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Elson

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[54] **IMPLANTABLE PROSTHETIC KNEE JOINT**

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[52] **U.S. Cl.** ..... **3/1,** 128/92 C, 287/96, 287/97

[51] **Int. Cl.** **A61f 1/24**

[58] **Field of Search** ..... 3/1, 22–29; 128/92 C, 92 CA, 92 R; 287/96, 97, 92

[56] **References Cited**

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[57] **ABSTRACT**

A prosthetic knee joint comprising a tibial member having a stem for insertion into, and securing to, the tibia, and spindle means at the end of the member opposite to the stem, the spindle means extending transversely to the stem; and two bearing bushes designed for anchorage in femoral condyles to extend laterally of the knee, the bearing bushes pivotally supporting opposite ends of the spindle means.

7 Claims, 4 Drawing Figures

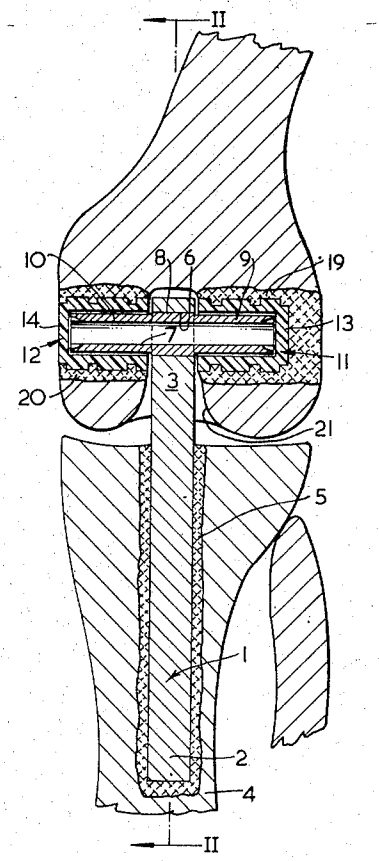
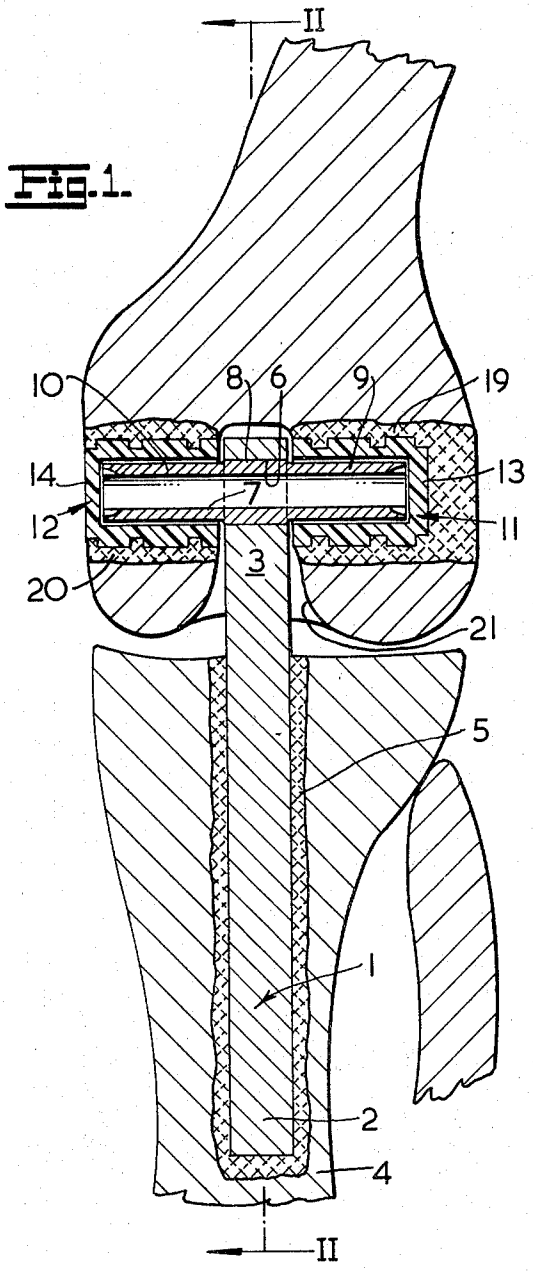


Fig. 1.



