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(54) **Title:** REPLACEABLE TOOL HEAD HAVING SERRATED COUPLING PORTIONS AND A TOOL HOLDER THEREFOR

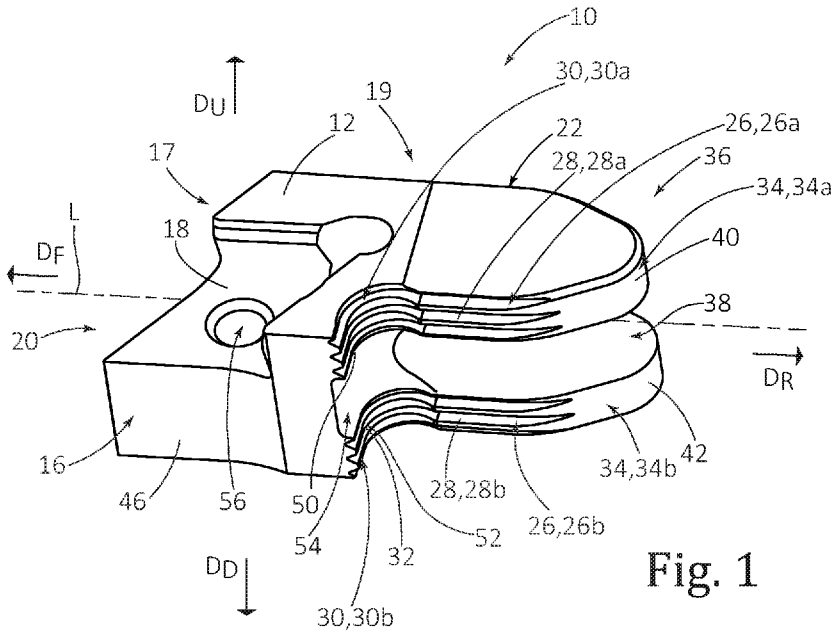

Fig. 1

(57) **Abstract:** A tool head (10) has a longitudinal axis L, forward and rearward ends 20, 36, and top, bottom and peripheral surfaces 12, 14, 16. The peripheral surface (16) has first and second side walls 22, 26 provided with respective first and second serrated portions 24, 28, each of the first and second side walls being divided into spaced apart top and bottom side wall portions 22a, 22b, 26a, 26b. The peripheral surface also has a stopper wall (30) which faces in the rearward direction DR, extends transversely to the second side wall and is provided with a stopper serrated portion (32). A rear wall (34) formed at the rearward end connects the first and second side walls. The tool head also includes an insert retaining portion (17) proximate the forward end, and a coupling portion (19) which extends in the direction of the rearward end and includes vertically spaced apart top and bottom coupling arms 40, 42 separated by a coupling recess (38) opening out to the rear wall.

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REPLACEABLE TOOL HEAD HAVING SERRATED COUPLING PORTIONS AND A TOOL HOLDER THEREFOR

FIELD OF THE INVENTION

The subject matter of the present application relates to tool holders, in general, and to tool holders having separable tool heads carrying cutting tools, in particular.

BACKGROUND OF THE INVENTION

In the field of metal cutting, tool holders are known to have a cutter bar removably connected to a holder blade. A fastener is used to clamp a mounting surface of the holder blade between two inner walls of a groove of the cutter bar. Serrated surfaces are provided both on the inner walls of the groove and on the mounting surface. For example, such tools are disclosed in CN209598226 and CN106180773.

Also known are tool holders having a bolt passing across an end of the shank, allowing for assembly without removing the bolt. For example, such tools are disclosed in US 4,575,293 and US 7,240,594.

It is an object of the subject matter of the present application to provide tool holder having a quick removal mechanism while providing improved coupling between the tool head and the tool holder.

SUMMARY OF THE INVENTION

In accordance with a first aspect of the subject matter of the present application there is provided a tool head having a longitudinal tool head axis extending in a rearward to forward direction, comprising:

a top surface, a bottom surface, and a peripheral surface extending therebetween, the peripheral surface further comprising:

a first side wall extending along the tool head axis and having a first serrated portion;

a second side wall located opposite the first side wall, relative to the tool head axis, in a top view of the tool head taken perpendicular to the top surface, the second side wall extending along the tool head axis and having a second serrated portion;

a stopper side wall, facing in the rearward direction and extending transversely to the second side wall, the stopper side wall including a stopper serrated portion; and

a rear wall extending between the first side wall and the second side wall, at a rearward end of the tool head;

an insert seat located at an intersection of the top surface and the peripheral surface, at a forward end of the tool head; and

a coupling recess located at the rearward end of the tool head, the coupling recess opening out to the rear wall, to the first side wall and to the second side wall.

In accordance with a second aspect of the subject matter of the present application there is provided a cutting tool comprising a tool holder, a tool head according to the present application, and a cutting insert mounted in the insert seat of the tool head.

BRIEF DESCRIPTION OF THE FIGURES

For a better understanding of the present application and to show how the same may be carried out in practice, reference will now be made to the accompanying drawings, in which:

Fig. 1 is a first perspective view of a tool head, in accordance with the present application;

Fig. 2 is a second perspective view of the tool head of Fig. 1;

Fig. 3 is a top view of the tool head of Fig. 1;

Fig. 4 is a first side view of the tool head of Fig. 1, taken as per the view IV of Fig. 3;

Fig. 5 is a second side view of the tool head of Fig. 1, taken as per the view V of Fig. 3;

Fig. 6 is a perspective view of a cutting tool in accordance with the present application;

Fig. 7 is an exploded view of the cutting tool of Fig. 6;

Fig. 8 is a top view of the cutting tool of Fig. 6;

Fig. 9 is a cross sectional view of the cutting tool of Fig. 6, taken along the lines IX-IX of Fig. 8;

Fig. 10A is an elevated view of a cutting tool in accordance with another embodiment of the present application;

Fig. 10B is an exploded view of the cutting tool of Fig. 10A;

Fig. 10C is another exploded view of the cutting tool of Fig. 10A;

Fig. 11A is a top exploded view of a cutting tool in accordance with a further embodiment of the present application; and

Fig. 11B is an elevated exploded view of the cutting tool of Fig. 11A.

It will be appreciated that for simplicity and clarity of illustration, elements shown in the figures have not necessarily been drawn to scale. For example, the dimensions of some of the elements may be exaggerated relative to other elements for clarity, or several physical components may be included in one functional block or element. Further, where considered appropriate, reference numerals may be repeated among the figures to indicate corresponding or analogous elements.

DETAILED DESCRIPTION OF THE INVENTION

In the following description, various aspects of the subject matter of the present application will be described. For purposes of explanation, specific configurations and details are set forth in sufficient detail to provide a thorough understanding of the subject matter of the present application. However, it will also be apparent to one skilled in the art that the subject matter of the present application can be practiced without the specific configurations and details presented herein.

Attention is first drawn to Figs. 1-5, showing a tool head **10** according to the present application. The tool head **10** has a longitudinal tool head axis **L** extending in a rearward to forward direction $\mathbf{D_R}$, $\mathbf{D_F}$ and a vertical tool head axis **V** perpendicular to the longitudinal tool head axis **L** and extending in an upward to downward direction $\mathbf{D_U}$, $\mathbf{D_D}$. The tool head **10** has a forward end **20** and a rearward end **36** located opposite the forward end **20** along the longitudinal tool head axis **L**.

The tool head **10** includes a top surface **12**, a bottom surface **14**, and a peripheral surface **16** extending therebetween. The vertical tool head axis **V** passes in a generally perpendicular direction through the top surface **12** and the bottom surface **14**.

The peripheral surface **16** further includes a first side wall **22** extending along the tool head axis **L** and having a first serrated portion **24**. A second side wall **26** is located opposite of the first side wall **22**, relative to the tool head axis **L**, in a top view of the tool head **10**, taken perpendicular to the top surface **12**. The second side wall **26** extends along the tool head axis **L** and has a second serrated portion **28** thereon.

A stopper wall **30** faces in the rearward direction D_R and extends transversely to the second side wall **26**. The stopper wall **30** includes a stopper serrated portion **32** thereon. A rear wall **34** of the tool head **10** extends between the first side wall **22** and the second side wall **26**, at a rearward end **36** of the tool head **10**.

