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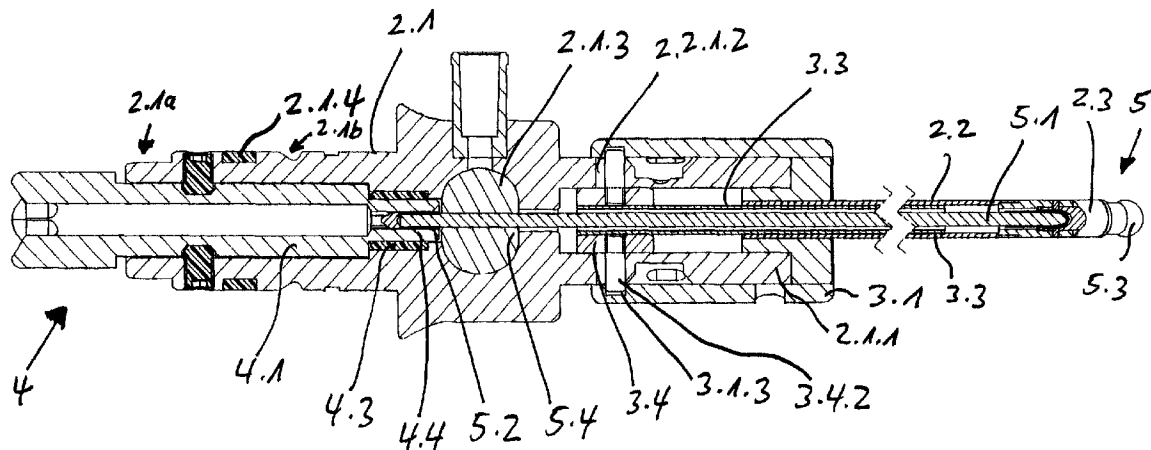


Fig. 5

(57) **Abrégé/Abstract:**

The invention relates to a medical device comprising a guide unit having a guide tube with a longitudinal axis, a proximal first coupling part being fixedly connected to the guide tube, and a distal pivoting head with a cylindrical surface, said medical device also comprising an actuating tube which is axially movable in the guide tube and is connected to the pivoting head, said actuating tube causing a pivoting movement of the pivoting head by means of a proximal operating element. According to the invention, in said device, in order to orient a distal guide element for a rotatable surgical tool more precisely and thus angularly orient the working head of such a tool, the operating element is pivotable about the longitudinal axis and causes the pivoting movement of the pivoting head by the axial displacement of the actuating tube.

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Abstract

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The invention relates to a medical device comprising a guide unit having a guide tube with a longitudinal axis, a proximal first coupling part being fixedly connected to the guide tube, and a distal pivoting head with a cylindrical surface, said medical device also comprising an actuating tube which is axially movable in the guide tube and is connected to the pivoting head, said actuating tube causing a pivoting movement of the pivoting head by means of a proximal operating element. According to the invention, in said device, in order to orient a distal guide element for a rotatable surgical tool more precisely and thus angularly orient the working head of such a tool, the operating element is pivotable about the longitudinal axis and causes the pivoting movement of the pivoting head by the axial displacement of the actuating tube.

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Medical device

The invention relates to a medical device comprising a guide unit having a guide tube with a longitudinal axis, a proximal first coupling part being fixedly connected to the guide tube, and a distal pivoting head with a cylindrical surface, said medical device also comprising an actuating tube which is axially movable in the guide tube and is connected to the pivoting head, said actuating tube being axially displaceable by an operating element by a pivoting movement of the pivoting head.

A generic medical device is generally known from EP 2 790 596 B1. In this device, a guide section bent laterally relative to the longitudinal axis of the device is provided at the distal end for the non-axial orientation of the working head of a rotatable surgical tool, such as a milling cutter or a drill, in a guide part of the device.

Furthermore, DE 100 36 108 A1 discloses a surgical instrument which has at the distal end thereof a housing-like receptacle for the rotatable mounting of a jaw part, which is

pivotably articulated on a distal end of a hollow shank.
The actuation is carried out by a hand acting on a proximal lever, from the proximal end via an actuating rod by means of a gear mechanism which acts on the proximal end thereof.

5 The operating mechanism is extremely complex, has considerable lateral or radial space requirements, and requires operation with the entire hand, including movement thereof relative to the arm of an operator.

10 The invention is therefore based on the object of developing a generic device in such a way that, with a simple design, it results in a small space requirement for the design of the pivoting mechanism itself, while leaving a cavity for a surgical workpiece on the one hand, and on the
15 other hand a simple and space-saving design of the proximal operating elements, an exact pivoting positioning of a distal pivoting element, and thus the orientation of a tool head determined by the latter.

20 According to the invention, the above object is achieved in a generic device in that the actuating tube can be displaced by pivoting the operating element.

