Dec. 8, 1959 M. M. BAIR 2,915,760

PROSTHETIC DEVICE

Filed Dec. 24, 1956

Fig. 1.

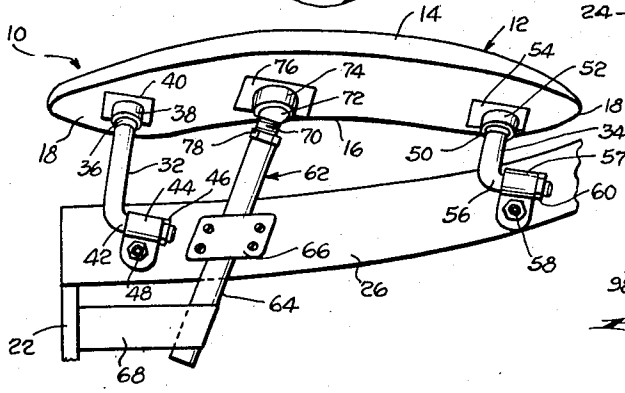


Fig. 5.

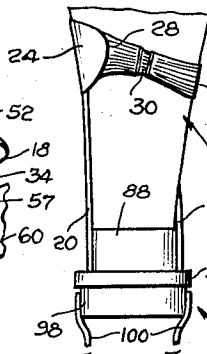


Fig. 6.

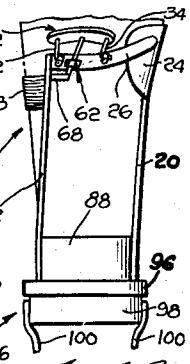


Fig. 2.

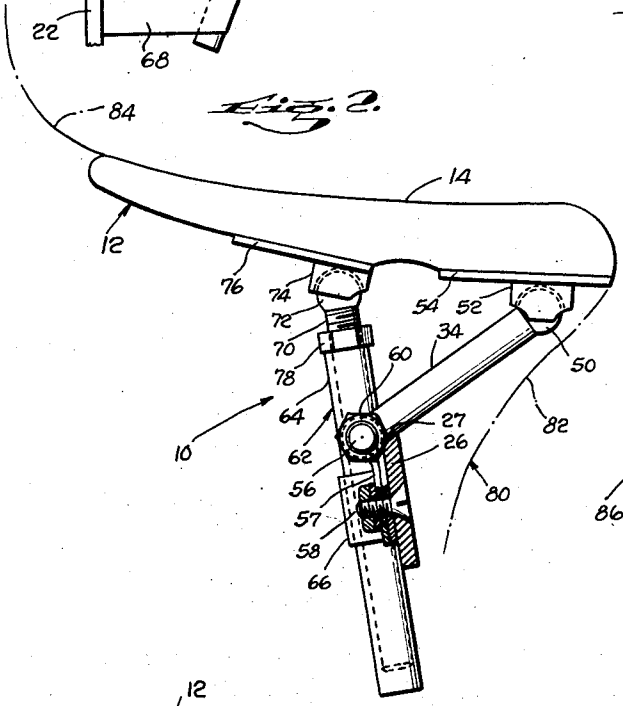


Fig. 7.

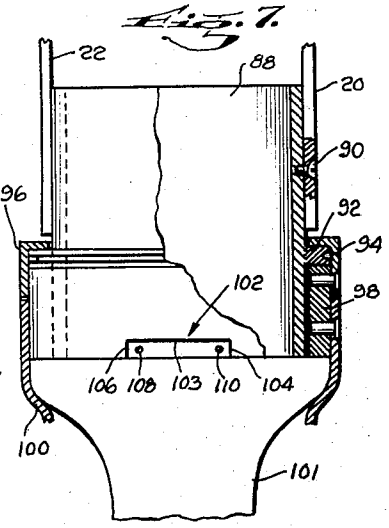


Fig. 3.

