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Charnley

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[54] ACETABULAR SOCKETS

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

[58] **Field of Search**.....3/1; 128/92 C, 92 CA, 92 R; 287/87, 90 R

[56] **References Cited**

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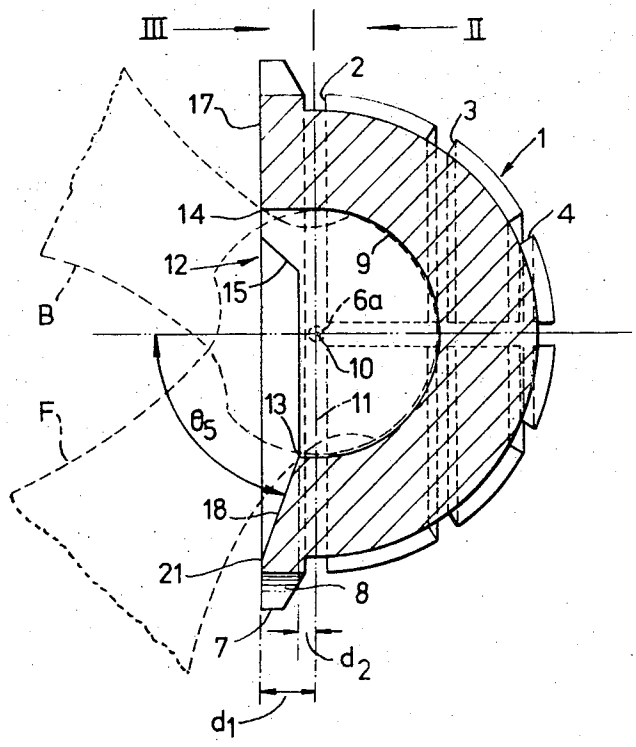
[57] **ABSTRACT**

An acetabular socket having an inner face for receiving the head of a femoral prosthetic component, said inner face being of hemispherical shape extended by a part-cylindrical section of radius equal to the radius of the hemisphere, the axial length of a first circumferential part of the part-cylindrical section being greater than that of a second circumferential part of the part-cylindrical section. Said socket is designed for mounting in the pelvis with the first circumferential part at the posterior to limit backward movement of the femoral prosthetic component, while the shorter, second circumferential part at the anterior allows a good range of forward flexion of the femoral prosthetic component.

11 Claims, 3 Drawing Figures



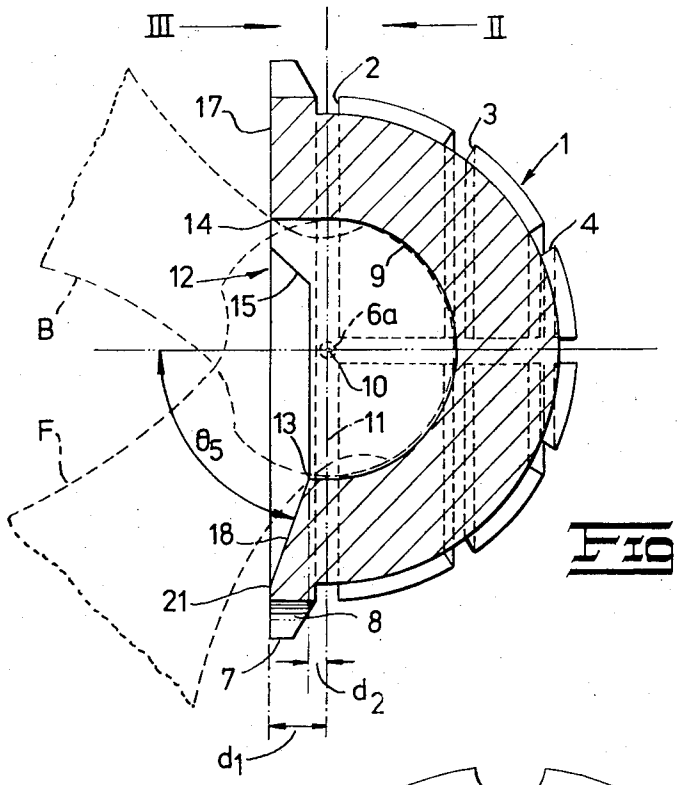

III
II
2
17
3
1
14
4
12
9
15
6a
B
10
F
13
11
θ_5
18
21
8
7
d_2
d_1

Fig. 1.

