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 0800833-6 14 April 2008 (14.04.2008) SE</p> <p>(71) Applicant (for all designated States except US): SECO TOOLS AB [SE/SE]; .., S-737 82 Fagersta (SE).</p> <p>(72) Inventor; and</p> <p>(75) Inventor/Applicant (for US only): FREJD, Stefan [SE/SE]; .., Erik Dahlbergsgatan 6, S- 614 30 Söderköping (SE).</p> <p>(74) Agent: CARLSSON, Lars-Åke; .., Sandvik Intellectual Property AB, S-811 81 Sandviken (SE).</p> | <p>(81) Designated States (<i>unless otherwise indicated, for every kind of national protection available</i>): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.</p> <p>(84) Designated States (<i>unless otherwise indicated, for every kind of regional protection available</i>): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).</p> <p>Published:</p> |
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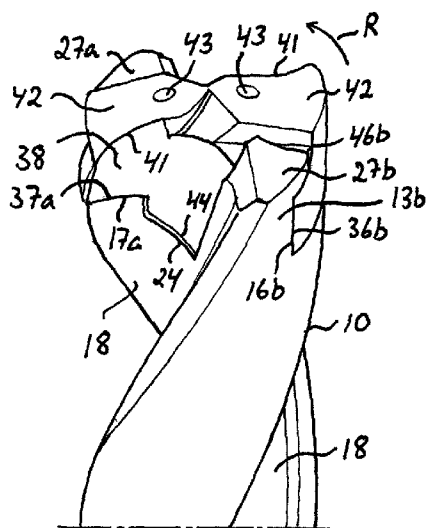


Fig 4

(57) Abstract: The invention relates to a tool for rotary cutting machining, comprising a tool body (10) and a replaceable cutting head (30) detachably attachable to the tool body. At its front end, the tool body is provided with two coupling legs (13a, 13b) projecting in axial direction. The respective coupling leg is provided with a stop surface (16a, 16b) for transferring torque from the tool body to the cutting head, which stop surface is designed for abutment against a corresponding stop surface (36a, 36b) of the cutting head. The respective coupling leg is provided with a shoulder (26a, 26b) protruding from the stop surface of the coupling leg. The cutting head is provided with two shoulders (46a, 46b) facing the front end of the cutting head and arranged on opposite sides of the centre axis of the cutting head, which shoulders border on a respective one of said stop surfaces of the cutting head and are arranged to extend in under a respective one of said shoulders of the coupling legs of the tool body when the cutting head is attached to the tool body, so as to thereby prevent the cutting head from being displaced in axial direction away from the tool body. The invention also relates to a tool body and a cutting head included in such a tool.

Tool for rotary cutting machining

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FIELD OF THE INVENTION AND PRIOR ART

The present invention relates to a tool for rotary cutting machining according to the preamble of claim 1 with a tool body and a
10 replaceable cutting head detachably attachable to the tool body. The invention also relates to a tool body and a cutting head included in such a tool.

A tool according to the preamble of claim 1 is previously known from
15 US 5 988 953 A and US 5 971 673 A. In this known tool, the mutual gripping surfaces of the tool body and the cutting head are conical and widen in the direction towards the rear end of the tool body and the cutting head, respectively, so as to thereby achieve a positive locking in axial direction between the tool body and the cutting head.
20 This positive locking prevents the cutting head from being displaced in axial direction away from the tool body, for instance when the tool is pulled out of a bore drilled by means of the tool. A disadvantage with these conical gripping surfaces is that the tolerance requirements are high for these surfaces and that they are relatively
25 complicated to achieve by means of mechanical machining.

OBJECT OF THE INVENTION

The object of the present invention is to achieve a tool of the type
30 mentioned by way of introduction with a new and favourable design.

SUMMARY OF THE INVENTION

According to the present invention, said object is achieved by means of a tool having the features defined in claim 1.

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In the tool according to the invention, the cutting head is prevented from being displaced in axial direction away from the tool body by means of a shoulder protruding from the torque carrying stop surface of the respective coupling leg, which shoulder is designed to extend out over a shoulder of the cutting head facing the front end of the cutting head, when the cutting head is attached to the tool body. The axial freedom of movement of the cutting head in relation to the tool body in the direction away from the tool body is consequently limited by these shoulders of the coupling legs of the tool body, and the cutting head is forced by these shoulders to accompany the tool body when the tool body is pulled in axial direction out of a bore drilled by means of the tool. With the solution according to the invention, this axial locking of the cutting head to the tool body is achieved without requiring any conical sections in the mutual gripping surfaces of the tool body and the cutting head. These gripping surfaces can thereby be given a shape that is simplified and favourable with respect to the manufacturing of the tool body and the cutting head.

According to a favourable embodiment of the invention, the stop surface of the respective coupling leg extends in parallel with the centre axis of the tool body and the corresponding stop surface of the cutting head extends in parallel with the centre axis of the cutting head. By letting the stop surfaces of the tool body be parallel with the centre axis of the tool body, an achievement of these stop surfaces by mechanical machining of a blank prepared for the formation of a tool body is facilitated, and by letting the stop surfaces of the cutting head be parallel with the centre axis of the cutting head, an achievement of these stop surfaces by mechanical machining of a blank prepared for the formation of a cutting head is facilitated.

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According to another favourable embodiment of the invention, the angle between the stop surface of a coupling leg and the shoulder protruding from this stop surface is between 80-90°, preferably 90°. An angle of 90° is here particularly favourable, since this will give a right-angled design which facilitates the manufacturing of the tool body.

According to another favourable embodiment of the invention, there is in the normal state of the tool a clearance between the respective shoulder of the coupling legs and the corresponding shoulder of the cutting head when the cutting head is attached to the tool body. Hereby, there is no risk of wear between the mutually co-operating shoulders and the tolerance requirements on these shoulders will also be very low.

According to another favourable embodiment of the invention, each one of said shoulders of the cutting head is arranged on the upper side of the cutting head and preferably formed by a depression in a clearance surface arranged on the upper side of the cutting head. Hereby, the shoulders of the cutting head can be achieved in a simple manner and these shoulders will not interfere with the remaining design of the cutting head.

