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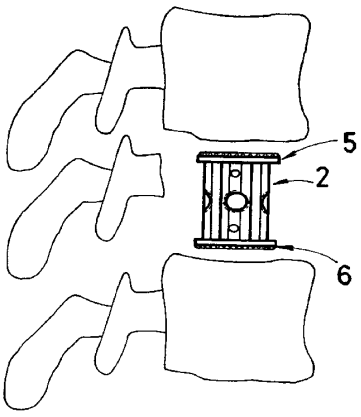
(54) **Vertebral prosthesis for the substitution of a vertebra in malignant tumour surgery.**

(57) The tumour-affected vertebra is removed and the prosthesis (2) is inserted in the closed position, with the minimum height thereof. Thereafter it is opened up until a sufficient height is obtained to restore the anatomical continuity of the column to make it capable of supporting the load and allow mobility of the patient. The prosthesis is made of steel and comprises three parts, a centre part (4) and an upper and a lower platform (5) and (6) which are moveable in opposite directions to extend the height of the assembly, until they bite into the body of the neighbouring vertebra.

The invention is applicable in surgery of malignant tumours of the dorsal and lumbar portions of the spinal column.

Fig. 8



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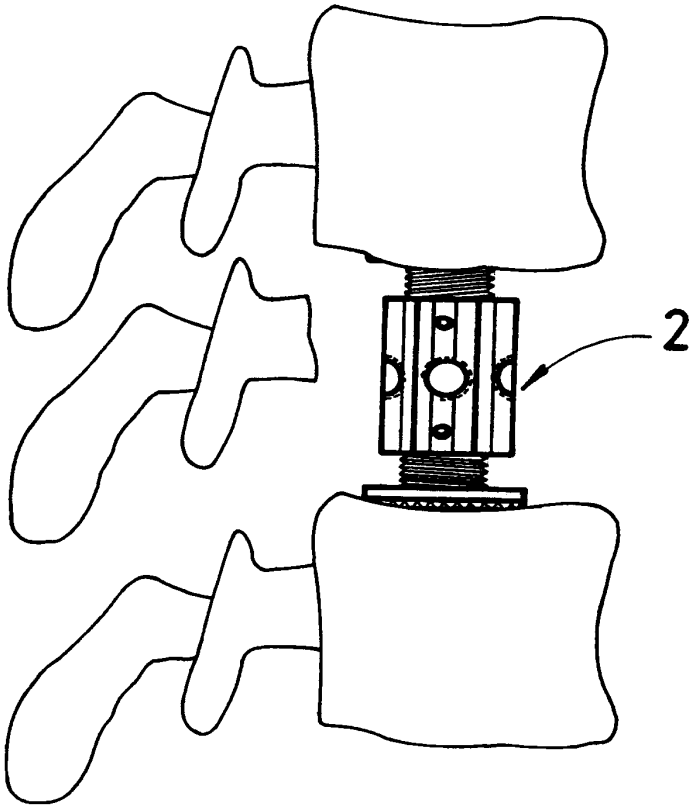


Fig. 9

FIELD OF THE INVENTION

The present invention relates to a process for the substitution of a prosthesis for a vertebra in malignant tumour surgery and to a prosthesis for the practice of said process, providing for the purpose to which it is directed various advantages which will be listed hereinafter, apart from others inherent in the organization and constitution thereof.

BACKGROUND OF THE INVENTION

It is known that the most appropriate technique and the one currently most used by spinal column surgeons in the treatment of malignant vertebral tumours is anterolateral decompression, by resecting the affected vertebra. Therewith, further to freeing the spinal cord, the volume of the tumour is significantly reduced, making it more accessible to post-operative radiotherapy and/or chemotherapy.

But resection of the vertebra of necessity causes a maximum instability which must be corrected during the operation itself, although at a later stage, in a second session it may be desirable to complete the stabilization with posterior instrumentation.

Stabilization involves a reconstruction of the anatomical continuity of the column, making it capable of supporting the load and allowing the patient freedom of movement, without complications such as pain, deformity or new nerve compression deriving therefrom.

The methods currently used in surgery for vertebral reconstruction are:

1) bone graft, associated with anterior instrumentation.

2) methyl methacrylate, associated with anterior instrumentation

3) vertebral prosthesis.

In the particular case of vertebral prostheses, which is the field of the present invention, experimental prostheses of very complex design are currently known for benign tumours of the cervical, thoracic and lumbar portions of the spinal column, but have not been used on human patients.

SUMMARY OF THE INVENTION

In the belief that fitting of a prosthesis should, theoretically, not suffer from any of the drawbacks of the current techniques, the present inventors have designed a process for fitting a vertebral prosthesis in the surgery of malign tumours of the dorsal and lumbar portions of the spinal column, as well as a vertebral prosthesis for the practice of the said process.

