Nov. 15, 1927. 1,649,773

H. M. WITMYER

ARTIFICIAL LIMB

Filed July 31, 1926

FIG. I

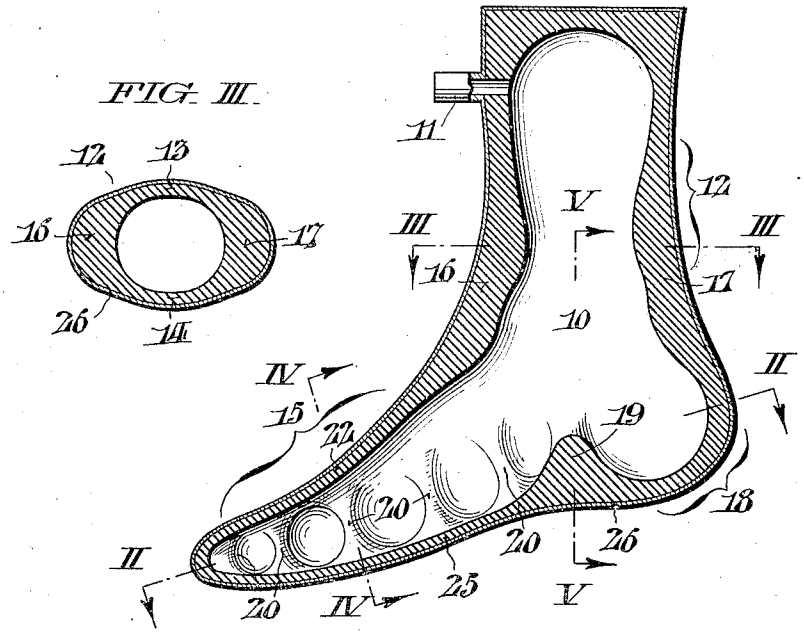


FIG. III

FIG. II

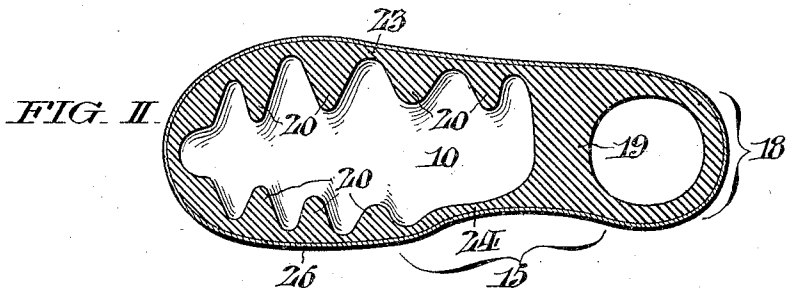


FIG. IV

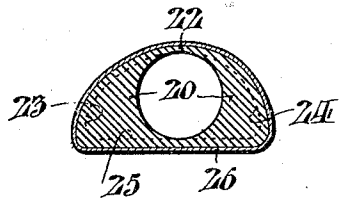
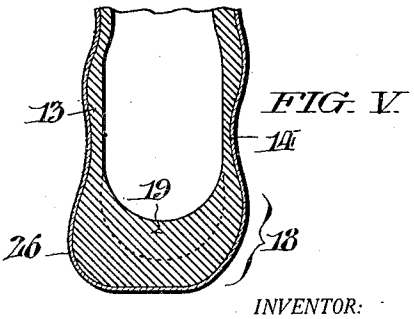


FIG. V



WITNESSES

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Patented Nov. 15, 1927. 1,649,773

UNITED STATES PATENT OFFICE.

HARRY M. WITMYER, OF MANHEIM, PENNSYLVANIA, ASSIGNOR OF ONE-THIRD TO JACOB H. NISSLEY AND ONE-THIRD TO HARRY E. TROUT, BOTH OF MANHEIM, PENNSYLVANIA.

ARTIFICIAL LIMB.

Application filed July 31, 1926. Serial No. 126,149.

This invention relates to artificial limbs, more particularly to artificial feet of the inflatable type and constructed of inherently elastic, flexible and resilient, material. In connection with artificial limbs of the specific type referred to, I seek to attain through novel internal construction and diversified distribution of stresses resultant from applied weight, a re-action tending to assist the forward thrust of the body in a manner simulative of the natural foot in walking, thereby not only to afford the wearer the utmost possible comfort, but to render the movements easier and therefore less fatiguing.

How these and other advantages may be secured in actual practice will be readily apparent from the detailed description hereinafter of the typical embodiment shown in the drawings, whereof Fig. I is a longitudinal sectional view of an artificial foot constructed in accordance with my invention.

Fig. II is a horizontal section taken as indicated by the arrows II—II in Fig. I.

Figs. III, IV and V are detail-sections taken locally, respectively, in accordance with the arrows III—III, IV—IV and V—V in Fig. I.

