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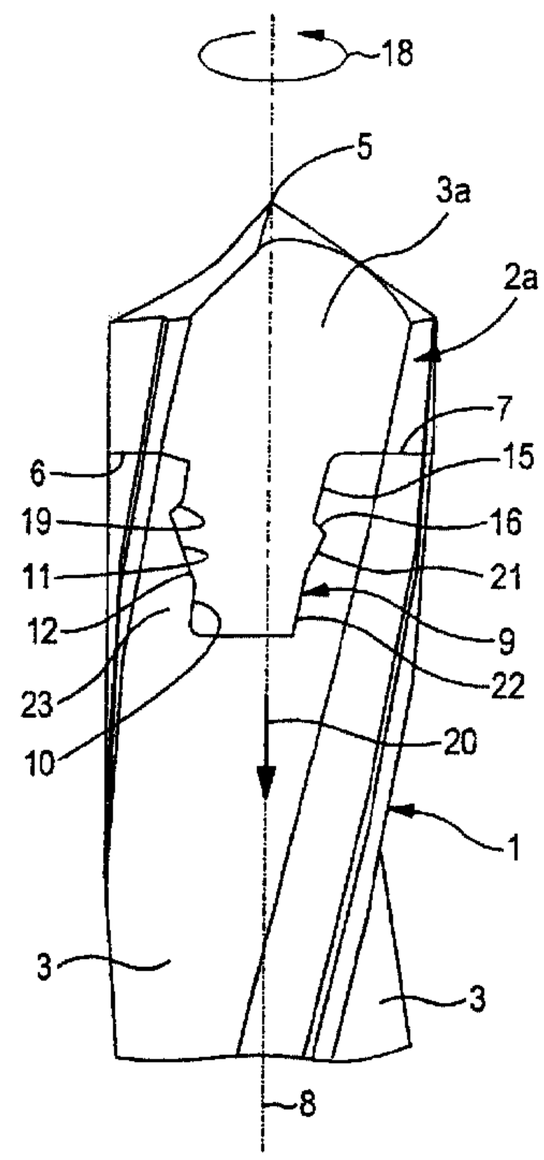
(54) Title: DRILL BIT HAVING A REPLACEABLE CUTTING HEAD



(57) Abrégé/Abstract:
The invention relates to a drill bit comprising a drill bit shaft (1), a cutting insert (2) which is detachably fixed thereto and which forms the tip area of the drill bit, and comprises a flute (3) that continues into the cutting insert (2). Said cutting insert rests, with a bearing surface (6) extending orthogonal to the center longitudinal axis (8) of the drill bit, on the face (7) of the drill bit shaft (1) and extends with a fixing stud (9), which centrally protrudes from the bearing surface (6), into a receiving recess (10) which is configured complementary thereto and which is provided in the face (7) of the drill bit shaft (1). At least one peripheral section (13) of the fixing stud (9) comprises a first longitudinal section (15) that, with a screw surface (16) which points away from the drill bit shaft (1), which slopes upward to the drill bit tip (5) in a direction of rotation of the drill bit, and which interacts with an opposite surface (19) on the inner wall (14) of the receiving recess (10), merges into a second longitudinal section (17).

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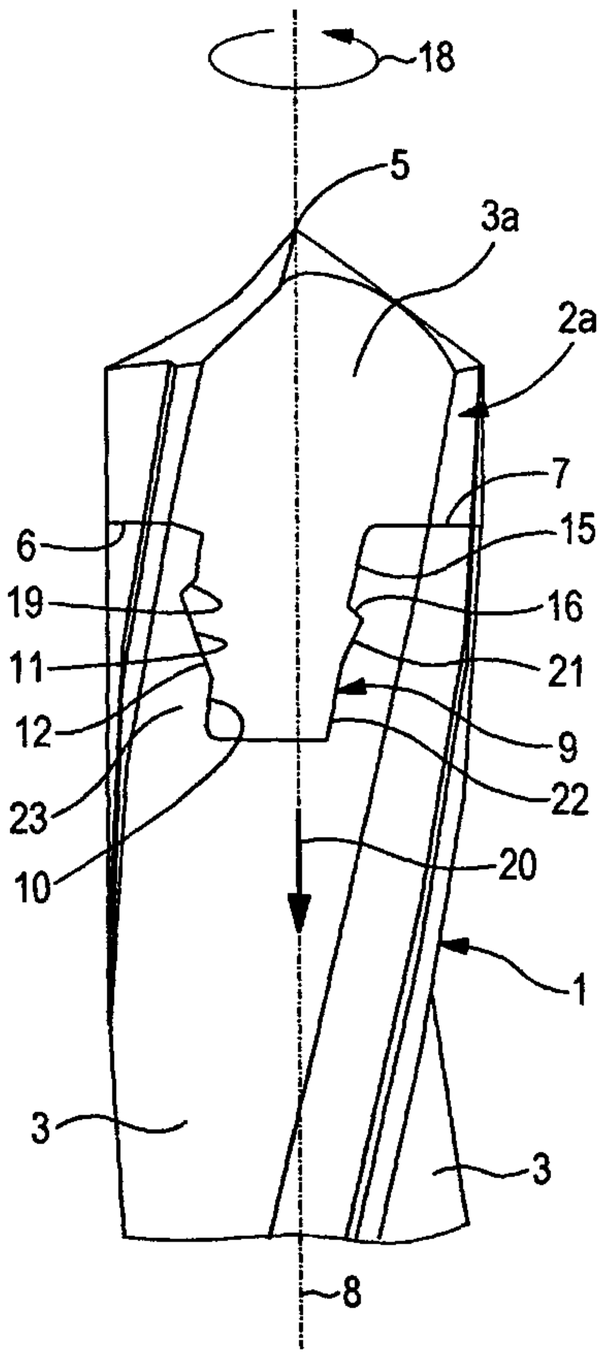
[Fortsetzung auf der nächsten Seite]

(54) Title: DRILL BIT HAVING A REPLACEABLE CUTTING HEAD

(54) Bezeichnung: BOHRER MIT AUSWECHSELBAREM SCHNEIDKOPF



(57) Abstract: The invention relates to a drill bit comprising a drill bit shaft (1), a cutting insert (2) which is detachably fixed thereto and which forms the tip area of the drill bit, and comprises a flute (3) that continues into the cutting insert (2). Said cutting insert rests, with a bearing surface (6) extending orthogonal to the center longitudinal axis (8) of the drill bit, on the face (7) of the drill bit shaft (1) and extends with a fixing stud (9), which centrally protrudes from the bearing surface (6), into a receiving recess (10) which is configured complementary thereto and which is provided in the face (7) of the drill bit shaft (1). At least one peripheral section (13) of the fixing stud (9) comprises a first longitudinal section (15) that, with a screw surface (16) which points away from the drill bit shaft (1), which slopes upward to the drill bit tip (5) in a direction of rotation of the drill bit, and which interacts with an opposite surface (19) on the inner wall (14) of the receiving recess (10), merges into a second longitudinal section (17).

