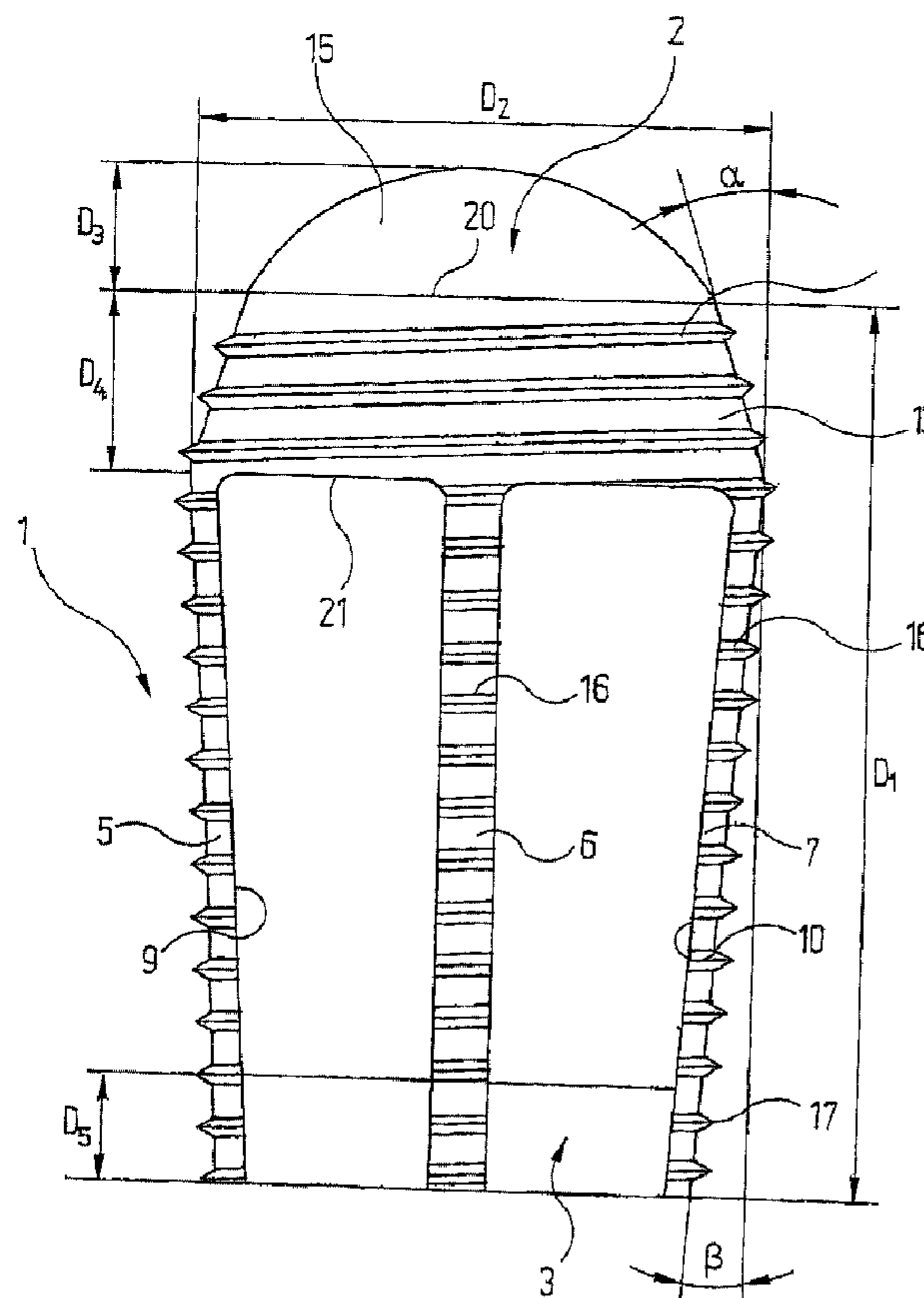




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(54) Titre : IMPLANT INTERVERTEBRAL ET METHODE CHIRURGICALE DE SPONDYLODESE DE LA COLONNE VERTEBRALE LOMBAIRE
(54) Title: INTERVERTEBRAL IMPLANT AND SURGICAL METHOD FOR SPONDYLODESIS OF A LUMBAR VERTEBRAL COLUMN



(57) Abrégé/Abstract:

The invention relates to an intervertebral implant (1) comprising a known head (2) having a conical section (13) and an external thread (14). A central section (5, 6, 7, 8) consisting of a plurality of struts extending from the head (2) to a base structure (3) is

(57) **Abrégé(suite)/Abstract(continued):**

formed on the head (2). As a result, large-surface windows (9, 10, 15 11, 12) are open between the head (2) and the struts (5, 6, 7, 8) and the base structure (3). According to said invention, the external thread (14) of the head (2) is formed on the conical section (13) and the external end section of the head (2) is formed by The protective elevation (15) which is convexly curved, from the outside view, and is devoid of sharp edges. The inventive intervertebral implant (1) makes it possible to carry out a complete distraction, in particular including the ventral circumference of the adjacent vertebral bodies (30, 31) by eliminating the risk of injury of an adjacent hollow vein or aorta. Simultaneously, a lordosis can be adjusted by selecting the intervertebral implant (1) geometry. A surgical method for spondylodesis of a lumbar vertebral column by using said intervertebral implant (1) is also disclosed.