The process contemplates, in the first place, removal of the vertebra, by way of an appropriate surgical technique and once the cavity for receiving the prosthesis has been prepared, the latter is inserted in the closed position with a minimum height thereof. The prosthesis is held in position with the aid of appropriate clips and it is opened up with a spanner so as to achieve the necessary height for the prosthesis to bite at both the top and bottom ends into the field of the neighbouring vertebra. The system is locked in place by a plate which is attached by screws laterally to the next above and the next below vertebras, contributing to stabilization by preventing the antero-posterior translation, lateral rotation and twisting movements.

The process of the invention offers the advantages that have been described above, apart from others that will be readily gathered from the more detailed description of an embodiment given hereinafter to facilitate an understanding of the features mentioned above, while at the same time disclosing sundry details. The specification is accompanied for this purpose by drawings in which, only as an example and not as a limitation of the scope of the invention, one embodiment of the subject matter is given.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

Figure 1 shows the prosthesis in closed position.

Figure 2 shows the prosthesis assembly in the extended state;

Figure 3 is an elevation view of the external hexagonal body forming part of the prosthesis assembly;

Figure 4 shows threaded cylinders forming part of the prosthesis assembly;

Figure 5 is a view of one of the cylinders, seen from "A";

Figure 6 is a view of the said cylinder, seen from "B";

Figures 7, 8, 9, 10 and 11 show the different successive steps of the surgical process.

DESCRIPTION OF ONE EMBODIMENT OF THE INVENTION

As shown in the drawings, the process comprises a first step in which the tumorous vertebra 1 (Figure 7) is removed; the prosthesis, generally indicated at 2, is inserted in a second step, in the closed state, with the minimum height thereof (Figure 8); the prosthesis 2 is opened out in a third step with appropriate tools, so that the moving components thereof may move apart and bite into the body of the neighbouring vertebra, as shown in Figure 9, corresponding to a side view, and Figure 10, corresponding to an anteroposterior view. In a fourth step, the system is locked in place by way of a plate 3 which is screwed laterally into the upper and lower vertebras and compressed, as shown in figures 11 and 12, corresponding to side and antero-posterior views.

The prosthesis 2, used for the practice of the process described, is made from steel and consists of three portions: a centre body member 4 and upper and lower platforms 5 and 6.

The centre body member 4 is a hollow tube having an internal thread 7. It is cylindrical on the outside at both ends and has a hexagonal waist in the middle.

Each platform 5 and 6 consists of two parts: a peripheral flat plate 8 having a roughened sheet 9 attached to the outer surface thereof; and a lower hollow cylinder 10, provided with a thread 11 on the outside thereof, which screws into the inside of the centre body member.

The internal thread 7 of the centre body member 4 and the external threads 11 of the cylinders 10 of the respective platforms 5 and 6 are made in such as way that when the centre body member 4 is rotated clockwise with a hexagonal spanner, the two cylinders 10 of the platforms simultaneously move axially outwards, thereby extending the height of the assembly. When the centre body member is rotated in the opposite direction, the cylinders retract simultaneously into the body member 4, shortening the total height.

The centre body member 4 is provided with four small threaded holes 12 at each end. After rotating the centre body member in the desired direction, to set the desired height of the prosthesis assembly 2, two small Allen screws are screwed up, one in each of the small holes of the centre body member. In this way, the Allen screws bear against the thread 11 of the cylinders 10 of the platforms 5 and 6 and lock them against further movement.

A plate 3, provided with countersunk self-compression holes 13 for spongiosa screws 14 and a normal centre hole 15 for the bolt 16 which passes through the diametral threaded holes 17 of the centre body member 4 in combination with a nut 18, is attached to the prosthesis.

The centre body member 4 is provided with grooves 19 facilitating the seating of the end of a small chisel with a view to rotating the prosthesis body member on the cylinders 10. The said body member 4 is manipulated with the aid of a spanner, not shown, having wide jaws to take in almost the whole length of the body member 4, facilitating the screwing thereof on the upper and lower cylinders.

Claims

1.- A process for the substitution of a prosthesis for a vertebra in malignant tumour surgery and a prosthesis for the practice of said process, characterized essentially in that it comprises a first step in which the tumour-affected vertebra is removed so that once the cavity for receiving the prosthesis has been prepared, the latter is inserted in the closed position with a minimum height thereof, it being held in the operative position with the aid of appropriate clips; thereafter the prosthesis is opened up with aid of an appropriate spanner allowing a centre component of said prosthesis to be rotated, which rotation causes the outward movement relative to the said component of further axially movable components capable of moving in opposite directions until the necessary height is obtained for the said moving components to bite above and below into the body of the neighbouring vertebra; to be followed thereafter by locking of the moving components relative to the centre component of the prosthesis to prevent further movement; and in that in a final step there is added a plate contributing to stabilize the system to prevent anteroposterior translation movements, lateral rotations and twisting, which plate is screwed laterally into the vertebra above and below and into the centre component of the prosthesis.