The tool head **10** further comprises an insert retaining portion **17** proximate the forward end **20** and a coupling portion **19** connected to the insert retaining portion **17** and extending rearwardly in the direction of the rearward end **36** of the tool head **10**.

The insert retaining portion **17** includes an insert seat **18**, located at an intersection of the top surface **12** and the peripheral surface **16**, at the forward end **20** of the tool head **10**.

The insert seat may have a screw bore **56** opening out to the insert seat **18**.

The screw bore **56** may be extending toward the bottom surface **14**.

The coupling portion **19** comprises a rearwardly extending top coupling arm **40** and a rearwardly extending bottom coupling arm **42**, spaced apart from one another along the vertical axis **V** by a coupling recess **38** opening out to the rear wall **34** located at the rearward end **36** of the tool head **10**.

The first side wall **22** is divided into spaced apart top and bottom first side wall portions **22a, 22b**, each side wall portion being at least partially formed on a corresponding top or bottom coupling arm **40**, **42**. The second side wall **26** is divided into spaced apart top and bottom second side wall portions **26a, 26b**, each side wall portion being at least partially formed on a corresponding top or bottom coupling arm **40**, **42**. The first serrated portion **24** formed on the first side wall **22** thus comprises top and bottom serrated first side wall sections **24a**, **24b** at least partially formed on a corresponding top or bottom coupling arm **40**, **42**. Similarly, the second

serrated portion **28** formed on the second side wall **26** has top and bottom serrated second side wall sections **28a**, **28b** at least partially formed on a corresponding top or bottom coupling arm **40**, **42**.

The stopper wall **30** may be divided into top and bottom stopper portions **30a**, **30b**, each stopper portion may be at least partially formed on a corresponding top or bottom coupling arm **40**, **42**. Thus, the stopper serrated portion **32** is divided into top and bottom stopper serrated sections **50**, **52**.

The rear wall **34** is divided by the coupling recess **38** into top and bottom rear wall portions **34a**, **34b** formed on corresponding top and bottom coupling arms **40**, **42**. Thus, the coupling recess **38** opens out to the rear wall **34**, to the first side wall **22** and to the second side wall **26**, thereby forming the spaced apart top coupling arm **40** and bottom coupling arm **42**.

As best seen in Figs. 4 and 5, the first serrated portion **24** and the second serrated portion **28** each comprise a plurality of serration grooves **33** which run in a direction parallel to the longitudinal tool head axis **L**. The stopper serrated portion **32** also comprises a plurality of serration grooves which run transverse to the longitudinal tool head axis **L** and transverse to the vertical tool head axis **V**.

As shown in Figs. 3 and 5, the peripheral surface **16** includes a front wall **44** at the forward end **20** of the tool head **10**. A forward support wall **46** extends from the front wall **44** in the rearward direction $\mathbf{D_R}$.

In some embodiments of the present invention, the insert seat **18** is located at an intersection of the top surface **12** with the front wall **44** and the forward support wall **46**.

In some embodiments of the present invention, as shown in Figs. 1-9, the rear wall **34** of the coupling portion **19** of the tool head **10** is devoid of serrations.

Attention is now drawn to Figures 6-9, showing a cutting tool **100**, in accordance with an embodiment of the present application. The cutting tool **100** includes a tool holder **102**, the tool head **10**, and a cutting insert **62** mounted in the insert seat **18** of the tool head **10**. The tool holder **102** has a longitudinal holder axis **H** extending in the rearward to forward direction $\mathbf{D_R}$, $\mathbf{D_F}$, and a tool head receiving portion **104**, located at a holder forward end **106** of the tool holder **102**.

The tool head receiving portion **104** has a holder stopper wall **118** facing in the forward direction $\mathbf{D_F}$ and having a tool holder stopper serrated portion **120** thereon. The tool head receiving portion **104** further includes a first clamping arm **108** and a second clamping arm **110**. The first

clamping arm **108** and the second clamping arm **110** are located on opposite sides of the holder axis **H**, and are spaced apart by a tool head receiving pocket **112**.

The first clamping arm **108** has a first internal serrated portion **114** facing the tool head receiving pocket **112** and a through bore **122** extending transversely to the holder axis **H**. The second clamping arm **110** has a second internal serrated portion **116** facing the tool head receiving pocket **112** and a threaded bore **124** extending transversely to the holder axis **H**. The threaded bore **124** and the through bore **122** extend along a common lateral axis **M**.

As shown in Figures 6, 8 and 9, the tool head **10** is coupled with the tool holder **102**. For this, the tool head **10** is placed in front of the tool head receiving portion **104** (as in Fig. 7), and moved in the rearward direction $\mathbf{D_R}$ along the holder axis **H**. In other words, the tool head **10** slidingly engages the tool head receiving portion **104**.

As the tool head **10** is inserted in the tool head receiving portion **104**, the tool head's first serrated portion **24** interacts with the tool holder's first internal serrated portion **114**, the tool head's second serrated portion **28** interacts with the tool holder's second internal serrated portion **116** and the tool head's stopper serrated portion **32** interacts with the tool holder stopper serrated portion **120**. Such tool coupling provides serrated surface interaction between the tool holder **102** and the tool head **10**, along multiple surfaces thereof, including at their respective stopper walls **30**, **118**. The serrated surface coupling prevents relative movement between the tool holder **102** and the tool head **10**, in a direction transverse to the serrations, such as in the upward to downward direction $\mathbf{D_U}$, $\mathbf{D_D}$.

A clamping member **126** passes through the through bore **122** of the first clamping arm **108** and partially interacts with the threaded bore **124** of the second clamping arm **110**. The clamping member **126** is also received within the coupling recess **38** of the tool head **10**.

It is noted, that the coupling recess **38** provides a degree of flexibility for movement of the top coupling arm **40** and the bottom coupling arm **42** in a direction perpendicular to the tool head axis **L**. Thus, as the tool head **10** is advanced into the tool head receiving portion **104**, the top and bottom coupling arms **40**, **42** may move in the direction perpendicular to the tool head axis **L**, allowing for smooth coupling between the tool head's first serrated portion **24** and the tool holder's first internal serrated portion **114**, and also between the tool head's second serrated portion **28** and the tool holder's second internal serrated portion **116**.

The clamping member **126** may be inserted into the through bore **122** and the threaded bore **124**, before the tool head **10** is inserted into the tool head receiving portion **104**. In such a case, the coupling recess **38** passes over the clamping member **126**. More specifically, the tool head's top and bottom coupling arms **40**, **42** pass on either side of (e.g., above and below, respectively) the clamping member **126**.

Alternatively, the clamping member **126** may be inserted into the through bore **122** and the threaded bore **124**, after the tool head **10** is inserted into the tool head receiving portion **104**. In such a case, the clamping member **126** slides through the coupling recess **38**, along the lateral axis **M**.

As the clamping member **126** is threadedly engaged in the threaded bore **124**, the first clamping arm **108** and the second clamping arm **110** are pulled toward one another, thereby pressing against the tool head **10**, and clamping it.

The interaction between the tool head's first serrated portion **24** with the tool holder's first internal serrated portion **114**, and the interaction between the tool head's second serrated portion **28** with the tool holder's second internal serrated portion **116**, forms contact between the tool head **10** and the tool holder **102**, along repeatable and multiple contact surfaces. Similarly, this applies to the interaction between the tool head's stopper serrated portion **32** with the tool holder stopper serrated portion **120**.

In some embodiments, the tool head's stopper serrated portion **32** is provided proximate to the insert seat **18**. The tool holder stopper serrated portion **120** is provided at a forward end of the second clamping arm **110**, forming repeatable contact in proximity to the insert seat **18**. The serrated contact along the stopper wall **30** supports the tool head **10** during cutting operations, countering the machining forces which are applied on the cutting insert **62**.

