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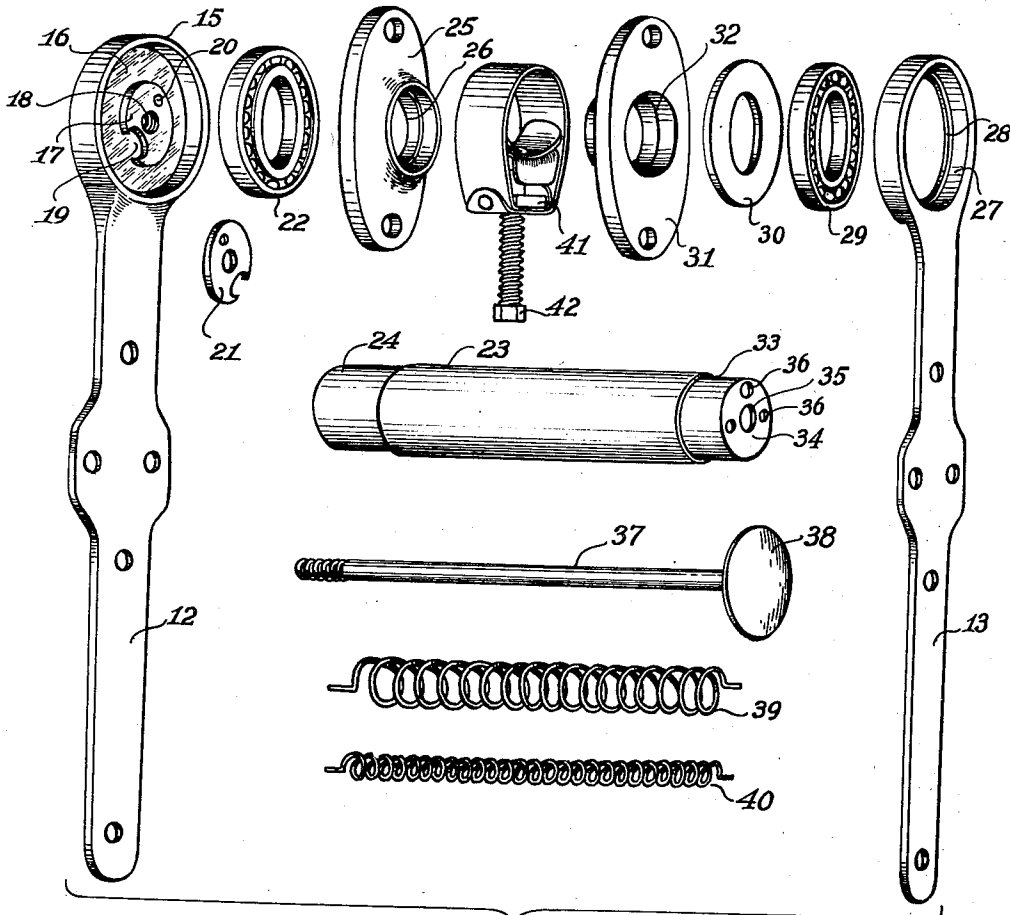
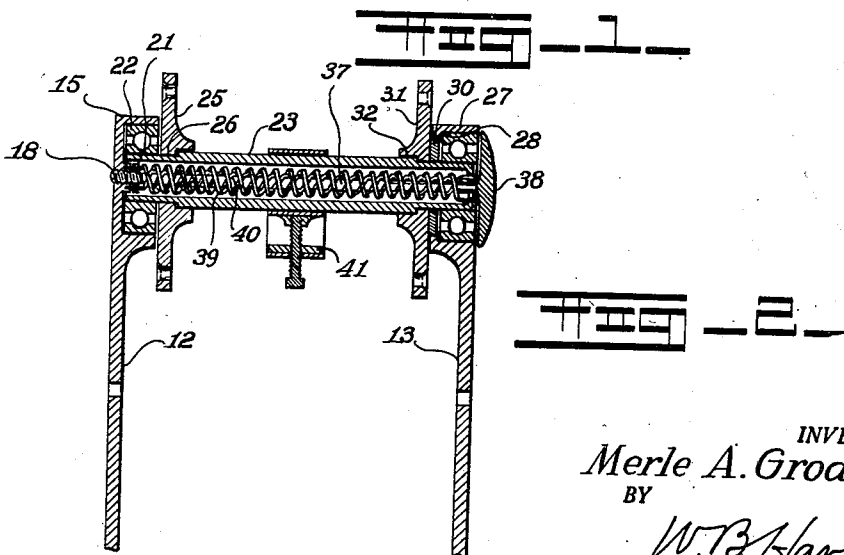
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KNEE JOINT FOR ARTIFICIAL LIMB

