Oct. 26, 1948. J. E. HANGER, III 2,452,459

KNEE STRUCTURE FOR ARTIFICIAL LEGS

Filed Oct. 3, 1945 3 Sheets-Sheet 1

Fig. 1

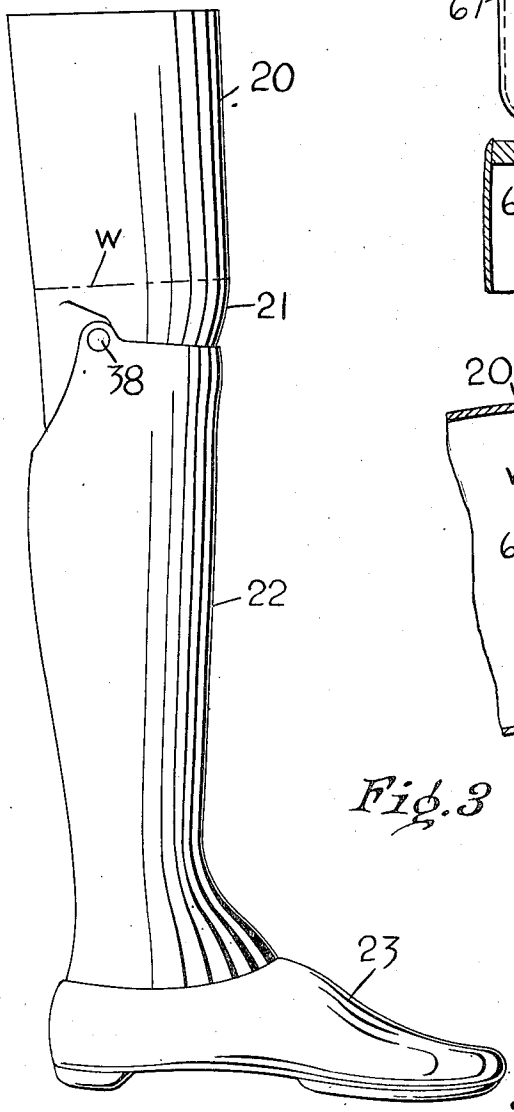
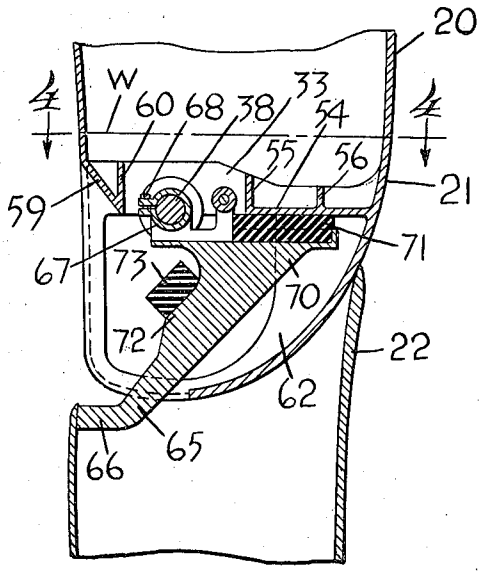