It would be appreciated, that the clamping member **126** is received within the coupling recess **38** without contacting the tool head **10**. Therefore, when the clamping member **126** is partly unthreaded from the threaded bore **124**, the first and second clamping arms **108**, **110** no longer clamp the tool head **10**. In this state, the tool head **10** may be removed from the tool holder **102**, without completely removing the clamping member **126**. Similarly, and as noted above, the tool head **10** may be mounted into the tool holder **102**, when the clamping member **126** is already partly threaded into the threaded bore **124**. This provides a quick-release, or quick-change, mechanism for coupling the tool head **10** with the tool holder **102**.

Such modular quick-change configuration, as disclosed in the present application, encompasses the advantage of using the same tool holder **102**, with different tool heads **10**, while the tool holder remains connected to the machine. The different tool heads **10** may have various cutting configurations of the cutting insert, not limited to the one shown in the drawings. That is, different tool heads **10** may have different insert pocket structures, for carrying different cutting inserts and performing different cutting operations. This provides a modular cutting tool allowing a variety of cutting operations to be performed with the same tool holder still connected to the machine.

With further reference to Figures 2, 3 and 7-9, in some embodiments of the present invention, the first side wall **22** of the tool head **10** has a side recess **48** thereon, located axially forward of the coupling recess **38**. The first clamping arm **108** of the cutting tool **100**, has a retention bore **134** passing there through, and opening out to the first internal serrated portion **114**. The retention bore **134** extends along a retention bore axis **B**, transverse to the holder axis **H**.

A retention member **128** is inserted into the retention bore **134**. When the tool head **10** is mounted in the tool head receiving pocket **112**, the side recess **48** faces the retention bore **134**, and thus faces the retention member **128**.

In some embodiments, the retention member **128** includes a housing **130** and a spring loaded spherical member **132**. As seen in Fig. 9, the retention bore **134** may comprise a narrow neck portion **134a** connected to an enlarged body portion **134b** which is configured and dimensioned to receive the housing **130** of the retention member **128**. As shown particularly in Figs. 8-9, the spherical member **132** is urged by the spring (not shown) into the tool head's side recess **48**. In this manner, the spherical member **132** applies a retention force $\mathbf{F_R}$ on the tool head **10**, along the retention bore axis **B**. The tool head **10** is thus pressed against the second clamping arm **110** of the tool holder **102**.

Due to the force applied by the spherical member **132**, the tool head **10** is held in place inside the tool head receiving pocket **112**, even when the clamping member **126** is not fully threaded in the threaded bore **124**. In this manner, the retention member **128** is used to retain the tool head **10** and prevent it from falling out by sliding out of the tool holder **102** along the holder axis **H**, even when not fully clamped by the clamping member **126**. Such falling prevention mechanism is particularly advantageous when the forward direction $\mathbf{D_F}$ is as the gravitational direction, i.e., downwards.

In some embodiments, the retention bore **134** is located forward of the through bore **122**, along the holder axis **H**.

In some embodiments of the present invention, the stopper serrated portion **32** of the tool head **10** may have a top stopper serrated section **50** extending along the top surface **12**, and a bottom stopper serrated section **52** extending along the bottom surface **14**. The bottom stopper serrated section **52** is spaced apart from the top stopper serrated section **50** by a stopper wall indent **54**. The stopper wall indent **54** has no serrations thereon. This ensures spaced apart, split contact areas between the tool head's stopper serrated portion **32** and the tool holder stopper serrated portion **120**.

Further, the holder stopper wall **118** of the tool holder **102** may have a holder stopper recess **136**, separating the tool holder stopper serrated portion **120** into two spaced apart portions. This forms free space for insertion of the retention member **128** into the retention bore **134**. That is, the holder stopper recess **136** provides uninterrupted access to the retention bore **134**, along the retention bore axis **B** (Fig. 7), so that the retention member **128** may be inserted in a straight line into the retention bore **134**.

In some embodiments of the present invention, as indicated for example in Fig. 3 and Fig. 8, the rear wall **34** of the tool head **10** has a V-shape, including a first rear wall portion **58** and a second rear wall portion **60**, which converge in the rearward direction D_R. This may allow for easier insertion of the tool head **10** into the tool head receiving pocket **112**, since the tool head **10** is slidingly led into the tool head receiving pocket **112**, with no sharp edges at its rearward end **36**.

Attention is now drawn to Figures 10A, 10B and 10C, depicting a cutting tool **200** according to another embodiment of the present application. The cutting tool **200** includes a tool holder **202** and a tool head **210**. The tool holder **202** is similar to the tool holder **102**, except for the position of the holder stopper wall. In this embodiment, the holder stopper wall **118'** is located at an inner (rearward) end of the tool head receiving pocket **112**.

The tool head **210** is similar to tool head **10**, except for the position of the stopper wall. In this embodiment, the stopper wall **30'** is located on the rear wall **34** of the tool head **210**. In this case, the stopper serrated portion **32** comprises a plurality of serration grooves **33** (formed on the rear wall **34**) which run in a direction perpendicular to the tool head longitudinal axis **L** and to the vertical tool head axis **V**. Furthermore, as seen in Fig. 10C, the stopper serrated portion **32** is located between the first serrated portion **24** and the second serrated portion **28** on both the top and

bottom coupling arms **40**, **42**. Also in this embodiment, the top and bottom stopper serrated sections **50**, **52** are vertically spaced apart from one another by the coupling recess **38**.

The coupling of the tool head **210** with the tool holder **202** is similar to the coupling described herein above with regard to tool head **10** and tool holder **102**. The difference being that the interaction between the tool head's stopper serrated portion **32** and the tool holder stopper serrated portion **120** occurs at the inner (rearward) end of the tool head receiving pocket **112**. In practice, this embodiment is an alternative to the embodiment shown in figures 1-9, resulting at the same technical result of tool coupling, by maintaining serrated surface interaction between the tool holder **202** and the tool head **210** also at their stopper surfaces.

Attention is further drawn to Figures 11A and 11B, showing a cutting tool **300** according to yet another embodiment of the present application. The cutting tool **300** includes a tool holder **302** and a tool head **310**. Compared to the tool holder **102**, the tool holder **302** further includes a center clamping arm **312** located between the first clamping arm **108** and the second clamping arm **110**. The center clamping arm **312** extends longitudinally in the forward direction **DF** from the inner (rearward) end of the tool head receiving pocket **112**. The center clamping arm **312** has a holder center serrated portion **314**.

In the tool head **310**, the top coupling arm **40** is divided into a first top coupling arm portion **316** and a second top coupling arm portion **318**, spaced apart from one another. Likewise, the bottom coupling arm **42** is divided into a first bottom coupling arm portion **320** and a second bottom coupling arm portion **322**, spaced apart from one another. The coupling arm portions **316**, **318**, **320** and **322** have a tool head central serrated portion **324**.

The coupling of the tool head **310** with the tool holder **302** is similar to the coupling described herein above with regard to tool head **10** and tool holder **102**, i.e., in the following manner. The tool head **310** is inserted into the tool head receiving pocket **112** along the holder axis **H**, in the rearward direction **DR**. The center clamping arm **312** of the tool holder **302** is received in the space between the first top coupling arm portion **316** and the second top coupling arm portion **318**, and also between the first bottom coupling arm portion **320** and the second bottom coupling arm portion **322**.

The holder center serrated portion **314** of the tool holder **302** interacts with the tool head central serrated portion **324** of the tool head **310**. This provides a strong coupling between the tool head **310** and the tool holder **302**, due to enlarged serrated contact area there between.

Although the subject matter of the present application has been described to a certain degree of particularity, it should be understood that various alterations and modifications could be made without departing from the spirit or scope of the invention as hereinafter claimed.

