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(54) **ANCHORING ELEMENT FOR FIXING A ROD OF A DEVICE FOR SETTING A HUMAN OR ANIMAL SPINAL COLUMN TO A VERTEBRA**

(76) Inventor: **Peter Metz-Stavenhagen**, Bad Wildungen (DE)

Correspondence Address:
WELSH & KATZ, LTD
120 S RIVERSIDE PLAZA
22ND FLOOR
CHICAGO, IL 60606 (US)

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(57) **ABSTRACT**

The invention relates to an anchoring element for fixing a rod of a device for setting a human or animal spinal column to a vertebra, comprising a screwed element (**16**) and a retaining element, whereby the screwed element (**16**) has a bearing element in the form of a spherical segment and a conically-tapering threaded shaft (**18**) and the retaining element has a mounting (**12**), for housing the rod and a bearing shell (**14**), for housing the bearing element of the screwed element (**16**). According to the invention, an anchoring element with low material requirements and simple to produce can be achieved, whereby the bearing shell (**14**) is embodied to correspond to the bearing element such that the bearing element may be directly mounted in the bearing shell (**14**).

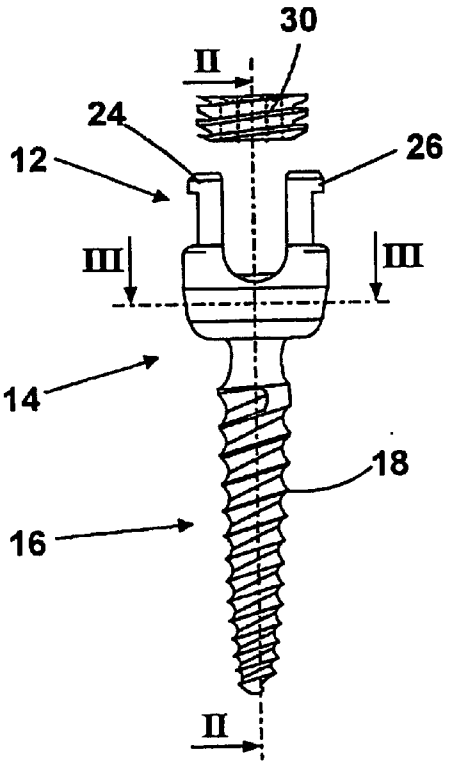

Fig. 1

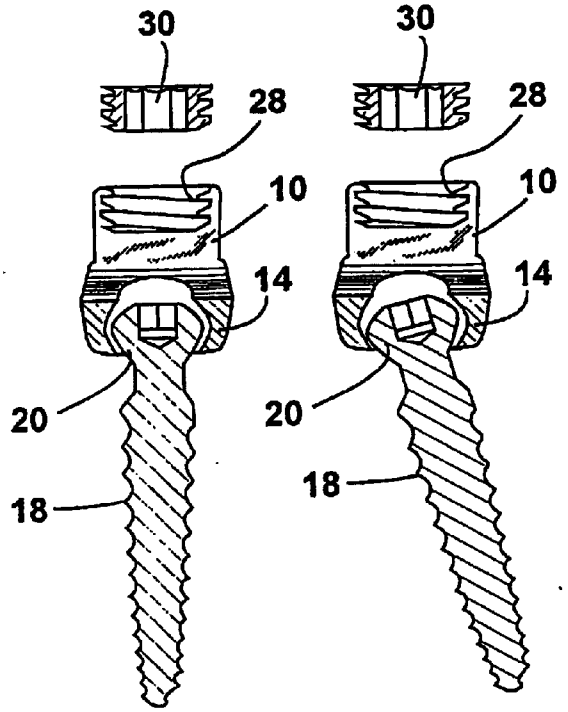

Fig. 2a Fig. 2b

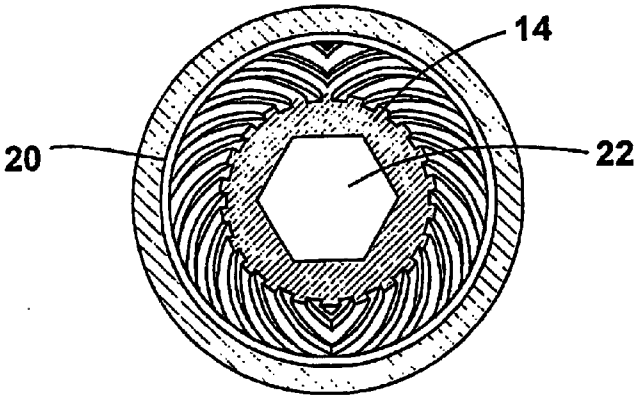

Fig.3

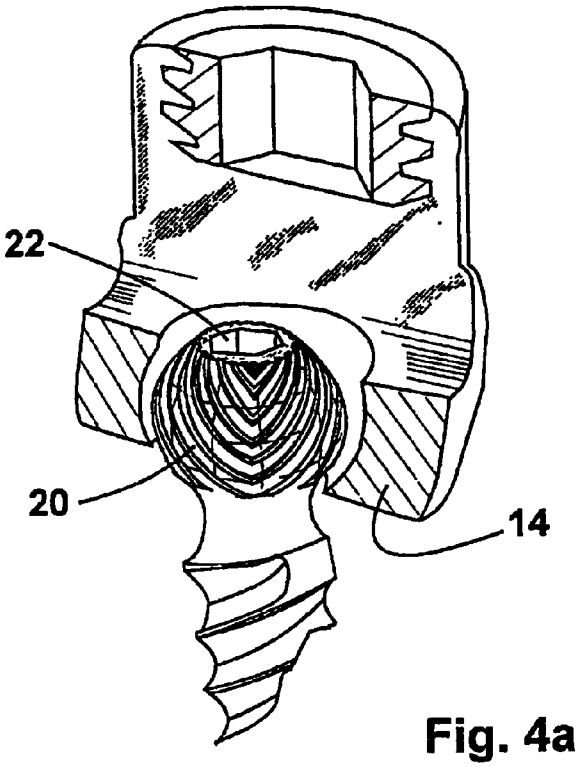