Fig. 2



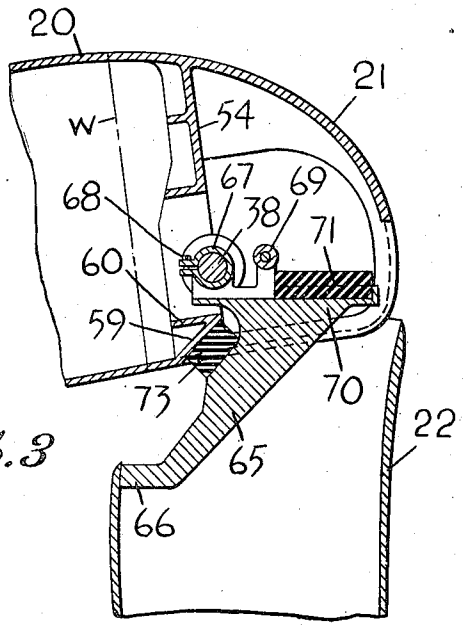


Fig. 3

Inventor

James E. Hanger, III

By Cushman, Darby & Cushman

Attorneys

Oct. 26, 1948. J. E. HANGER, III 2,452,459

KNEE STRUCTURE FOR ARTIFICIAL LEGS

Filed Oct. 3, 1945 3 Sheets-Sheet 2

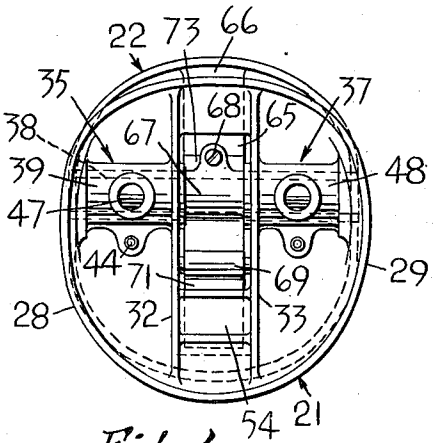


Fig. 4

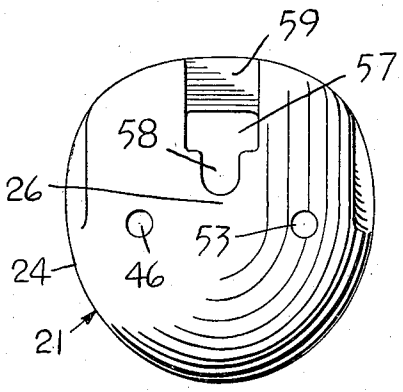


Fig. 5

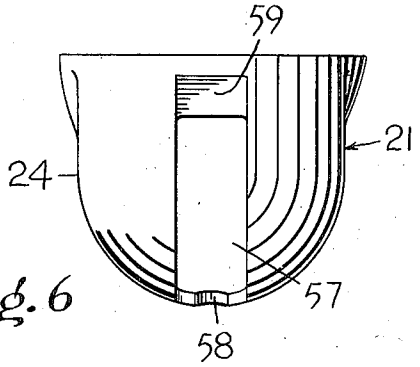


Fig. 6

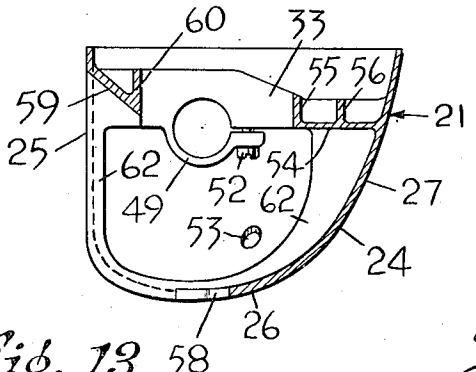


Fig. 13

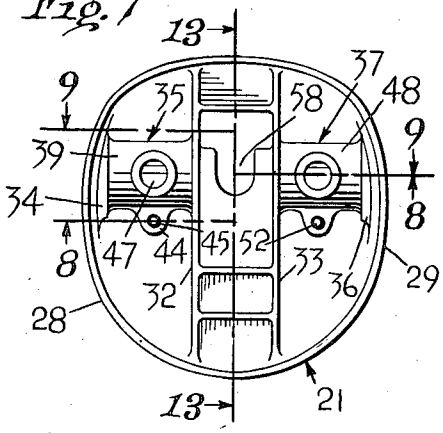
Inventor
James E. Hanger, III
By Cushman Darby & Cushman
Attorneys