A preferred embodiment provides that the axial movement of
25 the guide tube is carried out via a link guide having a slot which extends in the circumferential direction at an angle not equal to $\neq 90^\circ$ to the axis and a pin guided therein, wherein the pin is further fixedly connected to the guide tube and the slot is formed on a cylinder jacket
30 which is fixed, in particular in one piece, to the operating element.

In addition, preferred developments provide that the pins each engage a radially oriented, elongated hole extending in the direction of the axis in a part which is fixedly connected to the guide tube, in particular a cylinder part, wherein in particular the pivoting head is pivotable relative to the guide tube via diagonally opposite joints formed at the distal end of the guide tube. In order to ensure the necessary space for the drive shaft of a tool to pass through, especially in the distal area, further developments provide that the actuating tube acts with a tab eccentrically in a proximal area of the pivoting head for the pivoting movement thereof, wherein latching depressions are arranged next to one another in the circumferential direction at an angle unequal to 90° to the axis in a cylinder jacket part connected to the guide tube and a spring pin connected to the operating element and engaging in the latter.

A precise positioning of the angular position can be achieved by means of a rotating unit which is rotatable relative to the guide unit.

In addition, the device according to the invention can be configured in a preferred embodiment for connection to the output shaft of a rotating drive in such a way that the rotating unit has a second coupling part which is arranged axially fixed but rotatable in the first coupling part, wherein preferably the rotating unit, in particular the second coupling part thereof, has coupling slots for a rotationally fixed connection to an output shaft of the pressure drive and the first coupling part has formations - preferably in the form of slots and an annular groove - for

the axially and rotationally fixed connection to a drive and/or the housing of a drive.

Further developments provide a surgical rotating tool that
5 is rotatable relative to the guide and actuating unit, but that can be axially fixed to the latter, wherein in particular the rotating tool has, at the proximal end of a shank, a non-cylindrical, preferably square, design for non-rotatable engagement in a corresponding non-cylindrical,
10 preferably square, recess of the second coupling unit.

In addition, it can preferably be provided that a shank of the tool having a tapered area engages in the opening of a release and blocking element of the first coupling part.

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Further preferred configurations are characterized in that the actuating tube is arranged coaxially in the guide tube and/or that the outer diameter of the actuating tube corresponds to the inner diameter of the guide tube.

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The coupling elements can preferably be coupled as shown in EP 2 393 435. The above-mentioned connection configurations of the coupling elements are designed in such a way that a connection described in that publication is possible with a
25 drive. In this respect, the disclosure content of the cited publication is completely incorporated in the disclosure content of the application.

Further advantages and features of the invention result
30 from the claims from the following description, in which an exemplary embodiment of the invention is explained in detail with reference to the drawing. In the drawings:

- Fig. 1 is a side view of the medical device according to the invention;
- 5 Fig. 2 is a side view at a different angular angle, partially cut;
- Fig. 3 is the side view of the figure with a different distance into an outer part to show the formation of an underlying part;
- 10 Fig. 4 is a longitudinal section through the device according to the invention corresponding to A-B of Fig. 2;
- 15 Fig. 5 is a longitudinal section at an angular angle of 90° to the section of Fig. 4; and
- 20 Fig. 6 is an enlarged view of the pivoting head of Fig. 2.

The device 1 according to the invention initially has a guide part 2. The guide part 2 is connected to a motor drive or the housing of a motor drive according to EP 2 393 435 in a fixed manner, i.e. in a rotationally and axially fixed manner. The fixation takes place via the proximal longitudinal slots 2.1a and the annular groove 2.1b of a coupling part 2.1 of the guide part 2 in the manner described there.

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A guide tube 2.2 of the guide part 2 is fixedly connected to the coupling part 2.1, that is to say in a rotationally

and axially fixed and non-detachable manner. At the distal end of the guide tube 2.2, a pivoting head 2.3 with a cylindrical surface is pivotally arranged thereon. The articulated connection is formed by diametrically opposite joints 2.3.1 at the level of a central axis A of the guide tube 2.2 and the first coupling part 2.1.

In one piece with the first coupling part 2.1, a first cylinder jacket 2.1.1 is formed distally thereto (also Fig. 4), into which a pipe connection part 2.1.2 (Fig. 4) is inserted at the distal end, to which the guide tube 2.2 is connected and in a preferably materially fixed manner. The parts 2.1, 2.1.1, 2.1.2 and 2.2 mentioned are preferably made of stainless steel, wherein the materially fixed connections are each formed by means of laser welding on the one hand between the cylinder jacket 2.1.1 and the pipe connection part 2.1.2 in the form of a bush and on the other hand between the latter and the guide tube 2.2.

Approximately in the middle of the coupling part 2.1, a release and blocking element 2.1.3, preloaded by a spring (not shown), can be seen in the form of a push button, the function of which is described below.