CLAIMS

What is claimed is:

1. A tool head (10, 210, 310) having a longitudinal tool head axis (L) extending in a rearward to forward direction (D_R, D_F), a vertical tool head axis (V) perpendicular to the longitudinal tool head axis (L) and extending in an upward to downward direction (D_U, D_D), a forward end (20), and a rearward end (36) located opposite the forward end (20); the tool head (10, 210, 310) comprising:

a top surface (12), a bottom surface (14), and a peripheral surface (16) extending therebetween, the peripheral surface (16) comprising:

first and second side walls (22, 26) located on opposite sides of the longitudinal tool head axis (L) in a top view of the tool head (10), the first side wall (22) having a first serrated portion (24) and the second side wall (26) having a second serrated portion (28);

a stopper wall (30, 30') facing in the rearward direction (D_R) and extending transversely to the second side wall (26), the stopper wall (30) having a stopper serrated portion (32); and

a rear wall (34) extending between the first side wall (22) and the second side wall (26), at the rearward end (36) of the tool head (10);

an insert retaining portion (17) comprising an insert seat (18) located at an intersection of the top surface (12) and the peripheral surface (16); and

a coupling portion (19) connected to the insert retaining portion (17) and comprising rearwardly extending top and bottom coupling arms (40, 42) which are spaced apart from one another along the vertical axis (V) by a coupling recess (38) which opens out to the rear wall (34) at the rearward end (36).

2. The tool head (10, 210, 310) according to claim 1, wherein:

the first side wall (22) is divided into vertically spaced apart top and bottom first side wall portions (22a, 22b), each first side wall portion being at least partially formed on a corresponding top or bottom coupling portion (40, 42);

the first serrated portion (24) is divided into top and bottom serrated first side wall sections (24a, 24b) which are at least partially formed on corresponding top and bottom coupling arms (40, 42);

the second side wall (26) is divided into vertically spaced apart top and bottom second side wall portions (26a, 26b), each second side wall portion being at least partially formed on a corresponding top or bottom coupling portion (40, 42);

the second serrated portion (28) is divided into top and bottom serrated second side wall sections (28a, 28b) which are at least partially formed on corresponding top and bottom coupling arms (40, 42); and

the coupling recess (38) opens out to the rear wall (34), to the first side wall (22) and to the second side wall (26), thereby forming the spaced apart top and bottom coupling arms (40, 42).

3. The tool head (10, 210, 310) according to any of the preceding claims, wherein:

each of the first serrated portion (24) and the second serrated portion (28) comprises a plurality of serration grooves (33); and

the serration grooves (33) of the first serrated portion (24) and the serration grooves (33) of the second serrated portion (28) run in a direction parallel to the longitudinal tool head axis (L).

4. The tool head (10, 210, 310) according to claim 3, wherein:

the stopper serrated portion (32) comprises a plurality of serration grooves (33); and

the serration grooves (33) of the stopper serrated portion (32) run in a direction transverse to the longitudinal tool head axis (L).

5. The tool head (10, 210, 310) according to any of the preceding claims, wherein:

the stopper serrated portion (32) has a top stopper serrated section (50) extending along the top surface (12), and a bottom stopper serrated section (52) extending along the bottom surface (14), and

the bottom stopper serrated section (52) is spaced apart from the top stopper serrated section (50) by either a stopper wall indent (54) or the coupling recess (38).

6. The tool head (10, 210, 310) according to any of the preceding claims, wherein the first side wall (22) includes a side recess (48), located axially forward of the coupling recess (38).

7. The tool head (10, 210, 310) according to any of the preceding claims, wherein:
the peripheral surface (16) further comprises:
a front wall (44) at the forward end (20) of the tool head (10), and
a forward support wall (46) extending from the front wall (44) in the rearward direction (D_R);
the insert retaining portion (17) further comprises an insert seat screw bore (56) opening out to the insert seat (18) and extending toward the bottom surface (14); and
the insert seat (18) is located at an intersection of the top surface (12) with the front wall (44) and the forward support wall (46).

8. The tool head (10) according to any of the preceding claims, wherein the rear wall (34) includes a first rear wall portion (58) and a second rear wall portion (60), converging in the rearward direction (D_R).

9. The tool head (10) according to any of the preceding claims, wherein the rear wall (34) is devoid of serrations.

10. The tool head (10) according to any of the preceding claims, wherein the stopper wall (30) is located adjacent to, and forward of, the second side wall (26).

11. The tool head (210) according to any one of claims 1 to 7, wherein:
the stopper wall (30') is located on the rear wall (34) of the tool head (210);
the stopper serrated portion (32) is formed on the rear wall (34) and comprises a plurality of serration grooves (33); and
the serration grooves (33) of the stopper serrated portion (32) run in a direction perpendicular to the longitudinal tool head axis (L).

12. The tool head (310) according to any one of claims 1 to 7, wherein:

the top coupling arm (40) is divided into a first top coupling arm portion (316) and a second top coupling arm portion (318) which are spaced apart from one another; and

the bottom coupling arm (42) is divided into a first bottom coupling arm portion (320) and a second bottom coupling arm portion (322) which are spaced apart from one another.

13. A cutting tool (100, 200, 300), comprising:

a tool holder (102, 202, 302);

a tool head (10, 210, 310) in accordance with any of the preceding claims mounted on the tool holder; and

a cutting insert (62) mounted in the insert seat (18) of the tool head (10, 210, 310).

14. The cutting tool (100, 200, 300), according to claim 13, wherein:

the tool holder (102, 202, 302) has a longitudinal holder axis (H) extending in the rearward to forward direction (D_R, D_F), and a tool head receiving portion (104) located at a holder forward end (106) of the tool holder (102, 202, 302), the tool head receiving portion (104) comprising:

a first clamping arm (108) and a second clamping arm (110), located on opposite sides of the holder axis (H), and spaced apart by a tool head receiving pocket (112);

the first clamping arm (108) having a through bore (122) extending transversely to the holder axis (H) and a first internal serrated portion (114) facing the tool head receiving pocket (112);

the second clamping arm (110) having a threaded bore (124) extending transversely to the holder axis (H) and a second internal serrated portion (116) facing the tool head receiving pocket (112); and

a holder stopper wall (118, 118') facing in the forward direction (D_F) and having a holder stopper serrated portion (120);

wherein the tool head (10) is mounted in the tool head receiving portion (104), such that:

the first serrated portion (24) interacts with the first internal serrated portion (114),

the second serrated portion (28) interacts with the second internal serrated portion (116),

the stopper serrated portion (32) interacts with the holder stopper serrated portion (120), and

a clamping member (126) passes through the through bore (122) of the first clamping arm (108), received within the coupling recess (38) of the tool head (10), and interacts with the threaded bore (124) of the second clamping arm (110).

15. The cutting tool (100, 200, 300) according to claim 14, wherein:

the first clamping arm (108) has a retention bore (134) passing therethrough and opening out to first internal serrated portion (114);

the cutting tool (100, 200, 300) further comprises a retention member (128) inserted into the retention bore (134), the retention member (128) pressing against the side recess (48) of the tool head (10, 210, 310).

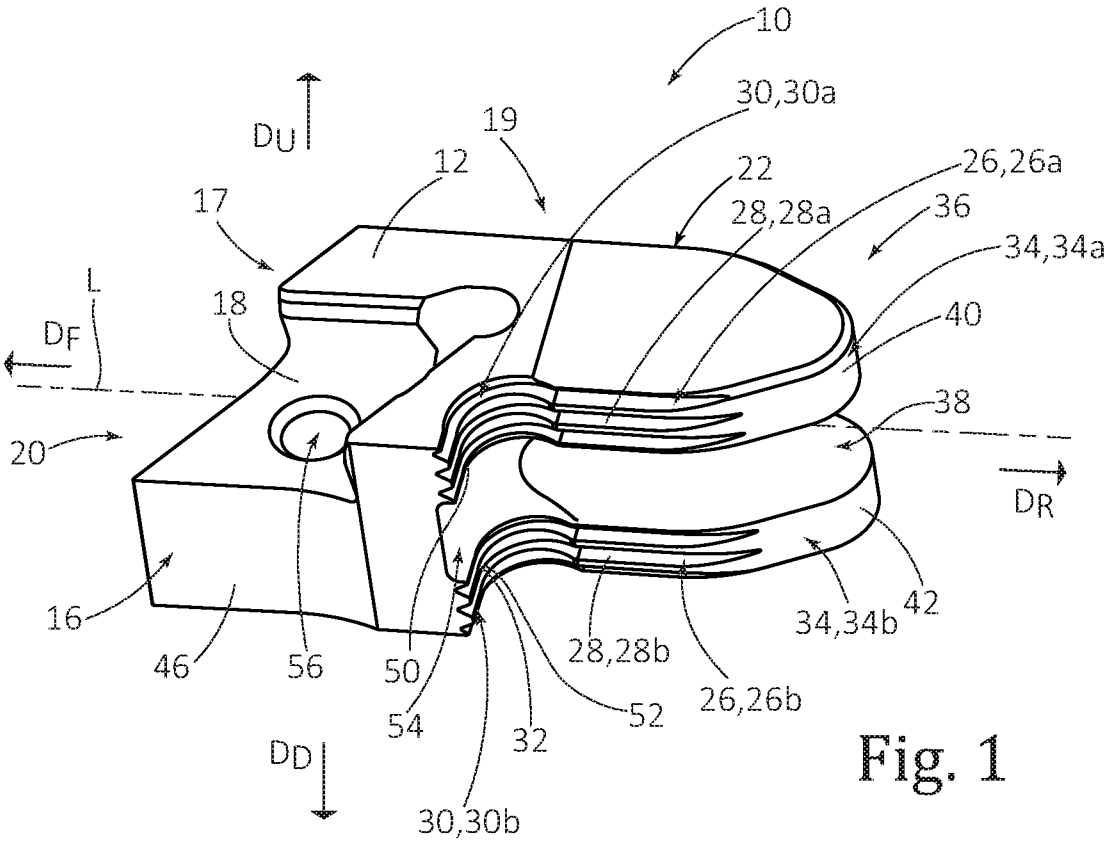
16. The cutting tool (100, 200, 300) according to claim 15, wherein the retention member (128) includes a housing (130) and a spherical member (132), the spherical member (132) being spring loaded in the housing (130), and pressing against the side recess (48) of the tool head (10, 210, 310).