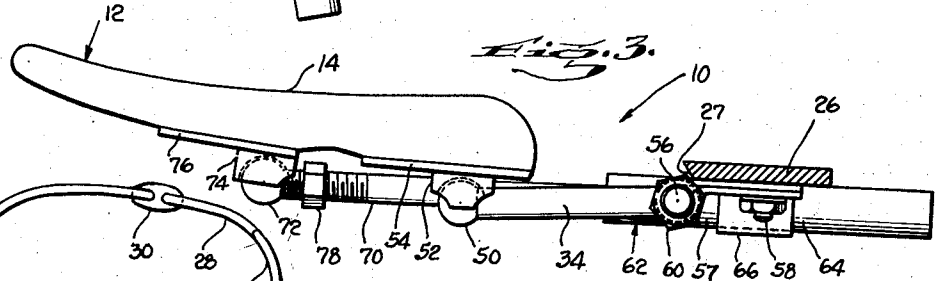
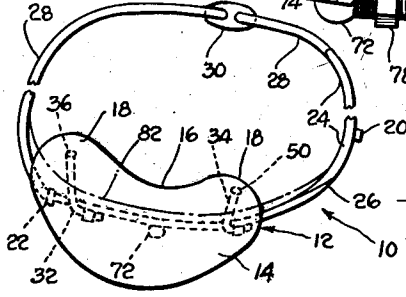


Fig. 4.



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PROSTHETIC DEVICE

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15 Claims. (Cl. 3—2)

This invention relates to artificial limbs or prosthesis for leg amputees and to the method of supporting the weight of such amputees.

It is the desideratum of this invention to provide more useful and practical means and methods for supporting the weight of a leg amputee, whether the amputee be double or single, by attempting to approach, as closely as possible, the support that is normally afforded by the natural limbs cooperating with the pelvic girdle.

It has been the accepted practice to secure the artificial limb or prosthesis about the wearer's thighs, socketing the stumps in the prosthesis to transmit the body weight from the thighs to the prosthesis. To accomplish this, straps secured about the thighs, are the immediate means whereby the weight is transmitted from the body to the artificial limb. From actual experience, it is known that the strap srtuctures being rigid and cumbersome in nature, are extremely uncomfortable after any period of prolonged use. The wearer experiences an annoying constriction and tightening about his thigh because of the weight that is transmitted to the straps thereat. Hence if the fit of the strap is not precise, there results a rubbing unhealthful irritation in those areas of movement of the strap relative to the thigh. This is even more true with double amputees who are forced to wear two such prosthesis, thereby doubling the strain and uncomfortable experience.

In carrying out the purposes and objects of this invention, namely to achieve a support that approaches the function performed by normal limbs, it is within the concept of the invention that the prosthesis be positioned about areas of the anatomy, as close as possible to the location of the natural limbs to provide the desired results.

To understand the invention, it is first important to know the principles of support afforded by the normal limbs in their connection with the pelvic girdle. The pelvic girdle defines surfaces for the attachments of the trunk and lower limbs. Its most important mechanical function, however, is to transmit the weight of the trunk and upper limbs to the lower extremities or lower limbs; that is to say, the pelvic girdle is the jointure or bridge between the lower limb supports and the remaining upper body portion. Hence, one of the chief functions of the pelvic girdle is that of transmitting the body weight to the lower limb supports. For the reception and the diffusion of the weight, the pelvic girdle is provided with two acetabulum cavities, each of which is generally strengthened by two additional bars running toward the pelvis and ischium. The ischium forms the lower and back part of the hipbone while the acetabular cavities each form a socket for the receipt of the hip of the supporting femur.

Amputation or loss of the natural support afforded by the lower limbs, removes the means to which the pelvic girdle normally transmits the body weight to the ground during walking and standing positions. In carrying out the objects of the invention, advantage is seized upon the natural formation of the pelvic girdle and its included

structure. The rest or seat conveniently positioned beneath the pelvic girdle and retained in position therebeneath, serves to absorb the body weight from the pelvic girdle substantially in the same manner as does the head of the femur socketed in the acetabular cavity. The rest or seat is then supported in such manner that the weight transmitted thereto is, in turn, transmitted thereby directly to the ground in substantially the same manner and location relative to the pelvic girdle as do the natural limbs.

It will be readily recognized that the most nearly perfect structure would be one whereby the pelvic girdle is supported directly at the acetabulum. However, inasmuch as we are here concerned with amputees who have had only a portion of their limb or limbs removed, such support directly at the acetabulum is not feasible. In practical application it has been found that the portion of the pelvic girdle most easily adapted for support is the ischium although it will be clear that other portions thereof may also be applicable, depending upon the particular bone structure and nature of the amputation.

