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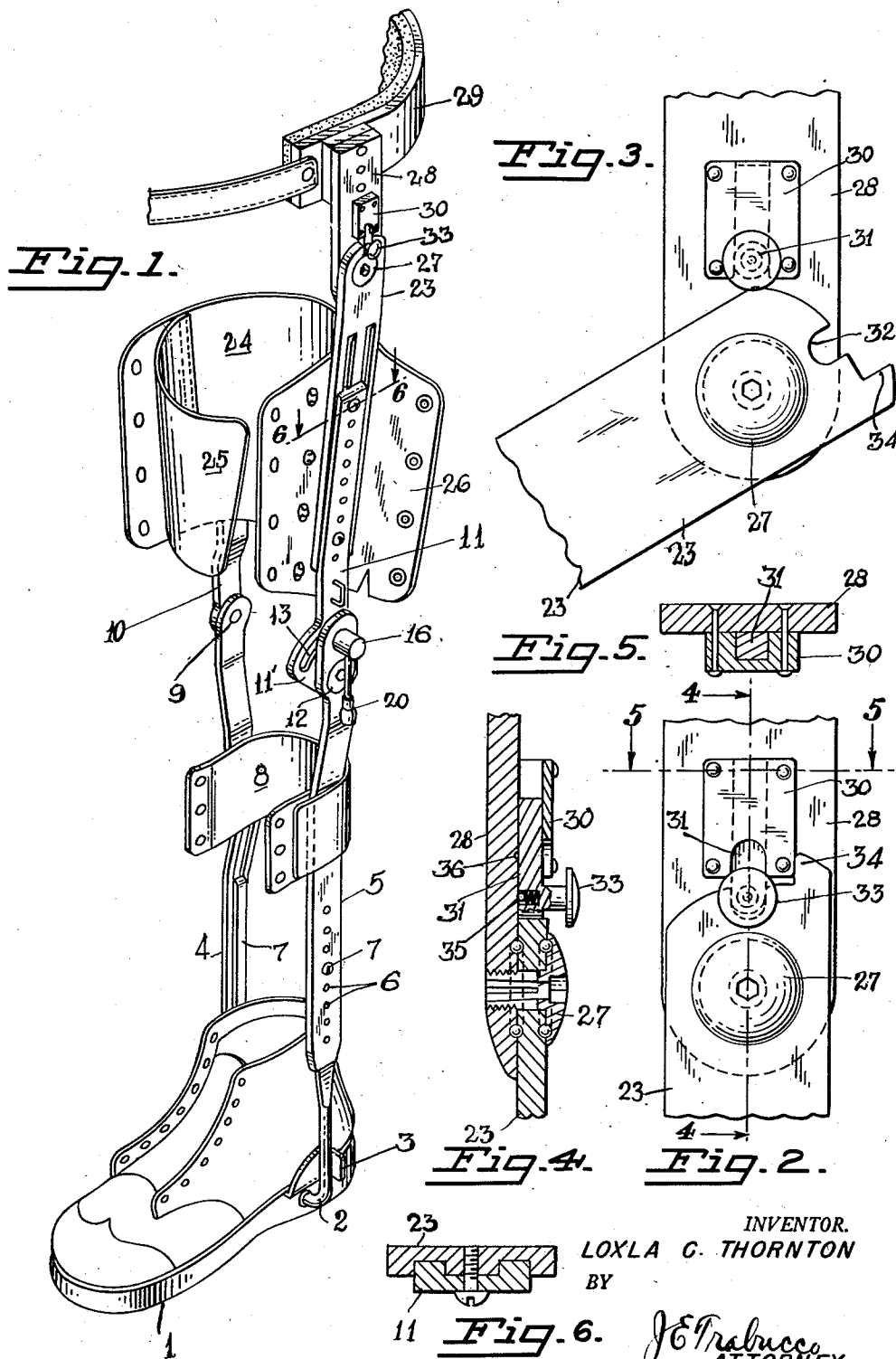
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LEG BRACE

