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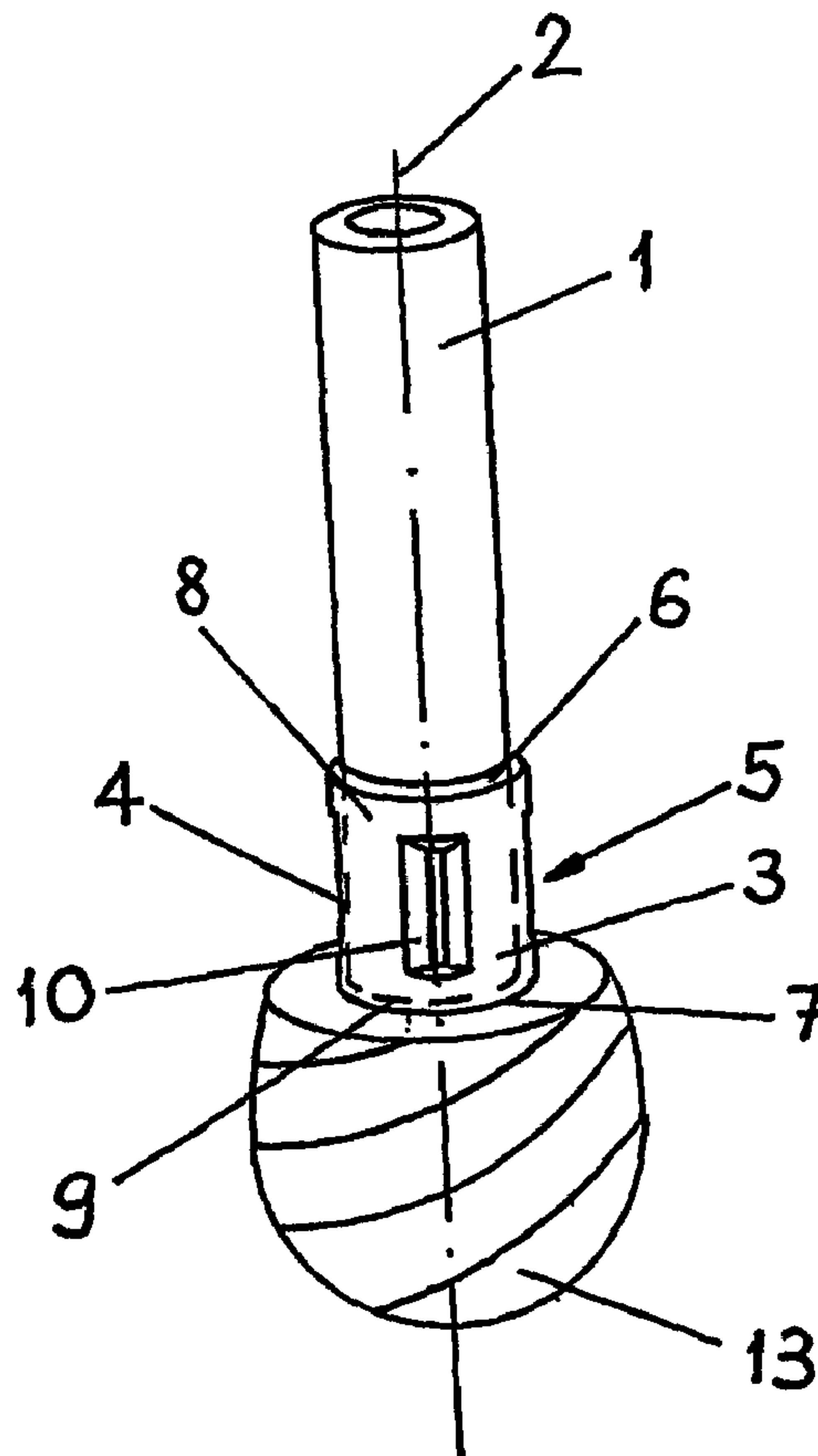
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(54) Title: DEVICE FOR CONNECTION OF SURGICAL CLEARING OR DRILLING TOOL COMPONENTS



(57) Abrégé/Abstract:

