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DEVICE FOR THE ADJUSTABLE FIXING OF SPINAL OSTEOSYNTHESIS RODS
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- (57) Claim

1. A device for fixing spinal osteosynthesis rods on pedicular screws of the type including a diapason-shaped head defining two branches collectively receiving a rod to be fixed which is blocked in its housing by a locking screw, wherein it further comprises, fitted onto the rod and inserted between the locking screw and the bottom of said housing, a split ring whose opposing external faces directed towards said locking screw and said bottom are convex and received on complementary concave surfaces provided on an adjacent extremity of the locking screw and the bottom of the receiving housing of the rod, said ring authorising a certain angular clearance of the rod with respect to the axis of the locking screw prior to tightening of the locking screw.

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Complete Specification for the invention entitled:

DEVICE FOR THE ADJUSTABLE FIXING OF SPINAL
OSTEOSYNTHESIS RODS

The following statement is a full description of this
invention, including the best method of performing it
known to us:-

21703-A: COS: RK

1555A: rk

DEVICE FOR THE ADJUSTABLE FIXING OF SPINAL
OSTEOSYNTHESIS RODS

The present invention concerns an adjustable spinal instrument for pedicular fixing and makes it possible to
5 adapt and re-establish the physiological curves of the spine.

Generally speaking, joined pedicular screws are implanted by rods or plates, the screw in all cases being strictly perpendicular to the rod or plate.

10 The invention seeks to at least ameliorate this drawback and embodiments offer a rod fixing device enabling the rods to be adjusted with respect to the axis of the pedicular screws.

The invention provides a device for fixing spinal
15 osteosynthesis rods on pedicular screws of the type including a diapason-shaped head defining two branches collectively receiving a rod to be fixed which is blocked in its housing by a locking screw, wherein it further comprises, fitted onto the rod and inserted between the
20 locking screw and the bottom of said housing, a split ring whose opposing external faces directed towards said locking screw and said bottom are convex and received on complementary concave surfaces provided on an adjacent extremity of the locking screw and the bottom of the
25 receiving housing of the rod, said ring authorising a certain angular clearance of the rod with respect to the axis of the locking screw prior to tightening of the locking screw.

Such a device makes it possible to adjust the angle
30 formed by the rod with the axis of the pedicular screw, especially in the sagittal plane, and to lock the rod in the desired position by virtue of the split ring



which deforms and immobilizes the rod under the pressure of the locking screw.

Other characteristics and advantages of the invention shall appear more readily from a reading of the following description of an embodiment of the device of the invention, this description being given solely by way of example and with reference to the accompanying drawings on which :

- Figure 1 is an exploded view of a device conforming to the invention ;

- Figure 2 shows the device of figure 1, the device being assembled except for the cap ;

- Figure 3 is a section along the sagittal plane of a pedicular screw according to the invention ;

- Figure 4 is a perspective view of a split ring according to the invention ;

- Figure 5 is a lateral front view of the ring of figure 4 ;

- Figure 6 is an axial cutaway view of a locking screw according to the invention, and

- Figure 7 is an enlarged view of the extremity of the rod of figure 1.

Figure 1 shows at 1 a known type of pedicular screw. It comprises a conical screw 2, an ogival point 3 and a diapason-shaped cylindrical head 4 pierced on both sides. More specifically, the head 4 comprises two opposing parallel branches 4a and 4b collectively defining a scalloping or housing 5 with a general axis perpendicular to the axis of the screw 2 and able to receive a generally cylindrically shaped rod or integralization element 6. Such a structure is well known and is described in the document GB-2.173.104, for example.

The opposing internal faces of the branches 4a and 4b are cylindrical and threaded in such a way as to receive a locking screw 7 for locking the rod 6 in its housing 5 in the same way as the screw locking device

The head 4 receives a cap 8 covering the upper extremities of the branches 4a and 4b.

In accordance with the invention, locking of the rod 6 is ensured by means of a split ring 9 able to slide freely over the rod 6 received in the housing 5 and locked by the locking screw 7.

The ring 9, the extremity of the locking screw 7 and the portion of the housing 5 in contact with the ring 9 are made to conform with one another in a particular way.

In the embodiment represented, the ring 9 comprises (figure 4) an external spherical convex surface 10 cooperating firstly with a spherical concave surface 11 (figure 6) provided at the extremity of the conical section of the locking screw 7, and secondly with a spherical concave surface 12 (figure 3) provided in the bottom of the receiving housing 5 between the branches 4a and 4b of the rod 6.

