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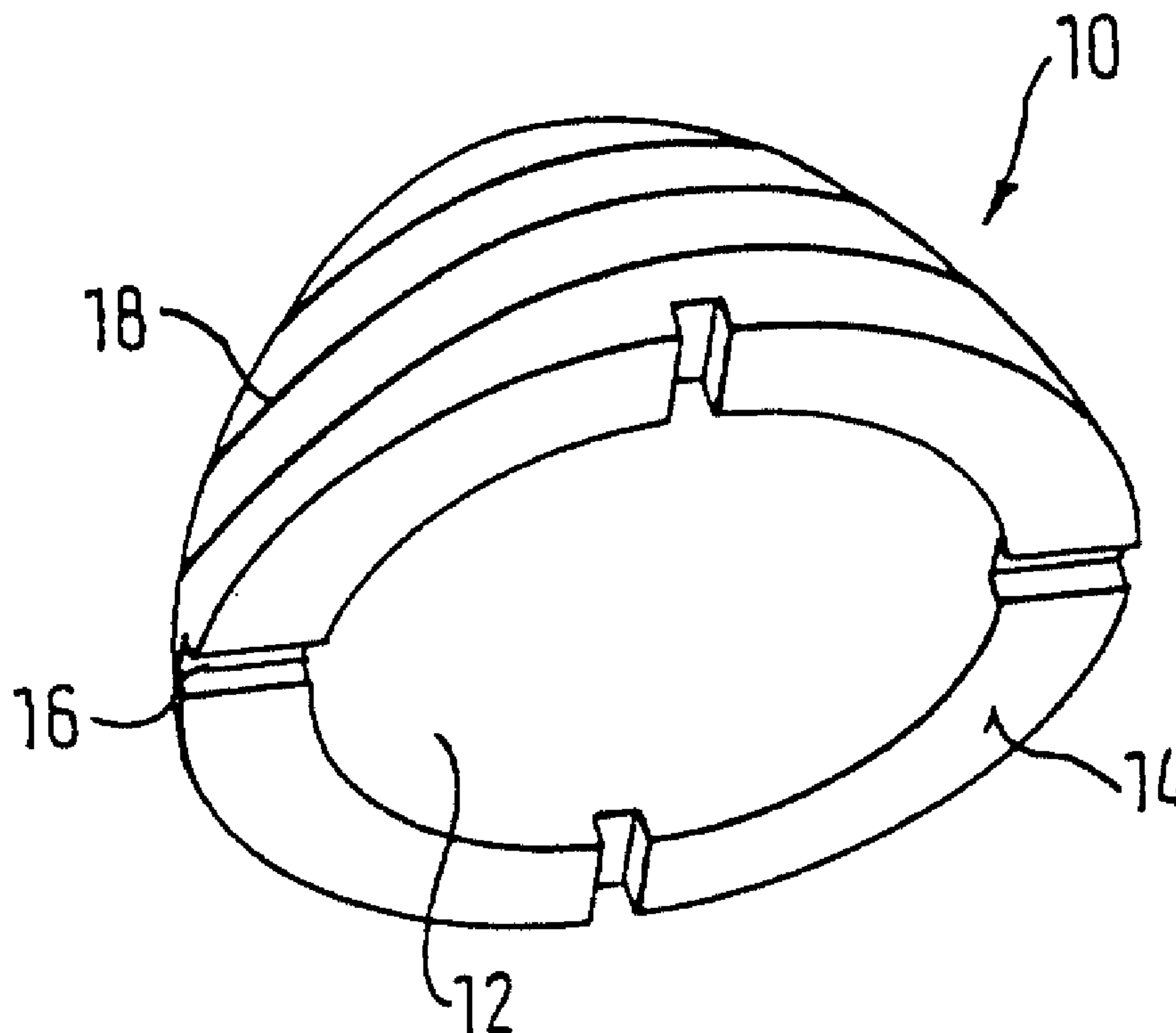
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The inventive bone implant for replacing defective joint sockets comprises a base body (10) consisting of preserved natural spongiosa with an approximately hemispherical cavity (12).