Relative to the guide part 2, an actuating unit 3 is limitedly rotatably and axially movably provided.

For this purpose, the actuating unit 3 has a second cylinder jacket 3.1 which movably surrounds the first cylinder jacket 2.1.1 and has an actuating element 3.2 in the form of a tab which can be pivoted in the circumferential direction of the axis A, both of which are integrally formed with one another. The second cylinder jacket 3.1 is provided

ed on one side of the actuating element 3.2 with a slot 3.1.1 which extends in the circumferential direction of the second cylinder jacket 3.1 and is oriented at an angle to the axis A $\neq 90^\circ$, that is to say not perpendicular to the axis A. The extension angle of the slot 3.1.1 perpendicular to the axis A is only a few degrees, preferably 3° to 5° . A pin 2.4, for example in the form of a screwed-in headless slot screw, projects into the slot 3.1.1 and is fixedly connected to the first cylinder jacket 2.1.1. The slot 3.1.1 thus forms a link guide for the pin 2.4. A Luer lock 2.5 is provided on the side of the guide part 2 in order to enable rinsing.

Short axial slots 3.1a in the cylinder jacket 3.1 of the actuating unit allow better cleaning by rinsing and contribute to saving weight.

As can be seen in Fig. 2, a plurality of depressions 2.1.1.1 are formed proximally to the arrangement of the pins 2.4 in the outer wall of the cylinder jacket 2.1.1 in the circumferential direction, likewise at the same angle as the slot 3.1.1 to the axis A, each in which - as can be seen in Fig. 4 - a ball 3.1.2.2 of a spring pin 3.1.2 mounted in the cylinder jacket 3.1 and preloaded by a spring 3.1.2.1 can snap into the angular positions determined by the position of the depressions 2.1.1.1.

As shown in Figs. 3 and 5, an actuating tube 3.3 for the pivoting head 2.3 extends axially displaceably. The actuating tube 3.3 is fixed proximally, that is to say in a rotationally and axially fixed manner, to a bush 3.4 (Fig. 4), preferably in a materially fixed manner, in particular by laser welding. The bush 3.4 has two diametrically opposed

radial threaded bores 3.4.1 (Fig. 5), into which radial pins 3.4.2 are screwed in the form of headless screws. The pins 3.4.2 extend through radial openings 2.1.1.2, which are formed in this area in the first cylinder jacket 2.1.1 in the axial direction as elongated holes, so that the pins 3.4.2 and also the actuating tube 3.3 connected via the bush 3.4 are axially displaceable or are movable over a limited distance in these radial openings 2.1.1.2 (Fig. 5). Radially outer ends of the pins 3.4.2 protrude into a radially inwardly oriented recess 3.1.3 of the second cylinder jacket 3.1 of the actuating unit 3 which corresponds to the transverse dimensions of the pins.

As shown in Fig. 6, the actuating tube 3.3 continues at its distal end in a distal tab 3.3.1, which engages around pins 2.3.2 arranged on both sides eccentrically to the joints 2.3.1 on the pivoting head 2.3.

The longitudinal sections of Figs. 4, 5 show magnets 2.1.4 on the outer circumference of the coupling part 2.1 to detect the device connected to the drive (not shown), so that this speed and direction of rotation are automatically adjusted.

The pivoting head 2.3 is actuated as follows on the basis of the configuration described:

If the second cylinder jacket 3.1 is pivoted by a user engaging the tab 3.2 and pivoting it about the first cylinder jacket 2.1.1 and thus relative to the coupling part 2.1, the second cylinder jacket 3.1 is simultaneously moved axially in the direction of the axis A due to the link guide formed by the slot 3.1.1 and the pin 2.4. This axial move-

ment is transmitted to the pins 3.4.2 and via the latter and the bushes 3.4 to the actuating tube 3.3, which is also moved axially in this way. This axial movement is transmitted to the pivoting head 2.3 via the tab or the attachment 3.3.1 and the eccentrically arranged pins 2.3.2 and pivot said pivoting head about the pivoting axis thereof formed by the joints 2.3.1 from an extended position into an angled position relative to the axis A, as can be seen in particular in Fig. 2.

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It is thereby achieved that a surgical rotating tool which extends through the guide tube 2.2 and actuating tube 3.3 can work with a distal working head in an angular position to the axis, in particular the angular position shown in Fig. 2.

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In Figs. 1 to 5, a rotation unit 4 is also shown on the left. Firstly, the latter has a second coupling part 4.1 which is rotatably mounted in the first coupling part 2.1 and has coupling elements at its proximal end in the form of slots which are coaxial with the axis A and can be coupled to the output axis of a rotary drive in such a way as is disclosed in EP 2 393 435.