The ring 9 is disposed in such a way that its plane is approximately perpendicular (figure 2) to the sagittal plane of the screw 1, which is defined by the axis 13 of the screw and the general axis of the housing 5 receiving the rod 6.

The ring 9 is provided with a straight slot 14 (figures 4 and 5) and has one internal cylindrical face 15 just slightly larger than the diameter of the rod 6.

The rod 6 on which a ring 9 is fitted is inserted inside the housing 5 of the pedicular screw 1 after

placing this screw in the appropriate bony portion. The ring 9 is engaged in the housing 5, 12 as shown on figure 2, then the locking screw 7 is screwed into the space between the branches 4a and 4b. Before locking the ring 9, the cap 8 is placed by simply being engaged astride the two branches 4a and 4b, then the rod 6 is suitably orientated inside the sagittal plane (figure 2) and locked with the desired orientation by compressing the split ring 9 with the locking screw 7. The angular clearance of the rod 6 is, for example, 15° around the position perpendicular to the axis 13 of the screw 1, as illustrated by figure 2.

When adjusting the rod 6, the ring 9 slides over the spherical surfaces 11 and 12 confining the rod.

So as to allow for the free angular clearance of the rod 6, the bottom of the housing 5 at the right of two opposing inlets is slightly recessed at 15 (figures 2 and 3), the truncated section 16 of the point of the locking screw 7 (figure 6) ensuring the free clearance of the rod from the locking screw side.

The cap 8 comprises (figure 2) two opposing scallopings 17 for the free clearance of the rod 6 and a central piercing 18 for the passage of a wrench, such as a six-sided wrench, for tightening the locking screw 7 by means of a hollow six-sided recession 19 provided in the upper face of said screw 7.

The role of the cap is mainly to avoid spacing of the two branches 4a and 4b when tightening the locking screw. The cap 8 may be suppressed if the material of the screw 1 or the size of the branches 4a, 4b, especially as regards its thickness, so allows.

A thorough tightening of the locking screw 7 causes the rod 6 to be locked by the ring 9 in the selected

position, the aperture 14 preferably being placed laterally, as shown on figure 2.

The rod is thus completely locked, both as regards its orientation and rotation around its axis.

The rod 6 may, for example, be a smooth interlocking element provided at its two extremities with a hollow six-sided recession (figure 7) or even an element made up of flexible plaited cylindrical strands.

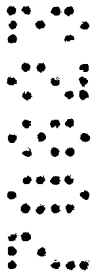
By providing holes or recessions 20, this allows a complementary shaped wrench to be introduced with a view to acting on the derotation of the vertebral column.

In effect, by acting with wrenches on the rotation in the same direction of the rod 6 on its axis, this rod is made to rotate and accordingly the spine rotates along its vertical axis.

Finally, the invention is clearly not merely restricted to the embodiment described above, but covers all possible variants, especially as regards the shape and disposition of the convex and concave surfaces respectively of the ring 9 and the surfaces 11 and 12 between which it is screwed and as regards the locking screw 7 which may be screwed in the opposing branches 4a and 4b or in a piece mounted on the head 4 of the screw. Similarly, the shapes and dimensions of the ring 9 and the slot 14 may also vary without departing from the context of the invention to the extent that the slot plays the same role for elastic clamping the ring by crushing it on the rod to be locked.

In addition, the extremities of the rod 6 may generally have an internal or external angular shape,

as shown on figure 7, the contour of this shape able to be any, such as polygonal with n sides, and suitably-adapted to the contour of the wrench allowing the rod 6 to be rotated on its axis.



THE CLAIMS:

1. A device for fixing spinal osteosynthesis rods on pedicular screws of the type including a diapason-shaped head defining two branches collectively receiving
5 a rod to be fixed which is blocked in its housing by a locking screw, wherein it further comprises, fitted onto the rod and inserted between the locking screw and the bottom of said housing, a split ring whose opposing external faces directed towards said locking screw and
10 said bottom are convex and received on complementary concave surfaces provided on an adjacent extremity of the locking screw and the bottom of the receiving housing of the rod, said ring authorising a certain angular clearance of the rod with respect to the axis of the
15 locking screw prior to tightening of the locking screw.

2. A device according to claim 1, wherein said convex and concave surfaces of the locking screw and the bottom of the receiving housing of the rod are spherical.

3. A device according to claim 1 or 2, wherein the
20 locking screw has a truncated conical point in its central portion so as to define said concave surface.