Hence it is another object of the invention to take advantage of the formation of the pelvic girdle by providing a rest or seat therefor at the ischium, as close to the acetabular cavity as possible, and onto which the weight of the body may rest; thence retaining the seat and its position and supporting it above the ground in the nature and in the location relative to the pelvic girdle substantially as does a natural limb.

Heretofore the wearer of an artificial limb has lacked the ability to pivot the same at the heel thereof in the same manner and with the same degree of rotation as a natural leg. In order to simulate a pivoting motion, the amputee was forced to unduly swing his body in the attempt and the hope that by such exaggerated manipulation, he could cause the rigid artificial limb to assume a shuffling sliding arcuate motion about the ground.

Accordingly, it is another object and feature of the invention to enable the amputee to actually rotate or pivot his prosthesis at the heel thereof about the ground in substantially the same manner and with substantially the same degree of rotation as one would pivot his natural foot without contorted or excessive swinging motion of the thigh or upper body regions.

Other and further objects of my invention reside in the structures and arrangements hereinafter more fully described with reference to the accompanying drawings in which:

Fig. 1 is a rear view of the seat or reference member in its sitting position and a partial view of the support structure therefor constructed in accordance with the teaching of the invention.

Fig. 2 is a side view of the reference member shown in Fig. 1 in its resting position.

Fig. 3 is a side view of the reference member shown in Figs. 1 and 2 wherein the wearer thereof is in a reclining position.

Fig. 4 is a top view of the reference member and part of the supporting structure therefor.

Fig. 5 is a front view of the wearer's legs with the strap secured thereabout.

Fig. 6 is a rear view of the wearer's leg showing the reference memebr retained thereto.

Fig. 7 is an enlarged view of the foot swivel.

Referring now to figures of the drawing, numeral **10** generally identifies the upper section of the prosthesis. The prosthesis comprises at least a seat member **12**. For the most efficient and effective support of the pelvic girdle, the seat member **12** is positioned proximate, or as close as possible, to the joint of the femur with the acetabulum. In this position the seat member affords a

resting surface for the lowermost pre-selected portion of the pelvic girdle. For purposes of explanation and to provide a better understanding of the invention, although many predetermined areas of the pelvic girdle may be utilized, the ischium will be referred to hereinafter as the pre-selected portion for the sake of clarity.

The seat 12 includes a resting surface 14 that is adapted to take the weight from the ischium of the pelvic girdle when positioned therebeneath. Member 12 is of sufficient area as to extend beneath the bottommost portion of the ischium to support the weight of the body during the walking and standing movements of the wearer. At its forward or leading edge 16, it is curved inwardly, the depth of the curve and the configuration thereof being determined by the curvature of the thigh of the wearer.

To determine the shape of the curve 16 and also that of the resulting lobes or leaves 18, it is recommended that a mold be taken of the thigh at the portion thereof proximate the joint of the femur with the acetabulum, the mold thus serving to provide a guide from which the curve 16 and the lobes or leaves 18 may be formed. The leaves 18 thence serve to encompass slight portions of the thigh. Once again, in order that the seating surface 14 be made comfortable, it may be contoured, as seen in Figs. 2 and 3, by taking a mold of that portion of the body directly beneath the ischium. However, in practice a number of members 12 each having a different shape and size, may be applied to the wearer until the most comfortable one is found.

The care with which the surface 14, the curve 16 and leaves 18 are formed will result in a more comfortable prosthesis, eliminating the incidence of irritation. The edges of the seat 12 are smoothed, as shown in Figs. 1 to 3 to eliminate rough edges, thereby removing possible sharp surfaces that might penetrate or irritate the adjacent skin areas.

Because the seat 12 carries the weight rested upon it by the pelvic girdle, it is retained and supported in position beneath the weight-transmitting pre-selected ischium at all times. It is necessary to retain this position at all times regardless of the movements of the wearer. Hence, for the purpose of providing a clearer insight to the concepts of the invention, the seat 12 is also referred to as a reference member. It is so termed because it retains substantially the same fixed reference plane, whether the wearer is standing or walking as depicted in Fig. 2, or is sitting in a partial or a full reclining position as seen in Fig. 3.

