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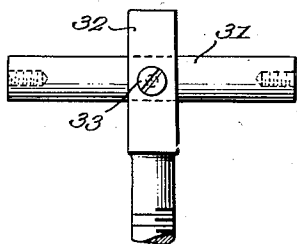
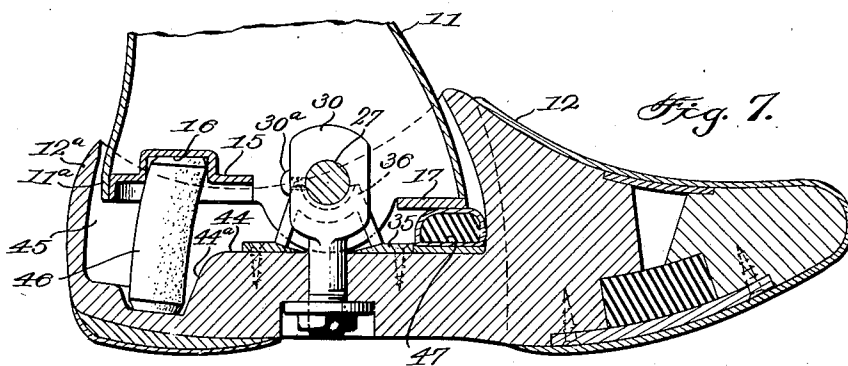
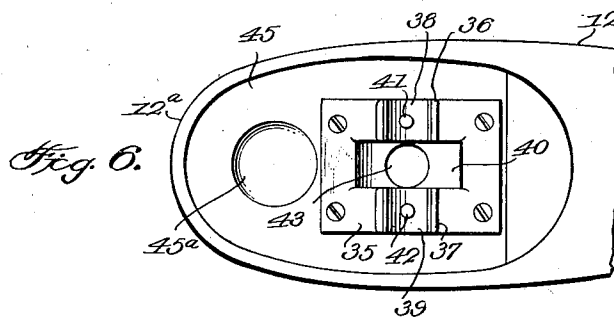
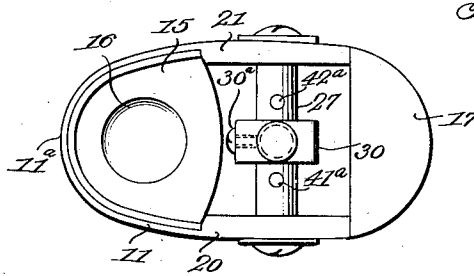
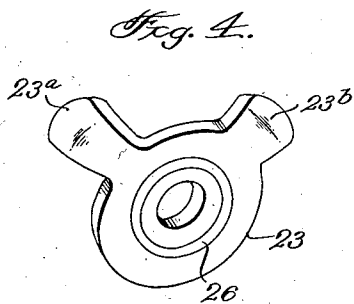
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2,152,402

ANKLE JOINT STRUCTURE FOR ARTIFICIAL LIMBS

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2 Sheets-Sheet 2



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ANKLE JOINT STRUCTURE FOR ARTIFICIAL LIMBS

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4 Claims. (Cl. 3—6)

The present invention relates to improvements in the ankle joint structure of artificial limbs, whereby appearance and reliability of the joint are greatly enhanced. Since the invention will be best understood from a detailed description of a specific exemplification, such a description will be given with reference to the accompanying drawings which show a practical embodiment.

In the drawings:

Figure 1 is a side elevation of an artificial limb embodying the present invention.

Figure 2 is a perspective view of the ankle portion of the limb at one stage of manufacture.

Figure 3 is a section substantially on line 3—3 of Figure 1.

Figure 4 is a perspective view of a bearing-carrying fitting or insert forming a part of the ankle joint.

Figure 5 is a bottom plan view of the shin portion of the limb with the foot removed.

Figure 6 is a plan view of the rear portion of the foot.

Figure 7 is a longitudinal section of the foot and lower end of the shin portion, and

Figure 8 is an elevation of a modified form of ankle joint bolt and anchoring bolt or sleeve.

Referring to the drawings, reference numeral 10 designates the thigh portion of an artificial limb, reference numeral 11 the shin portion, and reference numeral 12 the foot portion. The design of limb is the same as that shown in my copending application Serial No. 19,897, filed May 4, 1935, the present application being a continuation in part and, as above stated, being directed to the ankle joint structure.

The thigh and shin portions or sections are of hollow metal construction, preferably seamless and formed in a manner such as is disclosed in my United States Patent 1,884,589, granted October 25, 1932. The foot portion may be made of wood or other suitable material.

The lower edges of the shin member are in substantially the same plane, except that the side walls have arcuate downward extensions or continuations opposite each other, these being designated at 13 and 14. In the heel portion is set a fitting in the form of an inverted cup-like member 15, which has side and rear flanges welded to the walls of the shin portion around the heel zone thereof. Member 15 is provided medially with an upward offset which provides a recess 16 (Fig. 7). Member 15 terminates forwardly at the extensions 13 and 14.

Forwardly of the extensions the side and front

walls of the shin portion are bridged by a fitting in the form of an arcuate plate 17 whose margins are butted by the edge of the shin portion, the parts being secured together by welding.