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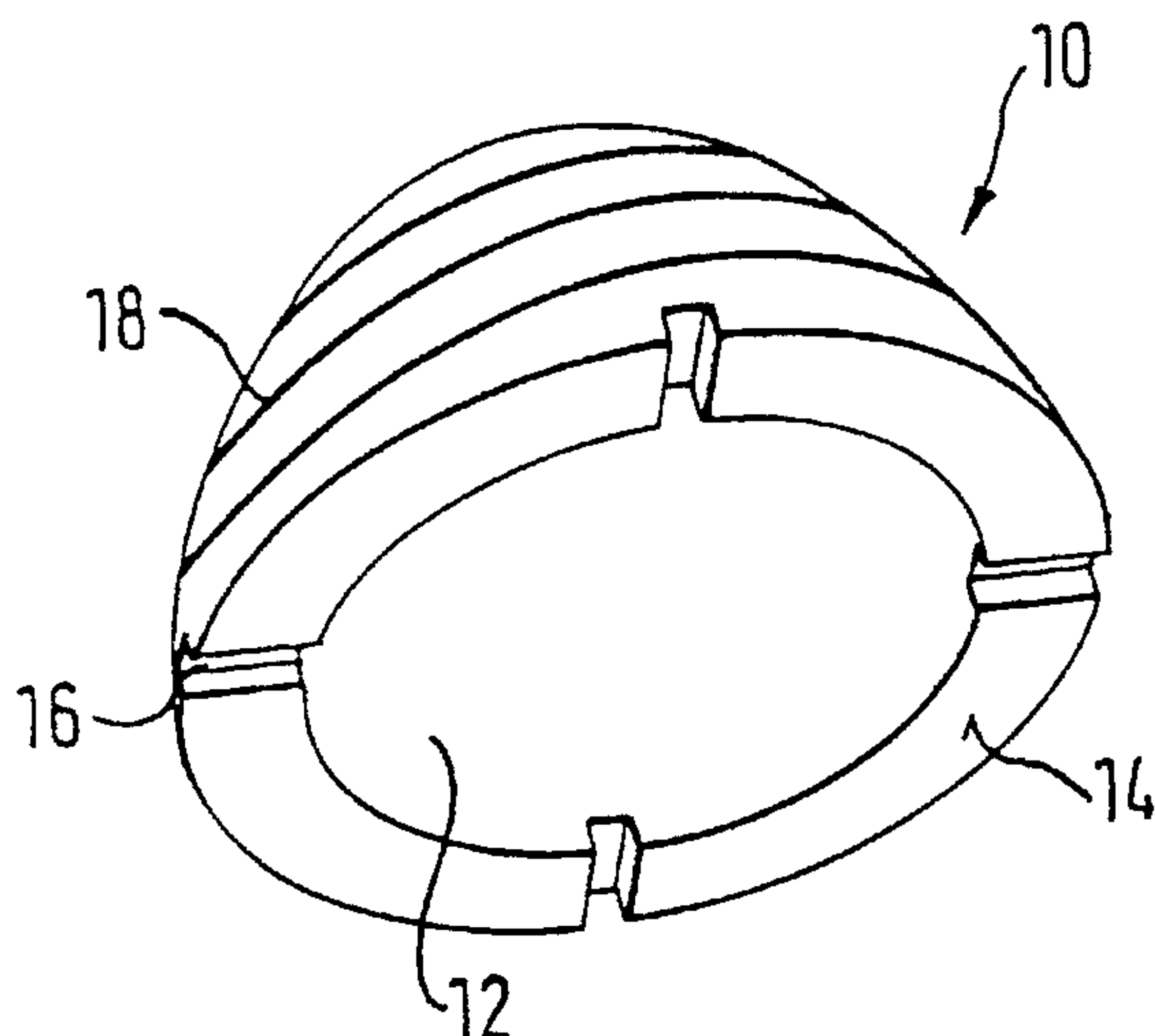
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(54) Title: BONE IMPLANT

(54) Bezeichnung: KNOCHENIMPLANTAT

(57) Abstract: The inventive bone implant for replacing
defective joint sockets comprises a base body (10) consisting of
preserved natural spongiosa with an approximately hemispherical
cavity (12).(57) Zusammenfassung: Ein Knochenimplantat zum Ersatz von
schadhaften Gelenkpfannen besteht aus einem Grundkörper (10)
aus konservierter, natürlicher Spongiosa mit einem etwa halbku-
gelförmigen Hohlraum (12).

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New description pages 1, 1a and 2

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A bone implant

The present invention relates to a bone implant to support the fitting of an artificial socket into a damaged bone.