17. The cutting tool (100, 200, 300) according to any one of claims 15 to 16, wherein the retention bore (134) is located axially forward of the through bore (122), along the holder axis (H).

18. The cutting tool (100) according to any one of claims 14 to 17, wherein the holder stopper wall (118) of the tool holder (102) has a holder stopper recess (136), separating the holder stopper serrated portion (120) into two spaced apart portions.

19. The cutting tool (200) according to any one of claims 14 to 17, wherein:
the stopper wall (30') is located on the rear wall (34) of the tool head (210); and
the holder stopper wall (118') is located at an inner end of the tool head receiving pocket (112).

20. The cutting tool (300) according to any one of claims 14 to 17, wherein:
the tool holder (302) further includes a center clamping arm (312) located between the first clamping arm (108) and the second clamping arm (110), the center clamping arm (312) extending in the forward direction (DF) from a rearward end of the tool head receiving pocket (112);
the tool head's top coupling arm (40) is divided into a first top coupling arm portion (316) and a second top coupling arm portion (318) which are spaced apart from one another; and
the tool head's bottom coupling arm (42) is divided into a first bottom coupling arm portion (320) and a second bottom coupling arm portion (322) which are spaced apart from one another.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30,30a
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DU
12
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34,34a
L
18
DF
40
20
38
DR
16
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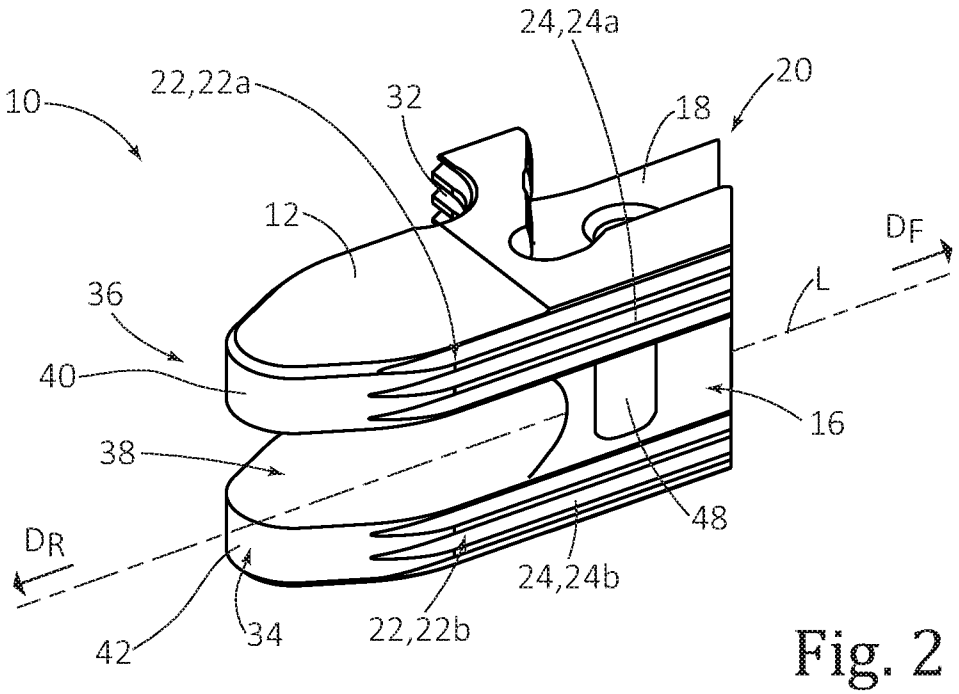
42
46
56
50
28,28b
26,26b
54
52
32
DD
30,30b

Fig. 1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10
32
18
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L
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40
16
38
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DR
24,24b
42
34
22,22b