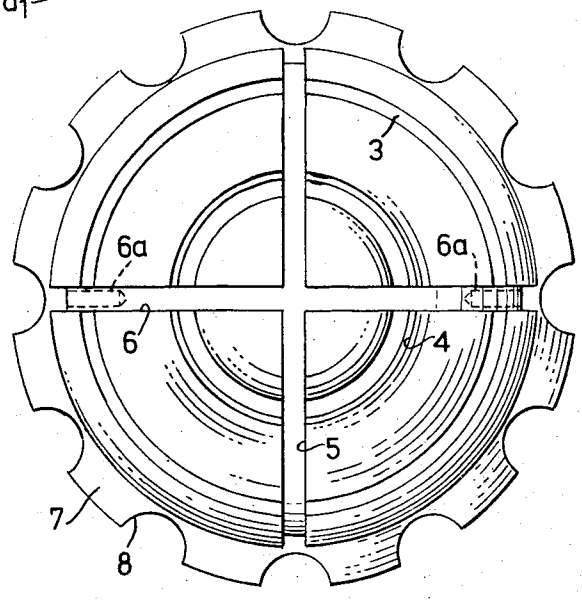

3
6a
6a
6
4
5
7
8

Fig. 2.

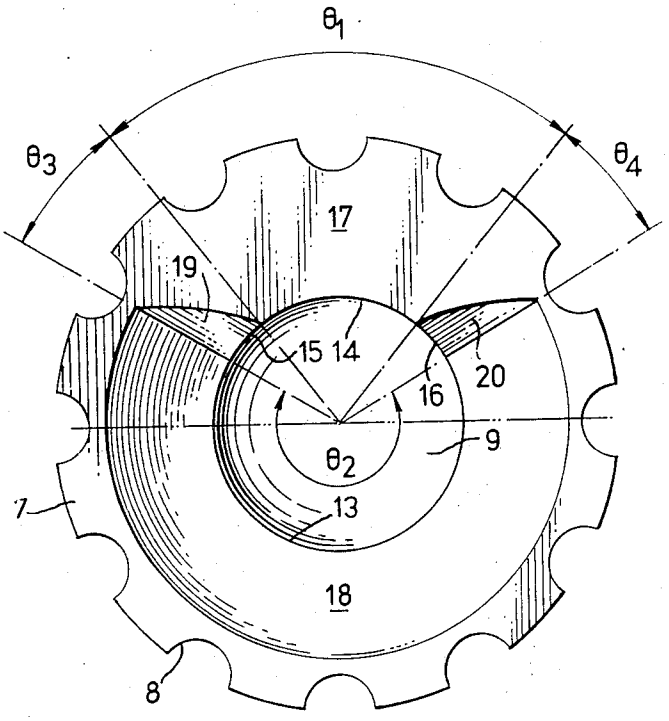


FIG. 3.

ACETABULAR SOCKETS

This invention relates to acetabular sockets used in the surgical operation of total hip prosthesis.

Conventional sockets have a substantially hemispherical inner face for receiving the head of the femoral component, this face being symmetrical about the axis of the socket. The socket is conventionally mounted in the human pelvis so that it is tilted forwardly by from 10° to 15°. This tilting enhances the range of flexion of the hip by delaying contact between the neck of the femoral component and the rim of the socket after the 90° position of flexion of the hip has been passed; and it also increases the projection of the posterior wall of the socket to deter dislocation of the hip in a backwards direction. However, the arrangement suffers from the disadvantages that it favors dislocation of the femoral head by external rotation and that it reduces the area of contact under pressure between the femoral head and the socket when the leg is in the neutral position.

The object of this invention is to provide a socket which may be mounted in the pelvis without tilting so that the aforesaid disadvantages are avoided, while still retaining the advantages of the conventional arrangement.

According to the present invention an acetabular socket is formed with an inner face of hemispherical shape extended by a part-cylindrical section of radius equal to the radius of the hemisphere, the axial length of a first circumferential part of the part-cylindrical section being greater than that of a second circumferential part of the part-cylindrical section.

In use this socket is positioned in the pelvis without any tilting, and with said longer first circumferential part forming the posterior wall of the socket. This provides a posterior wall with sufficient projection to deter backwards dislocation of the hip while allowing a good range of forward flexion. The disadvantages obtained with a tilt mounted socket are avoided.

The angular extent of said first circumferential part should, in most cases, be no more than 180° and no less than 90°, and is preferably about 120°. An angular extent of about 120° allows the socket to be used for either a right or left hip prosthesis, an angular extent much greater than this necessitates the provision of left and right sockets of slightly different shape. The extra extent of axial length of said first circumferential part is conveniently from 2 to 10 mm, and preferably about 4 mm.

A specific embodiment of a socket according to the invention will now be described in more detail, by way of example, with reference to the accompanying drawings in which:

FIG. 1 is a cross-section through the socket.

FIG. 2 is an elevation in the direction of the arrow II; and

FIG. 3 is an elevation in the direction of the arrow III.

The socket is manufactured, as is conventional, from a dense plastics material, and its convex surface 1 is formed with grooves 2 to 5 to assist keying the socket into the cement securing it to the pelvis and a further groove 6 for receiving a substantially semicircular radio-opaque marker having radially inturned ends for location in holes 6a. The socket has an outwardly extending flange 7 formed with serrations 8 which again assist keying to the cement.

