March 20, 1951 M. J. FLETCHER 2,545,452

SEGMENTED ARTICULATED FINGER

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Fig.1.

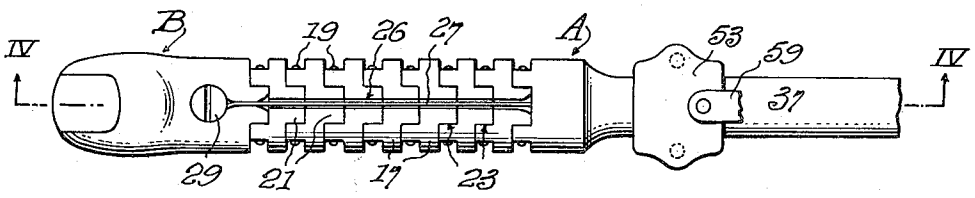


Fig.2.

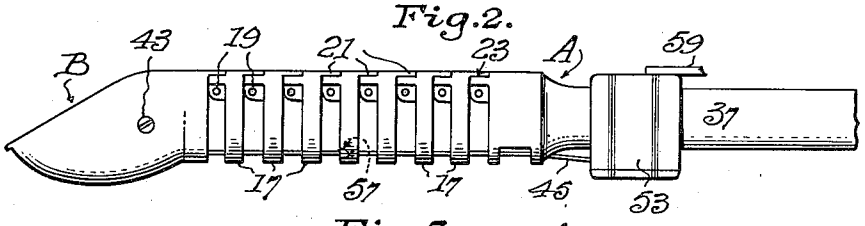


Fig.3.

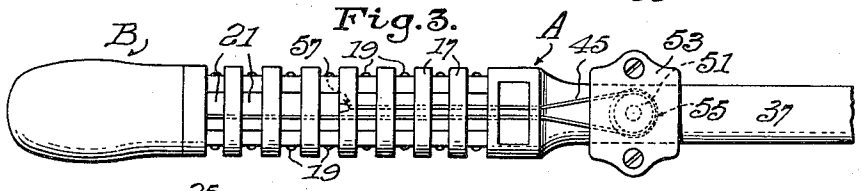


Fig.4.

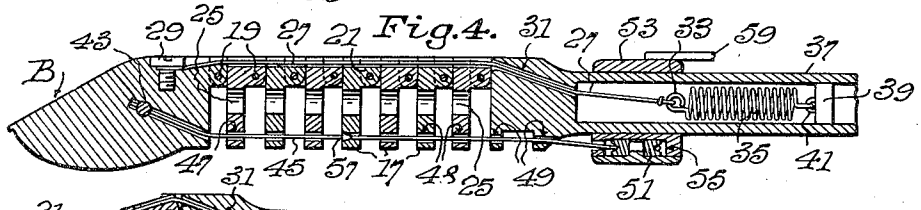


Fig.5.

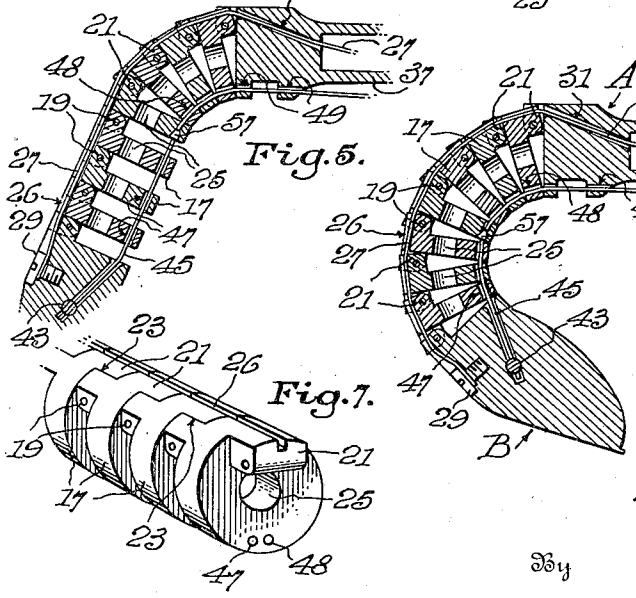


Fig.6.