According to another favourable embodiment of the invention, the internal gripping surfaces of the coupling portion of the tool body are cylindrical and extend in parallel with the centre axis of the tool body, and the external gripping surfaces of the coupling portion of the cutting head are cylindrical, extend in parallel with the centre axis of the cutting head and have a radius which is larger than the radius of said internal gripping surfaces. By letting the gripping surfaces of the tool body be cylindrical and parallel with the centre axis of the tool body, an achievement of these gripping surfaces by mechanical machining of a blank prepared for the formation of a tool body is facilitated, and by letting the gripping surfaces of the cutting head be cylindrical and parallel with the centre axis of the cutting head, an achievement of these gripping surfaces by mechanical

machining of a blank prepared for the formation of a cutting head is facilitated.

5 According to another favourable embodiment of the invention, the internal gripping surfaces of the coupling portion of the tool body are arranged on the inside of a respective one of said coupling legs at the level of the stop surface of the coupling leg, and the external gripping surfaces of the coupling portion of the cutting head are arranged at the level of the stop surfaces of the cutting head.

10 Hereby, the coupling portion of the tool body and the coupling portion of the cutting head can be given a relatively compact design with a comparatively short extension in axial direction.

15 Other favourable features of the tool according to the invention will appear from the dependent claims and the following description.

The invention also relates to a tool body having the features defined in claim 11 and a cutting head having the features defined in claim 15.

20 Other favourable features of the tool body according to the invention and the cutting head according to the invention will appear from the dependent claims and the following description.

25 BRIEF DESCRIPTION OF THE DRAWINGS

The invention will in the following be more closely described by means of embodiment examples, with reference to the appended drawings. It is shown in:

30 Fig 1 a perspective view of a cutting head and a tool body included in a tool according to an embodiment of the present invention in the form of a twist drill, with the cutting head and the tool body shown separated from each other,

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- Fig 2 a perspective view corresponding to Fig 1, but with the cutting head attached to the tool body,
- 5 Fig 3 a lateral view of the tool according to Fig 2,
- Fig 4 a perspective view of the front part of the tool according to Fig 2,
- 10 Fig 5 a lateral view in a first rotary position of the front part of the tool body included in the tool according to Fig 2,
- Fig 6 a lateral view in a second rotary position of the front part of the tool body,
- 15 Fig 7 a perspective view of the front part of the tool body,
- Fig 8 a perspective view from the front of the cutting head included in the tool according to Fig 2,
- 20 Fig 9 a lateral view of the cutting head,
- Fig 10 a perspective view from behind of the cutting head,
- 25 Fig 11 a cross-section along the line XI-XI in Fig 3, with the cutting head shown in an engagement position, and
- Fig 12 the cross-section of Fig 11, with the cutting head shown in a free position.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

The tool 1 of the invention is intended to be rotated for cutting machining of a workpiece. In the illustrated example, the tool is
5 designed as a twist drill, but the tool of the invention could also be designed as another type of tool for rotary cutting machining, such as for instance a milling cutter or the similar.

The intended direction of rotation of the tool 1 for machining is
10 marked with the arrow R in Figs 2, 4 and 11-12. This direction of rotation is in the following denominated "machining direction of rotation" and consequently constitutes the direction in which the tool is intended to be rotated in order to achieve cutting machining of a, preferably metallic, workpiece. Alternatively, the workpiece can be
15 rotated while the tool is kept stationary.

The tool 1 comprises a tool body 10 and a replaceable cutting head 30, which is detachably attachable to the tool body.

20 The cutting head 30 is formed in a one piece of a suitable cemented carbide, i.e. made of pressed or injection moulded cemented carbide. "Cemented carbide" here refers to WC, TiC, TaC, NbC etc, in sintered combination with a binder metal, such as for instance Co or Ni. The cutting end is preferably at least partially coated with a layer
25 of for instance Al_2O_3 , TiN and/or TiCN. In some cases, it can be suitable to have the cutting edges made of superhard materials, such as CBN or PCD, attached by soldering. The tool body 10 is likewise made in one piece, preferably of steel or other suitable metallic material.

30 The tool body 10 is symmetrically designed as seen in cross-section. At its rear end, the tool body 10 has an attachment portion 11, through which the tool body is intended to be attached to a chuck or the similar of a drilling machine or another suitable type of working
35 machine. At its front end, the tool body has a coupling portion 12 for receiving a corresponding coupling portion 32 of the cutting head. As

appears from Figs 5-7, the coupling portion 12 of the tool body is provided with two coupling legs 13a, 13b projecting in the axial direction of the tool body and arranged on opposite sides of the centre axis C1 of the tool body. Between the coupling legs 13a, 13b there is a space 14 for receiving the coupling portion 32 of the cutting head. Internal gripping surfaces 15a, 15b are arranged in this space 14. These internal gripping surfaces are designed for engagement with corresponding external gripping surfaces 35a, 35b (see Figs 8-12) of the coupling portion of the cutting head, as will be more closed described below. In the illustrated example, these gripping surfaces 15a, 15b are two in number.

The respective coupling leg 13a, 13b is provided with a surface 16a, 16b, here denominated stop surface, which is designed for abutment against a corresponding stop surface 36a, 36b (see Figs 8-12) of the coupling portion of the cutting head in order to transfer torque from the tool body to the cutting head during rotation of the tool in its machining direction of rotation R. The internal gripping surfaces 15a, 15b of the coupling portion of the tool body are suitably arranged on the inside of a respective one of the coupling legs 13a, 13b at the level of the stop surface 16a, 16b of the coupling leg, as illustrated in Figs 6 and 7.

In the respective coupling leg 13a, 13b, the stop surface 16a, 16b of the coupling leg borders on a support surface 17a, 17b extending perpendicularly to the centre axis of the tool body. Each one of these support surfaces 17a, 17b is designed for abutment against a corresponding support surface 37a, 37b (see Figs 9 and 10) of the coupling portion of the cutting head in order to carry axial forces when the cutting head 30 is pressed against a workpiece. The respective stop surface 16a, 16b of the coupling portion 12 of the tool body is suitably parallel with the centre axis C1 of the tool body, in which case the stop surface 16a, 16b consequently extends perpendicularly to the support surface 17a, 17b bordering thereon. The respective stop surface 16a, 16b could alternatively, starting out from its rear edge facing the rear end of the tool body, be inclined

forward in the intended machining direction of rotation R of the tool body, in which case the angle α between the stop surface 16a, 16b and the support surface 17a, 17b bordering thereon suitably is between 75-90°.

