Oct. 6, 1953 A. L. WHITAKER 2,654,365

COMBINED BODY AND LEG BRACE

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Fig. I.

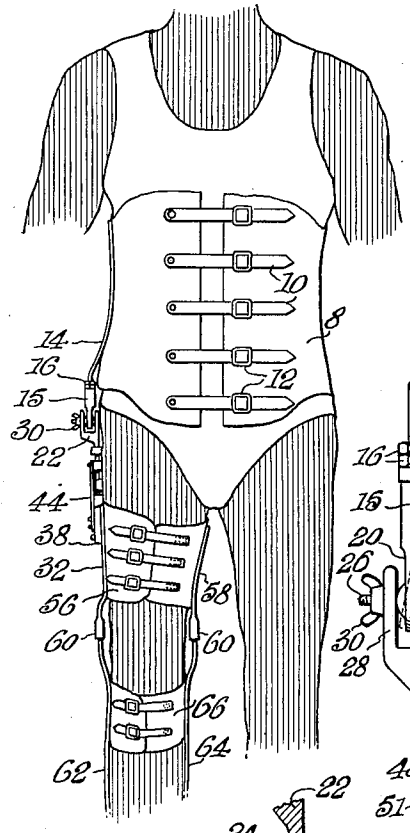


Fig. II.

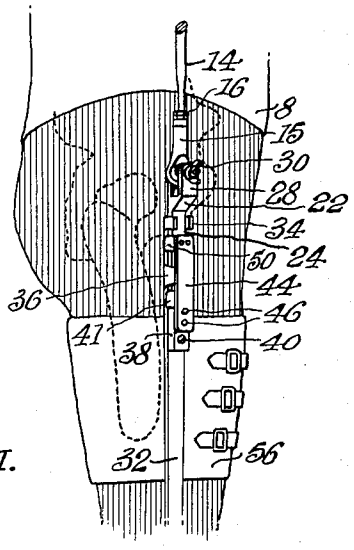


Fig. III.

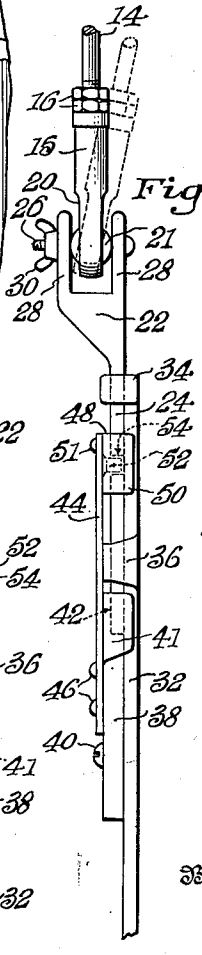


Fig. IV.

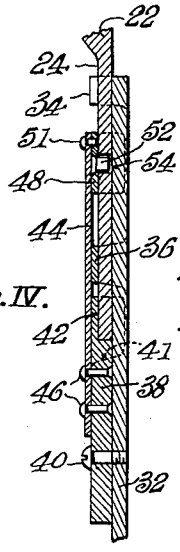


Fig. V.

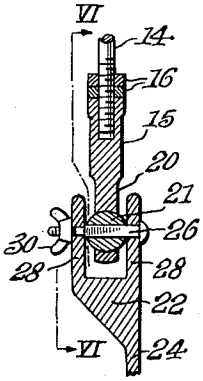
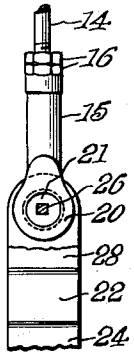


Fig. VI.



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COMBINED BODY AND LEG BRACE

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10 Claims. (Cl. 128—80)

(Granted under Title 35, U. S. Code (1952), sec. 266)

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The invention described herein may be manufactured and used by or for the Government for governmental purposes, without payment to me of any royalty thereon.

The present invention relates to prosthetic devices, and more particularly to a combined body and leg brace which enables the wearer of an artificial leg to impart natural movements to the leg, or to a natural leg immobilized by any form of motor paralysis.

More particularly, the invention relates to a combined body and leg brace that is particularly adapted to senile scoliosis, the brace embodying an improved type of universal joint which permits natural universal movement to either an artificial leg or to a natural leg which is crippled by motor paralysis.

It will be apparent, therefore, that an essential feature of the invention resides in the fact that there is interposed between a pelvic brace and the bucket portion of the leg, a universal joint which permits normal movements of the leg when the individual is walking or sitting for enabling the leg to be opened or moved in any direction.