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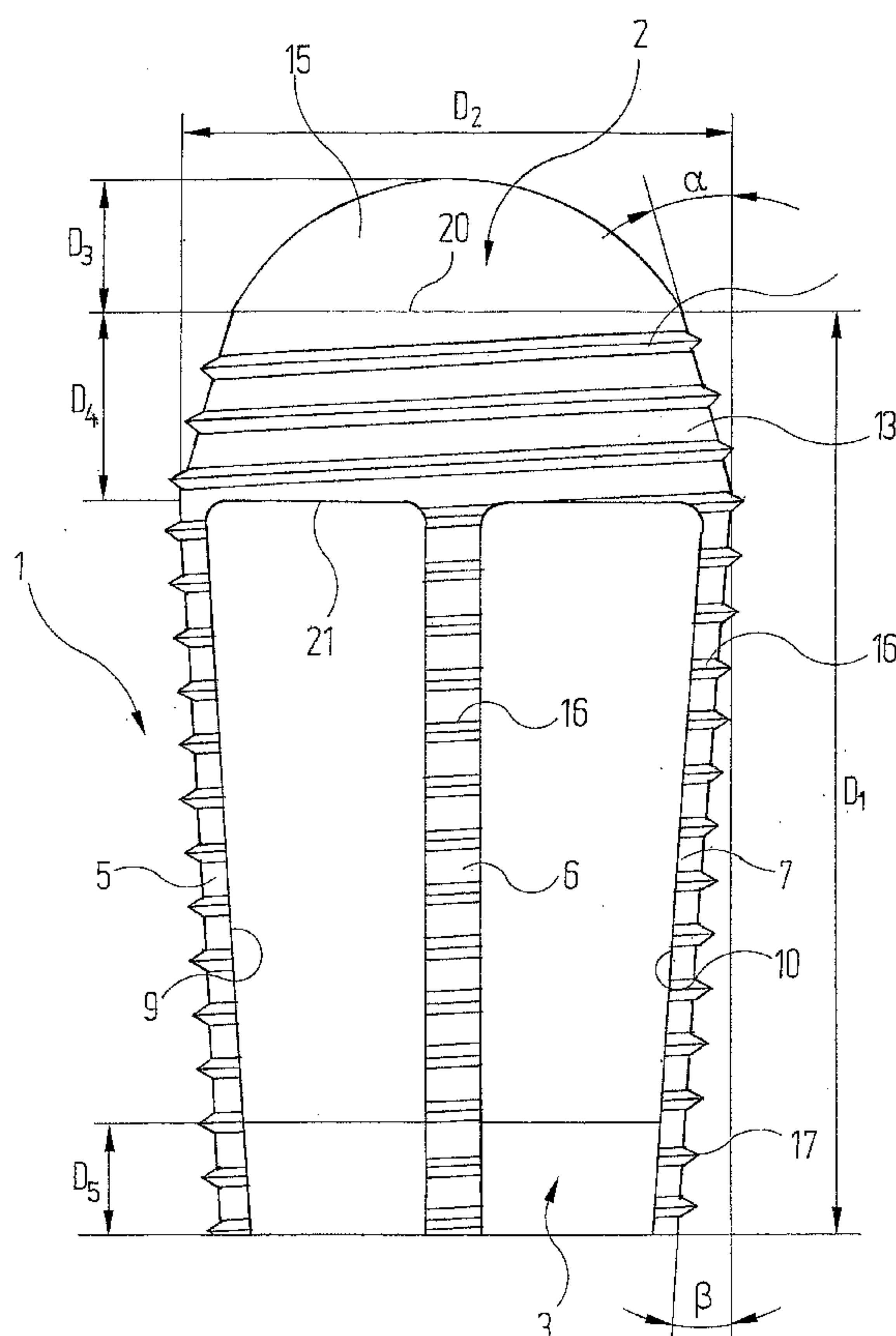
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(54) Title: INTERVERTEBRAL IMPLANT AND SURGICAL METHOD FOR SPONDYLODESIS OF A LUMBAR VERTEBRAL COLUMN

(54) Bezeichnung: ZWISCHENWIRBELIMPLANTAT SOWIE CHIRURGISCHES VERFAHREN ZUR SPONDYLODESE DER LENDENWIRBELSÄULE



(57) Abstract: The invention relates to an intervertebral implant (1) comprising a known head (2) having a conical section (13) and an external thread (14). A central section (5, 6, 7, 8) consisting of a plurality of struts extending from the head (2) to a base structure (3) is formed on the head (2). As a result, large-surface windows (9, 10, 15, 11, 12) are open between the head (2) and the struts (5, 6, 7, 8) and the base structure (3). According to said invention, the external thread (14) of the head (2) is formed on the conical section (13) and the external end section of the head (2) is formed by the protective elevation (15) which is convexly curved, from the outside view, and is devoid of sharp edges. The inventive intervertebral implant (1) makes it possible to carry out a complete distraction, in particular including the ventral circumference of the adjacent vertebral bodies (30, 31) by eliminating the risk of injury of an adjacent hollow vein or aorta. Simultaneously, a lordosis can be adjusted by selecting the intervertebral implant (1) geometry. A surgical method for spondylosis of a lumbar vertebral column by using said intervertebral implant (1) is also disclosed.

(57) Zusammenfassung: Es wird ein Zwischenwirbelimplantat (1) beschrieben, das in an und für sich bekannter Weise einen Kopf (2) mit einem konischen Abschnitt (13) und einem Aussengewinde (14) besitzt. An den Kopf (2) ist ein Zentralabschnitt (5, 6, 7, 8) angeformt, der von einer Mehrzahl sich vom Kopf (2) zu einer Grundstruktur (3) erstreckender Streben gebildet ist. Auf diese Weise bleiben zwischen dem Kopf (2), den Streben (5, 6, 7, 8) und der Grundstruktur (3) großflächige Fenster (9, 10, 15, 11, 12) offen. Erfindungsgemäss ist das Aussengewinde (14) des Kopfes (2) auf dem konischen Abschnitt

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ZW), eurasisches (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), europäisches (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Zur Erklärung der Zweibuchstaben-Codes und der anderen Abkürzungen wird auf die Erklärungen ("Guidance Notes on Codes and Abbreviations") am Anfang jeder regulären Ausgabe der PCT-Gazette verwiesen.

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(13) ausgebildet und der äussere Endbereich des Kopfes (2) ist von einer Schutzerhebung (15) gebildet, die von aussen gesehen konvex gekrümmt und frei von scharfen Kanten ist. Mit dem erfindungsgemässen Zwischenwirbelimplantat (1) gelingt eine vollständige Distraction insbesondere auch der ventralen Zirkumferenz der benachbarten Wirbelkörper (30, 31) ohne Gefahr der Verletzung der benachbarten Hohlvene bzw. Aorta. Gleichzeitig lässt sich durch die Wahl der Geometrie des Zwischenwirbelimplantats (1) die Lordose einstellen. Ausserdem wird ein chirurgisches Verfahren zur Spondylodese der Lendenwirbelsäule unter Verwendung derartiger Zwischenwirbelimplantate (1) beschrieben.

