

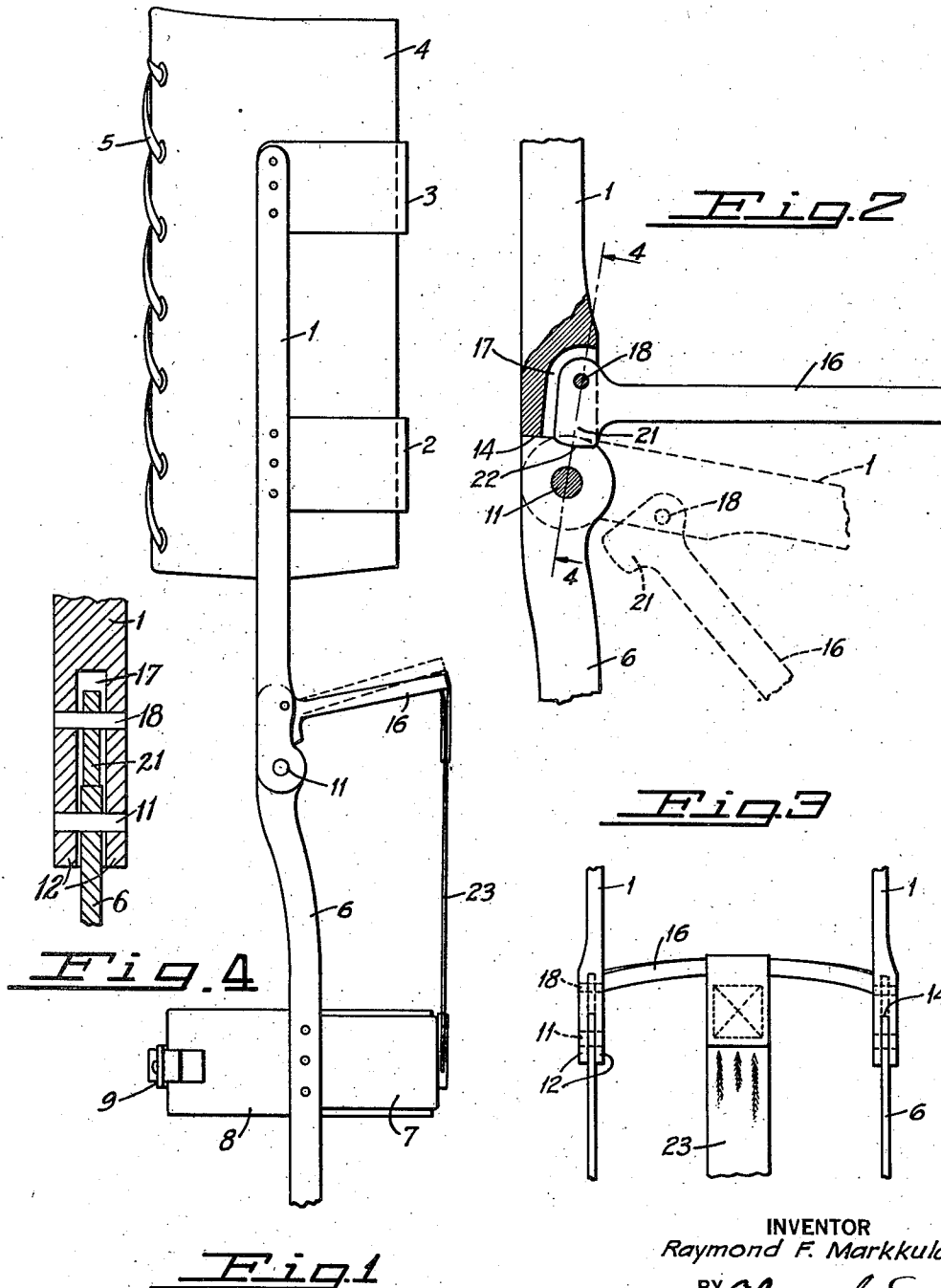
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LEG BRACE KNEE LOCK

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LEG BRACE KNEE LOCK

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My invention relates to a lock for the knee joints of leg braces of the character worn by paralytics, spastics, and used in cases of fracture.

Leg braces such as those worn by paralytics, spastics, and in various cases such as leg fractures, are provided with joints corresponding to the knee joint of the wearer. Such joints must be effectively locked in extended position while the wearer walks or stands, but must be releasable to permit bending of the brace at the knee when the wearer sits. Failure of such knee joints to perform as expected or required frequently causes serious falls and injury to the crippled wearers of such devices.

