June 19, 1951 C. L. INVIDIATO 2,557,603

DROP-FOOT BRACE

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Fig 2

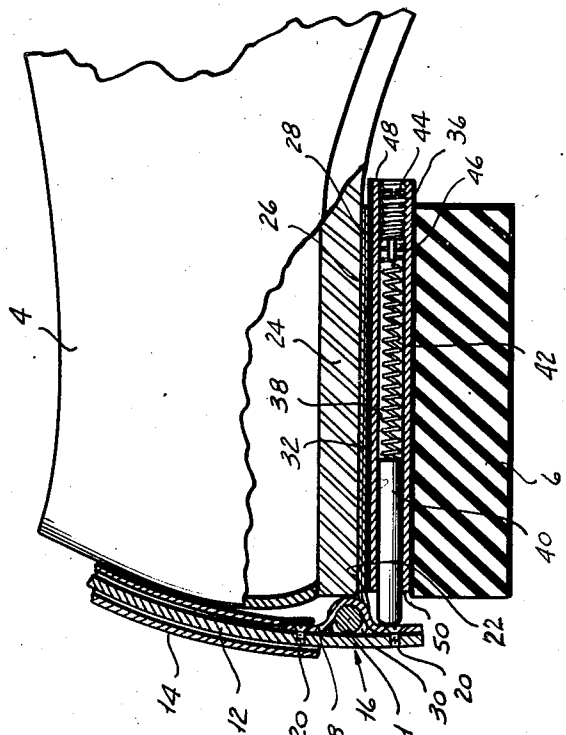


Fig 3

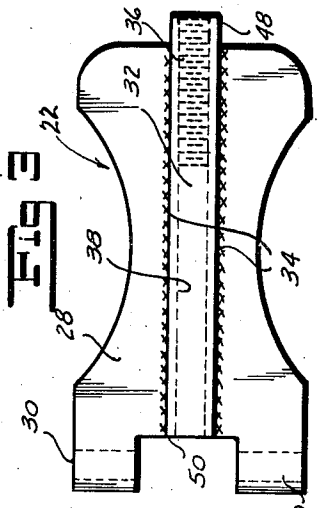
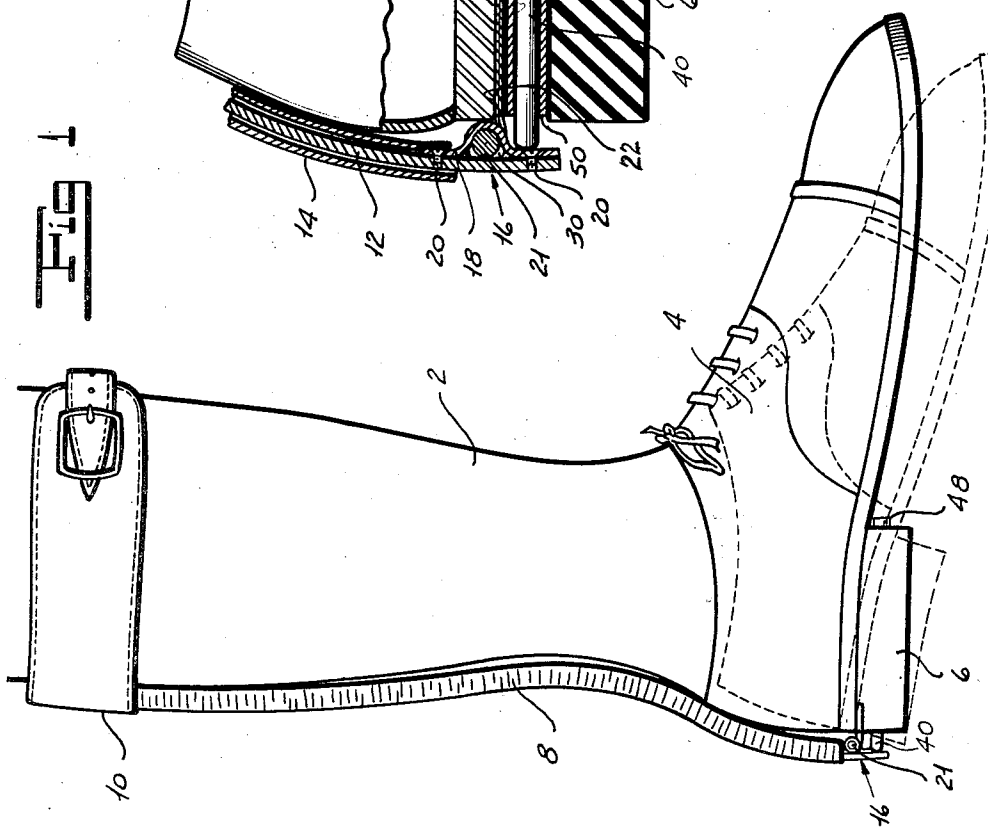


Fig 1



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DROP-FOOT BRACE

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3 Claims. (Cl. 128—80)

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This invention relates to a brace adapted to be worn by a person afflicted with drop-foot, whereby such person may walk or engage in other similar activities in a nearly normal manner.