Filed Aug. 16, 1949

2 SHEETS—SHEET 1



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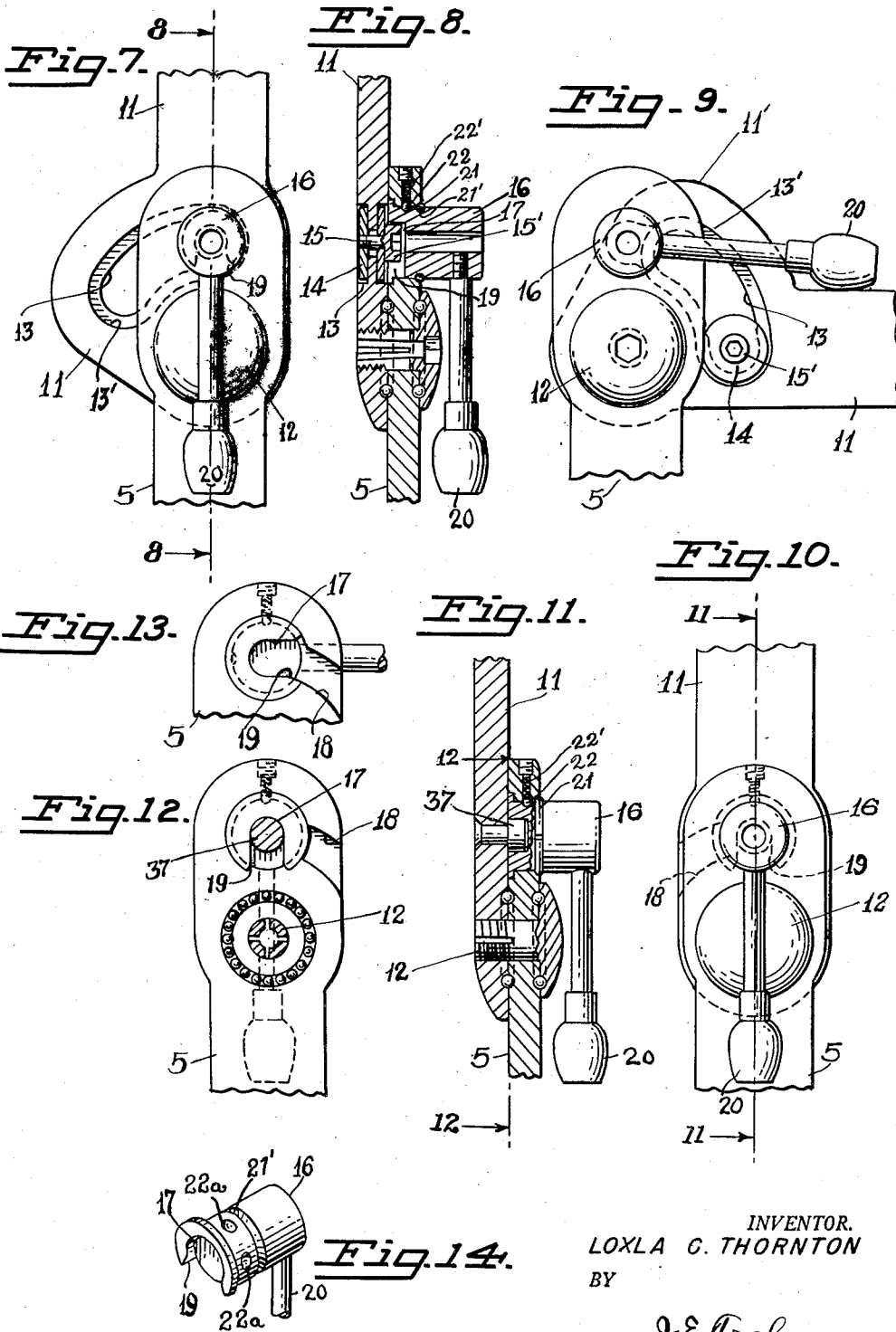
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2 SHEETS—SHEET 2



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LEG BRACE

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5 Claims. (Cl. 128—80)

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This invention relates to improvements in artificial limbs, and more particularly to a leg brace of the type adapted for use by paralytics or other persons not capable of utilizing their natural legs in walking.

The present invention provides an improved artificial leg or brace of the type characterized, having a construction capable of bracing a partially paralyzed natural leg when walking. Such a brace embodies a novel knee joint which may be adjusted from time to time to change the angular relationship between its lower and upper portions in accordance with progressive corrections occurring with respect to certain deformities in the user's natural leg. The novel knee joint may be used in the normal manner to permit a pivotal movement with respect to the upper and lower portions of the artificial leg or brace while at the same time maintaining these portions in such relatively adjusted positions that a suitable corrective pressure is maintained upon the wearer's natural leg in a direction tending to straighten the shin portion of the leg with respect to the thigh. Suitable locking means is provided at the thigh and knee joints for preventing the pivotal movement of their respective associated elements when their relative movement is not desired.

