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Component for an endo-joint prosthesis

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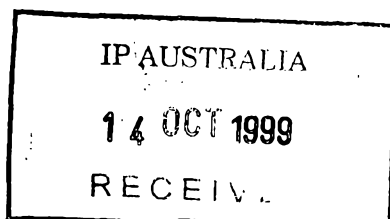
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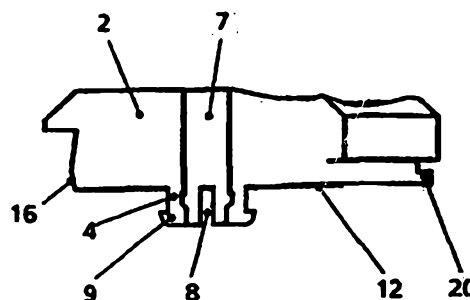
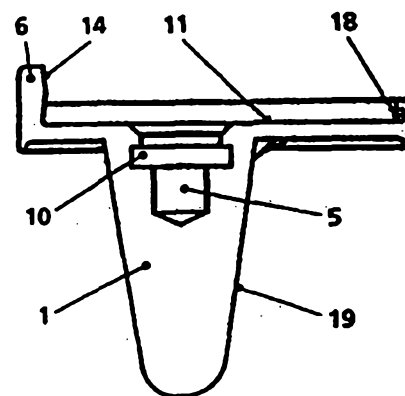
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**(54) Title:** COMPONENT FOR AN ENDO-JOINT PROSTHESIS**(54) Bezeichnung:** KOMPONENTE FÜR EINE ENDOGELENKPROTHESE**(57) Abstract**

The tibia component for an endo-joint prosthesis comprises a metallic first part (1) with one level (11), for anchoring in the bone, and a plastic second part containing a sliding surface (3) of the endo-joint prosthesis with a level (12) which can be placed on the level (11) of the first part (1) without any play in relation to said level (11). The second part (2) has a pin (4) which extends vertically in relation to the level (12) and which has a radially compressible swollen section (9) extending around its periphery. The first part (1) has a bore (5) which extends vertically in relation to the level (11) and which has an undercut (10). When the pin (4) is inserted into the corresponding bore (5), the swollen section (9) is compressed and then expands in the undercut (10), hereby blocking the pin (4) in the bore (5). The swollen section (9) and the undercut (10) are arranged in such a way that when the pin is blocked, both parts (1; 2) are also free of vertical play in relation to the levels (11; 12).

(57) Zusammenfassung

Die Tibiakomponente für eine Endogelenkprothese umfasst einen metallischen, im Knochen zu verankernden, ersten Teil (1), der eine Ebene (11) aufweist und einen aus Kunststoff bestehenden, eine Gleitfläche (3) der Endogelenkprothese enthaltenden, zweiten Teil (2) mit einer Ebene (12), welche auf der Ebene (11) des ersten Teils (1) spielfrei relativ zur Ebene (11) zur Anlage bringbar ist. Der zweite Teil (2) weist einen senkrecht zur Ebene (12) verlaufenden Zapfen (4) mit einem peripher umlaufenden Wulst (9) auf, der radial komprimierbar ist. Der erste Teil (1) weist eine senkrecht zur Ebene (11) verlaufende Bohrung (5) mit einem Unterschnitt (10) auf. Bei der Einführung des Zapfens (4) in die dazu korrespondierende Bohrung (5) wird der Wulst (9) komprimiert und expandiert danach im Unterschnitt (10), so dass der Zapfen (4) in der Bohrung (5) blockiert ist. Wulst (9) und Unterschnitt (10) sind derart angebracht, dass nach erfolgter Blockierung beide Teile (1; 2) auch senkrecht zu den Ebenen (11; 12) spielfrei sind.



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Component for an endo-joint prosthesis

The invention concerns a component for an endo-joint prosthesis.

