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Tronzo

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[54] **PROSTHESIS FOR FEMORAL SHAFT**

[76] Inventor: **Raymond G. Tronzo,** 133 S. 36th St., Philadelphia, Pa. 19104

[*] Notice: The portion of the term of this patent subsequent to May 7, 1991, has been disclaimed.

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[52] **U.S. Cl.** ..... **3/1,** 128/92 CA

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

[58] **Field of Search** ..... 128/92 C, 92 CA, 92 R, 128/92 EC

[56] **References Cited**

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FOREIGN PATENTS OR APPLICATIONS

1,215,737 12/1970 Great Britain ..... 128/92 C

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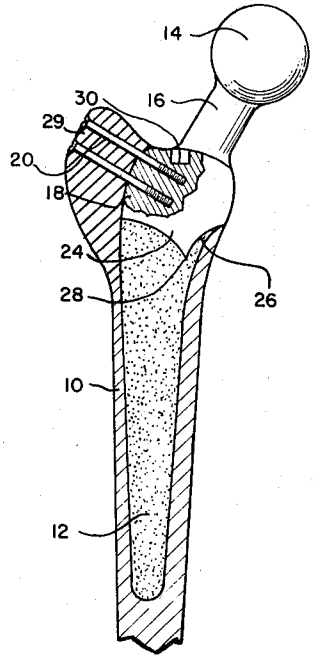
"New Stainless Steel Intramedullary Femoral Head--Neck Prosthesis" M-1776-Leinbach Modification of J. Gosset type, advertisement, page 16 of American Ossacryl Co., "The Journal of Bone & Joint Surgery," Vol. 37A, Jan. 1955.

Primary Examiner—Richard A. Gaudet
Assistant Examiner—Ronald L. Frinks
Attorney, Agent, or Firm—Jackson, Jackson & Chovanes

[57] **ABSTRACT**

A prosthesis for femoral shaft having a ball at one end, a medullary stem at the other end, a neck connecting the ball to the stem, a head at the connection between the stem and the neck and including means for fastening the prosthesis to the femur and outrigger knives on the head on either side of the head oriented to dig into the femur, from the side so that the bone fits between the knives.