The primary object of the present invention is to provide a novel artificial leg or brace adapted to be worn by persons not having normal control over their natural legs and which provides adjustable means for applying corrective pressures with respect to the user's natural leg or legs.

For the purpose of this application I have elected to show herein certain forms and details of an artificial leg or brace representative of my invention. It is to be understood, however, that the embodiment of my invention herein shown and described is for the purpose of illustration only, and that therefore it is not to be regarded as exhaustive of the variations of the invention.

In the accompanying drawings:

Fig. 1 is a perspective view of an artificial leg or brace embodying the preferred principles of my invention;

Fig. 2 is an enlarged side view of the pivot joint employed in connection with the upper leg portion and the body strap; showing the joint in a locked position;

Fig. 3 is a similar view showing the joint unlocked;

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 2;

Fig. 5 is a sectional view taken on the line 5—5 of Fig. 2;

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Fig. 6 is a sectional view taken on the line 6—6 of Fig. 1;

Fig. 7 is an enlarged side view of the knee joint illustrated in Fig. 1, showing it locked;

Fig. 8 is a sectional view taken on the line 8—8 of Fig. 7;

Fig. 9 is a view similar to Fig. 7, showing the knee joint unlocked and in a different adjusted position;

Fig. 10 is an enlarged side view of a knee joint having a modified construction;

Fig. 11 is a sectional view taken on the line 11—11 of Fig. 10;

Fig. 12 is a sectional view taken on the line 12—12 of Fig. 11;

Fig. 13 is a view similar to Fig. 12 showing the joint in an unlocked position; and

Fig. 14 is a perspective view of the locking element used in the knee joint.

The artificial leg or brace embodying my invention is adapted to be used singly when but one natural leg requires a supporting brace, or when both natural legs are impaired a pair of such braces may be used. Since the braces or artificial legs are identical in construction, a description of one will suffice.

Referring to the drawings the numeral 1 designates a shoe which is pivotally supported on a U-shaped bar 2. A stop 3 secured to the heel portion of the shoe is adapted to engage with the bar 2 when the shoe is turned in a certain direction, thereby limiting the pivotal movement of the shoe. The upright portions of the U-shaped bar 2 adjustably fit in longitudinal open grooves provided on the inner faces of two rigid inner and outer lower side members 4 and 5. The lower side members 4 and 5 are provided with corresponding longitudinally spaced holes 6, each of which is adapted to receive a screw 7 for securing the U-shaped bar to the said side members. The length of the lower leg portion of the brace may thereby be adjusted. Mounted on the lower side members 4 and 5 is a strap 8 which is adapted to extend around the calf and shin of a wearer's natural leg. A cord (not shown) is adapted to be threaded through the openings in the ends of the strap to securely fasten the lower portion of the brace to the lower part of a person's natural leg.

As shown in Figs. 1 to 6 the upper end of the lower side member 4 is pivotally connected as at 9 to the lower end of an inner rigid thigh bar 10. The lower end of an outer rigid thigh bar 11 is formed with an enlargement 11' which is pivotally connected at its lower end as by a pivot screw 12 to the upper end portion of the lower side

member 5. Suitable anti-friction ball bearings are preferably interposed between the opposite sides of the outer lower side member 5 and both the head of the pivot screw 12 and the enlargement 11' of the outer thigh bar 11. The pivot screw 12 is partially tubular and split, thereby making it possible to force the threaded portion thereof outwardly through the application of a suitable tool to normally prevent the unscrewing of the said pivot screw with respect to the enlargement 11' of the thigh bar 11. The pivots 9 and 12 are arranged in horizontal alignment directly opposite one another.

The enlargement 11' of the outer thigh bar is provided with an arcuate slot 13 which is arranged in concentric relationship with respect to the pivot screw 12. The enlargement 11' is cut away at its opposite sides adjacent the arcuate slot 13 to provide arcuate shoulders 13' against which the opposed sides of an adjustable element 14 are adapted to engage. As shown in Fig. 8 the adjustable element 14 embodies opposed disc-like members, one of which has an axial opening through which a screw 15 loosely extends and the other of which is formed with an axial threaded opening which receives the threaded shank of the said screw. The screw 15 has an enlarged cylindrical head 15' which constitutes a projecting member, the said head being formed with an axial socket for receiving a tool adapted for use in turning the screw. The adjustable element 14 may be secured in any suitable position along the slot 13 by the adjustment of the screw 15, it being noted that by turning the screw in a certain direction the disc-like members are moved into clamping engagement with the opposite sides of the enlargement 11'.