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The second coupling part 4.1 is rotatable in the first coupling part 2.1, in particular via a mounting 4.3, but is axially fixed (Figs. 3, 5). It has an axially extending recess 4.4, which is not circularly symmetrical in cross section, for example a square recess, into which the proximal end of a shank 5.1, such as a drill or milling cutter, can be inserted in a rotationally fixed manner from the distal end of the device, that is to say from the pivoting head 2.3. For this purpose, the rotating tool 5 has a shank 5.1

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which is cylindrical over the major part of its longitudinal extent, but this is formed at the proximal end corresponding to the recess 4.4 as a polygon 5.2, in particular a square. A tool head 5.3, for example in the form of a
5 milling or drilling head, is provided at the distal end of the tool 5.

The axial fixation of the tool 5 takes place via the already mentioned push button 2.1.3, which has an axial opening, by means of which when the push button 2.1.3 is
10 pressed to insert and remove the tool 5, the shank 5.1 including the square 5.2 at its proximal end up to the depression 4.4 can be pushed through and, when the push button 2.1.3 is released, the shaft 5.1 is axially fixed over
15 a tapered area 5.4 under the action of the springs (not shown).

Claims

1. Medical device comprising a guide unit (2) having a guide tube (2.2) with a longitudinal axis (A), a proximal first coupling part (2.1) being fixedly connected
5 to the guide tube (2.2), and a distal pivoting head (2.3) with a cylindrical surface, said medical device also comprising an actuating tube (3.3) which is axially movable in the guide tube (2.2) and is connected to the pivoting head (2.3), causing a pivoting movement of
10 the pivoting head (2.3) by means of a proximal operating element (3.2), characterized in that the operating element (3.2) is pivotable about the longitudinal axis (A) and causes the pivoting movement of the pivoting head (2.3) with axial displacement of the actuating
15 tube (3.3).
2. Device according to claim 1, characterized in that the axial movement of the guide tube (2.2) is carried out via a link guide having a slot (3.1.1) which extends in
20 the circumferential direction at an angle not equal to

≠ 90° to the axis (A) and a pin (2.4) guided therein.

3. Device according to claim 2, characterized in that the pin (2.4) is fixedly connected to the guide tube (2.2) and the slot (3.1.1) is formed on a cylinder jacket (3.1) which is fixed, in particular in one piece, to the operating element (3.2).
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4. Device according to any of the preceding claims, characterized in that radially extending pins (3.4.2) are connected to the guide tube (3.3), each engaging into an inwardly oriented guide groove having a diameter corresponding to the width thereof in the axial direction of the operating element (3.2).
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5. Device according to claim 4, characterized in that the pins (3.4.2) each engage through a radially oriented elongated hole extending in the direction of the axis (A) in a part which is fixedly connected to the guide tube (2.2), in particular a cylinder part (2.1.1).
20
6. Device according to any of the preceding claims, characterized in that the pivoting head (3) is pivotable relative to the guide tube (2) via diagonally opposite joints (2.3.1) formed at the distal end of the guide tube (2.2).
25
7. Device according to any of the preceding claims, characterized in that the actuating tube (3.3) acts eccentrically with a tab in a proximal area of the pivoting head (2.3) for the pivoting movement thereof.
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8. Device according to any of the preceding claims, characterized by latching depressions (2.2.1.1) which are arranged next to one another in the circumferential direction at an angle unequal to 90° to the axis (A) in a cylinder jacket part (2.1.1) connected to the guide tube (2.2) and a spring pin (3.1.1) connected to the operating element (3.2) and engaging in the latter.
9. Device according to any of the preceding claims, characterized by a rotating unit (4) which is rotatable relative to the guide unit (2).
10. Device according to claim 9, characterized in that the rotating unit (4) has a second coupling part (4.1) which is arranged axially fixed but rotatable in the first coupling part (2.1).
11. Device according to claim 9 or 10, characterized in that the rotating unit (4), in particular the second coupling part (4.1), has coupling slots (4.2) for the rotationally fixed connection to a drive shaft.
12. Device according to any of the preceding claims, characterized in that the first coupling part (2.1) has formations (2.1a, 2.1b) for axially and rotationally fixed connection to a drive and/or the housing of a drive.
13. Device according to any of the preceding claims, characterized by a surgical rotating tool (5) which is rotatable relative to the guide and actuating unit (2, 3) but can be axially fixed to the latter.

14. Device according to claim 13, characterized in that the rotating tool (5) has, at the proximal end of a shank (5.1), a non-cylindrical, preferably square design (4.4) for non-rotatable engagement in a corresponding non-cylindrical, preferably square recess of the second coupling unit (4.1).
15. Device according to claim 13 or 14, characterized in that a shank (5.1) of the tool (5) having a tapered area engages in the opening of a release and blocking element (2.1.3) of the first coupling part (2.1).
16. Device according to any of the preceding claims, characterized in that the actuating tube (3.3) is arranged coaxially in the guide tube (2.2).
17. Device according to any of the preceding claims, characterized in that the outer diameter of the actuating tube (3.3) corresponds to the inner diameter of the guide tube (2).

