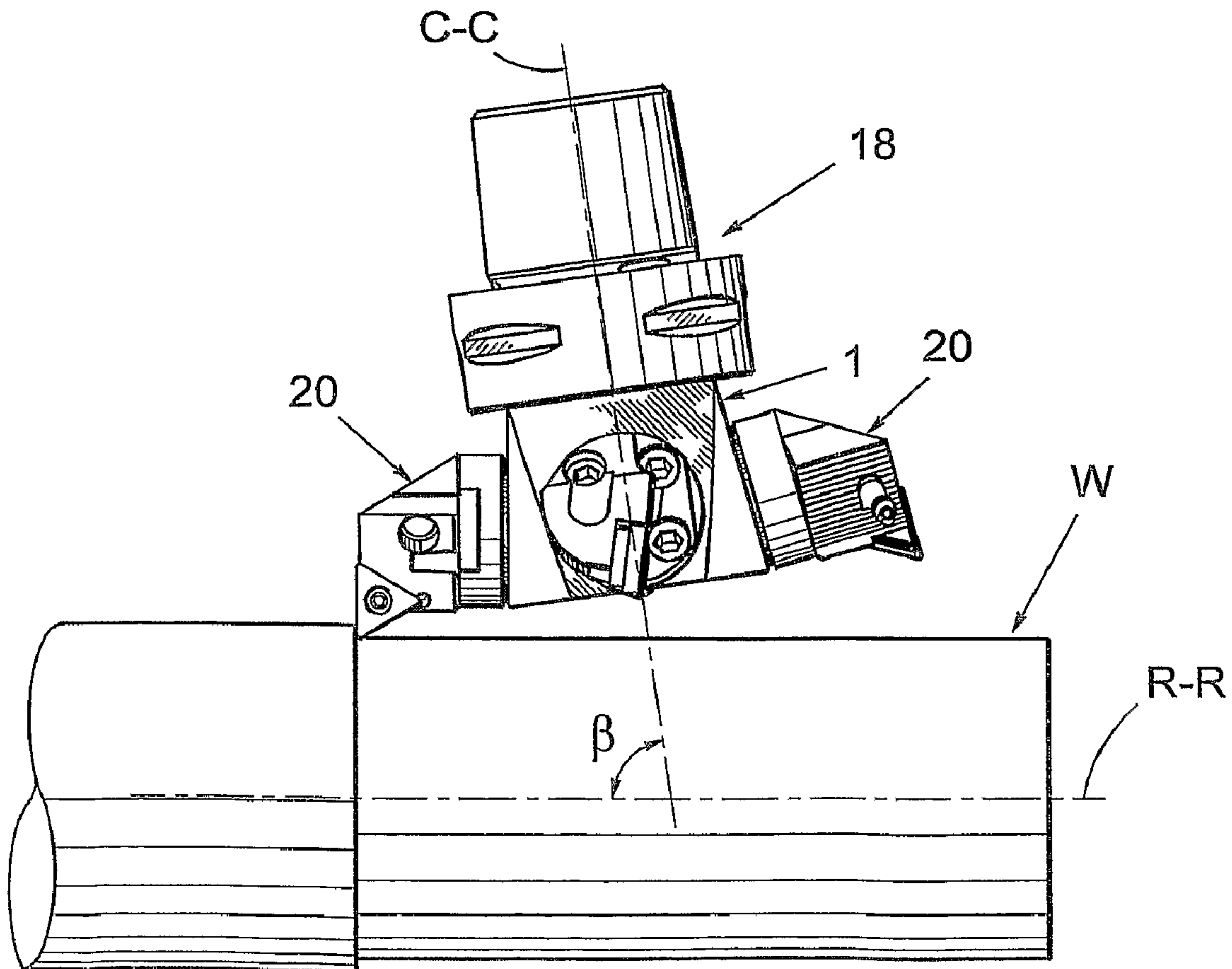




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 (54) Title: TOOL HOLDER WITH DIAMETRICALLY OPPOSITE SIDE SURFACES



(57) Abrégé/Abstract:

The present invention relates to a tool holder, which is intended to simultaneously carry at least two diametrically arranged heads (20), which carry cutting inserts for chip removing machining, the tool holder comprising an adaptor (1) and a coupling (18). The



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

invention also separately relates to the adaptor (1). Characteristic of the tool holder according to the present invention is that the adaptor (1) has at least two diametrically opposite side surfaces (3), which diverge in the direction from the coupling (18), that the side surfaces (3) have members (10) in order to replaceably receive a tool head (20), and that a line (L) which is situated in a first basal plane (BP1) and in one of the side surfaces (3) forms an angle (α) in the interval 1°-15° to a longitudinal centre line C-C for the tool holder.