When the wearer is in the standing or walking position (Fig. 2) the pre-selected ischium is located directly above the surface 14. This surface, being smoothly contoured exactly to that of the body contour of the wearer, forms therewith a cooperating mating working engagement. When the wearer is in a reclining position, as shown in Fig. 3, the surface 14 remains in its reference plane, but the pelvic girdle has changed its position relative thereto. During the transition movement of the wearer from a reclining position to a standing or walking position, the pelvic girdle is caused to assume two different positions; the first one wherein the same is out of engagement with the surface 14, and the second position wherein the same is in mating working engagement therewith. Inasmuch as surface 14 is substantially fixed in its reference plane, it is positioned always to accept and cooperate with the pre-selected ischium as the ischium moves into mating contour engagement therewith.

To enable the member 12 to transmit the weight applied thereto to the ground in the manner of a natural limb, the prosthesis of the invention comprises a framework supporting structure that simulates the wearer's natural limb. The upper portion 10 of the prosthesis includes a pair of spaced rigid frames 20 and 22. The one frame 20 extends upwardly along the outermost side of the wearer's thigh to provide lateral or sidewise support for the body. It is retained close against the thigh by a form-fitting strap 24 to which it is made integral.

The frame 22, spaced from the first frame 20, also extends upwardly along a portion of the wearer's thigh but on the side thereof opposite that of the frame 20. Frame 22 is bent slightly inward toward the seat member 12 to support the same as directly as possible. The topmost portion of the frame 22 is made integral with a rigid strap 26 which is co-extensive with the form-fitting strap 24 and formed as an integral part thereof. The rigid strap 26 thus defines an extension of the form-fitting strap 24 and, on its other side, defines an extension of a semi-flexible strap 28. The semi-flexible strap 28 is secured at its end adjacent to the strap 26 to the frame 22.

As seen in Fig. 5, the form-fitting and flexible straps 24 and 28 are joined together or made integral to form a complete strap structure. In order that the completed strap structure defined by the form-fitting strap portion 24, the rigid strap portion 26, and the semi-flexible strap portion 28 may be secured to and about the thigh, there is provided at the front thereof a suitable fastening adjustor 30. For simplicity of explanation, the adjustor 30 is here shown in the form of a lacing structure.

The form-fitting strap portion 24 cooperates with the outermost sideway portion of the thigh to take the weight therefrom and distribute it on to the framework structure defined by the frames 20 and 22. The semi-flexible strap 28 and the adjustor 30 permits proper and comfortable placement of the completed strap structure about the thigh of the wearer. The rigid strap portion 26, being retained in position at its one end by its connection to the frame 22 and, at its other end, by the form-fitting strap portion 24, is sufficiently stable to support the seat member 12 in its desired position.

As will be recognized, because it is desirable to retain the seat 12 in its reference plane during the movements of the pelvic girdle relative thereto, the same must be connected with the support structure therebeneath, namely, frames 20 and 22 and the retaining strap 24, 26 and 28 in such manner that it will be permitted movement relative thereto. The strap structure serves to retain the seat 12 in its pre-determined position beneath the pre-selected ischium, whereas the supporting framework 20, 22 transmits the weight from the seat and strap structure to the ground.

In order that the weight may be transmitted efficiently and effectively, the supporting structure, including the strap and the framework, is positioned about the thigh to assume the same location as the femur relative to the acetabulum and simulate the natural limb of the wearer. Hence, it will be clear that the transmission of the wearer's weight from the seat to the strap and thence to the frame, and finally to the ground, is done so along substantially the same aligned position relative to the pelvic girdle as would the wearer's natural limb.

Mounted to the under-side of the seat 12 is a supporting operable tripod. The tripod comprises a pair of arms 32 and 34. Each arm is substantially the same in construction and manner of operation and connection between the rigid strap 26 and the under-side of the seat 12. The top of the arm 34 is formed as a ball joint 36 that fits within and is secured to the under-side of the seat 12 by a ball joint receiving socket 38 secured to the seat at its plate 40. Arm 32 is formed substantially L shaped; its leg 42 extending through an eyelet opening defined in a strap connector element 44. The eyelet of the connector 44 is of sufficient internal diameter as to swingably receive the leg 42 therein.

