Aug. 4, 1959 C. E. SACKETT 2,897,512

ARTIFICIAL LIMBS

Filed Aug. 30, 1956 2 Sheets-Sheet 1

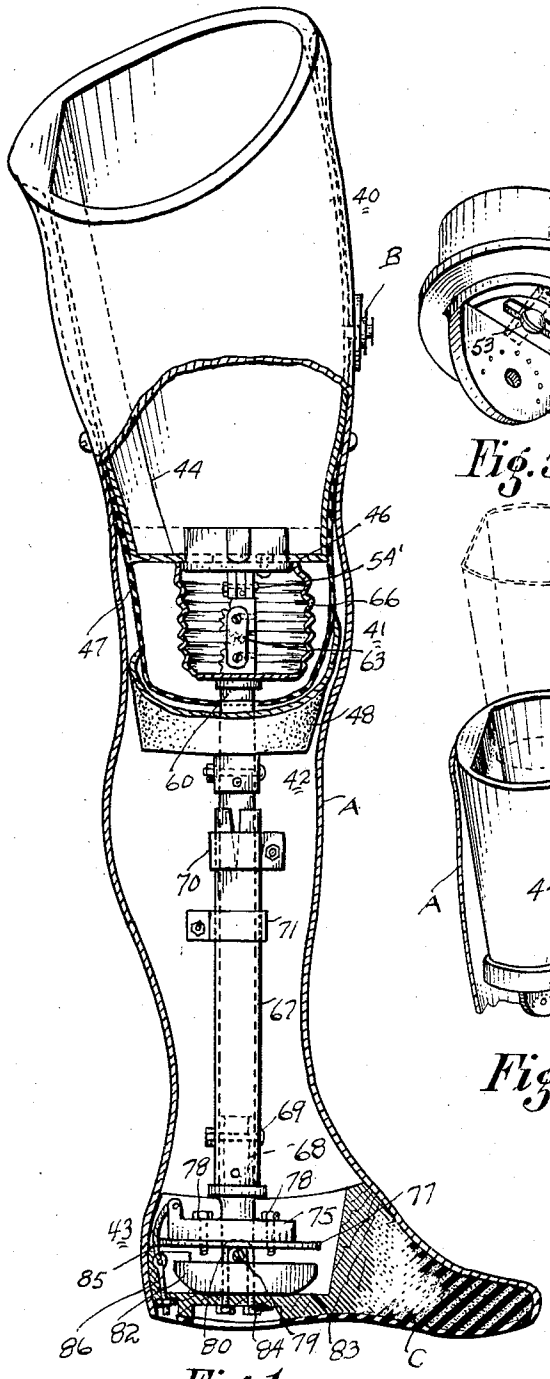

Fig. 1.

Fig. 5.

Fig. 2.

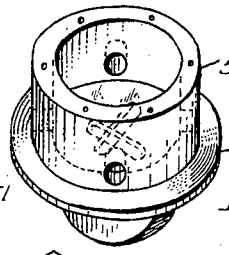

Fig. 4.

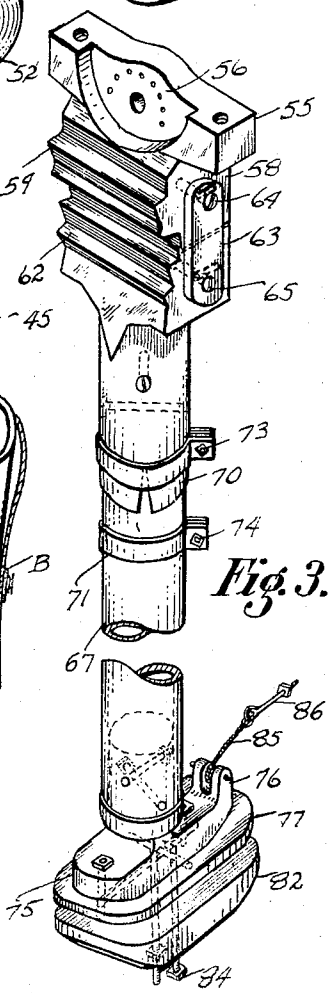

Fig. 3.