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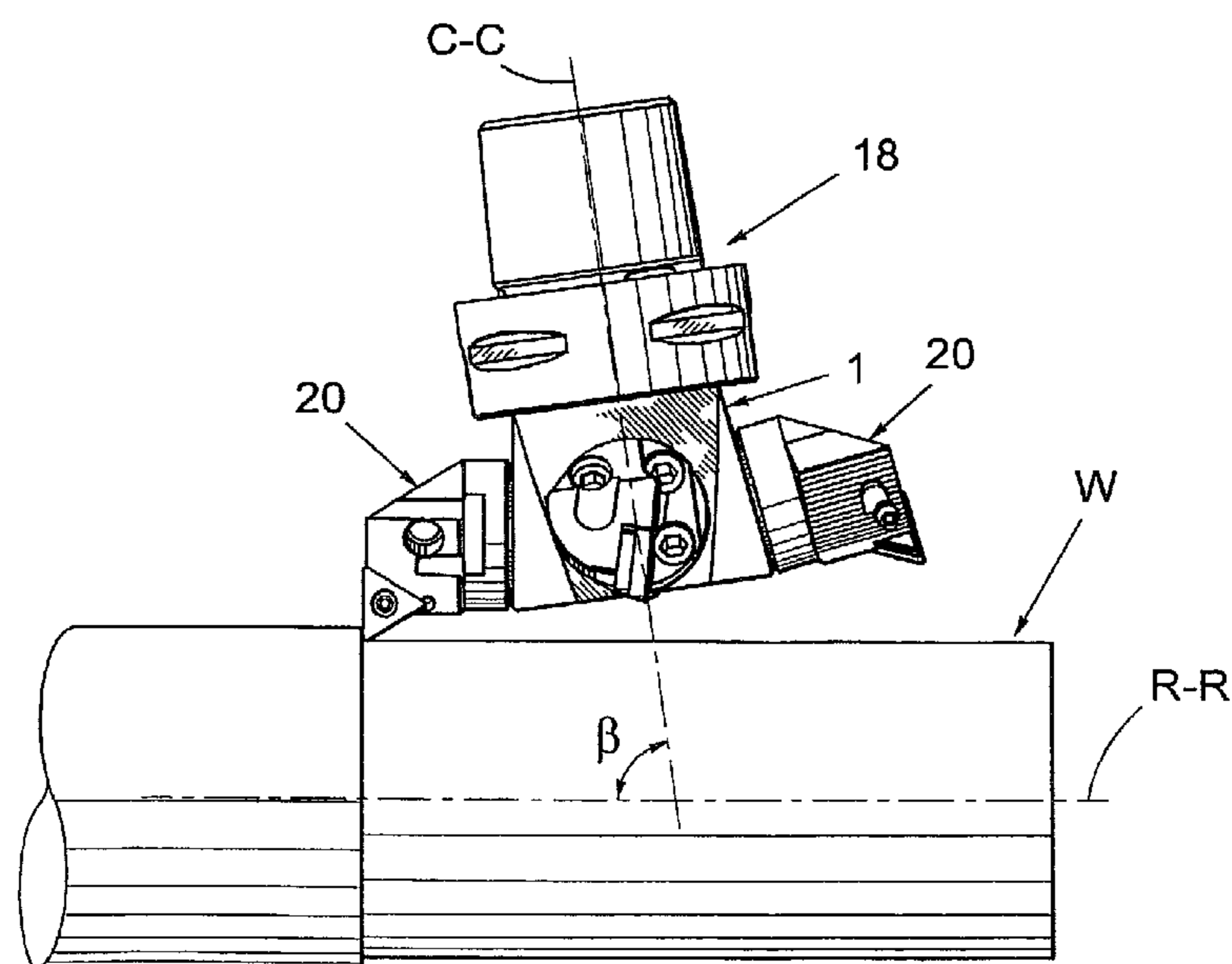
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(54) Title: TOOL HOLDER WITH DIAMETRICALLY OPPOSITE SIDE SURFACES



(57) Abstract: The present invention relates to a tool holder, which is intended to simultaneously carry at least two diametrically arranged heads (20), which carry cutting inserts for chip removing machining, the tool holder comprising an adaptor (1) and a coupling (18). The invention also separately relates to the adaptor (1). Characteristic of the tool holder according to the present invention is that the adaptor (1) has at least two diametrically opposite side surfaces (3), which diverge in the direction from the coupling (18), that the side surfaces (3) have members (10) in order to replaceably receive a tool head (20), and that a line (L) which is situated in a first basal plane (BP1) and in one of the side surfaces (3) forms an angle (α) in the interval 1° - 15° to a longitudinal centre line C-C for the tool holder.



WO 03/053615 A1

TOOL HOLDER WITH DIAMETRICALLY OPPOSITE SIDE SURFACES

Technical Field of the Invention

5 The present invention relates to a tool holder, which is intended to simultaneously carry at least two diametrically arranged tool heads, which carry cutting inserts for chip removing machining, the tool holder comprising an adaptor and a coupling. The invention also relates separately to an adaptor included in the tool holder.

10 Prior Art

An embodiment of a tool which has three serrated surfaces, two of which are preferably parallel to each other and the third surface has an extension perpendicularly to the two parallel surfaces holder is previously known from US-A-6 244 780. All of said three
15 surfaces have members for receipt of a tool head, said members in this case consisting of holes, in which a drawbar of the tool head is intended to be received. The tool holder according to US-A-6 244 780 is not intended to carry a plurality of tool heads simultaneously.

20 Objects and Features of the Invention

A primary object of the present invention is to provide a tool holder of the kind defined in the introduction and which simultaneously can carry at least two substantially diametrically arranged replaceable tool heads, said tool heads being arranged in a way
25 which ensures that they do not interfere with the workpiece when chip removing machining is carried out with any one of the tool heads.

Another object of the present invention is to ensure that the tool holder should preferably carry a relatively large number of replaceable tool heads, whereby switching
30 between different tool heads can be effected exceptionally quickly.

Yet another object of the present invention is to provide an exceptionally exact positioning of the replaceable tool heads on the tool holder.

At least the primary object is realised by means of a tool holder having the features
5 defined in the subsequent independent claim 1. Preferred embodiments of the invention are defined in the dependent claims.