The invention relates to a device for connecting surgical clearing or drilling tools with a shaft, comprising the following: A) a shaft (1) with a central axis (2) and a front end (3); and B) a hollow body (5) comprising a first end (6), a second end (7), a wall (8) and a

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

hollow space (4) which is coaxial to the central axis (2). The shaft (1) is guided into the hollow space (4) coaxially from the first end (6), with its front end (3), while the hollow body (5) can be or is connected to an implant or instrument component with its second end (7). After the shaft (1) has been guided coaxially into the hollow space (4) from the first, shaft-side end (6) of the hollow body with its front, drill head-side end (3), a stamping tool (not included in the drawing) is used to plastically deform the wall (8) of the hollow body (5) in such a way as to produce four impressions (10), each with a projection (11) in the hollow space (4). The projections (11) cause the shaft (1) to become deformed on the periphery in accordance with the projections (11), so that a form-fit fixture is created coaxially to the central axis (2) in terms of rotation about the central axis (2) and displacement between the shaft (1) and the hollow body (5).

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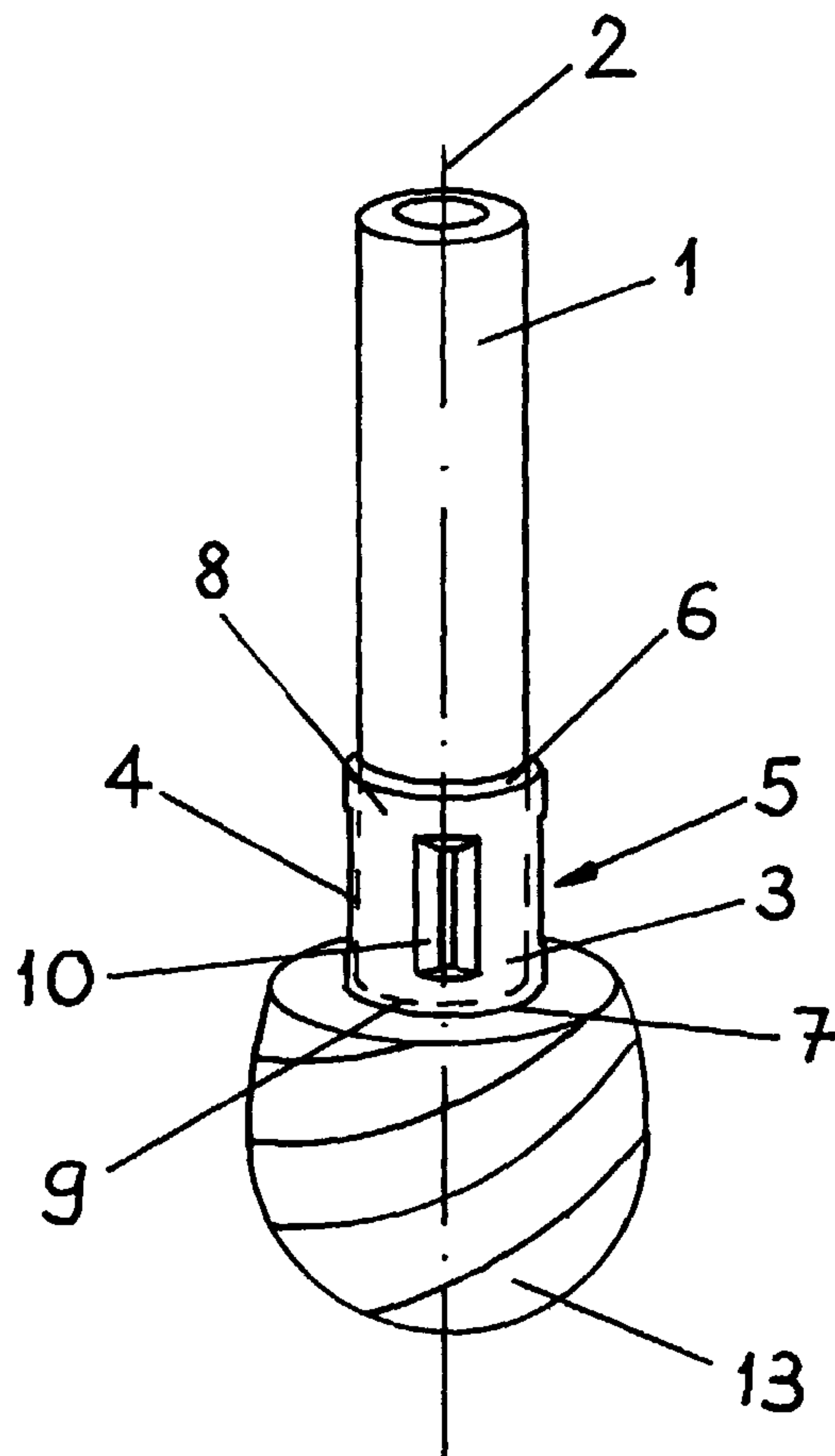
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[Fortsetzung auf der nächsten Seite]