It is among the objects of my invention to provide a locking device for the knee joint of leg braces by which the joint is normally locked to rigidly hold the upper and lower leg sections in alignment and prevent inadvertent collapse at the knee joint while the wearer is standing or walking; and at the same time permit the joint to be readily and inconspicuously released for knee bending movement when the wearer desires to assume a sitting position.

Another object is to provide a locking means for leg brace construction which will automatically lock the upper and lower leg sections in their aligned relation as a wearer rises to a standing position.

Another object is to provide a locking means for the knee joints of leg braces which may be operated manually with a small degree of movement to release the joint for knee bending; and which will insure an effective locking action notwithstanding a substantial degree of wear upon the interengaging surface of the locking members.

My invention possesses other objects and features of value, some of which with the foregoing will be set forth in the following description of the invention. It is to be understood that I do not limit myself to the showing made by the said description and the drawings as I may adopt variant forms of the invention within the scope of the appended claims.

In the drawings:

Figure 1 is a side elevation of a leg brace embodying my invention, the lower portion of the lower section being broken away.

Figure 2 is a fragmental side elevation, partly in section, showing the knee joint and locking means of my invention upon a larger scale.

Figure 3 is a front elevation of the knee joint.

Figure 4 is a fragmental section detail, the section being taken upon a plane indicated by

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the line 4—4 of Figure 2 and viewed in the direction indicated by the arrows, the pivot pins being shown in elevation.

In terms of broad inclusion, the device of my invention comprises upper and lower leg bracing sections pivoted upon an axis corresponding to the knee of a wearer. A locking lever is pivoted upon the leg sections adjacent the knee joint for movement between locking and unlocking positions. Normally the locking lever serves to lock the upper and lower leg bracing sections in substantial alignment while the wearer is standing or walking. The lever is normally actuated toward its locking position by means which will yield to manual pressure applied to the lever for moving the same in the opposite direction to its unlocking position when the wearer desires to assume a sitting position. The invention contemplates a structure and arrangement of the interlocking parts such that an effective interlocking engagement will be insured notwithstanding substantial wear upon the interlocking surfaces, and which will permit ready release for knee bending action by a small amount of movement of the locking lever.

In terms of greater detail, the device of my invention comprises upper and lower leg bracing sections pivotally joined at their adjacent ends to provide a knee joint. The upper section comprises a pair of side frame pieces 1 secured in spaced parallel relation by arcuate cross pieces 2 and 3 riveted or otherwise secured to the side pieces and extending rearwardly therefrom substantially normal thereto. A pocket 4 of leather or other suitable material is secured inside the side and cross pieces to fit over the wearer's leg above the knee. Preferably the pocket 4 is provided with lacing 5 or other suitable means for removably fitting and securing the pocket onto the leg.

The lower section also comprises a pair of side frame pieces 6 secured in spaced parallel relation by a cross piece 7 preferably of arcuate shape arching outwardly to the rear of the leg at substantially right angles to the side pieces 6. A leather lining 8 is preferably secured inside the side and cross pieces to extend around the wearer's leg below the knee. Fastening means 9, such as a strap and buckle, connect the front ends of the lining.

Corresponding upper and lower side frame pieces 1 and 6 are pivotally joined by a pivot pin 11. Preferably the frame piece 1 has its lower end bifurcated, as at 12, to receive the upper end

of the lower frame piece 6, which is fitted closely therebetween, and to provide support for the pivot pin 11 at opposite sides of the frame piece 6. The upper end of the frame piece 6 seats against a shoulder 14 to prevent forward pivotal movement of the lower section beyond a position in substantial alinement with the upper leg section, as shown in full lines in Figure 2 of the drawings.

A locking lever 16 is pivoted upon one of the leg sections and arranged to engage the other section for releasably locking the sections in their alined relation. Preferably, the lever 16 is an arcuate yoke having its ends received within recesses 17, above the bifurcated lower ends of the frame pieces 1, and pivotally supported therein upon pivot pins 13. Between its ends, the yoke 16 arches outwardly rearwardly at substantially right angles to the side frame pieces 1, to extend in back of the wearer's leg.

Extensions 21 upon the ends of the lever 16 are arranged to be moved into locking engagement with notches 22 in the upper ends of the side frame pieces 6. The end of each extension 21 is shaped as a substantially arcuate cam face the rearward end of which is more widely spaced from the pivot 13 than the forward end, as shown in Figure 2 of the drawings. Each notch 22 is of corresponding arcuate shape conforming, along substantially its entire length, to the curvature of the cam face of the adjacent extension 21.