4. A device according to any one of claims 1 to 3, wherein the bottom of the receiving housing of the rod is provided at the right of the inlets of said housing and
25 on both sides of said concave surface with clearance recesses.

5. A device according to any one of claims 1 to 4, wherein the branches of the head of the screw and the locking screw are covered by a cap provided with a
30 central hole for access to the recession for control of said locking screw.



6. A device according to claim 5, wherein said cap is provided on its edge with opposing scallopings ensuring the rod with free clearance.

5 7. A device according to any one of claims 1 to 6, wherein the rod is provided at each extremity with a hollow or relief shape making it possible, with the aid of suitably sized wrenches, to rotate the rod around its axis.

10 8. A device for fixing spinal osteosynthesis rods on pedicular screws substantially as herein described with reference to the accompanying drawings.

DATED this 7th day of February 1994

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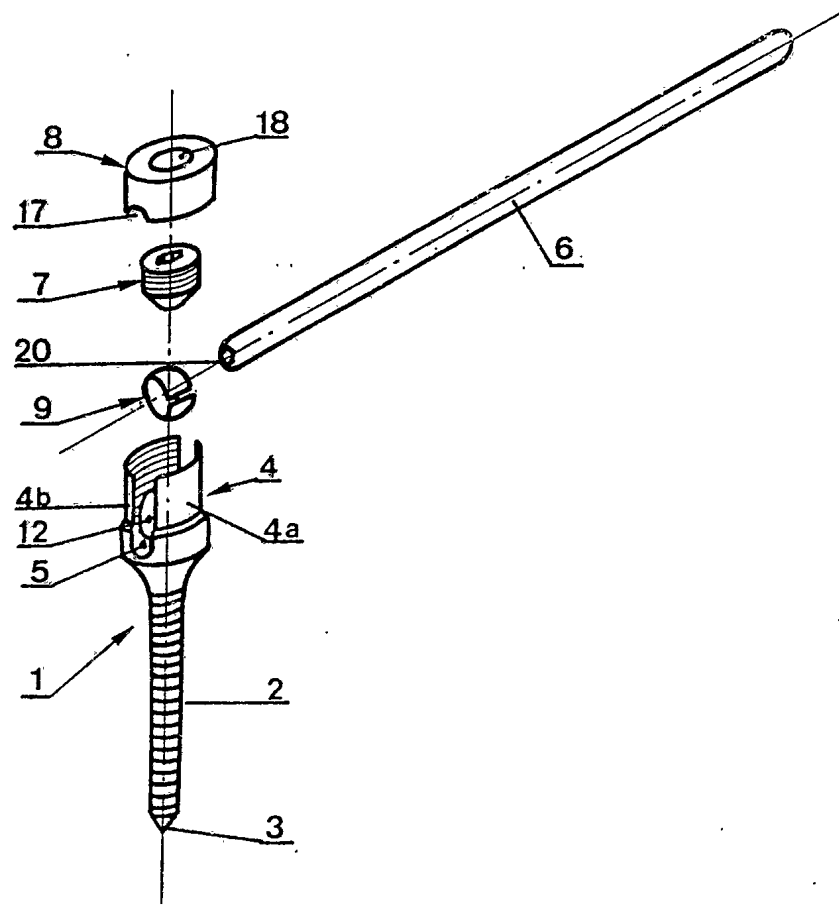