Brief Description of the Drawings

10 Embodiments of the invention will be described below, reference being made to the accompanying drawings, where:

Fig 1 shows a perspective view of a first embodiment of an adaptor that is included in the tool holder according to the present invention;

15

Fig 2 shows a planar view from above of the adaptor according to Fig 1;

Fig 3 shows a side view of a tool holder according to the present invention, which is equipped with a number of replaceable tool heads;

20

Fig 4 shows a side view of the tool holder equipped with a number of replaceable tool heads according to Fig 3 during chip forming machining of a rotating workpiece, the axis of rotation of the workpiece being in the plane of the paper;

25 Fig 5 shows a view, somewhat in perspective, of the tool holder according to the present invention during chip forming machining of the workpiece illustrated in Fig 4, the axis of rotation of the workpiece extending perpendicularly to the plane of the paper;

30 Fig 6 shows a perspective view of a second embodiment of an adaptor that is included in the tool holder according to the present invention;

Fig 7 shows a planar view of the adaptor according to Fig 6;

Fig 8 shows a side view of a tool holder according to the present invention equipped with replaceable tool heads, in which tool holder the adaptor according to Figs 5 and 6 and 7 is included, a tool head of the tool holder performing chip removing machining of a rotating workpiece, where the axis of rotation of the workpiece is in the plane of the paper;

Fig 9 shows a view from above, somewhat in perspective, of the tool holder equipped according to Fig 8, a tool head of the tool holder performing chip removing machining of a rotating workpiece, where the axis of rotation of the workpiece is in the plane of the paper; and

Fig 10 shows a schematic side view of additionally one alternative embodiment of the tool holder according to the present invention, which tool holder is equipped with a number of tool heads.

Detailed Description of Preferred Embodiments of the Invention

The adaptor 1 illustrated in Figs 1 and 2 comprises four side surfaces 3, a contact surface 5 as well as a front surface 7, see Fig 5, which is parallel to the contact surface 5. Generally triangular, bridging surfaces 9 are arranged between adjacent side surfaces 3, which bridging surfaces are somewhat curved and positioned in the neighbourhood of the corners of the adaptor 1.

Each one of the side surfaces 3 has a mounting area 10, which in the embodiment illustrated is circular and provided with ridged teeth 11. A first centre hole 12 as well as four threaded anchor holes 13 are arranged in the mounting area 10, and they are all arranged symmetrically around the centre hole 12, which is intended for supply of cooling medium.

30

A circular cylindrical recess 14 as well as a groove 15 are arranged in the contact surface 5, which is intended to come to abutment against a co-operating surface in a

coupling. The circular cylindrical recess 14 has an extension from the contact surface 5 in the direction of the front surface 7, the recess 14 having a certain depth due to the fact that the inner end thereof is defined by a step 16, which has a radial extension in respect to a longitudinal centre line C-C for the recess 14. A second centre hole 17 which is a
5 through hole extends from the step 16 and penetrates the front surface 7.

The groove 15 penetrates two opposite side surfaces 3 and is centred in respect to said opposite side surfaces 3.

10 In order to facilitate the description of the mutual orientation of the surfaces of the adaptor 1 as well as the relevant parts of the replaceable tool heads, see Figs 3-5, which are intended to be brought into contact with the adaptor 1, a number of basal planes are inserted in Figs 1-5. A first basal plane BP1 contains the centre line C-C, which is situated at the centre of the groove 15 and divides the adaptor 1 into two equally large,
15 mirror-inverted halves. A second basal plane BP2 also contains the centre line C-C as well as having an extension perpendicular to the first basal plane BP1, i.e. the second basal plane BP2 also divides the adaptor 1 into two equally large, mirror-inverted halves. A third basal plane BP3 contains the contact surface 5, i.e. the third basal plane BP3 has an extension parallel to the plane of the paper in Fig 2.

20

Opposite side surfaces 3 are not parallel to each other but diverge from each other in the direction from the contact surface 5 towards the front surface 7. A line L which is situated in the first basal plane BP1 and in one of the opposite side surfaces 3 which are
25 penetrated by the groove 15 forms an angle α to the centre line C-C, wherein $1^\circ < \alpha < 15^\circ$ and is preferably $2,5^\circ < \alpha < 7,5^\circ$. The line L is shown in Fig 3 where the first basal plane BP1 is parallel to the plane of the paper. The other side surfaces 3 of the adaptor 1 have the same inclination in relation to the centre line C-C.

30 The adaptor 1 is connected, as shown in Figs 3-5, to a coupling 18, whereby the tool holder according to the present invention is obtained. The coupling 18 has a male part (not shown) that is received in the recess 14. An anchor bolt 19 extends through the

second centre hole 17 and into a threaded hole on the male part, whereby the contact surface 5 is brought into contact with a co-operating surface of the coupling 18. The coupling 18 is also provided with driver members 20, which are received in the grooves 15 in order to provide a joint suitable for the rotation between the adaptor 1 and the coupling 18. The centre line C-C also constitutes centre line for the coupling 18, and thereby also for the tool holder according to the present invention.

Replaceable tool heads which may be of standard type since the mounting areas 10 have been formed to co-operate with tool heads 20 of standard type 20 are applied on the mounting area 10 of the adaptor 1. The replaceable tool heads 20 are anchored on the mounting areas 10 by means of a screw joint, i.e. screws 21 extend into the anchor holes 13. Ridged teeth which co-operate the ridged teeth 11 which are arranged on the mounting surface 10 are arranged on the surface of the tool heads 20 that is intended to co-operate with the appurtenant the mounting surface 10. Thereby, an exceptionally inelastic anchorage of the tool heads 20 on the adaptor 1 is obtained.

15

Figs 4 and 5 show how the tool holder according to the present invention is oriented when a tool head performs chip-removing machining on the rotating workpiece W. In that connection, the centre axis C-C of the tool holder does not form a right angle to the rotation axis R-R of the workpiece W but the angle β which is formed is smaller than 90° . This means that the tool head 20 that is opposite the active tool head 20 is distanced a certain distance from the workpiece W. This is the result of the fact that the active tool head should be have a certain orientation in relation to the workpiece W and that the side surfaces 3 of the adaptor 1 have the above-described inclination. By studying Figs 4 and 5, it is realized that the tool holder according to the present invention can be indexed in a simple way, i.e. be rotated around the shaft C-C, wherein another tool head 20 becomes active. In this connection, it should be pointed out that the indexing can be effected without the angle β having to be changed.