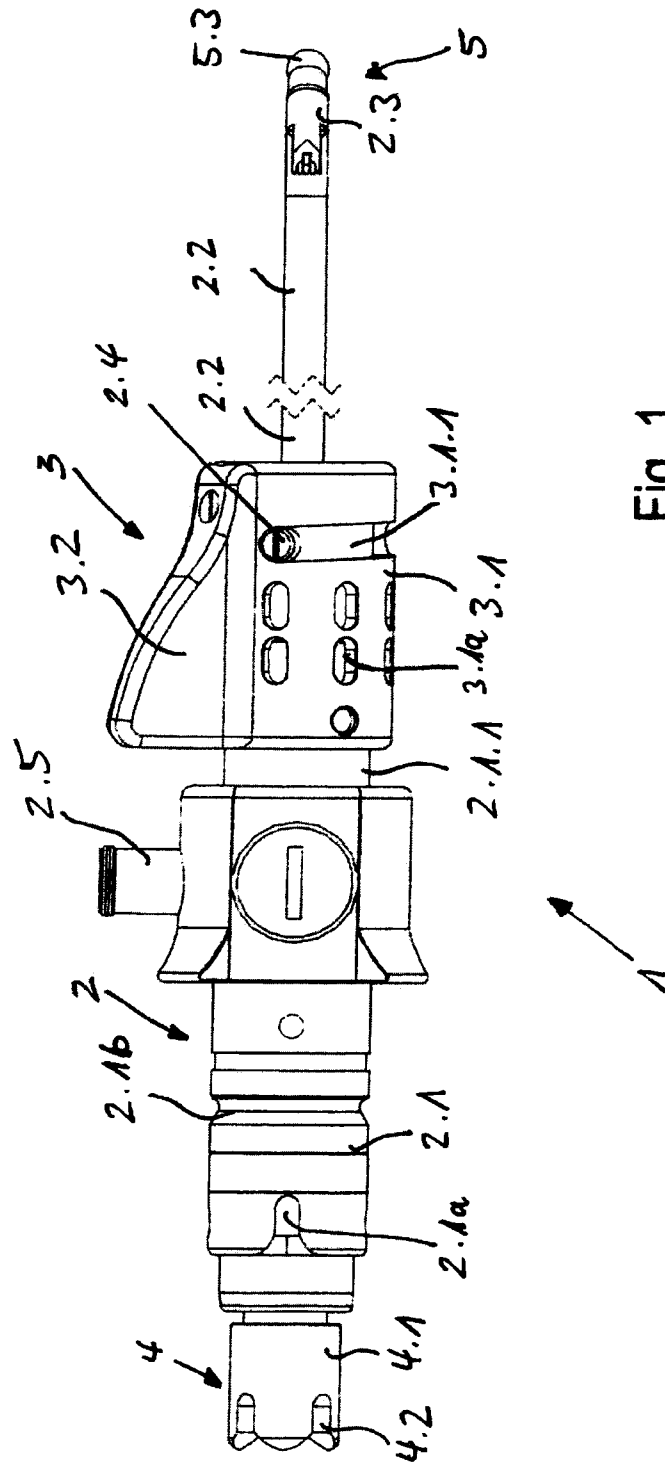


Fig. 1

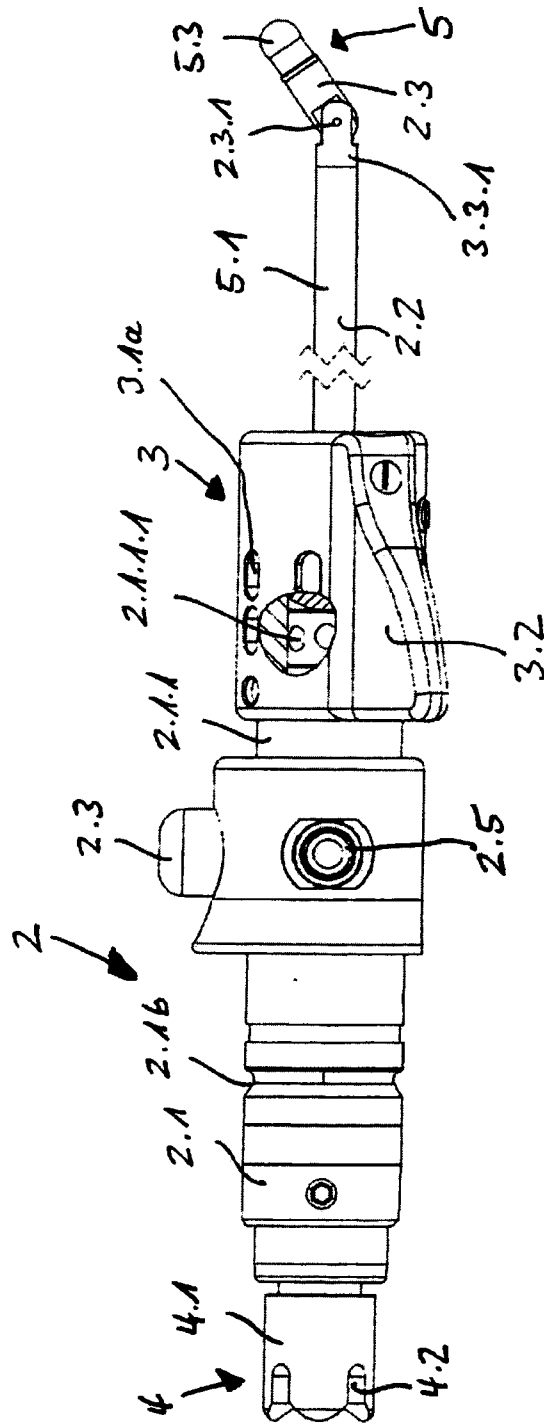


