

### [54] ORTHOPEDIC BRACE

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[51] Int. Cl. .... **A61f 3/00**

[58] Field of Search .... 128/80 E, 80 R, 80 A, 80 B, 128/80 G, 80 H, 87, 83, 84, 85

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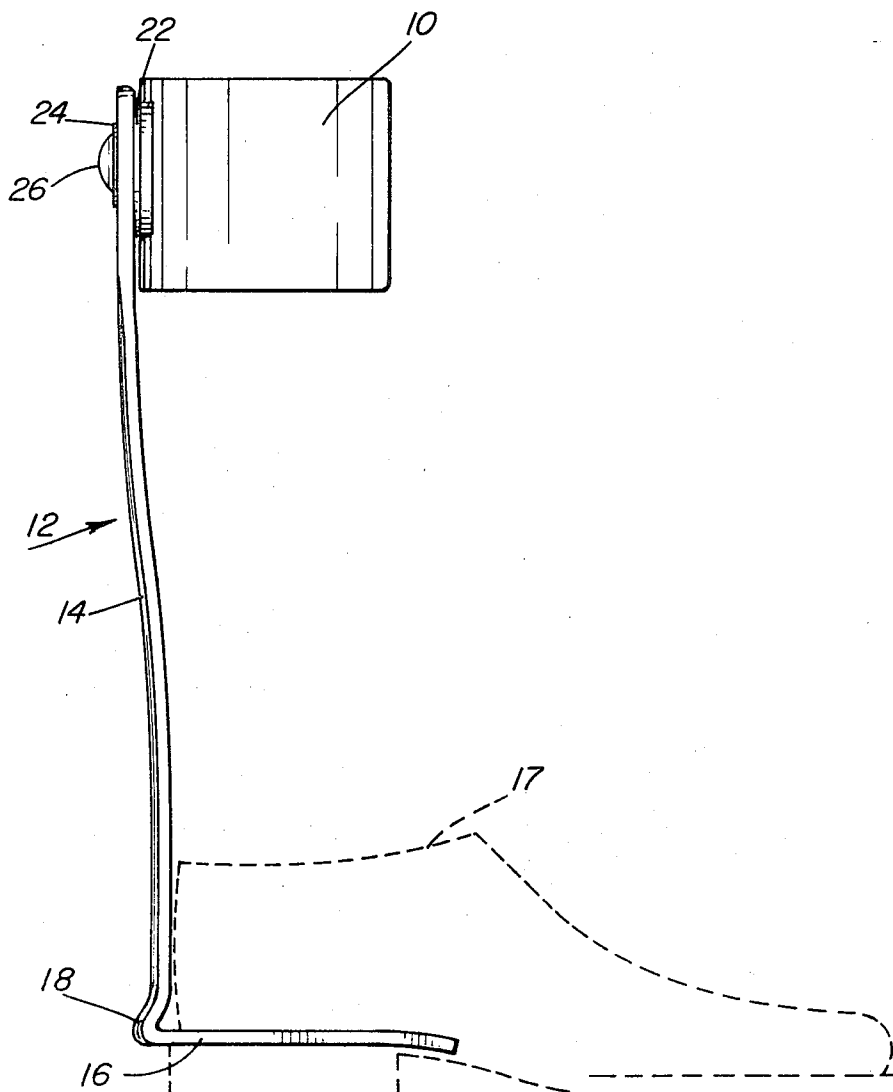
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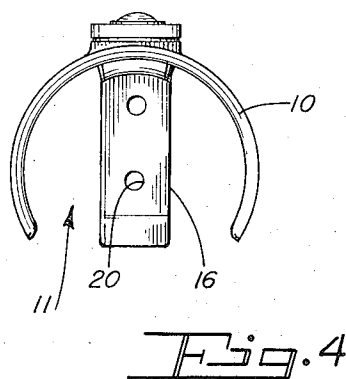
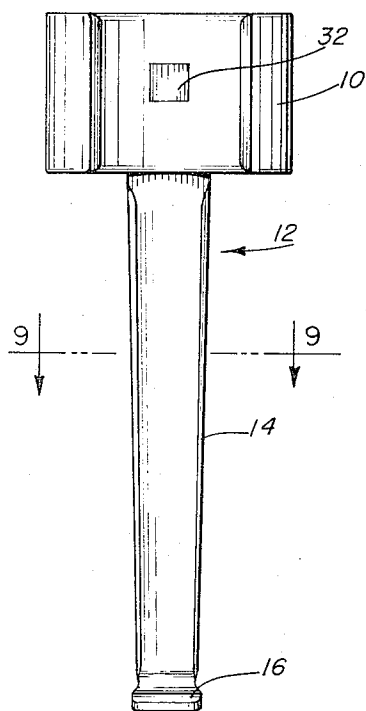
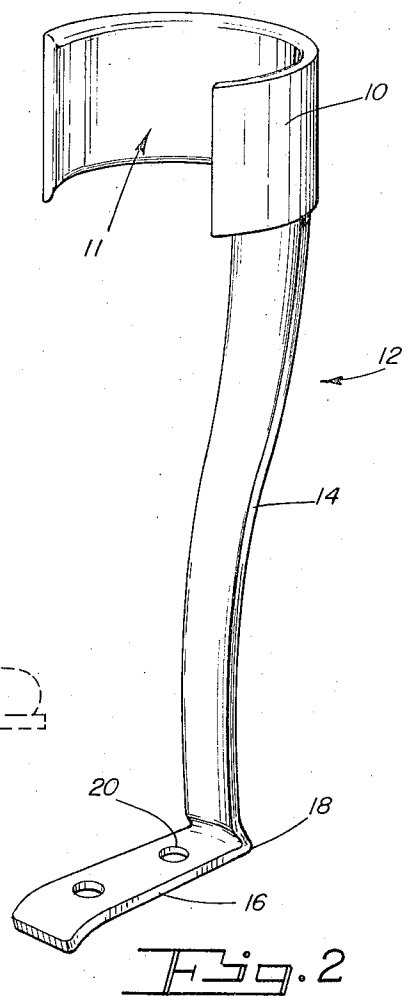
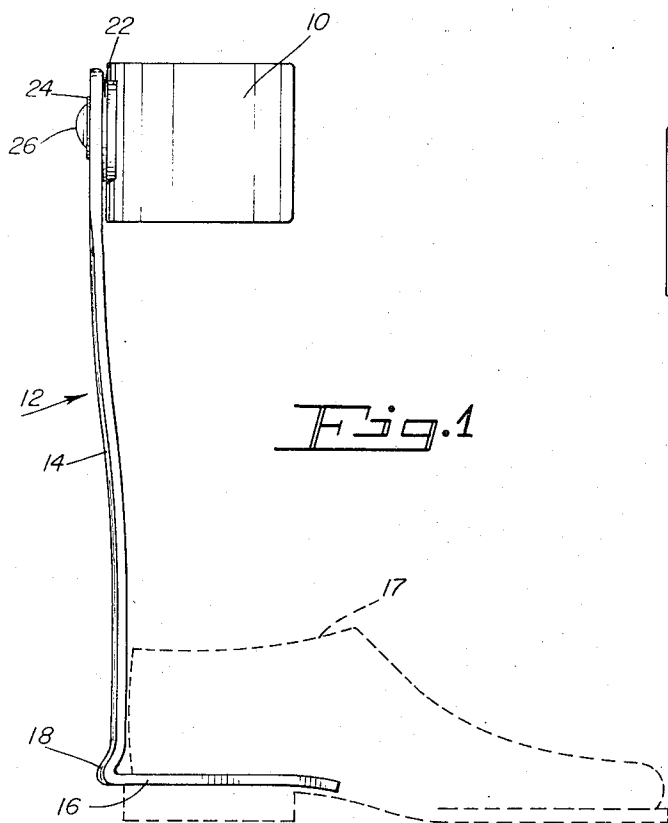
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### [57] ABSTRACT

The specific embodiment provides an orthopedic foot brace comprising a shank member having an elongated vertical portion and a shoe engaging portion at the lower end of the vertical portion. The shoe engaging portion is biased upwardly about a pivot point at the lower end of the vertical portion. An elongated vertical slot is provided at the upper end of the vertical portion, and a calf engaging member is slidably mounted in the slot.