INTERVERTEBRAL IMPLANT AND SURGICAL METHOD FOR
SPONDYILODESIS OF A LUMBAR VERTEBRAL COLUMN

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The invention relates to an intervertebral implant comprising

- a) a head which carries a conical portion and an external thread;
- 5 b) a central portion formed on the head and which also carries an external thread;
- c) a basic structure formed on the central portion,

wherein

- 10 d) the central portion is formed by a plurality of struts extending from the head to the basic structure, so that large-area windows remain open between the head, the strut and the basic structure,

and

15 a surgical method for spondylodesis of the lumbar vertebral column in which at least one intervertebral implant is inserted into the intervertebral space between adjacent vertebral bodies.

An intervertebral implant of the above-mentioned type is described in DE 199 57 339 C2. This consciously dispenses with the previously known sleeve-type form of intervertebral implants and instead uses a central portion with
5 narrow struts which leave open an optimally large window. A large-area direct path from one vertebral body to another can be exposed in this manner for the spongiosa introduced into the intervertebral implant, and this allows a particularly good frictional connection and accelerates
10 bone formation. In addition X-ray examination during and after an operation is more easily possible with intervertebral implants of this type.

With the known intervertebral implant the head comprises a cylindrical portion, which carries the external thread,
15 and a conical, thread-free portion adjoining at the end region. Using this intervertebral implant it is not possible to carry out a complete distraction, in particular of the ventral circumference of the vertebral body, without risk as the risk of injury to the adjacent vena cava
20 and the aorta cannot be completely ruled out.

The object of the present invention is to configure an intervertebral implant of the type mentioned at the outset in such a way that it is also suitable for distraction, in particular in the ventral region of the verte-
25 bral body as well.

This object is achieved according to the invention in that

- f) the external thread of the head is formed on the conical portion;
- 5 g) the outer end region of the head is formed by a protective elevation which is convexly curved, viewed from the outside, and is free from sharp edges.

Using the external thread of its head the intervertebral implant according to the invention can be screwed into
10 the compacta at the ventral circumference of the vertebral body, wherein, owing to the conicality, a corresponding distraction of the vertebral body takes place. The protective elevation of the head is in the process moved beyond the ventral edge of the vertebral body but
15 owing to its freedom from sharp edges cannot injure the adjacent large vessels, but rather, if necessary, it edges them away slightly from the vertebral bodies in a blunt manner. The intervertebral implant according to the invention may be exactly positioned on the edges of the
20 vertebral body.

The conical portion of the head should have an axial extension of at least 7 mm in order to be able to adequately transmit forces to the vertebral body at the ventral circumference thereof during the distraction procedure.
25

For the same reason it is expedient for the external thread on the head to comprise at least three full turns.

The protective elevation of the head should have an axial extension of at least 5 mm to ensure that all sharp
5 edges, and this also includes the turns, always do actually have adequate spacing from the adjacent vessels.

The protective elevation can have the form of a closed cap or be annular and have a central through-opening as well.

10 The basic structure of the intervertebral implant according to the invention preferably has an axial extension of at least 5 mm. This takes account of the anatomical fact that the compacta at the dorsal side of the vertebral body is thinner than at the ventral side.

15 The basic structure can in particular also be a plate.

It should comprise an application device for a screw-in instrument, wherein an embodiment which may be coupled to the screw-in instrument merely with positive action of the surgeon and may likewise be released again merely
20 with active involvement of the surgeon is preferred. Application devices of this type are known.

The angle (α) enclosed by the conical circumferential surface of the conical portion of the head and by an

imaginary coaxial circumferential surface of a circular cylinder should be between 10° and 20° , and preferably be 15° , largely independently of the individual patient information.

5 A particularly advantageous embodiment of the intervertebral implant according to the invention is characterised in that the central portion and the basic structure are conical in the opposite direction to the conical portion of the head. The conicality of the central portion and
10 the basic structure thus determine the lordosis of the two vertebral bodies between which the intervertebral implant is inserted.

According to the general anatomical conditions it is usually sufficient if two coning angles are optionally held
15 ready for the central portion and the basic structure: the angle (β) enclosed by the conical circumferential surface of the central portion and the basic structure and by an imaginary coaxial circumferential surface of a circular cylinder should be about 3° in one embodiment
20 and in another embodiment be about 6° .

The intervertebral implant can be made of different materials, in particular of stainless steel, carbon-ceramic material, aluminium alloys, titanium, plastics material, in particular polyisocyanate or the like.

The intervertebral implant according to the invention can, however, also be produced from bioresorbable material, in particular polyactide.

5 If the intervertebral implant has a non-rotationally symmetrical cross-sectional shape in at least one axial region, it is secured against unintentional rotation after screwing-in. It is particularly advantageous here if the basic structure itself, which cooperates with the dorsal region of the compacta of the vertebral bodies, has non-
10 rotationally symmetrical cross-sectional shape.

The intervertebral implant is particularly gentle for the vessels if its protective elevation is polished.

The object of the present invention is also to disclose a surgical method which is gentle for the patient for
15 spondylodesis of the lumbar vertebral column, of the type mentioned at the outset.

This object is achieved by a method which comprises the following method steps:

- a) access to the intervertebral space is opened micro-
20 surgically from the dorsal side and with partial removal of the small vertebral joints;
- b) the cartilage fractions of the deck plate and basal plate of the intervertebral space are removed;

- c) a thread is cut into the dorsal region of the intervertebral space;
- d) the intervertebral space is pre-distracted using a distraction instrument;
- 5 e) the pre-distraction is maintained using a spacer and the distraction instrument is removed;
- f) a first intervertebral implant is screwed into the thread in the intervertebral space;
- g) steps a) to f) are repeated for a second interverte-
- 10 bral implant which is inserted at a spacing from the first intervertebral implant.