Fig. 2

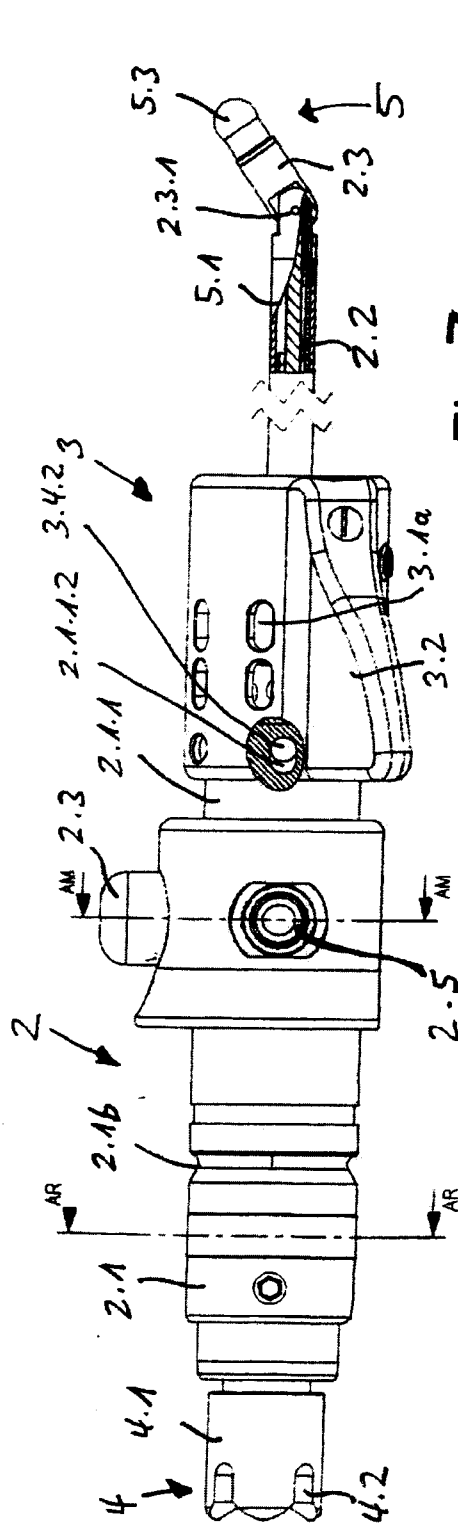


Fig. 3

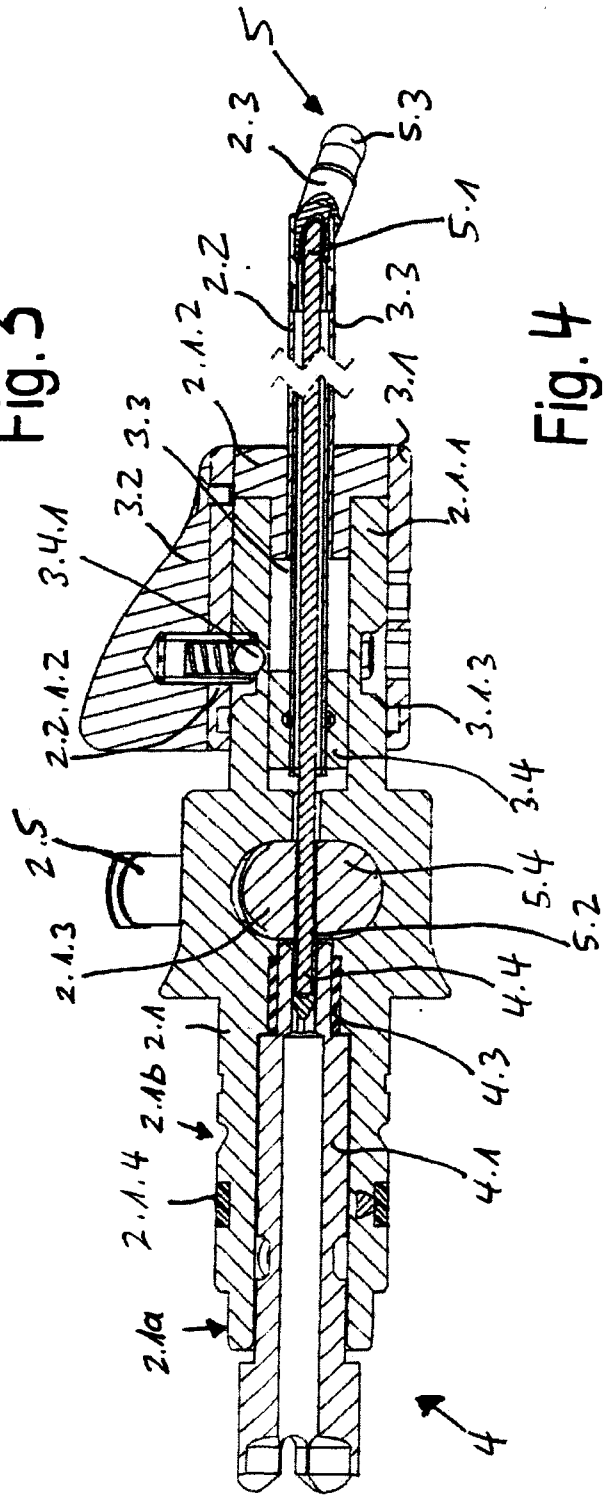


