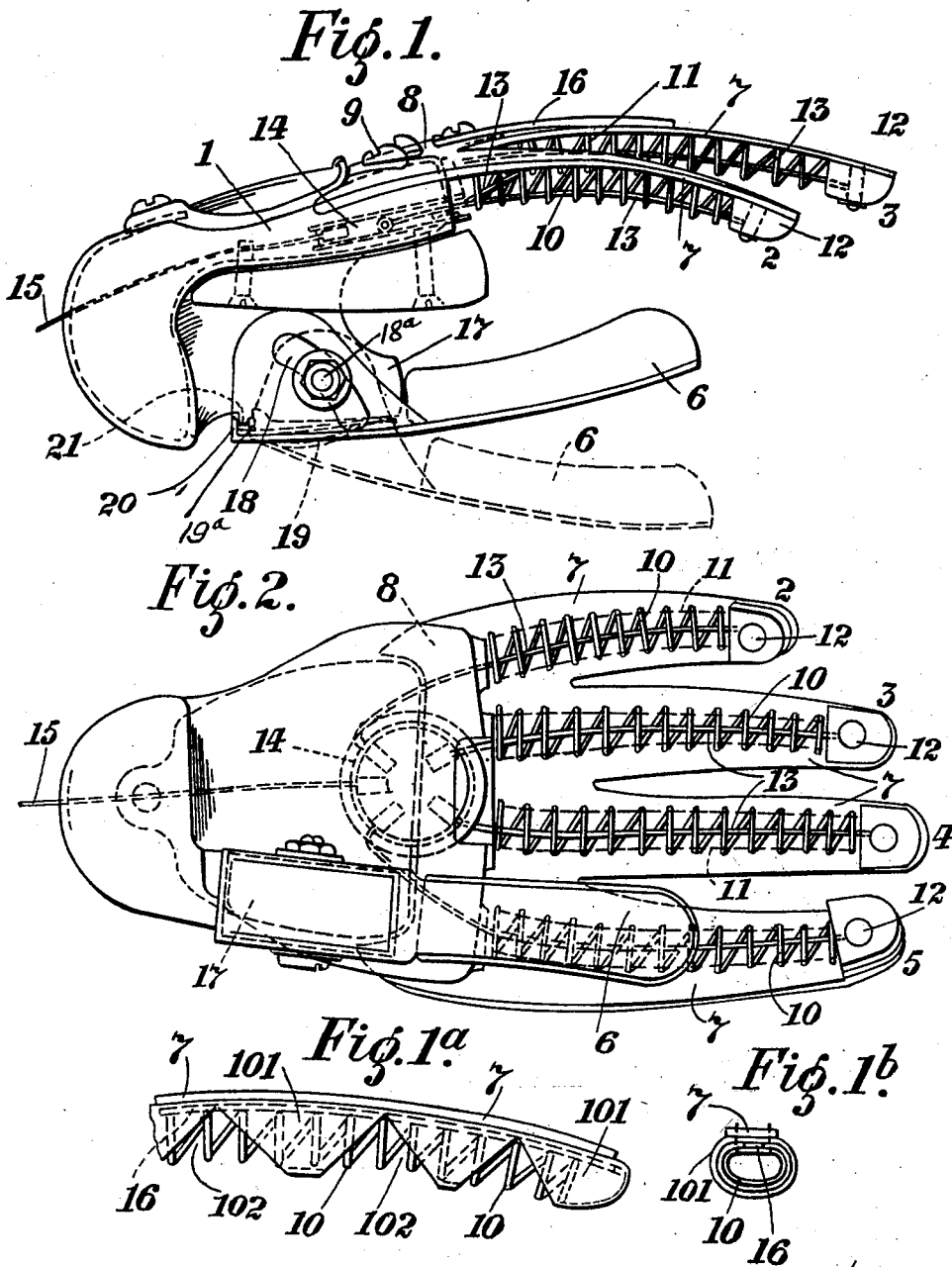


A. PRINGLE.
ARTIFICIAL HAND.
APPLICATION FILED MAR. 28, 1918.

1,324,564.

Patented Dec. 9, 1919.
3 SHEETS—SHEET 1.



Inventor
by *Alexander Pringle*
Gleditsch & Fairbanks
Attorneys.