Pivotally mounted on the upper end of the lower side member 5 at a point directly above the pivot screw 12 is a substantially cylindrical locking element 16 having its inner end formed with an axial socket 17 within which the head 15' of the screw 15 is adapted to fit. The inner side of the lower side member 5 is formed with an arcuate guide slot 18 which is adapted to slidably receive the head 15' of the screw 15 and guide the same through a side opening 19 at the inner end of the locking element 16 and into the socket 17. The guide slot 18 is arranged in concentric relation to the pivot screw 12 and the said slot is positioned to receive the screw head 15' when the lower leg portion and the thigh portion of the artificial leg or brace are moved from angular relative positions to one in which they are vertically aligned. Secured to the locking element 16 is a hand lever 20 which is adapted to be swung through an angle of 90 degrees to lock and unlock the locking element 16 when the screw head 15' is lodged in the socket 17 of the said locking element. When the hand lever is in a substantially vertical position as shown in Fig. 7, the opening 19 in the locking element is in a closed position, thus confining the screw head 15' inside the socket 17 of the locking element 16, and thereby preventing the relative movement of the thigh and lower leg portions of the brace. When the hand lever 20 is turned through an angle of 90 degrees to a horizontal position the locking element 16 is rotated to a position in which the opening 19 is aligned with the arcuate guide slot 18, thereby making it possible for the screw head 15' to enter the said guide slot when the lower leg portion of the brace and the upper thigh portion are moved to angular positions, as shown in Fig. 9. A suitable split ring 21 lodged

in an annular groove 21' in the locking element 16 prevents the said locking element from becoming displaced with respect to the opening in the upper end of the lower side member 5 through which it extends. A spring pressed ball 22 held in one of two suitably positioned ninety degree depressions 22a in the locking element 16 by a spring 22', limits the rotation of the said locking element when the ball enters a depression 22a, thereby limiting the movement of the said locking element so the latter cannot be turned beyond either its locked or fully unlocked positions.

It will be noted that when the adjustable element 14 is in a fixed position at the extreme right end of the slot 13, as shown in Figs. 7 to 9, the upper and lower portions of the brace may be moved (when the locking element is unlocked) from aligned positions to positions in which they are at various angles to one another. By adjusting the adjustable element 14 to a position nearer the left end of the slot 13, the relative movement of the upper and lower leg portions may be accordingly restricted depending upon the precise position of the said adjustable element with respect to the ends of the slot. Thus when the wearer's leg is impaired or deformed to such an extent that the below the knee portion cannot be moved to an aligned position with respect to the thigh portion, the adjustable element 14 is secured in such a position with respect to the ends of the slot 13 that the lower side member 5 and the thigh bar 11 when locked against relative pivotal movement are substantially in the same relative angular positions as the normal positions of the upper and lower portions of the wearer's natural leg. A sustained pressure may be applied to the said natural leg in a direction tending to bring its upper and lower portions into aligned relationship by periodically adjusting the adjustable element 14 toward the right end of the slot 13 (Fig. 7) as the natural leg gradually straightens. It will be noted that the cylindrical locking element 16 is formed with an axial opening through which a tool may be inserted to engage with the socket in the screw head 15' when the adjustment of the element 14 is to be made. It is also to be noted that the adjustable element 14 in combination with the locking element 16 provides means whereby the lower side member 5 and the thigh bar 11 may be locked in various angular positions with respect to each other.

The thigh bar 11 has an upwardly projecting aligned extension 23 which is adjustably secured thereto by screws or other suitable means. Longitudinally arranged tongue and groove means associated with the thigh bar 11 and its extension 23 maintain them in parallel relationship and facilitate their relative adjustment. A strap 24 secured to the inner thigh bar 10 and the extension 23 is adapted to extend around the thigh of the wearer. A suitable lacing (not shown) is employed to secure the ends of the strap in connected relationship. The strap 24 has a tongue 25 and an overlapping piece 26, the latter being adapted to extend over the thigh bar 11 and fasten at its free end to the said strap by means of snap fasteners.