2.- A process for the substitution of a prosthesis for a vertebra in malignant tumour surgery and a prosthesis for the practice of said process, according to claim 1, characterized in that the prosthesis is formed by a centre component with which there are associated a further two components formed with upper and lower platforms and in that the said centre component is formed by an internally threaded tubular body member which is externally configured as a cylinder at the two ends, with an hexagonal waist, while the said platforms comprise two parts, one of which is a flat peripheral sheet having a roughened sheet on the outer surface thereof, the other part being a lower hollow cylinder having an external screw thread for screwing into the centre body member, said threads being formed in such a way that rotation of the centre body member causes an axial movement of the cylinders carrying the platforms outwardly, lengthening the height of the prosthesis.

3.- A process for the substitution of a prosthesis for a vertebra in malignant tumour surgery and a prosthesis for the practice of said process, according to claims 1 and 2, characterized in that the prosthesis is provided at both ends of the centre body member with small transverse threaded through holes for the screwing of appropriate screws which bear against the threads of the platform cylinders, locking the movement thereof, to set the height of the prosthesis assembly.

Fig. 1

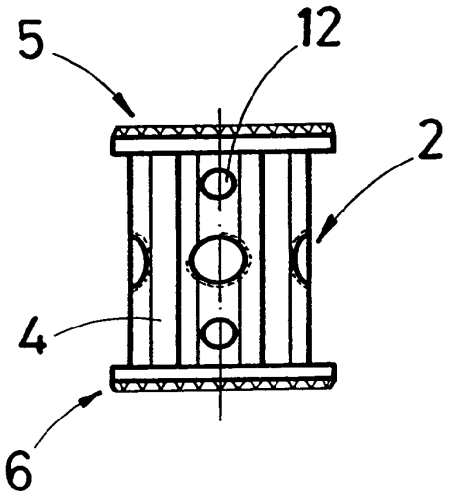


Fig. 2

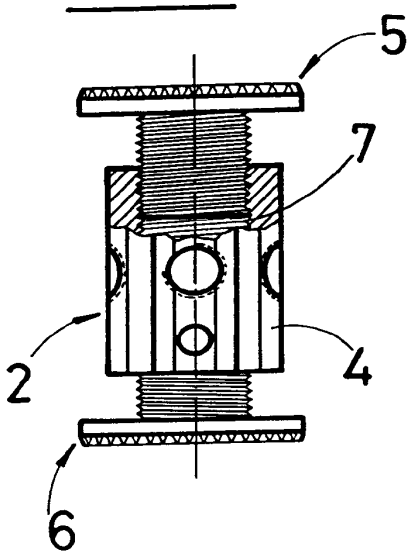


Fig. 3

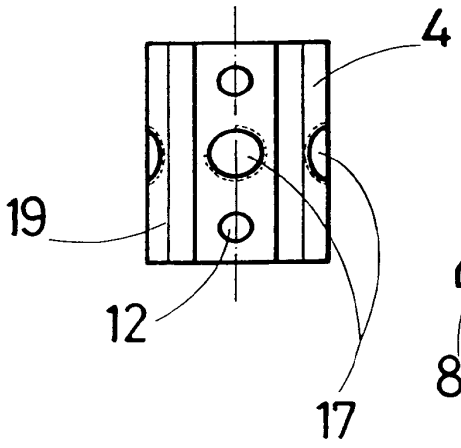
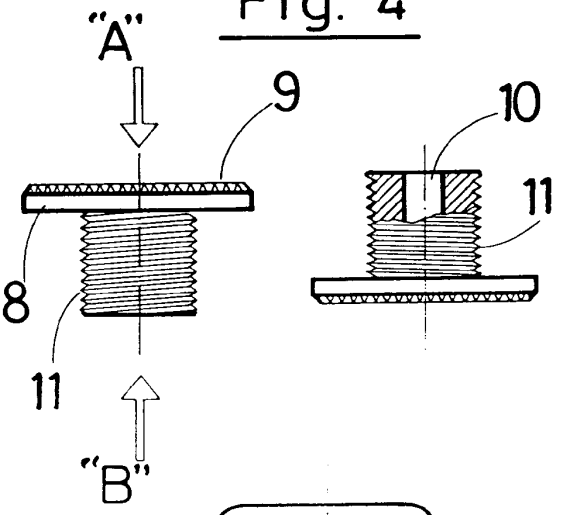


Fig. 4



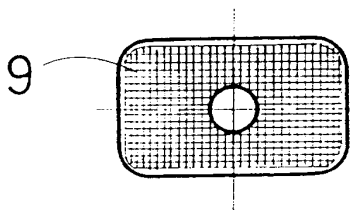


Fig. 5
(view from "A")

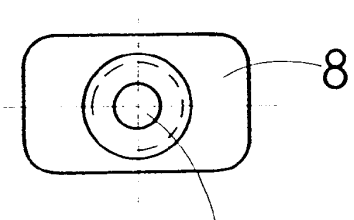


Fig. 6
(view from "B")

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