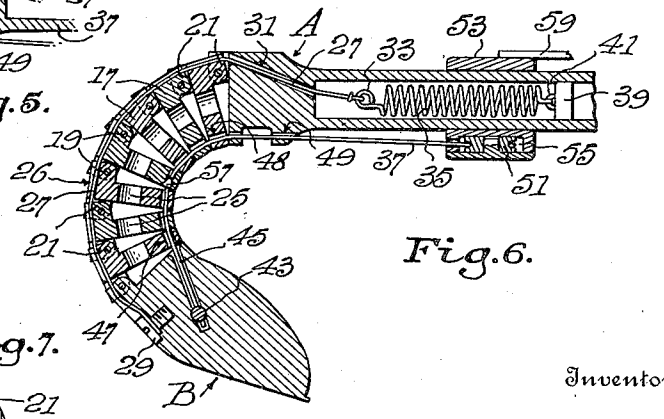


Fig.7.

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SEGMENTED ARTICULATED FINGER

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Fig. 8.

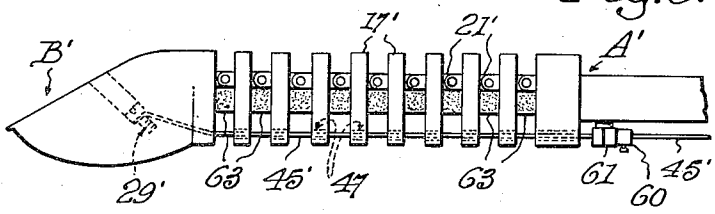


Fig. 9.

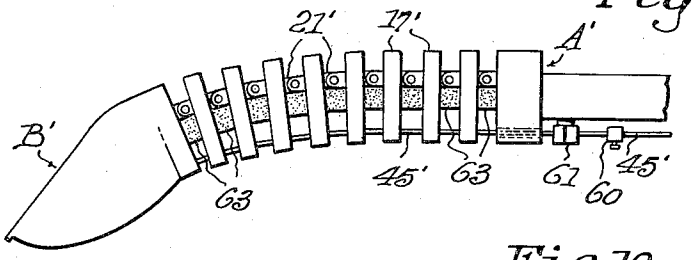


Fig. 10.

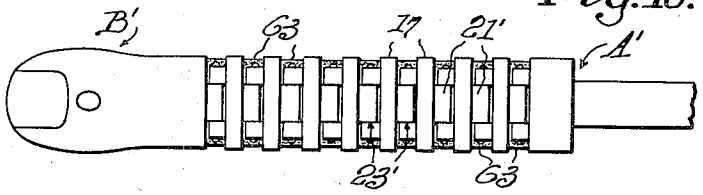


Fig. 11.

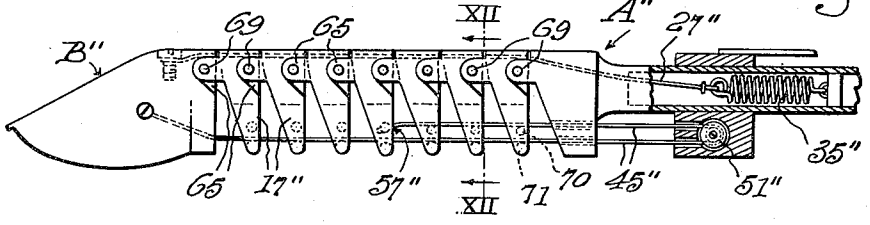
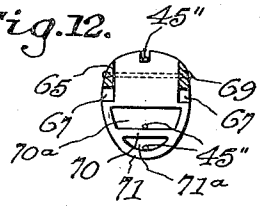


Fig. 12.



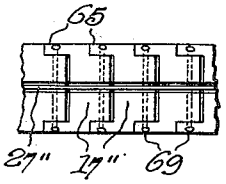


Fig. 13.

Fig. 14.

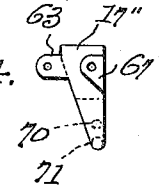
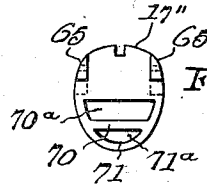


Fig. 15.



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UNITED STATES PATENT OFFICE

2,545,452

SEGMENTED ARTICULATED FINGER

Maurice J. Fletcher, Maxwell, Iowa, assignor to the United States of America as represented by the Secretary of War

Application October 1, 1946, Serial No. 700,538

18 Claims. (Cl. 3—12)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

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The invention described herein may be manufactured and used by or for the Government for governmental purposes, without payment to me of any royalties thereon.

The present invention provides an improved articulated finger construction for an artificial hand.

Articulated finger members heretofore employed have a number of inherently serious disadvantages, among which may be mentioned specifically high starting torques, inflexibility, lack of sensitivity, complicated and individually fitted parts, excessive weight, and inability to conform to irregularly imposed loads and to unequal contour.