A further object of the invention is the provision of an improved universally acting ball joint intermediate the pelvic brace and the bucket portion of the leg, the joint employing approximately three-fourths of a sphere, the joint allowing unrestricted motion of the leg.

A still further object of the invention is the provision of an improved slip lock mechanism which enables the pelvic brace and leg brace portions of the appliance to be rigidly and strongly, yet removably, interconnected.

Further objects of the invention will become apparent as the description proceeds, and the feature of novelty will be pointed out in particularity in the appended claims.

The invention will be understood more readily by considering the accompanying drawings, wherein:

Fig. 1 represents a front view of the improved prosthetic appliance of the present invention;

Fig. 2 is a side view;

Fig. 3 is a fragmentary front view of one of the leg brace members showing the improved universal joint and slip lock means of the present invention;

Fig. 4 is a fragmentary sectional elevation of the parts of Fig. 3 below the joint showing details of the slip lock mechanism for joining the leg and body braces of the appliance;

Fig. 5 is a detailed enlarged sectional elevation

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taken through the vertical axis of the joint; and

Fig. 6 is a lateral sectional elevation of the joint taken on the line VI—VI of Fig. 5.

Referring more particularly to the drawings, the improved prosthetic appliance of this invention comprises an upper, stiff, body-supporting brace or corset 8 made of heavy leather which encloses the lower half of the body trunk and is particularly adaptable for use in cases of senile scoliosis. The corset 8 is adjustable by straps 10 and buckles 12.

Laterally secured to the corset brace 8 and forming a part thereof is a metal carrier bar 14, shaped to conform to the curvature of the body, and is threadedly secured in an internally threaded hinge member 15 and secured by lock nuts 16.

The lower end 20 of the hinge member is flattened and has a hole therethrough for receiving an approximately spherical steel ball 21 that is diametrically oppositely flattened somewhat to seat in the enlarged bifurcated end 22 of the lower leg brace bar 24.

The ball 21 has a hole therethrough for receiving a pin 26, which extends through registering holes in the sides 28 of the bifurcated end 22 of the lower leg brace bar 24, the end of the pin 26 being threaded for receiving a wing nut 30 for holding the pin 26 and the ball 21 in position. By making the ball 21 with oppositely flattened surfaces, the proper centering of the hole through the ball is facilitated and the thickness of the joint is reduced. The resulting universally acting trochanteric joint is positioned when the device is in service, slightly posterior and higher than the greater trochanter, as is indicated diagrammatically in Fig. 2. The fact that the hinge member 15 is turnable on the ball 21 produces a universal movement between the upper and lower brace bars.

It may be pointed out at this point that the most common trochanteric joint is constructed as a simple hinge or extension and flexion of the hip-joint. This usual construction of the hinged double-action joint permits motion in two planes or flexion and extension plus abduction and adduction with a feeling of resistance on the part of the wearer of such appliance. The ball type of trochanteric joint of the present invention gives movement in two planes of motion at the same time, namely flexion and extension plus abduction or adduction without restricted motion. Loss of balance has been noted especially with senile scoliosis patients, and a patient wearing a body and leg brace without freedom of movement

tends to be thrown in case of a fall. With the ball type of trochanteric joint of the present invention the feeling of resistance is not experienced if the upper or lower body needs quick movement if loss of balance occurs.

It is found in practice that it is desirable to make the leg portion of the brace detachable from the body portion. For this purpose an improved slip-joint has been provided.

For this purpose, a leg-brace bar 24 engages a reinforcing bar 32, the upper end of the latter, which terminates adjacent to the enlarged end 22 of the bar 24, being provided with an end guide bracket 34 through which the bar 24 is slipped, and also being provided with a second guide bracket 36 under and through which the bar 24 extends.

A relatively thick but short locking bar 38 is secured to the brace bar 32 by means of a screw 40. This bar 38 together with the bar 32 forms a pair of complemental bars which retain the brace-bar 24 between them, as will be pointed out hereinafter, the bars 38 and 32 reinforcing the brace-bar 24 and making a rigid assembly for carrying the leg brace, the bars of the assembly mutually reinforcing each other. The bar 38 is provided with reinforcing guides 41. One end of this locking bar 38 is undercut to receive the end of the brace-bar 24, the undercut end 42 of the locking bar 38 forming an abutment for the end of the brace-bar 24, the remainder of this bar extending from its undercut end portion defining a flange member which extends forwardly on the upper surface of the brace-bar. Overlying the resulting assembly is a spring strip 44 riveted adjacent to one end by rivets 46 to the locking bar 38. The other end of the spring strip 44 has secured on its underside a stirrup-bracket 48, the sides 50 of which frictionally engage the sides of the assembled bars 24 and 32. This stirrup-bracket 48 is held in place by rivets 51 and carries a projecting lug 52 that locks into a hole 54 provided therefor in the brace-bar 24. The resulting assembly constitutes a rigid and strong joint.