(54) Title: DEVICE FOR CONNECTING SURGICAL CLEARING OR DRILLING TOOL COMPONENTS

(54) Bezeichnung: VORRICHTUNG ZUR VERBINDUNG CHIRURGISCHER RÄUM- ODER BOHRWERKZEUG-BE-
STANDTEILEN

(57) **Abstract:** The invention relates to a device for connecting surgical clearing or drilling tools with a shaft, comprising the following: A) a shaft (1) with a central axis (2) and a front end (3); and B) a hollow body (5) comprising a first end (6), a second end (7), a wall (8) and a hollow space (4) which is coaxial to the central axis (2). The shaft (1) is guided into the hollow space (4) coaxially from the first end (6), with its front end (3), while the hollow body (5) can be or is connected to an implant or instrument component with its second end (7). After the shaft (1) has been guided coaxially into the hollow space (4) from the first, shaft-side end (6) of the hollow body with its front, drill head-side end (3), a stamping tool (not included in the drawing) is used to plastically deform the wall (8) of the hollow body (5) in such a way as to produce four impressions (10), each with a projection (11) in the hollow space (4). The projections (11) cause the shaft (1) to become deformed on the periphery in accordance with the projections (11), so that a form-fit fixture is created coaxially to the central axis (2) in terms of rotation about the central axis (2) and displacement between the shaft (1) and the hollow body (5).

(57) **Zusammenfassung:** Vorrichtung zur coaxialen Verbindung von chirurgischen Räum- oder Bohrwerkzeugen mit einer Welle, umfassend A) eine Welle (1) mit einer Zentralachse (2) und einem vorderen Ende (3); und B) einen Hohlkörper (5) mit einem ersten Ende (6), einem zweiten Ende (7), einer Wand (8) und einem zur Zentralachse (2) coaxialen Hohlraum (4). Die Welle (1) ist mit ihrem vorderen Ende (3) vom ersten Ende (6) her coaxial in den Hohlraum (4) eingeführt, während der Hohlkörper (5) mit seinem zweiten Ende (7) mit einem Implantaten- oder Instrumenten-Bestandteil verbindbar oder verbunden ist. Nachdem die Welle (1) mit ihrem vorderen, bohrkopfseitigen Ende (3) vom ersten, wellenseitigen Ende (6) des Hohlkörpers her coaxial in den Hohlraum (4) eingeführt wurde, wird mittels eines Prägewerkzeuges (nicht gezeichnet) die Wand (8) des Hohlkörpers (5) so plastisch verformt, dass vier Einprägungen

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DEVICE FOR THE CONNECTION OF SURGICAL CLEARING OR DRILLING TOOL COMPONENTS

The invention relates to a device, for the coaxial connection of surgical clearing or drilling tools to a shaft which includes A) a shaft with a central axis and a front end, B) a hollow body with a first end, a second end, a wall, and a hollow space coaxial to the central axis, where the shaft is introduced, by its front end, coaxially into the hollow space, from its first end, and the hollow body can be connected or is connected by its second end to a tool or coupling part, characterized by the fact that C) the wall has at least one plastically deformed impression having a raised section in the hollow space.