Fig. 2

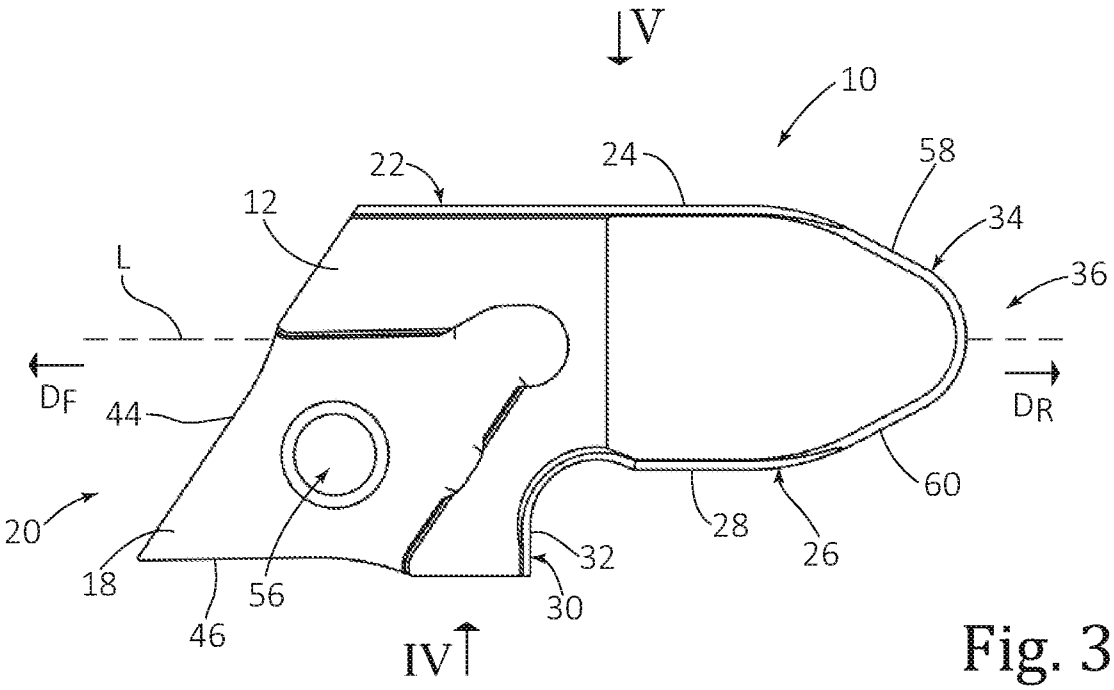


Fig. 3

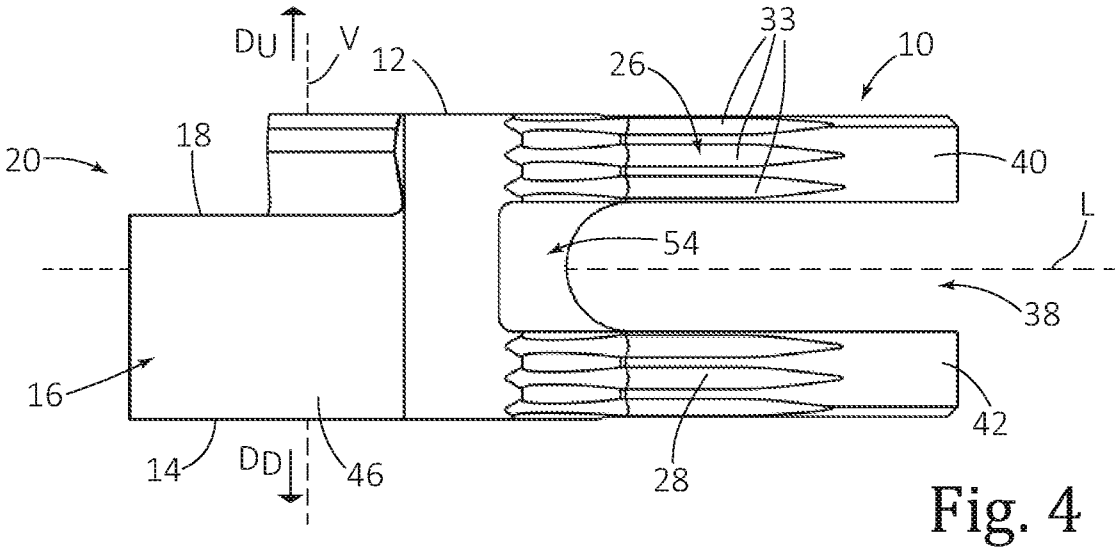


Fig. 4

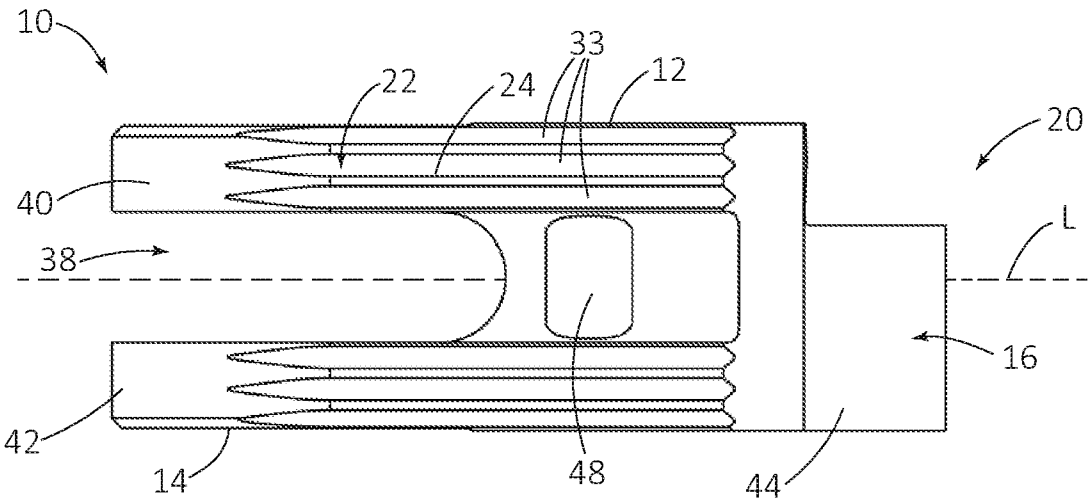
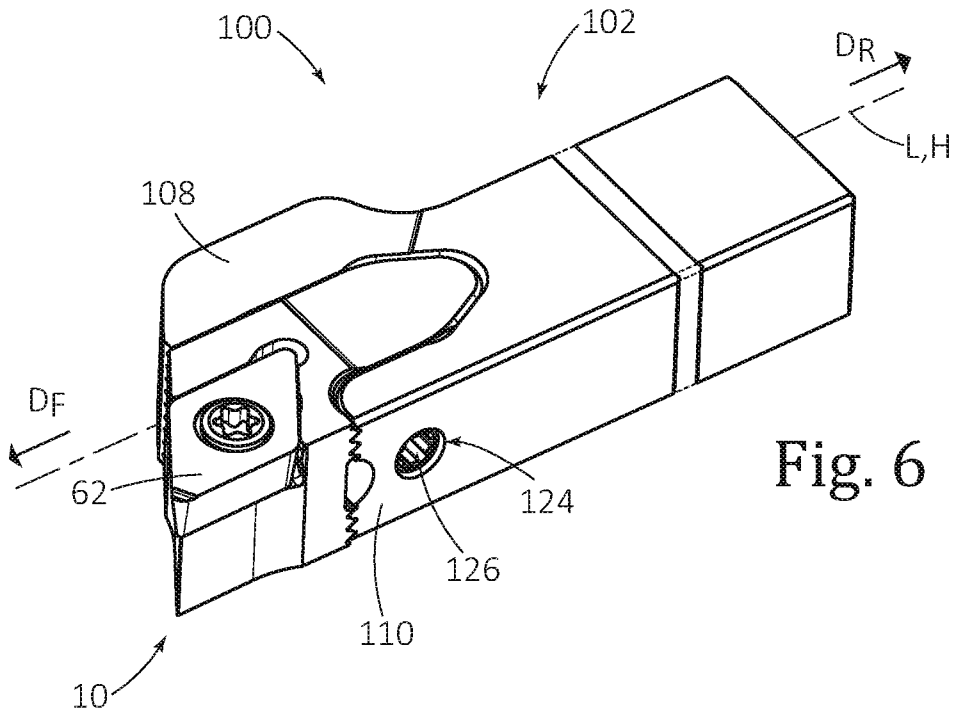


Fig. 5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102
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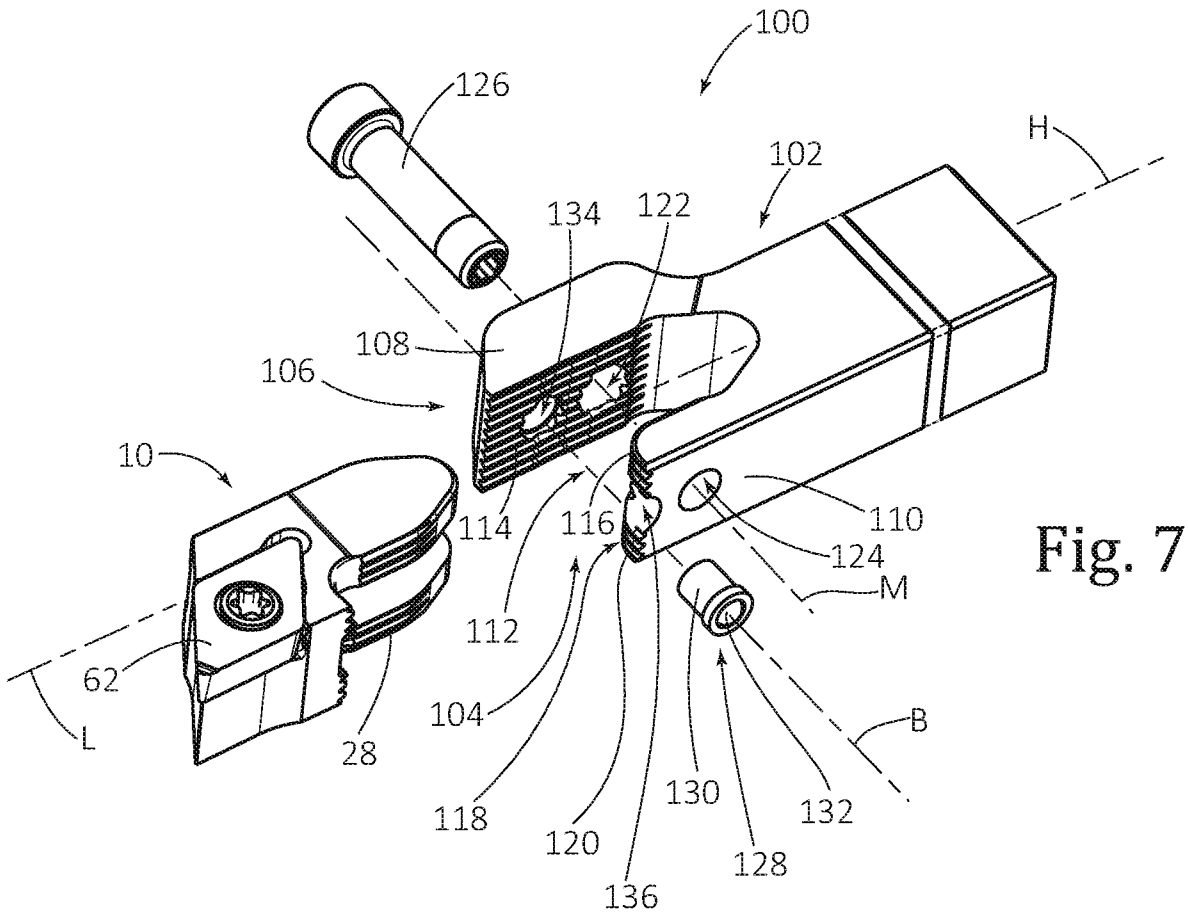
L,H
108
DF
62
124
126
110
10