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The replaceable cutting head 30 of the tool is shown in closer detail in Figs 8-10. The cutting head is symmetrically designed as seen in cross-section. At its front end, the cutting head has a cutting portion 40, which in a conventional manner comprises at least one cutting edge 41 extending in the radial direction of the cutting head. In the illustrated example, the cutting head 30 is provided with two cutting edges 41. Behind the respective cutting edge 41, as seen in the machining direction of rotation R of the cutting head, a clearance surface 42 is arranged. In the illustrated example, a coolant channel 43 opens into the respective clearance surface 42. At its other end, the respective coolant channel 43 opens into a bottom surface 44 on the underside of the cutting head. When the cutting head 30 is attached to the tool body 10, the respective coolant channel 43 is connected to a corresponding coolant channel 23 which extends through the tool body and which opens into a bottom surface 24 of the space 14 between the coupling legs 13a, 13b of the tool body (see Fig 7). The distance in axial direction between the bottom surface 24 of the space 14 and the support surfaces 17a, 17b of the tool body is suitably somewhat larger than the distance in axial direction between the bottom surface 44 of the cutting head 30 and the support surfaces 37a, 37b of the cutting head, so that there is a small clearance between these bottom surfaces 24, 44 when the support surfaces 37a, 37b of the cutting head abut against the support surfaces 17a, 17b of the tool body, as illustrated in Fig 4.

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The above-mentioned coupling portion 32, which is designed for engagement with the coupling portion 12 of the tool body and receivable in the space 14 between the coupling legs 13a, 13b of the coupling portion of the tool body, is located below the cutting portion 40. External gripping surfaces 35a, 35b are arranged on the coupling portion 32 of the cutting head on either side of the centre axis of the

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- cutting head. In the illustrated example, these gripping surfaces 35a, 35b are two in number. The external gripping surfaces 35a, 35b of the cutting head are designed for engagement with the corresponding internal gripping surfaces 15a, 15b in the space 14 of the coupling portion 12 of the tool body. Furthermore, the coupling portion 32 of the cutting head is provided with two stop surfaces 36a, 36b arranged on opposite sides of the centre axis of the cutting head, each of which being designed for abutment against the stop surface 16a, 16b of one of the coupling legs 13a, 13b of the coupling portion of the tool body. The external gripping surfaces 35a, 35b of the coupling portion of the cutting head are suitably arranged at the level of the stop surfaces 36a, 36b of the cutting head, as illustrated in Figs 8-10.
- 15 The respective stop surface 36a, 36b of the cutting head borders on a support surface 37a, 37b extending perpendicularly to the centre axis of the cutting head. These support surfaces 37a, 37b are designed for abutment against the corresponding support surfaces 17a, 17b of the coupling portion of the tool body. The respective stop surface 36a, 36b is suitably parallel with the centre axis of the cutting head, in which case the stop surface 36a, 36b consequently extends perpendicularly to the support surface 37a, 37b bordering thereon. In the case when the stop surfaces 16a, 16b of the tool body are inclined in the above-mentioned manner, the stop surfaces 36a, 36b of the cutting head consequently have a corresponding inclination so that the respective stop surface of the cutting head is able to come into flat abutment against the corresponding stop surface of the tool body.
- 30 The coupling portion 32 of the cutting head is turnable in the space 14 of the coupling portion 12 of the tool body about the centre axis of the cutting head to and fro between:
- a free position (see Fig 12), in which the stop surfaces 36a, 36b of the coupling portion of the cutting head do not abut against the corresponding stop surfaces 16a, 16b of the coupling legs 13a, 13b and the gripping surfaces 35a, 35 of the cutting head are not in

holding engagement with the corresponding gripping surfaces 15a, 15b of the tool body; and

- an engagement position (see Fig 11), in which the stop surfaces 36a, 36b of the coupling portion of the cutting head abut against the corresponding stop surfaces 16a, 16b of the coupling legs and the gripping surfaces 35a, 35b of the cutting head are in holding engagement with the corresponding gripping surfaces 15a, 15b of the tool body.

When the cutting head 30 is in said free position, the cutting head can be moved in axial direction away from the tool body 10, out of the space 14 between the coupling legs 13a, 13b of the tool body. When the cutting head 30 is in said engagement position, the cutting head is locked to the tool body 10 and the tool 1 is ready for machining of a workpiece. The turning of the cutting head 30 between the free position and the engagement position or vice versa is suitably performed by means of an implement in the form of a key of the like, which is brought into temporary engagement with the cutting head.

The respective stop surface 16a, 16b of the tool body is suitably so arranged that it has its extension in a plane which does not cross the centre axis C1 of the tool body, in which case the corresponding stop surface 36a, 36b of the cutting head consequently has its extension in a plane which does not cross the centre axis of the cutting head. As seen in a cross-section through the tool body 10 and the cutting head 30 (see Fig 11), the lines of contact L1a, L1b between the respective stop surface 16a, 16b of the tool body and the corresponding stop surface 36a, 36 of the cutting head in this case extends at an angle in relation to a line L2 crossing the centre axis C1 of the tool body and the radial extreme points Pa, Pb of the lines of contact L1a and L1b, the distance between the respective line of contact L1a, L1b and the line L2 increasing in the direction towards the centre of the tool. Starting out from its radial extreme point Pa, Pb, the respective line of contact L1a, L1b is inclined forward in relation to the line L2 in the intended machining direction of rotation

R of the tool. This results in that the cutting head 30 through the stop surfaces 36a, 36b, 16a, 16b will exert a force on the coupling legs 13a, 13b of the tool body directed towards the centre of the tool during machining of a workpiece, which in its turn results in that the internal gripping surfaces 15a, 15b of the coupling legs are pressed against the corresponding external gripping surfaces 35a, 35b of the cutting head. Hereby, the mutual holding between these gripping surfaces is consequently promoted. The angle between the line L2 and the respective line of contact L1a, L1b is suitably between 10-30°.

Two chip flutes 18 are arranged on the outside of the tool body and extend, preferably helically, diametrically opposite each other along the tool body 10 from an area in the vicinity of the attachment portion 11 and up to the coupling portion 12. Each one of these chip flutes 18 extends up to an area between the two coupling legs 13a, 13b and is arranged to connect to a corresponding chip flute 38 on the outside of the cutting head when the cutting head 30 is attached to the tool body 10. The chip flutes 18, 38 could alternatively be rectilinear instead of helical. The chip flutes 18, 38 are intended to carry away the chips generated by the cutting edges 41 during machining of a workpiece.