25

An alternative embodiment of an adaptor 101 according to the present invention is shown in Figs 6 and 7. As can be seen in Figs 6 and 7, the adaptor 101 has five side surfaces 103, a contact surface 105 and a front surface (not shown), which is parallel to the contact surface 105. Between adjacent side surfaces 103, bridging surfaces 109 are

30

arranged, which are composed of generally triangular and rectangular portions as well as situated in the area of the corner of the adaptor 101.

Each one of the side surfaces 103 has a mounting area 110, which in principle is
5 identical to the mounting area 10 of the embodiment according to Figs 1–2, i.e. circular and provided with ridged teeth 111. A first centre hole 112 as well as four threaded anchor holes 113 which are arranged symmetrically around the centre hole 112 are arranged in the mounting area 110.

10 A circular cylindrical recess 114 as well as a groove 115 which is intended to come to abutment against a co-operating surface in a coupling are arranged in the contact surface 105. The circular cylindrical recess 114 has an extension from the contact surface 105 in the direction of the front surface, the recess 114 having a certain depth due to the fact that the inner end thereof is defined by a step 116, which has a radial extension in
15 respect to a longitudinal centre line C–C for the recess 114. A second centre hole 117 which is a through hole extends from the step 116 and penetrates the front surface.

Three basal planes BP1, BP2 and BP3 are indicated in Figs 6 and 7, in the same way as in Figs 1 and 2. The first basal plane BP1 divides the adaptor 101 into two equally large,
20 mirror-inverted halves. The second basal plane BP2 divides the adaptor 101 into two halves that are **not** mirror-inverted. The third basal plane BP3 contains the contact surface 105 and is parallel to the plane of the paper in Fig 7.

The side surfaces 103 diverge from the centre line C–C in the direction from the contact
25 surface 105 towards the front surface. A line L which is situated in the first basal plane BP1 and in the side surface 103 which is penetrated by the groove 115 forms an angle α to the centre line C–C, wherein $1^\circ < \alpha < 15^\circ$ and is preferably $2,5^\circ < \alpha < 7,5^\circ$. The line L is shown in Fig 6 and 8, in Fig 8 the first basal plane BP1 being parallel to the plane of the paper. The other side surfaces 103 of the adaptor 101 has the same inclination in
30 relation to the centre line C–C.

The tool holder according to the present invention is shown in Figs 8 and 9, the tool holder thus comprises the adaptor 101 and a coupling 18 which may be identical with the coupling 18 according to Figs 4–5, is equipped with five tool heads 20, which thus may be identical with the tool heads 20 in illustrated Figs 3–5 and preferably of a
5 standard embodiment. The maximum number of tool heads 20 equals the number of side surfaces 103. As is seen especially clear in Fig 9, the tool heads 20 are not directly opposite each other, however, it is necessary that the two tool heads 20 which are situated on opposite side of the adaptor 101, in comparison with the active tool head 20, are distanced from the workpiece W since they would otherwise interfere with said
10 workpiece W.

The embodiment illustrated in Fig 10 comprises an adaptor 201 which is "double-conical", i.e. in addition to the first side surfaces 203 which diverge in a direction away from the contact surface 205 towards the adaptor 201 it also comprises second side
15 surfaces 204, which converge very strongly in a direction away from the contact surface 205. A line L that is parallel to the plane of the paper in Fig 10 and is situated in a first side surface 203, inclined at a corresponding angle α in relation to the centre line C–C as in the above-described embodiments, i.e. $1^\circ < \alpha < 15^\circ$. In that connection, a first basal plane BP1 is parallel to the plane of the paper in Fig 10, said basal plane BP1
20 dividing the appurtenant first side surface 203 exactly in two halves. As for the inclination of the second side surfaces 204, the angle γ which is contained between meeting first and second side surfaces 203, 204 is in the interval 70° – 90° . In the embodiment according to Fig 10, the number of first and second side surfaces 203, 204 may vary according to what is said below under the heading **Feasible Modifications of**
25 **the Invention**, wherein, however, the number of first side surfaces 203 should be equal to the number of second side surfaces 204. As is shown in Fig 10, both the first side surfaces 203 and the second side surfaces 204 may be equipped with tool heads 20, preferably of standard embodiment.

Feasible Modifications of the Invention

5 In the embodiments illustrated above, the adaptor 1; 101 is provided with four and five
side surfaces 3; and 103, respectively. However, within the scope of the present inven-
tion, it is also conceivable that the adaptor is provided with two diametrically opposite
side surfaces or more than five side surfaces. The fact that the case where the adaptor is
provided with three side surfaces has been excluded, depends on the fact that the
10 inactive tool heads in this case normally do not interfere with the workpiece.

In the above-described embodiments, the adaptor 1; 101 and the coupling 18 are two
separate units that are connected in a suitable way. Within the scope of the present
invention, it is also conceivable that the adaptor and the coupling are integrated into one
15 unit.

In the above-described embodiments, all side surfaces 3; 103 have the same inclination
in relation to the centre line C-C. However, it is conceivable within the scope of the
present invention that the side surfaces 3; 103 have different inclinations in relation to
20 the centre line C-C. With an exemplifying and not limiting aim, it is conceivable that a
side surface has a deviating inclination while the rest of the side surfaces have the same
inclination relatively the centre line C-C. Alternatively, it is conceivable that all side
surfaces have different inclinations relatively the centre line C-C. In case the side
surfaces have different inclinations, the angle β in, for instance, Fig 4 has to be changed
25 when the tool holder is indexed.