Filed July 17, 1956

2 Sheets-Sheet 1



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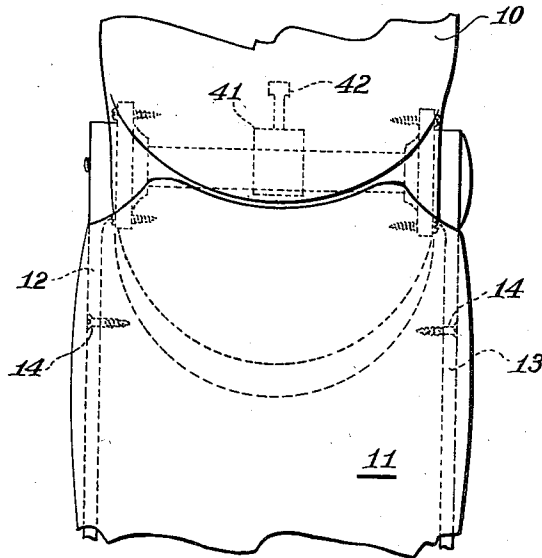


FIG. 3

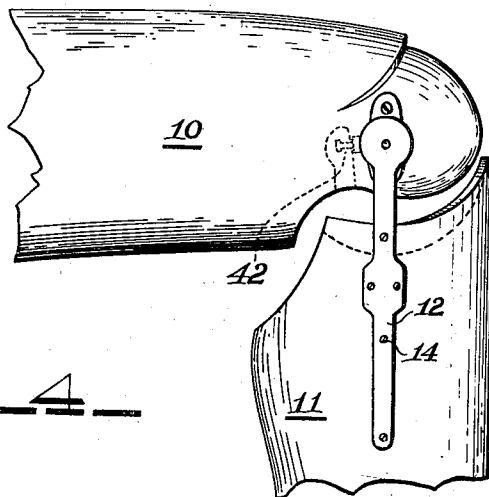


FIG. 4

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4 Claims. (Cl. 3—22)

This invention relates to artificial limbs in general and more particularly to knee joints therefor.

The principal object of the invention is the provision of an improved knee joint for an artificial limb.

A further object of the invention is the provision of a knee joint construction for an artificial limb incorporating tensioning means biasing one portion of the limb with respect to the other in opposite directions and at different degrees of tension.

A still further object of the invention is the provision of a simple and efficient knee joint construction incorporating antifriction bearings readily removable and replaceable parts.

A still further object of the invention is the provision of a knee joint construction wherein the tensioning of the lower limb with respect to the upper limb joined by the construction may be readily adjusted.

The knee joint construction for artificial limbs disclosed herein comprises an improvement in the art in that tensioning means are incorporated in the construction for normally biasing the respective portions of the artificial limb in opposite directions and with respect to a normal endwise positioning. Such a construction provides better control of the limb below the knee inasmuch as opposed tensioning means, one of which is relatively stronger than the other, are brought into play when the limb is moved from vertically aligned position.

Those skilled in the art will recognize that attempts have heretofore been made to bias knee joint construction means and such constructions have inevitably biased one portion of the limb in one direction with respect to the other whereas the present invention incorporates opposed tensioning means which provide an adjustable self-centering positioning of the one portion of the limb with respect to the other so that a natural flexible and somewhat resilient knee action results.

