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JOINT FOR ELBOWS AND KNEES OF ARTIFICIAL LIMBS

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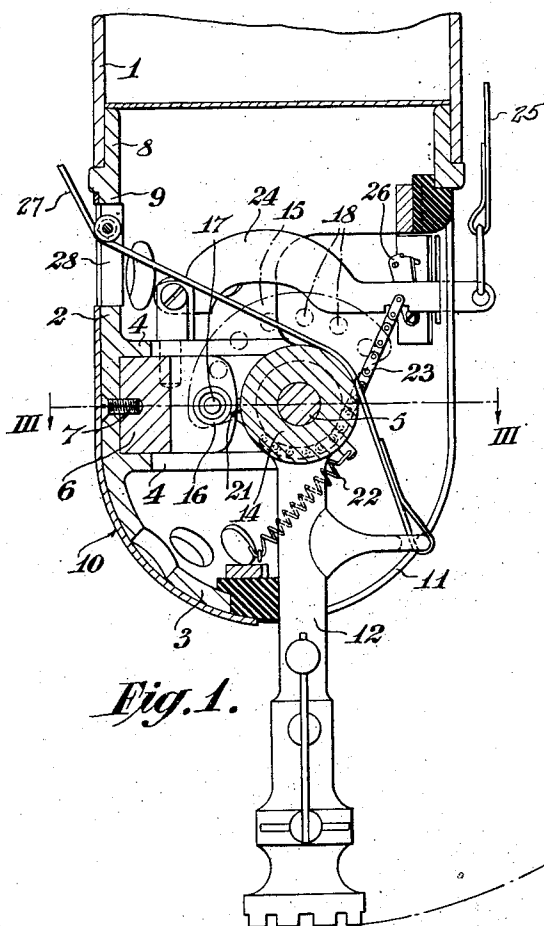


Fig. 1.

Fig. 2.

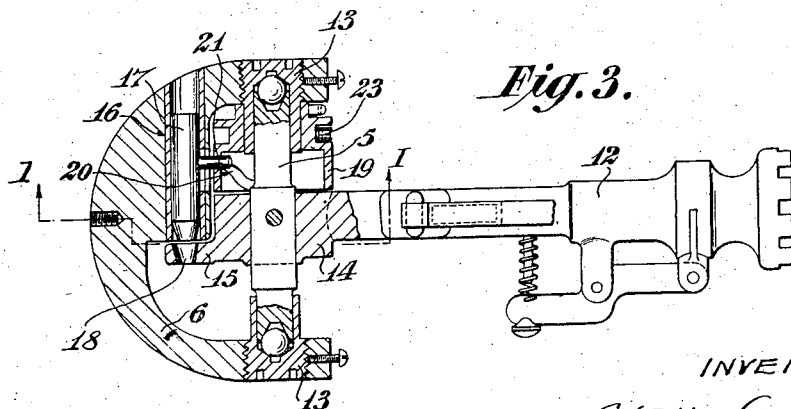
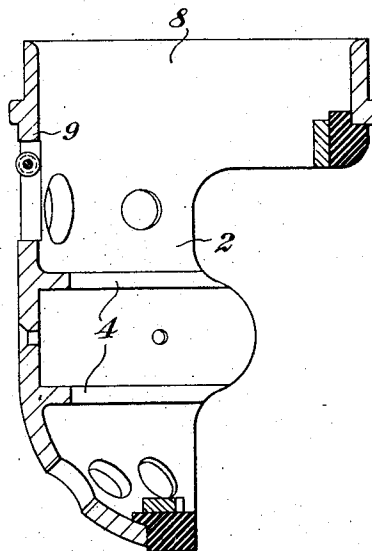


Fig. 3.

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JOINT FOR ELBOWS AND KNEES OF ARTIFICIAL LIMBS.

Application filed February 16, 1927, Serial No. 168,773, and in Great Britain November 3, 1925.