The surgical method according to the invention spares the patient owing to its microsurgical configuration and its application from the dorsal side, and causes only small
15 wounds. The risk of infection is therefore considerably reduced. The patient is exposed to much less pain and the time spent in hospital is considerably shorter.

If the patient has not already been pre-operated on, it may be necessary after step a) to thin out the *Ligamentum*
20 *flavum* from the outside to the inside. An inner region is retained in the process however, so scar formation is largely avoided.

After step b) the exposed bone fractions can be freshened, in other words superficially abraded, and this facilitates adherence with spongiosa introduced into the intervertebral space.

- 5 The intervertebral implants themselves should be filled with spongiosa before introduction into the intervertebral space.

The intervertebral space itself is also preferably filled with spongiosa at the latest before introduction of the
10 second intervertebral implant.

The method according to the invention is particularly helpful if an intervertebral implant according to any one of claims 1 to 13 is used, wherein it is screwed in with distraction, in particular of the ventral region, until
15 the transition line between the protective elevation and the conical region of the head is at the height of the apexes in the lateral image of the ventral circumference of the vertebral bodies. With this configuration of the method according to the invention, the ventral region of
20 the vertebral body in particular may therefore also be distracted in the required manner without risk.

When screwing-in the intervertebral implant the torque may be measured. If a predetermined value of the torque is fallen below this means that the maximum diameter of
25 the intervertebral implant used is too small and the dis-

traction achieved is not sufficient. A different intervertebral implant with a larger maximum diameter is then selected.

The present invention also provides the use of the present intervertebral implant for the treatment of a condition necessitating spondylodesis.

An embodiment of the invention will be described in more detail hereinafter with reference to drawings, in which:

Fig. 1 shows an intervertebral implant in a side view with dimensioning;

Fig. 2 shows the bottom view of the intervertebral implant of Fig. 1;

Fig. 3 schematically shows in a plan view two intervertebral implants implanted side by side between two vertebral bodies;

Fig. 4 shows on a slightly larger scale and in a side view an intervertebral implant between two vertebral bodies illustrated in section.

Reference will firstly be made to Fig. 1. This shows an intervertebral implant which is designated overall by reference numeral 1. It comprises a, in the implanted state, ventrally-pointing head 2 and a, in the implanted state, dorsally-pointing base plate 3 which are connected to each other by four narrow struts 5, 6, 7 and 8. Large-area windows 9, 10, 11, 12 remain between the struts 5, 6, 7, 8, the head 2 and the base plate 3.

The head 2 of the intervertebral implant 1 comprises a conical portion 13, which carries an external thread 14, and a, viewed from the outside, convex protective cap 15 adjoining the conical portion 13 and forming the ventral
5 end of the intervertebral implant 1. The protective cap 15, which is a spherical cap surface in the illustrated embodiment, is polished for reasons which will become clear below. In particular it does not have any sharp edges therefore. The arrow height D_3 of the protec-
10 tive cap 15 is at least 4 to 5 mm. The reason for this will also become clear below. The conical portion 13 has an axial length D_4 which should not fall below 7 mm. The external thread 14 has at least three full turns inside the conical portion 3. The angle α which the circumferen-
15 tial surface of the cone of the conical portion 13 encloses with an imaginary circumferential surface of a circular cylinder and which corresponds to half the cone angle is between 10 and 20°, preferably about 15°.

The struts 5, 6, 7, 8 are also located on an imaginary
20 surface of a circular cone which tapers in the opposite direction to the conical region 13 of the head 2, however, toward the dorsal end of the intervertebral implant 1, located at the bottom in Fig. 1. The angle β which the circumferential surface of the cone of this imaginary
25 cone encloses with a circumferential surface of a circular cylinder and which corresponds to half the cone angle is about 6° or about 3°, depending on between which vertebral bodies the intervertebral implant 1 is to be in-

served. The struts 5, 6, 7, 8 also carry an external thread 15 which is constructed as a continuation of the external thread 14 on the conical region 13 of the head 2.

5 The struts 5, 6, 7, 8 merge in one piece into the rounded corners of the base plate 3, as Fig. 2 shows in particular. The bottom view of the base plate 3 is moreover approximately square. The external thread 16 of the struts 5, 6, 7, 8 continues in an external thread 17 on the
10 rounded corners of the base plate 3.

An application device for a screw-in instrument is worked into the lower side of the base plate 3, as can be seen in Fig. 2, and in the illustrated case has the form of a cross groove 18. The associated screw-in instrument,
15 which is not shown in the drawings however, has a complementary cross-shaped axially extending projection and can be clicked into a latching device 19 which is schematically shown in the drawings as a circular hole. The latching device 19 is configured in such a way that the
20 production of a connection between the screw-in instrument and the cross-groove 18 requires a positive action by the surgeon and conversely release of the screw-in instrument from the base plate 3 can only take place with positive action by the surgeon and not unintentionally.
25 Connections of this type are known per se and individually and so do not need to be described in more detail here.

The axial extension D_5 of the base plate 3 should not fall below 4 mm.

As described thus far the intervertebral implant 1 does not substantially differ from patient to patient. Individual patient information flows into the dimensions of
5 the intervertebral implant 1 in the following manner, however and must be taken preoperatively from CT scans or X-ray images:

the axial distance D_1 between the dorsal, outer end face
10 of the base plate 3 and the transition line 20 between the conical region 13 of the head 2 and the polished protective cap 15 corresponds, as may be gathered in particular from Fig. 4, to the spacing between the dorsal outer edges of the vertebral bodies 30, 31 to be con-
15 nected and the opposing vertices 32, 33 of the ventral edges of the vertebral bodies 30, 31 in the lateral image. The implantation position of the intervertebral implant 1 is therefore such that the dorsal outer end face approximately aligns with the dorsal edges of the verte-
20 bral bodies 30, 31 while the transition line 20 at the head 2 of the intervertebral implant 1 connects the vertices 32, 33 of the two vertebral bodies 30, 31. The protective cap 15 of the head 2 projects in the process ventrally beyond the ventral edges of the vertebral bodies
25 30, 31.