In the above-described embodiments, the mounting areas 10; 110 are provided with
ridged teeth 11; 111 and anchor holes 13; 113 for a satisfactory mounting of the tool
heads 20 on the adaptor 1; 101; 201. However, alternative members are conceivable
30 within the scope of the present invention that enable mounting of tool heads on an
adaptor according to the present invention. With an exemplifying and not limiting aim,

as alternatives to the mounting members illustrated in the embodiments according to the above, splines, different types of cones, drawbars and centre bolts may be mentioned.

List of Reference Designations

5	1; 101; 201	Adaptor
	3; 103; 203	Side surfaces
	204	Second side surfaces
	5; 105; 205	Contact surface
10	7; 107	Front surface
	9; 109	Bridging surfaces
	11; 111	Ridged teeth
	12; 112	First centre hole
	13; 113	Anchor holes
15	14; 114	Circular cylindrical recess
	15; 115	Groove
	16; 116	Step
	17; 117	Second centre hole
	18	Coupling
20	19	Anchor bolt
	20	Tool head
	21	Screws

CLAIMS

1. A tool holder for simultaneously carrying at least two chip-removing tool heads, comprising:
 - 5 a coupling defining an axis of rotation; and
an adapter including axially spaced front and rear ends, the rear end mounted on the coupling to be driven thereby, the adapter including at least one pair of side surfaces arranged generally diametrically opposite one another with respect to the axis and facing away from one another, the pair of side surfaces converging toward an imaginary point of
10 intersection spaced axially rearwardly of the axial front end of the adapter, each of the side surfaces of the pair including a seat configured to replaceably receive a tool head, the pair of surfaces being bisected by an imaginary basal plane, wherein a line lying in both the basal plane and either of the pair of side surfaces forms with the axis an angle of inclination in the range of 1-15 degrees.
- 15 2. The tool holder according to claim 1 wherein the angles of inclination of the respective side surfaces are identical.
3. The tool holder according to claim 1 wherein the angle of inclination is in the
20 range 2.5 to 7.5 degrees.
4. The tool holder according to claim 1 wherein the adapter is detachably connected to the coupling.
- 25 5. The tool holder according to claim 1 wherein the adapter is integral with the coupling.
6. The tool holder according to claim 1 wherein each seat comprises teeth in the
30 form of parallel ridges.

7. The tool holder according to claim 1 wherein the adapter comprises more than one pair of opposing side surfaces.

8. The tool holder according to claim 1 wherein the adapter includes a through-hole
5 extending along the axis.

9. An adapter for simultaneously carrying at least two chip-removing tool heads, comprising a body defining a center axis, the body including axially spaced front and rear ends and at least one pair of side surfaces arranged diametrically opposite one another
10 and facing away from one another, the rear end defined by a contact surface including a connection structure adapted to connect to a coupling; the pair of side surfaces converging toward an imaginary point of intersection spaced axially rearwardly of the axial front end, each of the side surfaces including a seat configured to replaceably receive a tool head, the pair of surfaces being bisected by an imaginary basal plane,
15 wherein a line lying in both the basal plane and either of the pair of side surfaces forming with the axis an angle of inclination in the range of 1 15 degrees.

10. The adapter according to claim 9 wherein the angles of inclination of the side surfaces are equal.

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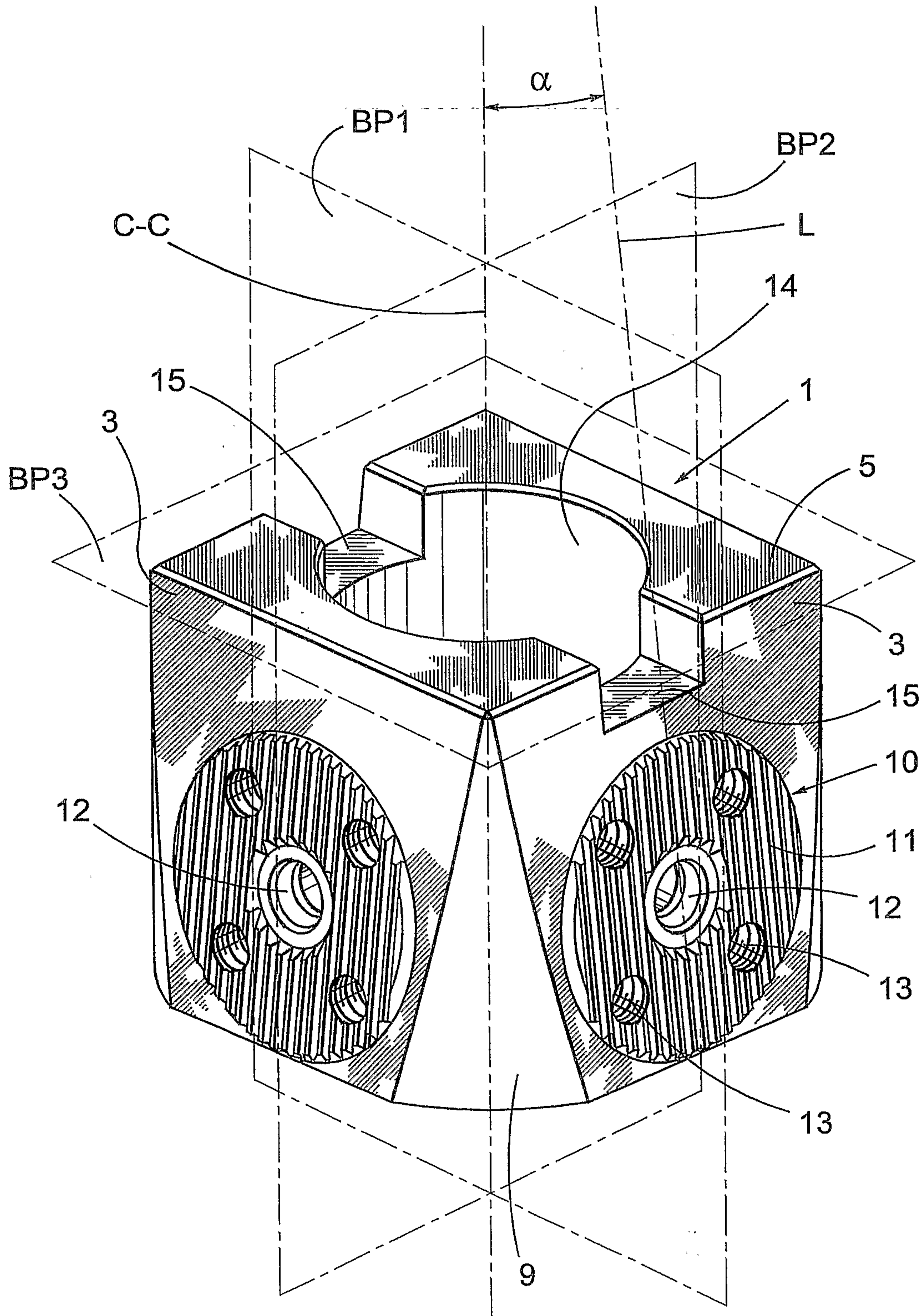
11. The adapter according to claim 9 wherein the angle of inclination is in the range of 2.5 to 7.5 degrees.