Pivotally fastened to the upper end of the extension 23 as by a pivot screw 27 is a bar 28 which supports one side of a body strap 29. Secured to the bar 28 is a latch housing 30 which carries a reciprocable latch member 31, the latter being arranged for engagement with

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a groove 32 in the upper end of the said bar. A finger piece 33 secured to the latch member 31 provides means for moving the latter upwardly and downwardly to slide it out of and into locking engagement with the groove 32. A stop 34 on the upper end of the extension 23 is adapted to engage with the latch housing 30 when the extension 28 and the extension 23 are in alignment, thereby providing means for preventing the body of the person wearing the brace from moving backwardly beyond a balanced position. As indicated in Fig. 4 a spring pressed ball 35 is adapted to releasably engage with a groove 36 in the bar 28 when the latch member 31 is in its upward position, thereby normally holding the said latch member in a disengaged position with respect to the groove 32 of the extension 23.

In the embodiment of my invention shown in Figs. 10, 11, 12, and 13, the knee joint is provided with means whereby the lower member 5 and the thigh bar 11 may be locked together only when they are in aligned positions. In this particular embodiment the slotted enlargement 11' is eliminated and there is provided on the thigh bar 11 a cylindrical protuberance 37 which is adapted to pass through the arcuate guide slot 18 in the lower member 5 and fit inside the socket 17 of the locking member 16. When the hand lever 20 is in a horizontal position the locking member 16 is unlocked and is positioned with its opening 19 in registry with the arcuate guide slot 18, thereby permitting the thigh bar 11 to be pivotally moved and carry the protuberance 37 from its socket 17 through the opening 19 and the said guide slot. When the lower member 5 and the thigh bar 11 are again in aligned positions the hand lever 20 may be turned to a vertical position, thereby locking the protuberance 30 within the socket 17 of the locking member 16, and thus securing the lower leg portion and the upper thigh portion of the artificial leg against relative pivotal movement.

What I claim is:

1. In a leg brace, a lower portion having two opposed lower side members, a shoe pivotally suspended from the lower side members, a thigh portion having two opposed thigh members, knee joints pivotally connecting the upper end portions of the lower side members with the lower end portions of the thigh members, an arcuate slot formed in the lower end portion of one of the thigh members and arranged in concentric relation to the adjacent knee joint, an adjustable element secured within the slot, and a rotatably adjustable locking member carried by the upper end portion of the associated lower side member and having a socket adapted to receive the adjustable element when in a certain adjusted position.

2. In a leg brace, a lower portion having two opposed lower side members, a thigh portion having two opposed thigh members, knee joints pivotally connecting the upper end portions of the lower side members with the lower end portions of the thigh members, an arcuate slot formed in the lower end portion of one of the thigh members, an adjustable element secured within the slot, and a rotatably adjustable locking member carried by the upper end portion

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of the associated lower side member and having a socket adapted to receive the adjustable element when in a certain adjusted position, and a hand lever secured to the locking member.

3. In a leg brace, a lower brace portion, an upper thigh portion, a connecting pivot joining the lower brace portion and the thigh portion, an arcuate slot in the thigh portion, the said slot being in concentric relation to the pivot, a protruding member adjustably secured to the thigh portion and located in the slot thereof, a locking member rotatably mounted on the lower brace portion and having a socket for receiving the protruding member of the thigh portion when the thigh portion is pivotally moved to a certain position with respect to the lower brace portion, the said locking member having a slotted opening connecting with the socket for the entry of the protruding member into the socket when the locking member is in a certain adjusted position, and hand adjusting means secured to the locking member.

4. In a leg brace, a lower brace portion, an upper thigh portion, a connecting pivot joining the lower brace portion and the thigh portion, a protruding member secured to the thigh portion, an adjustable locking member rotatably mounted on the lower brace portion and having a socket adapted to receive the protruding member of the thigh portion when the thigh portion is pivotally moved to a certain position with respect to the lower brace portion, the said locking member having a slotted opening connecting with the socket for the entry of the protruding member into the socket when the locking member is in a certain adjusted position.

5. In an artificial brace, a lower portion having two opposed lower side members, a thigh portion having two opposed thigh members, knee joints pivotally connecting the upper end portions of the lower side members and the lower end portions of the thigh members, a protruding element carried by one of the thigh members, and an adjustable locking member mounted on the associated lower side member and having a socket adapted to receive the protruding member when the thigh members and the lower side members are in certain relative positions, the said locking member having a slotted opening connecting with the socket for the entry of the protruding member when the locking member is in a certain adjusted position.

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