Fig. 6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126
H
102
134
122
108
106
10
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110
124
M
112
62
L
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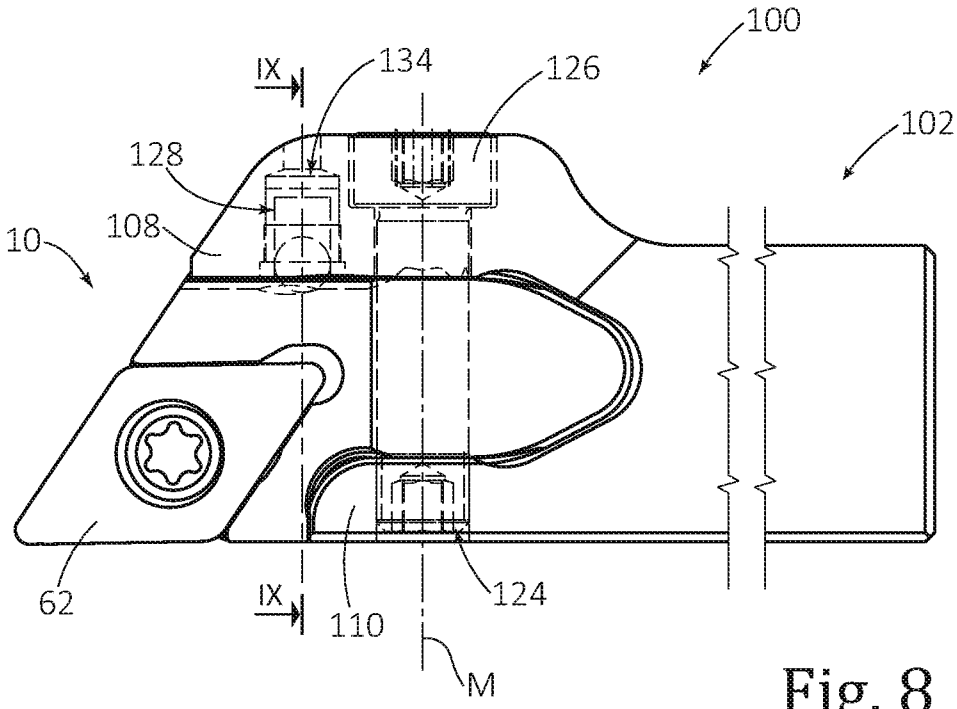
28
B
118
120
130
132
128
136

Fig. 7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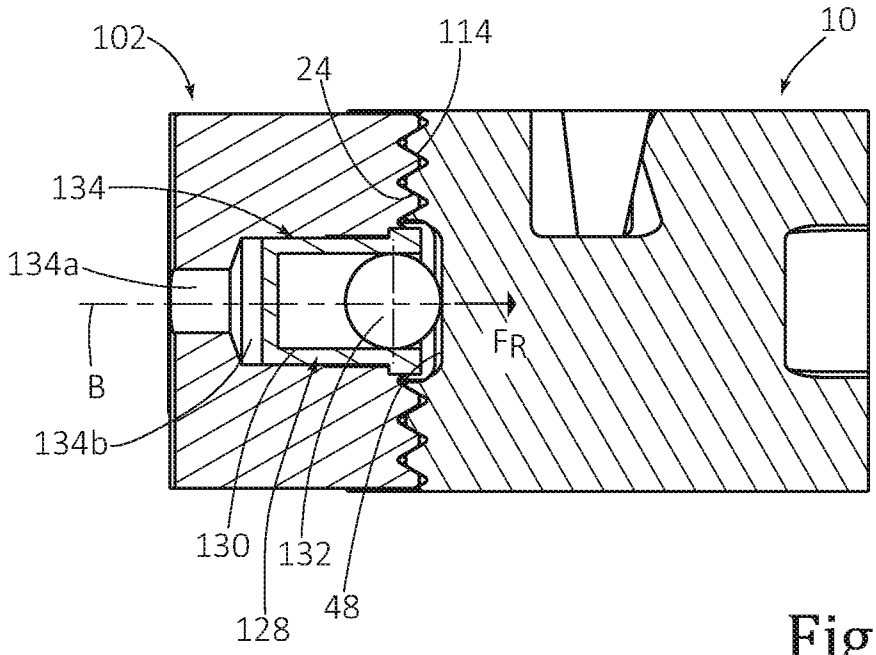
134
126
102
128
108
10
62
IX
110
124
M

Fig. 8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114
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24
134
134a
FR
B
134b
130
132
48
128