In order to release the assembly and separate the leg brace frame from the corset 8, the upper end of the spring strip 44 is lifted manually to disengage the lug 52 from the hole 54, thus releasing the leg brace frame from the brace-bar 24.

The leg brace frame is shown as comprising the upper or bucket support 56 which is of stiff leather and is secured in a well-known suitable manner to the complemental bar 32 and an opposite br 58 which terminates just short of the crotch of the wearer. The lower ends of the bars 32 and 58 terminate in knee joints 60, and are continued by the lateral bars 62 and 64 which extend along the leg to the ankle joint, not shown. A second leather support 66 which is connected to the lateral bars 62 and 64, supports the leg just below the knee joints.

It may be noted that the oppositely flattened surfaces of the ball 21 facilitate the location of, and drilling through, the center of the ball. In practice, these flattened surfaces are such that the spherical portions of the ball amount to approximately three-fourths of a complete sphere, thus reducing the thickness and weight of the joint without impairment of the universal movement thereof.

It will be apparent from the foregoing that a structure has been provided by the present contribution which affords an effective brace,

which also permits quick movement without a feeling of resistance if the lower or upper portions of the body needs quick movement for recovery if loss of balance occurs. The construction also permits a convenient means for detaching the leg brace portion from the remainder of the brace; and while the preferred form of the invention is shown in the accompanying drawings and described above, it will be apparent that the invention contemplates modification in structural details which still permit the attainment of the advantages inherent in the present construction. It will be apparent, therefore, that it is intended and desired to embrace within the scope of this invention such modifications and changes as may be necessary to adapt it to varying conditions and uses, as defined in the appended claims.

Having thus described my invention, what I claim as new and wish to secure by Letters Patent, is:

1. A combined body and leg brace, which comprises, in combination, a rigid corset member defining a body and spinal support, a carrier bar secured to a side of the corset member, a leg frame carried by the carrier bar, a trochanteric joint between the carrier bar and leg frame, means in the trochanteric joint enabling universal movement of the leg frame relative to the body and spinal support, and slip lock means between the trochanteric joint and the leg frame enabling the leg frame to be disconnected from the corset member, the slip lock means including a brace-bar defining a seat for the said joint and constituting an element of the leg frame, a pair of complemental bar members engaging the brace-bar on opposite surfaces and throughout substantially the length thereof in overlapping reinforcing and stiffening relation therewith, means on an end of one of the complemental bar members adjacent to the joint for slidingly receiving the brace-bar and for restraining the brace-bar and complemental bar against relative lateral movement at corresponding end portions of the bars, a plurality of spaced lateral guide flanges on one of the complemental bar members laterally enclosing the brace-bar and the other complemental bar of the pair thereof, for preventing lateral shifting of the resulting bar assembly throughout the entire length thereof, and means interconnecting the complemental bars of the said assembly adjacent to corresponding ends thereof.

2. In a combined body and leg brace having a rigid corset member defining a body and spinal support, and also having a carrier bar secured to a side of the corset member, the improvements which comprise a leg frame carried by the carrier bar, a trochanteric joint connecting the carrier bar to the leg frame, the said trochanteric joint comprising a ball joint member received in the carrier bar and a portion of the leg frame defining holding means for the ball, the said ball permitting universal, unrestricted movement between the carrier bar and the leg frame, and removable means passing through the said ball and the holding means therefor for disconnectably attaching the leg frame to the carrier bar.

3. In a combined body and leg brace having a rigid corset member defining a body and spinal support, and having a carrier bar secured to a side of the corset member and having a free end, the improvements which comprise a leg frame carried by the carrier bar and comprising

a plurality of frame bars one of which extends beyond the others and is provided with an enlarged bifurcated end, a hinge member mounted on the free end of the carrier bar and terminating in a flattened end defining an eye opening therein, a trochanteric joint between the hinge member and the leg frame and including an approximately spherical ball mounted in the bifurcated end of the said frame bar and received in the eye opening in the hinge member for allowing universal unobstructed movement between the leg frame and corset member, releasable means passing through the bifurcated end of the frame bar and through the ball and the eye opening in the flattened end of the carrier bar for disconnectably attaching the leg frame to the said joint and to the carrier bar, a slip-lock intermediate the joint and leg frame, and means for releasing the slip-lock for disconnecting the leg frame from the trochanteric joint and carrier bar.