In various instruments used in surgery a transmission of torque or force between two components of the instrument is necessary. The transmission of torque serves, for example, for the rotative drive of a surgical tool while the transmission of force is done in the axial direction. Form-locking connections between the two parts are advantageous for the transmission of torque or force. Such connections occur, for example, in the coupling of a flexible drill shaft with the drilling heads for the boring of marrow spaces in bones.

Such a device with form-locking connections for the transmission of torque and axial force between a drive means and a flexible shaft, as well as between the flexible shaft and a clearing tool, has been disclosed in US 5,720,749 RUPP. In one form of embodiment, cams are formed in the cylindrical hollow section in a hollow body on the clearing tool, said hollow body serving for the axial accommodation of the flexible shaft, before the joining of the clearing tool and flexible shaft through plastic deformation. Subsequently, the flexible shaft is pressed in the axial direction into this hollow section provided with cams whereby the shaft is radially deformed by the cams and thus is connected to the hollow body tangentially by means of a form-lock and axially by means of a press fit. It is disadvantageous in this known connection that through the pressing of the flexible shaft into the hollow body's hollow space provided with cams the flexible shaft is significantly deformed by the cams and thus, despite the axial conical centering at the front end, a corresponding concentric coaxial connection is not ensured.

Here the invention aims to provide a remedy. The objective of the invention is to provide a form-locking connection for the transmission of torque and axial force in which the joining of the flexible shaft to the hollow body is accomplished, absolutely concentrically and coaxially, by means of a sliding fit and a rotatively and axially form-locking connection can be produced.

The invention realizes the objective set with a device for the coaxial connection of surgical clearing or drilling tools to a shaft which includes A) a shaft with a central axis and a front end, B) a hollow body with a first end, a second end, a wall, and a hollow space coaxial to the central axis, where the shaft is introduced, by its front end, coaxially into the hollow space, from its first end, and the hollow body can be connected or is connected by its second end to a tool or coupling part, characterized by the fact that C) the wall has at least one plastically deformed impression having a raised section in the hollow space.

The device according to the invention for the coaxial connection of surgical clearing or drilling tools to a shaft includes a shaft and a hollow body with a hollow space coaxial to the central axis, where the shaft is introduced, by its front end, coaxially into the hollow space, from its first end, and the hollow body can be connected by its second end to an instrument component, for example, a coupling part or a drill head for marrow space drilling. Moreover, the wall of the hollow body has at least one plastically deformable impression with a raised section in the hollow body. In this case, the shaft's deformation caused by the at least one raised section can be a plastic and/or elastic deformation.

In a preferred form of embodiment of the device according to the invention the shaft is structured at the front end as a circular cylinder coaxial to the central axis and has a diameter d . The hollow space is also formed as a circular cylinder coaxial to the central axis and has a diameter D , where the diameters d and D are chosen so that a close sliding fit is formed between the shaft and the hollow space. Through the close sliding fit a precisely coaxial connection between shaft and hollow body is made possible which is not affected by the application of pressing forces during the production of the plastic impressions in the hollow body after pushing in the shaft. Thereby a fixed, axially and tangentially form-locking, connection between the shaft and hollow body can be produced which ensures a concentric rotation of the instrument component.

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In an additional form of embodiment of the device according to the invention the hollow space includes at a depth T measured from the first end an axial stop face for the shaft. Through this axial stop face a securement for the accommodation of large axial pressing forces on the device arises in addition for the axially and tangentially form-locking connection between the shaft and hollow body by means of the impressions.

Preferably the wall thickness of the hollow body is between 0.1 mm and 1.0 mm while the raised sections preferably project between 0.05 mm and 0.70 mm from the wall.

Further advantageous developments of the invention are characterized in the subordinate claims.

The advantages achieved by the invention are essentially to be seen in the fact that, thanks to the device according to the invention, a fixed connection can be produced between the shaft and the hollow body with the instrumental component, for example, a coupling part or a drill head for the marrow space. The individual parts of the device according to the invention are simple to manufacture and the connection between the shaft and hollow body, which is accomplished by the plastic deformation of the wall after pushing the shaft into the wall, can be produced with the simplest means. Furthermore, smaller shaft diameters as well as a left/right course of the drive machine are possible.

In the following the invention and extensions of the invention are explained with the aid of partially schematic representations of several embodiment examples.