**8 Claims, 9 Drawing Figures**





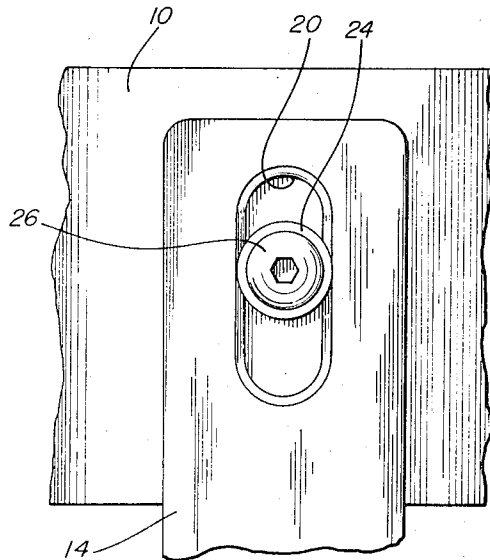


Fig. 5

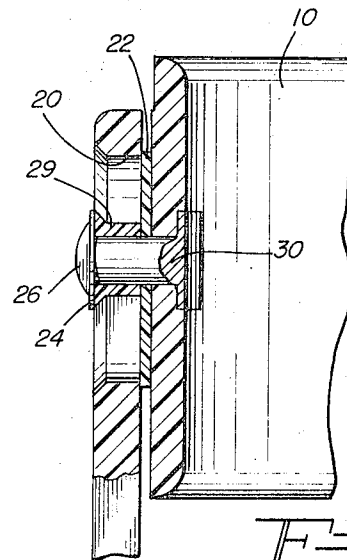


Fig. 6

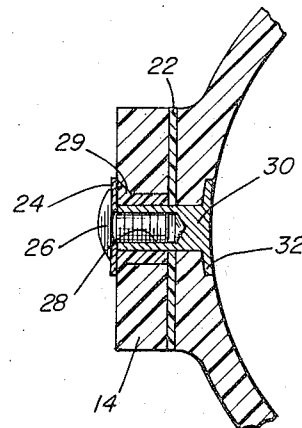
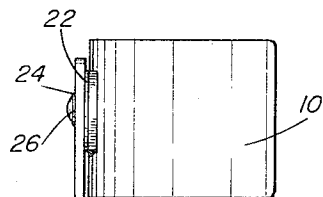


Fig. 7

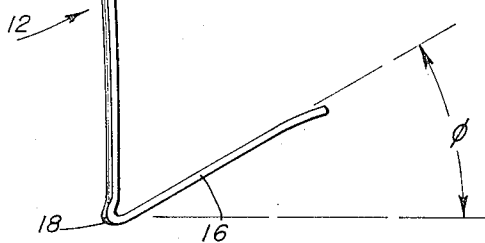


Fig. 8

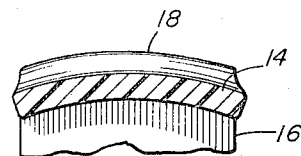


Fig. 9

## ORTHOPEDIC BRACE

### BACKGROUND OF THE INVENTION

#### 1. Field of the Invention

The present invention relates to an orthopedic foot brace. More particularly, the present invention relates to a brace of the type worn by persons suffering from drop foot.

#### 2. Description of Prior Art

Drop foot is a malady wherein muscles or nerves have been weakened or destroyed to an extent that an individual cannot draw his foot upwardly. As a consequence, the foot tends to drag while walking.