The intervertebral implant 1 can be made of different materials. On the one hand, as already described in the above-mentioned DE 199 57 339 C2, stainless steel or carbon-ceramic material can be considered. As a permanent
5 material that remains in the body aluminium alloys, titanium and certain plastics materials, in particular polyisocyanate (PIC), are also suitable. Bioresorbable materials, such as polylactide in particular, in other words copolymers of poly (L-lactide-co-D, L-lactide), as sold
10 for example under the trade name Telamon, may also be used, however.

Sets of intervertebral implants 1 which differ in terms of the size of the dimension D1 therefore have to be held ready for different patients. In general it is sufficient
15 to provide gradations of 2 mm here, wherein in practice dimensions D1 of 28, 30, 32, 34 and 36 mm can be considered in particular.

The largest diameter D2 of the intervertebral implant 1 occurs, as emerges from the above description, at the
20 transition line 21 between the head 2 and the struts 5, 6, 7. It corresponds to the desired distraction between the adjacent vertebral bodies 30, 31 and can be taken from the X-ray image, for example from neighbouring healthy segments. A whole set of intervertebral implants
25 1 which have to be kept ready by the surgeon is thus required with respect to dimension D₂ as well. A gradation

of 2 mm is again sufficient. In practice dimensions D_2 of primarily 10, 12, 14 and 16 mm are considered.

In the case of an embodiment of the intervertebral implant 1 not shown in the drawings the ventral end is not
5 formed by a closed protective cap but by a ring with a through-opening and that is convexly curved, viewed from the outside, and which should not be larger than 5 mm. The outer face of this protective ring pointing in the ventral direction should also be polished.

10 The surgeon carries out spondylodesis using the described intervertebral implant 1, of which two are required in each case, as follows:

Firstly the individual items of information D_1 and D_2 of the intervertebral implants 1 to be used are determined
15 preoperatively from the CT scans or X-ray images. The angle β is selected according to the desired lordosis of the vertebral bodies that are to be joined together.

The operation is carried out by way of microsurgery from the dorsal side. The required access to the interverte-
20 bral space is obtained by partial removal of the small vertebral joints, wherein the *Ligamentum flavum* can largely be spared in the case of patients that have not been operated on already. This merely needs to be thinned out slightly from the outside to the inside, so that an
25 inner layer is retained. Scar formation is thus avoided.

The intervertebral space is then carefully freed from cartilage fractions of the deck plate and basal plate. The bone fractions are "freshened" in the process, i.e. thinly superficially abraded, wherein their load-bearing capacity is not damaged. A pre-distraction of the vertebral bodies 30, 31 is then carried out using a distraction instrument which substantially attaches at the dorsal vertebral edges. The pre-distraction thus achieved is maintained by a sleeve provided with two attached spacer clips introduced into the intervertebral space when the distraction instrument is now removed again.

A thread is then cut through this sleeve in the dorsal part of the intervertebral space. A first intervertebral implant 1 is now introduced through the sleeve head 2 first and by rotation screwed to the thread of the vertebral body 30, 31 cut-in in advance, so that it moves axially in the ventral direction. The intervertebral implant 1 has been filled with spongiosa in advance.

The intervertebral implant 1 is now rotated until the external thread 14 on the head 2 of the intervertebral implant 1 comes to rest against the compacta of the ventral circumference of the two vertebral bodies 30, 31. With further rotation of the intervertebral implant 1 the external thread 14 cuts into the compacta of the ventral edges of the vertebral body 30, 31, wherein the conical shape of the conical region 13 of the head 2 provides a corresponding distraction of the ventral edges of the

vertebral bodies 30, 31. The screwing-in movement of the intervertebral implant 1 is continued with X-ray observation until the transition line 20 comes to rest in the region of the vertices 32, 33 of the two vertebral bodies 30, 31. Further movement cannot take place. Up to this point the protective cap 15 of the head 2 has potentially pushed away the vena cava and the aorta, which extend in this direction, slightly in the ventral direction, without being able to injure them however as it does not have any sharp edges.

The remaining intervertebral space is now filled with spongiosa and a second intervertebral implant 1' inserted next to the first intervertebral implant 1 in the above-described manner (cf. Fig. 3). The spacing between the two intervertebral implants 1, 1' should not be less than 1 cm. The second intervertebral implant 1' has also already been filled with spongiosa before insertion.

When screwing-in the external thread 14 of the two intervertebral implants 1, 1' the torque that is required for this is measured. If this torque is below a specific value this is an indication of the fact that the dimension D_2 of the intervertebral implant 1 selected from the set is too small. The intervertebral implant 1 must then be exchanged for one whose dimension D_2 is slightly larger.

With sufficient distraction without ventral displacement of the vertebral body no further measures are required. A "stand alone" technique is therefore sufficient in this case in which only the intervertebral implants 1, 1' are
5 inserted. Otherwise additional securing by means of a fixateur interne takes place.

CLAIMS

1. Intervertebral implant comprising,
 - a) a head (2) which carries a conical portion (13) and an external thread (14);
 - b) a central portion (5, 6, 7, 8) formed on the head (2) and which also carries an external thread (16);
 - c) a basic structure (3) formed on the central portion (5, 6, 7, 8),

wherein

- d) the central portion (5, 6, 7, 8) is formed by a plurality of struts extending from the head (2) to the basic structure (3), so that area windows (9, 10, 11, 12) remain open between the head (2), the struts (5, 6, 7, 8) and the basic structure (3),

characterised in that

- e) the external thread (14) of the head (2) is formed on the conical portion (13);
 - f) the outer end region of the head (2) is formed by a protective elevation (15) which is convexly curved, viewed from the outside, and is free from sharp edges.

2. Intervertebral implant according to claim 1, characterised in that the conical portion (13) of the head (2) has an axial extension (D_4) of at least 7 mm.

3. Intervertebral implant according to claim 1 or 2, characterised in that the external thread (14) on the head (2) comprises at least three full turns.

4. Intervertebral implant according to any one of claims 1 to 3, characterised in that the protective elevation (15) of the body (2) comprises an axial extension (D_3) of at least 5 mm.

5. Intervertebral implant according to any one of claims 1 to 4, characterised in that the protective elevation (15) has the form of a closed cap.

