cross head.

4. In an artificial body member, a hand 130

member having finger members comprising
 a plurality of pivotally connected sections,
 and means for moving said finger members
 to closed position including a closing rod
 5 for each finger member, each closing rod
 being connected at its outer end to the outer
 section of its finger member, and a spring
 connection between the inner end of each
 closing rod and the cross head.
 10 5. In an artificial body member, an arm
 casing, a hand member connected to the arm
 casing and having finger members compris-
 ing a plurality of pivotally connected and
 15 shell like sections and a thumb member in-
 cluding a swinging section, a stump jacket
 adapted to be connected with the stump, a
 stump plate connected with the stump
 plate, a main rod connected with the stump
 20 including a plurality of pivotally connected
 sections, a cross head, a spring connection
 between each closing rod and the cross head,
 a closing rod for the swinging section of the
 thumb, motion transmission means between
 the closing rod of the thumb and the cross
 head, motion transmission means between
 the main rod and the cross head, means for
 releasably maintaining the sections of the
 30 finger members in adjusted position and in-
 cluding toothed plates carried by certain
 of the sections of the finger members and
 pivoted pawls carried by the other of said
 sections and engageable with the toothed
 plates and spring for urging said pawls in
 engagement with said toothed plates, means
 35 for releasably maintaining the swinging sec-
 tions of the thumb member in adjusted posi-
 tion including a toothed plate, a pivoted
 pawl and a spring for urging the pawl into
 engagement with the toothed plate, and
 40 means for disengaging all of said pawls
 from their plates including a crank pin fixed
 to the stump plate, a main operating cord
 connected with the crank pin, and auxiliary
 45 cords leading from the main operating cord
 to the pivoted pawls.

CYRIL MEREDITH SURRY.