The cutting head 30 is provided with two guide edges 39a, 39b arranged diametrically opposite each other, which constitute the extreme surfaces of the cutting head in radial direction and which extend in the axial direction of the cutting head. During the drilling of a bore, the tool 1 abuts against the hole wall of the bore through these guide edges 39a, 39b, the guide edges guiding the tool 1 so that the bore will be straight and round. By arranging the gripping surfaces 35a, 35b of the cutting head at the level of its stop surfaces 36a, 36b, the cutting head 30 can be given a comparatively short extension in axial direction while maintaining a given length of the guide edges 39a, 39b, or the guide edges 39a, 39b can be given a comparatively long length while maintaining a given extension in axial direction of the cutting head.

If so considered suitable, the cutting head 30 can on its underside be provided with a centrally located guide pin 45 projecting in the axial direction of the cutting head, which guide pin is arranged to be
5 received in a corresponding central recess 25 in the bottom of the space 14 between the coupling legs 13a, 13b when the coupling portion 32 of the cutting head is inserted into this space 14. Hereby, the initial centering of the coupling portion 32 of the cutting head in the space 14 is facilitated in connection with the mounting of the
10 cutting head to the tool body. The guide pin 45 is suitably chamfered at its outer free end.

The respective coupling leg 13a, 13b is provided with a shoulder 26a, 26b, which protrudes from the stop surface 16a, 16b of the
15 coupling leg and which extends a distance out over the support surface 17a, 17b of the coupling leg. The angle β between this shoulder 26a, 26b and the stop surface 16a, 16b bordering thereon is suitably between 70-110°. In the case when the stop surfaces 16a, 16b of the tool body extend in parallel with the centre axis of the tool
20 body, the angle between the stop surface 16a, 16b of the respective coupling leg and the shoulder 26a, 26b protruding therefrom is suitably between 80-90°, preferably 90°. The respective shoulder 26a, 26b is formed by a hook-shaped protrusion 27a, 27b on the
25 respective coupling leg 13a, 13b, which protrusion 27a, 27b protrudes from the coupling leg in the intended machining direction of rotation R.

The cutting head 30 is provided with two shoulders 46a, 46b facing the front end of the cutting head and arranged on opposite sides of the centre axis of the cutting head, which border on a respective one
30 of said stop surfaces 36a, 36b of the coupling portion of the cutting head and are arranged to extend in under a respective one of said shoulders 26a, 26b of the coupling legs 13a, 13b of the tool body when the coupling portion 32 of the cutting head is in the engagement position in the space 14 of the coupling portion 12 of the
35 tool body, so as to thereby prevent the cutting head 30 from being displaced in axial direction away from the tool body 10. The shoulder

26a, 26b of the respective coupling leg 13a, 13b is consequently designed to extend out over the corresponding shoulder 46a, 46b of the cutting head 30 when the cutting head is attached to the tool body 10. In order to avoid wear between the shoulders 26a, 26b, 5 46a, 46b, there is suitably, in the normal state of the tool, a small clearance between the respective shoulder 26a, 26b of the coupling legs 13a, 13b and the corresponding shoulder 46a, 46b of the cutting head 30 when the coupling portion 32 of the cutting head is in the engagement position in the space 14 of the coupling portion 12 of the 10 tool body. The normal state of the tool here refers to the state when the coupling portion 32 of the cutting head is in the engagement position in the space 14 between the coupling legs 13a, 13b and the support surfaces 37a, 37b of the cutting head abut against the corresponding support surfaces 17a, 17b of the tool body. The 15 shoulders 26a, 26b, 46a, 46b are only intended to abut against each other when the cutting head 30 is jammed in a bore during the pulling of the tool 1 out of the bore.

Each one of said shoulders 46a, 46b of the cutting head 30 is 20 suitably arranged on the upper side of the cutting head and is preferably formed by a depression in one of the clearance surfaces 42 arranged on the upper side of the cutting head. In the illustrated example, said shoulders 26a, 26b, 46a, 46b have such an inclination that they essentially follow the angle of inclination of the clearance 25 surfaces 42 of the cutting head, but these shoulders could alternatively be arranged to extend perpendicularly to the centre axis C1 of the tool body and the centre axis of the cutting head, respectively.

30 The internal gripping surfaces 15a, 15b of the coupling portion 12 of the tool body are suitably cylindrical and arranged to extend in parallel with the centre axis C1 of the tool body, in which case the corresponding external gripping surfaces 35a, 35b of the coupling 35 portion of the cutting head are cylindrical and arranged to extend in parallel with the centre axis of the cutting head. These cylindrical external gripping surfaces 35a, 35b of the cutting head have a radius

that is somewhat larger than the radius of the cylindrical internal gripping surfaces 15a, 15b of the tool body, so that there will be a certain elastic deflection of the coupling legs 13a, 13b in radial direction when the coupling portion 32 of the cutting head is turned
5 from the free position to the engagement position. Hereby, a stable mutual grip between the gripping surfaces is obtained.

In order to facilitate the turning of the cutting head 30 from the free position to the engagement position, the coupling portion 32 of the
10 cutting head is provided with two guide surfaces 48 arranged diametrically opposite each other, which extend in the axial direction of the cutting head. Each one of these guide surfaces 48 is formed by a chamfer in the transition between a chip flute 38 and the gripping surface 35a, 35b bordering on the chip flute, and follows the
15 helical path of the chip flute. Guide surfaces 28 are likewise arranged on the respective coupling leg 13a, 13b, these guide surfaces 28 being formed by a chamfer in the transition between the stop surface 16a, 16b and the gripping surface 15a, 15b of the coupling legs 13a, 13b.

20 The invention is of course not in any way limited to the embodiments described above. On the contrary, several possibilities to modifications thereof should be apparent to a person skilled in the art without departing from the basic idea of the invention as defined
25 in the appended claims.

The disclosures in Swedish patent application No. 0800833-6, from which this application claims priority, are incorporated herein by
30 reference.