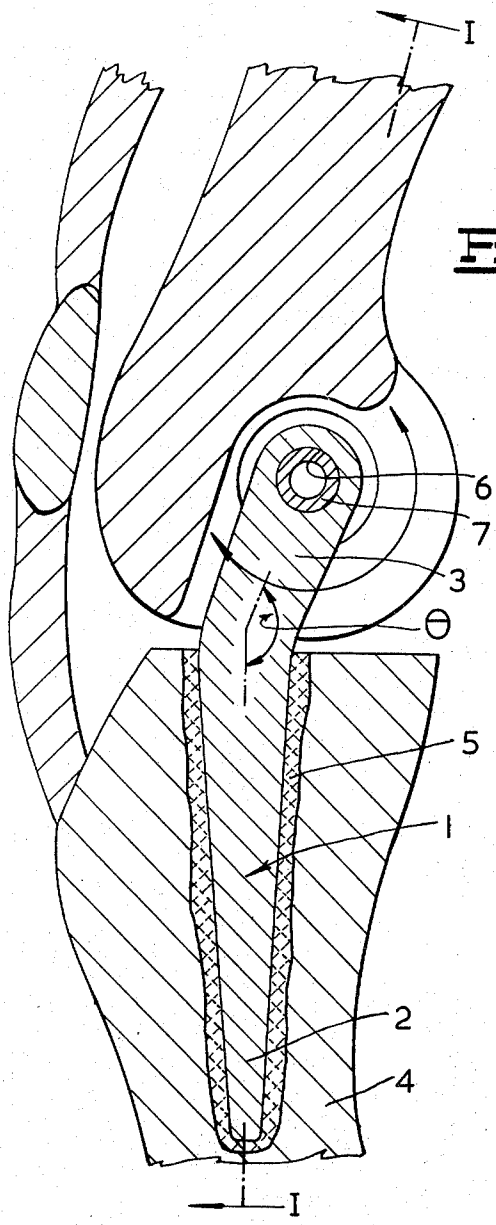


Fig. 2.

Fig. 4.

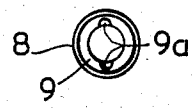
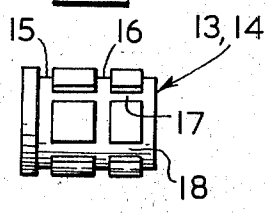


Fig. 3.



IMPLANTABLE PROSTHETIC KNEE JOINT

This invention relates to prosthetic replacements for the knee joint. Known prostheses fall broadly into two types, the first being those which replace one or both bearing surfaces or interpose some material between these and which rely for stability on the existing natural ligaments and the second of which entails some removal of the natural bearing ends of the femur and tibia and which give stability by some form of pivot and limits its extension by a stop.

According to the present invention a prosthetic knee joint comprises a tibial member having a stem for insertion into, and securing to, the tibia, and spindle means at the end of the member opposite to the stem, the spindle means extending transversely to the stem; and two bearing bushes designed for anchorage in the femoral condyle to extend laterally of the knee, the bearing bushes pivotally supporting opposite ends of the spindle means.

The presence of the spindle means in the bearing bushes and the fact that the tibial member extends upwardly between the two bushes gives lateral stability to the prosthetic joint but the joint has no artificial stop for limiting extension. When implanted extension is limited by the checks applied by the posterior ligaments, deep fascia and knee flexor tendons. The absence of a rigid artificial stop will improve the natural appearance of gait in the patient and the invention generally provides an improved prosthetic knee joint

Preferably the tibial member comprises the stem and an extension from the upper end of the stem, the axis of the extension making an obtuse angle with the axis of the stem and the spindle means extending to either side of the free end of the extension.

Conveniently the extension is formed at its free end with a bore and the spindle means as a circular-section spindle fitting through the bore and projecting to each side of the extension. The spindle may have a central section of greater diameter than the remainder thereof, said central section being a force fit in the bore.

An example of the prosthesis according to the invention will now be described in more detail with reference to the accompanying drawings in which:

FIG. 1 is an antero-posterior sectional view of the prosthesis when implanted, the section being taken on line I—I of FIG. 2;

FIG. 2 is a sectional side view taken on the line II—II of FIG. 1;

FIG. 3 is an elevation of a bearing bush; and

FIG. 4 is an end elevation of a spindle.