These disadvantages are overcome in the improved finger construction of the present invention. The improved construction of the present invention also may be said to include specifically the following objects, among others:

1. The provision of an articulated finger mechanism which will force a load imposed upon it towards its point of greatest strength, and which simulates normal finger action.

2. The provision of an articulated finger that is adapted to any type of motivating power, such as mechanical, electrical, hydraulic, or pneumatic operating mechanisms.

3. The provision of an articulated finger mechanism that is characterized by simplicity of construction, ease of operation and maintenance and low cost of production.

Further objects of the invention will become apparent as the description proceeds, and the features of novelty will become apparent from a consideration of the appended claims.

The invention will be understood more readily from a consideration of the accompanying drawings, in which:

Fig. 1 represent a top plan view of one form of articulated finger embodying the features of the present invention;

Fig. 2 is a side elevation of the construction shown in Fig. 1;

Fig. 3 is a bottom plan view of the finger construction of Figs. 1 and 2;

Fig. 4 is a sectional elevation taken on the line IV—IV of Fig. 1;

Fig. 5 is a fragmentary sectional elevation similar to Fig. 4, but showing the position of the segments at initiation of articulation of the finger;

Fig. 6 is a sectional elevation similar to Fig. 4, but showing the position of the segments upon full articulation of the finger;

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Fig. 7 is a fragmentary perspective view showing details of interconnection of the segments;

Fig. 8 is a side elevation of a modified form of an articulated finger embodying the features of the present invention;

Fig. 9 is a fragmentary side elevation of the modification of Fig. 8, the view showing initiation of articulation of the modification of Fig. 8;

Fig. 10 is a bottom plan view of the modification shown in Figs. 8 and 9;

Fig. 11 is a side elevation, partly in section, of a further modification;

Fig. 12 is a section on line XII—XII of Fig. 11;

Fig. 13 is a top plan view of portion of Fig. 11;

Fig. 14 is a side elevation of one of the segments shown in Fig. 11; and

Fig. 15 is a front elevation of the segment shown in Fig. 14 looking toward the left as viewed in Fig. 14.

Referring more particularly to the drawings and first to Figs. 1 through 7, there is shown an improved articulated finger. As shown in Figs. 1 through 7, reference character A represents the base portion of an articulated finger and B the extremity thereof. The finger itself is made up of a series of interconnected identical segments 17, which segments are pivotally interconnected by pins 19 which pass through projecting lugs 21 of each segment, each of which lugs is received in a complemental recess 23 of the adjacent segment, the individual segments being joined together as indicated clearly in Figs. 1 and 7, for example. In order to save weight, each segment 17 is made as an annulus with a central opening 25 therethrough, these openings being in registry in the assembled finger, and the segments 17 being maintained suitably spaced apart by the connecting lugs 21. These connecting lugs impart lateral rigidity to the assembly.

Each segment is recessed along its top to receive a flexible cable 27, the assembled registering recesses defining a receiving groove 26 for the cable 27. This cable is anchored in the finger extremity B in a suitable manner, such as by means of a screw 29, and passes through base A of the finger by way of a hole 31 provided therein for this purpose. Cable 27 has its end affixed in an eye 33 at one end of a coil spring 35 that is mounted in a tubular extension 37 of the base A. This extension 37 is closed by a plug 39 to which the other end of spring 35 is attached, as is indicated at 41. In the assembly, the extremity B forms the segment most remote from the base section A. It will be seen

that the base section A and the segments of the finger are in columnar alignment.

Also mounted in the extremity B of the finger and anchored thereon by suitable means, such as a screw 43, is a second cable 45 which passes through segments 17 by way of registering openings 47 therein, this cable passing as shown through the base A of the finger, through opening 49, thence around a pulley sheave 51 mounted in a slidable operating collar 53 that is mounted slidably on the tubular extension 37 of the base A, and which has a recess 55 for the reception of the pulley sheave 51.

After passing around the pulley sheave 51, the cable 45 is returned through the segments 17 through holes 43 provided therefor on a course closely adjacent to its first course, and secured to the middle segment as indicated at 57.

When the operating collar 53 is actuated by pulling on it through link 59, the cable 45 moves around sheave 51 and the finger starts to flex at the juncture 57, the bending of the finger starting by the lower portions of the base segments being brought into engagement; and the cable 27 is lengthened in effect by corresponding expansion of the spring 35, further retraction of the collar 53 causing progressively full flexing of the finger as indicated in Fig. 6. The initiation of the flexing of the finger at approximately its mid-point (juncture 57) gives greater strength to base portions of the finger and to the segments adjacent to the base portions.

