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[54] KNEE JOINTS FOR ARTIFICIAL LEGS

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[52] **U.S. Cl.** **3/27,** 3/29

[51] **Int. Cl.** **A61f 1/104**

[58] **Field of Search** 3/22–29, 2

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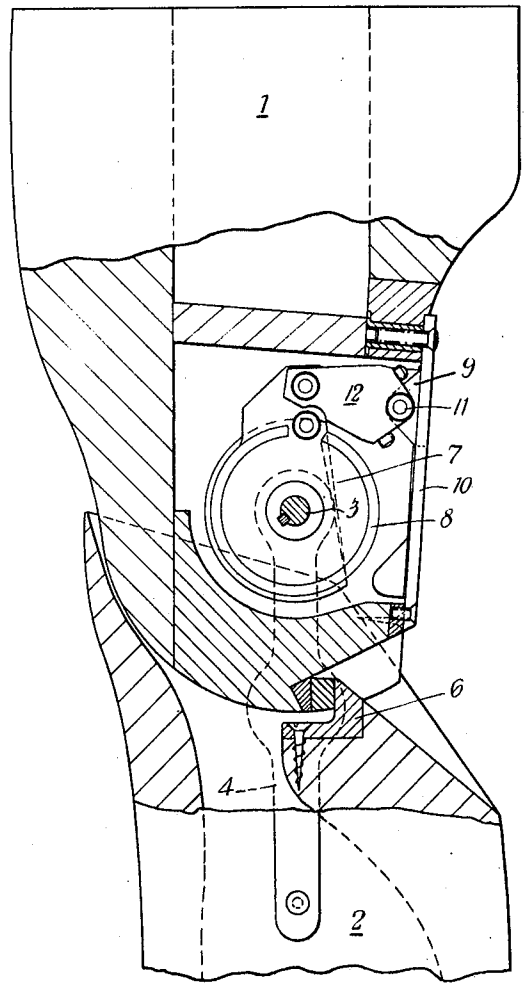
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[57] **ABSTRACT**

The invention provides a prosthetic knee joint of the kind applying a lock against flexure when it is bearing a patient's weight, in which a brake band is applied to a drum on the knee joint spindle by an accurately adjustable lever carried by the thigh portion of the joint.