6. Intervertebral implant according to any one of claims 1 to 4, characterised in that the protective elevation is annular and has a central through-opening.

7. Intervertebral implant according to any one of claims 1 to 6, characterised in that the basic structure (3) has an axial extension (D_5) of at least 5 mm.

8. Intervertebral implant according to any one of claims 1 to 7, characterised in that the basic structure (3) is a plate.

9. Intervertebral implant according to any one of claims 1 to 8, characterised in that an application device (18, 19) for a screw-in instrument is provided on the basic structure (3).

10. Intervertebral implant according to any one of claims 1 to 9, characterised in that an angle (α) enclosed by the conical circumferential surface of the conical portion (13) of the head (2) and by an imaginary coaxial circumferential surface of a circular cylinder is between 10° and 20° .

11. Intervertebral implant according to claim 10, wherein said angle (α) is of 15° .

12. Intervertebral implant according to any one of claims 1 to 11, characterised in that the central portion (5, 6, 7, 8) and the basic structure (3) are conical in the opposite direction to the conical portion (15) of the head (2).

13. Intervertebral implant according to claim 12, characterised in that an angle (β) enclosed by the conical circumferential surface of the central portion (5, 6, 7, 8) and the basic structure (3) and by an imaginary coaxial circumferential surface of a circular cylinder is about 3° .

14. Intervertebral implant according to claim 12, characterised in that an angle (β) enclosed by the conical circumferential surface of the central portion (5, 6, 7, 8) and the basic structure (3) and by an imaginary coaxial circumferential surface of a circular cylinder is about 6° .

15. Intervertebral implant according to any one of claims 1 to 14, characterised in that it is made of stainless steel.

16. Intervertebral implant according to any one of claims 1 to 14, characterised in that it is made of carbon-ceramic material.

17. Intervertebral implant according to any one of claims 1 to 14, characterised in that it is made of an aluminium alloy.

18. Intervertebral implant according to any one of claims 1 to 14, characterised in that it is made of titanium.

19. Intervertebral implant according to any one of claims 1 to 14, characterised in that it is made of plastics material.

20. Intervertebral implant according to claim 19, characterised in that it is made of polyisocyanate.

21. Intervertebral implant according to any one of claims 1 to 14, characterised in that it is made of bio-resorbable

material.

22. Intervertebral implant according to claim 21, characterised in that it is made of polyactide.

23. Intervertebral implant according to any one of claims 1 to 22, characterised in that in at least one axial region it has a non-rotationally symmetrical cross-sectional form.

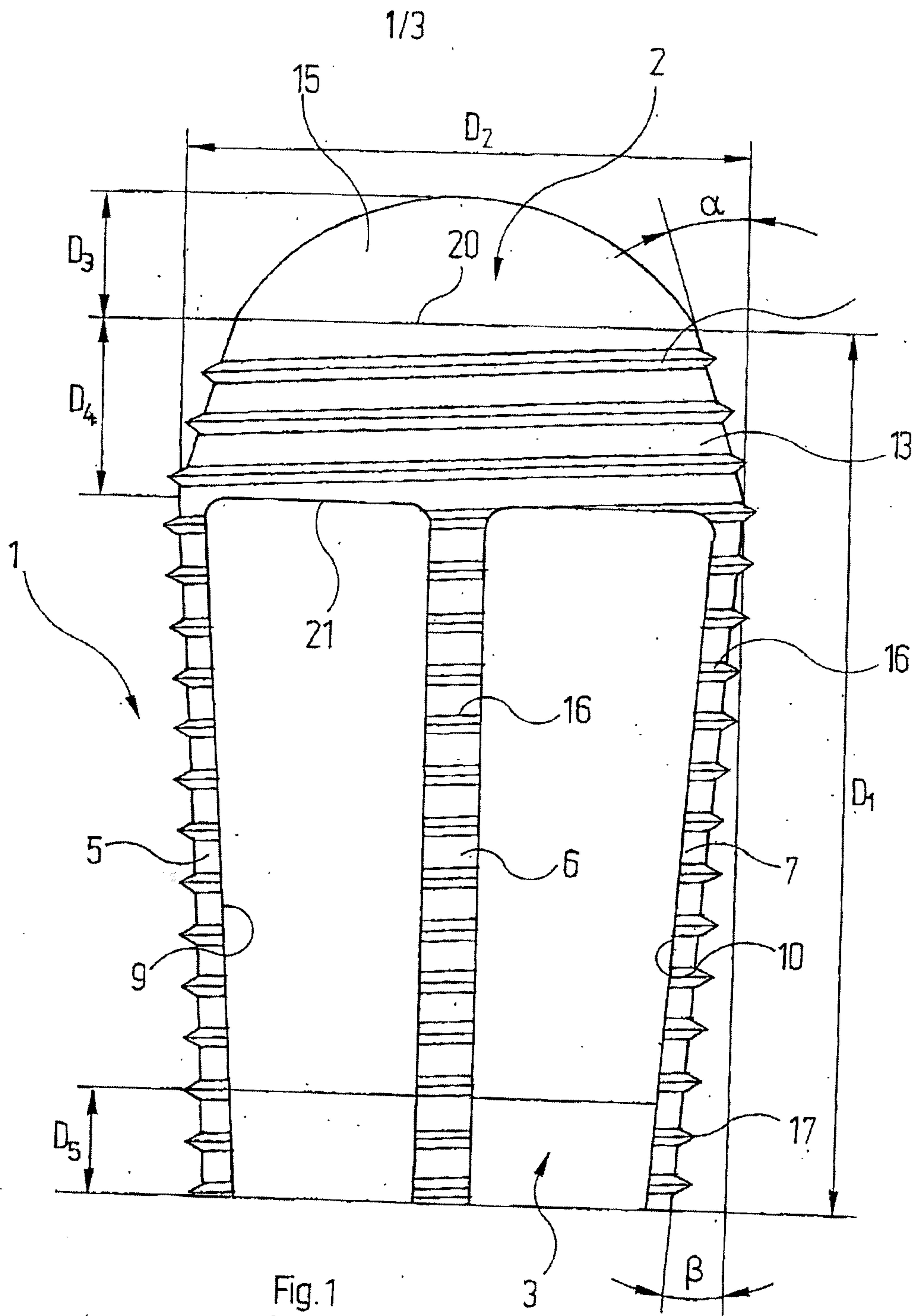
24. Intervertebral implant according to claim 23, characterised in that the basic structure (3) has non-rotationally symmetrical cross-sectional form.

