

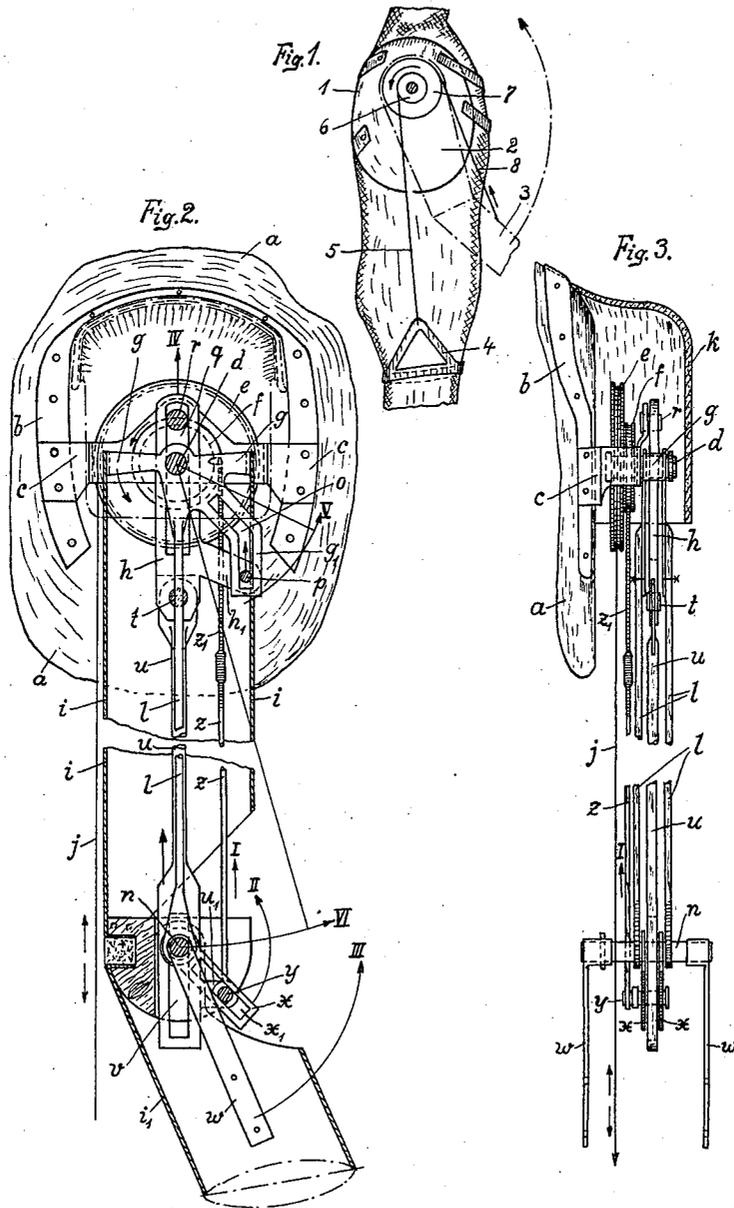
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ARTIFICIAL ARM

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# UNITED STATES PATENT OFFICE.

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## ARTIFICIAL ARM.

Application filed June 3, 1922. Serial No. 565,760.

*To all whom it may concern:*

Be it known that I, DUNCAN MACKENZIE ANDERSON, a citizen of Canada, residing at Mainz, Germany, have invented certain new and useful Improvements in Artificial Arms, of which the following is a specification.

To produce the movement of the forearm of an artificial arm attached to a stump of the upper arm by traction means connected with the forearm and with a fixed point of the human body and conducted over interposed reversing elements, has become known already. The bending position of the upper arm is produced with devices of this type by the stump.

This invention relates to an improvement of artificial arms of this type in such a sense, that the transformation of the lifting movement of the shoulder into the lifting movement of the artificial arm is effected, with exclusion of elements situated outside the artificial arm except the points of attachment to the human body, from points which are all situated in the artificial arm, and enclosed and hidden by the same, the elements for changing the direction of the traction element being supported in the shoulder joint of the artificial arm, whereby further the angular torsion of the guiding elements in the shoulder joint, which occurs at the lifting of the shoulder, is transferred at first only upon the joint of the forearm to produce the bent position of the forearm to be transferred only hereafter for producing the lifting of the whole arm. Owing to the suppression of reversing elements for the pull rope arranged outside the artificial arm, the attachment and the carrying of the artificial arm is facilitated and rendered more comfortable, its use is less exposed to disturbances and the elements for transmitting and executing the movements are well protected in the artificial arm. The increase of weight is of little importance as the principal mass of the reversing elements is situated in the shoulder joint and has to be drawn along only very little at the lifting of the arm.

An embodiment of the invention is shown on the accompanying drawing, wherein:—

Fig. 1 is a diagram illustrating the idea of the invention.

Fig. 2 is a front elevation, the artificial arm being shown cut open.

Fig. 3 is a side elevation viewed from the left, the artificial arm being omitted.