1 Claim, 5 Drawing Figures



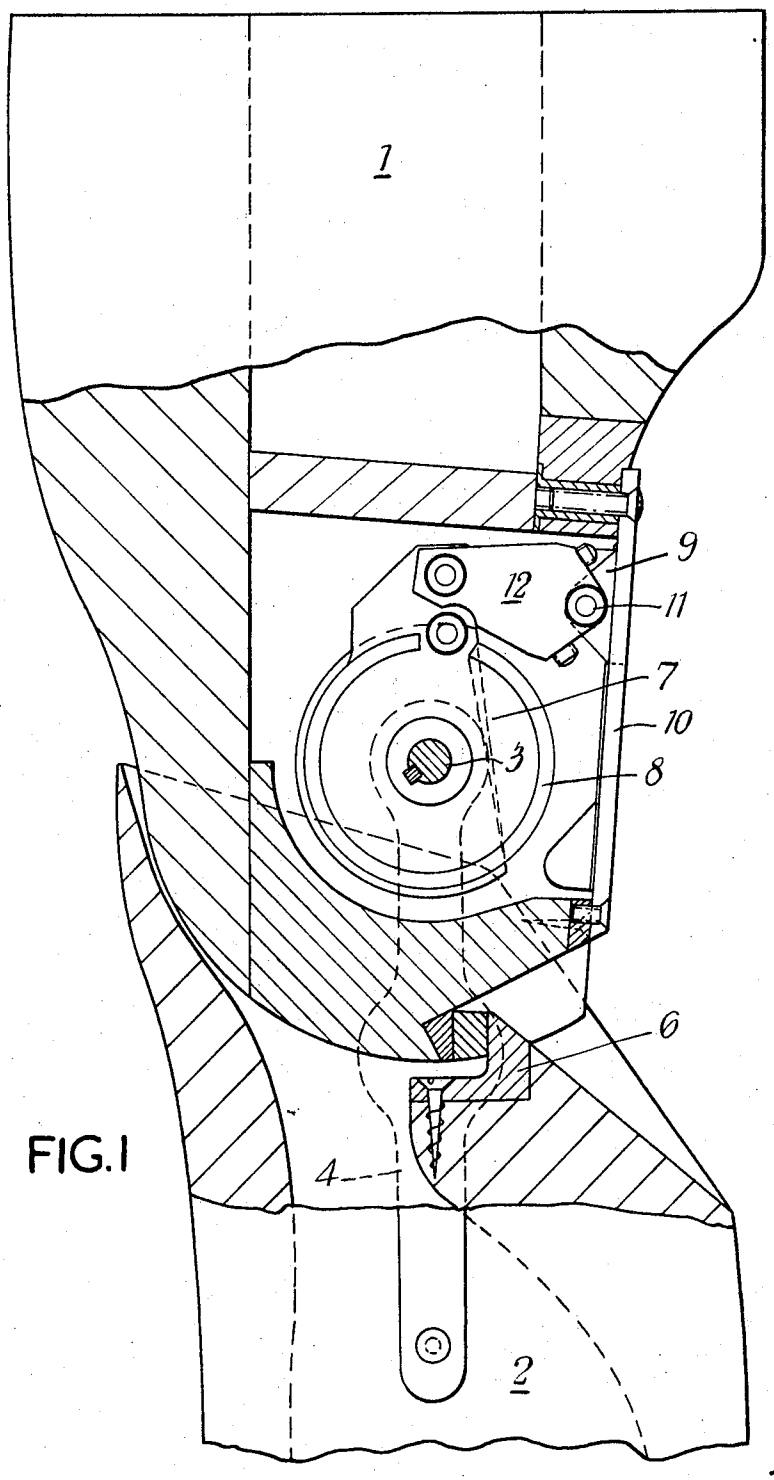


FIG. 1

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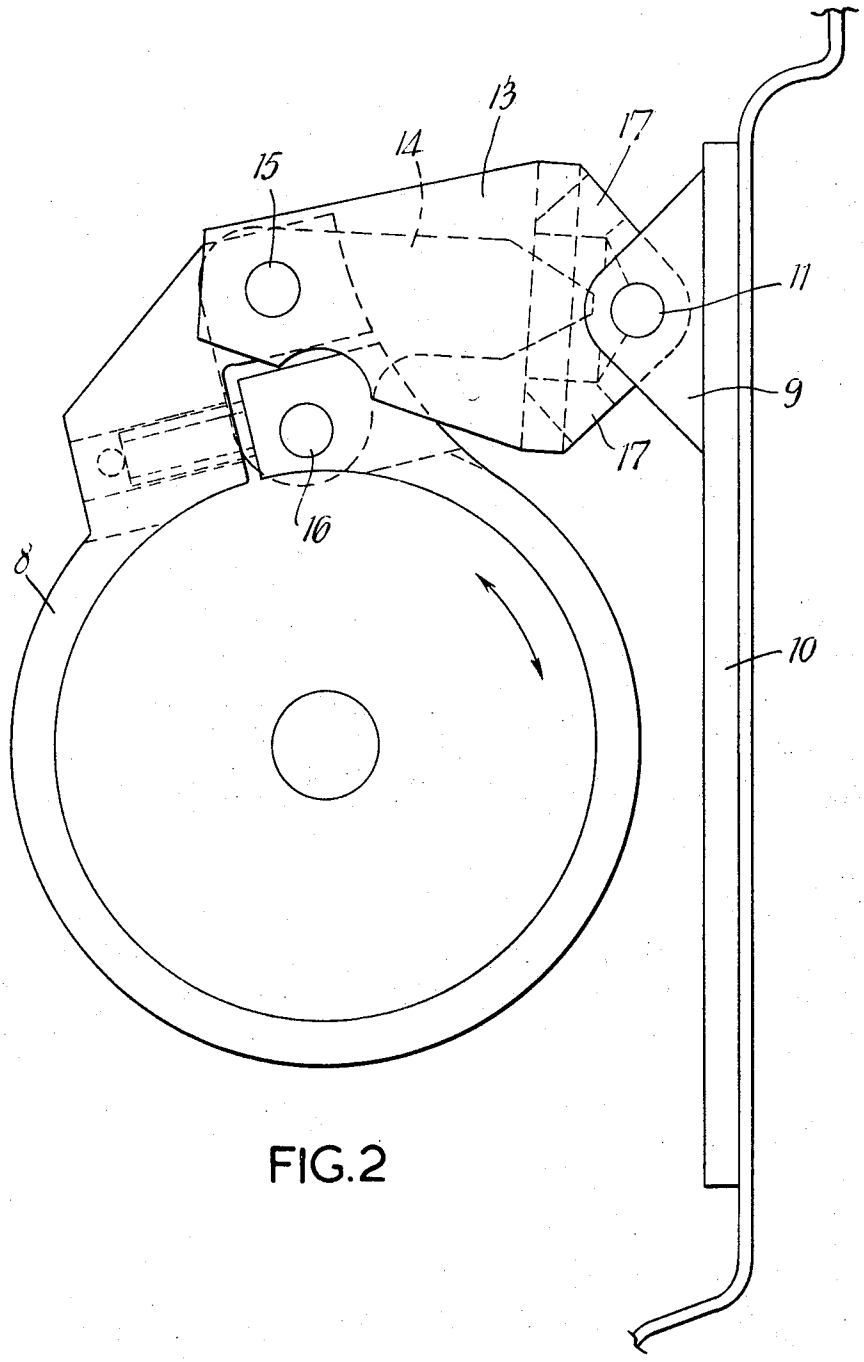