In certain types of injuries to the foot and ankle, as for instance poliomyelitis, in which the nerves and muscles controlling the foot have been injured or have deteriorated, there is a tendency for the forward part of the foot to drop down and in, the person having lost the ability to raise the forward part of the foot. A person thus afflicted cannot walk normally, because he first must engage the toe of the afflicted foot with the ground or floor to raise the foot whereby its sole and heel will then engage the floor squarely. If he were not to do this, the toe would be, of course, in effect stubbed and the person would fall. The walking gait of such a person, unaided by any brace to overcome the tendency of the foot to drop, is therefore very halting and slow. Braces have been devised in the past to overcome the tendency of such foot to drop, but they have been heavy, cumbersome, and not readily adjusted.

It is accordingly among the objects of the present invention to provide a simple, compact, light brace for a drop-foot to allow near normal usage of the foot and leg thus afflicted.

A further object of the invention resides in the provision of such brace as an adjunct to a regularly worn shoe, but little of the brace appearing when worn by a man with trousers.

Yet another object of the invention resides in the provision of an easily adjustable spring tension means for elevating the foot and shoe of the wearer of the brace of the invention, whereby the foot is held in proper ground engaging position when the patient walks.

These and further objects of the invention will be more readily apparent upon consideration of the following description of a preferred embodiment of the drop-foot brace of the invention.

In the drawing appended hereto, and forming a part of the specification,

Fig. 1 is a view in side elevation of the brace of the invention applied to a shoe worn on the foot of a person;

Fig. 2 is a view in central vertical section through the heel portion of the shoe and brace shown in Fig. 1; and

Fig. 3 is a view in bottom plan of the plate forming the body of the bottom portion of the brace, such plate being embedded in the heel portion of the shoe.

In Fig. 1 the reference character 2 designates the lower part of a leg of a patient of which the

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ankle and foot are afflicted with "drop-foot." The shoe on such foot is designated 4. In Fig. 1 the extent to which the foot, unaided by a brace, would fall forwardly is indicated in dotted lines. Such dotted lines also indicate, in general, the extent of freedom of movement of the ankle when provided with the brace of the present invention. The reference character 6 denotes the solid heel portion of a shoe 4. From the rear of the shoe, in the vicinity of the heel 6, there rises the vertically extending elongated brace member 8 which terminates in the upper broad leg embracing member 10. Member 8, which is bent generally to conform with the outline of the rear portion of the leg, is composed of a central core member 12 of metal such as aluminum, and an outer covering sheath 14 of material such as leather. The inner core member 12 is attached at its upper end to an inner core member, not specifically designated, of metal about which a covering sheet of leather is applied to form the upper leg embracing member 10.

Between the bottom of the vertical brace member 8 and a portion of the brace which is attached to and preferably embedded in the shoe, as will be subsequently described, there is provided a pivotal connection generally designated 16. The axis of such pivotal connection is horizontal and at right angles to the longitudinal extent of the leg and the longitudinal axis of the shoe, the pivotal axis extending at right angles to the paper in both Figs. 1 and 2. On the rear of the bottom portion of the core 12 of the brace member there is secured by rivets 20 a clip member 18, which forms a part of the aforesaid hinge connection.

The member to which brace 8 is attached is in the form of a plate, generally designated 22, which is embedded between the rear sole portion 24 of the shoe and the bottom heel forming member 6 thereof. Plate 22 is formed of thin gauge metal bent upon itself along its central transverse axis so as to form two layers, the upper layer, shown in Fig. 2, being designated 26 and the lower layer being designated 28. Such two layers may be secured together, if desired, by tack welding at one or more of their edges. The blank from which the plate 22 is bent is so formed as to present at the rear end thereof, when so bent, the parallel spaced ears 30, shown more particularly in Fig. 3. Such ears 30 extend upwardly above the plane containing the general extent of the plate 22, as more clearly shown in Fig. 2. The spaced parallel ears 30 snugly receive between them the clip 18 on the rear of

member 12. A pivot pin 21 extends through one ear 30, through the clip 20, and then through the other ear 30, in that order, being secured in such relation by being headed on both ends.

The plate 22 has secured centrally and longitudinally thereof the elongated tube 32. Such tube is secured to thickness or layer 28 of the plate by weld fillets, shown at 34. Tube 32 is so positioned that one end 50 thereof lies flush with the rear portion of the plate between ears 30, and so that the other end 48 thereof projects somewhat outwardly of the heel 6, as shown more clearly in Fig. 2. Tube 32 has a longitudinal bore 38 therethrough, the forward portion of such bore being internally threaded at 36. A freely slidable plunger 40 is positioned in bore 38 at the rear thereof, the rear end of plunger 40 centrally contacting the bottom end portion of the clip 18 on member 12 below the axis of pivot pin 21. Plunger 40 is backed up by the coil compression spring 42 positioned to the front thereof in bore 38, the coil compression spring in turn being abutted by the adjustable abutment plug 44 threadedly received within the threaded portion 36 of the tube. A pilot pin 46 on the rear face of abutment 44 tends to maintain the front end of coil spring 42 centrally located relative thereto.