Shown are:

Figure 1 a perspective representation of a form of embodiment of the device according to the invention connected to a surgical clearing tool,

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Figure 2 a section through the shaft and hollow body of the inventive device's form of embodiment represented in Fig. 1,

Figure 3 a perspective representation of a form of embodiment of the device according to the invention.

In Figure 1 and 2 a form of embodiment of the inventive device is represented which includes a hollow body 5 fixedly connected to a surgical drill head 13. The cylindrical shaft 1 coupled to the drive (not shown) is introduced coaxially relative to the central axis 2 into the cylindrical hollow space 4 in the hollow body 5, where the outer diameter of the shaft 1 and the inner diameter of the hollow space 4 form a close sliding fit so that the shaft 1 and the hollow body 5 are aligned exactly concentrically and the shaft 1 can nonetheless be introduced into the hollow space 4 without the expenditure of force. At a certain depth of the hollow space 4 and transverse to the central axis 2 an axial stop face 9 is introduced which, for example, can coincide with the apical surface, on the hollow body-side, of the drill head 13. The hollow body 5 is structured as a hollow cylinder concentric to the central axis 2 and includes on the shaft side a first end 6, on the drill side a second end 7, a wall 8, and a hollow space 4 coaxial to the central axis 2. After the shaft 1 was introduced coaxially into the hollow space 4 by its front, drill-side end 3 from the first, shaft -side end 6 of the hollow body, the wall 8 of the hollow body 5 is plastically deformed by means of an impressing tool (not shown) so that four impressions 10 arise each of which has a raised section 11 in the hollow space 4. Through the raised sections 11 the shaft 1 is deformed on its circumferential surface in a manner corresponding to the raised sections 11 so that a form-locking fixation with respect to rotation about the central axis 2 and with respect to displacement between the shaft 1 and the hollow body 5 coaxially to the central axis 2 is produced. In the inventive device's form of embodiment shown here the hollow body 5 and the drill head 13 are one piece.

The inventive device's form of embodiment represented in Figure 3 is distinguished from the form of embodiment described by Figure 1 only in that the hollow body 5 is connected, at its second end 7 axially at a distance from the

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shaft 1, to a coupling part 12, where the coupling part 12 serves for removable connection to a surgical clearing or drilling tool (not shown).

English translation of the amended claims as annexed to the International Preliminary Examination Report of the International Patent Application No. PCT/CH00/00527 "Device for connecting surgical clearing or drilling tool components" in the name of Synthes AG Chur

Claims

1. A device for coaxially connecting surgical clearing or drilling tools with a shaft (1), comprising

A) a shaft (1) with a central axis (2) and a front end portion (3);

B) a hollow body (5) having a first end portion (6), a second end portion (7), a wall (8), and a cavity (4) extending coaxially to the central axis (2), the shaft (1) being inserted into the cavity (4) with the shaft front end portion (3) entering the cavity coaxially from the first end portion (6) of the hollow body (5), said hollow body (5) being connectible, or being connected, with its second end portion (7) to a tool or to a coupling member, characterized in that

C) the wall (8) is provided with at least one plastically deformed impression (10) having a projection (11) sticking out into the cavity (4) and that the shaft (1) is subject to an elastic deformation by means of the at least one projection (11); and

D) the impression (10) ensures a firm, axially and tangentially positive connection between the shaft (1) and the hollow body (5).

2. A device as claimed in claim 1, characterised in that on its front end portion (3), the shaft (1) is shaped in the form of a regular cylinder extending coaxially to the

central axis (2) and has a diameter d , in that the cavity (4) is shaped in the form of a regular cylinder extending coaxially to the central axis (2) and has a diameter D , and in that the diameters d and D are dimensioned in such a way that a close-sliding fit is formed between the shaft (1) and the cavity (4).

3. A device as claimed in claim 1 or 2, characterised in that the shaft (1) is subjected to elastic deformation by means of the at least one projection (11).

4. A device as claimed in claim 1 or 2, characterised in that the shaft (1) is subjected to elastic and plastic deformation by means of the at least one projection (11).

5. A device as claimed in claim 1 or 2, characterised in that the shaft (1) is subjected to plastic deformation by means of the at least one projection (11).