5 Particularly in the case of prostheses for knee joints such components are made from a metallic part which is to be anchored in the bone and from a plastic part which contains a sliding surface of the knee joint prosthesis.

10 From EP-A-0 709 074 a tibia component for a knee joint prosthesis is known, which has the features of the generic part of claim 1. The main disadvantage of this known component is, however, that lack of play between the two assembled parts cannot be assured. The tibia components for a knee joint prosthesis known from US-A-5 062 852 has the same disadvantage of the lack of assured lack of play of the assembled parts.

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 The discussion of the background to the invention herein is included to explain the context of the invention. This is not to be taken as an admission that any of the material referred to was published, known or part of the common general knowledge in Australia as at the priority date of any of the

20 claims.

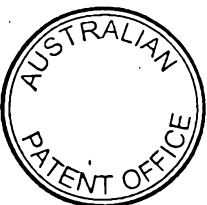
The requirements placed on such metal/plastic components are:

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- a simple and reliable handling in the operating theatre under sterile conditions,
- the safety against disintegration of the assembled component implanted into the body under the motive forces occurring, and above all
- lack of play of the two assembled parts.

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The lack of play is of particular significance, because micro-movements between the two assembled parts will cause very small particles of the plastic to abrade, leading to a strain on the patient's tissues and to undesirable biological reactions.



Furthermore, the change of the mechanical conditions in the assembled component, in particular in the mechanically highly stressed region of the plastic part due to the ageing of the plastic, so far unavoidable, is particularly critical.

- 5 Due to the embrittlement of the plastic the endo-joint components may lose their function partly or even completely.

10 It would be desirable to produce a component for an endo-joint prosthesis assembled from a metal and a plastic part, which assures lack of play between the two parts in the long term. By the particular form-locking connection between the metal and plastic parts a firm connection is achieved between the two parts which can be still stressed even when the plastic becomes brittle, i.e. after a partial or complete loss of the elastic properties.

- 15 According to the present invention there is provided a component for an endo-joint prosthesis, with

A. a metallic first part which is to be anchored into the bone and having a plane, and

- 20 B. a second part which is made from plastic and contains a sliding surface of the endo-joint prosthesis with a plane, which can be placed on the plane of the first part free of play relative to the plane, wherein

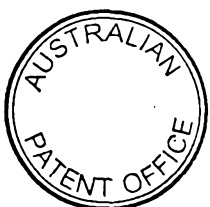
C. the second part has a spigot, extending perpendicularly to the plane, which has a circumferentially continuous bead that can be radially compressed,

- 25 D. the first part has a bore extending perpendicularly to the plane and having an undercut,

E. during the introduction of the spigot into the corresponding bore the bead is compressed and it expands into the undercut, so that the spigot is locked in the bore,

- 30 F. The bead and the undercut are positioned in such a manner that after locking the spigot both parts are free of play also perpendicularly to the planes, and

G. the first part is provided with a guide ridge for the positioning of the second part, the guide ridge being arranged at such a distance from the



bore that the spigot, when being inserted into the bore, is centred relative to the bore,

and wherein

5 H. on the external periphery of the plane of the second part a plurality of ribs are provided, and

10 I. viewed from the bore, on that side of the first part which is situated opposite the guide ridge a plurality of undercuts are provided, in which the ribs of the second part can rest as a hinged joint to position the first and second parts relative each other.

In a preferred development the spigot of the plastic part has radial slots. This has the advantage that by a corresponding dimensioning and number of slots the desirable insertion force can be set.

15 A further development of the invention is that the spigot has a hollow space that passes through it. In this manner the elastic properties of the spigot, which is now capable to accept an expansion pin in the hollow space, can be influenced.

