

Dec. 11, 1945.

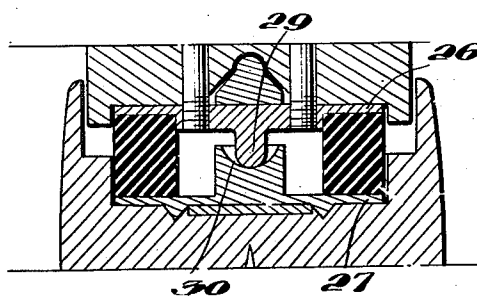
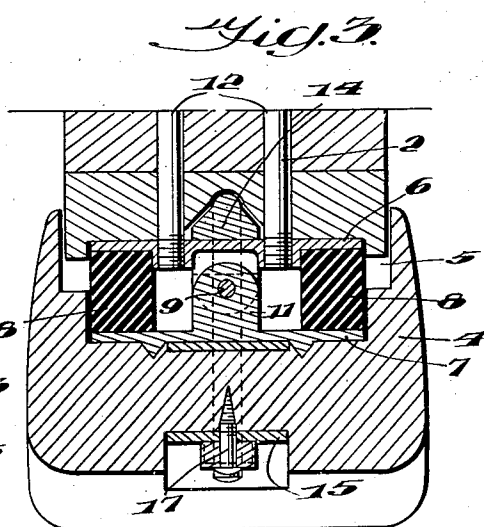
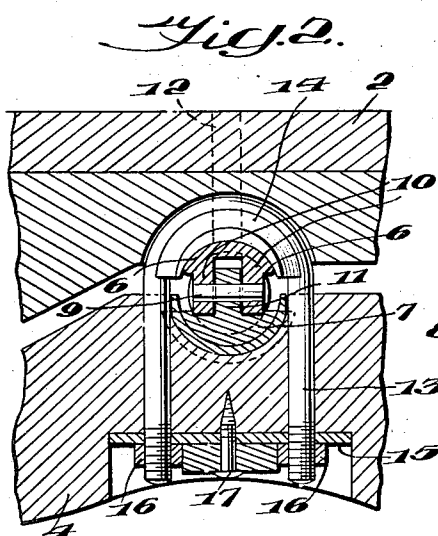
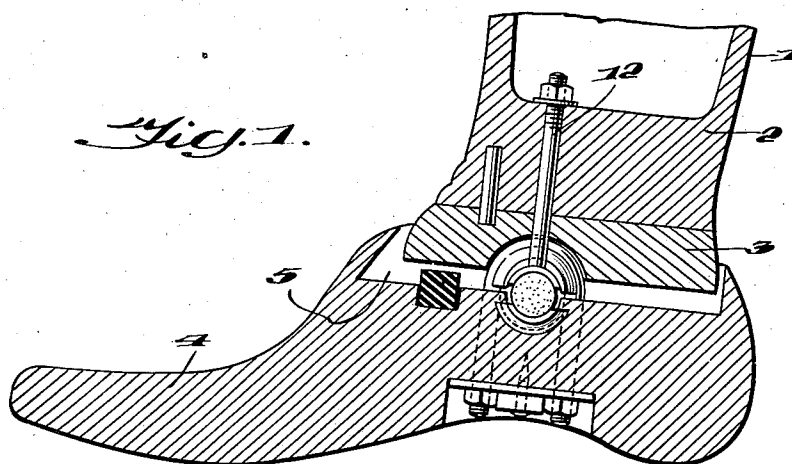
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2,390,920