(57) Zusammenfassung: Bei einem Bohrer mit einem Bohrerschaft (1) und einem daran lösbar fixierten, den Spitzenbereich des Bohrers bildenden Schneideinsatz (2) und, sich in den Schneideinsatz (2) hinein fortsetzenden Spannut (3). Mit einer sich rechtwinklig zur Mittellängsachse (8) des Bohrers erstreckenden Anlagefläche (6) an der Stirnfläche (7) des Bohrerschaftes (1). Zentral aus der Anlagefläche (6) vorstehenden Fixierzapfen (9) und eine komplementär dazu ausgestaltete Aufnahmeausnehmung (10) in der Stirnfläche (7) des Bohrerschaftes (1). Wenigstens ein Umfangsabschnitt (13) des Fixierzapfens (9) weist einen ersten Längsabschnitt (15) auf, der mit einer vom Bohrerschaft (1) wegweisenden, im Bohrdrehsinn (18) zur Bohrerspitze (5) hin ansteigenden und mit einer Gegenfläche (19) an der Innenwandung (14) der Aufnahmeausnehmung (10) zusammenwirkende Schraubenfläche (16) in einen zweiten Längsabschnitt (17) übergeht.

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Description

Drill Bit Having A Replaceable Cutting Head

This invention relates to a drill bit with a replaceable drill bit. On a drill bit of this type, a cutting head is detachably fixed to a drill shaft. DE 196 05 157 A1 describes a drilling tool of the prior art in which the cutting head projects by means of a stud into a receiving recess on the face of the drill shaft, where it is fixed in position with a screw that is oriented at a right angle to the longitudinal axis of the drill. On a drilling tool of the prior art described in WO 98/53943, the drilling head is fixed in position in the drill shaft with a force fit that acts in the axial direction and in the direction of rotation of the drill.

The object of the invention is to propose a drill bit with an alternative fixing of the cutting head.

This object is accomplished by a drill bit that has the characteristics disclosed in Claim 1.

The cutting head is in contact with a bearing surface against the face of the drill shaft, and extends by means a fixing stud that projects centrally out of the bearing surface into a complementary receiving recess in the face of the drill shaft. The peripheral area of the fixing stud that interacts with the inner wall of the recess has two longitudinal segments, namely a first longitudinal segment which, with a screw surface that points toward the drill tip, slopes upward in the direction of rotation of the drill and interacts with an opposite surface on the inner wall of the receiving recess and merges into a second longitudinal segment. When the drill head is designed in this manner, it can be easily inserted with its fixing stud into the receiving recess and fixed in position opposite to the direction of rotation of the drill. The screw surface is thereby pushed onto the opposite surface of the receiving recess and the cutting head is pressed with its bearing surface onto the face of the drill shaft. This fixing is further strengthened when the drill is in operation.

In one preferred embodiment, the second longitudinal segment of the fixing stud tapers toward its free end. The receiving recess becomes narrower by the same extent toward its base. The shaft walls that are adjacent to the receiving recess can be correspondingly thicker and more stable in this area. The tool shaft is therefore more stable with regard to a force that is exerted on the cutting head at a right angle to the longitudinal axis of the drill than would be the case with a receiving recess that becomes wider toward its base in an approximately swallowtail shape. A particularly stable mounting and centering of the fixing stud in the receiving recess is guaranteed if the free end of the fixing stud is provided with a cylindrical peripheral surface and the area adjacent to it and extending to the screw surface is provided with a conical peripheral surface.

To limit the axial strain between the cutting insert and the tool shaft and to create a defined limit position for the cutting insert, in an additional embodiment of the invention, a rotation stop projects from the face of the drill shaft and extends into a complementary recess in the bearing surface of the cutting insert. The bearing surfaces of the drill shaft and the face of the tool shaft also preferably each extend at a right angle to the longitudinal axis of the drill. The screw surface can form an angle of 90° with the longitudinal axis of the drill. The screw surface is preferably oriented at an angle, however, and forms an angle which is < 90° and > 45°. The angle is preferably 60°. As a result of the inclined position of the screw surface, the cutting insert is pushed, in addition to the axial strain, with a force that centers it and is directed toward the center longitudinal axis of the drill.

The invention is explained in greater detail below with reference to the exemplary embodiments illustrated in the accompanying drawings, in which:

Figure 1 shows the upper segment of a drill bit with three chip flutes and a corresponding three-edged cutting insert, in a side view,

Figure 2 is a side view of the cutting insert illustrated in Figure 1,

Figure 3 is a plan view from overhead of the cutting insert in the direction of the arrow III in Figure 2,

Figure 4 is a side view of a drill shaft as illustrated in Figure 1, with the cutting insert removed,

Figure 5 is a plan view from overhead of the face of the tool shaft in the direction of the arrow 5 in Figure 4,

Figure 6 shows an additional embodiment of a cutting insert in longitudinal section,

Figure 7 shows an additional embodiment of a cutting insert in longitudinal section,

Figure 8 is a side view of the upper portion of a drill bit with a two-edged cutting insert,

Figure 9 is a side view of the upper longitudinal segment of the drill with the cutting insert removed,

Figure 10 is a plan view from overhead in the direction of the arrow X in Figure 9,

Figure 11 shows a two-edged cutting insert in a side view, and

Figure 12 is a plan view from overhead in the direction indicated by the arrow XII in Figure 11.

The drill bits illustrated in the accompanying drawings are composed of a drill shaft 1 and a cutting insert 2. The cutting insert 2a on the drill illustrated in Figures 1 to 5 is three-edged. Accordingly, there are a total of three chip flutes 3 in the drill shaft 1, which continue with chip flute segments 3a into the cutting insert 2a. The cutting insert has three major cutting edges 4 which - as can be seen in particular in the plan view from overhead in Figure 3 - are oriented in approximately a star shape and converge in the drill tip 5. The three edges of the cutting insert mean that the cutting insert, likewise shown in the plan view from overhead in Figure 3, has approximately the shape of a trifurcated star.

The cutting insert 2a has a flat bearing surface 6, which is in flat contact against the face 7 of the drill shaft 1. The bearing surface 6 and the face 7 extend at a right angle with respect to the center longitudinal axis 8 of the drill bit. Shaped onto the bearing surface 6 is a central fixing stud 9, which extends in the direction of the center longitudinal axis 8. When the drill bit is inserted, the fixing stud 9 lies in a complementary configured receiving recess 10 in the drill shaft 1, where it is fixed by effectively axial undercuts. The receiving recess 10 emerges

into the chip flutes 3 with lateral openings 11 that extend to the face 7. When the drill bit is inserted as illustrated in Figure 1, the cutting surface areas that form the chip flute segments 3a and the chip flute 3 of the drill shaft 1 are aligned with one another, whereby they are interrupted only by the joint 12 between the cutting insert 2a and the drill shaft 1.