Fig. 4a

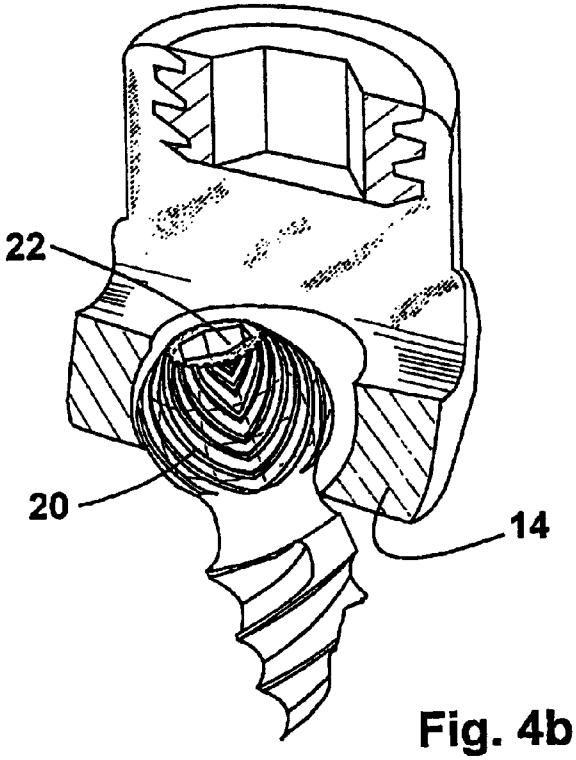

Fig. 4b

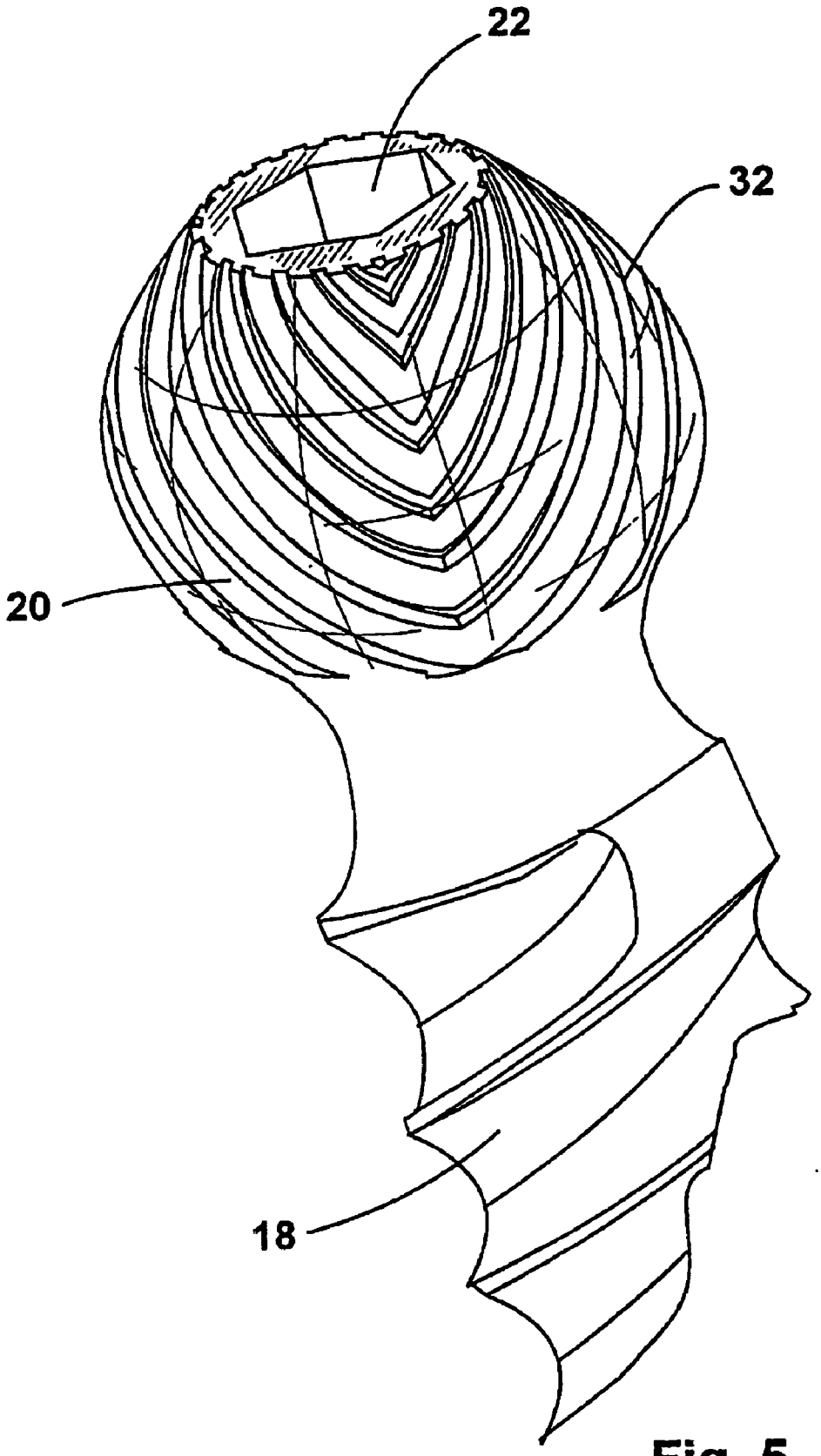

Fig. 5

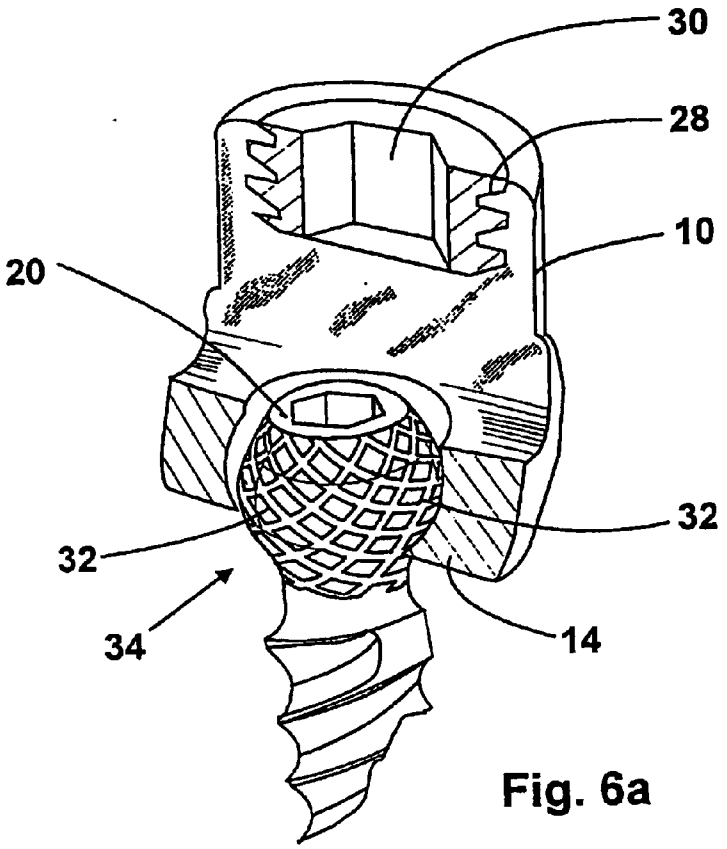

Fig. 6a

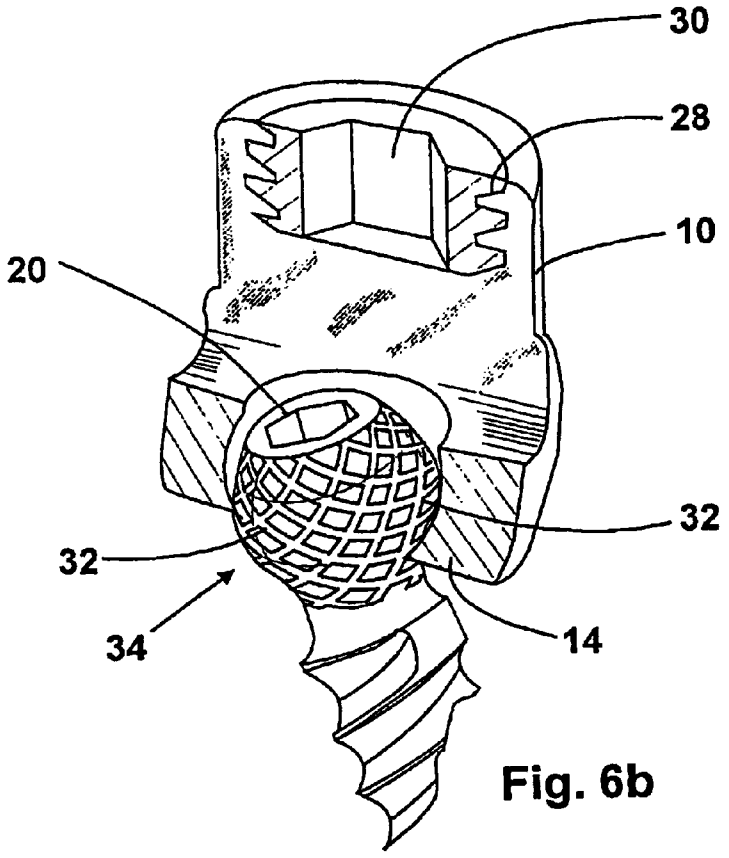

Fig. 6b

ANCHORING ELEMENT FOR FIXING A ROD OF A DEVICE FOR SETTING A HUMAN OR ANIMAL SPINAL COLUMN TO A VERTEBRA

BACKGROUND OF THE INVENTION

[0001] DE 203 07 776.8 dated May 19, 2003

[0002] 1. Field of the Invention

[0003] The present invention relates to an anchoring element for fastening a rod of a device for adjusting a human or animal spine to a vertebral bone, said anchoring element having a screw element and a retaining element, the screw element comprising a bearing element in the shape of a spherical segment and a threaded shank provided with a conical taper and the retaining element comprising a mounting for receiving the is rod and a bearing shell for receiving the bearing element of the screw element.

[0004] 2. Description of the Prior Art

[0005] An anchoring element in which the screw element is configured to be detached from the retaining element is known from EP 0 885 598 A2. A bearing element disposed on the screw element is thereby configured in the shape of a spherical segment so that the retaining element is pivotal in any direction with respect to the screw element. Such type anchoring elements are often referred to as polyaxial screws.