The extensions or ears 13 and 14 are inwardly offset as are also the side wall portions thereabove, depressions 18 and 19 being thus formed. The ears are rimmed by outwardly projecting flanges 20 and 21, which are turned therefrom and which terminate upwardly at the lower edge of the ankle portion as is most clearly shown in Figure 2. Each of the depressions has frontwardly and rearwardly extending branches as at 19^a and 19^b, Figure 2, and fittings or inserts 22 and 23 are received in the respective recesses, each being shaped as particularly shown in Figure 4. In this latter figure, the insert 23 is shown and it will be observed that it has a main substantially circular body portion with projecting arms 23^a and 23^b, the insert being positionable in the recess 19 in conforming relation to the latter with arms 23^a and 23^b in the branches 19^a and 19^b, respectively. When thus positioned, the fitting is secured in place preferably by welding throughout its perimeter so that the welding metal as at 24, Figure 3, entirely obliterates the joint between the two parts and gives a perfectly smooth finish as in Figure 1.

The fittings 22 and 23 carry in suitable central openings ball bearing assemblies 25 and 26 which may be screwed or pressed into position. The extensions 13 and 14 which back the fittings, are centrally pierced to provide openings through which the reduced ends of a pivot bolt 27 are passed into the inner races of the bearing assemblies. The ends of the bolt 27 are tapped to receive retaining screws 28 and 29, and if desired washers may be interposed between the heads of the screws and the outer ends of the inner races. The central portion of bolt 27 is engaged in the eye of an anchor bolt or stem 30.

With the described construction the bolt 27 must be sprung into position, and unless care is exercised some permanent distortion may result. Furthermore, the bolt must be positioned prior to the welding of the fittings 22 and 23 in place. Consequently, as a desirable modification, the pivot bolt may be of the simple form shown in Figure 8. The bolt or pin 31 of this figure is cylindrical and of uniform diameter throughout, the diameter being such that the bolt may be slid through one inner race, then threaded through the eye of the bolt or stem 32, Figure 8, and the entering end then slid into the other inner race,

retaining screws such as 28 and 29 of Figure 3 being then applied. When thus positioned, bolt 32 is secured to bolt 31 by means of a set screw 33.

To refer again to Figure 3, the bolt 30, which is secured to pivot bolt 27 by means of a set screw 30^a, has a threaded stem which is passed through the foot portion 12 and engaged by a nut 34. The foot supports a bolster 35, which has two channel portions 36 and 37 of arcuate cross-section and in which the end portions of bolt 27 are seated, non-metallic or soft metal cushions 38 and 39 being interposed between the bolt and the channel portions. Bolt 30 extends through the slot 40, which separates the channel portions 36 and 37. The latter have fixed in their bottom walls upwardly projecting pins or studs 41 and 42, which engage with a close fit in sockets 41^a and 42^a in the underside of the pivot bolt so that the latter is securely held against rotation and axial displacement.

While as above stated, bolt 30 is secured to bolt 27 by means of the set screw 30^a, nevertheless this screw may become loose, and since, moreover, the stem of bolt 30 may wear away or enlarge the bore 43 in the foot through which it passes, I have provided the pin and socket connection to insure that the pivot bolt will be held absolutely fixed, the cradle 35, it will be understood being rigidly fixed on the bottom wall 44 of the foot recess 45 which receives the ankle end of the shin portion.

It will be understood that the pivot and anchor bolt of Figure 8 are designed to be associated with the foot portion in exactly the same manner as the bolts 27 and 30.

An elongated rubber pedestal 46, has one end received in a depression 45^a in the heel portion of recess 45 and its upper end embraced in the recess 16 of fitting 15 so as to be securely retained in upright position. A rubber pad 47 is interposed between plate 17 and the forward bottom wall portion of recess 45.

It will be seen that the lower rear portion 11^a of the shin portion is adequately lapped by the heel wall 12^a of the foot, Figure 7. This latter wall, however, is sufficiently low so that the top edge of the counter of the ordinary low shoe will lie sufficiently above the wall 12^a so as to obscure the break between the latter and the wall portion 11^a. Due to the relative low position of the wall portion 11^a in the foot cavity, I have provided the inverted cup-shaped fitting 15 in order that the rubber pedestal 46 may be made of sufficient length to afford the required yielding support. In other words, I have provided a rela-

tively elevated abutment for the upper end of the pedestal and by reason of this fact, I am enabled to utilize a pedestal of sufficient length to give proper compression characteristics.

The described ankle structure is entirely silent in use due to the complete anchoring of the pivot bolt and to the rigid nature of the bearing-carrying inserts and their rigid association with the shin portion. The lower end of the shin portion is also greatly strengthened by the welded elements 15 and 17 which extend throughout that part of the ankle not occupied by the fittings 22 and 23 so that a welded structure is present from the front to the rear of the said lower end.

Since changes in form and arrangement may be made from what has been described without departure from the scope of the invention, it will be understood that I do not limit myself in these respects, except as in the following claims.

I claim:

1. An artificial limb comprising a hollow metal shin portion, a fitting closing the rear portion of the ankle end of said shin portion, a fitting closing the forward portion of the ankle end of said shin portion, said fittings being welded in place, side portions of the shin portion depending between said fittings, and bearing-carrying reinforcements fixed to said depending portions.

2. A hollow metal artificial limb having at one end depressions in its side walls, each of said depressions having frontwardly and rearwardly extending branches, and bearing-carrying metal inserts received in said recesses and having arms extending in said branches, the inserts being welded in position.

3. An artificial shin comprising a hollow metal body having at the ankle end depressions in the body side walls at the lower edges of the latter, each depression having frontwardly and rearwardly extending branches, and bearing-carrying metal inserts received in said recesses and having arms extending in said branches, the inserts being welded in position.

4. An artificial limb comprising a hollow metal shin portion having in its lower side walls depressions with branch portions extending frontwardly and rearwardly, said side walls having substantially semi-circular extensions below said depressions, which extensions are rimmed by outwardly projecting flanges, and bearing-carrying fittings disposed and welded in said depressions and against said extensions and flanges, said fittings having arms extending in said branch portions.

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