1 Claim, 3 Drawing Figures



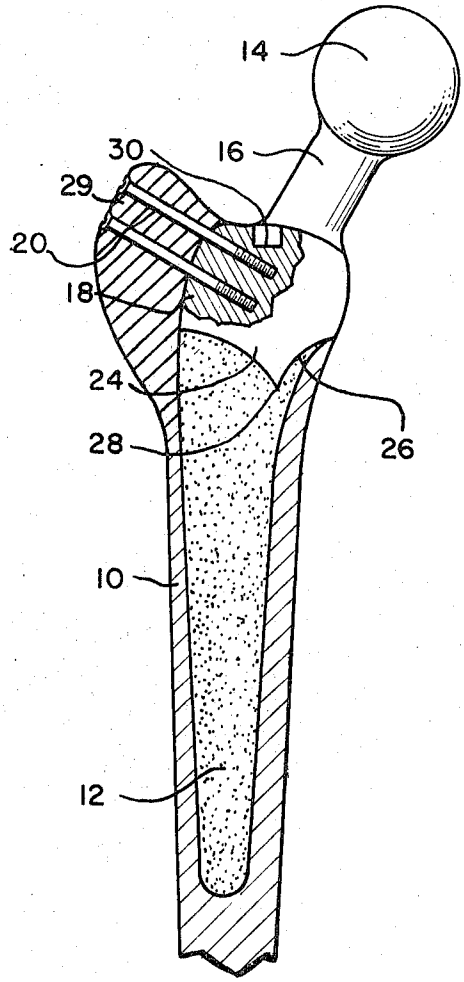


FIG. 1

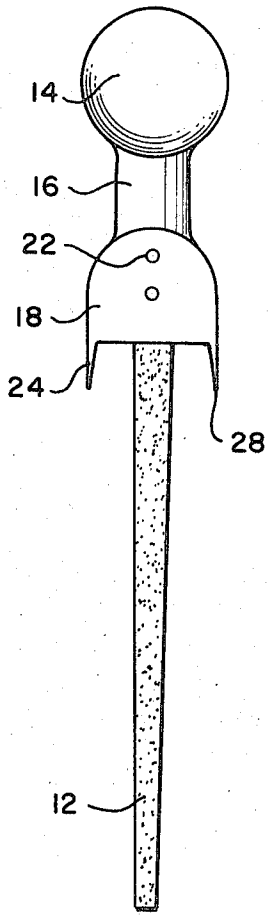


FIG. 2

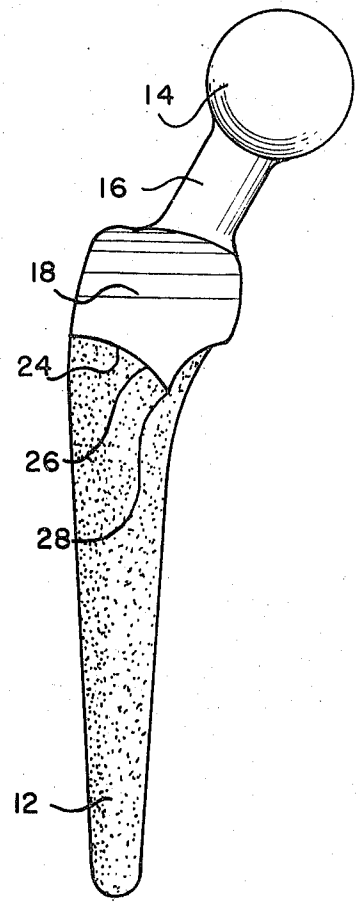


FIG. 3

PROSTHESIS FOR FEMORAL SHAFT

DISCLOSURE OF INVENTION

The invention contemplates a prosthesis for making femoral shaft for use primarily in the total prosthesis of a hip joint but permissibly on the partial prosthesis. It is for use in making implants in mammals such as human beings and higher animals in veterinary surgery, particularly experimental animals such as dogs.

In making a femoral shaft, the ball on the femur is removed by surgery and must be replaced by an implant or prosthesis.

Most of the implants are part of total hip joint replacements, but on occasion they may be used as femoral head components exclusively.

My invention particularly involves a new prosthesis making an intermedullary fixation by inserting this prosthesis in the sawed-off femur so that it will complete an artificial hip joint.

One purpose is to insert a new femoral component having a medullary extension at one end, a head at the top of the medullary extension, outrigger knives from the head extending toward the bone and a neck connected with a ball at the top.

A further purpose is to coat the medullary extension with a porous material having three sizes of pores, small, medium and large, and distributing them according to the later development of this application.

In the invention FIG. **1** is a section showing the prosthesis inserted in the femur bone.

FIG. **2** is a front view of the prosthesis by itself.

FIG. **3** is a side view of the prosthesis.

In the invention the femur **10** is cut off by removing its ball from the top and cutting down so that the new prosthesis will complete the joint making the substitute femur of the same approximate length as the original femoral neck and head.

In the new prosthesis, a medullary stem **12** is provided at one end and a ball **14** which will mate in a socket in the acetabulum, either the natural socket or a substitute socket is provided at the other end. The ball is joined to the medullary extension by a neck **16.** Adjoining the top of the medullary extension and connecting the medullary extension to the neck, is a head **18.** The greater trochanter **29** is attached to the prosthesis by screws **20** in holes **22.**

On either side of this head and oriented toward the femur are outriggers **24** which are knives having triangular blending knife edges **26** to a point **28** for extramedullary fixation.

There is a socket **30** on the top of the head and suitably threaded to receive a tool (not shown) which is adapted to be hit with a hammer at its upper end to force the medullary component **12** into the medullary cavity of the femur and also the knife edges of outriggers **24** into the bone so that the correct position can be assumed by the head to receive the screws **20,** and thereby prevent rotation of the prosthesis within the femur. The effect is to engage the bone at the side.