4. In a combined body and leg brace including a body support, and having carrier means secured to the support, the improvements which comprise a leg frame carried by the carrier means, a trochanteric ball joint connecting the carrier means to the leg frame enabling universal and unrestricted movement between the leg frame and carrier means, releasable means extending through the trochanteric joint, releasable locking means for locking the said releasable means for enabling separation of the leg frame from the carrier means responsively to release means, and a releasable slip lock connecting the leg frame to the joint and affording a rigid connection for the leg frame when locked, and means for releasing the slip lock for enabling release of the leg frame from the joint and carrier means.

5. In a combined body and leg brace including a body support and having a carrier bar secured to a side of the body support, the improvements which comprise a leg frame carried by the carrier bar and including a brace-bar, a trochanteric joint connecting the carrier bar and leg frame through the brace-bar, and releasable slip lock means for releasably connecting the leg frame to the joint, the slip lock means including a locking bar overlapping the brace-bar through a substantial length thereof in engagement with the brace-bar, spaced guide means on the locking bar laterally enclosing the brace-bar for preventing lateral displacement therebetween, another bar complemental to the locking bar and engaging both the locking bar and the brace-bar and defining with the locking bar a pair of complemental bars engaging the brace-bar on opposite sides thereof, means securing the pair of complemental bars together in engagement with the brace-bar, a resilient strip mounted on both the locking bar and on the brace-bar, a locking lug on the resilient strip projecting into a complemental locking recess in the brace-bar for securing the brace-bar between the pair of complemental bars, and means on one of the complemental bars for preventing complete separation between the brace-bar and the pair of complemental bars except by a sliding movement after release of the locking lug from the locking recess in the brace-bar responsively to a lifting movement imparted to the resilient strip until the said locking lug clears the said recess.

6. In a combined body and leg brace including a rigid corset-like body support having a carrier bar secured thereto and a leg-supporting frame attached to the carrier bar through a trochanteric ball joint and a brace-bar connected thereto, the improvements which comprise means for separating the leg frame from the joint, the said means including a pair of complemental bars engaging the brace bar on opposite sides thereof throughout substantially its length, one of the said complemental bars having an end bracket slidably enclosing the brace bar, the other of the complemental bars being a locking bar, a series of spaced lateral flanges on the locking bar and laterally enclosing the brace-bar and the other complemental bar, and releasable means securing the brace-bar and complemental bars together, the complemental bars engaging the brace-bar in overlapped relation and the said releasable means securing the bars in overlapped relation, the releasable means including a resilient strip extending over both the locking bar and the brace-bar, means securing rear portions of the resilient strip to the locking bar while leaving the forward end of the resilient strip in free engagement with the brace-bar, and a locking lug carried by the resilient strip and projecting from the underside of the strip into a registering recess provided therefor in the brace-bar, engagement of the locking lug in the recess maintaining the brace-bar normally in releasably locked position between the complemental bars.

7. In a combined body and leg brace having a body support, a leg support, and a universal joint connection therebetween, the improvements which include slip lock means interconnecting the leg brace and the universal joint connection, the slip lock means comprising a pair of complementl bar members, one of which is a locking bar, means securing the complemental bar members together in overlapping position, a brace-bar intermediate the complemental bar members, a bifurcated head for the brace-bar receiving the universal joint, means securing the universal joint in the bifurcated head of the brace-bar, oppositely directed lateral flanges on the complemental bar members laterally engaging the intermediate brace-bar in opposite directions, one of the complemental bar members terminating adjacent to the head on the brace-bar, an enclosing bracket for the brace-bar mounted on the last mentioned complemental bar member adjacent to the head on the brace-bar nd restraining movements between the brace-bar and the complemental bar members except in directions parallel to the longitudinal axes of the brace-bar and of the complemental bar members, and resilient locking means secured at one end to the locking bar member of the complemental bar members and having a locking device adjacent to an opposite end engaging the brace-bar and releasably interlocking the brace-bar and the complemental bar members against all relative movement.

