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Screw comprising an integrated screwdriver

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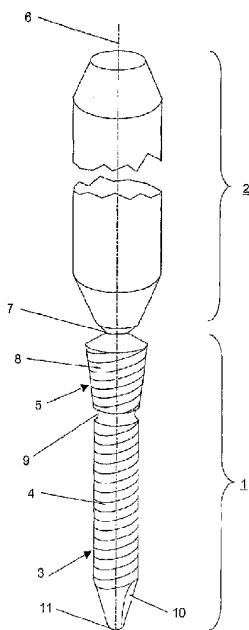
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[Fortsetzung auf der nächsten Seite]

(54) Title: SCREW COMPRISING AN INTEGRATED SCREWDRIVER

(54) Bezeichnung: SCHRAUBE MIT INTEGRIERTEM SCHRAUBENDREHER



(57) Abstract: The inventive device consists of a screw (1) comprising an integrated screwdriver (2). The screw (1) has a screw shank (3) with a thread (4), a screw head (5) with a thread (8), and has a longitudinal axis (6). The screwdriver (2) is, via a predetermined breaking point (7), joined to the screw head (5) in a manner that is coaxial to the longitudinal axis (6). When tightening the screw, the integrated screwdriver is sheared off at the predetermined breaking point, whereby the shearing off torque is defined by the selected dimensions of the predetermined breaking point. The inventive screw comprising an integrated screwdriver permits even very small-dimensioned screws to be easily held and to be screwed into the plate boring (13) of a bone plate (12) while being guided well therein at a constant angle. The coaxial disposition of the integrated screwdriver and its fixed connection to the screw head enables the screw (1) to be received in any position around the longitudinal axis, and the position of the screwdriver does not need to be considered.

(57) Zusammenfassung: Die erfindungsgemässe Vorrichtung besteht aus einer Schraube (1) mit integriertem Schraubendreher (2). Die Schraube (1) weist einen Schraubenschaft (3) mit Gewinde (4), einen Schraubenkopf (5) mit Gewinde (8) und eine Längsachse (6) auf. Der Schraubendreher (2) ist koaxial zur Längsachse (6) über eine Sollbruchstelle (7) mit dem Schraubenkopf (5) verbunden. Beim Festziehen der Schraube wird der integrierte Schraubendreher an der Sollbruchstelle abgesichert, wobei das Absichermoment durch die gewählte Dimensionierung der Sollbruchstelle definiert ist. Die erfindungsgemässe Schraube mit integriertem Schraubendreher gestattet auch sehr klein dimensionierte Schrauben einfach zu halten und gut geführt winkelt stabil in die Plattenbohrung (13) einer Knochenplatte (12) einzudrehen. Durch die koaxiale Anordnung des integrierten Schraubendrehers und seine feste Verbindung mit dem Schraubenkopf, kann die Schraube (1) in jeder beliebigen Position um die Längsachse aufgenommen werden und es muss nicht auf die Position des Schraubendrehers Rücksicht genommen werden.



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**Veröffentlicht:**

— mit internationalem Recherchenbericht

*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.*

# **SCREW COMPRISING AN INTEGRATED SCREWDRIVER**

The invention concerns a screw with an integrated screwdriver.

- 5 The below discussion of documents, acts, materials, devices, articles and the like is included in this specification solely for the purpose of providing a context for the present invention. It is not suggested or represented that any of these matters formed part of the prior art base or were common general knowledge in the field relevant to the present invention as it existed before the prior date of
- 10 each claim of this application.

The problem of reliable manipulation, holding and guiding is a problem occurring especially in the case of screws having small dimensions, like those used, for example, in osteosynthesis. The grasping of smaller screws itself,

15 particularly when carrying out critical tasks, as those occurring, for example, in bone-surgery, can be extremely difficult.

A further problem is that the torque cannot be controlled with conventional screwdrivers. To enable to apply a predetermined torque special torque-

20 indicating screwdrivers are required.

According to the present invention, there is provided a screw with an integrated screwdriver, wherein

- 25 A) the screw has a screw shank with a thread, a screw head and a longitudinal axis, and
- B) coaxially with the longitudinal axis the screwdriver is connected with the screw head via a predetermined breaking position, wherein
- C) the screw head has an outside thread, wherein
- D) the screw head expands tapered in the direction of the screwdriver, and
- 30 wherein
- E) between the screw shank and the screw head an undercut for the thread is provided.

Desirably, the present invention can provide a screw with a screwdriver integrated via a predetermined breaking position that can be anchored in an angularly stable manner, so that the screw can be simply screwed in in an angularly stable manner with a predetermined torque.

