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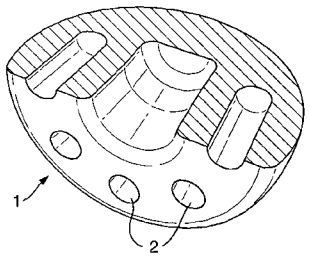
(54) Title: PROSTHESIS

Fig.2.



(57) Abstract: A ceramic head for a prosthesis having a ball joint, said ceramic head comprising a plurality of wells extending into the body of the head from a non-articulating surface thereof. A method of manufacturing the head is also described.

PROSTHESIS

The present invention relates to a prosthesis. More particularly, it relates to a femoral component for a hip prosthesis and a method of manufacture thereof.

The efficient functioning of the hip joints is extremely important to the well being and mobility of the human body. Each hip joint is comprised by the upper portion of the upper leg bone (femur) which terminates in an offset bony neck surmounted by a ball-headed portion which rotates within a socket, known as the acetabulum, in the pelvis. Diseases such as rheumatoid- and osteo-arthritis can cause erosion of the cartilage lining of the acetabulum so that the ball of the femur and the hip bone rub together causing pain and further erosion. Bone erosion may cause the bones themselves to attempt to compensate for the erosion which may result in the bone being reshaped. This misshapen joint may cause pain and may eventually cease to function altogether.

Operations to replace the hip joint with an artificial implant are well-known and widely practiced. Generally, the hip prosthesis will be formed of two components, namely: an acetabular, or socket, component which lines the acetabulum (hereinafter an acetabular component); and a femoral, or stem, component (hereinafter the femoral component) which replaces the femoral head. During the surgical procedure for implanting the hip prosthesis the cartilage is removed from the acetabulum using a reamer such that it will fit the outer surface of the acetabular component of the hip prosthesis. The acetabular component of the prosthesis can then be inserted into place. In some arrangements, the acetabular component may simply be held in place by a tight fit with the bone. However, in other arrangements, additional fixing means such as screws or bone cement may be used. The use of the additional fixing means help to provide stability in the early stages after the prosthesis has been inserted. In some modern prosthesis, the acetabular component may be coated on its external surface with a bone growth promoting substance which will assist the bone to grow and thereby assist the holding of the acetabular component in place. The bone femoral head will be removed and the femur hollowed using reamers and rasps to accept the prosthesis. The femoral component will then be

inserted into the femur.

In some cases, a femoral component of the kind described above may be replaced with components for use in femoral head resurfacing.

The femoral component may be formed as a single component and may be modular. Where it is modular, it may comprise two or more components and generally at least one of the components may be the head component.

Conventionally hip components are formed from metals. However, in recent times, there has been a suggestion that ceramics may offer suitable materials from which at least part of the prosthesis may be formed.

Where the size of the ball head of the femoral prosthesis is small, forming it from ceramics is not generally a problem. However, if it is desirable to provide a femoral head prosthesis which has a ball size similar to that of the natural femur or even larger, this cannot be produced by the conventional sintering techniques used to produce ceramic prosthetic components. Without wishing to be bound by any theory, it is believed that it is not possible to supply sufficient pressure to condense the powder in the centre of the large component. It is therefore desirable to produce a prosthesis which can be formed from ceramic but which still maintains the desired properties in the final product.

According to the present invention there is provided a ceramic head for a prosthesis having a ball joint, said ceramic head comprising a plurality of wells extending into the body of the head from a non-articulating surface thereof.

It will therefore be understood that the mouths of the wells do not open onto an articulating surface of the ceramic head.

The ceramic head will generally be the head of a femoral head prosthesis. Said prosthesis may be a modular femoral head prosthesis or it may be a head component which is integral

with a femoral stem.

It has surprisingly been found that not only does the arrangement of the present invention allow large size prostheses to be satisfactorily produced by sintering but surprisingly the presence of the wells does not adversely impact on the operation or life of the prostheses.

Any suitable number of wells may be used. In one arrangement a plurality of wells may be used. These will be located in any suitable position. In one arrangement, where the prosthesis is a hip prosthesis, the wells are located around the point of connection between the head and the stem of the prosthesis.

The number and size of the wells will depend on the size of the ceramic head. However, it is important that the thickness of the ceramic between adjacent wells is sufficient to bear the loads applied in use. Generally, the thickness of material between wells will be of the order or from about 3 mm to about 8 mm, with thickness of from about 4 mm to about 6 mm being particularly preferred.