20 Since the inserting operation for both components of the endo-joint prosthesis has to be carried out in the open human joint and under difficult circumstances, the reciprocal secure positioning of the two components prior to the insertion operation is very important. If the positioning is not carried out accurately, there will be the danger of damaging both components, rendering
25 these parts unusable and resulting in an earlier breakdown in the functioning of the artificial joint. To avoid this danger, in a preferred embodiment of the invention the first part is provided with a guide ridge for the positioning of the second part. On the one hand this guide ridge facilitates the positioning and on the other, in the case of insufficient positioning, prevents the spigot becoming
30 damaged. Therefore, the guide ridge is arranged at such a distance from the bore that the spigot, when being inserted into the bore, is centred relative to the bore. This order of events can be additionally improved when the guide ridge has a wedge surface that is inclined relative the longitudinal axis of the bore, which wedge surface can be brought into contact with a wedge surface



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provided on the circumference of the second part. During the joining operation the plastic component can slide along the inclined plane of the guide ridge in its locked, free of play, final position.

5 The invention and developments of the invention are explained in detail in the following based on partly schematic illustrations of several embodiments, in particular on an example of the tibia component of a knee joint prosthesis.

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Figure 1. The four types of the proposed fuzzy membership functions.



They show in:

Fig.1 – a longitudinal section through the first, metallic part of the component according to the invention,

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Fig.2 – a longitudinal section through the second, plastic part of the component according to the invention,

Fig.3 – a view of an expansion pin for the second part according to Fig.2,

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Fig.4 – a longitudinal section through the second part according to Fig.2 with the expansion pin according to Fig.3 temporarily inserted,

Fig.5 – a longitudinal section through the second part placed upon the first part shortly before positioning it on the guide ridge and penetration of the spigot into the bore,

15

Fig.6 – a longitudinal section through the second part placed upon the first part after the penetration of the spigot into the bore and the anchoring of the bead in the undercut,

20

Fig.7 – a longitudinal section through the assembled component according to the invention according to Fig.6, with the expansion pin being definitively inserted,

25

Fig.8 – a partial perspective view of the component according to Fig.7,

Fig.9 – a perspective view of the first, metallic part of the components according to the invention, as well as

30

Fig.10 – a perspective view of the second part according to Fig.2, made from plastic.

The component schematically illustrated in Figs.1 and 2 for an endo-joint prosthesis basically comprises a metallic first part 1 which is anchored in the

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bone and a second part 2 which is made from plastic and contains a sliding surface 3 of the endo-joint prosthesis.

5 The first part 1 has a plane 11 which, as this is shown in Fig.9, is enclosed by a circumferentially continuous edge 17, on the inside of which a plurality of undercuts 18 are provided. As this is illustrated in Fig.1, this first part can be anchored in the bone by means of a taper 19.

10 The second part 2, illustrated in Figs.2 and 10, has a plane 12, which can be placed on the plane 11 of the first part 1 free of play relative to the plane 11. For this purpose a plurality of ribs 20 are provided on the external circumference of the second part 2, which can be snapped into the undercuts 18 of the first part 1.

15 The second part 2 has a further spigot 4, extending perpendicularly to the plane 12, which has a circumferentially continuous bead 9. The spigot 4 has a hollow space 7 passing through it and has radial slots 8, so that it can be radially compressed.

20 The first part 1 has a bore 5 that is complementary to the spigot and extends perpendicularly to the plane 11, the bore having an undercut 10 which is also complementary to the bead 9. When the spigot 4 is introduced into the corresponding bore 5, the bead 9 can be compressed by virtue of the slots 8 and then it expands into the undercut 10, so that the spigot 4 is locked in the bore 5, as this is illustrated in Fig.6. The bead 9 and the undercut 10 are executed in
25 such a manner that after blocking both parts 1; 2 are free of play also perpendicularly to the planes 11; 12 also (and not only in these planes).

30 As it is illustrated in Figs.3 and 4, for the purpose of securing of the locking of the spigot 4 in the bore 5 additionally an expansion pin 13 may be provided that can be introduced, before or after the assembly of the two parts 1; 2, into the hollow space 7 of the spigot 4.