[0006] In the case of the polyaxial screw in accordance with EP 0 885 598 A2, there is provided between the bearing element and the retaining element a resilient clamping element which, after mounting of the rod, gets jammed with respect to the retaining element in such a manner that the bearing element is solidly and non-slidably retained in its actual position together with the screw element. This makes it possible to position the rod for adjusting a human or animal spine in almost any position with respect to the actual screw element while still achieving sufficient anchorage in the spine. It is very complicated, in terms of construction, to dispose such a clamping element between the bearing element and the retaining element and it requires a great expense of material. Considering that such polyaxial screws are usually made from titanium, it will be evident that very high costs are involved.

BRIEF SUMMARY OF THE INVENTION

[0007] In view thereof it is the object of the present invention to provide an anchoring element that requires less material to construct and is easier to fabricate.

[0008] As a technical solution to this object the present invention suggests an anchoring element in accordance with the features of claim **1**. Advantageous developed implementations of the anchoring element of the invention are recited in the subordinate claims.

[0009] An anchoring element configured in accordance with this technical solution has the advantage that having the bearing element directly carried in the bearing shell allows a clamping element known from prior art to be eliminated. Material savings can thus be made on the very expensive titanium and construction can be simplified so chat the anchoring element of the invention can be manufactured at a much lower cost.

[0010] A rod is placed into the preferably U-shaped mounting of the anchoring element of the invention and is fixed with a screwable securing element. Said rod thereby pushes onto the bearing element in the shape of a spherical segment and presses it into the bearing shell. As a result, an increased friction is generated between the bearing element and the bearing shell, said friction retaining the holding element with respect to the screw element in the momentary position. Although the bearing element comes to rest against the bearing shell by a portion of its surface only, the pressure exerted by the rod via the bearing element onto the bearing shell is sufficient to prevent the holding element from sliding out of place with respect to the screw element as soon as the rod is firmly fixed in the mounting.

[0011] In a preferred developed implementation, it has been found advantageous to provide the surface of the bearing element and/or the bearing shell with dimples or to roughen the same, more specifically to provide for a number of flutes or grooves in the surface of the bearing element and/or the bearing shell. By designing the surface in this way, the contact surface between the bearing element and the bearing shell will be further reduced so that the pressure exerted by the rod onto the bearing element leads to an increased surface pressure on the remaining contact surface, which, in the end, s results in an increased frictional contact and causes the holding element to be reliably fixed with respect to the screw element.

[0012] It has thereby been found very advantageous to have the flutes or grooves oriented obliquely, more specifically to dispose the flutes or grooves on the confronting sides of the bearing element so as to be oriented in opposite directions. This permits to achieve an even better frictional contact between the bearing element and the bearing shell when the rod is mounted.

[0013] Further advantages of the anchoring element of the invention will become apparent in the appended drawings and in the following description of embodiments thereof. Likewise, the invention lies in each and every novel feature or combination of features mentioned above or described herein after. The embodiments discussed herein are merely exemplary in nature and are not intended to limit the scope of the invention in any manner.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

[0014] In the drawing:

[0015] FIG. **1** is a front view of an anchoring element of the invention with the securing element being pulled out to show an exploded view thereof;

[0016] FIG. **2***a* is a sectional view of the anchoring element of FIG. **1**, taken along the line II-II of FIG. **1** in a first position;

[0017] FIG. **2***b* is a sectional view of the anchoring element of FIG. **1**, taken along the line II-II of FIG. **1** in a second position;

[0018] FIG. **3** is a top view of the anchoring element of FIG. **1**, taken along the line III-III of FIG. **1**;

[0019] FIG. **4***a* is a perspective partial view of the anchoring element of FIG. **2***a;*

[0020] FIG. **4***b* is a perspective partial view of the anchoring element of FIG. **2***b;*

[0021] FIG. **5** is a perspective view of the bearing element of the anchoring element of FIG. **1**;

[0022] FIG. **6***a* is a partial perspective view of a second embodiment of an anchoring element of the invention in a first position, illustrated in partial section view;

[0023] FIG. **6***b* is a partial perspective view of a second embodiment of an anchoring element of FIG. **6***a* in a second position, illustrated in partial section view;

