RESILIENT PIVOT JOINT FOR AN ARTIFICIAL LEG

Inventor: Albert L. Weber, Appleton, N.Y.
Assignee: Lloyd J. Watkins, Lockport, N.Y.; a part interest
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Primary Examiner—Richard A. Gaudet
Assistant Examiner—Ronald L. Frinks
Attorney, Agent, or Firm—Clarence A. O'Brien; Harvey B. Jacobson

ABSTRACT

A pivot joint for an artificial leg and the like has a thrust bearing and a pair of joint segments arranged spaced from one another and abutting the thrust bearing. A bolt may be arranged in apertures provided in the joint segments and retained by a nut for pivotally connecting the joint segments together. The joint segments are attached to respective sections of an artificial leg, with the cut preferably made in the lower leg area between the ankle and knee. A resilient sleeve is arranged about the joint segments for restoring same to a normal or predetermined relationship with respect to one another following the application of a torsional force to the joint.

7 Claims, 6 Drawing Figures
RESILIENT PIVOT JOINT FOR AN ARTIFICIAL LEG

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates generally to prosthetic devices, and in particular to a pivot joint for artificial limbs.

2. Description of the Prior Art

A problem commonly encountered by amputees and the like having been provided with a suitable prosthetic device such as an artificial limb is that the stump becomes strained and irritated by bodily movements performed while the prosthetic device remains stationary. The resulting discomfort is particularly severe for persons with leg amputations — both above and below the knee. A twisting, for example, either to the right or left by the wearer while the artificial leg remains stationary can subject the stump to strain and cause a slight movement of the stump relative to the socket of the artificial leg. As a result, the amputee suffers from vestigations and the like which may become so severe as to prevent use of the prosthetic device. Further, the rigidity of conventional artificial limbs, particularly legs, discourages the wearer from climbing stairs, ramps, hills, and the like, and may subconsciously cause body movements to become, for example, strained and unnatural.

Arrangements have been proposed which insert a cushioning device in an artificial leg. However, these arrangements are primarily intended to improve foot fall by means of a limited horizontal movement and cushion the stump from shock, and do not reduce strain and irritation to a stump from various body movements. Further, these cushioning devices may reduce the stability of the prosthetic device.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide for use with an artificial limb and the like a pivot joint which will give an amputee and the like relief from vestigation and the like, more comfort, improved mobility, and increased stability.

It is another object of the present invention to provide a pivot joint which may be simply and inexpensively installed on existing prosthetic limbs.

These and other objects are according to the present invention by providing a pivot joint having a bearing member, and a pair of joint segments arranged abutting the bearing member and spaced from one another. The joint segments may be connected together for movement relative to one another and connected to respective sections of a member, such as an artificial leg, in a suitable manner. A resilient element is arranged about the joint segments for restoring same to a predetermined relationship following the application of a torsional force to the pivot joint.

In a preferred embodiment of the present invention, the support member is a thrust bearing, and the resilient element is a sleeve constructed from pure gum rubber and the like.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming part hereof, wherein like numerals refer to like parts throughout.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary, perspective view, partly cut away and in section, showing a pivot joint according to the present invention installed on an artificial leg.

FIG. 2 is a fragmentary, sectional view, taken generally along the line 2—2 of FIG. 1.

FIG. 3 is a sectional view, taken generally along the line 3—3 of FIG. 2.

FIG. 4 is an exploded, perspective view of the pivot joint of FIGS. 1 to 3.

FIG. 5 is a fragmentary, sectional view, similar to FIG. 2, showing a modified embodiment of a pivot joint according to the present invention.

FIG. 6 is an exploded, perspective view of a portion of the pivot joint of FIG. 5.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 of the drawings shows a pivot joint 10 according to the present invention arranged in an artificial leg 12. As illustrated, leg 12 is cut into sections 14 and 16 at a point located approximately, for example, eight inches from the bottom of its associated foot. Although the stump socket (not shown) is indicated as being arranged for an above-the-knee amputation, it is to be understood that a pivot joint 10 may be used with below-the-knee amputations as well.

Referring now to FIGS. 2 to 4 of the drawings, pivot joint 10 includes a bearing member such as a conventional thrust bearing 18. A pair of joint segments 20, 22 are arranged spaced from one another and abutting bearing 18. Segments 20, 22 are connectable to respective sections 14, 16 of leg 12 so as to pivotally connect these sections together. One of segments 20, 22 — segment 22 being illustrated — is provided with a, for example, annular pocket or recess 24 for receiving bearing 18. Recess 24 is dimensioned such that bearing 18 protrudes slightly above the adjacent surface of joint segment 22 for spacing segments 20, 22 from one another. Aligned apertures are provided in segments 20, 22. Each aperture has a section 26 arranged in a portion of its respective segments 20, 22 so as to be closer to the other segments 22, 20 when joint 10 is assembled than the other aperture section 28 forming the aperture. Aperture section 26 has a smaller area than aperture section 28. A shoulder 30 is formed at the junction of aperture sections 26 and 28. Hollow sleeves 32 - preferably constructed from a, for example, hardened and ground, suitable metal to reduce wear in joint 10 — are arranged in aperture section 26 with a flange 34 thereof abutting shoulder 30. A, for example, spanner head bolt 36 is arranged in the apertures and threadingly engages a, for example, spanner nut 38 for being retained therein. In this manner, segments 20, 22 are connected together for movement relative to one another about bolt 36 and axis a—a (FIG. 2).