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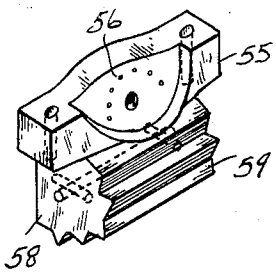

Fig. 7.

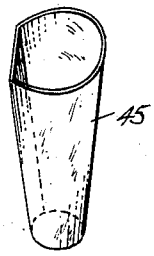

Fig. 6.

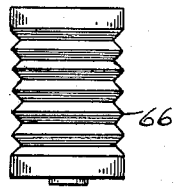

Fig. 13.

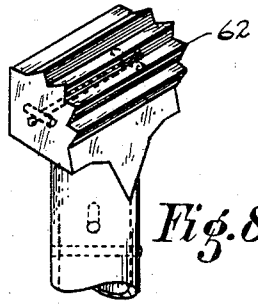

Fig. 8.

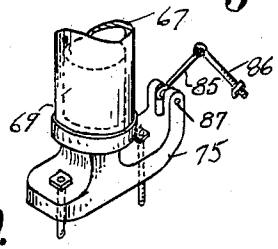

Fig. 10.

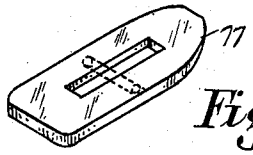

Fig. 11.

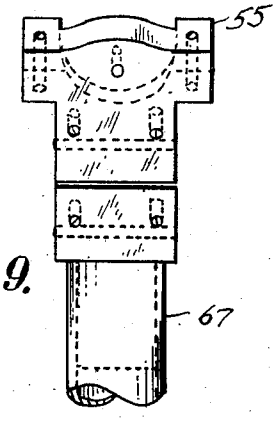

Fig. 9.

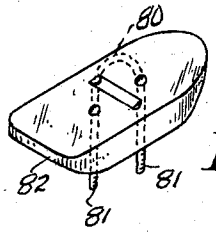

Fig. 12.

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ARTIFICIAL LIMBS

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Application August 30, 1956, Serial No. 607,015

1 Claim. (Cl. 3—22)

This invention relates to improvements in artificial appliances and has particular reference to the construction of an artificial leg.

The principal object of the invention is the production of an orthopedic appliance of the character described that can be readily made by a doctor, an orthopedic fitter, an artificial limb maker, or a rehabilitation technician, thus producing an artificial leg that can be safely and most comfortably worn by an amputee as a temporary or permanent structure, and wherein a fitting to the proper shape and size can be effected by the utilization of a flexible plastic form in conjunction with a solid breakable plastic material to obtain the proper cast or impression.

Other objects and advantages are to provide means in the production of the appliance to allow for stump shrinkage or expansion; to provide means to permit adjustment of the knee assembly to thus give greater control and stability to the shin and foot assembly, and to provide means to vary the height of the ankle assembly to correspond or agree with the true weight and walking axis.

A further object of the invention is the production of an appliance of the character described that is simple in construction, comparatively economical to manufacture, strong, durable, and highly efficient and serviceable in use.

Other objects and advantages will be apparent during the course of the following description.

In the accompanying drawing forming a part of this specification and in which like numerals are employed to designate like parts throughout the same,

Fig. 1 is a side elevational view partly in section and partly in elevation of an artificial leg constructed in accordance with my invention,

Fig. 2 is a perspective view of the cast fitting, with the cover being shown partly in section,

Fig. 3 is an enlarged perspective view disclosing the adjustable knee reduction gear assembly, the means for obtaining height adjustment, and the adjustable ankle and the foot assembly.