Fig. 4

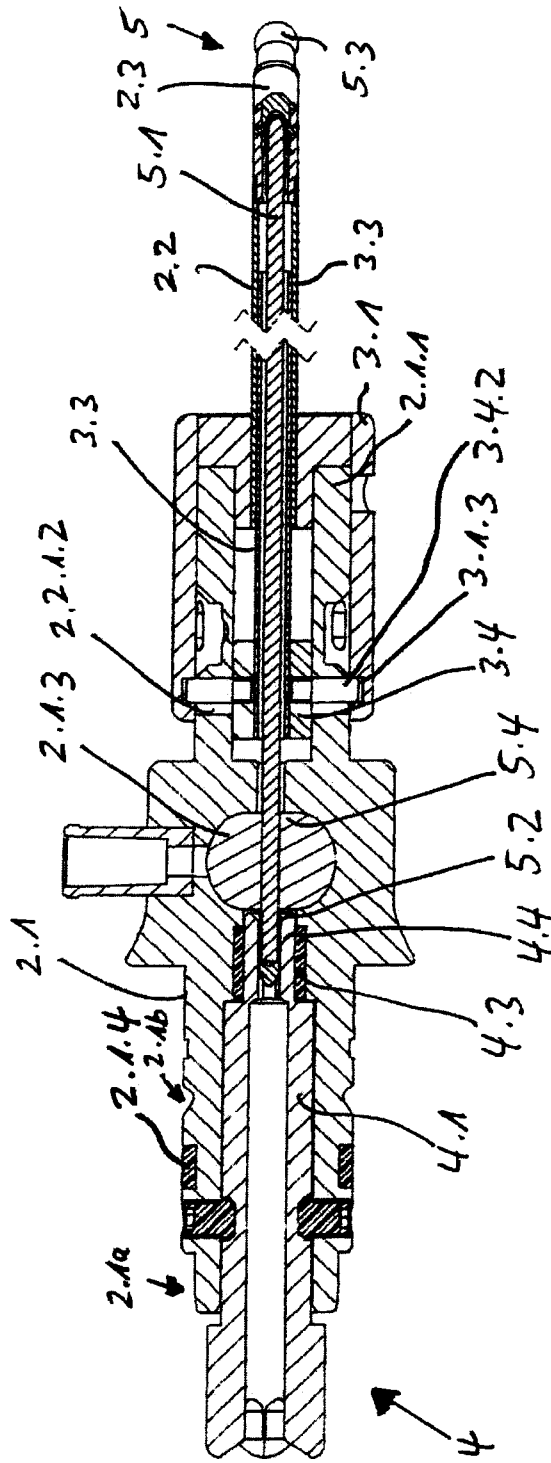


Fig. 5