The chip flute segments 3a divide the fixing stud 9 into three peripheral segments 13, which interact with the inside walls 14 of the receiving recess 10. The fixing stud 9 has a first longitudinal segment 15 which with a screw surface 16 that points toward the drill tip 5 and projects in the manner of a radial shoulder from the peripheral segment 13 and merges into a second longitudinal segment 17. The screw surface 16 slopes upward in the direction of rotation 18 of the drill bit toward the drill tip 5 and interacts with a complementary configured opposite surface 19 on the inside walls 14 of the receiving recess 10. To fix the cutting insert to the drill shaft 1, the cutting insert is inserted with the fixing stud 9 into the receiving recess 10 so that its peripheral segments 13 are located in the vicinity of the openings 11. As the result of a rotation in the direction opposite to the direction of rotation 18 of the drill bit, the screw surfaces 16 arrive below the opposite surfaces 19 on the inner walls 14, as a result of which the cutting insert is pressed in the direction indicated by the arrow 20 with its bearing surface 6 against the face 7.

The surface of the second longitudinal segment 17 that interacts with the inner walls 14 can be a partly cylindrical surface as illustrated in Figure 6. In the exemplary embodiment illustrated in Figure 7, the second longitudinal segment 17 tapers conically toward the drill shaft. However, special preference is given to the configuration illustrated in Figure 2, in which adjacent to the screw surface 16 there is a conical segment 21, which merges into a cylindrical segment 22. The cylindrical segment 22 effects a centering of the cutting insert 2a in the receiving recess 10. The diameter of the cylindrical segment 22 can be relatively small compared to the segments adjacent to it toward the tip and that have the screw surfaces 16 necessary for the axial bracing. Accordingly, the area 23 of the receiving recess 10 that interacts with the cylindrical segment 22 can also have a small inside diameter. That in turn means a greater wall thickness 24 in the area 23 and thus increased stability. Especially in the area 23 have a greater effect on

account of the lever effect. However, the greater wall thickness 24 in this area guarantees increased stability of the drill shaft 1.

The screw surfaces 16 on the fixing stud 9 of a cutting insert 2 can basically form an angle of 90° with the center longitudinal axis 8 of the drill or of the cutting insert. However, preference is given to screw surfaces 16 that are oriented at an angle and form an angle α with the center longitudinal axis 8 which is $< 90^\circ$ and $\geq 45^\circ$.

Figures 8 to 12 show a drill bit with two chip flutes and accordingly a two-edged cutting insert 2b. The configuration of the fixing stud 9 and of the receiving recess 10 of this drill bit is the same as that of the drill bit described above. One difference is that two rotation stops 25 project from the face 7a of the drill shaft 1. The rotation stops 25 are diametrically opposite each other and are realized with four surfaces in an essentially wedge shape. Their outside surface 26 is formed by the peripheral surface of the drill shaft 1. Their inside surface 27 interacts with a complementary configured opposite surface 28, which is part of the wall of a recess 29 in the bearing surface 6 of the cutting insert 2b, which recess 29 holds the rotation stop 25. The rotation stops also have two inclined surfaces, whereby the one inclined surface 30 points in the direction of rotation 18 of the drill bit and merge into a face 7a. The other inclined surface 31 points opposite to the direction of rotation 18 of the drill bit and is a partial surface of the face 32 that forms the chip flute 3. The inclined surface 30 interacts with an inclined surface 33 that is formed from the wall of the recess 29 and acts as an opposite bearing surface.

Nomenclature

1	Drill shaft	19	Opposite surface
2	Cutting insert	20	Arrow
3	Chip flute	21	Conical segment
3a	Chip flute segment	22	Cylindrical segment
4	Major cutting edge	23	Area
5	Drill tip	24	Wall thickness
6	Bearing surface	25	Rotation stop
7	Face	26	Outside surface
8	Center longitudinal axis	27	Inside surface
9	Fixing stud	28	Opposite surface
10	Receiving recess	29	Recess
11	Opening	30	Inclined surface
12	Joint	31	Inclined surface
13	Peripheral segment	32	Face
14	Inside wall	33	Inclined surface
15	First longitudinal segment		
16	Screw surface	α	Angle
17	Second longitudinal segment		
18	Direction of rotation of drill bit		

Claims

1. Drill bit with a drill bit shaft (1) and a cutting insert that forms the tip area of the drill bit and is detachable fixed to the drill bit shaft, and at least one chip flute (3) that is located in the drill bit shaft (1) and extends into the cutting insert (2), whereby the cutting insert is in contact with a bearing surface (6) on the face (7) of the frill shaft (1) and extends with a fixing stud (9) that projects centrally from the bearing surface (6) into a receiving recess (10) which is configured complementary thereto in the face (7) of the drill shaft (1),
characterized by the fact
that at least one peripheral segment (13) of the fixing stud (9) has a first longitudinal segment (15) which with a screw surface (16) that points away from the drill shaft (1), slopes upward in the direction of rotation (18) of the drill bit toward the drill bit tip (5) and interacts with an opposite surface (19) on the inner wall (14) of the receiving recess (10), merges into a second longitudinal section (17).

2. Drill bit as claimed in Claim 1,
characterized by the fact
that the second longitudinal segment (17) tapers toward its free end.

3. Drill bit as claimed in Claim 2,
characterized by
a first stud segment (22) forming the free end with a cylindrical peripheral surface, and a second segment (21) that has a conical peripheral surface and extends to the screw surface (16).

4. Drill bit as claimed in Claims 1, 2 or 3,
characterized by
a rotation stop (25) that projects from the face (7) of the drill shaft (1) and projects into an essentially complementary shaped recess in the bearing surface (6) of the cutting insert (2).

5. Drill bit as claimed in one of the Claims 1 to 4,
characterized by the fact
that the screw surface (16) forms an angle (α) of 90° to 45° with the longitudinal axis (8) of the drill bit.