It will be noted that all of the segments 17 are identical and interchangeable regardless of the size of the hand or finger employed, providing ease of maintenance of the fingers and uniformity of action.

These features and actions just described above are present in the modifications shown on Figs. 1 and 11 of the drawings, wherein the flexing of the segments progresses sequentially from the base segment outwardly to the extremity segment B.

In connection with Fig. 1, it is to be noted that the interengagement of lugs 21 in the complemental recesses 23 of adjacent segments and the pivotal pin connections 19 provides for lateral stability of the finger when it is used as a pinch through either a scissors or rotating action between the first and second fingers of a hand. The recesses 23 form abutment surfaces for the lugs 21 when the fingers are in open position thereby limiting the movement of the segments in a direction opposite to the direction of flexing and producing a rigid construction in that direction.

The finger of Figs. 1 through 7 is opened responsively to release of the cable-retracting tension applied to link 59 of collar 57. The spring 35 returns to its original position, shortening, as it does so, the effective length of the cable 27 and shifting the cable 45 around pulley sheave 51, thereby returning the finger to open position, the pulley sheave being rotated correspondingly.

It will be seen that each of the segments 17 is connected to its adjacent segments at the outer portion thereof through pivotal connections 19, the inner portions of the segments being spaced apart when the finger construction is in extended columnar position. It will be seen also that each of the segments 17 of the finger constitutes a lever arm having a long end actuated by the operating cable 27 to obtain the greatest possible mechanical advantage for each operation of an individual lever arm. During flexing, as each succeeding lever arm touches the preceding lever arm, the pivot point which had functioned for

this action is immobilized, giving way to the succeeding pivot point, thereby causing each lever arm to work only through its cycle of greatest mechanical advantage and efficiency. The force end of the lever arm never approaches alignment with the pivot points and therefore lever efficiency is maintained at the maximum, which would not be true were long hinge points or bars used rather than the comparatively thin segments.

In order to obtain the degree of angle necessary in articulation of joints of a finger, and in order to keep the lever arms operating at their near maximum efficiency, it is necessary that the segments occur in greater frequency than the frequency of joints occurring in a normal finger. More than three segments are placed in the finger to articulate the finger only to the first joint to give the proper angle of approach of the finger tips so that they will meet in palmar prehension conjointly between the thumb and first two fingers of the prosthetic hand. A greater number of segments is necessary to produce what is known as tip prehension in the fingers meeting conjointly with the thumb.

A further desirable character of the present construction is the fact that the efficiency increases as the fingers approach the flexed position inasmuch as the chord of the angle of force is applied at a point at the greatest distance from the base point of the segments.

The value of the plurality of segmental lever arms employed in the present construction lies in their maximum of efficiency of operation within a relatively slender operating column. To obtain a given angle of articulation or flexure of the finger, this connection obviously is several times more efficient than would be the best possible finger having bars of a length equal to the lengths of the points of a natural finger. This advantage is due partly to the shifting fulcrum upon which the segments operate and due partly to the possibility of applying directly full power through all of the segments to the tip without robbing the finger of power to operate a joint at which no force or load is impressed. In a linked three-bar finger jointed approximately as the human finger is jointed, all of the joints are operated at every movement of the finger regardless of where the power or force is encountered on the finger. With the segmental type of finger of the present construction, all of the power first is applied above or at the point of loading and none of the power is taken up at points irrelevant to the load encountered at the time.

Reference now may be had to the modification of Figs. 8, 9 and 10, wherein the connections between the segments 17' are similar to those shown in the modification of Figs. 1 through 7. However, connecting lugs 21' and their complemental recesses 23' are countersunk in this modification rather than being peripherally flush with the outer surface of the finger as in the previously described modification. A single retracting cable 45' is secured in the tip segment B' of the finger in any suitable manner, such as, for example, by means of screw 29' countersunk in the surface of the finger extremity B'. This cable passes through registering holes 47' in the underside of the segments 17', and is slidably retained in a lug 61 secured to the base A' of the finger, and which is engaged by a stop 60 carried by cable 45', engagement of the stop with the lug 61 limiting the opening or backward pivotal movement of the

segments. A pull on this cable 45' closes the finger into a position corresponding to the showing of Fig. 6, but the closing action is opposite to that shown in Figs. 5 and 6 in that the closing is progressively from the segments beginning with the tip segment B' towards the segments of the base A', whereas the showings of Figs. 5 and 6 demonstrate that, where the attachment of the return length of the cable 45 is at approximately the mid-point of the finger, the compression of the segments incident to closing movement of the finger starts with the segments adjacent to the base A. Also in the modification of Figs. 1 through 7, the separation moment is transferred from the base segment to the intermediate segment defining the junction 57, this giving greater strength to the lower portion of the finger. However, the modification of Figs. 8 and 9, wherein the moment of separation is at the base segment, will be found satisfactory in practice.