Oct. 26, 1948. J. E. HANGER, III 2,452,459

KNEE STRUCTURE FOR ARTIFICIAL LEGS

Filed Oct. 3, 1945 3 Sheets-Sheet 3

Fig. 7



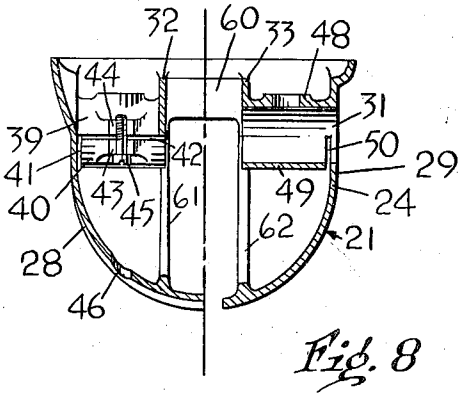


Fig. 8

Fig. 10

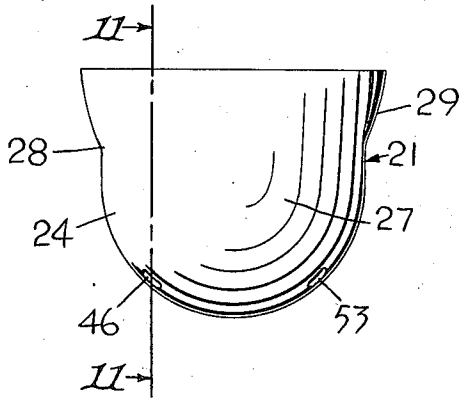


Fig. 9

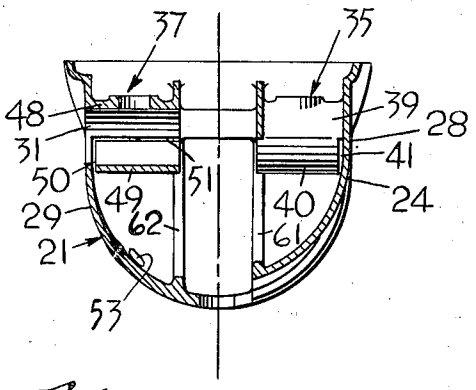
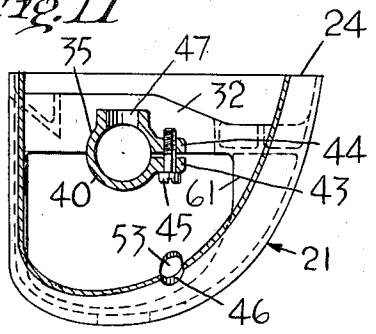


Fig. 11



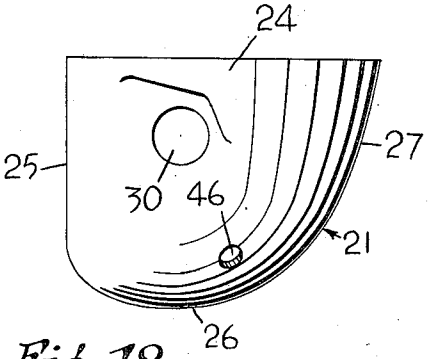


Fig. 12

Inventor
James E. Hanger, III
By Cushman Darby & Cushman
Attorneys

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KNEE STRUCTURE FOR ARTIFICIAL LEGS

James E. Hanger, III, Washington, D. C., assignor to Metal Limb Manufacturers, Inc., Washington, D. C., a corporation of Delaware

Application October 3, 1945, Serial No. 620,049

3 Claims. (Cl. 3—2)

1

This invention relates to knee structure for artificial legs, and in particular to an improved knee cap unit. A main object is to provide a knee cap unit which is both strong and light, and of simple construction. This is accomplished, in accordance with the invention, by forming the knee cap as an integral casting of, for example, a suitable light metal, such as an aluminum alloy, the casting including the necessary bearing and stop portions and being such as to require a minimum of finishing operations. The invention also includes a particular association of knee cap and check.

In the accompanying drawings, illustrative of the invention,

Figure 1 is a side elevation of an artificial leg embodying the improved knee structure,

Figure 2 is a longitudinal section of the knee structure embodied in the leg of Figure 1, the section being taken in a central fore and aft plane,

Figure 3 is a section showing the parts of Figure 2 is a different relation,

Figure 4 is a section substantially on line 4—4 of Figure 2,

Figure 5 is a bottom view of the knee cap which appears in the preceding figures,

Figure 6 is a rear view of the cap,

Figure 7 is a plan view of the cap,

Figure 8 is a section substantially on line 8—8 of Figure 7,

Figure 9 is a section substantially on line 9—9 of Figure 7,

Figure 10 is a front view of the cap,

Figure 11 is a section substantially on line 11—11 of Figure 10,

Figure 12 is an elevation of the cap as seen from the right, and

Figure 13 is a section substantially on line 13—13 of Figure 7.