6. Drill bit as claimed in Claim 5,
characterized by
an angle (α) of 60°.

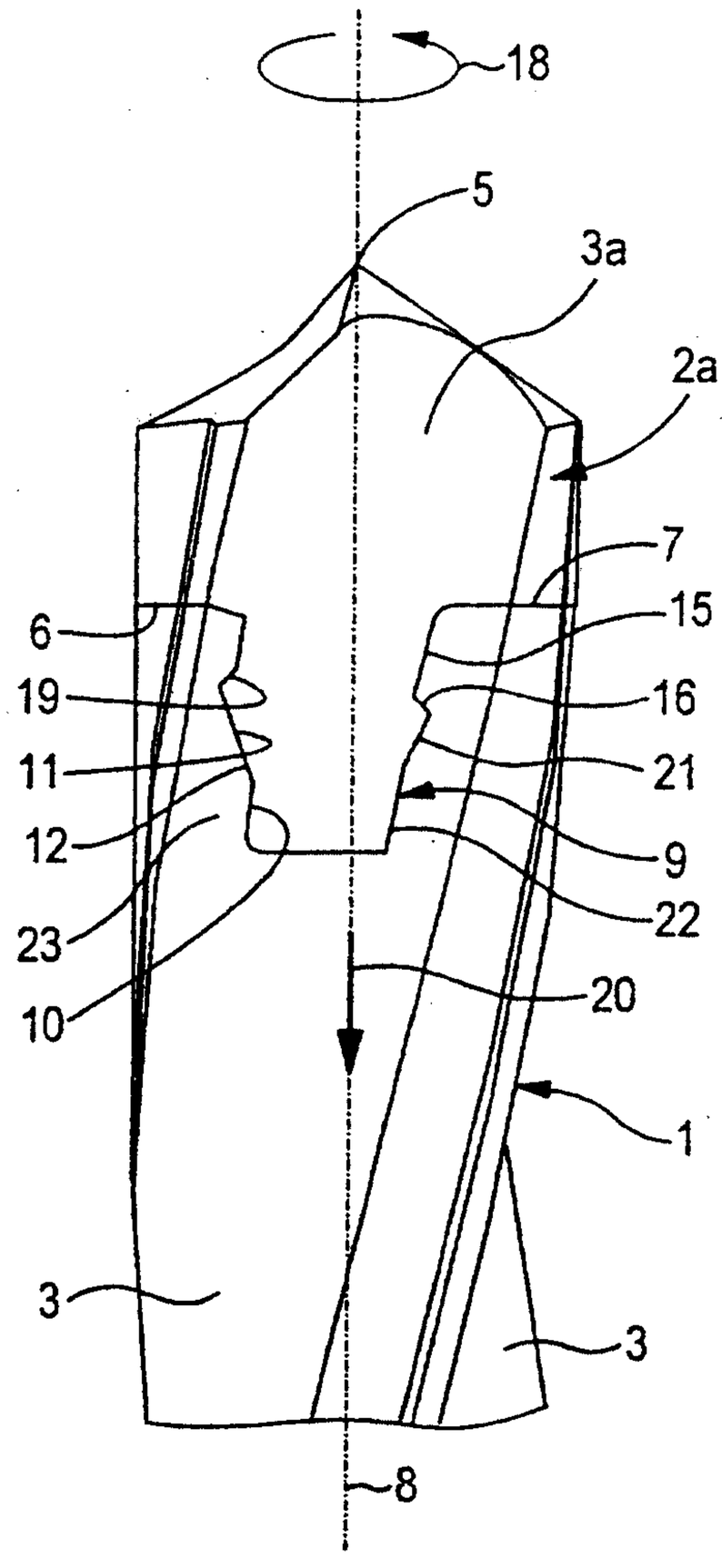

Fig. 1

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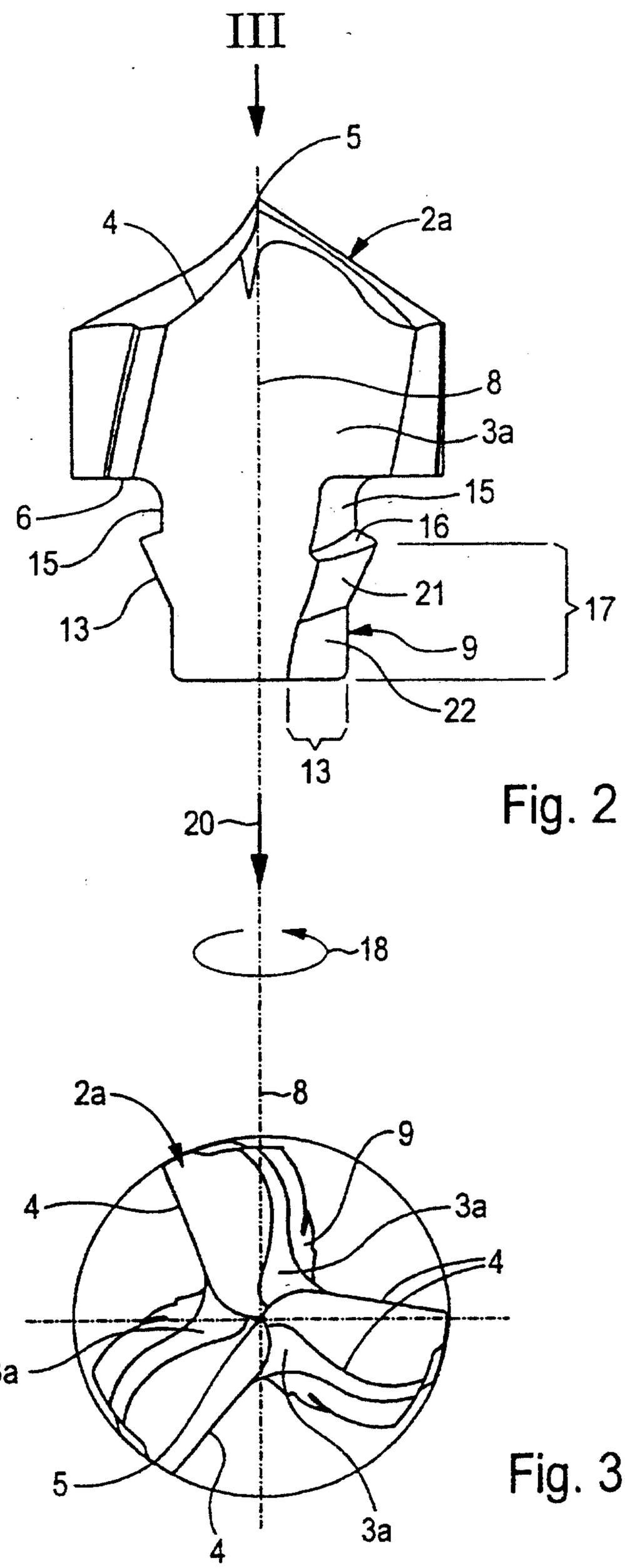