The leg 42 is retained in the eyelet and has an adjustment relative therein by the provision of a nut 46 adjustably threaded along the end thereof. In order that the arm 32 have substantially universal connection with the rigid strap 26, the eyelet connector element 44 is pivotally mounted to the strap 26 at 48. The pivotal mounting 48 thus permits the eyelet and the arm 32 to pivot about the

As noted previously, arm 34 is connected in exactly the same manner between the seat 12 and the outer surface outer surface of the strap 26, while the leg 42 may swing within its connector 44.

of the rigid strap portion 26 as arm 32. That is to say, arm 34 is secured at its balled head 50 thereof to the under-side of the member 12 by a cooperating receiving socket 52 secured thereto at its plate 54. The L shaped leg 56 of the arm 34 is swingably mounted in a slightly enlarged opening of an eyelet of strap type connector element 57 which, in turn, is pivotally mounted at 58 to the outer surface of the rigid strap portion 26. Adjustment of the arm 34 relative to the eyelet 57 may be accomplished by the rotation of the threaded nut 60.

Because of the normal formation of the thigh, the rigid strap 26 slopes downwardly slightly from its jointure with the form-fitting strap portion 24 toward the arm 22 and the semi-flexible strap portion 28. However, in some instances, the strap need not slope, depending upon the bone structure of the wearer. In order that the seat 12 may be retained substantially level, the arm 32 connected to the rigid strap 26, is made longer than the arm 34. The result is that its respective lobe 18 is thereby thrust well beneath the ischium and toward the inside of the thigh.

Completing the tripod arrangement of support, is a retractable plunger structure generally identified as 62. The tripod structure 62 comprises a tubular housing 64 which is secured at a slight angle to the vertical intermediate its ends by a suitable securing means 66 to the outer surface of the rigid strap 26. An additional support for the plunger structure 62 is provided by a further suitable securing means 68 that joins the lower portion of the tubular housing with the supporting frame 22. The securing means 66 and 68 serve to retain the retractable plunger structure in a substantially fixed position.

Slideably mounted for movement within the tubular housing 64, is a threaded plunger 70 having formed, at its upper end, a ball joint 72. The plunger 70 is connected between the supporting framework and the under-side of the seat 12 by a ball joint receiving socket 74 that is in turn, fastened to the seat 12 at its attendant plate 76. The ball joint connection 72, 74 thus permits pivotal movement of the seat relative to the plunger.

Rotatably mounted on the threads of the plunger 70 is an adjustment member or nut 78. The threaded position of the adjustment member 78 along the plunger 70 serves to control the depth to which the plunger will be permitted to retract into its tubular housing 64, the member 78 thereby serving as a stop seat cooperable with the end of the housing. As the description proceeds, it will also be realized that by adjustment of the member 78 along the threaded plunger 70, the reference plane of the seat member 12 may be varied to a position that is most comfortable for the wearer.

The tripod structure thus described, and as seen in Figs. 1–4 and 6, provide a suitable operable support whereby the weight applied to the surface 14 of the seat member 12 may be transmitted directly to the supporting structure, including the thigh strap and framework 20 and 22, which form a diagrammatic part of the artificial limb or prosthesis simulating the natural limb of the wearer.

In actual use, the seat member 12 is positioned as close as possible to the joint of the femur with the acetabular cavity. In this position the leaves 18 surround adjacent portions of the thigh while the cavity 16 accommodates or receives the bony portion of the femur. The seat 12 is thus accurately positioned beneath the pre-selected portion or ischium of the pelvic girdle.

Seat member 12 is retained in this position by the thigh strap structure 24, 26, 28. The strap thus retains in position not only the seat 12 beneath the pre-selected ischium and proximate the joint of the femur with the acetabulum, but also holds the supporting simulated natural limb frames 20 and 22 in alignment with that position which the wearer's natural limb normally assumes. The reference plane of the seat is then adjusted by rotation of the adjustment member 78 along the plunger 70 to provide complete contact and comfortable mating engagement with the pre-selected ischium.