Commercially available drop foot braces appear to be predominantly constructed of metal and include a steel wire coiled about a pin placed in a shoe heel and fastened to the calf by means of a leather strap. Another commercially available brace has a hinge device constructed of springs for biasing a foot upwardly. The former brace thus requires pins protruding from a shoe heel which can cause damage by scraping against one's other heel or furniture and the like. Further, this type of brace can be dangerous in icy weather if the coil springs contact ice before the heel or sole of a shoe makes contact with the ice. The spring type of commercially available brace requires rather frequent replacement of the springs as well as constant lubrication.

Each of the foregoing commercially available braces is highly noticeable and cumbersome. They each have leather straps which are bothersome, particularly in the presence of cuts, irritations and the like. Further, since the commercially available braces are predominantly metallic, they heavily register in metal detecting devices and can cause personal inconvenience and embarrassment during security screening, such as prior to boarding commercial aircraft.

### SUMMARY OF THE INVENTION

In accordance with the present invention, there is provided an orthopedic foot brace comprising a shank member having a vertical elongated portion and a shoe engaging portion connected to the lower end of the vertical portion. The shoe engaging portion is biased upwardly about the lower end of the vertical portion. A calf engaging member is mounted on an upper end of the vertical portion and is vertically slidably movable in an elongated slot formed in the vertical portion.

In accordance with an aspect of the present invention, the vertical and shoe engaging portions of the shank member are unitarily formed of a transparent material with the shoe engaging portion extending upwardly and outwardly from the vertical portion at a predetermined angle to provide a necessary upward bias.

The shoe engaging portion is preferably secured in a slot formed in a shoe heel, or, in the case of heelless shoes such as tennis shoes, the shoe engaging portion is fitted under the insole and riveted to the shoe instep. When thus secured to a shoe, vertical movement of the vertical elongated portion is accommodated by the relative motion of the calf engaging member in the slot.

### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevation view of an orthopedic foot brace constructed in accordance with the present invention, and shown secured to a shoe;

FIG. 2 is a front perspective view of the brace;

FIG. 3 is a front elevation view of the brace;

FIG. 4 is a top plan view of the brace;

FIG. 5 is a rear elevation view of the brace showing means for connecting a calf engaging member to a shank member;

FIG. 6 is a vertical cross-section of the connecting means shown in FIG. 5;

FIG. 7 is a horizontal cross-section of the connecting means shown in FIG. 5;

FIG. 8 is another side elevation view of the brace showing a shoe engaging portion pre-set at a predetermined angle with respect to the horizontal; and

FIG. 9 is a cross-sectional view taken along Lines 9 — 9 of FIG. 3.

### DESCRIPTION OF SPECIFIC EMBODIMENTS

The figures show an embodiment of the present invention wherein a calf engaging member 10 is mounted at the upper end of a shank member 12. The shank member 12 has a vertical elongated portion 14 and a horizontal elongated shoe engaging portion 16 connected to the lower end of the vertical portion 14. As shown in FIG. 8, the shoe engaging portion 16 is formed with a predetermined angle  $\phi$  with respect to a horizontal plane. The shoe engaging portion 16 has a plurality of bores 20' to provide a riveted connection to a shoe 17. As shown in FIG. 1, the shoe engaging portion 16 pivots about an axis 18 at the lower end of the vertical portion 14 to exert an upward bias to the underside of the shoe 17.

As shown in FIGS. 2 and 4, the calf member 10 has a generally cylindrical shape and a front opening 11. With reference to FIGS. 5 — 7, the calf member 10 is slidably mounted in a slot 20 formed at the upper end of the vertical elongated portion 14. The mounting means includes an insert 30 having an internally threaded bore 28 at one end thereof and a flanged portion 32 at the other end thereof. The flanged portion 32 is seated in a correspondingly formed recess in the calf member 10 to prevent relative rotational movement of the insert 30 with respect to the calf member 10. A washer 22 is fitted over the insert 30 between the calf member 10 and the vertical elongated portion 14. The insert 30 then extends through the slot 20 with a bushing 29 thereabout for engagement with the surfaces of the slot 20. Another washer 24 is fitted against the outer end of the insert 30, and a threaded bolt 26 is mated with the threaded bore 28 to secure the calf member 10 to the vertical portion 14. When thus assembled, the calf member 10 is vertically movable to an extent defined by the height of the slot 20. The mounting means also permits rotational movement of the calf member 10 with respect to the vertical portion 14 of the shank member 12.