Fig. 2

Fig. 3

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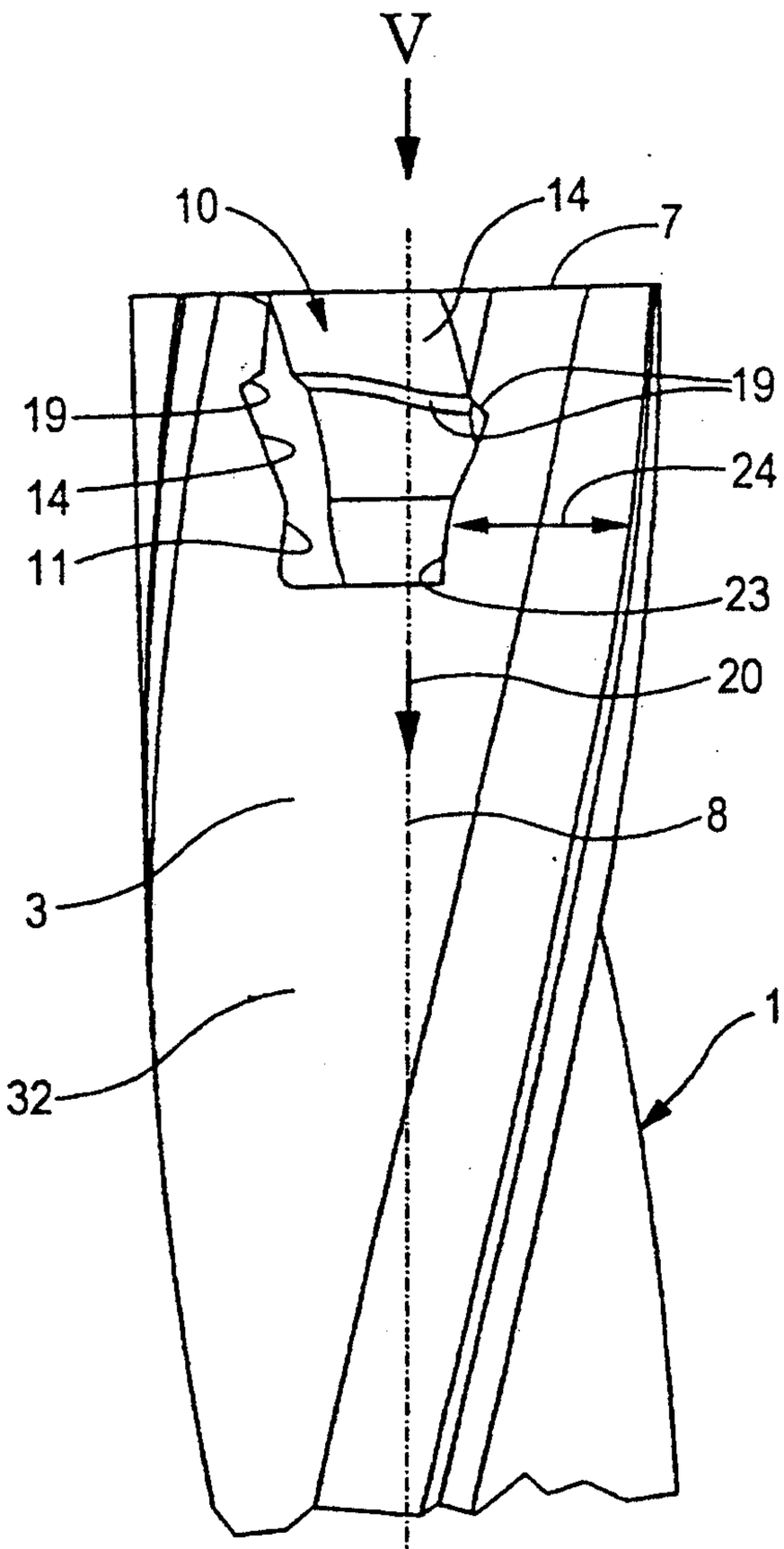

Fig. 4

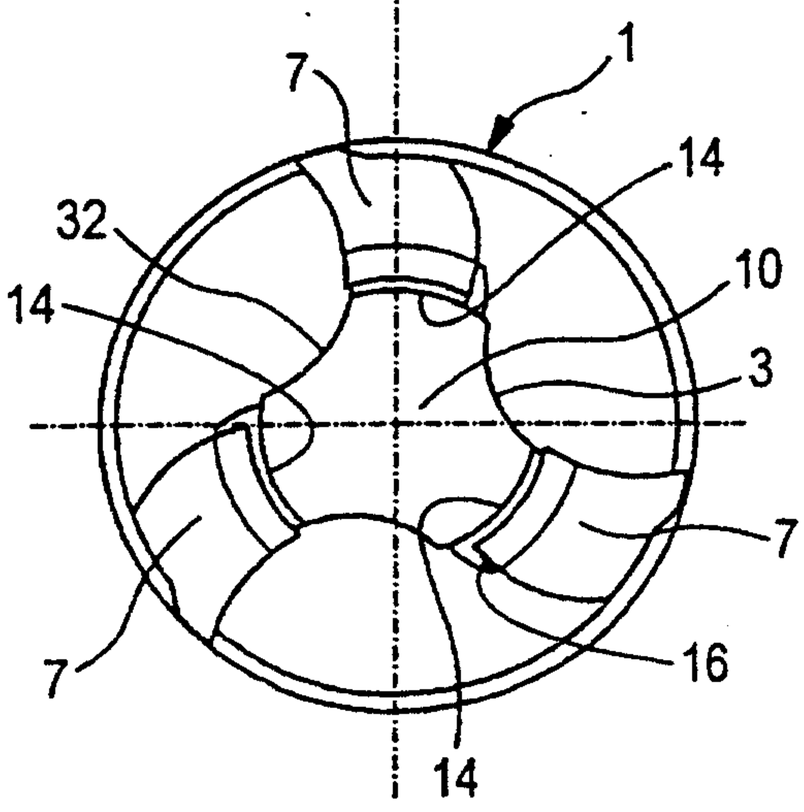

Fig. 5

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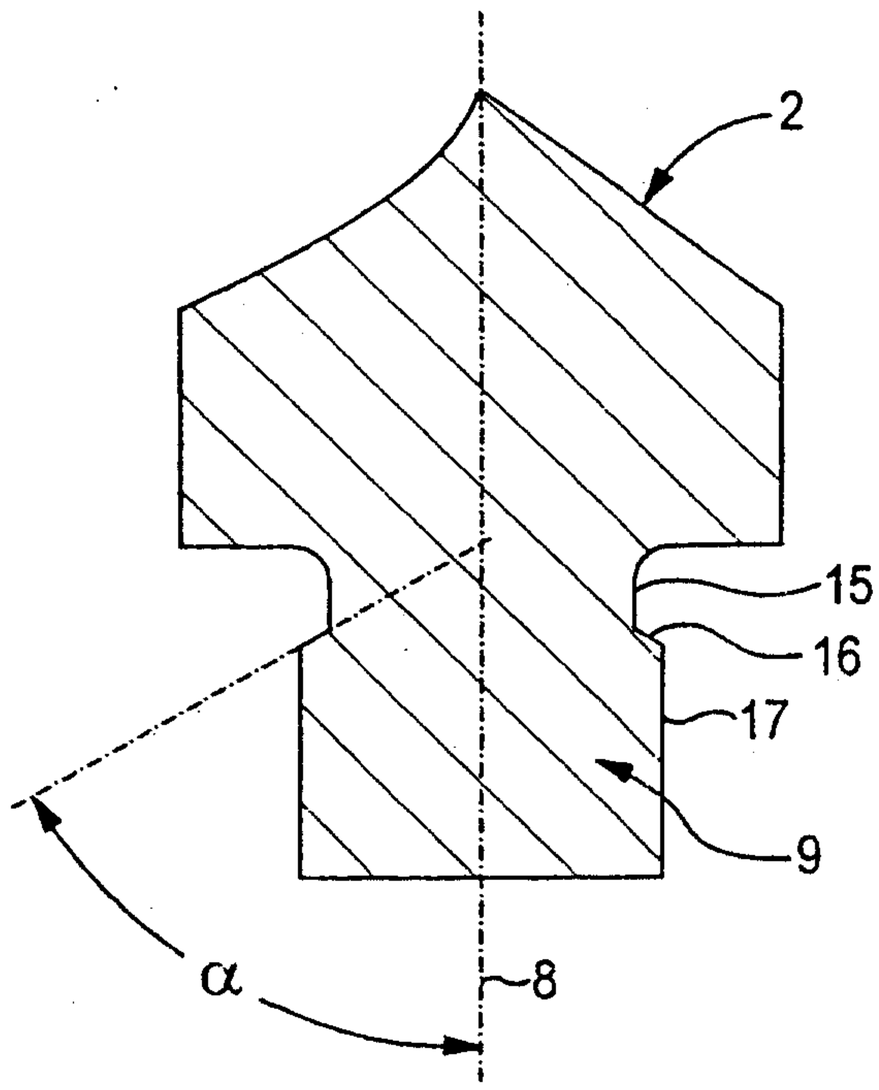