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By virtue of the outside thread of the screw head, said outside thread can correspond with a (preferably cylindrical or tapered) inner thread in the bore of a plate, it can be ensured that the plate will not be pressed against the bone and the screw can be reliably anchored in an angularly stable manner and can remain so. This is in contrast to a smooth tapered execution of the screw head, whereby the head is fixed only due to the frictional force and thus has no positive locking at all. The frictional locking, based on the frictional force alone, is brought about by holding the bone against it during the tightening of the screw, and has the disadvantage that the screw can get loose under load.

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When the screw is tightened, the integrated screwdriver can shear off at the predetermined breaking position, while the shearing torque is defined by the selected dimensioning of the predetermined breaking position.

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The screw with the integrated screwdriver according to the invention can allow also the simple holding of very small screws and their screwing into a bore, for example, of a bone plate, while being guided. By virtue of the coaxial arrangement of the integrated screwdriver and its firm connection with the screw head, the screw can be picked up in any position about the longitudinal axis and the position of the screwdriver does not need to be taken into consideration.

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In a preferred embodiment the screw head expands tapered in the direction of the screwdriver, allowing an angularly stable fixing of the screw head in a bone plate with a correspondingly tapered hole in the plate.

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The thread of the screw shank can be constructed as a self-tapping one, by providing on its free end, i.e. at the tip of the screw, a corresponding flute, that is preferably parallel with the longitudinal axis of the screw.

- 5 The device according to the invention can be particularly suitable for screws with small dimensions, preferably those having a diameter smaller than 2.0 mm, further preferably smaller than 1.0 mm.

- 10 The diameter of the predetermined breaking position is preferably greater than the diameter of the undercut for the thread between the screw shank and the screw head.

- 15 In the case of a special construction the diameter of the predetermined breaking position is 60 to 82 %, preferably 66 to 75 % of the outside diameter of the thread. In absolute figures the predetermined breaking position can have a diameter of 0.25 to 0.5 mm, preferably 0.32 to 0.38 mm.

- 20 The screw with the integrated screwdriver can be connected to a mechanical drive via a clutch. This drive can be either a manually actuated handle or a machine driven by a motor.

The invention and its developments are explained in the following in detail based on a partly schematic illustration of an embodiment.

- 25 They show in:

Fig.1 - a perspective view of the screw with the integrated screwdriver,

- 30 Fig.2 - a longitudinal section through the screw with the integrated screwdriver, and

Fig.3 - a perspective view of a bone plate to accept a screw according to Fig.1.

The screw 1, illustrated in Figs.1 and 2, and the integrated screwdriver 2 have a common longitudinal axis 6. The screw 1, constructed as a bone screw, is 2.6 mm long and has a 1.3 mm long screw shank 3 with a thread 4 and a 1.1 mm long tapered screw head 5 with an outside thread 8. Between the screw shank 3 and the screw head 5 an undercut 9 for the thread is provided. The thread 4 of the screw shank 3 has a self-tapping construction by means of a flute 10. The screwdriver 2 is 4.9 mm long and is joined coaxially with the screw head 5 via a predetermined breaking position 7. The predetermined breaking position has a diameter of 0.35 mm.

The screw 1 can be introduced into the bore 13 of the plate of the bone plate 12 illustrated in Fig.3. The inner thread 14 of the bore 13 of the plate, that corresponds with the outside thread 8 of the screw 1, brings about an angularly stable anchoring of the screw 1 relative the bone plate 12. The inner thread 14 and the outside thread 8 corresponding with it can be also carried out as multi-start, preferably two-start, threads.

The invention described herein is susceptible to variations, modifications and/or additions other than those specifically described and it is to be understood that the invention includes all such variations, modifications and/or additions which fall within the spirit and scope of the above description.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A screw with an integrated screwdriver, wherein
- 5      A) the screw has a screw shank with a thread, a screw head and a longitudinal axis, and
- B) coaxially with the longitudinal axis the screwdriver is connected with the screw head via a predetermined breaking position, wherein
- C) the screw head has an outside thread, wherein
- D) the screw head expands tapered in the direction of the screwdriver, and wherein
- 10      E) between the screw shank and the screw head an undercut for the thread is provided.
2. A screw with an integrated screwdriver according to claim 1, wherein the thread of the screw shank has a self-tapping construction.
- 15      3. A screw with an integrated screwdriver according to claim 1 or 2, wherein at a free end of the screw a flute is provided.
4. A screw with an integrated screwdriver according to any one of claims 1 to 3, wherein the screw is a bone screw.
- 20      5. A screw with an integrated screwdriver according to any one of claims 1 to 4, wherein the diameter of the screw is smaller than 2.0 mm.
6. A screw with an integrated screwdriver according to claim 5, wherein the diameter of the screw is smaller than 1.0 mm.
- 25      7. A screw according to any one of the embodiments substantially as herein described and illustrated.