CLAIMS

1. A tool for rotary cutting machining, comprising a tool body (10) and a replaceable cutting head (30) detachably attachable to the tool body, wherein:
- the tool body (10) at its front end has a coupling portion (12) with two coupling legs (13a,13b) projecting in the axial direction of the tool body and arranged on opposite sides of the centre axis of the tool body;
 - the cutting head (30) has a coupling portion (32), which is designed for engagement with the coupling portion (12) of the tool body and which is receivable in a space (14) between said coupling legs (13a,13b) of the coupling portion of the tool body;
 - internal gripping surfaces (15a,15b) are arranged in said space (14) of the coupling portion of the tool body, which are designed for engagement with corresponding external gripping surfaces (35a,35b) of the coupling portion of the cutting head;
 - the respective coupling leg (13a,13b) is provided with a stop surface (16a,16b) intended to transfer torque from the tool body to the cutting head, which stop surface is designed for abutment against a corresponding stop surface (36a,36b) of the coupling portion of the cutting head and which extends in parallel with the centre axis of the tool body or, starting out from its rear edge, is inclined forward in the intended machining direction of rotation (R) of the tool body; and
 - the coupling portion (32) of the cutting head is turnable in said space (14) of the coupling portion of the tool body about the centre axis of the cutting head to and fro between a free position, in which the stop surfaces (36a,36b) of the coupling portion of the cutting head do not abut against the corresponding stop surfaces (16a,16b) of the coupling legs (13a,13b) and the gripping surfaces (35a,35b) of the cutting head are not in holding engagement with the corresponding gripping surfaces (15a,15b) of the tool body, and an engagement position, in which the stop surfaces (36a,36b) of the coupling portion of the cutting head abut against the corresponding stop surfaces (16a,16b) of the coupling legs and the gripping

surfaces (35a,35b) of the cutting head are in holding engagement with the corresponding gripping surfaces (15a,15b) of the tool body, **characterized** in:

- that the respective coupling leg (13a,13b) is provided with a shoulder (26a,26b) protruding from the stop surface (16a,16b) of the coupling leg; and
- that the cutting head (30) is provided with two shoulders (46a,46b) facing the front end of the cutting head and arranged on opposite sides of the centre axis of the cutting head, which shoulders border on a respective one of said stop surfaces (36a,36b) of the coupling portion of the cutting head and are arranged to extend in under a respective one of said shoulders (26a,26b) of the coupling legs (13a,13b) of the tool body when the coupling portion (32) of the cutting head is in said engagement position in said space (14) of the coupling portion of the tool body so as to thereby prevent the cutting head (30) from being displaced in axial direction away from the tool body (10).

2. A tool according to claim 1, **characterized** in that, in the respective coupling leg (13a,13b), the stop surface (16a,16b) of the coupling leg borders on a support surface (17a,17b) extending perpendicularly to the centre axis of the tool body, which support surface (17a,17b) is designed for abutment against a corresponding support surface (37a,37b) of the coupling portion (32) of the cutting head in order to carry axial forces, the angle (α) between this stop surface (16a,16b) and this support surface (17a,17b) of the coupling leg being between 75-90°, preferably 90°, and the shoulder (26a,26b) bordering on this stop surface (16a,16b) extending out over this support surface (17a,17b).

3. A tool according to claim 1 or 2, **characterized** in that, in the respective coupling leg (13a,13b), the angle (β) between the stop surface (16a,16b) of the coupling leg and the shoulder (26a,26b) protruding from this stop surface is between 70-110°.

4. A tool according to any of claims 1-3, **characterized** in that, in the respective coupling leg (13a,13b), the stop surface (16a,16b) of the coupling leg extends in parallel with the centre axis of the tool body, and that said stop surfaces (36a,36b) of the cutting head (30) extend in parallel with the centre axis of the cutting head.
5. A tool according to claim 4, **characterized** in that, in the respective coupling leg (13a,13b), the angle (β) between the stop surface (16a,16b) of the coupling leg and the shoulder (26a,26b) protruding from this stop surface is between 80-90°, preferably 90°.
6. A tool according to any of claims 1-5, **characterized** in that there is a clearance, in the normal state of the tool, between the respective shoulder (26a,26b) of the coupling legs and the corresponding shoulder (46a,46b) of the cutting head when the coupling portion (32) of the cutting head is in said engagement position in said space (14) of the coupling portion of the tool body.
7. A tool according to any of claims 1-6, **characterized** in that each one of said shoulders (46a,46b) of the cutting head is arranged on the upper side of the cutting head and preferably is formed by a depression in a clearance surface (42) arranged on the upper side of the cutting head.
8. A tool according to any of claims 1-7, **characterized** in:
- that said internal gripping surfaces (15a,15b) of the coupling portion of the tool body are cylindrical and extend in parallel with the centre axis of the tool body; and
 - that said external gripping surfaces (35a,35b) of the coupling portion of the cutting head are cylindrical, extend in parallel with the centre axis of the cutting head and have a radius which is larger than the radius of said internal gripping surfaces (15a,15b).
9. A tool according to any of claims 1-8, **characterized** in that said internal gripping surfaces (15a,15b) of the coupling portion of the tool body are arranged on the inside of a respective one of said

coupling legs (13a,13b) at the level of the stop surface (16a,16b) of the coupling leg, and that said external gripping surfaces (35a,35b) of the coupling portion of the cutting head are arranged at the level of the stop surfaces (36a,36b) of the cutting head.

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10. A tool according to any of claims 1-9, **characterized** in that two chip flutes (18) are arranged on the outside of the tool body and extend, preferably helically, diametrically opposite each other along the tool body (10), each one of these chip flutes (18) extending up to an area between the two coupling legs (13a,13b) and being arranged to connect to a corresponding chip flute (38) on the outside of the cutting head when the coupling portion (32) of the cutting head is in said engagement position in said space (14) of the coupling portion of the tool body.

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11. A tool body intended to be attached to a replaceable cutting head in order to form a tool for rotary cutting machining, wherein:

- the tool body (10) at its front end has a coupling portion (12) with two coupling legs (13a,13b) projecting in the axial direction of the tool body and arranged on opposite sides of the centre axis of the tool body, and a space (14) arranged between these coupling legs designed for receiving a coupling portion of the cutting head;
- internal gripping surfaces (15a,15b) are arranged in said space (14) of the coupling portion of the tool body, which are designed for engagement with corresponding external gripping surfaces of the coupling portion of the cutting head; and
- the respective coupling leg (13a,13b) is provided with a stop surface (16a,16b) intended to transfer torque from the tool body to the cutting head, which stop surface is designed for abutment against a corresponding stop surface of the coupling portion of the cutting head and which extends in parallel with the centre axis of the tool body or, starting out from its rear edge, is inclined forward in the intended machining direction of rotation (R) of the tool body,

characterized in that the respective coupling leg (13a,13b) is provided with a shoulder (26a,26b) protruding from the stop surface (16a,16b) of the coupling leg, this shoulder (26a,26b) being designed

to extend out over a shoulder of the cutting head facing the front end of the cutting head, when the tool body is attached to the cutting head, so as to thereby prevent the cutting head from being displaced in axial direction away from the tool body.