Fig. 6

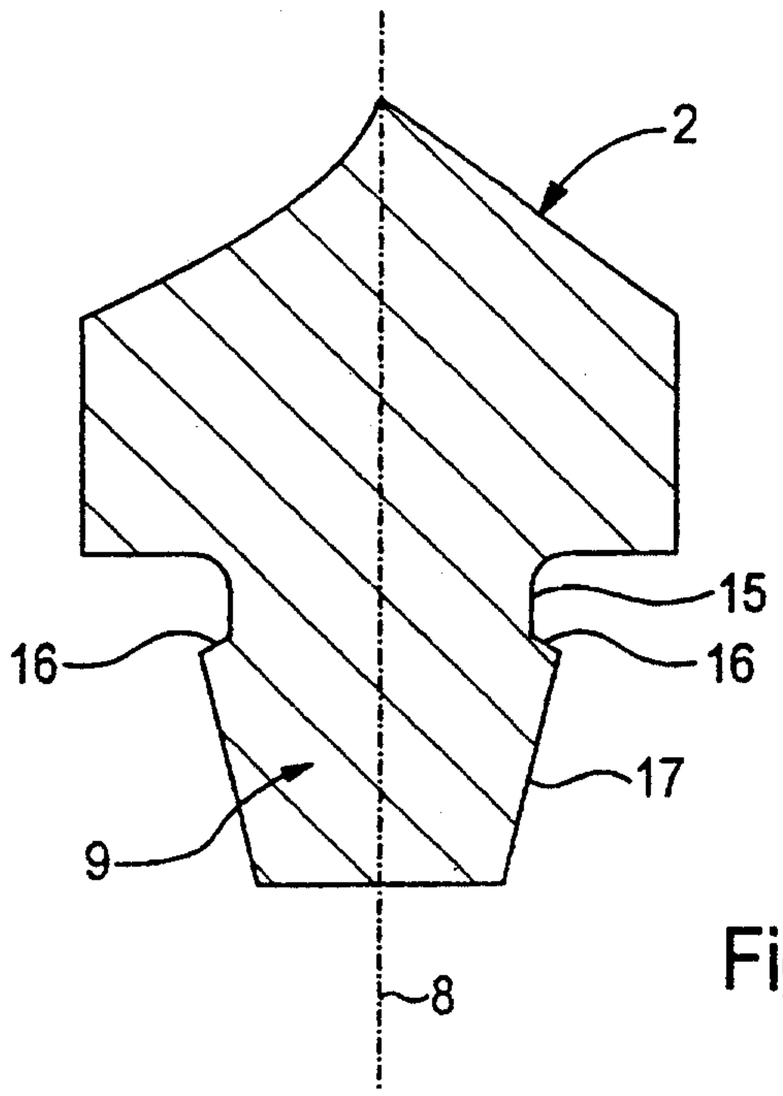

Fig. 7

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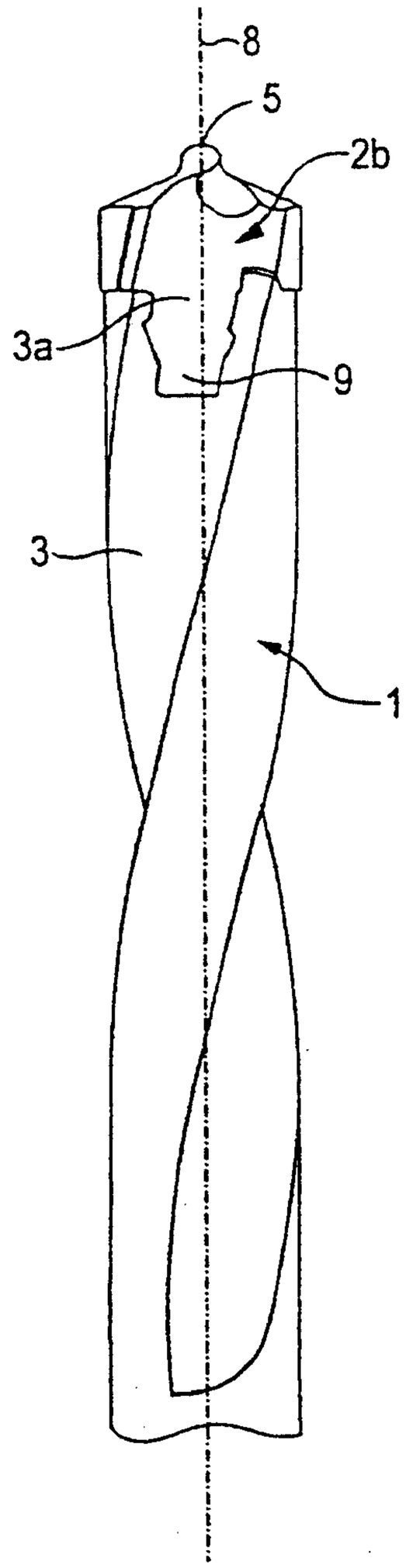