In Figs. 8, 9 and 10, return of the finger to open position is obtained through the interposition of resilient pads 63 between the segments. These pads are secured to the metal of the segments, and are of any resilient compressible material, foam or sponge rubber being found to be a suitable material in practice. Expansion of these pads responsive to release of pull on cable 45' returns the finger to open position. This form obviates the use of a spring member, such as spring 35. The resilient pad also prevents the pinching of a cosmetic glove between the segments.

The modification shown in Figs. 11 through 15 is similar in its action to the modification in Figs. 1 through 7, but differs therefrom in the shape of the segments 17''. In this modification, the segments are generally wedge-shaped as shown in the drawings and are assembled with like parts thereof in similar position. Each of the segments is identical and interchangeable with the remaining segments, as in the case with the segments of the other embodiments of the invention described herein, the connection between the segments being obtained by providing each segment with a pivot ear 65, the base of each segment being provided with a complemental recess 67 for the reception of the pivot ears. Connection is made through pivot pins 69. Each of the segments also includes polished cable guides 70 and 71, defining spaced upper and lower guide openings 70*a* and 71*a*, a cable 45'' being connected to the extremity segment B'' of the finger and extending through the cable lower guide opening 71*a* and thence over a pulley 51'' in the base A'' of the finger. The cable 45'' is returned through upper guide openings 70*a* and attached to an intermediate segment, for example, the middle segment, as indicated at 57''. The segments 17'' also are recessed for the insertion of a return cable 27'', which is attached to the extremity B'', extends into the base A'' and is actuated by a spring 35'', or the like, for the return of the finger to open position, in a manner analogous to that described in connection with the modification of Figs. 1 through 7.

In the modification of Figs. 1 through 7 and 11 through 15, it will be understood that the operating cables have a high degree of flexibility, and the purpose of doubling the finger-tract cable to a predetermined point intermediate the extremity and the base of the finger is to transfer the separation moment between the segments from a point adjacent to the base and the said intermediate point of attachment of the cable,

thereby giving greater strength to the lower portion of the finger.

The operation of the modification shown in Figs. 11 through 15 is the same as that of Figs. 1 through 7.

In the embodiments shown in Figs. 1 through 7 and 11 through 15, the pivot ears engaging the complemental recesses limit backward pivotal movement of the segments, and result in a very rigid construction in the direction opposed to flexing. In the modification of Figs. 8, 9 and 10 this backward movement of the segments is caused by engagement of the stop 60 with the fixed lug or abutment 61.

In these same embodiments, the outer surfaces form a flush, even periphery around the entire finger which is adapted for the ready reception of any desired flexible covering medium for concealing the mechanism of the finger and giving the same a more natural appearance.

It is understood that the operating cables are connected to any type of operating means that may be provided, such being well known in the art, and therefore not shown. Such means may be any convenient type of harness, and any type of actuating medium may be employed for the movement of the finger.

It will be understood that although one finger is shown on the drawings, an entire hand may be constructed employing four fingers and the thumb by constructing it in accordance with the present invention. It will be noted also that the number of the segments of the improved articulated finger of the present invention is greater than the number of joints of a normal finger, this permitting a high degree of flexibility of operation and sensitivity of control. A load imposed at any position of the finger is drawn towards the point of greatest strength and towards the V of the hand, by virtue of the action taking place above the point of loading.

Having thus described my invention, what I claim as new and wish to secure by Letters Patent is:

1. An articulated artificial finger comprising, in combination, a base section, a plurality of closely spaced segments pivoted to each other adjacent to one of their extremities and having one of such segments pivoted to the base section, each section being capable of rotation about its pivot point and forming a series of levers, a flexible cable member secured to one of the said segments positioned at the extreme and most distant point from the base section extending through each of the said segments and through the said base section, means for retracting the cable member for producing successive flexing of the segments, means for extending the said segments to original alignment upon completion of the said flexing and responsively to release of retracting tension on the cable member, means for limiting return pivoting movement of each of the said segments, a sheave pulley in the base section about which the flexible cable extends, the cable then extending to an intermediate segment and secured thereto, and means for reciprocating the pulley for causing flexing of the segments.

