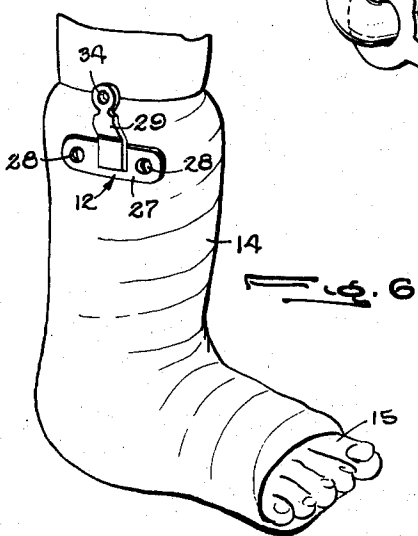
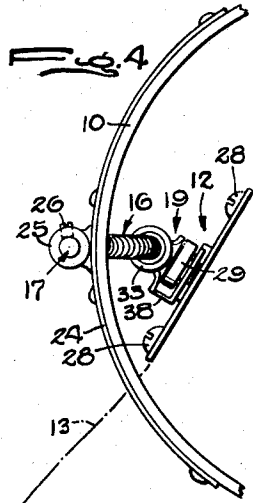
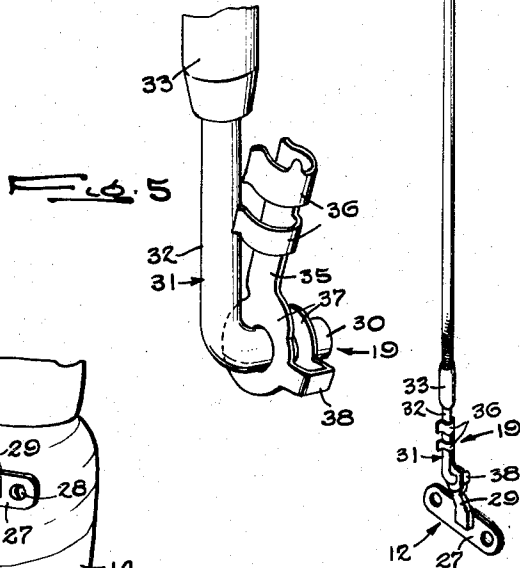
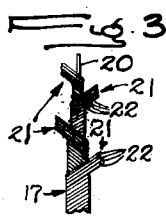
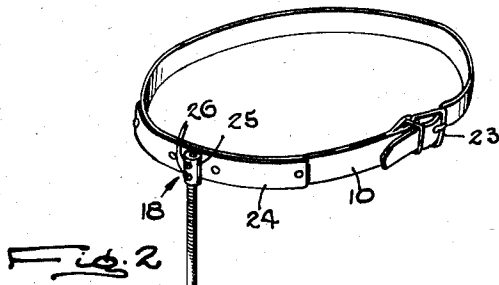
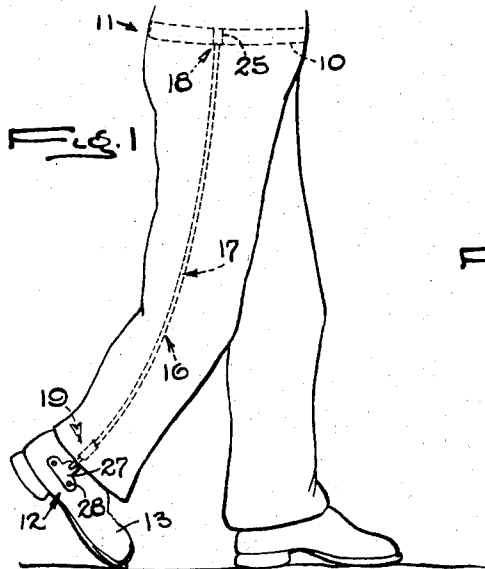


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L. D. MILLER
ORTHOPEDIC DEVICE

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INVENTOR
Leland D. Miller
by Carlson, Pitzer, Hubbard & Wolfe
ATTORNEYS

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ORTHOPEDIC DEVICE

Leland D. Miller, Rockford, Ill.

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This invention relates to an orthopedic appliance adapted for attachment to the body and one foot of the wearer to prevent rotation of the foot and the connecting leg relative to the wearer's hip during walking. Such rotation tends to occur due to weakened hip rotator muscles and results in so-called "pigeon toed" or "duck waddling" gaits.

A general object of the invention is to provide a novel orthopedic appliance which effectually controls the angular position of one foot and leg relative to the hip of the wearer, which is of simple and inexpensive construction readily adaptable to legs of different lengths, and which is easy to attach to and remove from the parts of the wearer's body.

A more detailed object is to couple the foot and the hip through the medium of an elongated torque resistant and laterally flexible element which is connected to the foot in a novel manner to facilitate attachment and detachment of the element and prolong its life.

Other objects and advantages of the invention will become apparent from the following detailed description taken in connection with the accompanying drawings, in which:

Figure 1 is a fragmentary side elevational view of a person equipped with an orthopedic appliance embodying the novel features of the present invention.

Fig. 2 is a perspective view of the appliance detached from a person.