Fig. 4 is a perspective view looking downwardly on the alignment table base,

Fig. 5 is a perspective view of the same and looking upwardly,

Fig. 6 is a perspective detail view of the flexible cast fitting form,

Fig. 7 is a perspective view of the upper portion of the adjustable knee reduction gear assembly.

Fig. 8 is a fragmentary perspective view of the lower part of said assembly,

Fig. 9 is a fragmentary front elevational view of the upper and lower parts of the knee assembly shown as joined together, and disclosing to advantage various adjustment bolts that are employed to take up slack,

Fig. 10 is a fragmentary perspective view of the upper portion of the adjustable ankle assembly,

Fig. 11 is a perspective detail view of an intermediate plate forming a part of the said ankle assembly.

Fig. 12 is a perspective view of a hard rubber core employed in the ankle and foot assembly, and

Fig. 13 is a front elevational view of the grease and noise reducing housing or collar forming a part of the present invention.

In the accompanying drawing wherein for the purpose of illustration is shown the preferred embodiment of the invention, the reference character A designates, as a whole, a flexible plastic cover formed to simulate the shape and contours of the human leg and foot and that is adapted to cover the structural features of the artificial leg and foot. The said leg embodies in its construction an upper open-ended bucket or socket portion **40**, a knee portion **41**, a shin portion **42**, and an ankle and foot portion **43**. In the socket portion there is positioned a permanent cast fitting **44** that is taken directly from an adjustable flexible form **45** that fits around the leg stump of the amputee, which form furnishes the proper shape for the cast fitting **44**.

The material of the cast fitting **44** can be made of Hydracal, Hydratone or plaster mixed with a plastic vehicle of the right consistency. The vehicle may be a plastic material that is not toxic to the skin and will produce a plastic cast with Hydracal, Hydratone or plastic as the filler. For those who do not care to use the cast fitting process, the adjustment alignment assembly, all or any part of it may be attached to any metal, wooden, or plastic type of bucket.

The reference character B designates a suction adjusting valve that is suitably connected to the outer periphery of the cover and the cast fitting **44** for the desired suction fitting. On the other hand, a cast fitting can be used for the conventional type of an artificial leg, and then a suction valve is unnecessary.

It will be noted that the cast fitting **44** is equipped with a horizontal slotted base **46**, and that an upper knee housing **47** is attached to the bucket. A lower knee housing **48** depends from and is secured to the housing **47**. This latter housing gives proper form to the shin and cover A, while the upper knee housing encloses the hereinafter described alignment base, alignment table, the noise and grease retention assembly, and the reduction base and gear assembly.

The knee assembly embodies in its construction an upper open-ended circular base or socket **50** that is movably mounted on an alignment table **51**, the movement being effected by a slot **52** and a slot **52'** provided respectively in the base of the socket and a bolt and nut connection **53** associated with the socket and the table. The lower end of the cast fitting **44** is adapted to rest on and to be secured to the socket member **50** (see Fig. 1). The said alignment table makes it possible to move the knee assembly forward and backward and to turn the knee in the proper direction. Depending from the bottom of the table and offset relative to the base is a semi-circular apertured extension **54** that has connected thereto by a bolt **54'** the upper portion of the adjustable knee gear reduction assembly. This assembly serves to furnish greater protection against buckling or jack-knifing and produces a smooth and stable gait in walking, because of the adjustment possible and the gear ratio that is employed. Furthermore by virtue of the construction the amputee has greater control of the knee, shin and foot portions.

The knee assembly also includes an upper rectangular portion **55** that is equipped with a semi-circular recess **56** in which is received the extension **54** of the table **51**. A cross bolt **54'** serves to detachably secure the extension and rectangular portion **55** together. Integrally formed with the latter portion and extending downwardly therefrom is a block **58** that is equipped with a grooved front face that defines a gear segment **59**.