It will be appreciated that as a result of the above described construction the shoe, and thus the foot contained therein, is constantly urged in a counter-clockwise direction as the brace and shoe are shown in Figs. 1 and 2. When the foot and leg are at rest, as when the wearer of the brace and shoe is sitting, the foot and shoe thus have a normal attitude with respect to the leg, the counter-clockwise motion of the shoe and foot being limited by contact between the lower end of brace 8 and the rear of the shoe 4. When the wearer of the brace and shoe walks, the heel 6 of the shoe first engages the ground or floor, as it does on the normal healthy foot. The shoe then tends at first to turn clockwise somewhat and then counter-clockwise, again as does the normal, healthy foot, allowing the body to progress with respect to the foot and ankle in a normal stride. When such foot has completed its step, it is, of course, raised from the ground and the brace again holds the foot and shoe in a normal position, ready for another engagement with the ground.

The force with which the brace restores the foot to the normal position is under ready control and adjustment by screwing the abutment plug 44 in or out as indicated. Such adjustment, which is preferably made by the attending physician, gives the brace a greater foot restoring force when the abutment plug is screwed inwardly, and, conversely, a smaller restoring force when such abutment is screwed outwardly of the threaded portion 36 of the bore in the tube.

The brace is of advantage because of its lightness and simplicity plus the ease with which the foot restoring force of the brace may be varied. No easily vulnerable parts of the brace are exposed, and thus the brace may be worn in bad weather in which the shoe is in contact with snow or slush. Because of its compactness, a rubber may be worn over the shoe thus braced, at most but a half size larger rubber than normal being required. Furthermore, but little of the brace is exposed to view. When the brace is worn by a man with trousers, only a small portion of such brace, the pivot providing portion 16, will be normally exposed to view.

Although for purposes of illustration I have described and shown a preferred embodiment of the surgical brace of my invention, it will be understood that the invention is not restricted thereto, since it is capable of numerous variations as to details of construction. The invention is, therefore, to be defined by the scope of the claims appended hereto.

I claim as new the following:

1. A foot support, comprising an elongated upper, generally vertical member, means on the vertical member for embracing and fastening said member to the leg, a lower brace member attached to a shoe, said lower brace member being in the form of a generally horizontal plate embedded in the heel of the shoe, said plate having at least one ear at the rear thereof extending outwardly past the rear of the heel of the shoe, an ear on the forward face of the upper vertical brace member adjacent the lower end thereof, a horizontal pivot pin extending through the ear on the plate and the ear on the upper brace member, said pivot pin being disposed transverse to the longitudinal axis of the shoe, and means constantly urging the lower brace member and shoe upwardly about the pivotal axis, said last named means comprising a plunger slidingly mounted within the heel of the shoe, the rear end of the plunger contacting the upper brace member below the pivotal axis, and means constantly urging the plunger rearwardly.

2. A foot support, comprising an elongated upupper, generally vertical, brace member, means on the upper end of said upper brace member for embracing and fastening said member to the leg, a lower brace member attached to a shoe, said lower brace member being in the form of a generally horizontal plate embedded in the heel of the shoe, said plate having spaced parallel ears at the rear thereof extending outwardly past the rear of the heel, an ear on the forward face of the upper brace member adjacent the lower end thereof, the last named ear fitting between the ears on the plate, a horizontal pivot pin extending through the ears on the plate and the ear on the upper brace member, said pivot pin being disposed transverse to the longitudinal axis of the shoe, and means constantly urging the lower brace member and shoe upwardly about the pivotal axis, said last named means comprising a tube affixed to the plate centrally and longitudinally thereof so as to be aligned with the upper brace member, a plunger slidingly mounted within the rear end of the tube, the rear end of the plunger contacting the upper brace member below the pivotal axis, resilient compressible means in the tube contacting the forward end of the plunger, and an abutment for the forward end of the compressible means.

3. A foot support, comprising an elongated upper, generally vertical, brace member generally conforming in curvature to the rear outline of the calf and ankle, means on the upper end of said upper brace member for embracing and fastening said member to the leg, a lower brace member attached to a shoe, said lower brace member being in the form of a generally horizontal plate embedded in the heel of the shoe, said plate having spaced parallel ears at the rear thereof extending outwardly past the rear of the heel, an ear on the forward face of the upper brace member adjacent the lower end thereof, the last named ear fitting between the ears on

the plate, a horizontal pivot pin extending through the ears on the plate and the ear on the upper brace member, said pivot pin being disposed transverse to the longitudinal axis of the shoe, and means constantly urging the lower brace member and shoe upwardly about the pivotal axis, said last named means comprising a tube affixed to the bottom surface of the plate centrally and longitudinally thereof so as to be aligned with the upper brace member, a plunger slidingly mounted within the rear end of the tube, the rear end of the plunger contacting the upper brace member below the pivotal axis, a compression spring in the tube contacting the forward end of the plunger, and an adjustable abutment for the forward end of the spring in the form of a plug having screw threaded engagement with

the inner wall of the tube at its forward end, the forward end of the tube protruding to some extent from the forward vertical surface of the heel.

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