35 Figs.5-7 illustrate the assembly of the two parts 1; 2 step-by-step. In a first step (Fig.5) the second part 2 rests with its ribs 20 in the undercuts 18 as a hinged joint and it is rotated up to the guide ridge 6 until the two wedge surfaces 16 and

14 abut against each other and the second part 2 is correctly positioned relative to the first part 1. At the same time the spigot 4 is provided at such a distance from the bore 5, that during the introduction of the spigot 4 it is accurately centred in the bore 5. After the bead 9 has snapped into the undercut 10, the spigot 4 is axially locked in the bore 5, as this is illustrated in Fig.6.

By a further driving home of the expansion pin 13 (Figs.7 and 8) into the bore 7 a definitive expansion and securing of the spigot 4 takes place in the bore.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A component for an endo-joint prosthesis, with
 - A. a metallic first part which is to be anchored into the bone and
 - 5 having a plane, and
 - B. a second part which is made from plastic and contains a sliding surface of the endo-joint prosthesis with a plane, which can be placed on the plane of the first part free of play relative to the plane, wherein
 - C. the second part has a spigot, extending perpendicularly to the
 - 10 plane, which has a circumferentially continuous bead that can be radially compressed,
 - D. the first part has a bore extending perpendicularly to the plane and having an undercut,
 - E. during the introduction of the spigot into the corresponding bore
 - 15 the bead is compressed and it expands into the undercut, so that the spigot is locked in the bore,
 - F. The bead and the undercut are positioned in such a manner that after locking the spigot both parts are free of play also perpendicularly to the planes, and
 - 20 G. the first part is provided with a guide ridge for the positioning of the second part, the guide ridge being arranged at such a distance from the bore that the spigot, when being inserted into the bore, is centred relative to the bore,
 - and wherein
 - 25 H. on the external periphery of the plane of the second part a plurality of ribs are provided, and
 - I. viewed from the bore, on that side of the first part which is situated opposite the guide ridge a plurality of undercuts are provided, in which the ribs of the second part can rest as a hinged joint to position the first and second
 - 30 parts relative each other.

2. A component according to claim 1, wherein the spigot has radial slots.



3. A component according to claim 1 or 2 wherein the spigot has a hollow space passing through it.
4. A component according to any one of claims 1 to 3, wherein additionally
5 an expansion pin is provided that can be introduced into the hollow space.
5. A component according to claim 4, wherein the guide ridge has a wedge surface that is inclined relative the longitudinal axis of the bore, which wedge surface can be brought into contact with a wedge surface provided on the
10 circumference of the second part.
6. A component according to any one of claims 1 to 5, wherein it is constructed as a tibia component of a knee joint prosthesis.
- 15 7. A component for an endo-joint prosthesis according to any one of the embodiments substantially as herein described and illustrated.