Fig. 8

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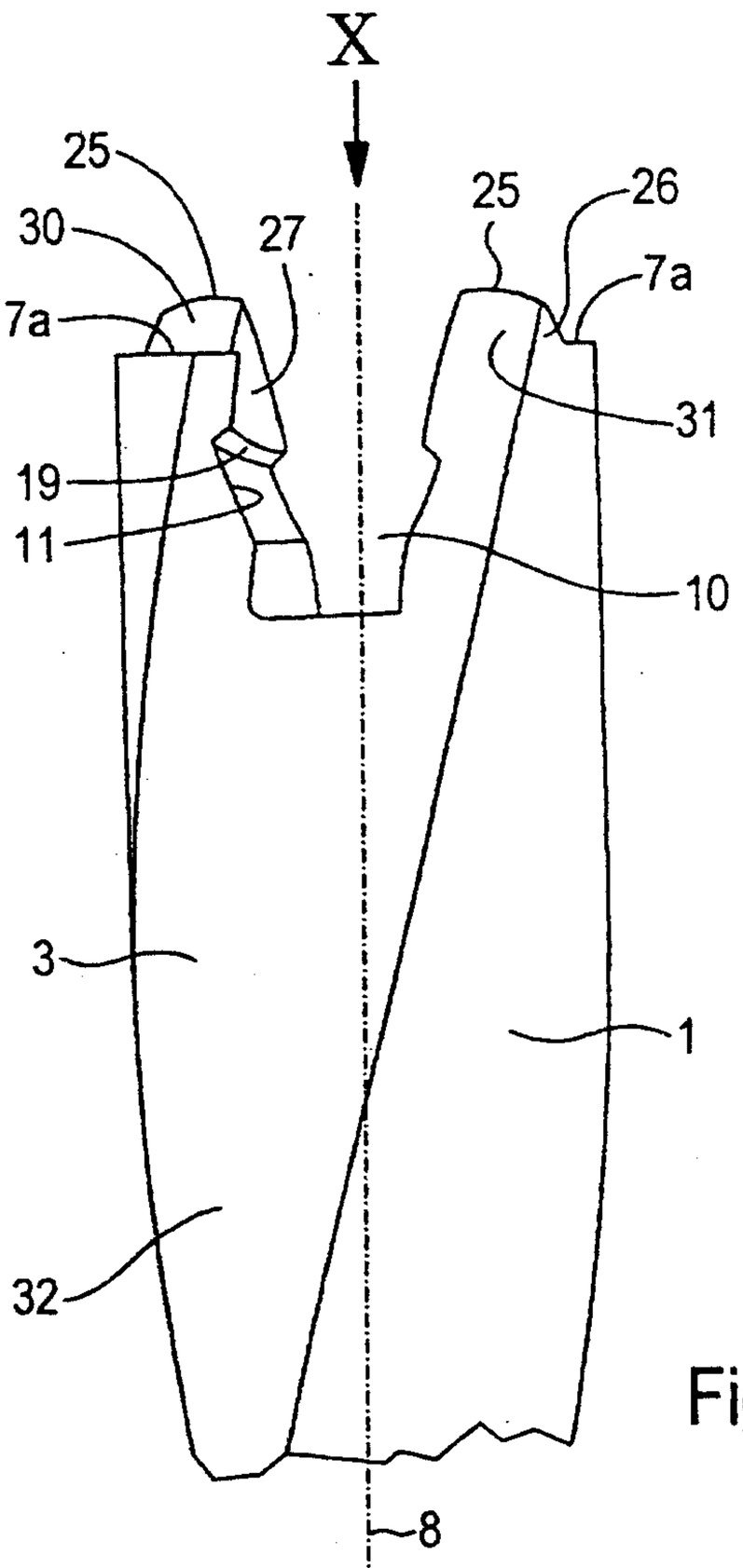