FIG.2

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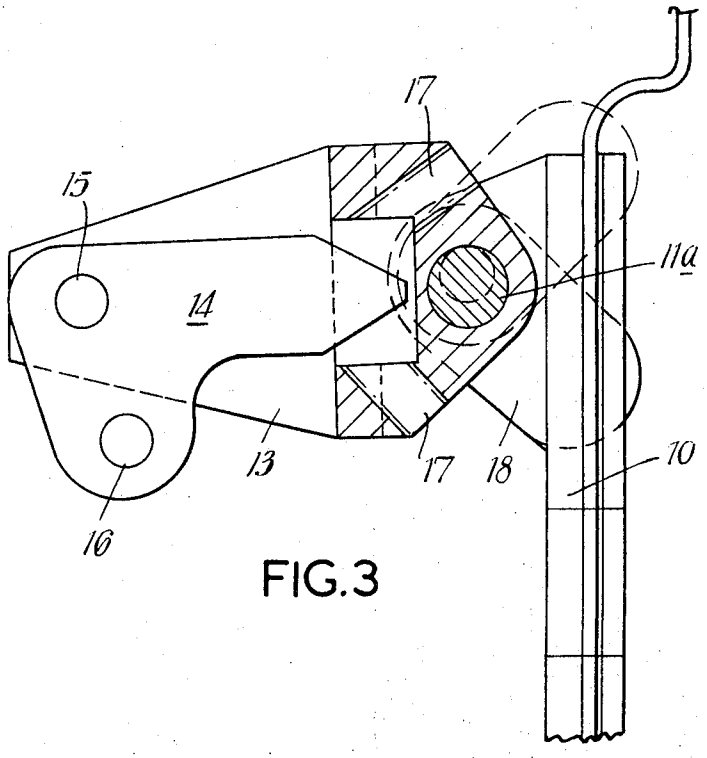
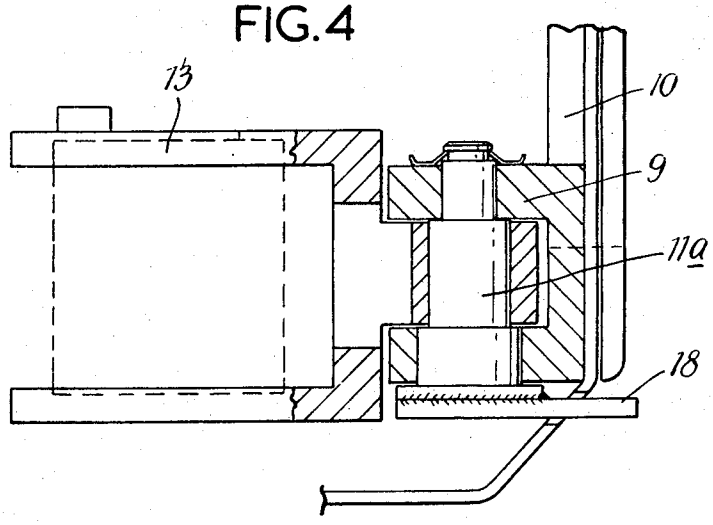