5

12. A tool body according to claim 11, **characterized** in that, in the respective coupling leg (13a,13b), the stop surface (16a,16b) of the coupling leg borders on a support surface (17a,17b) extending perpendicularly to the centre axis of the tool body, which support surface (17a,17b) is designed for abutment against a corresponding support surface of the coupling portion of the cutting head in order to carry axial forces, the angle (α) between this stop surface (16a,16b) and this support surface (17a,17b) being between 75-90°, preferably 90°, and the shoulder (26a,26b) bordering on this stop surface (16a,16b) extending out over this support surface (17a,17b).

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13. A tool body according to claim 11 or 12, **characterized** in that, in the respective coupling leg (13a,13b), the stop surface (16a,16b) of the coupling leg extends in parallel with the centre axis of the tool body.

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14. A tool body according to claim 13, **characterized** in that, in the respective coupling leg (13), the angle (β) between the stop surface (16a,16b) of the coupling leg and the shoulder (26a,26b) protruding from this stop surface is between 80-90°, preferably 90°.

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15. A cutting head detachably attachable to a tool body according to any of claims 11-14, wherein:

- the cutting head (30) has a coupling portion (32), which is designed for engagement with the coupling portion of the tool body and which is receivable in the space between the coupling legs of the coupling portion of the tool body;
- external gripping surfaces (35a,35b) are arranged on the coupling portion (32) of the cutting head, which gripping surfaces are designed for engagement with corresponding internal gripping surfaces in said space of the coupling portion of the tool body; and

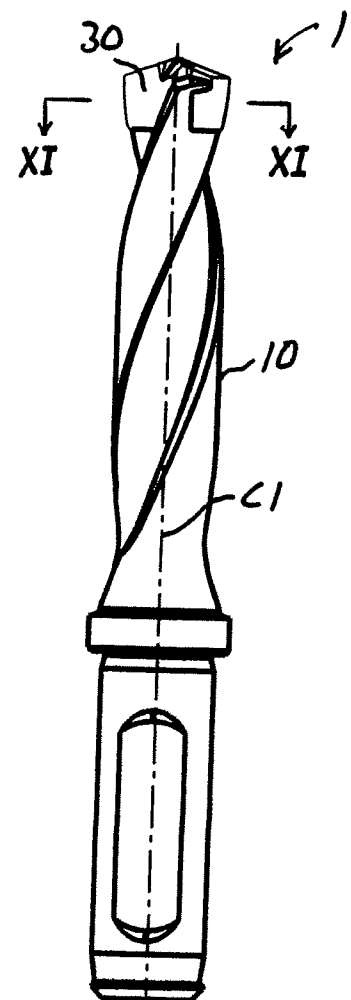
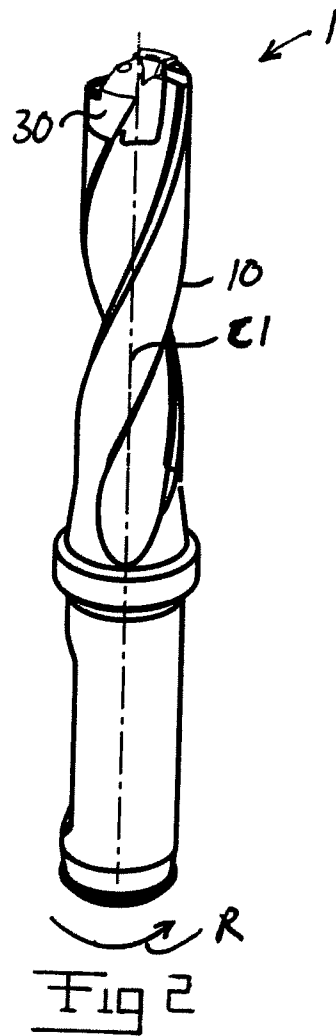
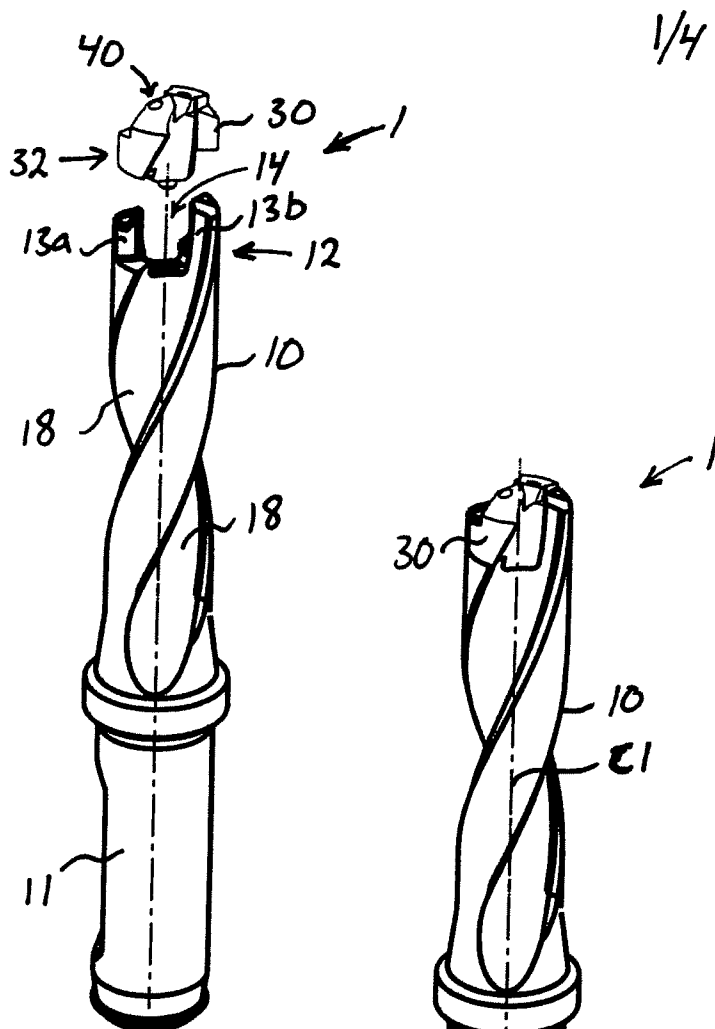
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- the coupling portion (32) of the cutting head is provided with two stop surfaces (36a,36b) arranged on opposite sides of the centre axis of the cutting head, each of which being designed for abutment against the stop surface of one of the coupling legs of the coupling portion of the tool body,

5 **characterized** in that the cutting head (30) is provided with two shoulders (46a,46b) facing the front end of the cutting head and arranged on opposite sides of the centre axis of the cutting head, which shoulders border on a respective one of said stop surfaces
10 (36a,36b) of the coupling portion of the cutting head and are arranged to extend in under a respective one of the shoulders of the coupling legs of the tool body when the cutting head is attached to the tool body.