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Fig. 3.

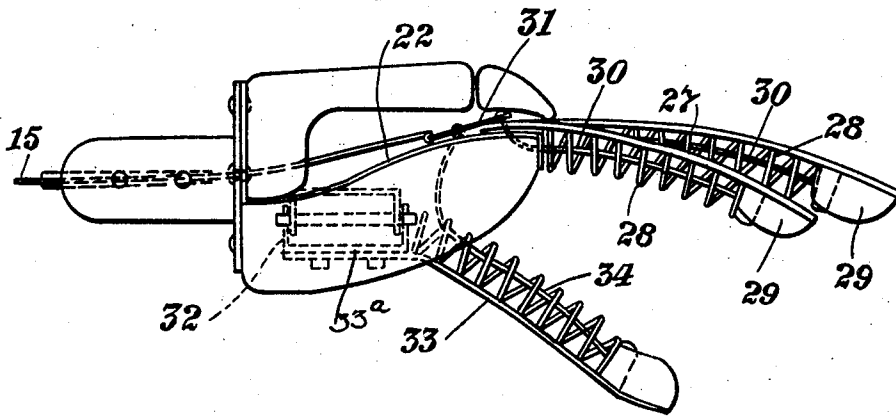
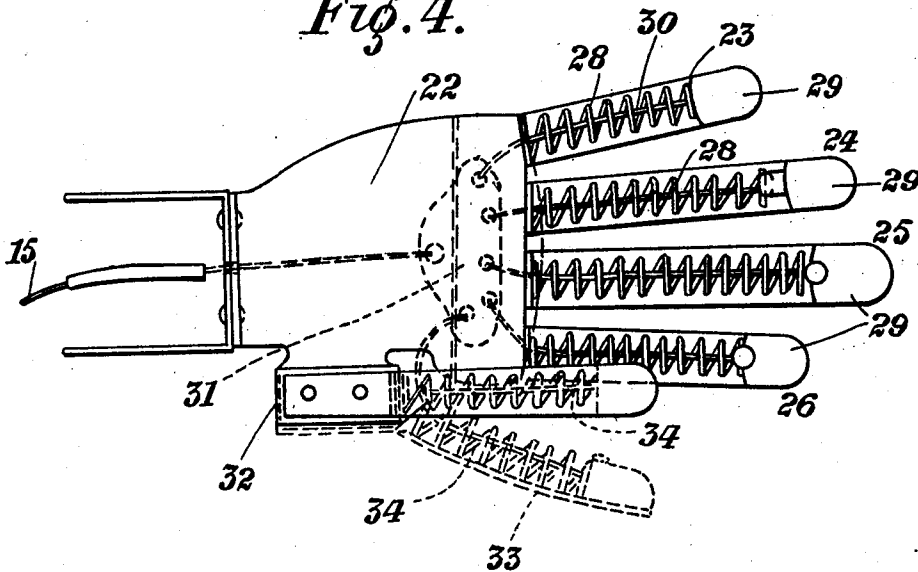


Fig. 4.



Inventor:
by *Alexander Pringle*
Diedersheim + Fairbank
Attorneys.

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Fig. 5.