With the foregoing and other objects in view which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being the intention to cover all changes and modifications of the example of the invention herein chosen for purposes of the disclosure, which do not constitute departures from the spirit and scope of the invention.

The invention is illustrated in the accompanying drawings, wherein:

Figure 1 is an exploded view of the several parts forming the knee joint construction.

Figure 2 is a vertical section through the assembly of the knee joint construction.

Figure 3 is a plan view of portions of an artificial limb incorporating the knee joint construction.

Figure 4 is a side view of a portion of an artificial limb incorporating the knee joint construction.

By referring to the drawings and Figures 3 and 4 in particular it will be seen that thigh and shank portions of an artificial limb are indicated respectively by the

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numerals 10 and 11 and that they are joined to one another for hinge-like action by a knee joint construction incorporating a pair of oppositely disposed vertical mounting brackets 12 and 13, each of which is apertured so that fasteners 14—14 may be positioned therethrough and engaged in the shank 11 so as to mount the oppositely disposed vertical mounting brackets with their upper ends above the upper ends of the shank 11.

The vertical mounting bracket 12 has an inturned annular flange 15 defining a cavity 16 in the center of which a raised boss-like portion 17 is formed. The raised boss-like section 17 is centrally apertured as at 18, the aperture being threaded. The raised boss-like section 17 is also provided with an elongated cutaway section 19 and a secondary aperture 20.

The area around the periphery of the raised boss-like section 17 and within the annular flange 15 is adapted to receive a washer 21 which is of a configuration matching the raised boss-like section 17 along with an annular ball bearing assembly 22. The annular ball bearing assembly 22 is adapted to be positioned over the tubular end of a hollow axle 23 and specifically over an end 24 thereof which is of reduced diameter with respect to the remainder of the axle. An elongated bracket 25 having a central aperture 26 is also adapted to be positioned over the end portion 24 of the axle as best shown in the vertical section comprising Figure 2 of the drawings.

It will thus be seen that the axle 23 is capable of relatively free rotation with respect to the bracket 25, ball bearing assembly 22 and the vertical mounting bracket 12.

The oppositely disposed vertical mounting bracket 13 has an annular upper end portion 27 which in turn is inwardly flanged as at 28 and defines means for receiving a secondary ball bearing assembly 29. A washer 30 is disposed adjacent the inturned flange 28 and alongside a secondary elongated bracket 31 which has a central aperture 32 which registers over the opposite end of the axle 23. The opposite end of the axle 23 is of reduced diameter and is indicated by the numeral 33. The end 33 is provided with an integrally formed end portion 34 which is centrally apertured as at 35 and has several circumferentially spaced apertures 36—36 positioned thereabout.

In assembly, as shown in Figure 2 of the drawings, a bolt 37, which has an enlarged flat head 38, is positioned axially of the hollow axle 23, passing through the aperture 35 in the end 34 of the axle, and extending therethrough and threadably engaging the threaded aperture 18 in the vertical mounting bracket 12, as heretofore described.

Two coil springs 39 and 40 of uniform length and of different diameter are positioned about the bolt 37 within the hollow axle 23, it being observed that the coil spring 40 is of lesser diameter than the coil spring 39 and is positioned in closely spaced relation to the bolt 37 while the coil spring 39 is positioned about the coil spring 40 and bolt 37. The ends of the coil spring 39 are respectively engaged in one of the apertures 36 in the end 34 of the hollow axle 23 and the elongated cutaway section 19 in the raised boss-like portion 17 of the vertical mounting bracket 12 so that rotation of the hollow axle 23 in one direction will be opposed by a winding tensioning of the coil spring 39. The respective ends of the coil spring 40 are engaged in one of the apertures 36 in the end portion 34 of the axle 23 and the aperture 20 in the raised boss-like portion 17 of the vertical mounting bracket 12.