25. Intervertebral implant according to any one of claims 1 to 24, characterised in that the protective elevation (159) is polished.

26. Use of the intervetebraal implant according to any one of claims 1-25 for the treatment of a condition necessitating spondylodesis.

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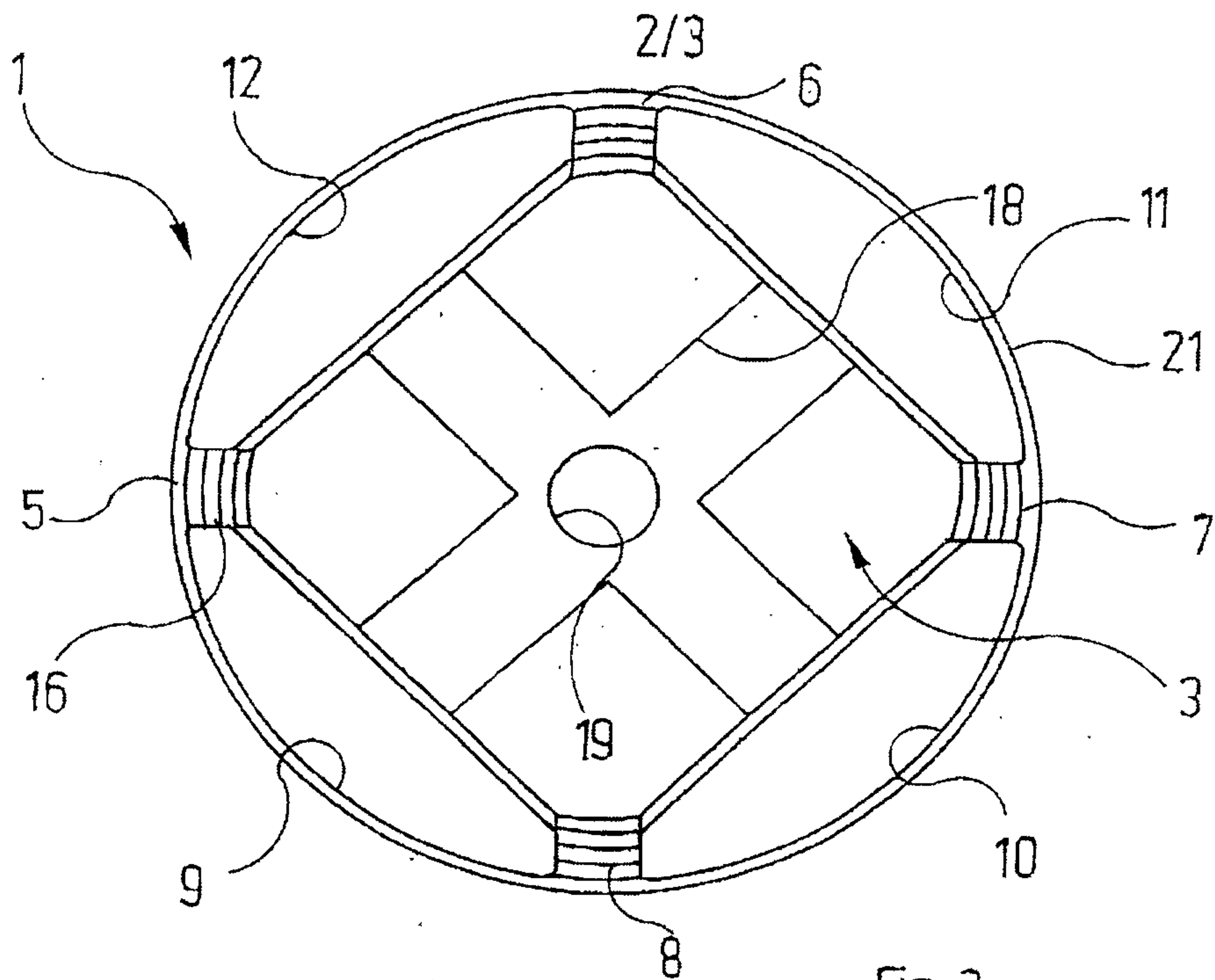