DETAILED DESCRIPTION OF THE INVENTION

[0024] The anchoring element illustrated in the FIGS. **1** through **5** is a component part of a device for adjusting a human or animal spine. This anchoring element serves to fasten a quite long rod to a vertebral bone and includes a holding element **10** with a mounting **12** for receiving a rod that has not been illustrated herein and a bearing shell **14** connected to, and integral with, said mounting **12** and a screw element **16** having a threaded shank **18** with a conical taper and a bearing element **20** in the shape of a spherical segment connected to, and integral with, the threaded shank **18**. The thread of the threaded shank **18** is for example configured to be a bio thread, a cancellous thread or the like and a wrench receiving bore **22** for a hexagon socket is provided on an upper side of the bearing element **20** so that the screw element can be readily introduced into, and fixated to, a vertebral body.

[0025] The mounting **12** is configured in a U shape and includes two coaxially disposed ridges **24**, **26** on the inner side of which there is formed a buttress thread **28**. This buttress thread **28** is described in detail in EP 0 885 598 A2. A securing element implemented as a grub screw **30** can be screwed in the axial direction into the mounting **12** in order to fixate the rod placed into the mounting **12**.

[0026] On its surface configured in the shape of a spherical segment, the bearing element **20** is provided with a number of flutes **32** that are oriented obliquely. On one half of the bearing element **20**, the flutes **32** are thereby oriented in another direction than on the opposite half of said bearing element **20**.

[0027] The FIGS. **6***a* and **6***b* illustrate another embodiment of the anchoring element of the invention. This embodiment differs from the first one in that all of the flutes **32** distributed over the entire surface of the bearing element are disposed so as to be oriented in opposite directions so that a fluting **34** is formed on the surface of the bearing element.

[0028] After the operating surgeon has screwed the screw element **16** into the vertebral bone at the desired location by means of a hexagonal wrench, the rod is placed into the mounting **12** and is at first retained by the grub screw **30**. After the spine, the rod and the holding element **10** are aligned as desired, the grub screw **30** is tightened so that the desired positions of the rod and the spine are fixed. The grub screw **30** thereby pushes onto the rod that has not been illustrated herein and the latter in turn presses the bearing element **20** into the bearing shell **14**. The surface of the bearing element **20**, which is provided with the flutes **32** or a fluting **34**, is thereby pushed into the bearing shell **14** so as to generate a very high surface pressure. This high surface pressure permits to fix the bearing shell **14** with respect to the bearing element **20** so that the holding element **10** is retained in the desired position with respect to the screw element **16**.

LISTING OF NUMERALS

[0029] **10** holding element

[0030] **12** mounting

[0031] **14** bearing shell

[0032] **16** screw element

[0033] **18** threaded shank

[0034] **20** bearing element

[0035] **22** wrench receiving bore

[0036] **24** ridge

[0037] **26** ridge

[0038] **28** buttress thread

[0039] **30** grub screw

[0040] **32** flutes

[0041] **34** fluting

I claim:

1. An anchoring element for fastening a rod of a device for adjusting a human or animal spine to a vertebral bone, s said anchoring element having a screw element (**16**) and a retaining element (**10**), said screw element (**16**) comprising a bearing element (**20**) in the shape of a spherical segment and a threaded shank (**18**) provided with a conical taper and the retaining element (**10**) comprising a mounting (**12**) for receiving the rod and a bearing shell (**14**) for receiving the bearing element (**20**) of the screw element (**16**), characterized in that the bearing shell (**14**) is configured to correspond to the bearing element (**20**) so that the bearing element (**20**) is adapted to be directly carried in the bearing shell (**14**).

2. The anchoring element according to claim 1,

characterized in that the bearing element (**20**) and/or the bearing shell (**14**) comprise surface dimples or roughenings.

3. The anchoring element according to claim 1,

characterized in that the bearing element (**20**) and/or the bearing shell (**14**) comprises a number of flutes (**32**) or grooves on its surface.

4. The anchoring element according to claim 3,

characterized in that the flutes (**32**) or grooves are oriented obliquely.

5. The anchoring element according to claim 4,

characterized in that the flutes (**32**) or grooves are disposed on confronting sides of the bearing element (**20**) or the bearing shell (**14**) so as to be oriented in opposite directions.

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