The wells will generally be equally spaced around the head rather than being located in one region. In one arrangement 2 to 10 or more wells may be present. In another arrangement there may be 3, 4, 5, 6, 7, 8, or 9 wells. Whatever number of wells are present they may be of any suitable size and configuration. The wells may be of the same or different sizes and/or configuration. Generally the wells will be of circular cross-section. However, it will be understood that any suitable cross-section may be used.

The wells will generally extend into the head for a sufficient depth to allow the sintering to take place efficiently without reducing the structural integrity of the head prosthesis. In one arrangement the well will extend into the head to a depth of from 1 to 2.5cm.

The ceramic head of the present invention will generally be formed from any suitable ceramic material. Suitable ceramic materials include silicon nitride, doped silicon nitride, an alumina-zirconia ceramic, yttria, stabilized zirconia, ceria, stabilized zirconia, zirconia

ceramics, alumina ceramics, oxinium or mixtures thereof.

The ceramic head of the present invention may be a modular head component or it may be a head component which is integral with a femoral stem.

Whilst the prosthesis of the present invention may be manufactured by any suitable method, it will generally be formed by drilling the wells in the prosthesis prior to the sintering of the ceramic.

According to a second aspect of the present invention there is provided a method of manufacture of the ceramic head according to the above first aspect of the present invention comprising:

(a) forming the ceramic powder in a mould into a green body;

(b) machining the green body to provide the one or more wells: and

(c) sintering the ceramic head.

It will be understood that a "green body" is a term of art and refers to the unsintered body. The machining may be carried out by any suitable means. Generally the machining may be carried out by drilling.

The present invention will now be described with reference to the accompanying figures in which:

Figure 1 is a perspective view from the underside;

Figure 2 is a cut away of the prosthesis of the present invention; and

Figures3 and 4 are alternative view of the prosthesis of the present invention

The ceramic head illustrated in the Figures is a large diameter ceramic modular head 1. A plurality of wells 2 are provided.

CLAIMS

1. A ceramic head for a prosthesis having a ball joint, said ceramic head comprising a plurality of wells extending into the body of the head from a non-articulating surface thereof.

2. A ceramic head according to Claim 1 wherein the ceramic head is the head of a femoral head prosthesis.

3. A ceramic head according to Claim 2 wherein said prosthesis is a modular femoral head prosthesis.

4. A ceramic head according to any one of Claims 1 to 3 wherein the thickness of ceramic between adjacent wells is about 3 mm to about 8 mm.

5. A ceramic head according to any one of Claims 1 to 3 wherein the thickness of ceramic between adjacent wells is from about 4 mm to about 6 mm.

6. A ceramic head according to any one of Claims 1 to 5 wherein the wells are equally spaced around the head

7. A ceramic head according to any one of Claims 1 to 6 wherein there are from 2 to 10 or more wells present.

8. A ceramic head according to any one of Claims 1 to 7 wherein the, each well, is be of circular cross-section.

9. A method of manufacture of the ceramic head according to the above first aspect of the present invention comprising:

(a) forming the ceramic powder in a mould into a green body;

(b) machining the green body to provide the one or more wells: and

(c) sintering the ceramic head.

10 A method according to Claim 9 wherein the machining is carried out by drilling.

Fig.1.

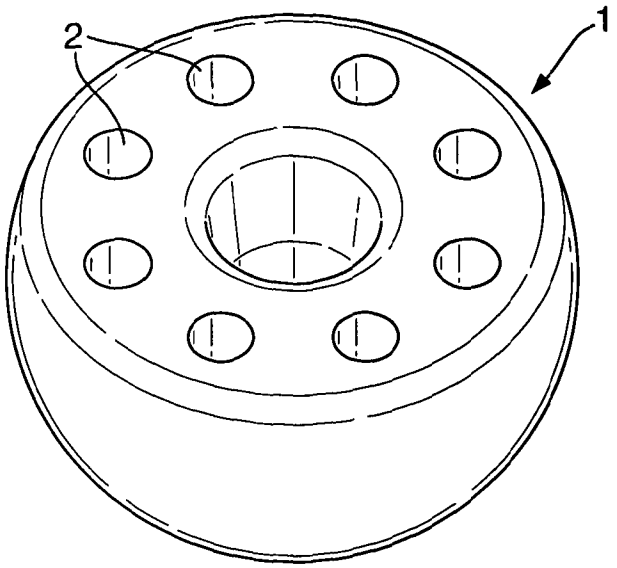


Fig.2.