Fig. 2

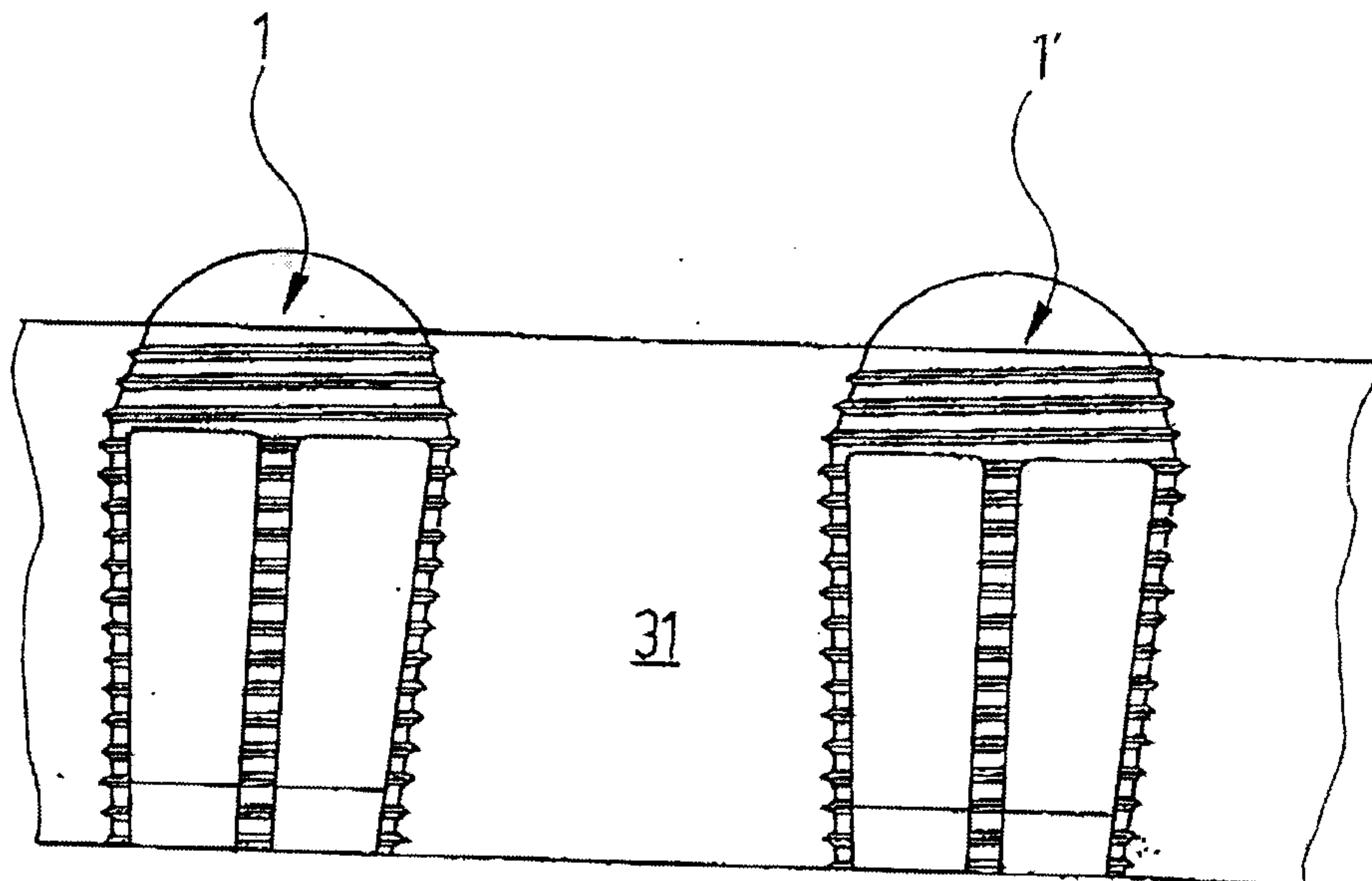


Fig. 3

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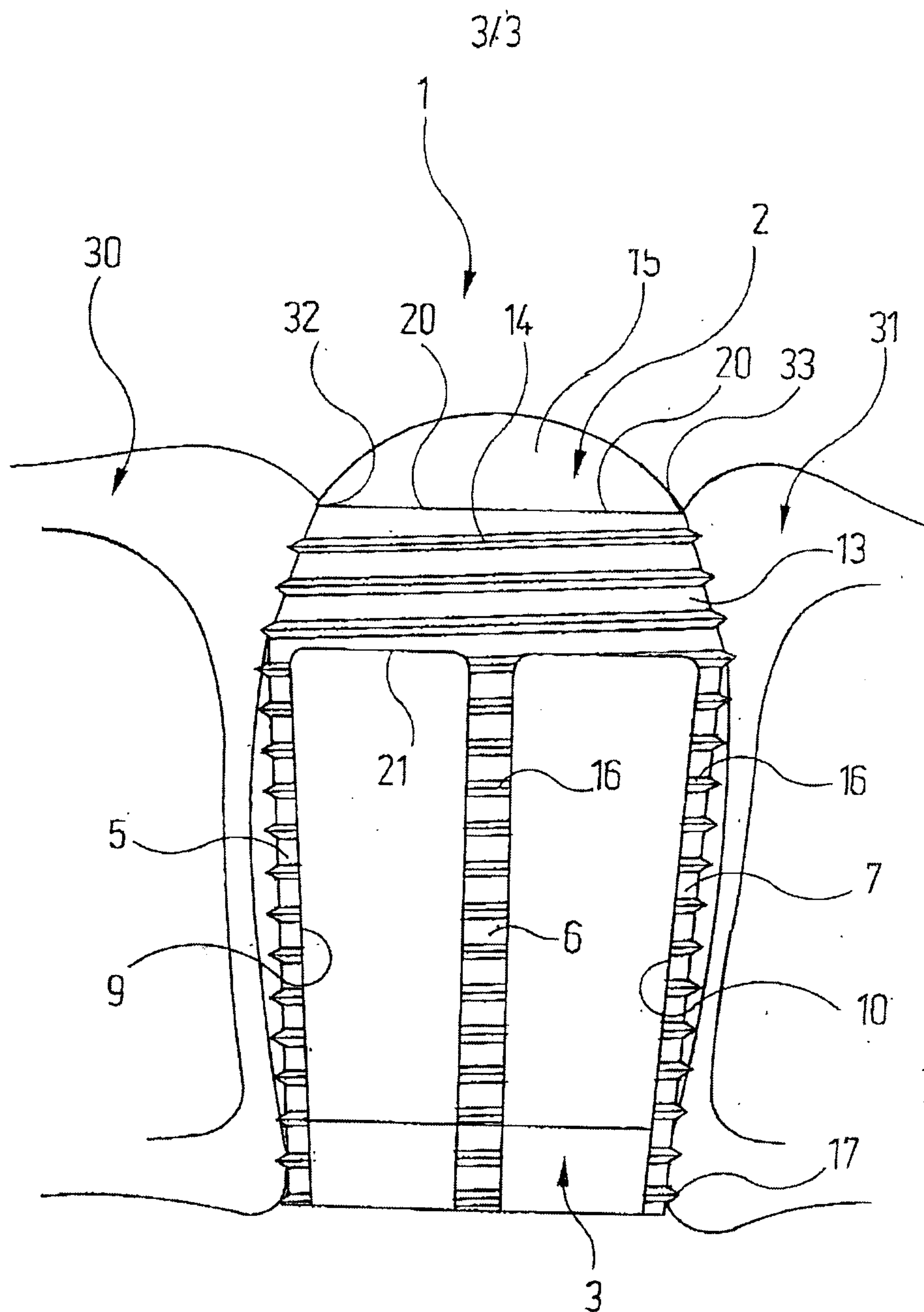


Fig. 4

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