ANKLE JOINT

Filed June 20, 1944

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

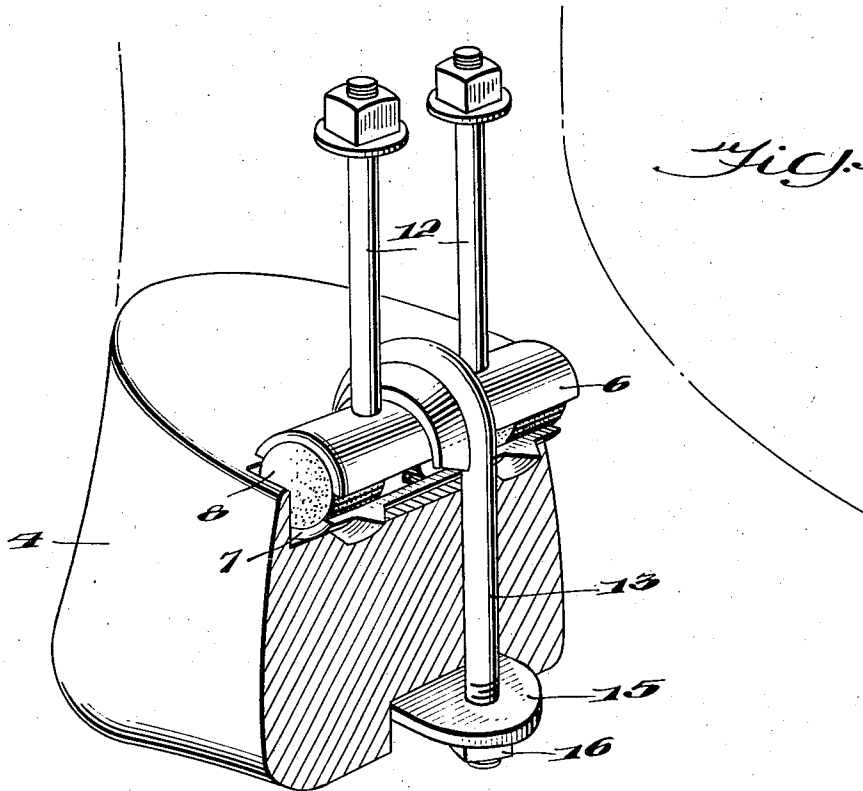


Fig. 5.

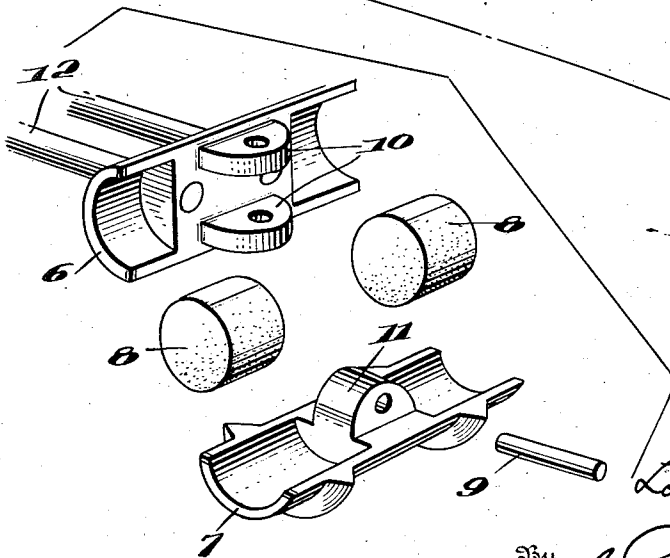


Fig. 6.

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UNITED STATES PATENT OFFICE

2,390,920

ANKLE JOINT

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3 Claims. (Cl. 3—6)

This invention relates to improvements in ankle joints for artificial limbs.

An artificial limb is usually constructed with foot and shin portions hinged together for relative motion during walking in a manner similar to the natural movements of the foot and leg at the ankle. Heretofore this ankle joint has been constructed generally as a hinged connection between these parts of the limb which permitted such swinging movement on a transverse axis. While this is satisfactory generally while walking on a level surface, it does not provide yieldability to accommodate for irregularities in the surface nor for slanting of the supporting surface upon which the foot may be placed.

The object of this invention is to improve the construction of the ankle joint of an artificial limb to enable the foot portion to yield transversely in the ankle joint to accommodate for transverse irregularities of the supporting surface, while yet providing a practical ankle joint which will allow the proper hinging action between the foot and shin section for normal walking motion.

This action is accomplished preferably by providing in the pivot pintle for transverse yielding at least to a limited extent of the foot relative to the shin section. This may be accomplished by constructing the pintle bearing in two parts which are longitudinally yieldable or swingable with yielding means arranged to return them to their normal positions. The parts may be pivoted together or connected through a universal joint, so as to yield upon an axis extending transversely of the length thereof, or in a general endwise direction. They may be returned to their normal positions by interposing yieldable pads therebetween of resilient material, which will give sufficiently to allow lateral movement of the foot relative to the shin section and then to return the parts to their normal positions in natural fashion.

A preferred embodiment of the invention, together with a modification thereof, are illustrated in the accompanying drawings, in which:

Fig. 1 is a vertical sectional view through the foot and shin section, showing the ankle joint in elevation;

Fig. 2 is a central vertical section therethrough;

Fig. 3 is a similar view at right angles thereto;

Fig. 4 is a view similar to Fig. 3, but showing a modification;

Fig. 5 is a perspective view, partly in section, showing the improved ankle joint assembled in the foot member; and

Fig. 6 is a disassembled perspective view of the parts of the ankle joint.

The invention is shown as applied to an artificial limb, the parts of which may be formed of any suitable material customarily used for the purpose, or of special structure as desired. Such a limb includes ordinarily a lower leg section or shin member 1, which is hollow throughout the major portion of the length thereof, but usually provided with a solid bottom portion 2 therein. The shin section 1 has an extension member 3, secured thereto under the end portion 2.