In the locking position indicated in full lines in Figure 2, the cam face of each extension 21 seats in the adjacent notch 22 over substantially the entire area thereof, and provides a rigid stop preventing rearward pivotal movement of either frame piece relative to the other about the pivots 11. The wide area of contact between the extensions 21 and notches 22 insures an effective distribution of the load and minimizes wear. Such wear as may occur does not impair the effectiveness of the locking action, as the extensions merely swing correspondingly farther to effect locking engagement with the adjacent notches. The difference in the radius between the cam face and the pivot 13 at the front and back of each extension 21 more than compensates for any normal wear that may occur along the contacting surfaces, and insures an effective locking action regardless of wear.

The pivots 13 are rearwardly offset relative to a vertical plane through the pivots 11, so that, when the lever 16 and extensions 21 are swung in a releasing direction about the pivots 13, the cam faces will be swung away from the notches 22. This action, coupled with the progressively receding curvature of the cam, permits a very slight upward movement of the lever 16 to swing the extensions 21 out of engagement with the notches 22. When then the upper frame pieces 1 are swung rearwardly and downwardly about the pivots 11 to a position such as indicated in dotted lines in Figure 2, the cam ends of the extensions 21 are swung outwardly past the adjacent notches 22, thereby freeing the frame pieces for pivotal knee movement.

The lever 16, with its extensions 21, is normally urged in a clockwise direction toward its locking position by an elastic band 23, secured to the yoke portion of the lever and to the back portion of the cross piece 7. Normally the band 23 holds the extensions 21 firmly seated in the notches 22, with the cam faces of the extensions tightly wedged against the notched ends of the frame

pieces. The band 23 yields under moderate pressure to permit the lever 16 to be raised manually to swing the extensions 21 to unlocking positions.

While the wearer is standing or walking, the upper and lower leg sections are effectively locked in their alined relation, and inadvertent collapse of the leg at the knee joint is prevented. Should the wearer desire to assume a sitting position, he lifts the lever 16 upwardly sufficiently to unseat the extensions 21 and release the lower side pieces for knee bending movement. As the wearer sits down, the knee joint bends and the locking lever swings free, as indicated in dotted lines in Figure 2. When the wearer again arises, the leg sections again swing into alinement. The band 23 automatically draws the lever 16 back into locking position, as the forward edges of the cam extensions ride over the ends of the lower frame pieces 6 and into the notches 22.

I claim:

1. In a leg brace, upper and lower leg sections pivotally connected at adjacent ends to provide a knee joint, a locking lever pivoted upon one section adjacent the joint and provided with a wedging cam movable into and out of locking engagement with the opposing section for locking the joint, and manually releasable means normally holding the lever in joint locking position with the leg sections in substantial alinement.

2. In a leg brace, upper and lower leg sections pivotally connected at adjacent ends to provide a knee joint, a locking lever pivotally mounted upon one of the leg sections adjacent the joint and movable to locking and unlocking positions, and interlockingly engageable wedging cam surfaces upon the lever and the other leg section respectively for releasably locking the sections in substantial alinement, one of said surfaces having one end thereof spaced from the pivot axis of the lever more widely than the other to provide a wedging action for effecting locking engagement notwithstanding a substantial degree of wear at the area of contact.

3. A leg brace comprising upper and lower leg sections pivotally connected at adjacent ends to provide a knee joint, a locking lever pivotally mounted upon one of the leg sections adjacent the joint and movable to locking and unlocking positions, interlockingly engageable wedging cam surfaces upon the lever and the other leg section respectively for releasably locking the sections in substantial alinement, one of said surfaces having one end thereof spaced from the pivot axis of the lever more widely than the other to provide a wedging action for effecting locking engagement notwithstanding a substantial degree of wear at the area of contact, and resilient means normally impelling the lever toward its locking position and yieldable to manual pressure applied to the lever for permitting movement of the lever to unlocking position.

4. In a knee joint for leg braces, an upper leg section, a lower leg section pivoted to the upper leg section upon a horizontal axis corresponding to a wearer's knee, a locking lever pivoted upon one leg section at a point offset from the knee axis and provided with a cam shaped extension having successive portions spaced progressively increasing amounts from the pivot axis of the lever for movement into and out of wedging engagement with a correspondingly recessed portion of the other leg section adjacent the joint

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for locking the sections in alined relation, and means normally holding the lever in locking position and yieldable to manual pressure applied to the lever for unlocking the joint.

5. In a knee joint for leg braces, an upper leg 5 piece having a bifurcated lower end, a lower leg piece having an end received between and pivoted to the bifurcations of the upper piece and provided with a shoulder preventing forward pivotal movement of the lower leg piece beyond a position 10 in substantial alinement with the upper leg piece, said lower leg piece also having a notch at its upper end, a lever pivoted between the bifurcations of the upper leg piece, an extension upon the lever having a wedging surface movable 15 into and out of locking engagement with the notch upon the adjacent end of the lower leg

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section, and means normally actuating the lever to a locking position.

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