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Fig. 1

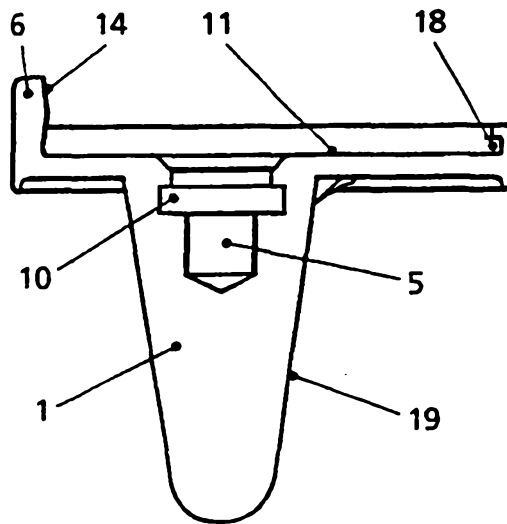


Fig. 2

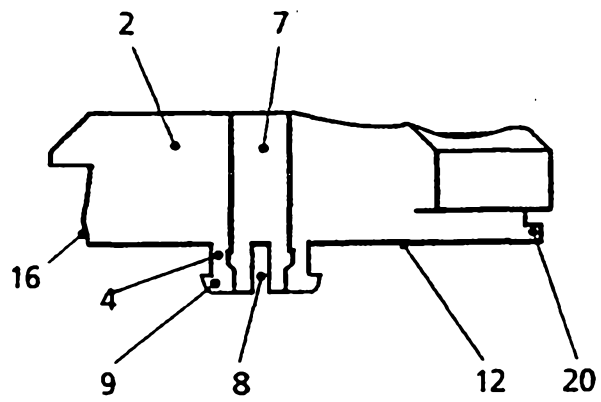


Fig. 3

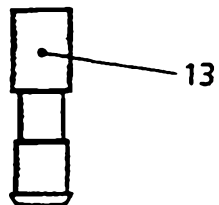


Fig. 4

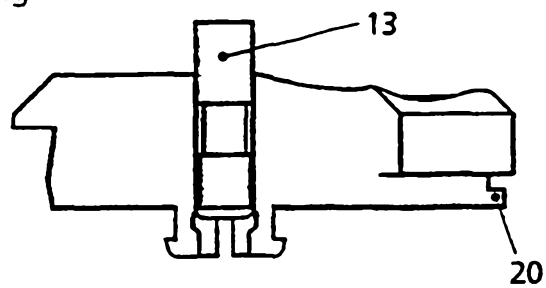


Fig. 5

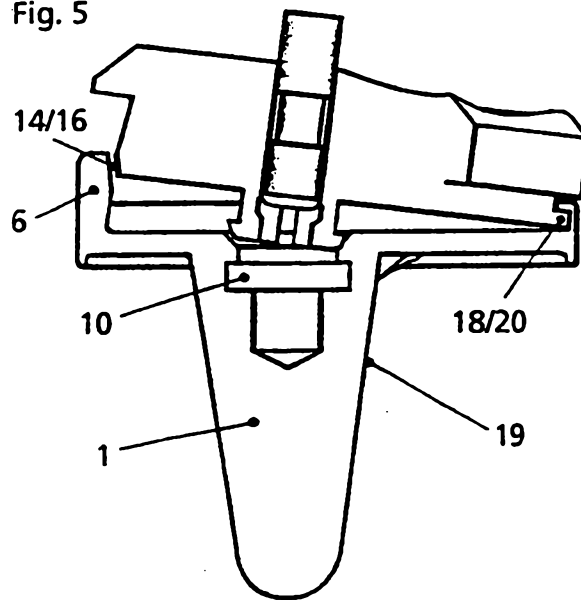


Fig. 6

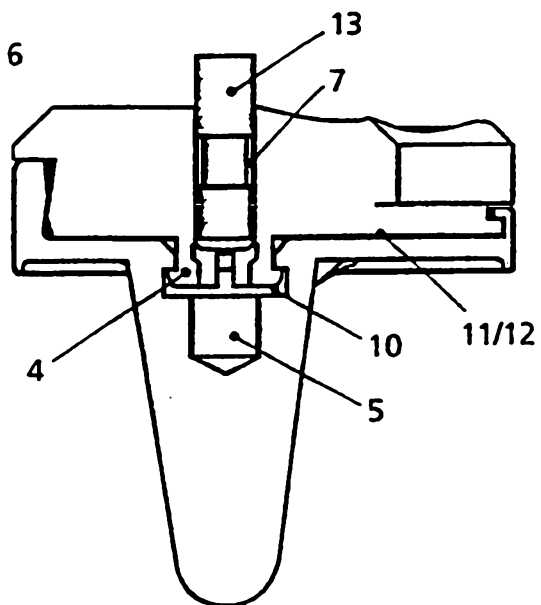


Fig. 7