10

The loosening of artificial joints, in particular of artificial hip joints, is regularly associated with a loss of bone tissue in the patient. A specific form of this tissue loss is concentric osteolysis all around the normally semi-spherical, artificial acetabulum. The reconstruction of the bone defect is often very difficult and time-consuming, in particular when the bone defect at the rear of the acetabulum includes the inner corticalis. Currently, attempts are being made with great technical and time effort to bridge the bone defect by using metal implants in order to offer the replacement socket a stable support with a large area support at the healthy bone.

20

In this connection, the currently used methods use a combination of special metal implants and bone blocks, discs and granulate whose required size and quantity can only be determined during surgery. The operation is hereby substantially extended with all the disadvantages for the patient which result from this.

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1a

Spacers are known from EP 0 834 294 A1 for prosthesis parts which can be cemented into bones and which consist of hardened bone cement.

5

In DE 195 43 110 1, a sterile bone matter for transplanting is known which is substantially free of fat, connective tissue and cartilage mass.

It is the object of the present invention to provide a bone implant with which the planning and operation time can be dramatically shortened in a replacement of damaged sockets.

This object is satisfied by a method having the features described below.

15 In accordance with the invention, a standard product is provided which consists of spongy bone, which maintains its biomechanical properties, is reworkable and can simultaneously serve for the anchoring of a socket. The base body can be inserted into the damaged bone, for example, by press fitting, in a short time, whereupon the socket of the
20 endoprosthesis can be inserted into the cavity of the base body.

By using such a standardized intermediate part of natural spongiosa, which is inserted more or less as an "adapter", the planning and operation time can be substantially shortened since the carrying out of a plurality of

individual measures to eliminate the bone defect and to anchor the joint shell can be dispensed with.

Advantageous embodiments of the invention are described by the description, the figures
5 and the dependent claims.

The invention further relates to a method for the manufacture of a bone implant for fitting an artificial socket into a damaged bone, in which a computer tomogram is made from the damaged body bone of the patient with the aid of which an artificial model of the
10 damaged body bone is produced, wherein

- a) a hardenable molding composition is filled into the region of the bone defect at the model;
- b) the molding composition is shaped such that it forms a reception for an artificial socket;
- 15 c) the molding composition is hardened into a molded piece; and
- d) a copy of the molded piece is made on a milling machine by scanning the hardenable molded piece, said copy being milled from a piece of preserved spongiosa.

20 The invention further relates to a bone implant comprising a piece of preserved spongiosa maintaining natural mineral collagen bond, the implant being formed by milling said piece of preserved spongiosa based on a molded piece derived from a computer tomogram.

It can also be advantageous to shape the base body with a structured surface at the outer side for a better fixing in place. It is, however, also possible to form the base body without a special outer structure and to anchor it by a press fitting or by cementing it in.

5

The bone implant is preferably produced from bovine bone.

The invention also relates to a set consisting of a plurality of bone implants of the said kind, with the bone implants in the set having
10 different, standardized outer dimensions and wall strengths. In this connection, the inner diameters of the respective cavities are matched to the outer diameters of commercial artificial sockets. The planning and operation times can be even further shortened with such a set of bone implants since the surgeon already has bone implants with standardized
15 sizes available which consist of preserved natural spongiosa.

The present invention further relates to a method for producing a bone implant for the installation of an artificial socket into a damaged bone in which a computer tomogram is made from the damaged body bone of the
20 patient with the aid of which an artificial model of the damaged body bone is produced.

The producing of a model of a body bone with the aid of a computer tomogram is generally known.

25

It is a further object of the present invention to provide a method for the producing of a bone implant with which the planning and operation of a bone defect can be simplified.

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The manufacture of the bone implant directly from the data of a computer tomogram is possible. The object can be solved in another way in a method of the kind initially named in that in the region of the bone defect
5 a hardenable moldable mass is filled in at the model, in that the molding composition is shaped such that it forms a reception for an artificial socket, and in that a copy of the molded piece is made on a milling machine by scanning the hardened molded piece, said copy being milled from a piece of preserved spongiosa.

10

A bone implant gained in this way fits accurately into the bone defect and thus satisfies the demands of a stable, large-area support at the healthy bone. At the same time, possible defects in the rear wall of the acetabulum can be closed in a stable and reliable manner with this bone implant.

15

When forming a reception for a socket, the planned replacement acetabulum of an endoprosthesis, or a model thereof, can be inserted or pressed into the molding composition to form the outer contour of the socket or of the model in the molding composition.

