

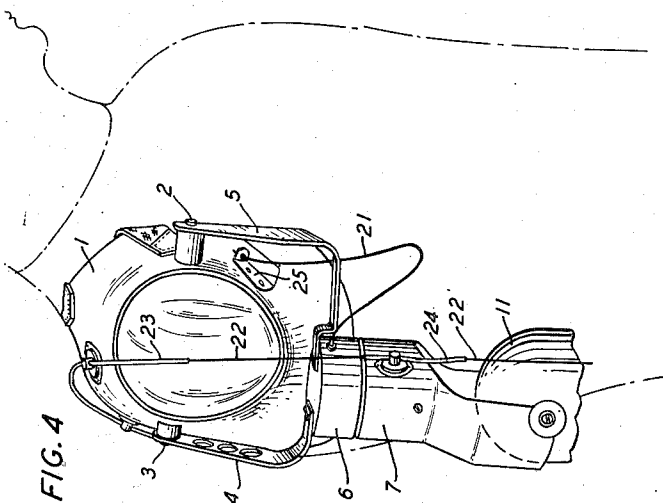
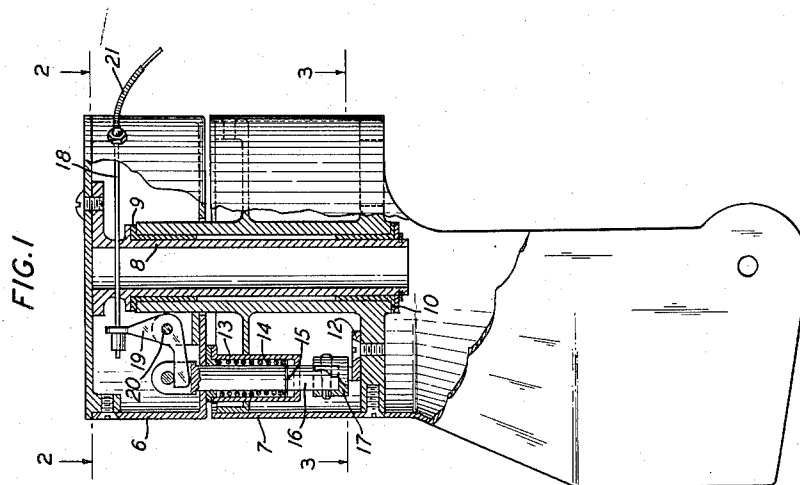
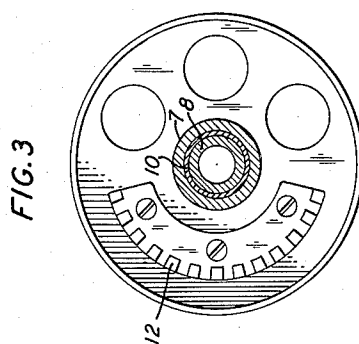
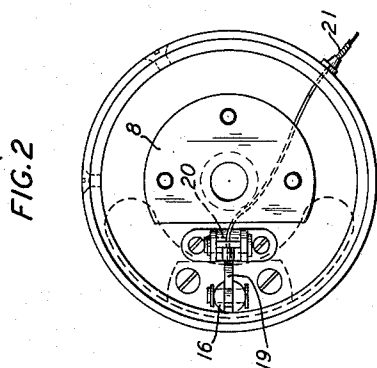
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LOCKING MEANS FOR PIVOTAL JOINTS

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LOCKING MEANS FOR PIVOTAL JOINTS

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1 Claim. (Cl. 3—12)

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This invention relates to prosthetic devices and particularly to muscular controlled locking means for pivotal joints in artificial limbs.

The object of the invention is to provide a locking means for an artificial limb joint whereby the limb may be held firmly in the last position to which it has been moved after the amputee has relaxed the effort required for the control thereof. By way of example, a lock for an artificial arm turntable must be capable of sustaining a comparatively heavy load, for the amputee may encounter a situation where it is necessary to lift and hold a considerable weight for some time and while the use of the turntable is not in great demand its action must be positive yet easily controlled.

The invention consists essentially of an artificial limb section constructed of two parts, one axially movable with respect to the other, as the shoulder portion of an upper arm section having an elbow portion axially supported thereby and rotatably movable with respect thereto. The elbow portion is provided with an arcuate rack and the shoulder portion is provided with a dog in cooperative relationship with said rack. The tooth or teeth on the end of said dog are normally in engagement with the teeth of said rack. A cable is attached to the opposite end of said dog in such a manner that the dog may be pulled away from the rack to free the elbow portion of the said upper arm section so that the forearm section of the artificial arm may be swung about as when the amputee wishes to raise his hand above his head. The cable may be pulled by the flexing of some muscle such as the pectoralis major or the infraspiratus. A means for translating the flexing of a muscle is disclosed in my application for patent, Serial Number 273,865 filed February 28, 1952, and such disclosure is by this reference incorporated herein and made a part hereof. Such means consists essentially of a plate or bearing surface sunk comfortably into the surface of the muscle and operating the end of a bell crank so that as the muscle is flexed the surface thereof will tend to straighten and will thereby push the said bearing surface outwardly. The bell crank and bearing surface are mounted on a comparatively large area plate which will move in accordance with the general movement of that part of the body whereby only a genuine flexing of the muscle and not an accidental movement of the muscle or a general body movement will operate the control cable. The cable is passed through a sheath so that as a whole it may be bent in any manner to avoid interference with the clothing and with other parts of the prosthetic device.