During the standing or walking positions, the skin of the wearer is caused to assume the dot-dash position generally identified by the numeral 80 in Fig. 2. Although the showing in Fig. 2 is slightly exaggerated, it is to be understood that, because the seat 12 is moved in and retained close to femur-acetabulum joint, it depresses the surrounding skin surfaces; hence we see a depressed skin surface 82. In this regard, it will be noted that the skin surface 82 beneath the seat 12 does not actually come into contact with the rigid strap portion 26 but is generally slightly spaced therefrom. However, the skin in the area of the hipbone and rectum sits smoothly and comfortably on the surface 14 and smoothly curves upwardly away therefrom as seen at 84. The slight depression at 82 is in the fleshy area of the body and creates no discomfort.

During the walking movements of the wearer, the tripod structure pivots at the upper ball joints thereof relative to the seat 12 and in movement with the strap structure fastened about the thigh. The level of the reference plane of the seat is maintained by the adjusted plunger 70 resting at 78 on the top of the housing 64. The slight pivotal movement of seat 12 that occurs at the ball joint 72, 74 of the plunger structure 62 does not affect the position of the seat member 12 when the wearer leans sideways during the walking movements but rather serves to retain and support it in its reference plane. The pivotal connections of the spaced tripod arms 32, 34 with both the under-side of the seat 12 and with the rigid strap portion 26, also serve to maintain the position of the seat member relative to the pre-selected ischium, thereby providing a constant supporting weight-receiving surface. Additional support is provided by arm 34 resting on strap 26 as at 27.

The transition movement of the wearer from the standing or walking position to the reclining position, as shown in Fig. 3, is unhampered. As the thigh of the wearer is bent relative to the pelvic girdle, the strap 24, 26, 28 is caused to move therewith. During this movement, the arms 32 and 34 and the plunger 70 pivot relative to the under-side of the seat. As the thigh is extended outwardly, the distance between the strap and the seat member increases. This increased distance is facilitated and permitted by the movement of the plunger 70, out from the housing 64 to an extended position therefrom as will be seen in Fig. 3. The arms 32 and 34 of the tripod structure merely pivot relative to the seat and swing about their connection with the rigid strap 26 at both their respective connectors 44, 57 and the mountings 48, 58 of such connectors with the strap 26. During this reclining movement the longer length of arm 32 swivels and tilts the seat 12 slightly away from the center of the body and pelvic girdle to a comfortable position beneath the wearer's buttocks.

During the wearer's transition movement from the reclining position to the standing position, the seat 12 retains its reference plane; the thigh of the wearer moving downwardly causes the strap secured thereabout, to move closer in distance to the under-side of the seat. There is a consequent pivoting and swinging of the tripod arms 32, 34 between the rigid strap portions 26 and the seat 12 to the position previously described. Simultaneously therewith, the plunger 70 retracts into its housing 64 and abuts the same at 78 when the wearer is in his normal standing position.

In order that the wearer of the prosthesis be permitted to pivot his foot about the ground in a manner simulating the natural pivoting action, there is secured to the same, a swivel structure generally identified by the numeral 86, Figs. 5, 6, and 7.

It comprises a substantially cylindrical housing 88 through which the amputated stump of the wearer is permitted to extend. Cylinder 88 is secured to the upper portion of the artificial limb or prosthesis by any suitable means as indicated at 90. Secured to the cylinder 88, or formed as a part thereof, is an annular projection 92 that rotates smoothly within a cooperating annular chamber 94. Chamber 94 is defined by the combination of an L-shaped cup member 96 and a ring 98 that are secured or made integral with each other and form a part of the lower portion 100 of the prosthesis or artificial limb. Included in the lower portion 100 is an engaging sock 101 into which the amputated limb may be securely socketed. This sock may be of any well known construction that will serve to receive the lower end of the amputated limb and secure it to the lower portion 100 for conjoint rotation. Hence when the lower end of the amputated limb is moved in rotation, it causes the sock 101 and portion 100 to rotate with it.

In operation, when the amputated limb that is socketed in the lower portion 100 of the prosthesis is rotated, the socket 101 within which it is securely seated and also the framework 100, is caused to rotate therewith. This rotation permits the foot or lower portion of the prosthesis at the lowermost end (not shown) of the framework 100 to rotate relatively to the upper portion thereof as identified for the purposes of explanation, by the framework 20, 22 (Fig. 7).