20

It is also advantageous to provide means for fixing, i.e. to reproduce these in the molding composition. For this purpose, the most favorable direction of extent of securing elements such as screws or pins can be fixed by pressing pins into the molding composition. The desired or required length
25 of these elements can likewise be fixed in advance. The securing elements then automatically fit correctly by pre-drilling the passages.

The present invention will be described in the following by way of example with reference to advantageous embodiments and to the enclosed drawings. There are shown:

- 5 Fig. 1 a perspective view of a first embodiment of a bone implant;
- Fig. 2 a plan view of the bone implant of Fig. 1; and
- Fig. 3 a plan view of a further embodiment of a bone implant.

10

The bone implant shown in Fig. 1 is an approximately semi-spherical shell 10 made of preserved, natural spongiosa which has a semi-spherical cavity 12. The outer contour of the bone implant 10 and the inner contour of the cavity 12 is thus semi-spherical or at least approximately semi-spherical. The circular aperture of the cavity 12 is surrounded by a peripheral end surface 14 which, in the example shown, has a plurality of radially extending recesses 16 to apply a setting tool.

15

20 An outer structure 18 is provided at the semi-spherical outer surface of the bone implant and the bone implant can be anchored in the damaged body with this in that a tool is inserted into the recess 16. The outer structure 18 can be formed as a thread.

25 Fig. 2 shows a plan view of the bone implant of Fig. 1. As can be recognized, the center of the aperture of the cavity 12 is arranged concentrically to the center of the base body 10.

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In the embodiment shown in plan view in Fig. 3, the center of the cavity 12 is, in contrast, arranged offset to the center of the base body 10, i.e. the cavity 12 is arranged eccentrically. In this way, the position of the cavity can be varied by rotation. With this embodiment, which is anchored
5 in the damaged bone by press fit, no outer thread is provided either. The recesses 16 are likewise omitted.

The outer diameters of the bone implants shown can vary in a range from approximately 30 mm to 70 mm. The inner diameters are each matched to
10 commercial outer diameters of artificial joint shells of endoprostheses.

The present invention allows the preparation of the implant support with commercial bone rasps by rasping out the tissue-like structures down to the healthy bone. An implant is possible by press fitting by choosing the
15 matching bone shell, with defects in the rear wall of the acetabulum being closed in a stable manner at the same time. The replacement acetabulum can now be fitted in the bone shell inserted into the damaged bone by press fitting, by cementing in or by screwing. A screw connection can also simultaneously serve for the anchoring of the bone shell in accordance
20 with the invention.

The starting material for the bone implant in accordance with the invention is animal bone from animals of a sufficient size, preferably cows, but also from other animals of a similar size which can be kept under
25 controlled conditions.

To remove the antigenicity, the bone is subjected to an osmotic treatment. Furthermore, an oxidizing treatment is carried out for denaturation of

- soluble proteins. To optimize virus deactivation, a reduction of pH to pH 3, or a treatment with caustic soda or another substance which destroys DNA/RNA, can take place. The dehydration takes place through organic solvents, preferably acetone. The concluding sterilization takes place
- 5 through high-energy radiation, preferably γ rays with a maximum dose of 25 kGy. The bone treated in this manner maintains its natural mineral collagen bond and thus its bio-mechanical properties properties. and it can be reworked.
- 10 In a method for the manufacture of a bone implant for the replacement of damaged sockets, in accordance with the invention a computer tomogram is first made from the damaged body bone of the patient with the aid of which an artificial model of the damaged body bone is produced. Subsequently, a hardenable molding composition is filled in in the region
- 15 of the bone defect at the model, with the molding composition then being shaped such that it forms a reception for an artificial socket. In this connection, the surgeon fills a preferably self-hardening molding composition into the bone defect at the model and subsequently shapes the mass according to his wants. The artificial socket which should be
- 20 inserted can be pressed into the molding composition at the desired point and thus be shaped. The fixing of the socket can likewise already be pre-planned.

Subsequently, the molding composition is allowed to set and a bone

25 implant, which corresponds to the hardened formed piece, is produced by milling from a sufficiently large piece of preserved spongiosa of natural origin (for example by copy milling) with the aid of the hardened formed piece. The implant gained in this way fits accurately into the defect and

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meets the demands on a stable, large-area support at the healthy bone. At the same time, possible background defects to the acetabulum can be closed in a stable and reliable manner with this bone implant.