8. In a combined body and leg brace having a body support, a leg support and a universal trochanteric joint connection therebetween, the improvements which comprise slip lock means interconnecting the leg support and the universal trochanteric joint connection, the slip lock means including a brace-bar having a head end defining a portion of the universal trochanteric joint connection, a pair of complemental bar members engaging the brace-bar on opposite surfaces thereof and in mutually reinforcing relation, one of the complemental bar members being a locking bar having an elongated flange

portion extending forwardly along the brace-bar and having a rear portion defining an abutment for the rear end of the brace-bar, the other bar of the pair of complemental bar members terminating in a forward end adjacent to the head end of the brace-bar and having a guide bracket thereon adjacent to the said forward end and encircling the brace-bar and slidingly receiving the latter, the last mentioned complemental bar member overlappingly engaging the brace-bar substantially throughout its length, means securing the complemental bar members together, a resilient strip having an end secured to the rear portion of the locking bar, the said strip overlapping the flange portion of the locking bar and the brace-bar in longitudinal engagement with both, the strip having a free end engaging the brace-bar and also having an inwardly extending locking lug releasably entering a complemental locking recess in the brace-bar, the locking lug being urged into locking position in the recess by the resiliency of the resilient strip, and oppositely extending lateral flanges on the last mentioned complemental bar member and on the flange portion of the locking bar, the said oppositely extending lateral flanges enclosing the brace-bar on opposite sides thereof for restricting relative lateral movement between the brace-bar and the complemental bar members.

9. A combined body and leg brace assembly including a body support, a leg support, a universal trochanteric joint connection therebetween, and slip lock means for removably interconnecting the leg support from the said joint and body support, the leg support including a pair of complemental bar elements, one of which is of substantially uniform length throughout its extent, the other of which defines an abutment flange adjacent to a rear end portion and a forwardly extending flange projecting from the rear end portion, this bar being a locking bar, a brace-bar intermediate the complemental bars having an inner end and an outer end, the said inner end seating against the abutment flange of the locking bar, means securing the locking bar to the first mentioned complemental bar, a resilient clamping strip secured to the rear end portion of the locking bar and overlying the flange portion of the locking bar and the brace-bar, complemental locking means on the resilient clamping strip and on the brace-bar and normally urged into interlocking relation by the resiliency of the clamping strip, the said strip having a free end engaging the brace-bar and liftable out of engagement with the brace-bar for releasing the locking means for enabling withdrawal of the brace-bar from the complemental bars, an enlarged bifurcated outer end on the brace-bar, a substantially spherical joint member in the bifurcated end of the brace-bar, the joint member having oppositely flattened surfaces engaging the bifurcated end of the brace-bar on opposite sides thereof, releasable means extending through the opposite sides of said bifurcated end of the brace-bar and through the spherical joint member for securing the spherical joint member in the said bifurcated end of the brace-bar, and a hinge member having an eye opening

in an end thereof enclosing the spherical joint member and defining a connecting link between the spherical joint member and the body support, and being capable of universal movement relative to the spherical joint member and the bifurcated head of the brace-bar, the said releasable means extending through the opposite sides of the bifurcated end of the brace-bar and the corresponding contacting areas of the spherical joint member comprising a pin projecting therethrough, and a wing nut on the pin bearing against a side of the bifurcated end of the brace-bar for compressing the said side in tightened relation against the spherical joint member.

10. A combined body and leg brace, which comprises, in combination, a rigid corset member defining a pelvic and spinal support for a wearer, a carrier bar secured to a side of the corset member and conforming in shape to lateral anatomic configurations and curvatures of the body of the wearer adjacent to the said bar, a leg frame carried by the carrier bar for receiving the leg of the wearer to be supported, a trochanteric joint between the carrier bar and leg frame, means in the trochanteric joint enabling universal movement of the leg frame relative to the pelvic and spinal support, the said trochanteric joint being positioned, when the brace is in service, slightly posterior to and higher than the greater trochanter of the wearer, and slip lock means between the trochanteric joint and the leg frame enabling the leg frame to be disconnected from the corset member, the slip lock means including a brace-bar defining a seat for the said joint and constituting an element of the leg frame, a pair of complemental bar members engaging the brace-bar on opposite surfaces and throughout substantially the length thereof in overlapping and stiffening relation therewith, means on an end of one of the complemental bar members adjacent to the joint for slidingly receiving the brace-bar and for restraining the brace-bar and complemental bar against relative lateral movement at corresponding end portions of the bars, a plurality of spaced lateral guide flanges on one of the complemental bar members laterally enclosing the brace-bar and the other complemental bar of the pair thereof for preventing lateral shifting of the resulting bar assembly throughout the entire length thereof, and means interconnecting the complemental bars of the said assembly adjacent to corresponding ends thereof.

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