In Figure 1 the illustrated leg includes a thigh section 20, knee cap 21, shin section 22, and foot section 23. With the exception of the knee cap, all of these sections may be of usual construction.

Referring to Figures 4 to 13, the cap 21 which is an integral casting, comprises a body 24 of bowl-like form, having a generally vertical rear surface 25 joining more or less arcuate bottom and front surfaces 26 and 27 as seen in side elevation. The side walls 28 and 29 of the cap are provided in their upper portions with aligned openings 30 and 31, Figures 8 and 12, the openings being circular and of the same size.

Reference numerals 32 and 33 designate laterally spaced apart strut portions, here shown

2

as webs disposed in parallel vertical planes, the strut portions extending in symmetrical relation across the interior of the cap and joining its front and rear walls. Extending between web 32 and a boss portion 34 on wall 28 is a bearing portion 35 and extending between web 33 and a boss portion 36 on wall 29 is a bearing portion 37, the bearing portion being aligned with the openings 30 and 31 and the webs being interrupted or relieved at the inner ends of the bearing portions in order to pass the knee bolt 38 which appears in Figures 1, 2 and 3. Bearing portion 35 includes a top part 39 in the form of a half bearing rigidly joining the side wall and adjacent web. The bearing portion includes a lower part 40 in the form of a half bearing which is constituted as a flexible strap by leaving, during casting, a vertical slot 41 between part 40 and the side wall, and a horizontal slot 42 between the upper and lower parts on the forward side thereof. Part 40 has a forwardly projecting ear 43 underlying a similar ear 44 on part 39. The former is pierced and the latter threaded to receive a screw 45 having a downwardly exposed head, the head of the screw being accessible through an aligned opening 46 in the bottom of the cap through which a screw driver can be inserted. The top part of the bearing is provided with an oil recess 47. Similarly, bearing portion 37 comprises a rigid top part 48 and a flexible bottom part 49 separated from the adjacent wall by a slot 50 and from the top part 48 by a slot 51, Figures 8 and 9, the bearing parts having superposed forwardly projecting ears engaged by a screw 52 aligned with a bottom opening 53, as seen, for example, in Figure 13.

The strut portions are of the same configuration and as seen in Figures 11 and 13, they have intermediate top edges extending above the top level of the side openings for adequate strength. Forwardly of the bearing portions the webs are jointed by a horizontal wall 54 and vertical walls 55 and 56 whereby a rigid structure is provided.

Reference numeral 57 designates a slot which extends downwardly from near the top of rear wall 25, centrally thereof, and into the bottom wall 26, terminating in the latter in a reduced portion or recess 58, the slot lying between the adjacent lateral planes of webs 32 and 33. At the top of the slot the webs are jointed by an upwardly and outwardly inclined wall 59 and a vertical wall 60, also joining wall 59, spaced rearwardly of the bearing portions. Reference numerals 61 and 62 designate ribs which extend between the ends of webs 32 and 33, respectively, in the planes thereof with their forward ends merg-

ing with the wall portion **54** which extends between the webs. The rear portions of the ribs rim slot **57** as particularly seen in Figure 13 with reference to rib **62**.

The cap is shaped for free swinging, between limits, relative to the shin portion on the knee bolt **38** which passes through the bearing portions, the latter having bushings clamped in the bearing portions under pressure as determined by the adjustment of screws **45** and **52** so that the desired frictional effect is obtained. It will be evident that in the flexed relation of the parts, Figure 3, openings **46** and **53** are exposed so that the screws can be easily reached for adjustment.

Reference numeral **65**, Figures 2 and 3, designates a knee check in the form of an arm having one end **66** secured to the top rear of the shin portion and having a hub portion **67** which includes a split collar engaged with the central portion of bolt **38** by means of a clamping screw **68**. Forwardly of the hub portion, the check, through upright ears, supports the usual roller **69** for the control strap. The hub portion and roller lie freely in the space between the webs and the upright wall portions **55** and **60**. Forwardly of the roller the check includes a shelf portion **70** which in the straightened relation of the parts, Figure 2, underlies wall **54** in substantially parallel relation. The shelf **70** carries a block **71** of cushion material, such as rubber, whereby forward swinging of the shin portion relative to the cap is yieldingly limited. Beneath the knee bolt the check has a further shelf portion **72** which carries a block of cushion material **73**, the disposition of the shelf **72** being such that it substantially underlies wall **59** in the flexed relation of the members shown in Figure 3, block **73** serving to yieldingly limit the rearward swing of the knee cap relative to the shin section.