This invention relates to an improved joint for elbows and knees of artificial arms and legs, and is of the type in which the lower member of the arm or leg is movable by hand or by means operable by the shoulder or hip into various adjusted positions from the fully flexed position to the fully extended position with the arm or leg straight, and is locked in any one of such positions or released therefrom.

In such limbs it is the practice to fit a metal mounting ring fixedly inside the bucket of the upper arm or thigh to carry in suitable bearings the rotatable shaft on which the fire-arm or lower member, secured thereto, can swing. A good example of this practice is shown in the specification and drawings of the prior U. S. Patent No. 1,507,998 granted to the present applicant and another. Sometimes, in models designed for light work, the shell of the lower member fits over the bucket and is attached to the outer ends of the said rotatable shaft which project through or are accessible on the exterior of the bucket (as in the said prior case). But the present invention concerns more particularly models known as "heavy-working type" wherein the lower member is detachably secured to a T-piece construction, i. e. to a rod formed with or fixed to the rotatable shaft at or about its middle, and right-angularly extending therefrom through a slot in the bucket.

With the heavy-working type of limb, wherein the lower member may be adapted or employed for comparatively heavy work entailing strain on the various fittings, a difficulty is experienced in securing the metal mounting ring in a sufficiently strong manner to avoid damage under the strain. The screws attaching the ring may shear or tear through the bucket. Other defects are inherent with such a construction when applied to the heavy-working type.

The primary object of the present invention is to improve the method of mounting the rotatable shaft in the bucket, dispensing with a mounting ring as described above. Another object is to provide improved locking means of the type wherein a plunger co-acts with holes on a sector fixed on the rotatable shaft, the plunger being reciprocated by a cam device suitably actuated.

Broadly, according to the invention, the bucket of the upper limb member is constructed not of pressed or spin sheet metal

as usually obtains, but as a sturdy solid bucket (e. g. a metal casting) formed integrally with a slideway into which the mounting frame carrying the rotatable shaft (to which is joined the lower limb member) slidably fits and is secured. Said mounting frame is analogous to the mounting ring of the aforesaid example.

In order that the said invention may be clearly understood, reference is directed to the following description, in detail, of an embodiment, illustrated by the accompanying drawings, wherein:—

Figure 1 is a vertical section of the joint, the lower limb member being detached and omitted. The section is on the line I—I of Figure 3.

Figure 2 is a view of the new cast metal bucket with the various fittings removed.

Figure 3 is a transverse section on the line III—III of Figure 1, the bucket (Figure 2) being omitted, and the arm for attachment of the lower limb being shown swung into a flexed position at right-angles to the Figure 1 position.

Referring to the drawings, the bucket formed with the upper limb member 1 is constructed as a stout metal casting (of aluminium or a suitable light alloy), but is not completely cylindrical in its body. It is divided longitudinally so that, in form, it is semi-cylindrical at 2, terminating in a semi-cup-shaped end 3. Interiorly, there is formed integrally a pair of parallel semi-circular ribs 4 extending from one longitudinal edge of the bucket to the other, and constituting between them a semi-circular recess or slideway. This recess may be machined or otherwise formed into any suitable cross-section, a rectangular section being suitable, as illustrated.

The rotatable shaft 5 and its various fittings are mounted on a semi-circular metal mounting frame 6 (serving the purpose of the mounting ring in the previous mentioned example), and said frame is adapted to drop into the recess or slideway between the ribs 4, 4. Now, as all heavy strains are mainly along the longitudinal axis of the bucket, or nearer this axis than at right-angles thereto, it will be seen that strains seeking to dislodge the mounting frame 6 are solidly taken up by the ribs 4 of the recess. The said mounting frame 6 is held in the recess by screws 7 or the like, but these are not subjected to any appreciable load, and then not

until the lower member approaches a 90-degree flexing as in the Figure 3 position.