However, in order to overcome the possibility that the pivoting of the limb at the foot thereof about the ground will assume unnatural proportions or appearances—for example, persons with amputations have a tendency to over-exaggerate their movements, thereby possibly resulting in a greater arc or pivoting movement of the heel of the foot of the instant invention—there is provided a rotative lost-motion connection 102. This connection is fitted between the substantially fixed upper framework 20, 22 of the prosthesis and the pivotable lower framework 100.

Defined in the cylindrical member 88 of the upper framework is at least one aperture 103. The aperture 103 is in the nature of a slot having side walls 104 and 106 which define stop surfaces. Cooperating stop members 108 and 110 are adjustably mounted about the interior peripheral surface of the ring 98 (said adjustment is not shown in the drawings). By fine adjustment of the spacing of the stops 108 and 110 relative to their cooperating stops 106 and 104 respectively, there will be permitted limited movement of the lower portion of the prosthesis relative to the upper portion, thereby eliminating the possibility of excessive abnormal rotation.

Hence when the amputee desires to pivot his artificial limb at the foot thereof, it will be unnecessary for him to pivot the whole of his body but merely to move the end of his amputated limb that is socketed in the framework 100. It will be readily recognized that this arrangement of structure thereby permits the wearer to pivot his foot but obviates the necessity of the wearer to swing or excessively manipulate the upper regions of his body or even the pelvic girdle.

While there have been shown and described and pointed out the fundamental novel features of the invention as applied to a preferred embodiment thereof, it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art, without departing from the spirit of the invention. It is the intention, therefore, to be limited only as indicated by the scope of the claims appended hereto.

I claim:

1. An artificial limb comprising a seat to be positioned beneath a preselected portion of the body of the wearer to support the weight thereof, support means spaced from said seat, said support means including means to secure the seat to the thigh of the wearer, means retractably

movable between said securing means and seat to connect the same in spaced relationship and being retractable to permit relative movement of the seat and the securing means during movements of the thigh of the wearer to retain the seat fixed in position beneath said preselected body portion and to transmit the weight from said seat to the securing means.

2. An artificial limb comprising a reference member adapted to define a seat having a fixed reference position on which the pelvic girdle of the wearer may rest, retractable means movably connected to said reference member to retractably move to retain the same in its fixed reference position to seat the pelvic girdle, and means spaced from said reference member and cooperable with said last named means to retain said member fixed to the thigh of the wearer.

3. An artificial limb comprising a member for seating a pre-determined portion of the pelvic girdle, support means connected with said member to support the same in seating position beneath said pre-determined portion, said support means including means adjustable about and movable with the thigh of the wearer, and means to retractably and movably connect said member to said adjustable means during the movements of the wearer.

4. In an artificial limb, a member adapted to be positioned in a fixed reference plane beneath the ischium of the wearer to provide a support therefor, means adapted to be secured about the thigh of the wearer and for movement therewith relative to said member, and means operatively connecting said last named means spaced from said member and for said relative movement, said operative connecting means having means to vary the space between said securing means and member to retain said member in its fixed reference plane.

5. An artificial limb construction comprising a member to be pre-determinedly positioned beneath the ischium to support the weight of the wearer when in the standing and walking positions, limb support means extending from a surface upon which the wearer may stand and walk and cooperating with said member to support the same above the surface, said means including means securable about the thigh of the wearer for movement therewith, and means movably operable to variably space said securable means and member from each other to retain the latter in position beneath the ischium to support the weight of the wearer during the standing and walking movements.

6. In an artificial limb that is adapted to take the place of a normal limb by supporting a pre-selected surface of the pelvic girdle proximate the connection of the femur with the acetabulum, a member on which the pre-selected surface of the pelvic girdle may rest, said member being of sufficient area to extend beneath and support the pre-selected surface and having a reference plane substantially fixed beneath said surface during the standing and walking movements of the wearer, said member being provided with a leading shaped edge to accommodate a portion of the wearer's thigh and to enable the same to be positioned proximate the socket connection of the femur with the acetabulum, support means movable relative to said member and cooperable therewith to retain the same beneath said pre-selected surface, and means movably and retractably mounting said member or said support means to retain its reference plane beneath said pre-selected surface during movements of said support means.