12. The adapter according to claim 9 wherein the body includes a through-hole
25 extending along the axis.

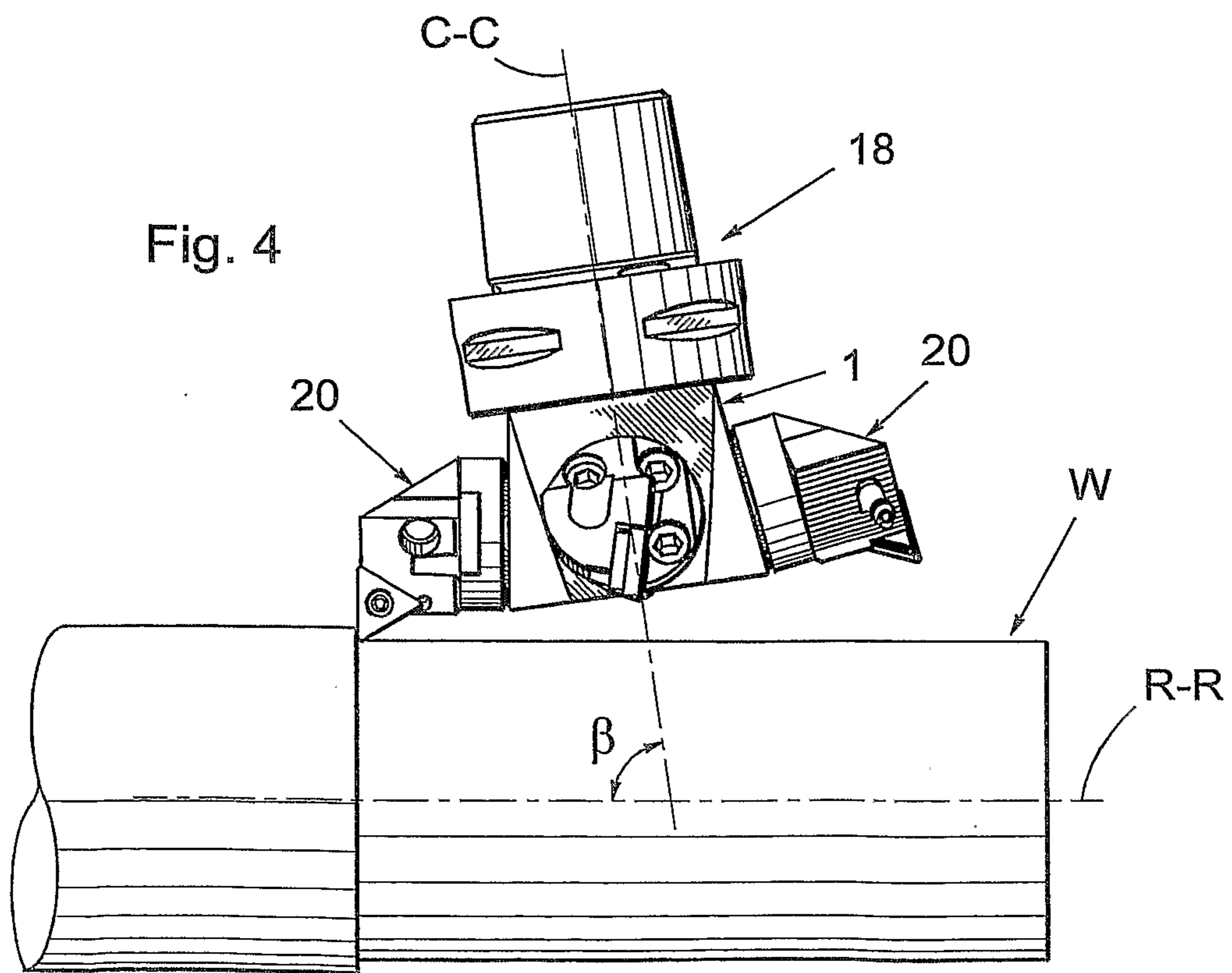