As shown in the drawings the prosthesis comprises a tibial member **1** having a stem **2** and an extension **3** from the upper end of the stem, the axis of the extension making an obtuse angle θ with the axis of the stem. When implanted the stem **2** is inserted into a reamed bore in the tibia **4** and is held in place by a conventional bone cement **5.**

The extension **3** is formed at its free end with a bore **6** in which is received a spindle **7.** The spindle is of circular cross-section and takes the form of a hollow cylinder of uniform internal diameter. A central section **8** of the spindle has a greater external diameter than the remainder thereof and this central section is designed to be a force fit in the bore **6** of the extension. When properly located in the bore the spindle provides circular sections **9** and **10** extending transversely to opposite

sides of the tibial member. Each end of the spindle is formed with two or more recesses **9***a* which may be engaged by a tool for holding the spindle during implantation of the prosthesis. Each section **9** and **10** of the spindle is rotatably mounted in a respective one of two bearing bushes **11** and **12.** The sections **9** and **10** are designed to be a push fit into the bearing bushes. The two bearing bushes are identical and each is substantially in the form of a hollow cylinder of circular cross-section, the cylinder being closed at one end thereof by an end wall **13, 14** respectively. Each bearing bush is formed around its outer surface with two spaced circumferentially extending grooves **15, 16** and with six equi-angularly spaced axially extending grooves such as **17** and **18.**

Each bush **11** and **12** is implanted within a femoral condyle which has been cut away to receive the bush and each bush is secured in place by conventional bone cement **19, 20.** The condyles are cut away to form a central channel **21** to allow pivotal movement of the tibial member over the angular range indicated by the double-headed arrow in FIG. **2.**

The bushes are desirably made of high density polyethylene and the stem and spindle means of the tibial member are made of stainless steel. However, alternative materials are possible as long as relative rotation between the spindle and the bearing bushes is allowed despite the close fit between these members.

It will be understood that variations may be made in the form of both the tibial member and the bearing bushes. Thus the tibial member may comprise a tibial stem having a transverse plate at its upper end from which a post projects upwardly, the post corresponding to the extension **3** and having its axis aligned at an angle to the axis of the stem. A circular cross-section spindle then extends transversely to the post near the upper end thereof. The spindle may be a separate element passing through a bore in the post and secured in place by brazing or welding or alternatively the whole of the tibial member may be an integral construction. The external form of the bushes may be varied as desired but it is desirable that some irregularity of the outer surface be provided in order that the bushes are firmly keyed in the bone cement.

What I claim is:

1. A prosthetic knee joint for implantation into a natural leg, comprising a tibial member having a stem for location within the tibia, and spindle means at the end of the member opposite to the stem, the spindle means extending transversely to each side of the stem; and two discrete bearing bushes, each bearing bush for direct anchorage in femoral condyles in spaced apart relationship, each bush respectively surrounding and pivotally supporting one of the opposite end portions of the spindle means.

2. A prosthetic knee joint according to claim **1** in which the tibial member comprises said stem and an extension from the upper end of said stem, the axis of said extension making an obtuse angle with the axis of said stem and said spindle means extending to either side of the free end of said extension.

3. A prosthetic knee joint according to claim **2** in which said extension is formed at its free end with a bore and the spindle means is a circular-section spindle fitting through said bore and projecting to each side of said extension.

4. A prosthetic knee joint according to claim 3 in which said spindle has a central section of greater diameter than the remainder thereof, said central section being a force fit in said bore.

5. A prosthetic knee joint according to claim 1 in which each said bearing bush is substantially in the form of a hollow cylinder closed at one end thereof.

6. A prosthetic knee joint according to claim 1 in which said tibial member is made from stainless steel and said bearing bushes are made from high density polyethylene.

7. A prosthetic knee joint for implantation into a natural leg comprising a tibial member having a stem for insertion into, and securing to, the tibia, and spindle means at the end of the member opposite to the stem, the spindle means extending transversely to the stem; and two bearing bushes for anchorage in femoral condyles to extend laterally with respect to the knee, said bearing bushes being substantially in the form of a hollow cylinder one end of which is closed, the outer surface of each bush being grooved, said bearing bushes pivotally supporting opposite ends of the spindle means.

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