2. An articulated artificial finger comprising, in combination, a plurality of segments each pivotally connected to a succeeding segment, the said segments being arranged in columnar alignment, a base section, one of the said segments being pivotally connected to the base section,

each segment being rotatable about its pivotal connection and forming a series of levers, a flexible cable member secured to one of the segments most distant from the base section, the said cable extending through each of the segments and through the base section, means for automatically extending the said segments to original alignment responsively to release of retracting tension on the cable-retracting means, means for limiting the pivoting action of each of the segments in a direction of movement opposite to the direction of flexing, and a sheave pulley in the base section for operating the cable member responsively to actuation of the cable-retracting means, the said cable member passing around the sheave pulley and being secured to an intermediate segment in the column, the said intermediate segment being the location of initiation of the separation between the segments incident to return of the segments to open position.

3. An articulated artificial finger comprising, in combination, a plurality of segments each pivotally secured adjacent to one of its extremities to a succeeding segment, the said segments being arranged in columnar alignment and providing a plurality of lever arms, a base section pivotally secured to one end of the column of segments. a flexible operating cable having one end secured to a segment most distant from the said base section and at the opposite extremity from its pivoting means, the said cable extending through and adjacent to the lever end of each of said segments for progressively and successively moving each of the said segments, means in the base section for retracting the flexible operating cable for flexing the segments, and compressible resilient cushioning means intermediate the segments and secured to the segments for returning the segments to original alignment responsively to release of retracting tension on the cable, and to provide resilient closure means between the segments for preventing interference of outside covering means with the lever action of the said segments.

4. An articulated artificial finger comprising, in combination, a plurality of segments each pivotally connected to a succeeding segment, the said segments being arranged in columnar alignment, a base section, one of the said segments being pivotally connected to the base section, each segment being rotatable about its pivotal connection and forming a series of levers, a flexible cable member secured to the segment most distant from the base section, said cable extending through each of the segments and through the base section, means for retracting the said cable for causing the segments to pivot sequentially for flexing the column of segments, a tubular extension for the base section, a coil spring mounted in the tubular extension, a second flexible cable anchored to the segment most remote from the base section and passing along the segments on the upper surface thereof, the said second cable being connected to the coil spring in the tubular extension of the base for causing expansion of the coil spring responsively to flexing movement of the segments, the said spring acting to return the segments to their original alignment responsively to release of retracting tension on the first-mentioned flexible cable member, a sheave pulley in the base section for operating the said first-mentioned cable member responsively to actuation of the cable-retracting means, the said cable member passing around the sheave pulley and being secured to intermediate segments in the column, the said intermediate segment being the location of initiation of separating moment between the segments incident to return of the segments to open aligned position, and means for limiting the pivoting action of each of the segments in a direction of movement opposite to the direction of flexing, whereby the segments assume rigidity of alignment in the direction opposite to the direction of flexing.

5. An artificial articulating finger comprising, in combination, an assembly comprising a plurality of segments pivotally secured together, the segments being greater in number than the number of joints in a natural finger, the said segments being normally in columnar alignment, a base section pivotally secured to one end of the column of segments, a flexible operating cable having one end secured to the segment of the column most distant from the base section, the flexible cable extending through each of the segments for sequentially moving the said segments from a position of columnar alignment to flexed position for carrying a load, means for applying retracting tension to the said cable for flexing the segments, means for returning the segments to their original alignment responsively to release of the cable-retracting tension, stop means on the segments for preventing backward flexing between the segments and laterally intermeshing ear means for imparting lateral stability to the assembled segments.

6. An artificial, articulated finger, comprising a plurality of segments arranged in frequency greater than the frequency of joints in a natural finger, rigid means pivotally interconnecting outer portions of the segments so that the segments are in columnar alignment in their extended position while inner portions of the segments are in spaced-apart relationship, operating means secured to the segments adjacent to their periphery extreme from the pivotal interconnecting means, means for flexing the segments into a continuous, substantially radial load-gripping curve through the operating means, stop means on the segments for preventing backward buckling of the sements during flexing thereof and under application of a load thereto, and laterally intermeshing ear means on the segments for imparting lateral rigidity thereto relative to each other.