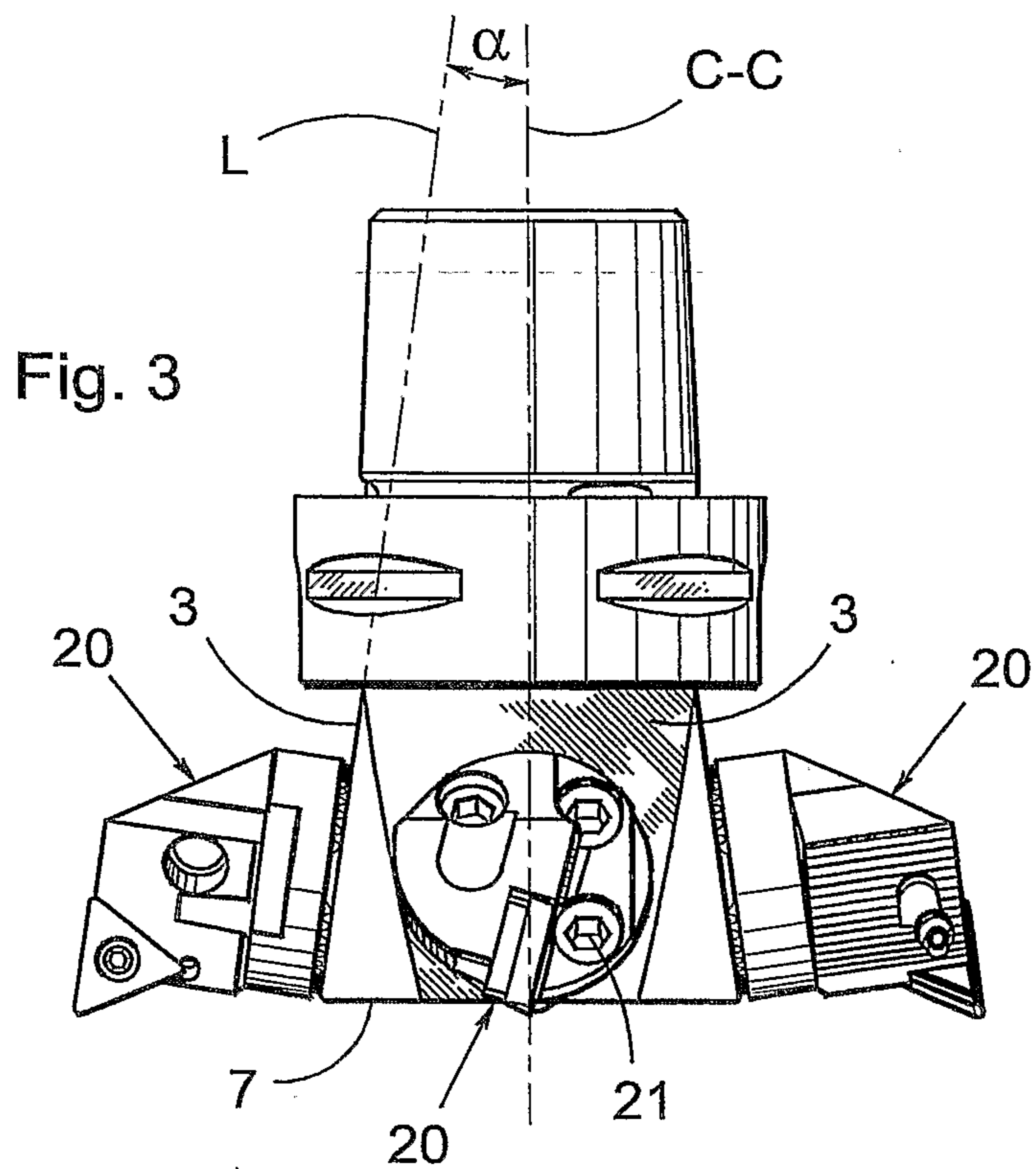
13. The adapter according to claim 9 wherein each seat comprises teeth in the form of parallel ridges.