The size of the medullary extension will be varied lengthwise and widthwise so that several sizes will be available to suit the individual patient's femur. Accordingly, the stem will be tightly fitted to the femur for immediate fixation on a press-fit basis, thus allowing bone to grow appropriately into the graded pores.

On the medullary extension but preferably not on the knives, the head, the neck and the ball, I preferably put a porous coating which is at least 100 microns thick, preferably at least one-sixteenth of an inch and most desirably at least one-eighth of an inch. All four sides or any one side may be coated with a porous surface, preferably the back, and the two lateral ones, leaving the medial one plain. This is done to facilitate removal. This porous coating is preferably made of metallic powders applied by metallic spray technique such as that described in Welding Handbook, Third Edition, although it could be made of ceramic or plastic applied by suitable technique.

The important thing from the standpoint of the present invention is that the porosity is at least 20 to 50 percent, preferably 30 to 40 percent and most desirably 33 percent of the total surface.

The pores in size must be divided between small, intermediate and large pores, and at the surface from 20 to 40 percent of the pore area, preferably from 30 to 36 percent and most desirably 33 percent must be in each category, large, intermediate and small pores. For the purpose of this invention small pores have a diameter between 50 and 200 microns, preferably 75 to 125 and most desirably about 100 microns. Pores smaller than this are largely ineffective for bone growth.

The intermediate pores are in the range of from 200 to 800 microns in diameter.

The large pores are larger than 800 microns in diameter and not larger than 3500 microns.

Additional disclosure regarding the porous bone implant is contained in my application, Ser. No. 228,052, filed Feb. 22, 1972 for "Bone Implant with Porous Exterior Surface," now abandoned and Ser. No. 342,461, filed Mar. 19, 1973 for "Bone Implant with Porous Exterior Surface."

It will be understood that the medullary extension of the prosthesis has a tendency to promote interlocking of bone growth, the small pores anchoring initially with the bone having a tendency to receive initial bone growth, but the intermediate and large pores have a tendency to receive more substantial and firm bone growth.

The coating may be of particles of stainless steel, for example 8 percent of nickel and 18 percent of chromium or for example 16 percent chromium, the balance in each case being iron.

The coating may also to advantage be Vitallium, a cobalt chromium molybdenum alloy of which one example is the following:

cobalt	62 ½%
chromium	31.2%
molybdenum	5.1%
manganese	0.5%
silicon	0.3%
carbon	0.4%

The Vitallium alloys have the following range:

cobalt	62.0 – 65.0%
chromium	27.0 – 35.0%
molybdenum	5.0 – 5.6%
manganese	0 – 0.6%
iron	0 – 1%
nickel	0 – 2%
silicon	0 – 0.6%
carbon	0 – 0.4%

The powder metallurgy material may also be of titanium or titanium alloy.

As an option, I may have plastic or ceramic porous material on the prosthesis.

In view of my invention and disclosure, variations and modifications to meet individual whim or particular need will doubtless become evident to others skilled in the art, to obtain all or part of the benefits of my invention without copying the apparatus shown, and I therefore claim all such insofar as they fall within the reasonable spirit and scope of my claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a prosthesis for a femoral shaft fixation, a ball at one end, a medullary stem at the other end, a neck connecting the ball and the stem, a head at the connection between the stem and the neck and including means for fastening the medullary stem to the bone and outrigger knives on the head, oriented for insertion into the bone, having on the outside surface of the medullary stem from 20 to 50 percent pore area, at least 100 microns in depth of pores, between 20 and 40 percent of the surface pore area being small pores of between 50 and 200 microns diameter, between 20 and 40 percent of the surface pore area being intermediate pores of between about 200 and 800 microns in diameter, and between 20 and 40 percent of the surface pore area being large pores exceeding 800 and not exceeding 3500 microns in diameter.

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