As indicated in Figures 1 to 3, the thigh section **20** is welded to the level upper edge of the cap along a line W which, in the finished product, is substantially invisible. However, the invention is not limited to this manner of association of the parts and the use of any other suitable type of joint is contemplated.

It will be seen that the strut portions provide rigid support between the front and rear walls of the cap, and the rigidity of the unit is enhanced by the internal ribs which join the ends of the strut portions. Thus the shock of a fall on the knee cap is distributed and absorbed so that the possibility of damage from such a cause is substantially eliminated. The strut portion, in conjunction with the side walls of the cap, also provides extremely rigid support for the bearing portions. Further, the abutment walls for the cushion blocks are carried by, or in part supported by, the strut portions and, in turn, reinforce the latter. These inter-related elements all unite to make possible an integrally cast cap of exceptional strength with unusual lightness.

Variations in the form and arrangement of parts from those herein specifically disclosed are contemplated under the claims which follow.

I claim:

1. An integrally cast knee cap adapted for attachment to the thigh portion of an artificial leg, said cap being of bowl-like form and having aligned side openings for the reception of a pivot bolt, a pair of laterally spaced apart vertical webs extending from front to rear across the interior of the cap, a pair of bearing portions aligned with said openings and each extending between one of said webs and the adjacent side wall of the cap, said webs being interrupted at the inner ends of said bearing portions so as to pass a pivot bolt supported in and extending between said bearing portions, a knee check movably connected to said bolt, said cap having a rear slot providing clearance for the knee check between the planes of said webs, and a transverse wall joining said webs at the top of said slot and presenting an externally faced abutment surface.

2. An integrally cast knee cap adapted for attachment to the thigh portion of an artificial leg, said cap being of bowl-like form and having aligned side openings for the reception of a pivot bolt, a pair of laterally spaced apart strut portions extending from front to rear across the interior of the cap member and having intermediate upper edge portions extending above the top level of said openings, a pair of bearing portions aligned with said openings and each extending between one of said strut portions and the adjacent side wall of the cap, said strut portions being interrupted at the inner ends of said bearing portions so as to pass a pivot bolt supported in and extending between said bearing portions, a knee check movably connected to said bolt, said cap having a rear slot providing clearance for the knee check between the vertical planes of said strut portions, and a transverse wall joining said webs at the top of said slot and presenting an externally faced abutment surface.

3. In an artificial leg, a hollow shin section, a knee bolt secured across the top of the shin section, a knee check having a portion secured to the shin section and a portion engaging the central portion of said bolt, an integrally cast knee cap adapted for attachment to a thigh section, said cap being of bowl-like form and having aligned side openings receiving said bolt outwardly of said central portion thereof, a pair of laterally spaced apart vertical webs extending from front to rear across the interior of the cap just outwardly of said outline position at opposite sides thereof, and interrupted so as to pass said bolt, said cap having a rear slot providing clearance for the knee check between the planes of said webs, a pair of bearing portions each extending between one of said webs and the adjacent side wall of the cap and engaging said bolt, a wall portion joining said webs forwardly of said bolt, a shelf on said underlying said wall portion in the straight position of the leg, cushion means between said wall portion and shelf for yieldingly limiting the forward swing of said shin portion relative to said cap portion, a wall portion extending between said webs at the top end of said slot, a shelf on the rear side of said check positioned to underlie the last-named wall portion when said cap portion is swung rearwardly relative to said shin portion, and cushion means between the last-named wall portion and shelf for yieldingly limiting such rearward swing.

JAMES E. HANGER, III.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,078,595	Barghausen	Apr. 27, 1937
2,249,365	Sansburg	July 15, 1941