

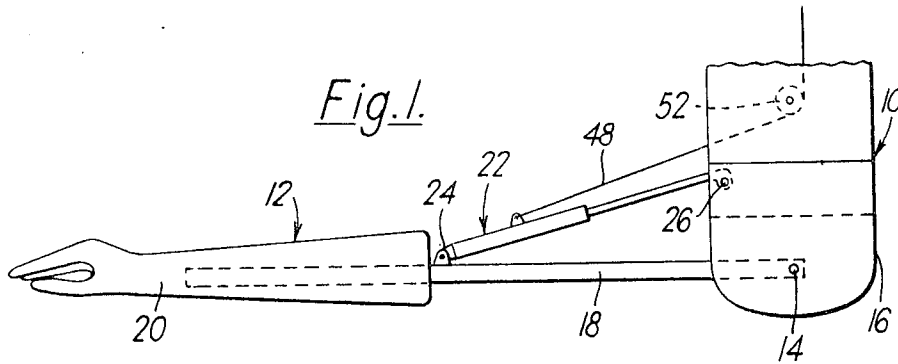
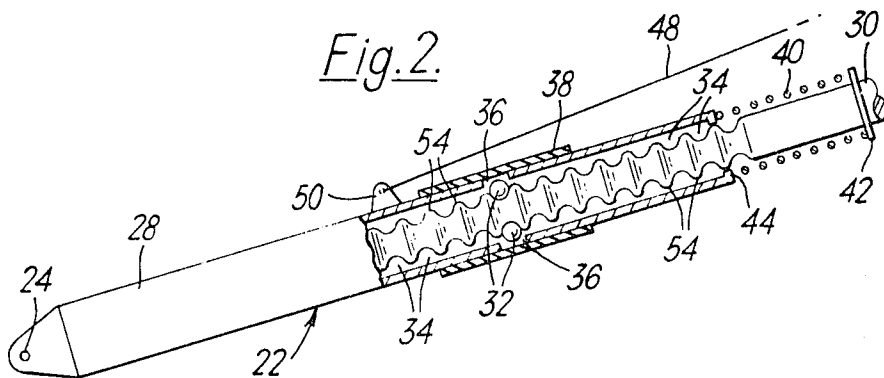
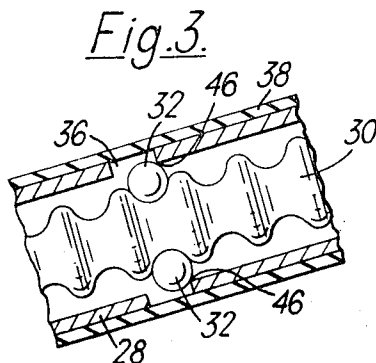
Nov. 16, 1971

D. W. COLLINS

3,619,818

ARTIFICIAL LIMBS

Filed Oct. 1, 1969



INVENTOR.
DENNIS WILLIAM COLLINS,

By
Berman, Davidson & Berman, ATTORNEYS.

1

3,619,818

ARTIFICIAL LIMBS

Dennis W. Collins, Kingston-upon-Thames, England, assignor to Hugh Steeper (Rochampton) Limited, London, England

Filed Oct. 1, 1969, Ser. No. 862,667

Claims priority, application Great Britain, Oct. 3, 1968, 47,045/68

Int. Cl. A61f 1/06

U.S. Cl. 3—12

2 Claims

ABSTRACT OF THE DISCLOSURE

An articulated artificial limb having two pivotally-connected limb members representing, for example, the upper arm and the fore-arm respectively of a human arm, the two limb members being further linked together by a telescopic link having a readily-releasable locking device to permit the angle between the two limb members to be varied as required.

This invention relates to articulated artificial limbs having two limb members pivotally connected together for relative pivotal movement. It is especially applicable to articulated artificial arms which comprise upper and lower limb members pivotally connected together for relative pivotal movement to simulate the way in which the upper and lower parts of a human arm pivot about the elbow joint.

It has already been proposed to provide an articulated artificial arm which has a ratchet and a half-portion of a ratchet wheel at the pivotal connection between the two limb members. This construction, however, has the disadvantage that it cannot be easily controlled by the wearer of the artificial arm.