7. An artificial, articulated finger, comprising a plurality of segments arranged in frequency greater than the frequency of joints in a natural finger, means pivitally interconnecting the segments adjacent to their periphery so that the segments are in columnar alignment in their extended position while inner portions of the segments are in spaced-apart relationship, operating means secured to the segments adjacent to their inner periphery extreme from said pivotal interconnecting means and adapted to flex the segments, under application of a flexing force thereto, into a continuous, substantially radial load-gripping curve, upwardly disposed stop means on the segments for preventing backward buckling of the segments during flexing thereof, and laterally rigid intermeshing means on the segments for imparting lateral rigidity thereto relative to each other.

8. In an artificial articulated finger, a plurality of closely spaced, interconnected segments pivotally secured to each other and greater in number than the number of joints in a natural

finger, a base section pivotally secured to one of the segments, operating means operatively connected to the segments adjacent to the inner periphery of said segments and extreme from the pivotal connecting means for shifting the segments between extended columnar alignment and forwardly flexed position responsively to application of flexing tension on the operating means, upwardly disposed stop means on the segments for preventing backward buckling of the segments during flexure, rigid, laterally intermeshing reinforcing means on the segments for imparting lateral stability thereto, and means in the base section for returning the segments to original columnar alignment responsively to release of the flexing tension on the operating means.

9. In an artificial, articulated finger, a plurality of closely spaced interconnected segments pivotally secured to each other adjacent to their outer periphery and greater in number than the number of joints in a natural finger, a base section pivotally secured to one of the segments, operating means extending through the base section and operatively connected to the segments adjacent to the inner periphery of the segments extreme from the pivotal connecting means for shifting the segments between extended columnar alignment and forwardly flexed position responsively to application of flexing tension on said operating means, upwardly disposed stop means integral with the segments located rearwardly of the pivotal connection thereof for preventing backward buckling of the segments during flexure, laterally disposed complemental reinforcing means on the segments adapted to intermesh rigidly laterally for imparting lateral stability thereto, and means for returning the segments from flexure to original columnar alignment.

10. In a device of the class described, a base section, a plurality of segments pivotally secured to each other and to the base section to form a flexible column, each of the segments comprising a lever arm, means for pivotally securing the lever arm to preceding and succeeding identical lever arms, each segmental lever arm being of greater length than the distance between its pivot points, stop means integral with each lever arm positioned to the rear of its pivot points, means on each lever arm capable of nesting in a succeeding lever arm for imparting lateral stability to a column composed of said lever arm segments, each of said segments having an operating opening extending therethrough, an operating means secured to one of the said segments and extending through the operating openings in succeeding segments positioned adjacent to the periphery of each of the segments extreme from the pivotal connection between the segments, the said operating means being capable of shifting a column of the segments between a columnar extended position and a retracted position by causing them to pivot individually into a radial load-bearing curve when said operating means is retracted responsively to application of a flexing force thereto and returning the segments to columnar extended position responsively to release of the flexing tension.

11. An artificial, articulated finger comprising a plurality of segments greater in number and occurring in greater frequency than the number of joints in a natural finger, each of the segments being so constructed that they are greater in length than height, means pivotally interconnecting outer portions of the segments so that the segments are in columnar alignment in an expanded position, laterally rigid reinforcing means on the segments adapted to intermesh laterally with complemental means on the next succeeding segment for imparting lateral rigidity to the segments and relative to each other, and operating means connected to the segments adjacent to their periphery and extreme from the said pivot points for flexing and extending the segments between a continuous, substantially radial load-gripping curve and an extended columnar alignment responsively to actuation of the operating means.

12. An artificial, articulated finger comprising a plurality of normally columnarly aligned segments disposed in frequency greater than the frequency of joints occurring in a natural finger, laterally extending, rigid pivot means pivotally interconnecting outer portions of the segments to maintain the columnar alignment thereof when in extended position while maintaining the inner portions of the segments in spaced relation, operating means secured to the segments adjacent to the periphery thereof that is extreme from the pivotal interconnecting means, means for flexing the segments into a continuous substantially radial load-gripping curve through the operating means, stop means on the segments integral with the segments positioned upwardly on each segment and rearwardly of the pivot means for preventing backward buckling of the segments during flexing thereof in engagement with a load to be grasped, and means on the segments capable of intermeshing laterally with complemental means on the succeeding segment for imparting lateral rigidity between succeeding segments, the said operating means for the segments applying the flexing force therefor at a point at the greatest distance from the pivotal connecting means between the segments.