The numeral 60 indicates a stub shaft that has mounted on its upper end a fixed segmental gear 62 equipped with teeth adapted to mesh with the teeth of the segmental gear 59, thus providing the desired hinge action of the meshing gears, whereby the knee assembly can readily bend to conform to the bending action of the human knee. A pair of vertical apertured straps 63 are retained by upper and lower cross bolts 64 and 65, respectively, that penetrate the apertured straps and pass through openings provided in the gear segments 59 and 62, that are thus retained in meshing relationship. Since the ends of the bolts are connected to the straps, the gear segments will be retained in alignment until the knee bending action is resorted to. As disclosed to advantage in Fig. 9, various bolt openings and bolts are employed to tighten the bolts and compensate for wear. As disclosed to advantage in Fig. 13 the numeral 66 designates a housing that is suitably secured to the base 46 and the stub shaft 60. This housing depends from said base and functions to retain the grease necessary to lubricate the parts of the knee assembly and also confine any noise or chattering that may emanate from the knee parts. It will be further noted that the stub shaft 60 is adapted to telescope into the upper portion of a vertical tubular sleeve 67. The lower end of the sleeve 67 is adapted to telescopically receive therein a shaft 68 that is connected to said sleeve by a bolt and nut connection 69. The sleeve has suitably mounted thereon spaced clamps 70 and 71 which together with an adjustment bolt 71' for the stub shaft and adjustment bolts 73 and 74 for the clamps, permit the proper adjustment of height and alignment for standing because it is thus possible to align the foot to the ankle, the foot and ankle to the knee, and the foot, the ankle and the knee to the proper weight bearing axis, or vice versa.

I have further provided an adjustable ankle assembly that permits the movement of the foot C forward or backward according to the desired gait and proper action of the foot. To carry out this object the shaft 68 is equipped with a base portion 75 that is provided with a vertical bifurcated lug 76. Underlying said base is a slidable slotted plate 77 that is connected to the base by bolt and nut connections 78. A cross pin or lug 79 pivotally supports thereon a U-bolt 80 that is provided with spaced threaded legs 81 that penetrate a flexion rubber base 82 and in turn penetrate the horizontal portion 83 of the artificial foot C. Fastening nuts 84 retain the U-bolt in position. The numeral 85 designates a cord to which is secured a spindle 86. The upper end of the cord is retained in the bifurcations of the lug by a pin 87, while the lower end of the connected spindle is locked to the portion 83 of the foot.

It is obvious that the alignment table and base can be

reduced to smaller dimension and readily utilized for a below the knee amputation. Of course in this instance the herein described shin and ankle assembly will be employed.

The suction and conventional fitting, adjustment and alignment leg permits the adjusting of the knee assembly, the height extension or reduction and the ankle assembly to the true weight and walking axis. The knee reduction gear assembly gives greater control and stability to the shin and foot assembly. The height reduction or extension assembly permits the adjusting of the leg to proper setting. The ankle assembly permits proper setting of shin to foot axis. In fact the suction and conventional fitting and alignment legs may be adjusted and set for each individual's need, and may be changed when necessary. Since the plastic cover is flexible it is a simple means to make adjustments.

It is to be understood that the form of my invention herewith shown and described is to be taken as the preferred example of the same and that various changes relative to the size, shape, material and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the subjoined claim.

Having thus described my invention, I claim:

An artificial leg embodying in its construction an upper open ended bucket member equipped with a horizontal base, an alignment table adjustably secured relative to said base, a knee portion assembly connected to said alignment table, said assembly including a pair of meshing gear segments, a housing surrounding the gear segments for confining the meshing noise thereof to the housing, an outer housing secured to and depending from said bucket member, a combined ankle and foot assembly, a shin portion connected to and interposed between the knee portion assembly and the combined ankle and foot assembly, means associated with said shin portion for obtaining height adjustments of the same, said bucket portion adapted to retain and snugly receive therein the remaining stump of a severed human leg, and a flexible covering for said artificial leg.

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