Fig. 3 is an expanded side view of the torque transmitting cable.

Fig. 4 is a fragmentary plan view of the appliance attached to the wearer's shoe.

Fig. 5 is a fragmentary perspective view similar to Fig. 2 showing a different relation of the parts.

Fig. 6 is a fragmentary perspective view showing the manner of attachment of the appliance to a cast on the wearer's foot and ankle.

The orthopedic appliance shown in the drawings to illustrate the present invention is especially adapted for use by a person having weakened hip rotator muscles. With such a condition, the person's feet, during walking, tend to turn about the axis of the legs and relative to hips either inwardly to produce a "pigeon toed" gait or outwardly in a "duck waddling" gait. The improved appliance operates to transmit torque from the wearer's hip to one foot and thereby retain the same angular relation of the two about the leg so that the foot always points ahead in the direction of walking. In general, the appliance comprises a belt 10 fitting around the pelvic region 11 of the wearer, a member 12 fastened to a part such as a shoe 13 (Figs. 1 and 4), a cast 14 (Fig. 6) or brace (not shown) secured to and movable with the wearer's foot 15 angularly about the axis of the leg and relative to the hip, and a torque transmitting connection 16 between the belt and the member.

The connection 16 for transmitting torque from the belt 10 to the wearer's foot 15 is readily adaptable to legs

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of different lengths and permits a substantially normal movement of the foot in a vertical plane either with the lower part of the leg in an arc about the knee or with the upper part of the leg in an arc about the hip. To these ends, the connection comprises an elongated laterally flexible cable 17 which resists twisting of one end relative to the other and is coupled at opposite ends to the belt and to the member 12 on the foot so as to extend along the outer side of the leg. The couplings 18 and 19 at the respective ends of the cable prevent the latter from turning about its own axis relative either to the belt or to the member. Torque thus is transmitted from the wearer's hip to his foot through the belt, the upper coupling 18, the cable 17, the lower coupling 19 and the member 12.

In the present instance, the cable 17 is of multiple ply construction comprising a center strand 20 of piano wire (Fig. 3) and four plies 21 wrapped one on top of the other around the center strand. Each ply is made up of four strands 22 of piano wire disposed side by side and wrapped helically around the center strand or the next inner ply, the strands of adjacent plies being wound in opposite directions in the manner of right and left hand threads. With this construction, the cable is laterally flexible, but resists twisting about its own axis. It may be cut easily into any desired lengths, the cut ends of the various strands 20 and 22 preferably being soldered together to prevent unraveling.

The belt 10 in this instance is leather and includes a buckle 23 for adjustment to different sizes. That portion of the belt where the cable 17 is attached is stiffened by an elongated metal plate 24 riveted to the belt, the plate having sufficient flexibility to adapt to the contour of the hip. In addition to the plate 24, the coupling 18 between the cable and the belt comprises a member 25 carried by the plate and adapted to be secured adjustably to the cable to permit the angular position of the latter relative to the member and thus the belt to be changed selectively. Herein, this member is a cylindrical tube telescoping over the upper end portion of the cable and welded on its exterior to the plate, the axis of the tube extending transversely of the plate. The cable is clamped in adjusted position within the tube by two set screws 26 threaded into radial apertures in the tube.

The member 12 which moves with the wearer's foot 15 in this instance is a T-shaped bracket having a flat cross bar 27 (Figs. 1, 2 and 6) secured by rivets 28 to the outer side of the shoe 13 or the cast 14 fitting the foot. Projecting upwardly from the cross bar is a flat center bar 29 having one end portion offset inwardly from the other end portion and welded to the outer side of the cross bar. The other end portion is joined to the cable 17 by the lower coupling 19.

To avoid breakage of the cable 17 at its point of attachment to the bracket 12 and thereby prolong the cable life, the lower coupling 19 includes a pivot 30. The latter, while preventing turning of the bracket and thus the foot 15 relative to the cable about the cable axis, permits relative rotation of the bracket and the cable about a transverse axis. This reduces the tendency of the lower end portion of the cable to flex laterally and ultimately break due to fatigue.

In the present instance, the lower coupling 19 comprises a stiff rod or connector 31 of L-shape having a vertical leg 32 telescoping and clamped tightly within one end portion of a sleeve 33. The other end portion of the sleeve telescopes over and is clamped permanently by crimping to the lower end portion of the cable for movement in unison with this portion. The pivot 30 (Figs. 1 and 5) is formed by the other or horizontal leg of the rod which is journaled in a cylindrical

bearing surface 34 (Fig. 6) in the outwardly offset end portion of the bracket center bar 29. The fit between the horizontal leg and the bearing surface is snug to permit relative turning of the two only about the axis of the leg.

The parts of the lower coupling 19 are held releasably in their interfitting positions to enable the wearer to detach the cable easily from the bracket 12, for example, when it is desired to use the same cable and the belt with different shoes. Such releasable holding is accomplished herein by the provision of an elongated metal clip 35 (Fig. 5) having spaced lugs 36 at one end curved to fit around and frictionally grip the vertical leg 32 of the L-shaped rod 31. Two rings 37 secured in spaced parallel relation by an integral crosspiece 33 at the other end of the clip telescope over the horizontal rod leg 30 and straddle the upper end portion of the bracket center bar 29 (Fig. 4). When so assembled on the horizontal leg, the clip is swingable about the axis thereof to move the lugs into and out of gripping engagement with the vertical leg.