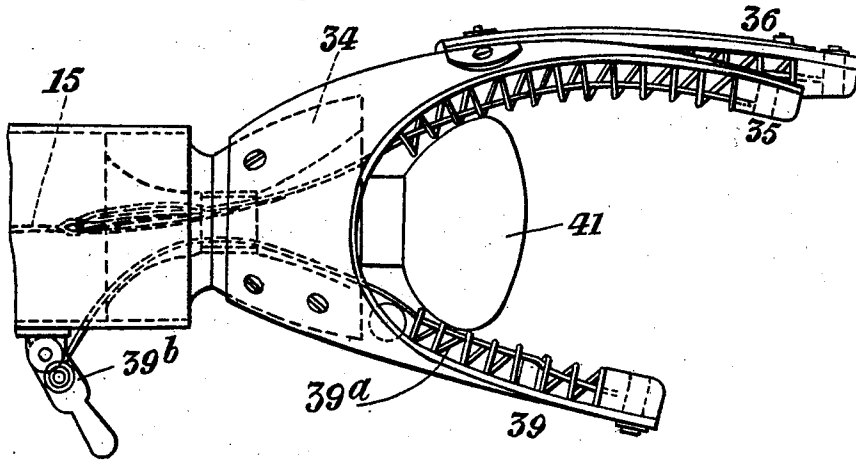
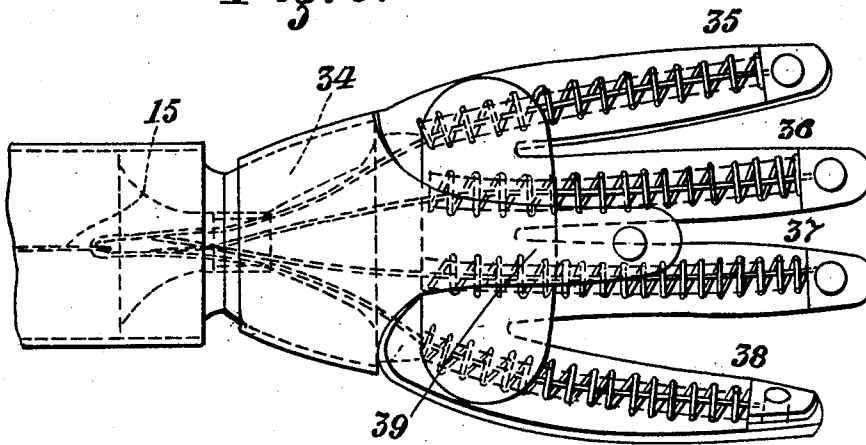


Fig. 6.



Inventor:
37 Alexander Pringle.
Gedensheim & Fairbanks.
Attorneys.

UNITED STATES PATENT OFFICE.

ALEXANDER PRINGLE, OF BELFAST, IRELAND, ASSIGNOR OF ONE-HALF TO THOMAS SINCLAIR KIRK, OF BELFAST, IRELAND.

ARTIFICIAL HAND.

1,324,564.

Specification of Letters Patent.

Patented Dec. 9, 1919.

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To all whom it may concern:

Be it known that I, ALEXANDER PRINGLE, a subject of the King of Great Britain and Ireland, residing at Belfast, Ireland, have invented certain new and useful Improvements in and Relating to Artificial Hands, of which the following is a specification.

This invention which relates to artificial hands, has for its object to provide improvements in such hands of the class in which the fingers can be bent by a pull on a cord, or drawn together by a spring action and released by some mechanical device operated for example from the upper arm so that the hand is adapted to be opened and closed for the purpose of gripping and holding, and when required, of releasing hold of any article.

Under this invention the artificial hand is characterized by one or more non-pivotal flexible gripping fingers (each mainly constituted by a spring, or equivalent) provided with means for drawing the fingers into a gripping position.

Each movable finger is connected, at its one end, to a base or support, preferably so disposed that the fingers extend therefrom and which is adapted to be engaged with or secured to the wrist part of an artificial arm. The outer end of each finger (or claw) is suitably formed to facilitate co-operative gripping action by the fingers which are, preferably, normally pulled, or drawn, inward at their outer ends by suitable means, and are adapted to be opened, or to open, against the action of said means, by their own spring action.

Preferably the spring is bound by suitable means and it may also be filled in between the coils with cord, or equivalent, so that the spring can only bend or flex in one direction, that is, inwardly, and toward the other fingers. If desired the binding and (or) filling medium may not extend throughout the entire length of the spring, a portion or portions being thereby capable of flexing more freely to give better gripping action in certain positions. The fingers are, preferably, normally held, by their own spring action or other means, in the open position and closed against such action when it is desired to close the hand or grip any article. The inward pull on the fingers is, or may be, obtained by connecting a cord or wire to the outer end of each finger at the

inner side thereof and leading same through the spring to the base where the cords may pass through a hole or holes and be connected to suitable operating mechanism, which, when operated, exerts a pull on the cords and causes them to bend or flex the fingers inwardly and toward each other at their outer ends, so that a resultant co-operative gripping action is obtained between the fingers or between the fingers and another part of the hand. By suitable action exerted on the operating means its pull on the finger cords can be released so that the fingers will straighten themselves by their own spring action and thus open the hand.