15 16. A cutting head according to claim 15, **characterized** in that each one of said shoulders (46a,46b) of the cutting head is arranged on the upper side of the cutting head and preferably is formed by a depression in a clearance surface (42) arranged on the upper side of the cutting head.



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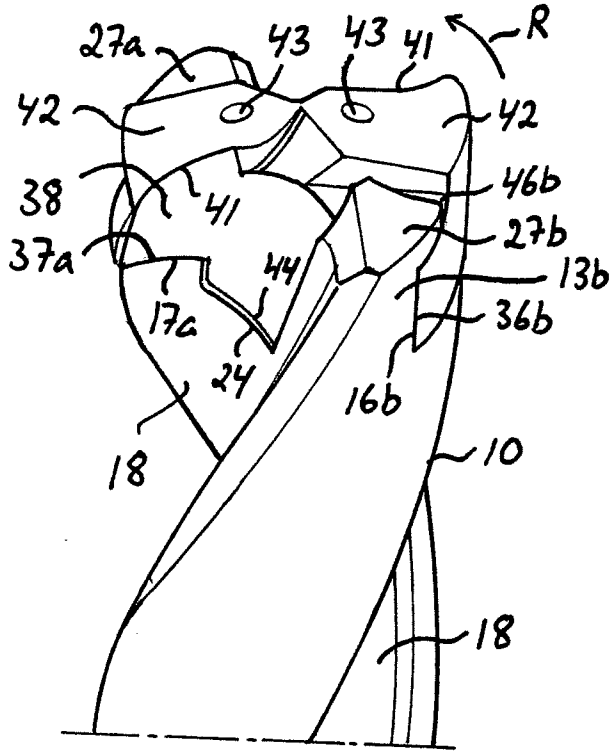