1/8

Fig. 1



3/8



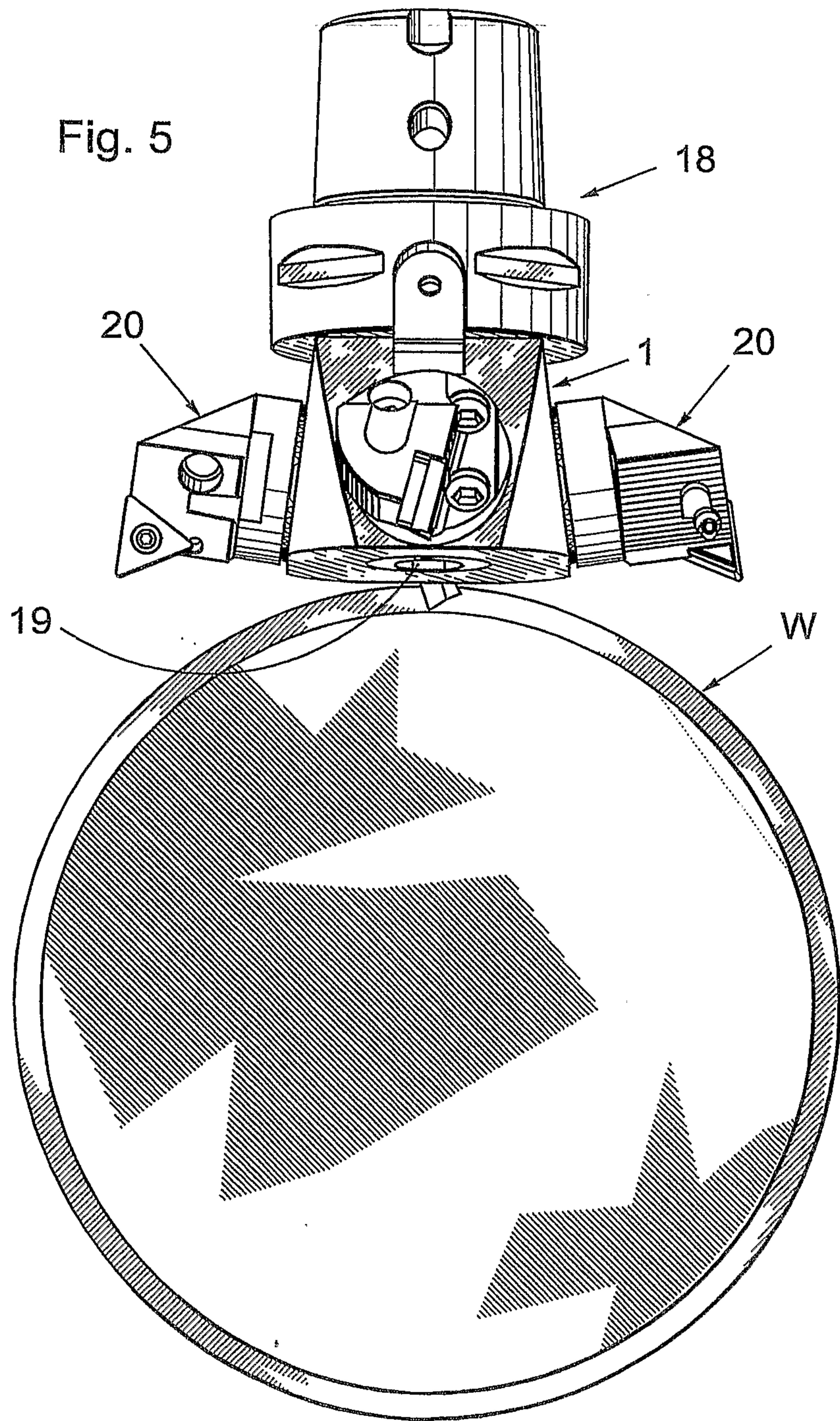


Fig. 6

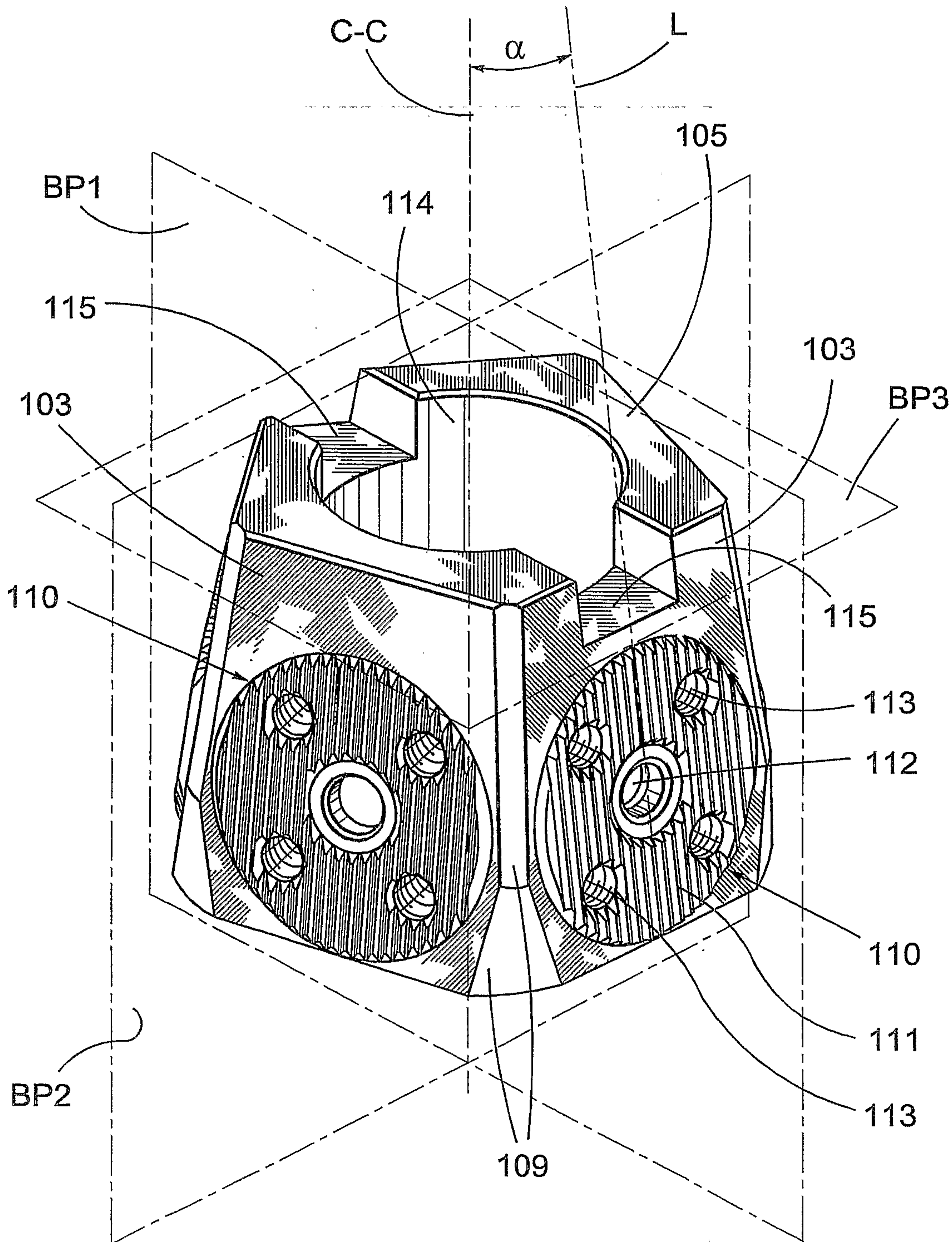


Fig. 7