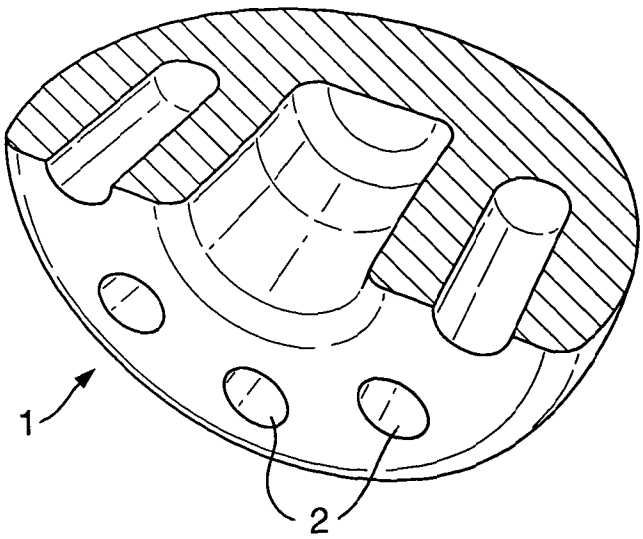


Fig.3.

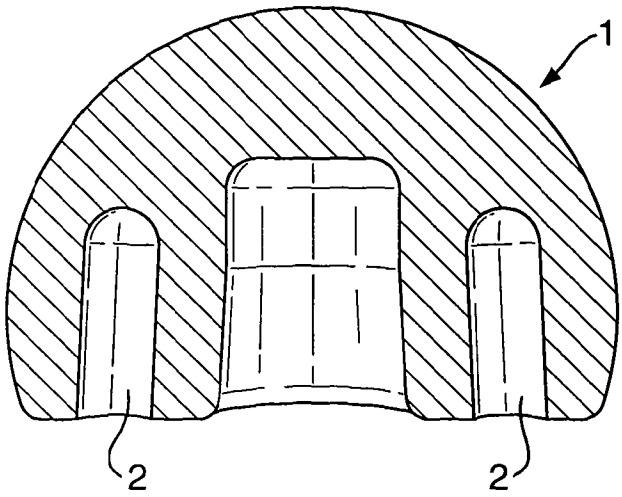
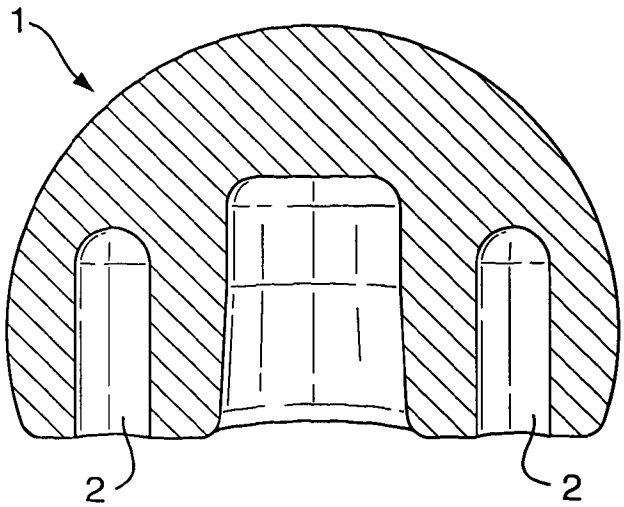


Fig.4.



INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER
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ADD. A61F2/30

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A61F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 33 06 171 A1 (SULZER AG [CH]; PROTEK AG [CH]) 8 December 1983 (1983-12-08) page 4, line 8 - page 5, line 12	1-10
A	DE 10 2004 027659 A1 (MATHYS AG BETTLACH BETTLACH [CH] MATHYS AG [CH]) 5 January 2006 (2006-01-05) the whole document	1-10
A	JP 2007 252417 A (JAPAN MEDICAL MATERIALS CORP) 4 October 2007 (2007-10-04) the whole document	1-10
A	US 2002/010070 A1 (CALES BERNARD [FR] ET AL) 24 January 2002 (2002-01-24) the whole document	1-10

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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US 2002010070 A1	24-01-2002	NONE	