7. In an artificial limb as in claim 6, said pre-selected surface of said pelvic girdle being the ischium thereof.

8. An artificial limb comprising a seat defining a surface onto which the weight of the wearer's body may be transmitted, a support comprising a frame simulating the size and shape of the limb of the wearer, said frame being adapted to support said seat above the ground and to transmit the weight of the wearer from said seat to the ground, strap means securable about the

thigh of the wearer for movement therewith and connected with said frame, and means movably connecting said seat with said strap means and operable during the movement of said strap means with the thigh to variably space said strap means and to enable said seat to transmit the weight of the wearer's body therefrom to said strap and said frame to the ground.

9. An artificial limb comprising a seat defining a surface on to which the weight of the wearer's body may be transmitted, a support comprising a frame simulating the size and shape of the limb of the wearer, said frame being adapted to support said seat above the ground and to transmit the weight of the wearer from said seat to the ground, strap means securable about the thigh of the wearer for movement therewith and connected with said frame, means operable during the movement of said strap means to enable said seat to transmit the weight of the wearer's body to the ground, a swivel included in said frame and comprising an upper member secured by said frame for movement with said strap means, a lower member secured to the lower end of said frame simulating the foot of the limb for engagement with the ground, a socket in said lower limb in which the amputated stump of the wearer engages to rotate said lower member and a rotatable lost-motion connection between said upper and lower members.

10. In an artificial limb having a seat upon which the wearer may rest his weight, a support for said seat simulating the size and shape of wearer's limb and to which the weight of the wearer may be transmitted by way of said seat, said support comprising strap means adapted to be secured about the wearer's thigh, said strap means having a rigid portion to extend about the rear of the wearer's thigh, a form-fitting portion co-extensive with one side of said rigid portion to extend about the outer contour of the thigh and a semi-flexible portion co-extensive with said form-fitting portion interconnecting same with the other side of said rigid portion, and means to spacedly connect said seat with said support and to vary the spacing therebetween in accordance with the movements of the wearer's thigh.

11. An artificial limb comprising a seat upon which the wearer may support his weight, a support structure to which the weight of the wearer may be transmitted from said seat to the ground, said support structure simulating the size and shape of the wearer's natural limb, strap means to secure said support structure to the wearer's thigh for movement therewith, retractable means connecting said seat with said support structure and strap means, and pivotable means interconnecting said strap means with said seat.

12. In a prosthesis for an amputee, a member having a forward curved edge to enable the same to be positioned beneath the pelvic girdle proximate the connection of the femur with the pelvic girdle, said member having a seating surface positioned in a fixed reference plane on which the weight applied by the pelvic girdle may rest, means to secure said member to the wearer, and retractable support means to retractably support said member spaced from said securing means in said proximate position in said fixed reference plane and to vary said spacing during the movements of the wearer.

13. In an artificial limb for an amputee, a swivel, said swivel comprising upper and lower relatively rotatable members, said lower member simulating the foot of the wearer, means to secure said upper member to the thigh of the wear, means in said lower member to secure the same to the wearer's amputated stump, and lost-motion connection means between said upper and lower members whereby rotation of the wearer's stump will cause said lower member to rotate relative to said upper member.

14. In an artificial limb as in claim 13, said lost-motion connection including engageable stop means on said upper and lower members respectively, said stop means on said respective members being spaced each from the other to permit limited relative movement therebetween.

15. In an artificial limb that is adapted to take the place of a normal limb by supporting a pre-selected surface of the pelvic girdle proximate the connection of the femur with the acetabulum, a member on which the pre-selected surface of the pelvic girdle may rest, said member being of sufficient area to extend beneath and support the pre-selected surface and having a reference plane substantially fixed beneath said surface during the standing and walking movements of the wearer, said member being provided with a leading shaped edge to accommodate a portion of the wearer's thigh and to enable the same to be positioned proximate the socket connection of the femur with the acetabulum, and support means movable relative to said member and cooperable therewith to retain the same beneath said pre-selected surface, said support means including means pivotably cooperating with said member to enable the same to retain its reference plane beneath said pre-selected surface during the standing and walking movements of said support means and means extensible to permit the wearer to assume a reclining position.

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