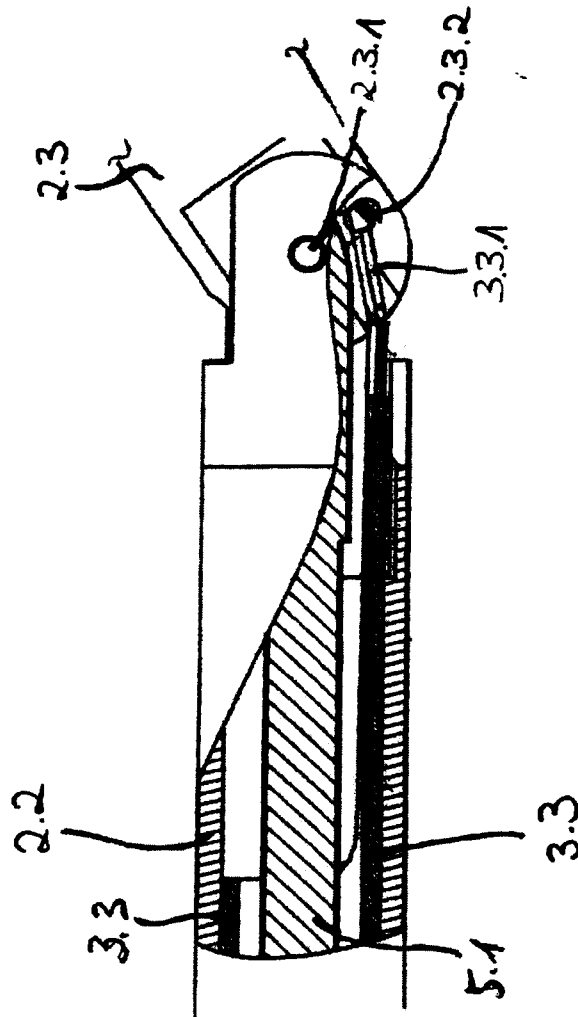


Fig. 6

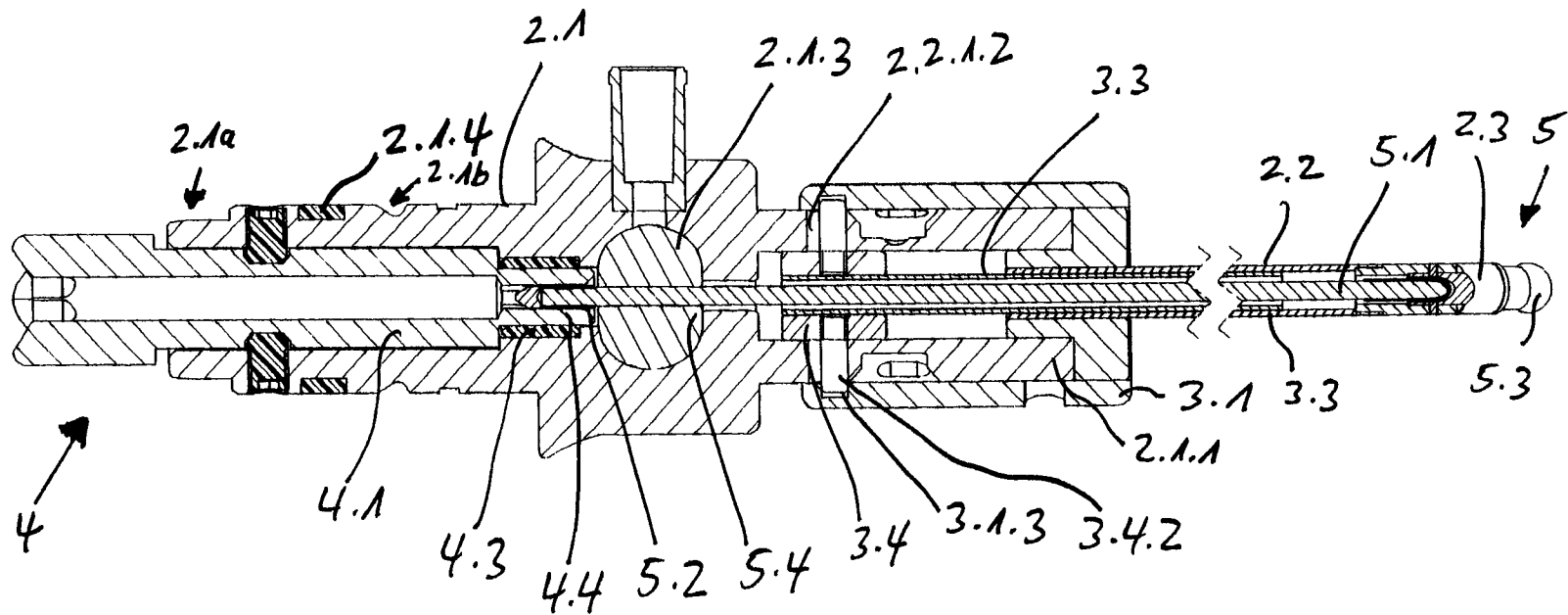


Fig. 5