6. A device as claimed in any of the claims 1 to 5, characterised in that the cavity (4) has an axial stop surface (9) formed at a depth T as measured from the first end portion (6) for the shaft (1) to rest upon.

7. A device as claimed in any of the claims 1 to 6, characterised in that the wall thickness of the hollow body (5) is comprised between 0.1 and 1.0 mm.

8. A device as claimed in any of the claims 1 to 7, characterised in that the at least one projection (11) protrudes from the wall (8) in the direction of the central axis (2) by an amount of between 0.05 mm and 0.7 mm.

9. A device as claimed in any of the claims 1 to 8, characterised in that the hollow body (5) is formed in a single piece with a surgical clearing or drilling tool.

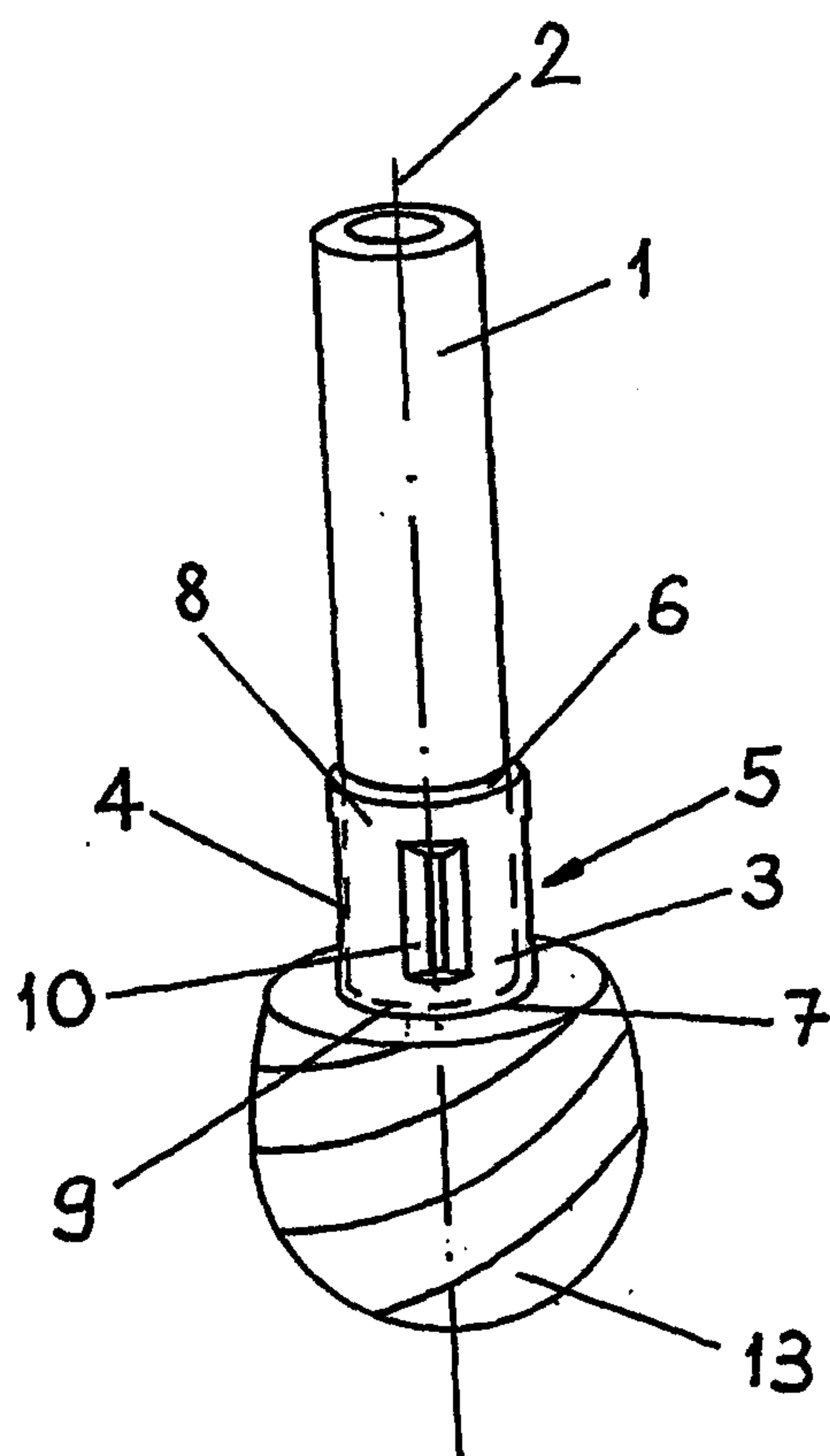


Fig. 1

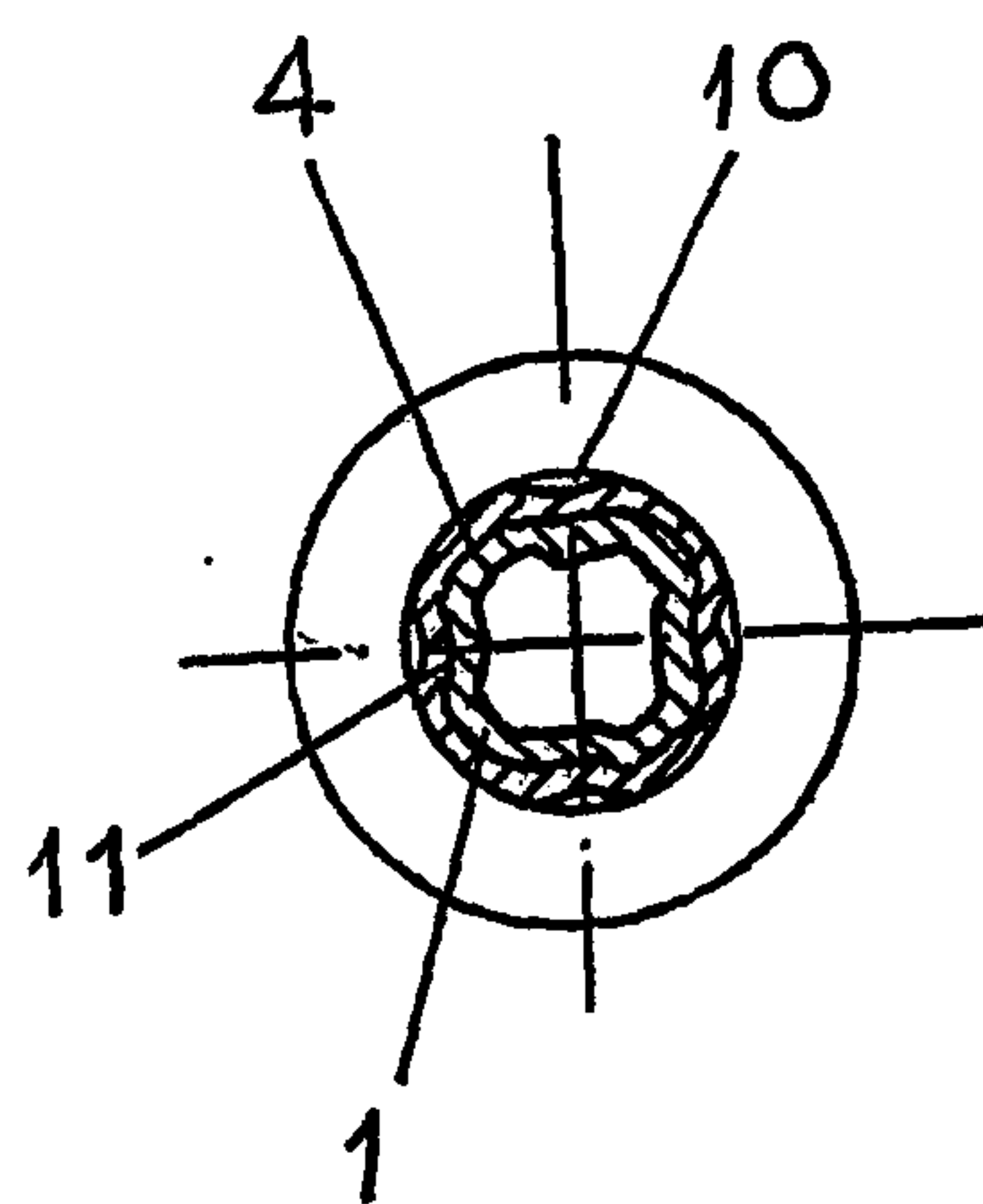


Fig. 2

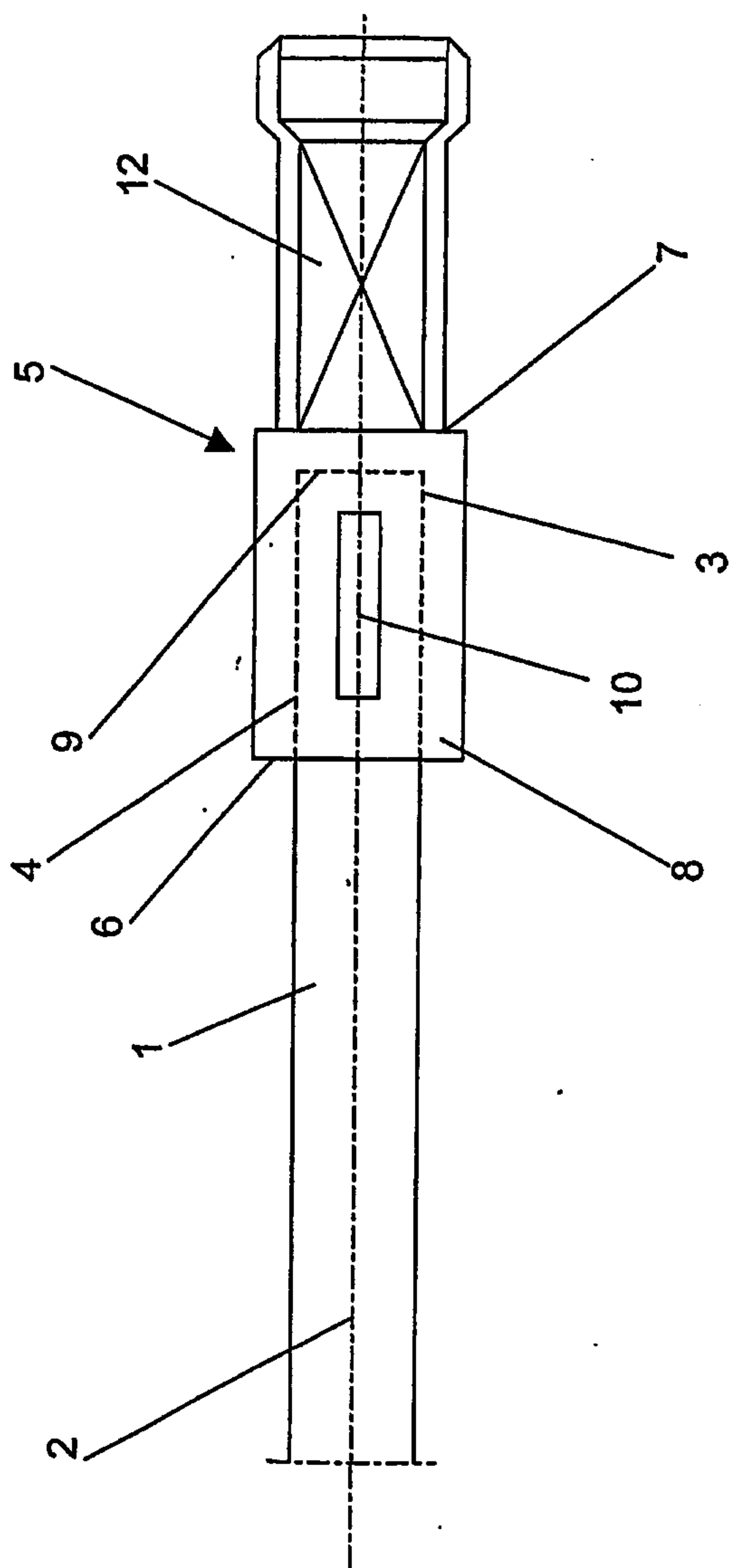


Fig. 3