FIG.3

FIG.4

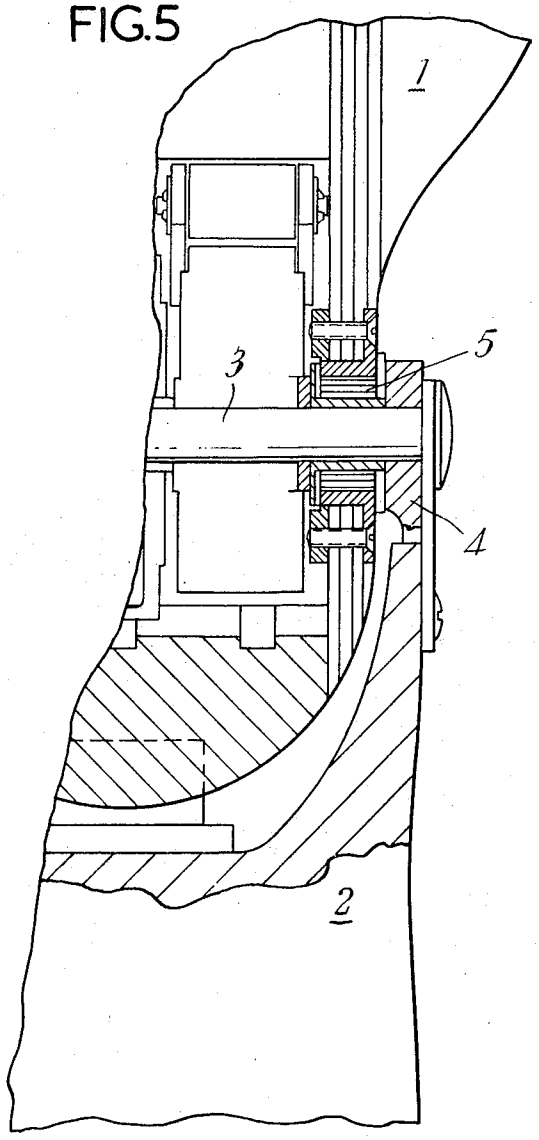


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FIG.5



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KNEE JOINTS FOR ARTIFICIAL LEGS

This invention concerns improvements in knee joints for artificial legs.

It is well known in the art that it is essential to provide a lock against flexure of a knee joint when an artificial leg is bearing a patient's weight either when standing or during the stance phase of walking. At the same time an instantaneous release of such lock must be provided to permit extension of the knee joint and prevent a limping gait.

A one-way rotary clutch such as a freewheel mechanism interposed between the articulated parts of the joint and having one part which can be locked to the thigh portion and another part uni-directionally movable with the shin part can render the locking mechanism ineffective at all times in prevention of an extending movement of the joint.

A preferred form of locking mechanism is a clamp or band connected to the thigh portion of the leg and embracing a drum fixed to the knee spindle which is itself locked to the shin portion.

It has been proposed to employ a simple toggle lever connected to the two ends of the clamp and pivoted to the thigh portion of the joint to apply a locking force. However experiments have shown that this is not satisfactory in practice due to lack of adjustability to suit individual patients.

According to the invention there is provided a knee joint between thigh and shin portions of an artificial leg, the said joint including a pivot pin locked to the shin portion and carrying a drum free to rotate unidirectionally relative to the said pin, a hoop clamp encircling the drum, a two-part tension member interconnecting the ends of the clamp with a pivot carried by a bracket fixed to the thigh portion and set screws in one part of the tension member engaging the other part thereof whereby the angular relationship between the ends of the clamp and the pivot on the thigh portion may be pre-set, so that application of weight to the thigh portion, inducing movement relative to the shin portion may be caused to actuate the hoop clamp as a result of such pre-setting in accordance with the requirements of an individual patient.