In order to prevent sideward twisting or displacement of the fingers I provide suitable stiffening means, for example, a steel band or bar may be placed within the spiral spring or between same and the backing to which it is secured or at the back of the fingers so that it resists any sideward movement of the finger while permitting the necessary inward and outward bending or flexing action. The end of the steel band may be extended to form the finger nail.

The fingers may be made of rubber or other flexible and resilient material instead of the spiral springs above described, the rubber or equivalent being suitably stiffened at one side so as to insure the bending or flexing movement in one direction only, as hereinbefore described.

Instead of using a spiral spring I may employ a flat steel spring to form the finger and, in this case, the finger operating cord or wire could be arranged to pass down the inner side of the spring or be otherwise passed from the base to a suitable point of attachment at the inner side of the spring, so as to be capable of flexing same inward when required. A flat spring, such as described, would, of itself, prevent any sideward movement or distortion of the finger. The flat spring could be made thinner in places, to give variable flexing action if required.

For operating the finger cord I may provide mechanism adapted to be operated by movements of the other upper arm.

In order that the invention may be clearly understood I have hereunto appended explanatory drawings showing examples of hands made in accordance with my invention.

Figures 1 and 2 show, respectively, side and palm views of a hand in accordance with my invention.

Figs. 1^a and 1^b show a slightly modified construction of the finger portion of the hand, illustrated at Figs. 1 and 2.

Figs. 3 and 4 show respectively side and palm views of another form of hand in accordance with my invention.

Figs. 5 and 6 show similar views of still another modification of a hand in accordance with my invention.

Referring to the drawings:—

The hand shown at Figs. 1 and 2 is mounted on the forearm by a ball and socket joint and it comprises a metacarpus or body part 1 which is hollow and to this body part 1 the fingers 2, 3, 4 and 5 and the thumb 6 are secured. The fingers 2, 3, 4, and 5 have each a leather or other equivalent back 7 connected to a common back piece 8 which is secured to the body part of the hand by screw fastenings 9. At the front of the leather part 7 of each finger a spiral spring 10, or equivalent, is suitably secured, for example, by stitching 11, and, at the front end of each finger a rubber or other block 12 is provided and connected with the hand operating mechanism by means of a cord or wire 13. The connection of the finger wires 13 with the hand operating mechanism is, in the example shown, effected through the medium of a ring 14 to which each finger wire is secured and which in turn is connected with a wire 15 of the operating mechanism. The ring 14 is accommodated within the hollow body part of the hand and, being free to turn and move within limits in any direction, it enables the fingers to adjust themselves to the object being gripped by them. The inner ends of the fingers, or some of them may be strengthened and stiffened by the addition of flat springs 16 as shown.

The thumb is movably connected to a projecting part 17 of the body part 1 of the hand and it is supported on a pin or bolt 18^a through the medium of slots 18 in such manner that it can be moved to and held at each end of the slots 18. The two positions are shown in the example illustrated, one as shown in full lines, for coöperating with the fingers to hold small articles while the other position shown in dotted lines takes the thumb clear of the closing fingers so as to permit of the grasping of any article between them and the palm of the hand. A spring 19 secured at 19^a normally tends to push the thumb outward and the lip 20 coacts with the projection 21 to take the thrust of the thumb.

In the modified construction of finger, illustrated at Figs. 1^a and 1^b, there is provided below the leather or equivalent back or top bar 7, a leather or equivalent cover 101, while below the cover 101 is situated the

flat spring 16, which in this arrangement, preferably extends to the extremity of the finger.

The leather or equivalent cover 101 is provided with angularly shaped openings 102 which are intended to give a free bending action to the finger and simulate the natural joints.

The spiral spring 10, in this arrangement, in place of being round, as shown in Figs. 1 and 2, is preferably of D section, as shown at Fig. 1^b.