What is claimed is:

1. A method for the manufacture of a bone implant for fitting an artificial socket into a damaged bone, in which a computer tomogram is made from the damaged body bone of the patient with the aid of which an artificial model of the damaged body bone is produced, wherein
 - a) a hardenable molding composition is filled into the region of the bone defect at the model;
 - b) the molding composition is shaped such that it forms a reception for an artificial socket;
 - c) the molding composition is hardened into a molded piece; and
 - d) a copy of the molded piece is made on a milling machine by scanning the hardenable molded piece, said copy being milled from a piece of preserved spongiosa.
2. A method in accordance with claim 1, characterized in that in step b) a socket of an endoprosthesis or a model of the socket is inserted into the molding composition to form the outer contour of the socket or of the model in the molding composition.
3. A method in accordance with claim 1, characterized in that, before step c), means are provided at the molding composition for the later fixing of the bone implant at the damaged body bone.
4. A bone implant comprising a piece of preserved spongiosa maintaining natural mineral collagen bond, the implant being formed by milling said piece of preserved spongiosa based on a molded piece derived from a computer tomogram.
5. The bone implant in accordance with claim 4 wherein the piece of spongiosa is formed to have a semicircular cavity.

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FIG. 1

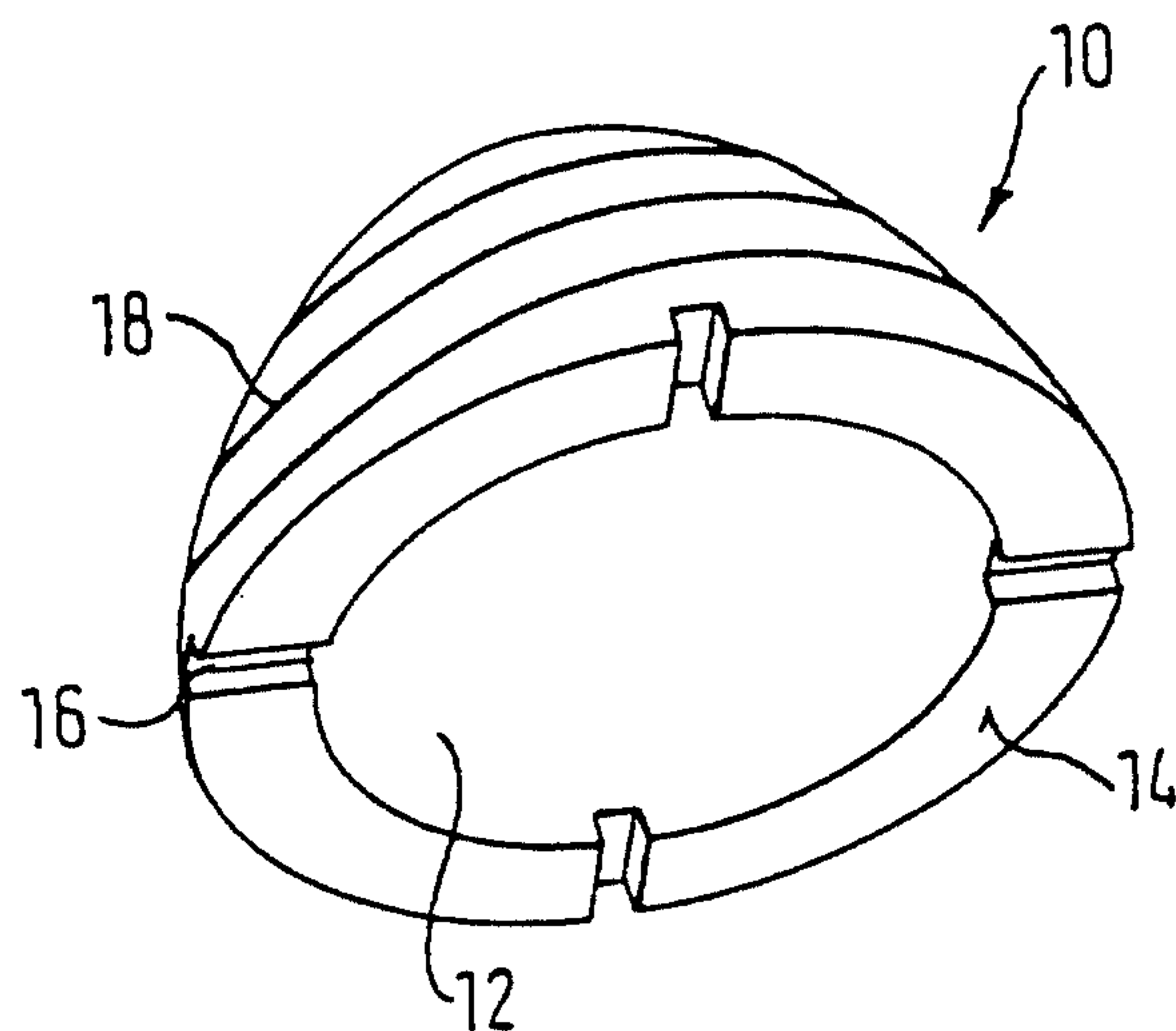


FIG. 2

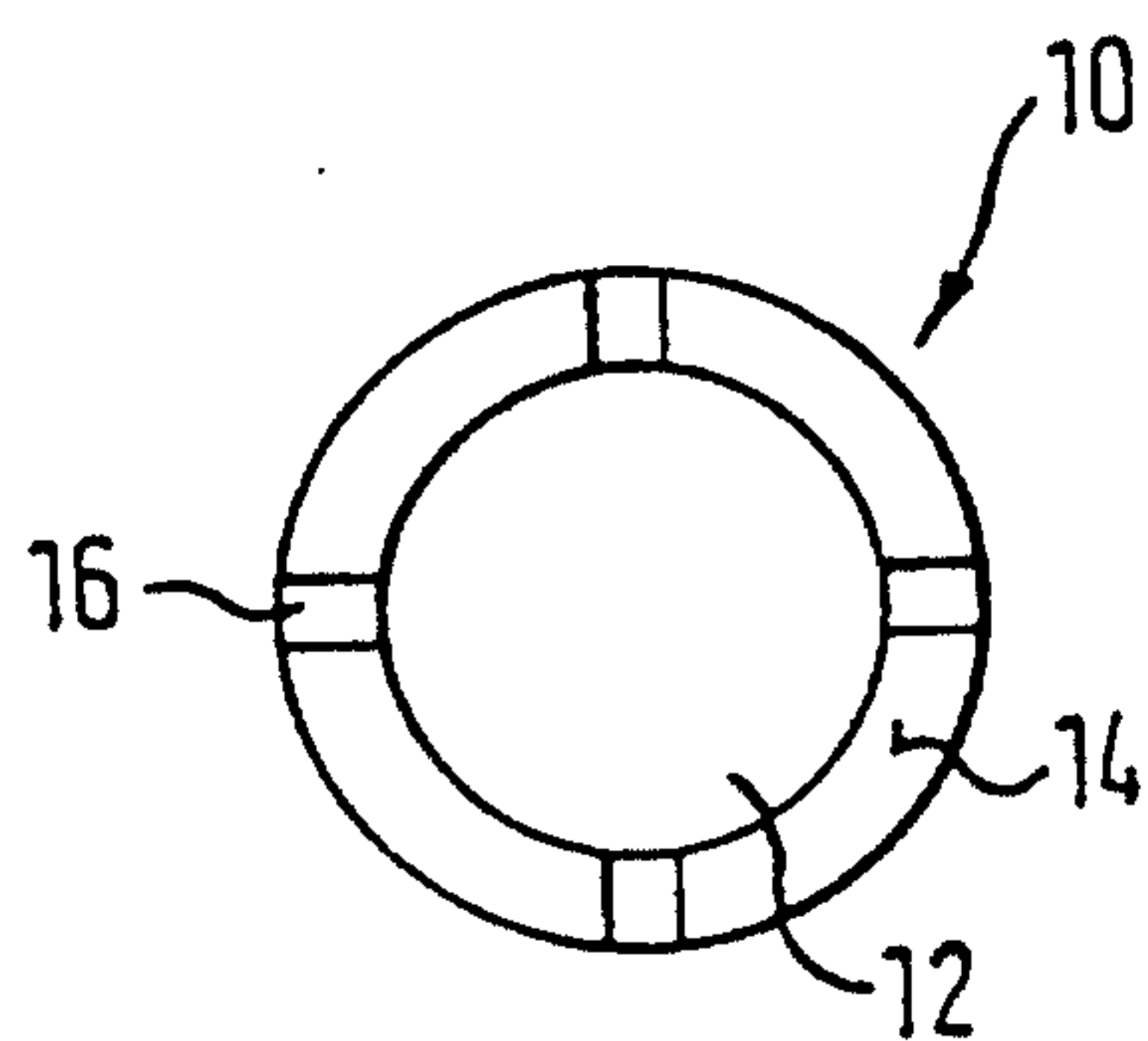


FIG. 3