Fig. 9

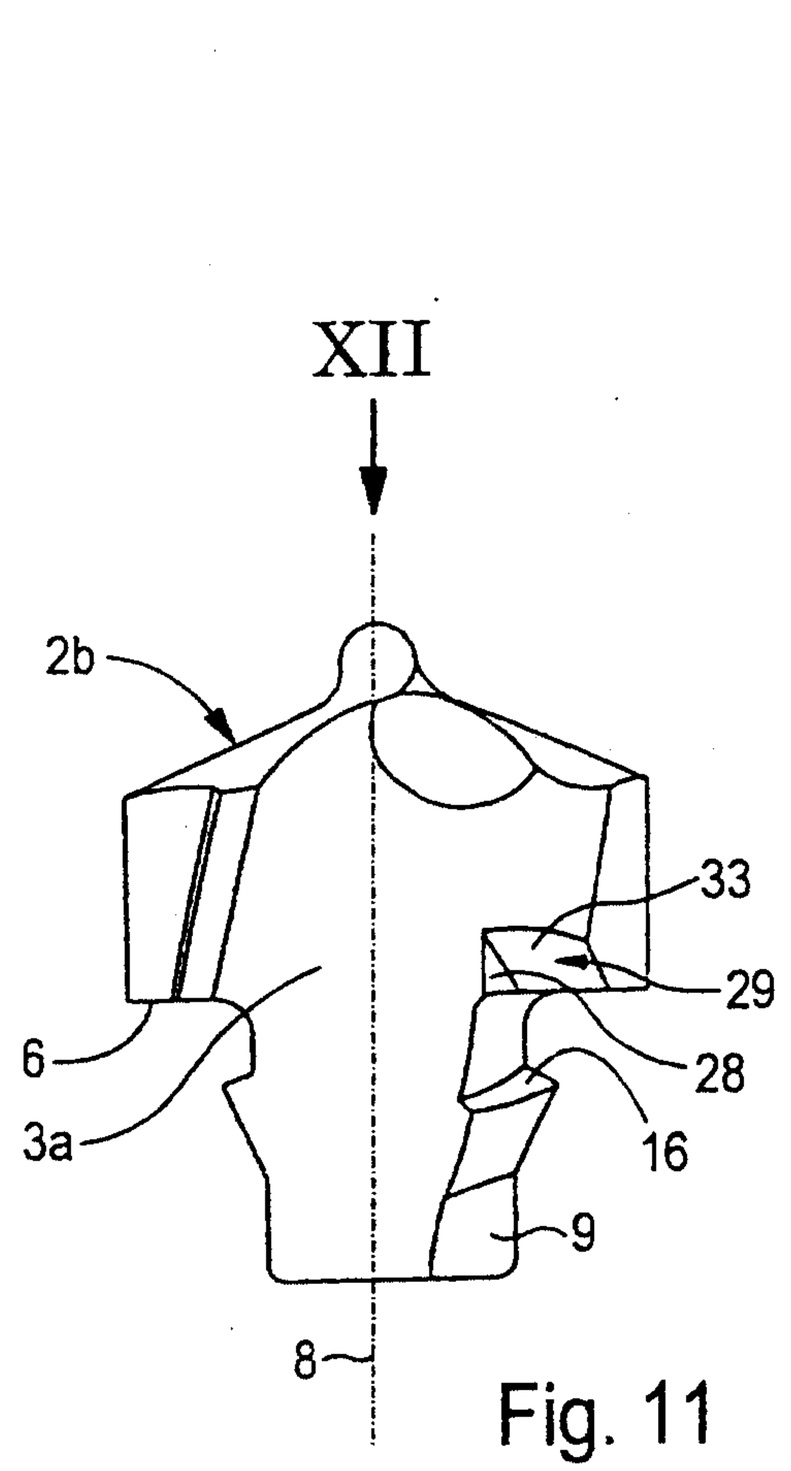


Fig. 11

Fig. 10

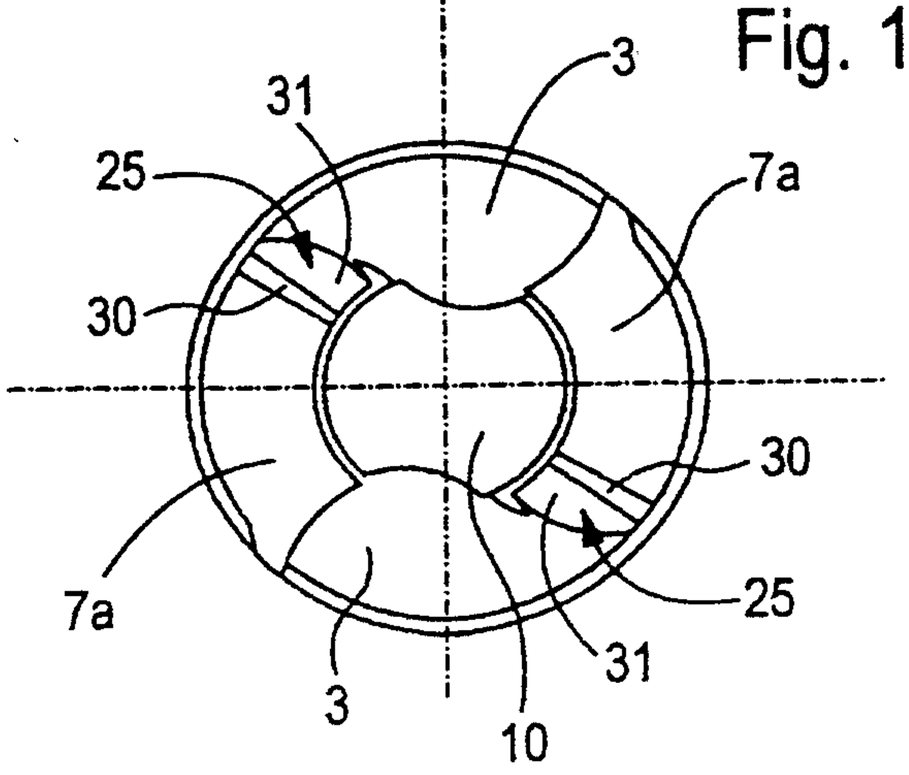
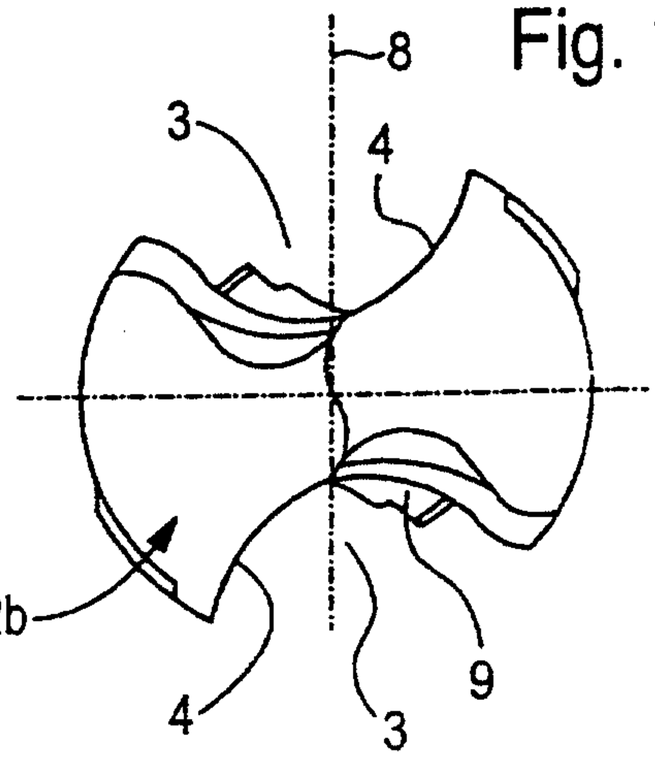


Fig. 12



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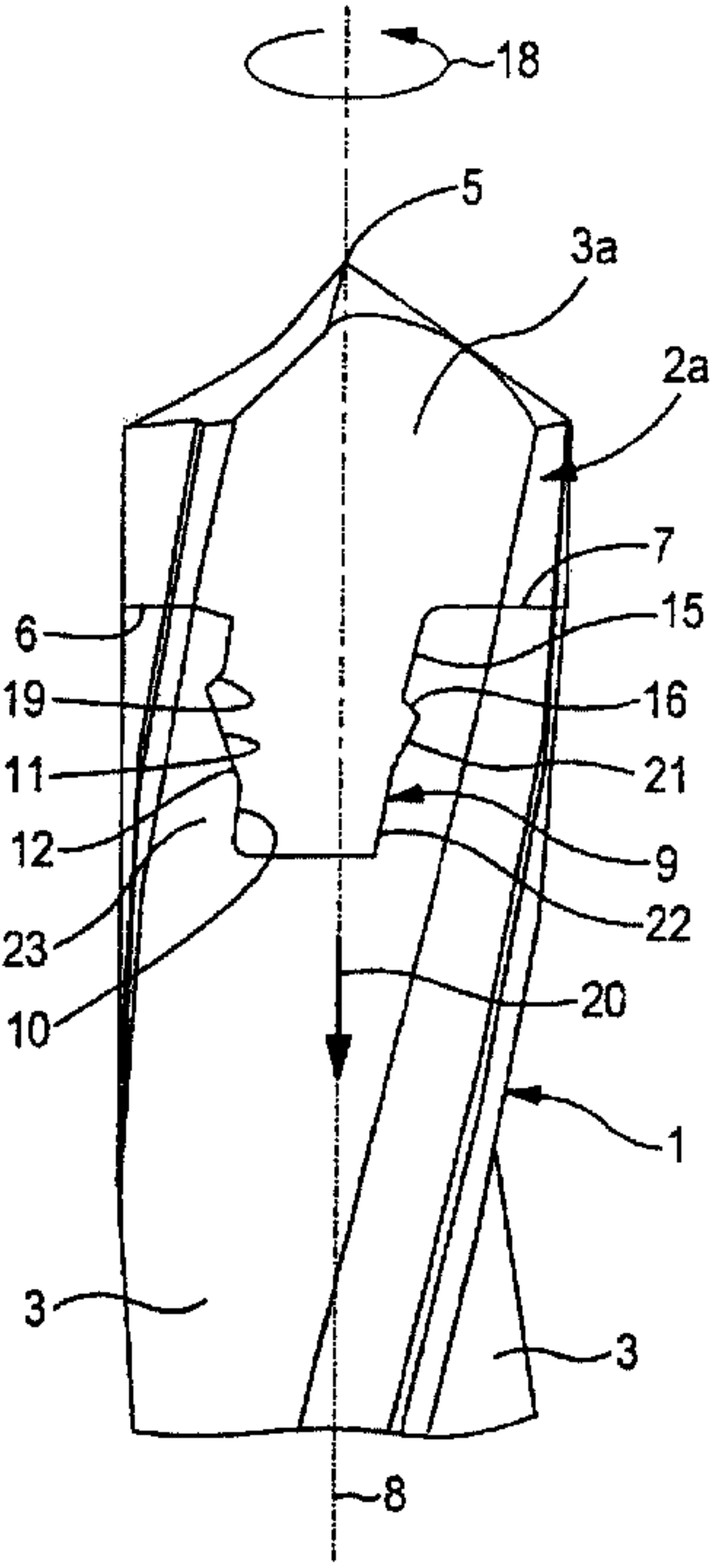
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