The hand shown at Figs. 3 and 4 has the body part 22 made of steel plate and extending therefrom are the fingers 23, 24, 25 and 26 consisting of flat spring steel back parts 27 with spiral springs 28 secured at the front of each finger and, at the extremity a block 29 of rubber, or equivalent, to which the finger operating wires 30 are secured and led therefrom to a plate 31 movably supported on the back of the body part 22. The wire 15 of the hand operating mechanism is secured to the plate 31. The body part 22 has a bracket 32 to which the thumb 33 is pivotally secured at 33^a so that it can be turned inward to the position shown in full lines at Figs. 3 and 4 or outward to the position shown in dotted lines at Fig. 4. The thumb 33 is, in the example shown, connected by a wire 34 with the movable plate 31 so that, when the thumb is in the position shown in full lines it will, by the pull on the plate 31, be flexed inwardly after the fingers have been partly flexed and so as to coöperate with same to grip any article.

The hand shown at Figs. 5 and 6 consists of a body part 34 to which the fingers 35, 36, 37 and 38 and thumb 39 are secured, the fingers in this case are shown of the same construction as already described with reference to Figs. 1 and 2 but the operating wires 40 are brought through a central passage in the body part 34, the fingers being flexed or bent against a pneumatic ball or a pad 41.

The thumb 39, in the example shown, is connected by a wire 39^a with a tensioning or pulling lever 39^b by means of which the thumb can be flexed inward when required and held at the bent position as long as desired and then released by turning the lever 39^b so that its pull on the wire 39^a is relieved when the thumb will straighten itself by its own spring action. If desired the wire 39^a could be connected to the finger operating wire 15 so that the thumb will be flexed along with the fingers.

If desired I may have the finger and (or) thumb wires capable of being connected and disconnected with the operating wire as required.

The hands made in accordance with this invention may be operated by any suitable mechanism.

Having now fully described my invention

what I claim and desire to secure by Letters Patent is:—

1. An artificial hand having non-pivotal flexible gripping means free to flex substantially throughout their length, and means provided in connection with said gripping means for operating same.

2. An artificial hand having non-pivotal flexible gripping means constituted by a finger free to flex substantially throughout its length and selective means in connection with the finger for operating same in the desired direction.

3. An artificial hand having non-pivotal flexible gripping means constituted by a finger free to flex substantially throughout its length, means whereby the finger can be bent inward throughout its length to close the hand and opened again by its own resiliency when relieved of the action of the bending means.

4. An artificial hand having a non-pivotal flexible gripping finger free to flex substantially throughout its length and constituted by a spring secured to the body part of the hand, bending means fitted in connection with the spring so that it can only bend in one direction and selective means in connection with the finger whereby it can be bent inward throughout its length to close the hand and opened again by its own resiliency when relieved of the action of the bending means.

5. An artificial hand having non-pivotal flexible gripping fingers free to flex substantially throughout their length and constituted by springs secured to the body part of the hand, bending means fitted in connection with the springs so that they can only bend in one direction and selective means in connection with the fingers whereby they can be bent inward throughout their length to close the hand and opened again by their own resiliency when relieved of the action of the bending means.

6. An artificial hand having a non-pivotal flexible gripping finger free to flex substan-

tially throughout its length and constituted by a spring secured to the body part of the hand, a binding medium fitted in connection with the spring so that it can only bend in one direction, the binding medium not being extended throughout the entire length of the spring, and selective means in connection with the finger whereby it can be bent inward throughout its length to close the hand and opened again by its own resiliency when relieved of the action of the bending means.

7. An artificial hand having non-pivotal flexible gripping means constituted by fingers and thumb free to flex substantially throughout their length, and each comprising a flat steel spring capable of resisting sideward distortion and adapted, by bending means, to be bent inward so as to close same and opened again by their own resiliency when relieved of the action of the bending means.

8. An artificial hand having non-pivotal flexible gripping means constituted by fingers and thumb free to flex substantially throughout their length, and each comprising a flat steel spring capable of resisting sideward distortion, means for bending the fingers or thumb inward, said means being attached to the upper ends of the fingers or thumb and to operating mechanism.

9. An artificial hand having non-pivotal flexible gripping fingers and thumb free to flex substantially throughout their length and constituted by springs secured to the body part of the hand, means for adjusting the thumb to various positions and means for adjusting the fingers to various positions whereby the thumb and fingers coöperate or keep clear of each other.

In testimony whereof I affix my signature in presence of two witnesses.

ALEXANDER PRINGLE.

Witnesses:

ANDREW HAMILTON,
JOHN KNOX.