A sleeve 40 is arranged about segments 20, 22 and is constructed from a resilient material such as, for example, pure gum rubber and the like for restoring segments 20, 22 to a normal or predetermined relationship with respect to one another following the application of a torsion force to joint 10 causing at least one segment 20, 22 to be displaced about axis a—a. Clamps 42 and 44 are arranged about sleeve 40 for clamping same to segments 20 and 22, respectively. The torque exerted by sleeve 40 may be decreased by moving clamps 42.
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44 further apart, and increased by arranging them closer together. This adjustment can be useful for providing a different degree of torque for persons of, for example, different weights. Each clamp 42, 44 is formed from a band 46 and a conventional, cam operated gripping device 48.

Each segment 20, 22 may be provided with a hole 50 arranged in a plane which is transverse through axis a-a. This hole 50 permits the associated segment 20, 22 to be attached to a respective leg section 14, 16 as by a pin 52 arranged in hole 50 and matching holes 54 in the respective section 14, 16. Segments 20, 22 are received in cut-out portions of leg sections 14, 16. The portions of joint segments 20, 22 in which aperture sections 28 are arranged have reduced diameters so as to form a shoulder which limits movement of the joint segments 20, 22 into these cut-out portions of leg sections 14, 16. Additional holes 56 may be arranged at, for example, 90° with respect to holes 50 and provided with screw threads for receiving, for example, set screws 58 which engage matching holes (not shown) in sections 14, 16 and furnish added support to the arrangement.

FIGS. 5 and 6 show a pivot joint 60 according to the present invention adapted to be used with the newer type cosmetic prosthetic legs constructed with, for example, aluminum tubing. A leg 62 is divided into sections 64 and 66. Although only section 64 is illustrated as having the tubing, it is to be understood that section 66 may be similarly constructed.

A joint portion 68 has a plurality of slots 70, four being shown, provided in a wall 72 and communicating with an aperture section 73 formed by wall 72. Section 73 is dimensioned to receive an end of a section of tubing 74, and, for example, tapered screw threads are formed on wall 72 for receiving a, for example, jam nut 76 and clamping tubing 74 in aperture section 73. Alternatively, a clamp such as 42, 44 may be employed in place of nut 76. Wall 72 and slot 70 form a split collar for gripping the tubing 74.

As can be readily understood from the above description, a pivot joint 10, 60 according to the present invention enables an amputee to twist right or left while his foot remains stationary without placing a strain and rubbing or producing irritation on the amputee's stump. Further, a pivot joint 10, 60 according to the present invention gives an amputee greater freedom of, for example, hip movement.

A pivot joint 10, 60 according to the present invention may be made in various sizes so that amputees of all sizes and ages may be fitted.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention.

What is claimed is new is as follows:

1. A pivot joint for an artificial limb, comprising, in combination:
   a. first and second joint segments;
   b. means connecting the first and second joint segments together for pivotal movement relative to one another about a pivot axis;
   c. a bearing member;
   d. a recess provided in one of the first and second joint segments and arranged for receiving the bearing member, the bearing member being arranged in the recess;
   e. resilient means including a sleeve arranged around the first and second joint segments for restoring same to a predetermined relationship with respect to another following the application of a torsional force to the segments;
   f. means for attaching the first and second joint segments to respective sections of a member to be pivotally joined together;
   g. first and second clamping elements arranged for clamping the resilient means to the first and second joint segments, respectively; and
   h. the first and second joint segments being provided with aligned apertures, the connecting means having a bolt arranged in these apertures and a nut threadingly engaging the bolt for retaining same, one of the joint segments having at least one slot provided in a wall thereof and communicating with an aperture provided in the joint segment, the aperture being dimensioned to receive an end of a length of tubing, and means arranged about the wall adjacent the slot for clamping the tubing in the aperture, the apertures provided in the joint segments each having two sections, the aperture section arranged closest to the other joint segment having a smaller area than the other aperture section of the same joint segment, and a shoulder being formed at the junction of the sections, and further including a hollow element provided with a flange and arranged in the smaller diameter aperture section with the flange abutting the shoulder.

2. A structure as defined in claim 1, wherein the member is an artificial leg, and the pivot joint is arranged between the knee and ankle.

3. The structure as defined in claim 1, wherein the bearing member is a thrust bearing.

4. A pivot joint for an artificial limb, comprising, in combination:
   a. first and second joint segments;
   b. means connecting the first and second joint segments together for pivotal movement relative to one another about a pivot axis, the first and second joint segments being provided with aligned apertures, and the connecting means having a bolt arranged in these apertures and a nut threadingly engaging the bolt for retaining same, the apertures provided in the joint segments each having two sections, the aperture section arranged closest to the other joint segment having a smaller area than the other aperture section of the same joint segment, and a shoulder being formed at the junction of the sections, and further including a hollow element provided with a flange and arranged in the smaller diameter aperture section with the flange abutting the shoulder;
   c. a bearing member;
   d. a recess provided in one of the first and second joint segments and arranged for receiving the bearing member, the bearing member being arranged in the recess; and
   e. resilient means including a sleeve arranged around the first and second joint segments for restoring same to a predetermined relationship with respect
to one another following the application of a torsional force to the segments.
5. A structure as defined in claim 4, further including means for attaching the first and second joint segments to respective sections of a member to be pivotally jointed together.
6. A structure as defined in claim 4, further including first and second clamping elements arranged for clamping the resilient means to the first and second joint segments, respectively.
7. A structure as defined in claim 4, wherein the bearing member is a thrust bearing.

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