In constructing such a bucket, it is preferred to make the top 8 undivided longitudinally, so that a complete annular portion is presented for a requisite depth where the upper limb member 1 is joined thereto, and to provide a mounting flange 9 for an exterior light sheet metal or equivalent bucket 10 which is fitted over the assembly above described, and formed with a slot 11 through which the T-piece 12 of the rotatable shaft 5 can project and in which it can swing.

Regarding the locking means, it is found convenient to adopt the following construction with the aforesaid slidably removable semi-circular mounting frame 6. The rotatable shaft 5 is mounted diametrically between the two horns of the mounting frame in suitable bearings 13. The T-piece arm 12 is carried by a boss 14 fitting centrally on the shaft 5 and clamped, screwed or otherwise held fixedly thereon. The said boss is formed with a sector member 15 which swings in a plane at right-angles to the shaft's axis as the shaft turns.

In the base of the semi-circular frame 6 a plunger socket 16 is formed (preferably in the one casting) having its longitudinal axis parallel to that of the shaft 5; the plunger 17 mounted therein is adapted to butt against the aforesaid sector member 15, and enter one of a series of holes 18 in the said sector. The plunger 17 is operable by a cam device mounted on the rotatable shaft 5, the cam being a sleeve 19 revoluble on the shaft, and having a helical or inclined slot 20 cut in its periphery. A right-angularly projecting pin 21 from the plunger 17 extends through a slot in the plunger socket 16 and enters said cam slot 20, thus partial rotation of the cam 19 will impart a reciprocation to the plunger 17. A spring 22 is provided to keep the cam in the normally locking position, and means are provided to move the cam when desired.

The means to move the cam may be the chain 23 secured between the cam sleeve 19 and lever 24, the latter being operated by a strap 25. A catch 26 on the outer cup 10 can be used to hold the lever 24 in the "up" position—plunger 17 retracted, and segment 15 free. A strap 27 may be secured to the arm 12, passing over the top of the mechanism and out through the slot 28 for the purpose of flexing the lower limb member.

The lower limb member (not shown) is attached to the arm 12, and the latter is a common fitting forming no part of the present invention.

I claim:—

1. In joints for elbows and knees of artificial limbs, a cast metal bucket for the upper limb member having a slideway at right angles to the vertical axis of the bucket, a mounting frame fitted in said slideway, and a rotatable shaft carried by the mounting frame.

2. In joints for artificial limbs, a cast metal bucket adapted to be attached to the upper limb, said bucket having a substantially semi-cylindrical body terminating in a semi-cup-shaped end, a pair of integral parallel ribs formed in a horizontal plane on the interior of the bucket, a mounting frame fitted between said ribs, and a rotatable shaft carried by said mounting frame.

3. A joint for artificial limbs comprising a cast metal bucket having spaced parallel ribs on the inside face thereof, a mounting frame seated between said ribs, said mounting frame being of substantially U-shaped formation, a shaft journaled in the opposite arm portions of said frame, an arm keyed to said shaft, a perforated segment carried by the arm, a locking pin slidably positioned in the mounting frame and adapted to be projected into one of the perforations of said segment, means for operating said arm and means for operating said locking pin.

4. In joints for artificial limbs, a cast metal bucket having an upper portion of substantially cylindrical formation and adapted to fit into the upper limb member and having its lower portion of substantially semi-cylindrical formation and rounded at its lower portion toward the vertical axis of the bucket, and spaced parallel ribs formed on the inside of the bucket on the said semi-cylindrical portion thereof.

5. A joint for elbows and knees of artificial limbs comprising a bucket member adapted to fit into the upper limb, an arm mounting frame for the lower limb secured to the inside of the bucket member, said frame including opposite journal portions, a shaft bearing in said journal portions, a lower limb mounting member keyed to said shaft, and means for locking said arm comprising a portion of the arm member having a series of arcuately arranged openings, a slidable latch member projectable into said openings, and means for operating said latch member including a cam mounted on the shaft and operatively interlocked with said latch member, and means for operating said cam.

In testimony whereof I have hereunto affixed my signature this 1st day of February, 1927.

CYRIL GEORGE HOARE.