The foot of the limb is designated generally at 4 and may also be constructed in any well-known or desired manner, being shown as formed with a recess 5 therein for interfitting relation with the lower end portion of the shin member in the manner customary in the art.

The shin section 1 and foot 4 are hinged together for relative swinging motion in walking. Such a hinged connection is provided preferably by means of a pintle and yoke connected together for relative swinging movement. These parts are adapted to be connected respectively with the shin section 1 and foot 4.

The pintle is preferably formed in two parts, designated respectively at 6 and 7, each formed arcuate in cross section with the edges thereof spaced apart, as shown in Figs. 1 and 2, so that the parts 6 and 7 thus form facing channels, at least at the ends thereof. Pads 8 preferably of soft yieldable material are fitted into these channels at the ends of the sections 6 and 7 and hold them spaced apart. These pads are formed preferably of yieldable resilient material, such as natural or artificial rubber or other similar material having the desired properties.

In the form shown in Figs. 2 and 3, the pintle sections 6 and 7 are pivotally connected together intermediate the ends thereof, on a transverse axis. Such a pivot is provided by a transverse pin 9 which extends through ears 10 formed on the section 6 and receiving therebetween an ear 11 formed on the section 7. The pin 9 pivotally connects the ears 10 and 11 together for endwise tilting action of the sections 6 and 7 about the axis of the pin, whereby the foot 4 will yield transversely with respect to the shin section 1 to accommodate for rough or uneven surfaces or for transverse sloping of the ground or floor.

The pintle formed by the sections 6 and 7 is secured to the shin section 1 by bolts 12 which are rigidly fixed to the section 6, as shown in Fig. 3, and extend upwardly therefrom through the end 2 to which the bolts are secured.

A yoke 13 has a closed side 14 over the pintle section 6 in bearing relation thereon, and extends downwardly around the pintle through the foot 4 to the bottom thereof. The yoke 13 extends through a plate 15 at the underside of the foot and has its ends threaded for adjustable connection by nuts 16. The plate 15 is in turn secured to the foot 4 by a screw 17.

The pintle formed by the sections 6 and 7, co-acting with the yoke 13, provide a pivotal bearing connection between the foot and shin section for turning movement about an axis extending transversely of the foot or lengthwise of the center of the pintle. This will allow tilting movement of the foot during the normal walking action. At the same time, the pivotal connection 9 between the sections 6 and 7 of the pintle will allow relative tilting movement of these sections for yielding of the foot transversely to accommodate irregularities in the floor or ground or a lateral tilting of the walking surface.

In place of the pivotal connection 9 between the sections 6 and 7, the latter may be interconnected by a universal joint, if desired, as shown in Fig. 4. In this form, the section 26 is provided with a ball portion 29, while the section 27 has a socket 30 receiving the ball portion 29, so as to allow general universal movement of these sections relative to each other. Otherwise the ankle joint shown in Fig. 4, is constructed substantially in the manner described above and illustrated in Figs. 1 to 3, 5 and 6.

This ankle joint not only permits yielding of the foot laterally during walking, but it is also simple and inexpensive, and may be readily and easily applied in place of the usual ankle joint, without modification of the leg or foot members. It is assembled in these members in the same way as the usual ankle joint used heretofore.

I claim:

1. In an artificial limb, including a foot and a shin section, an ankle joint connecting the foot and shin section together for relative swinging movement about a transverse axis, said ankle joint including a pintle and a yoke connected with said members and having journaled connection with each other, said pintle including a pair of sections extending lengthwise of the hinge axis, and means pivotally connecting said sections together intermediate the length thereof for relative swinging movement in a direction transverse to the hinge axis.

2. In an artificial limb, including a foot and a shin section, an ankle joint connecting the foot and shin section together for relative swinging movement about a transverse axis, said ankle joint including a pintle and a yoke connected with said members and having journaled connection with each other, said pintle including a pair of spaced sections extending lengthwise of the hinge axis, and means pivotally connecting said sections together intermediate the length thereof for relative swinging movement in a direction transverse to the hinge axis, and yielding means interposed between adjacent end portions of the respective sections tending to move said sections to normal positions relative to each other.

3. An ankle joint for connecting a foot and shin section of an artificial limb together comprising two elongated sections pivotally connected together intermediate the sections for relative endwise tilting motions and coacting to form a pintle, and a yoke extending about said pintle at the point of the pivot between the sections and having journaled connection with the pintle for swinging movement about an axis extending transversely of the pivot axis.

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