More especially from Figs. I and II, it will be observed that the structure illustrated has the general external configuration of the human foot. In practice I construct the limb hollow from suitable moldable material (preferably rubber) with consequent formation of an inner chamber 10 adapted to be inflated through a valved nipple 11 provided near the top of the ankle 12 for this purpose. At the latter region, the side walls 13, 14 are made comparatively thin (Fig. III) so as to yield readily to bending crosswise of the foot proper 15; while at the front 16 and rear 17 the walls are considerably thickened to strengthen the structure against collapse at said region, as well as promote its capacity to re-act and thus assist the forward thrust of the body in walking.

The lower part of the heel 18 immediately adjacent the hollow of the foot, is reenforced and stiffened internally by a transverse protuberance having the form of an integral ridge 19 that projects upward within the hollow 10 in line with the axis of the ankle, and joins the opposite side walls 13, 14 in well rounded curves as shown in Fig. V. That portion of the wall which defines the ball of the heel 18 is made of uniform thickness as shown in Figs. I and II, so as to effectively absorb the shocks of impact incident to walking, and merges rather abruptly with the reenforcements at 17 and 19.

The foot proper 15 is internally braced at appropriate intervals along its length by transverse buttress ribs 20, also integrally formed, that extend inward toward the longitudinal center of the structure from opposite sides. By reference to Fig. II it will be observed that these ribs 20 are tapered and differ in length as well as cross sectional area in accordance with location, and that they merge with the side walls through curves of very liberal radii, see Fig. IV. Except at the ribs 20, the top wall 22 of the instep and the sides 23, 24 are of uniform thickness, the same being also true of the sole 25 throughout; i. e., up to the locality of the transverse ridge 19. The sides 23, 24 of the foot proper 15 are thus well reenforced against the possibility of collapse under pressure from above, while a medial longitudinal area along 22 and 25 is left free to yield under the elasticity of the rubber in responding to longitudinal movements of the foot having their inception at the region of the ankle.

With inflation to the proper degree (determinable in practice by the weight which is to be sustained), it will be apparent that through the re-action of the compressive stresses initially induced in the various reenforced portions of the rubber in concert with the counter cushioning effect of the compressed air, an easy forward thrust is imparted to the body in close simulation of natural walking, the characteristic construction of the ankle incidentally permitting free sidewise flexure as required. The wearer is thus afforded the utmost possible comfort and with the aid of my invention may actually derive pleasurable enjoyment in walking over long periods without experiencing extreme fatigue or soreness.

For the purpose of protection and additional reenforcements, the structure is covered by a layer or skin of comparatively stout fabric 26 which may be readily incorporated incident to molding and vulcanizing.

Having thus described my invention, I claim:

1. An artificial limb formed hollow from inherently elastic, flexible and resilient material, with a continuous hollow for inflation, the walls of the structure being strengthened by internal lateral buttress ribs of different magnitude for sustenance against collapse and for capacity to yield to flexure of different extents in such buttressed regions.

2. An artificial limb formed hollow from inherently elastic, flexible and resilient material, the walls of the structure being thickened in some regions and strengthened in others by integral internal buttress ribs for sustenance against collapse and for capacity to yield to flexure to different extents in such reenforced regions.

3. An artificial limb formed hollow from inherently elastic, flexible and resilient material, the walls of the structure being strengthened internally by integral tapering buttress ribs extending in some regions entirely across the hollow and in other regions only part way across for capacity to yield to flexure to different extents in such reenforced regions.

4. An artificial foot formed hollow from inherently elastic, flexible and resilient material, the walls of the structure having transverse buttress ribs and being thickened at the front and rear regions of the ankle for relatively greater resistivity to forward and rearward bending than to sidewise flexure.

5. An artificial foot formed hollow from inherently elastic, flexible and resilient material, the walls of the structure being thickened at the front and rear of the ankle for relatively greater resistivity to forward and rearward bending than to sidewise flexure, and the sole likewise reinforced by an integral upstanding transverse ridge lying in the line of the axis of said ankle.

6. An artificial foot formed hollow from inherently elastic, flexible and resilient material with integral buttressing ribs joining the sole with the side walls at intervals lengthwise of the foot proper for sustenance against collapse and for capacity to yield to flexure to different extents in such reinforced regions.

7. An integral artificial limb having capacity for inflation to sustain determined weight and regionally thickened by lateral ribs for re-action in conformity with the movements of the natural limb.

8. An integral artificial foot having capacity for inflation to sustain determined weight and laterally thickened at intervals across the lower portion in varying extent as well as in the region of the ankle so as to re-act in conformity with natural foot movement and to assist forward thrust in the act of walking.

In testimony whereof, I have hereunto signed my name at Manheim, Pennsylvania, this 27th day of July, 1926.

HARRY M. WITMYER.