13. An artificial, articulated finger comprising a plurality of segments arranged in frequency and number greater than the frequency and number of the joints in a natural finger, means connecting the outer portions of the segments so that the segments are in columnar alignment in their extended position while the inner portions of the segments are in spaced-apart relationship, operating means secured to the segments adjacent to their periphery extreme from the pivotal interconnecting means, means for flexing the segments into a continuous, substantially radial load-gripping curve through the operating means, stop means capable of intermeshing with complemental means on a succeeding segment, on the segments for preventing backward buckling of the segments during flexing thereof when in engagement with a load to be grasped by the finger, and means on the segments for imparting lateral rigidity thereto relative to each other, the said operating means for the segments applying power initially to the segments at a point not below the point of application of the load, none of the applied power being taken up at points irrelevant to the load.

14. An artificial, articulated finger comprising a plurality of closely spaced interconnected segments pivotally secured to each other and greater in number than the number of joints in a natural finger, the segments including a base segment and a tip segment, operating means operatively connected to the segments adjacent to the inner

periphery of the said segments and extreme from the pivotal connection, means for shifting the segments between extended columnar alignment and forwardly flexed position responsively to application of flexing tension on the operating means, means on the segments for preventing backward buckling of the segments during flexure against the weight of an object to be gripped by the finger, lateral cooperating reinforcing means on the segments for imparting lateral stability thereto, the buckling-preventing means and the reinforcing means including intermeshing lugs on the segments and rigid pins passing therethrough hingedly connecting the segments together, and means for returning the segments to original columnar alignment responsively to release of the flexing tension on the operating means, the said operating means being disposed relatively to the segments for applying the force to the load from the tip segment inwardly, thereby forcing the object to be grasped towards the base of the finger, thereby positioning the object in a space between the finger and a thumb when the finger is connected to the thumb, the said object thereby being held in a position of greatest leverage and with maximum surface contact with the object.

15. An artificial, articulated finger comprising a plurality of closely spaced, interconnected segments pivotally secured together and greater in number and frequency than the number of joints in a natural finger, means on the segments preventing backward buckling and imparting lateral stability between the segments, the said means including intermeshing lugs on the segments and rigid pins passing therethrough hingedly connecting the segments together, whereby the finger is prevented from both rearward and lateral distortion.

16. An artificial, articulated finger comprising a plurality of segments, each pivotally secured adjacent to one of its extremities to a succeeding segment, the said segments being arranged in columnar alignment and providing a plurality of interconnected lever arms, a base section pivotally secured to one end of the column of segments, operating means secured to a segment most distant from the base section and at the opposite extremity from its pivoting means, rigid pivot means interconnecting the segments and extending laterally thereof, stop means on the segments rearwardly of the pivotal connection between the segments for preventing rearward buckling between the segments, lateral ear portions on each segment adapted to engage with complemental recesses on the succeeding segments from the base member to the most distant segment therefrom for providing lateral stability between the segments, means for retracting the operating member for moving the segments from columnar alignment into a radially curved load-grasping position, and means for extending the said segments back into columnar alignment after flexing of the segments has been accomplished, the said extending means becoming operable responsively to release of retracting tension on the said operating means.

17. An artificial, articulated finger comprising a plurality of segments pivotally secured together, the segments being greater in number than the number of joints in a natural finger, the said segments being in columnar alignment when extended, a base section pivotally secured to the column of segments, operating means connected to the segments for shifting the segments between extended columnar alignment and forwardly-flexed load-grasping position responsively to application of finger-closing tension on the operating means, the segments flexing first adjacent to the base section and then sequentially from the segment most distant from the base, stiffening means on the segments for preventing backward buckling of the segments during flexing and while in load-grasping position under application of a load being grasped, laterally intermeshing reinforcing means for the segments for imparting lateral stability to the segments, rigid pivot means extending through the reinforcing means laterally thereof and pivotally interconnecting each segment to the next succeeding segment, and return means for returning the segments to their original columnar alignment responsively to release of the finger closing tension on the said operating means.

18. An artificial, articulated finger comprising a plurality of segments greater in number than the number of joints in a natural finger, means pivotally interconnecting outer portions of the segments so that the segments are in columnar alignment in expanded position while inner portions of the segments are in spaced-apart relation, stop means on the segments for preventing backward buckling of the segments during flexing thereof, intermeshing lug means on the segments for imparting lateral rigidity thereto relative to each other, the pivotally interconnecting means extending laterally through the intermeshing lug means, and operating means connected to the segments for flexing the segments into a continuous substantially radial load-gripping curve, with the inner portions of the segments in nested relation and the outer portions of the segments smoothly held together by the interconnecting means therefor.

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