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A feature of the invention is an artificial limb section divided into two portions, one axially movable with respect to the other and normally latched together by a rack on one portion and a cooperating dog on the other. The two portions may be unlatched by a pull on a control cable operated by a muscular movement at any desired place on the amputee's body.

Another feature of the invention is the use of a cable extending from a bell crank on a muscular control device to a bell crank mounted on one portion of an artificial limb to translate an outward muscular thrust into a lifting movement of the said dog to disengage it from the arcuate rack to allow free movement of the lower or forearm section of an artificial arm.

Other features will appear hereinafter.

The drawings consist of one sheet having four figures, as follows:

Fig. 1 is a vertical section of part of an upper arm section of an artificial arm;

Fig. 2 is a sectional view looking downwardly from the plane including line 2—2;

Fig. 3 is a similar view looking downwardly from the plane including line 3—3; and

Fig. 4 is a perspective view showing how the prosthetic device is suspended from a shoulder cap worn by an amputee.

The device of the present invention shown in one of its applications consists of a turntable control placed in an upper arm section of an artificial arm. In general the amputee is provided with a shoulder cap 1, constructed of a stiff plastic casing, custom fitted to the amputee's shoulder. This cap is sufficiently stiff to support pivots 2 and 3 whereby a yoke 4 is hung from the shoulder cap to support the artificial arm in a manner through which the arm as a whole may be abducted. The yoke 4, actually shown as two pieces 4 and 5, supports the upper portion 6 of an upper arm section. An axle 8, is journaled in the body of a lower portion 7 of the said upper arm section. Bearings 9 and 10 facilitate the axial movement of the portion 7. The said lower portion terminates in means for rotatably supporting a forearm section 11, as indicated in Fig. 4.

An arcuate rack 12 is affixed to the body of the portion 7, having teeth provided for the greatest expected extent of movement of the arm. A cylinder 13 is secured to the upper portion 6, containing a spring 14 bearing against a ring 15 fixed to the dog 16 to normally force the dog 16 downwardly. The dog 16 is fitted with a cap 17 having teeth on its lower surface which will cooperate with the teeth of the rack 12. Thus,

in normal position, the lower portion 7 will be effectively latched to the upper portion 6.

To operate the device, the amputee executes a muscular movement, whereby the cable 18 is pulled toward the right (Fig. 1) so that a bell crank 19, pivoted at 20 to the upper portion 6 is rotated in a clockwise direction to lift the dog 16. The cable 18 is enclosed in a sheath 21, long enough to allow any expected movement of the arm and to be properly hidden under the amputee's clothing.

A means for moving or abducting the arm is shown in Fig. 4 as a cable 22, moving through sheaths 23 and 24. A strain on this cable 22 will raise the arm. If the elbow is locked, the arm as a whole will be moved outwardly from the body. If the elbow is freed, then the forearm is first abducted and then the arm as a whole is raised. If the turntable lock is freed by a strain on the cable 18, the forearm may be swung outwardly so that the amputee may raise his hand above his head.

The muscular control means is indicated by the part 25 which forms an anchor for the end of the sheath 21. The control device, while a co-operating element of the present invention, is conventional and therefore not shown in detail.

What is claimed is:

In a prosthetic device, a shoulder cap having a surface overlaying the pectoral muscle, an articulated arm pivoted thereto, said arm including an upper arm section divided into two elements joined by a swivel joint whereby the lower of said elements may be rotated about the longitudinal axis of said arm, a lock for securing said elements against relative movement consisting of

an arcuate rack fixed to the lower of said elements and a cooperating latch mounted on the upper of said elements, said latch comprising a longitudinally movable pin having teeth on one end thereof mounted in cooperative relationship with the teeth of said rack, a casing for guiding said pin, a spring for normally forcing said pin into engagement with said rack, a bell crank pivoted on said upper element of said upper arm section having one arm thereof pivoted to said latch pin, a cable sheath anchored at one end to said upper element and at the other end to said cap at the location of the pectoral muscle, said sheath depending in a loose loop between said anchored ends whereby said arm may be moved through a wide range simulating all natural movements of an arm, a muscular control device secured to said shoulder cap and including said cable sheath anchorage and a cable threaded through said sheath fixed at one end to the other arm of said bell crank and at the other end thereof to said muscular control device.

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