The socket is formed with an inner face 9 which is partly hemispherical about a center 10, the limit of the hemisphere being the plane 11, and partly cylindrical, the part-cylindrical section extending from the plane 11 towards an end face 12 of the socket.

A first circumferential part of the part-cylindrical section terminates in an edge having a central arcuate section 14 (subtending an angle θ_1 at the axis of the socket) lying in a first plane perpendicular to said axis and two end sections 15 and 16 (subtending angles θ_3 and θ_4 respectively at the axis of the socket) each inclined at an angle to said plane. A second circumferential part of the part-cylindrical section terminates in an arcuate edge 13 (subtending an angle θ_2 at the axis of the socket) lying in a second plane perpendicular to said axis. The axial length of the central section of the first circumferential part is d_1, and the axial length of the second circumferential part is d_2. The distance d_1 is greater than the distance d_2, i.e. the axial length of the first circumferential part is greater than that of the second circumferential part. The difference between d_1 and d_2, i.e. the perpendicular distance between the first and second plane is preferably from 2 mm. to 10 mm. and, in this particular example, is 3.5 mm. The inclined end sections 15 and 16 are provided to avoid a sharp step between the edges 13 and 14.

The part 17 of the end face 12 of the socket into which the first, longer cylindrical section opens is formed in a plane perpendicular to the axis of the socket. The part 18 of the face, into which the second, shorter cylindrical section opens is cut to form a wall inclined at an angle θ_5 to the axis of the socket. The two parts 17 and 18 are joined by triangular inclined face sections 19 and 20 making a smooth transition between the two major parts.

Exemplary values for the angles and distances given, for a socket capable of being used in either the left or right side of an adult of average size are as follows:

$\theta_1 = 80°$,	$\theta_2 = 240°$
$\theta_3 = \theta_4 = 20°$	$\theta_5 = 70°$
$d_1 = 5$ mm.	$d_2 = 1.5$ mm

It will be understood that these angles and distances are only exemplary, and that they may be changed as required.

In use, a socket according to the invention is installed in the pelvis without tilting and with the first, longer cylindrical section subtending angle θ_1 forming the posterior wall of the socket. When the femoral prosthesis is fitted in the socket it will be seen that this wall limits backward movement of the prosthesis, whereas the shorter, tapered anterior wall allows a good range of forward flexion. The forward and backward limit positions of the femoral prosthesis are shown in chain dotted lines F and B respectively in FIG. 1, and it will be noted that in the forward position F the limit is set by contact of the neck of the prosthesis with the inner edge 13 of the socket rather than the outer edge 21. This ensures a smaller leverage action at the maximum forward position, and reduces the distance that the head of the prosthesis will move out of the socket.

Although the drawings show the presently preferred way of putting the invention into practice, other formations of the socket are also possible.

What I claim is:

1. An acetabular socket having an inner face for receiving the head of a femoral prosthetic component, said inner face being of hemispherical shape extended by a part-cylindrical section of radius equal to the radius of the hemisphere, the axial length of a first circumferential part of the part-cylindrical section being greater than that of a second circumferential part of the part-cylindrical section.

2. An acetabular socket according to claim 1 in which the first circumferential part subtends an angle of from 90° to 180° at the axis of the socket.

3. An acetabular socket according to claim 2 in which the subtended angle is about 120°.

4. An acetabular socket according to claim 1 in which the second circumferential part terminates in an arcuate edge lying in a second plane perpendicular to the axis of the socket and the first circumferential part has an edge the central arcuate section of which lies in a second plane perpendicular to said axis and the two end sections of which extend from the central section to the respective ends of the edge of the second circumferential part at acute angles to said planes.

5. An acetabular socket according to claim 4 in which the perpendicular distance between said planes is from 2 mm. to 10 mm.

6. An acetabular socket according to claim 5 in which the perpendicular distance between said planes is about 3.5 mm.

7. An acetabular socket according to claim 4 in which the angle subtended at the axis of the socket by each end section of the edge of the first circumferential part is about 20°.

8. An acetabular socket according to claim 4 in which the end face of the socket into which the inner face opens has a first part extending radially outwardly from the central section of the edge of the first circumferential part, said first part lying in a plane perpendicular to the axis of the socket, and a second part extending radially outwardly from the edge of the second circumferential part and inclined at an acute angle to the axis of the socket.

9. An acetabular socket according to claim 8 in which said acute angle of the second circumferential part is about 70°.

10. An acetabular socket according to claim 8 in which said first and second parts of said end face are joined at each of their ends by triangular face sections each bounded by a junction line with said first part, a junction line with said second part and a respective one of said end sections of said edge of said first circumferential part.

11. An acetabular socket according to claim 10 in which said end face of said socket is bounded by an annular flange lying in the plane of said first part of said end face, the radially outer edge of said flange being formed with serrations.

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