FIG 1

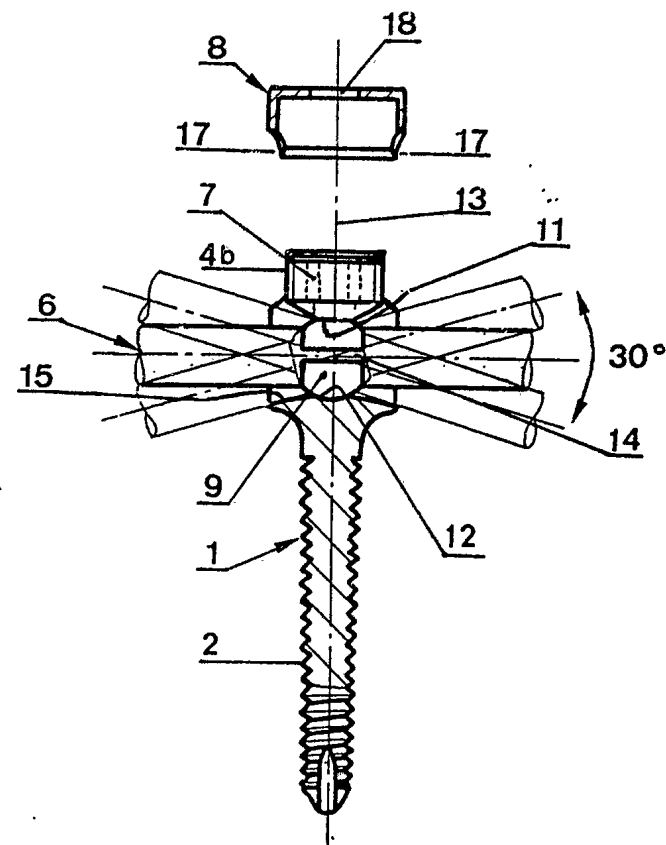


FIG 2

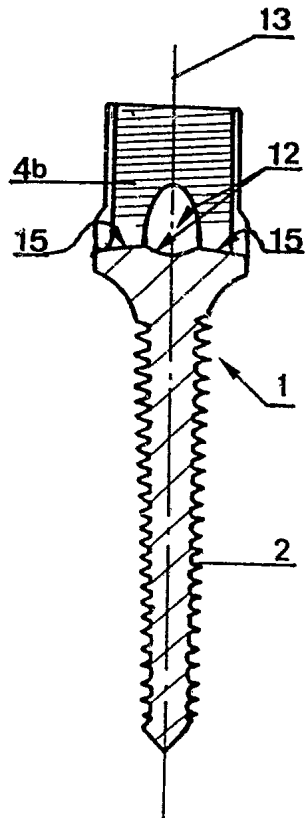


FIG 3

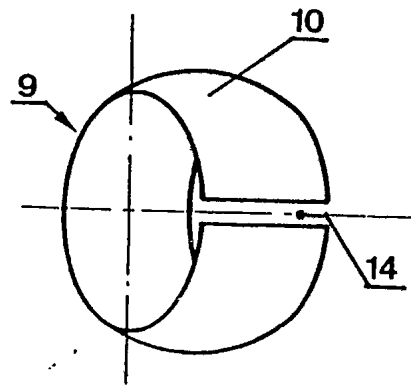


FIG 4

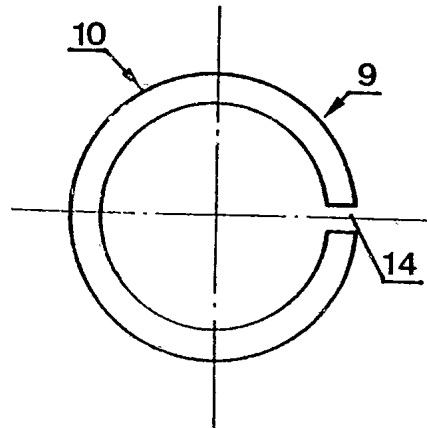


FIG 5

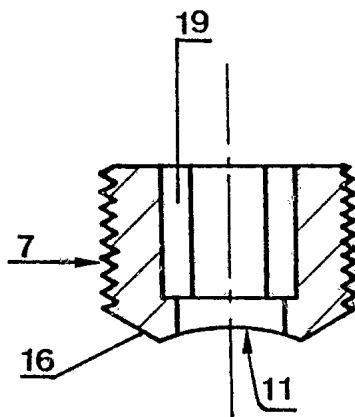


FIG 6

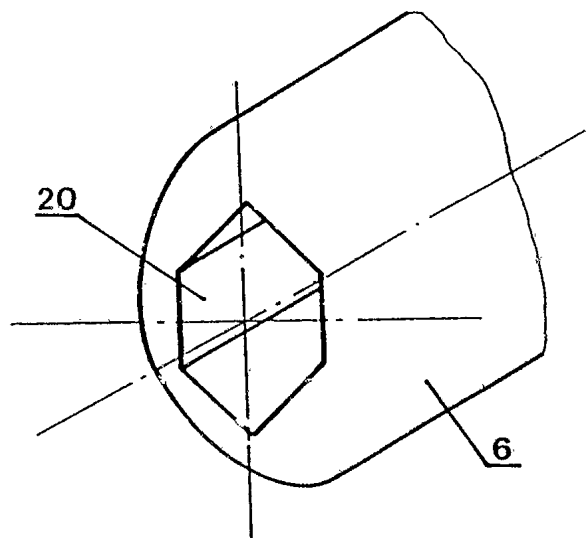


FIG 7