The washers 22, 24 and the bushing 29 can be suitably composed of materials such as Teflon which are durable and have a relatively low coefficient of friction. Further, the insert 30 and the bolt 26 can be made from relatively clear plastic materials. In addition, the bolt 26 and insert 30 combination can be replaced by a single rivet structure which is flanged at both ends thereof to secure the washers 22, 24, bushing 29, calf member 10 and vertical portion 14 together.

As noted above, the brace is preferably made from transparent materials for cosmetic reasons. One such embodiment was made from polycarbonate sheeting of

three-eighths inch thickness. The sheeting was cut into suitable dimensions, and thereafter heated for forming. The vertical portion 14 was approximately 16 inches in height, and the shoe engaging portion was 5.5 inches in length with the predetermined angle  $\phi$  set at 45°. The calf member 10 was also made from the polycarbonate sheeting. However, it is apparent that the calf member 10 can alternatively be a standard strap if such is desired by a user.

As noted above, the shoe engaging portion is fitted through a slot in a shoe heel, or, in the case of heelless shoes such as tennis shoes, fitted under the insole, and the shoe engaging portion 16 is then riveted to the shoe instep. As the shoe 17 is fitted on a user, the calf member 10 is positioned about the user's calf. The bias exerted by movement of the shoe engaging portion 16 from the position shown in FIG. 8 to that shown in FIG. 1 acts to bias the calf member 10 against the rear of the calf to maintain the member 10 in position without the need of the well-known straps or laces.

It is also apparent that the calf member 10 is vertically movable in the slot 20 as the brace is fitted to a user's leg. Thereafter, the vertical elongated portion 14 is movable with respect to the calf member as the foot turns on the ankle during each walking step.

It is further apparent that the calf member 10 can be perforated to provide ventilation. Also, the thus disclosed brace may be manufactured in several lengths and sizes to suit a variety of patients. In addition, the upward bias exerted by the shoe engaging portion 16 can be adjusted by varying the thickness of the material or the predetermined angle  $\phi$ .

Although the foregoing describes embodiments suitable for human beings, it is obvious that the brace in accordance with the present invention may be adapted for use on animals. For example, the thus described brace can be fitted to a horse that has an injured fetlock.

What is claimed is:

1. An orthopedic foot brace comprising:

a shank member having an elongated vertical portion, and a shoe engaging portion extending upwardly and inwardly from a lower end of said vertical portion,

said shoe engaging portion being unitarily formed with said vertical portion and resiliently movable about said lower end when in engagement with a shoe to bias the shoe upwardly,

said vertical portion including an elongated vertical slot at an upper end thereof,

a member for engaging a calf of a user, and

means for mounting said calf engaging member on said vertical portion,

said mounting means including an elongated element extending through said calf engaging member and said slot, and means at each end of said elongated element for preventing movement of said elongated element along a longitudinal axis thereof, said mounting means being slidably movable in said slot, whereby said calf engaging member is vertically movable with respect to said vertical portion when the user walks.

2. The brace of claim 1 wherein said shank member is formed of transparent material.

3. The brace of claim 1 wherein said shank member is formed of a polycarbonate.

4. The brace of claim 1 wherein said calf engaging member has an opened front end through which the calf of the user is inserted.

5. The brace of claim 1 wherein said calf engaging member is formed of a transparent material.

6. The brace of claim 1 wherein said calf engaging member is rotatable about an axis perpendicular to said slot.

7. The brace of claim 1 wherein said mounting means further includes a bushing about said elongated element for sliding engagement in said slot.

8. The brace of claim 1 wherein said mounting means further includes a washer on each side of said slot.

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