If to the human body and upon the corresponding shoulder, with the aid of a bandage 1, an artificial arm is attached whose upper arm 2 is articulated to the bandage by a pivot pin and whose forearm is articulated in the well known manner to the upper arm, and if further from a fixed point 4 of the human body a pull rope 5 is guided over a pulley 6 pivotally mounted in the shoulder joint where the end of said rope is made fast after having been wound partly or completely around said pulley, in order that the rope with the pulley can execute an angular rotation, and if a second pulley 7 rigidly coupled with the first mentioned pulley is connected in the same manner but in inverse succession by a pull rope 8 with the artificial forearm, the pulleys 6 and 7 can execute an angular rotation if the shoulder with the artificial arm is lifted, owing to the lengthening of the distance between the fixed point 4 and the joint of the shoulder, the artificial forearm and later on the whole arm being thus able to execute a bending movement in the direction of the arrow. At the lowering of the shoulder the initial position is resumed by the action of the natural weight or with the aid of springs.

This is the principle upon which the form of construction shown in Figures 2 and 3 is based.

The artificial arm is attached to the body in the well known manner by straps which terminate at the shoulder joint in a leather sleeve *a* having a metal bow *b* with the traverse *c* serving as bearing. This traverse *c* forms together with the front end of the journal *d* the shoulder joint. Upon the rear part of the journal *d* the pulleys *e*, *f* for changing the direction of the ropes are mounted which are rigidly connected the one with the other. Upon the front part of the journal *d* a joint cross *g* is mounted which embraces a connecting rod *h* from both sides. The artificial upper arm *i* is connected with the front ends of the cross *g* (Fig. 2). The artificial upper arm *i* is open at the upper end and covered by a leather cap *k* (Fig. 3). Parallel rods *l* hinged to the cross *g* are mounted at their lower ends each by an eye upon the pivot pin *n*. The joint-cross *g* has further two parallel arms *g'* which are bent at a convenient angle and have each an angularly bent slot *o*. Between the arms *g'* an arm *h'* of the con-

necting rod *h* is located which has laterally projecting studs *p* engaging with the slots *o*. The connecting rod *h* has a vertical longitudinal slot *q* traversed by the journal *d* and by an upper stud *r* supported by the traverse *c*. The connecting rod *h* is hinged by an articulation *t* to a rod *u* which has a longitudinal slot *v* guided upon the bolt *n*. To this bolt *n* the artificial forearm *i'* is attached by means of lug-straps *w*, the forearm being united with the artificial upper arm by a ball joint the pivot pin of which is formed by bolt *n*. Upon the bolt *n* inclined arms *x* arranged in pairs are fixed which have longitudinal slots *x'* and enclose a lug *u'* of the rod *u*, which engages by a bolt *y* with the longitudinal slots *x'*. Upon the bolt *y* a rod *z* is further mounted by its lug, said rod being extended by a chain *z'* guided upon the pulley *f* and fixed to the crown of the same. The pull rope *j* attached with one end at a convenient point of the body is guided over the pulley *e* and attached with its other end in the groove of the pulley after it has been wound around part of the pulley.

If the shoulder is lifted the pulley *e* is revolved by the pull rope *j* of a corresponding angle. The pulley *f* participates in this revolving movement so that the chain *z'* is wound upon the pulley *f* whereby the rod *z* is lifted in the direction of the arrow I. Herefrom results that the arms *x* are also turned upward in the direction of the arrow II whereby the pivot bolt *n* and consequently the artificial forearm are turned in the direction of arrow III. As the rod *z* is however also connected with the connecting rod *u* and as this rod is hingedly connected with rod *h* these rods are lifted in linear direction (arrow IV). This movement has at first no consequences until the stud *p* enters the inclined part of the slot *o*. At this moment the automatic lifting movement of the forearm is terminated. The stud *p* which continues to move in the same direction will now make the arm *g'* turn in the direction of arrow V and with it the cross *g* or the artificial upper arm attached to the same. This artificial upper arm is however lifted by the rods *l* connected with the cross *g* which cause, owing to their connection with the pivot bolt *n*, the simultaneous oscillation of the forearm and of the

upper arm in the direction of arrow VI. Owing to the articulation *t* the connecting rod *u* can participate in this oscillation. The parts return to the initial position shown on the drawing by their natural weight as soon as the lifting of the shoulder ceases.

I claim:—

1. In an artificial arm comprising a pull element serving for the movement of the forearm starting from a fixed point upon the human body over a pulley for changing the direction to the forearm and adapted to be put under tension by the lifting of the shoulder the combination of a pull rope made fast with one end to a fixed point of the body and with the other end to the forearm, with pulleys having their geometrical axes of rotation coinciding with the axis of rotation of the artificial shoulder joint, and means for stopping this bending movement.

2. An artificial arm of the type described and shown comprising in combination with a pull rope attached with one end to a fixed point of the human body and with the other end to the forearm, a large rope pulley, and a small rope pulley, the axle upon which said rope pulleys are mounted situated in the axis of articulation of the shoulder joint, a straight guide for the pull rope, a pivot bolt for the forearm, a pair of arms connected with said pivot bolt having slots and designed to transfer the angular rotation of the rope pulleys to the forearm for making the same oscillate, a jointed cross mounted upon said axle of the shoulder joint, a slotted arm of said joint cross, a linear guide link upwardly extending from the pivot bolt of the forearm, an arm of said linear guide link, a stud projecting from said arm engaging with said slotted arm of the joint cross so that the joint cross is partly revolved, and rods rigidly connecting said joint cross with said pivot bolt for transferring the part rotation of the joint cross to the artificial forearm for oscillating the same together with the artificial upper arm.

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

DUNCAN MACKENZIE ANDERSON.

Witnesses:

H. BLOUIN,  
EMILE BLOUIN.