The coil spring 40 is arranged in opposite position to the coil spring 39 so that rotation of the axle 23 in an opposite direction will be opposed by the winding tensioning action of the coil spring 40. The coil springs

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39 and 40 thus partially oppose one another at their dead-center positioning which corresponds with an approximately vertical positioning of the shank and thigh portions of the artificial limb between which the knee joint construction is positioned. So that this action may be utilized, the hollow axle 23 is secured in adjustable relation to the thigh portion 10 by a contraction clamp 41 which is positioned about the hollow axle 23 midway between the same and extends outwardly therefrom and is positioned in an appropriately formed opening in the thigh portion 10 of the artificial limb so that it is immovable with respect thereto.

An adjustment bolt 42 comprises part of the contraction clamp 41 and extends out of the opening in the thigh portion 10 of the artificial limb, as best seen in Figure 4 of the drawings, so that the device is adjustable.

It will thus be seen that the hollow axle 23 is positioned in desirable fixed relation to the thigh portion 10 while the vertical mounting brackets 12 and 13 are secured to the shank 11 and that in such position the opposed tensioning means comprising the springs 39 and 40 provide a resilient yet flexible knee joint action which permits the artificial limb to be used to greater advantage and in a more natural appearing manner, thereby meeting the several objects of the invention.

Having thus described my invention, what I claim is:

1. A knee joint for an artificial limb comprising a pair of vertical mounting brackets adapted to be secured to one portion of said artificial limb, a hollow axle journaled at its ends in said brackets, said hollow axle having a closed apertured end, a boss having apertures therein formed on one of said vertical mounting brackets in axial alignment with said axle and a bolt positioned through one of said brackets and said hollow axle and engaged in the other of said brackets, a pair of coil springs one of which is of a greater diameter than the other disposed within said hollow axle around said bolt, the respective ends of said coil springs being secured to said closed end of said axle and said apertured boss of said bracket, the convolutions of said coil springs arranged in oppositely disposed pattern so that tensioning of one coil spring releases tension of the other, a pair of elongated mounting brackets positioned on said hollow axle and forming means for securing said hollow axle to the other part of said artificial limb, a compression clamp positioned on said hollow axle and mounted in said last-mentioned portion of said artificial limb for holding said hollow axle stationary with respect thereto.

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2. The knee joint for an artificial limb set forth in claim 1 and wherein the vertical mounting brackets have annularly flanged openings, ball bearing assemblies disposed in said openings and said hollow axle rotatably supported in said ball bearing assemblies.

3. The knee joint for an artificial limb as set forth in claim 1 and wherein said vertical mounting brackets include elongated apertured members adapted to be secured by fasteners to a lower part of said artificial limb.

4. A combination of an artificial limb shank portion and thigh portion and a knee joint hingedly connecting said portions to one another, said knee joint comprising a hollow axle having brackets movably positioned thereon and secured to said thigh portion of said limb, means in said thigh portion of said limb for engaging said hollow axle in stationary relation thereto, said hollow axle having a closed end, said closed end having a plurality of apertures therein, one of which is centrally disposed and the others of which are radially positioned with respect thereto, said hollow axle having respective end portions of reduced diameter and vertical mounting brackets journaled over said end portions, said vertical mounting brackets including depending members apertured for attachment to said shank portion of said artificial limb, one of said vertical mounting brackets having a raised annular boss, said annular boss having a central threaded opening and a plurality of apertures radially spaced with respect thereto, a bolt positioned through said vertical mounting brackets and hollow axle and engaged in said threaded opening, a pair of coil springs of uniform length having outturned ends, said coil springs being of different diameters and disposed about said bolt within said hollow axle with the respective ends of said coil springs engaged in the radially spaced apertures in said closed end of said axle and the radially positioned apertures in the raised boss of said vertical mounting bracket, said springs being opposed to one another and one of said springs being of relatively greater tensioning capacity than the other whereby said hollow axle is urged to a dead-center position relative to said vertical mounting brackets and conforming to a substantially longitudinal aligned position of said artificial limb portions.

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