The main aim of the present invention therefore is to provide an articulated artificial limb having two limb members which includes improved means for locking one of the limb members in a number of angular positions in relation to the other limb member, and according to the invention the two limb members, in addition to being pivotally connected together for relative pivotal movement, are further linked together by a telescopic link comprising a pair of telescoped elements and a readily-releasable locking device which is operable to lock the telescoped elements in a number of different relative axial positions, thereby locking the two limb members in a corresponding number of relative angular positions.

Where the invention is applied to an artificial arm having an upper limb member and a lower limb member, the telescopic link preferably extends from a point in the upper limb member some two or three inches above the pivotal connection with the lower limb member to a point about halfway along the lower limb member. Because of the relative pivotal movement which is provided between the two limb members, the telescopic link is connected at each of its ends to the respective limb members by some form of pivotal attachment.

The locking device whereby the telescoped elements of the telescopic link can be locked in a number of different relative axial positions can take several different forms, but it preferably comprises one or more locking balls located in the outer telescopic element and arranged to seat in any one of a number of transverse or annular grooves provided along that portion of the inner telescopic member which slides in the outer telescopic member. A spring or some other biasing member is provided so as to cause the two telescoped elements to be urged into a position where they are locked against relative axial movement by the locking ball or balls, a change in the relative

2

axial position of the two telescoped elements being effected by pulling the outer telescopic member towards the upper limb member by means of a wire, cord or string attached to the outer telescopic member. The free end of this wire or string can be attached to a selected part of the body of the person having the artificial limb, so that, by tensioning the wire or string, the locking device is released and the two limb members are able to take up a different relative angular position.

In order that the invention may be fully appreciated, a specific example of an artificial limb in accordance with it is shown in the accompanying drawing, in which:

FIG. 1 is a side view of the artificial limb, the upper limb member being shown only partially;

FIG. 2 is an enlarged section through the telescopic link which forms part of the artificial limb shown in FIG. 1; and

FIG. 3 is a still further enlarged portion of the telescopic link shown in FIG. 2 illustrating the manner in which the locking device operates.

The artificial limb shown in FIG. 1 takes the form of an articulated artificial arm comprising an upper limb member or upper arm 10 and a lower limb member or lower arm 12 which are pivotally connected together by a transverse pivot pin 14 located in the lower part of the upper limb member. The upper limb member 10 here comprises a cup-shaped lower section 16 made, for example, of aluminium alloy or rigid synthetic plastics material, the lower part of this cup-shaped portion 16 being bifurcated to receive one end of a metal rod 18 which forms part of the lower limb member 12. The outer portion of the rod 18 is covered with a synthetic plastics foamed or sponge material or some other soft material 20 shaped to resemble a fore-arm and a human hand.

It will thus be seen that the artificial arm shown in FIG. 1 provides pivotal movement at 14 between the upper limb member 10 and the lower limb member 12 in the same way as the lower and upper arms in a human arm are able to pivot about the elbow.

As indicated above, it is the main aim of the invention to provide means by which the lower arm or limb member 12 can be locked in a number of different angular positions relatively to the upper arm or limb member 10, and for this purpose the upper and lower limb members are linked together by a telescopic link 22. This is pivotally attached to the rod 18 at about its mid-portion by a pivotal connection 24 and, in a similar manner, is pivotally connected at 26 to the upper limb member 10 at a point some two or three inches above the pivot pin 14. The telescopic link 22 comprises an outer tubular element 28 which, in this instance, is the part attached to the lower limb member 12, and an inner element 30 in the form of a rod which is the part attached to the upper limb member 10. As shown in FIG. 2, the inner element 30 extends into the tubular element 28, the two elements therefore being arranged for telescopic movement in relation to each other.

In order to enable the lower limb member 12 to be locked in the manner indicated above, the telescopic link 22 includes a locking device whereby the inner telescopic element or rod 30 may be locked in a number of different axial positions relatively to the outer telescopic element 28. The locking device here comprises two balls 32 which are arranged to be seated in a series of transverse or annular grooves 34 formed in that portion of the rod 30 which slides in the outer telescopic element 28. As will be seen, these transverse or annular grooves 34 are closely spaced together. In order that the balls 32 may be released from the particular grooves 34 in which they are seated, the outer telescopic element 28 is provided with holes 36 covered by a resilient sleeve 38 made of rubber or some other yielding material. Normally, however, the two telescopic elements 28, 30 are held in a locked position by

the action of a helical spring 40 which bears against an abutment 42 attached to the rod 30 and against the upper end 44 of the outer telescopic element 28. The effect of this spring is to urge the edge 46 bounding the holes 36 in the outer telescopic element 28 hard against the balls 32 (see FIG. 3). This inevitably traps the two balls in the particular groove or grooves 34 where they are seated and thus effectively locks the two elements 28, 30 against relative axial movement. This, in turn, locks the lower limb member 12 against angular movement relatively to the upper limb member 10.