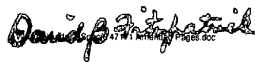
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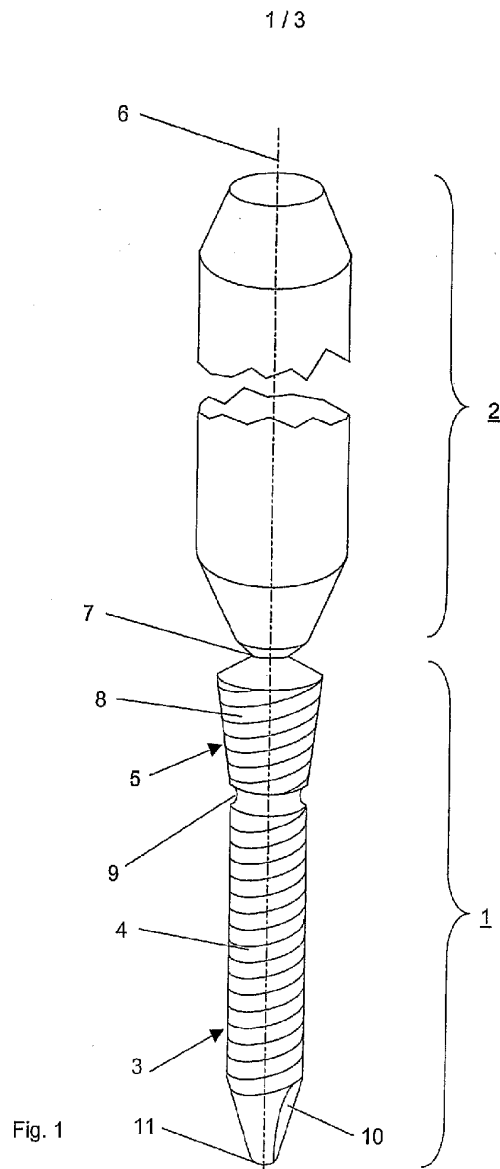
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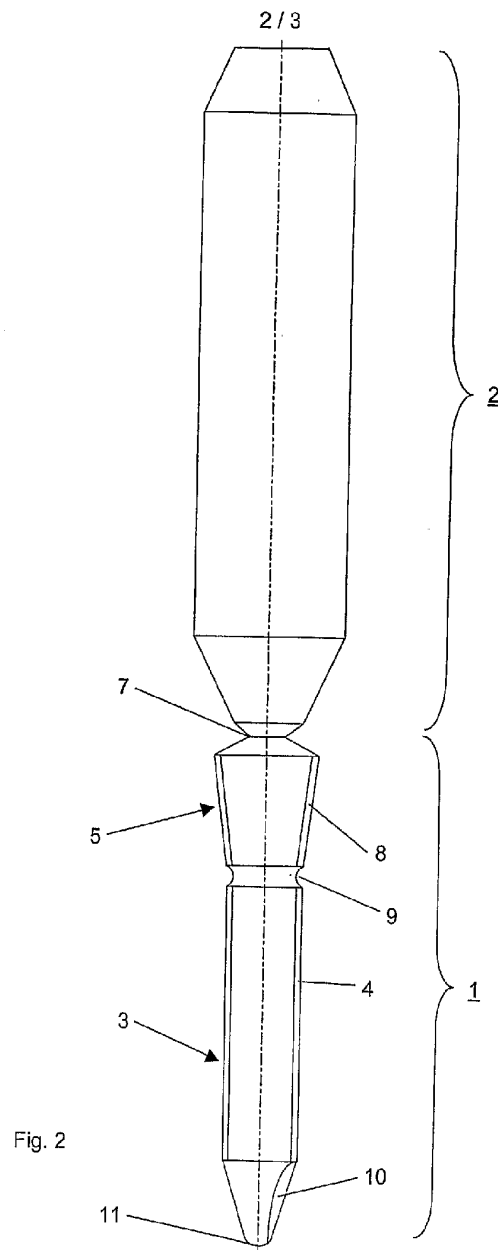
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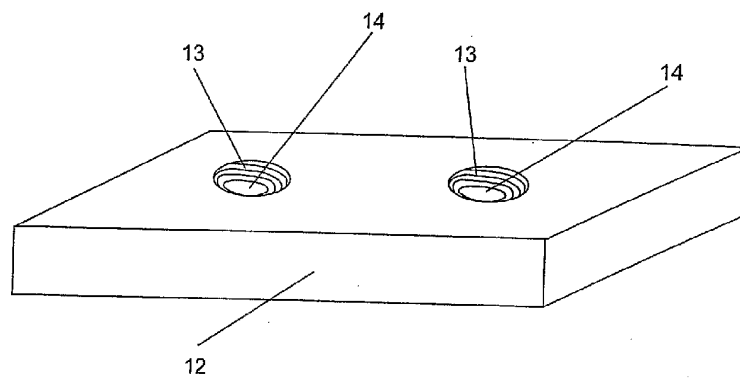


Fig. 3