Put in another way, there is provided an artificial knee joint between thigh and shin portions of a limb including mechanism for tightening a hoop clamp about a drum carried for rotation in one direction only by a pivot pin locked to the shin portion of the joint, said mechanism comprising a two-part tension member consisting of a housing pivoted to a bracket fixed to the thigh portion of the joint and to one end of the hoop clamp, and a lever pivoted to the said one end of the clamp and connected to the other end of the clamp, the said lever being angularly adjustable relative to the housing so as to pre-set the location of the two ends of the clamp relative to the thigh portion, whereby actuation of the clamp on application of a patient's weight causing relative movement between thigh and shin portions may be adjusted to suit an individual patient.

According to a further feature of the invention, bearings for the pivot pin of the joint are constructed so as to permit only limited eccentricity between bearing housings carried in the thigh portion and that pin on application of weight whereafter weight is transferred directly from thigh portion to shin portion.

According to another feature of the invention the pivot interconnecting the two-part tension member with the bracket carried by the thigh portion is constituted by an eccentric pin which may be rotated to render the tension member ineffective. This is a necessary feature in the case of patients who drive and whose limb must be permitted to flex in the operating of stiff pedals.

The invention is exemplified by the following description of one form of knee joint, illustrated in the accompanying drawings in which:

FIG. 1 is a part section on the center line.

FIG. 2 is an elevation to an enlarged scale of hoop clamp operating mechanism employed in the joint of FIG. 1.

FIG. 3 is a similar view to FIG. 2 of a modified form of operating mechanism.

FIG. 4 is a plan view of FIG. 3.

FIG. 5 is a scrap section showing a pivot pin bearing forming part of the joint of FIG. 1.

The thigh portion 1 of the joint is pivoted to the shin portion 2 through the medium of a pivot pin 3, which is locked to the shin portion by metal braces 4.

Bearings in the thigh portion 1 incorporate resilient bushes 5, which permit a limited degree of movement by that thigh portion relative to the pin 3, whereafter the base of the thigh abuts a block 6 carried by the shin portion.

The block 6 also constitutes a back-stop preventing over extension of the joint.

A drum 7 carried by the pin 3 is constituted by a one-way clutch of proprietory make.

The periphery of the drum 7 is encircled by a hoop clamp 8, which may be tightened into locking engagement therewith.

However, locking of this periphery does not prevent rotation of the pin 3 relative to the thigh portion 1 in the sense permitting extension of the joint but only prevents flexure.

A bracket 9 carried by the back-plate 10 carries a pivot pin 11 for a two-part tension member 12.

Referring to FIG. 2 it will be seen that this tension member is comprised by a housing 13 and a cranked lever 14.

Both the housing and lever are connected by a pin 15 to one end of the hoop clamp 8, and only the lever 14 is connected by a pin 16 to the other end of that clamp.

Threaded holes 17 in the housing 13 receive set screws (not shown), which contact the nose of the lever 14. By adjusting these set screws the relative angular positions of the pins 11, 15 and 16 and thus the degree of tension applied to the hoop-clamp 8 by rotation of the two-part tension member 12 about pin 16 may be pre-set.

In the modification illustrated in FIGS. 3 and 4 the pin 11 is replaced by an eccentric pin 11*a* fitted with a manually operable lever 18.

When the lever 18 is in the lowered position, shown in FIG. 3, downward movement of the thigh portion (and thus of the bracket 9) is not effective to apply tension to the member 12, so the hoop clamp 8 does not lock the drum 7. However, when the lever 18 is raised the locking member functions in the normal manner.

I claim:

1. An artificial knee joint between thigh and shin portions of a limb including mechanism for tightening a hoop clamp about a drum carried for rotation in one direction only by a pivot pin locked to the shin portion of the joint, said mechanism comprising a two-part tension member consisting of a housing pivoted to a bracket fixed to the thigh portion of the joint and to one end of the hoop clamp, and a lever pivoted to the said one end of the clamp and connected to the other end of the clamp, the said lever being angularly adjustable relative to the housing so as to preset the location of the two ends of the clamp relative to the thigh portion, whereby actuation of the clamp on application of a patient's weight causing relative movement between thigh and shin portions may be adjusted to suit an individual patient, a pivot pin connecting said two part tension member to said bracket, said pin being eccentric and moveable between positions rendering said tension member effective and ineffective.

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