For the purpose of releasing the locking device, a wire or string 48 is attached to a lug 50 on the outer surface of the outer telescopic element 28, the free end of the wire or string 48 being passed round a pulley 52 on the upper limb member 10 and then taken to a part of the body which can be moved so as to tension the wire or string 48. Accordingly, when the wire or string 48 is tensioned, it will pull the outer telescopic element 28 towards the abutment 42 on the rod 30 against the action of the spring 40 and will permit the balls 32 to ride over the ridges 54 separating the grooves 34 in the rod 30. As the balls 32 ride over the ridges, they are naturally forced radially outwards into the holes 32 and against the resilient sleeve 38 which yields to an extent sufficient to allow the desired relative axial movement between the rod 30 and the outer telescopic element 28. Directly, however, the wire or string 48 is released, the spring 40 acts quickly to push the end 44 of the outer telescopic element 28 away from the abutment 42. This causes the edge 46 (FIG. 3) to be forced against the balls in whatever groove or grooves 34 they happen to be at that time. The telescopic elements 28, 30 are now therefore locked against relative axial movement and thus hold the upper and lower limb members 10, 12 in whatever angular position they happen to be when the wire or string 48 was released.

It will be appreciated that the number of angular positions in which the lower limb member 12 can be locked in relation to the upper limb member 10 is governed by the number of grooves 34 on the inner telescopic member 30. Further, the angular distance over which the lower limb member 12 moves as the balls 32 move from one groove 34 to the next is governed primarily by the size of the balls, the size of the grooves, and the distance between adjacent grooves. These dimensions can naturally be selected to suit different requirements, but we have found that it is entirely acceptable to use balls of about 1/4" diameter with the distance between the bottom portions of adjacent grooves being about 1/3" apart.

For reasons of strength, the telescopic link will normally be made of metal, for example aluminium alloy or some other stainless metal.

Although the specific artificial arm described above makes use of locking balls 32 which cooperate with grooves 34 to lock the two elements of the telescopic link

against relative axial movement, it is possible for other locking devices to be used instead. For example, a pawl and ratchet mechanism can be provided whereby a spring-loaded pawl cooperates with a ratchet formed on the lower end of the rod 30. It would also be possible for the lower end of the rod 30 to be provided with some kind of projection which is urged by a spring into any one of a number of holes or serrations provided in the outer telescopic element 28.

The invention has been described above with particular emphasis on articulated artificial arms as this is the application where the invention will normally be used, but it can also be applied to artificial legs and other artificial limbs where two members are pivotally connected together and need to be held in a number of relative angular positions.

I claim:

1. An articulated artificial limb having two limb members, a pivotal connection between the two limb members to permit relative pivotal movement between them, a telescopic link comprising an outer telescopic element and an inner telescopic element linking the two limb members together at points displaced from the pivotal connection, and a readily-releasable locking device operable to lock the said two telescopic elements in a number of different relative axial positions so as to lock the two limb members in a corresponding number of relative angular positions, the said locking device comprising a plurality of transverse grooves formed in that portion of the said inner telescopic element which slides telescopically in the outer telescopic element, and at least one locking ball located in the outer telescopic element and arranged to seat in any one of the said transverse grooves.

2. An artificial limb as claimed in claim 1, wherein the locking ball is located in a hole in the outer telescopic element, the hole being covered by a resilient sleeve so as to permit the ball to be released from the transverse groove in which it is seated in the inner telescopic element.

References Cited

UNITED STATES PATENTS

1,334,834	3/1920	Blatchford	3—2
2,834,024	5/1958	Aveni	3—12
3,407,409	10/1968	Prahl	3—27

OTHER REFERENCES

Orthopaedic Appliances Atlas, vol. 2, artificial limbs, pp. 197, 198, J. W. Edwards, Ann Arbor, Mich., 1960.

RICHARD A. GAUDET, Primary Examiner

J. YASKO, Assistant Examiner

U.S. Cl. X.R.

55 3—12.2