In the use of the improved appliance, let it be assumed that the bracket 12 is secured to the wearer's shoe 13 but detached from the cable 17 and that the belt 10 is fastened around the wearer's pelvic region 11 with the upper end of the cable secured in the tube 25 on the belt. To attach the cable to the bracket, the clip 35 is positioned so that the rings 37 straddle the bracket center bar 29 and are aligned axially with the bearing surface 34 therein. Then, the horizontal rod leg 30 is inserted through the aligned parts and the clip is rotated about this leg to bring the lugs into gripping engagement with the vertical leg 32 as shown in Fig. 2. The attachment of the cable to the wearer's foot thus is completed and the appliance is ready for use assuming the cable is in the desired angular position relative to the belt. If such position is not correct, it may be changed simply by loosening the set screws 26 turning the cable relative to the tube, and retightening the screws.

When a handicapped person walks while wearing the improved appliance, the torque due to the tendency of the foot 13 or leg to twist relative to the hip is transmitted from the bracket 12 through the lower coupling 19, the cable 17 and the upper coupling 18 to the plate 24 on the belt 10. The plate being secured firmly against the hip resists the torque and the foot remains in the same angular position relative to the hip about the axis of the leg. During swinging of the foot in a vertical plane in an arc about either the ankle, the knee or the hip, the lower end portion of the cable 17 swings with the sleeve about the axis of the pivot 30 of the lower coupling rather than tending to flex laterally relative to the sleeve 33. As a result, fatigue and the accompanying breakage of the cable are avoided.

To detach the cable 17 from the bracket 12, the clip 35 is rotated about the axis of the horizontal rod leg 30 until the lugs 36 are out of engagement with the vertical leg 32 as shown in Fig. 5. Finally, the horizontal leg is shifted endwise and out of the aligned rings 37 and bearing surface 34 in the bracket center bar 29.

I claim as my invention:

1. An orthopedic appliance having, in combination, a belt adapted to fit around the pelvic region of the body of the wearer between the waist and the hip, an elongated torque resistant and laterally flexible element secured at one end portion to said belt and extending transversely thereof so as to lie along the outer side of one leg of the wearer when the belt is worn, a sleeve

having one end portion telescoping with and secured to the other end portion of said flexible element, a bracket adapted to be secured to a part such as a shoe fitting and movable with the wearer's foot, said bracket having a bearing defining a pivotal axis extending laterally away from the outer side of the wearer's foot when the bracket is attached thereto, an L-shaped rod having one leg telescoping with and secured in the other end portion of said sleeve and its other leg journaled in said bearing, and a clip detachably securing said rod and said bracket in assembled relation, said sleeve, said rod and said bearing transmitting torque from said element to said bracket to prevent turning of the wearer's foot relative to the hip about the axis of the leg.

2. An orthopedic appliance having, in combination, a belt adapted to fit around the pelvic region of the wearer between the waist and the hip, an elongated torque resistant and laterally flexible element secured at one end to said belt and extending transversely therefrom so as to lie along the outer side of one leg of the wearer when said belt is worn, a bracket adapted to be secured to a part such as a shoe attached to the wearer's foot and to move with the latter about the axis of the wearer's leg, and a connector secured rigidly to the other end portion of said flexible element and pivotally connected to said bracket to rotate relative to the bracket about an axis extending transversely of the element and of the wearer's leg and to rotate with the bracket about the axis of the element so as to transmit torque from the latter to the bracket and the wearer's foot.

3. An orthopedic appliance having, in combination, a flexible belt adapted to fit around the body of the wearer adjacent the pelvic region between the waist and the hip and having a stiffened portion extending around one side of the body, a tubular member secured to said stiffened portion of said belt, an elongated torque resistant and laterally flexible element having one end portion telescoping with and secured adjustably in said tubular member with the element extending transversely from the belt so as to lie along the outer side of one leg of the wearer when the belt is worn, a bracket adapted to be secured to a part such as a shoe attached to the wearer's foot and to move with the latter about the axis of the wearer's leg, and a connector secured rigidly to the other end portion of said flexible element and pivotally connected to said bracket to rotate relative to the bracket about an axis extending transversely of the element and of the wearer's leg and to rotate with the bracket about the axis of the element so as to transmit torque from the latter to the bracket and the wearer's foot.

4. An orthopedic appliance having, in combination, a belt adapted to fit around the pelvic region of the wearer between the waist and the hip, a bracket adapted to be secured to a part such as a shoe attached to the wearer's foot and to move with the latter about the axis of the wearer's leg, an elongated torque transmitting and laterally flexible element having one end connected to said belt to transmit to the latter torque applied to the other end of the element, and a coupling between said bracket and said other end of said element permitting rotation of the bracket relative to the element about an axis transverse to the element and preventing relative rotation between the two about the axis of the element.

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