Fig 4

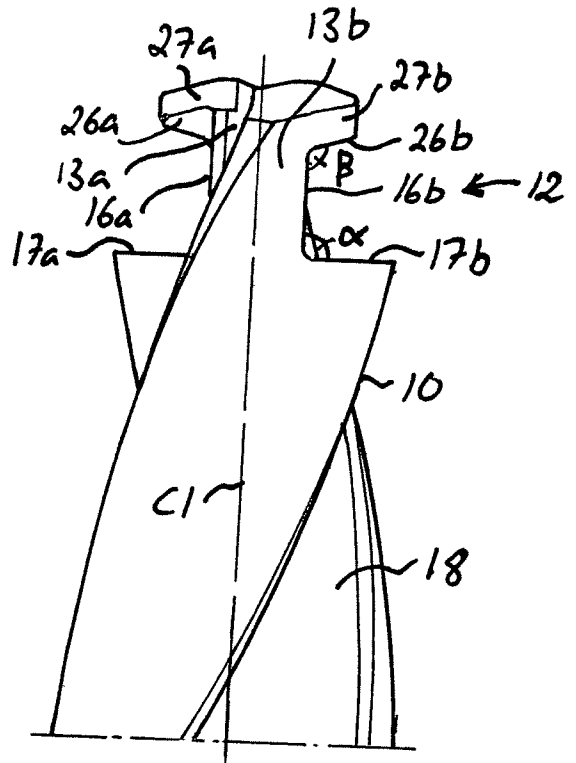


Fig 5

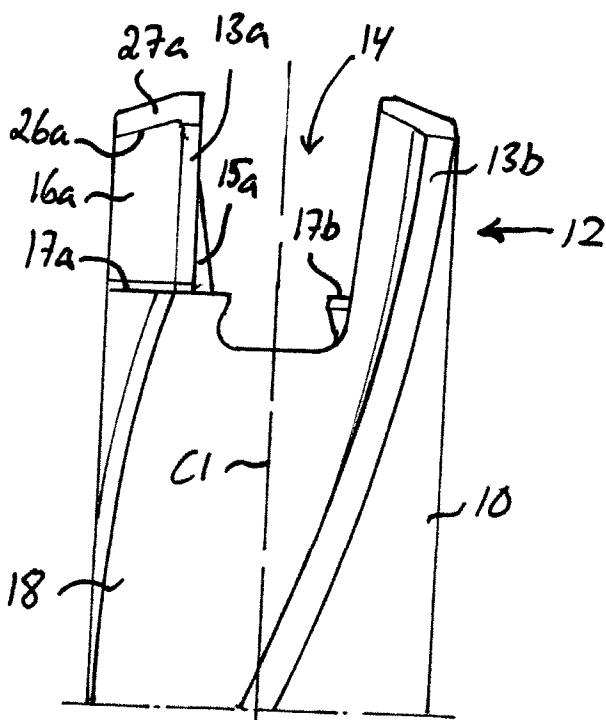


Fig 6

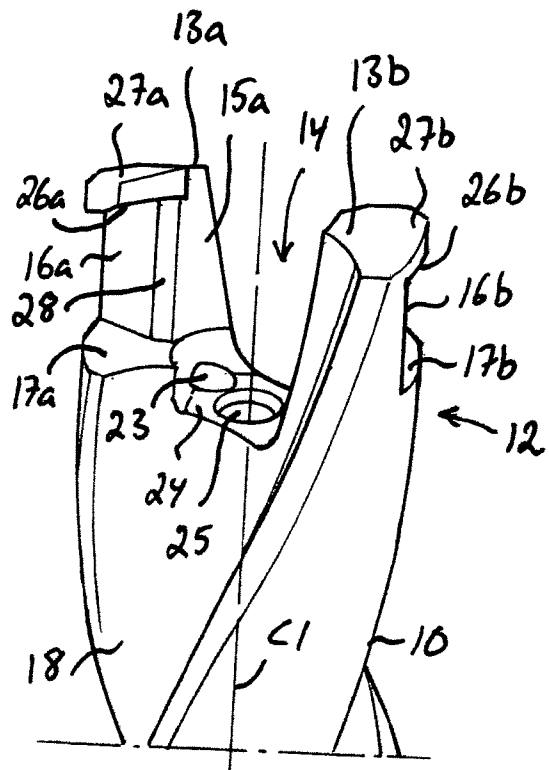
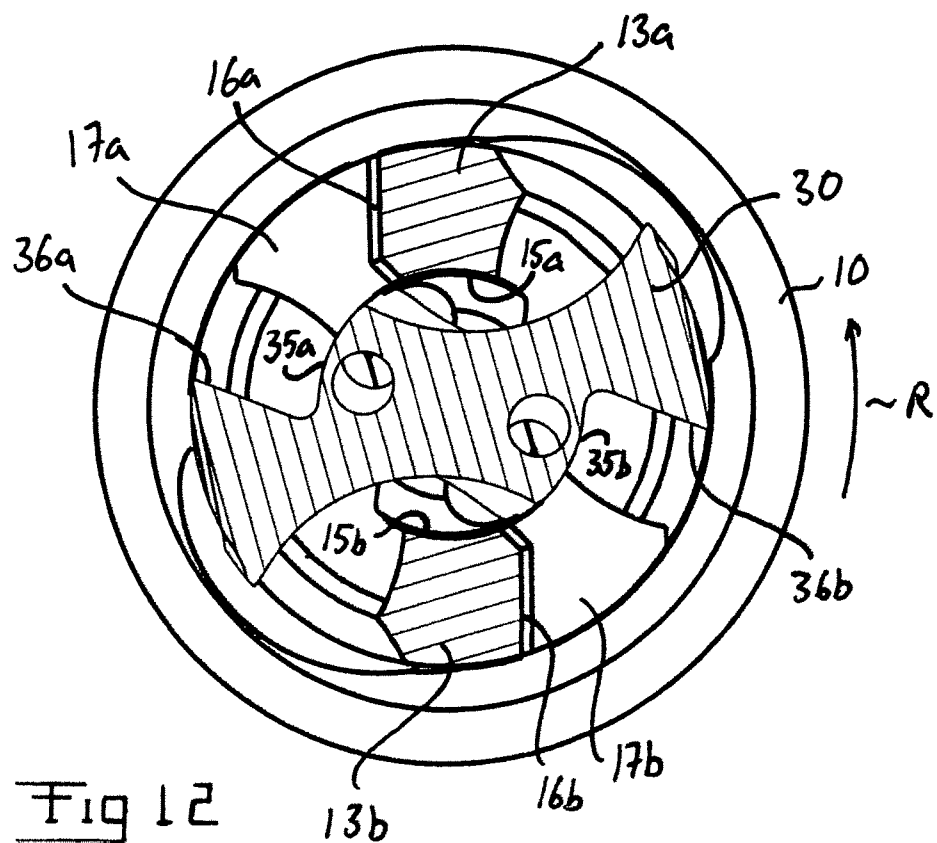
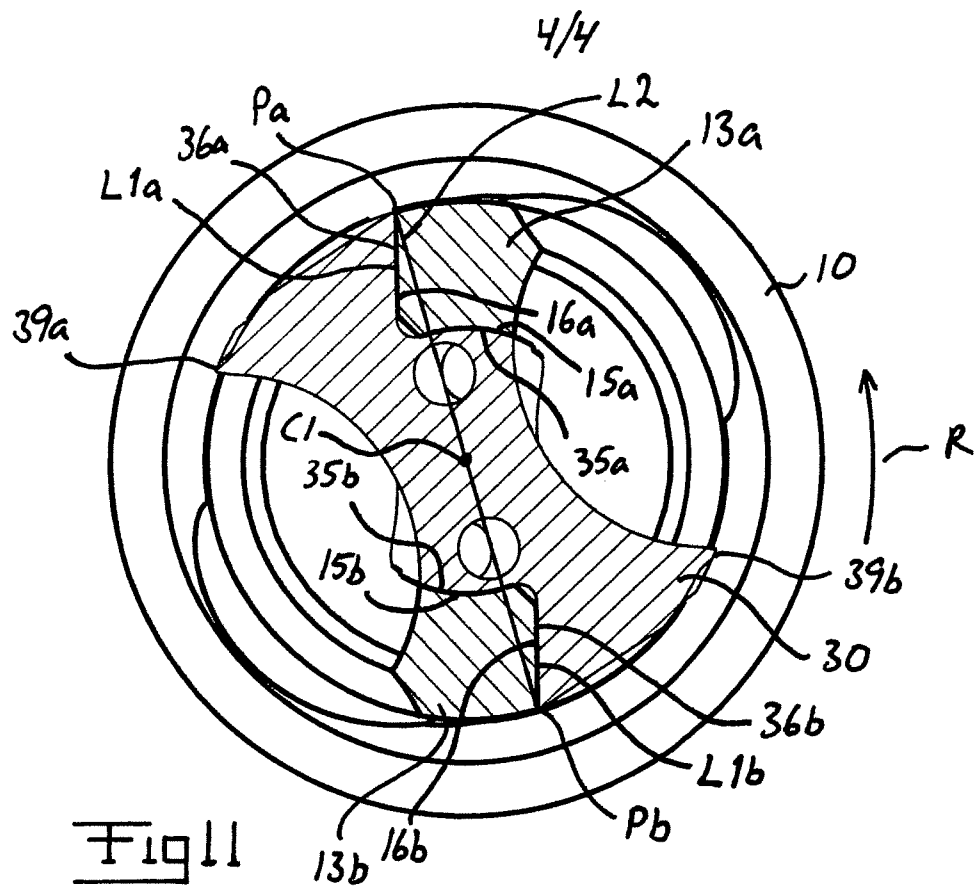


Fig 7



INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE2009/050382

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: B23B, B23C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2008014367 A1 (ALLIED MACHINE & ENGINEERING CORP.), 31 January 2008 (31.01.2008), page 4 - page 7, figures 1-4, abstract --	1-16
P,X	US 20080193237 A1 (MEN ET AL), 14 August 2008 (14.08.2008), figures 1-26, claims 1-20, abstract --	1-16
A	WO 2006046227 A1 (ISCAR LTD.), 4 May 2006 (04.05.2006), figures 1-12, abstract --	1-16

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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Date of the actual completion of the international search

24 June 2009

Date of mailing of the international search report

02-07-2009

Name and mailing address of the ISA/

Swedish Patent Office

Box 5055, S-102 42 STOCKHOLM

Facsimile No. +46 8 666 02 86

Authorized officer

Fredrik Strand / JA A

Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE2009/050382

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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A	US 5971673 A (BERGLUND ET AL), 26 October 1999 (26.10.1999), figures 1-9, abstract -- -----	1-16

International patent classification (IPC)**B23B 51/02** (2006.01)**B23C 5/22** (2006.01)**Download your patent documents at www.prv.se**

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Cited literature, if any, will be enclosed in paper form.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/SE2009/050382

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