Fig. 9

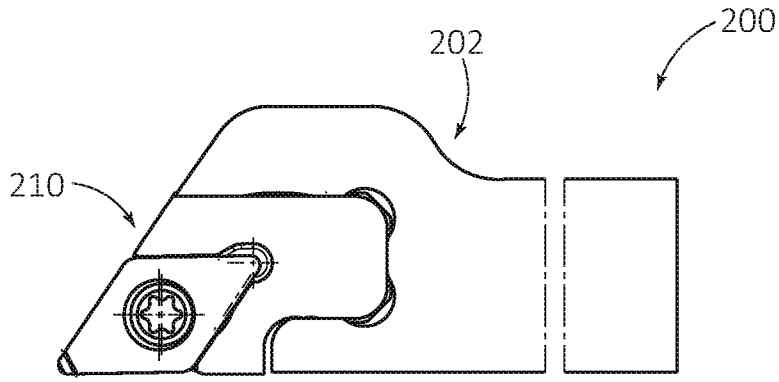

Fig. 10A

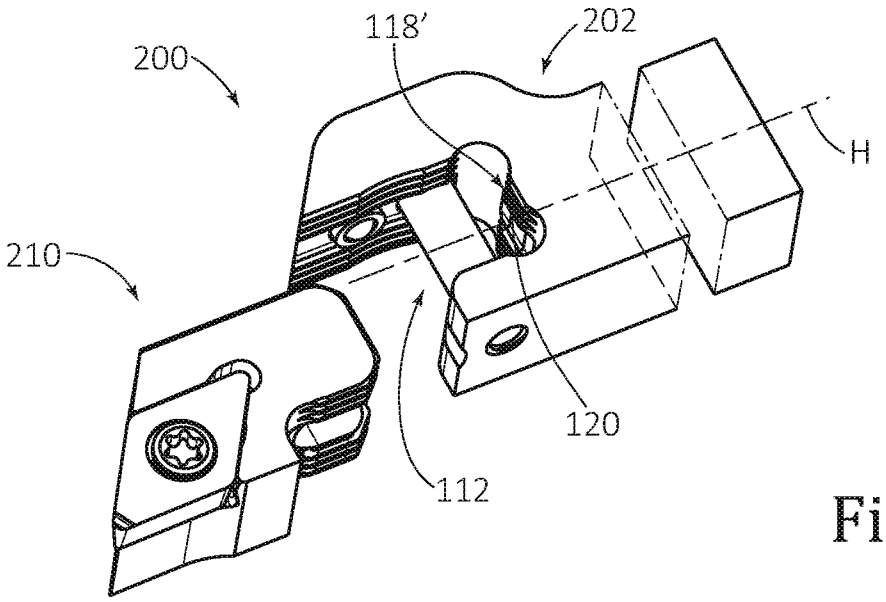

Fig. 10B

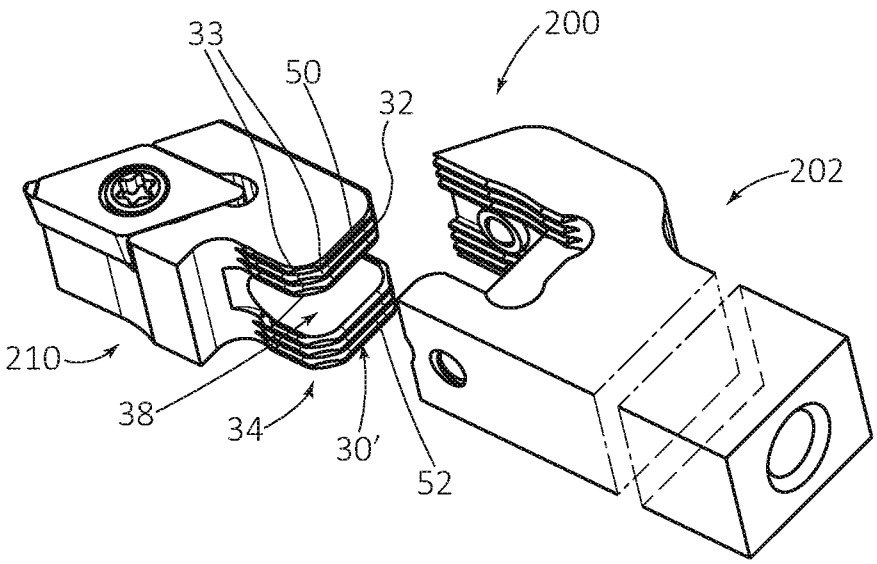

Fig. 10C

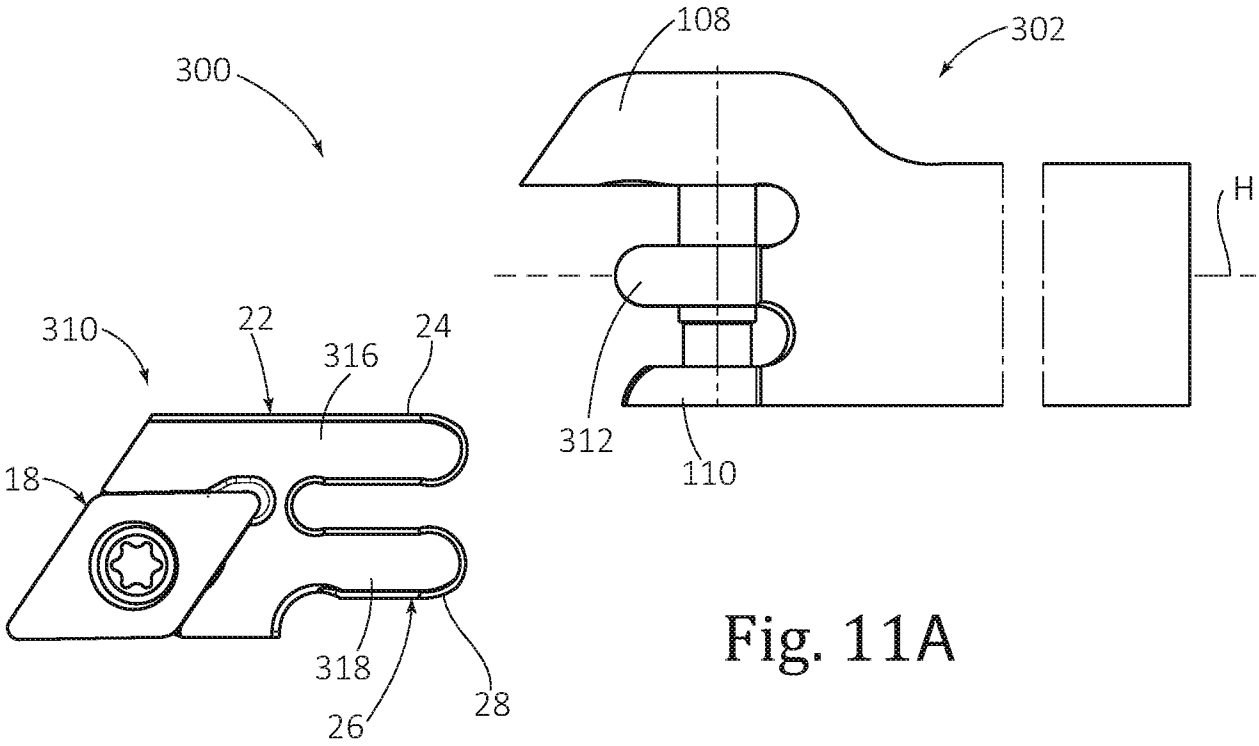

Fig. 11A

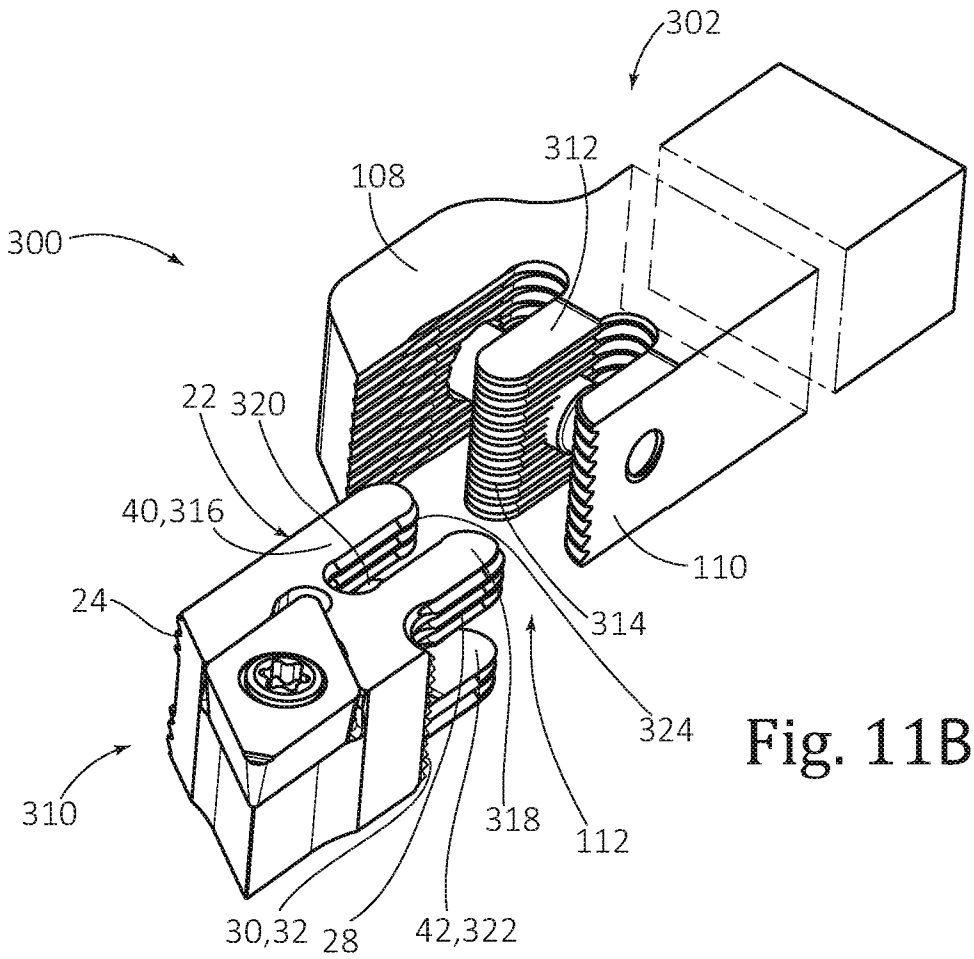

Fig. 11B

INTERNATIONAL SEARCH REPORT

International application No
PCT/IL2021/050674

A. CLASSIFICATION OF SUBJECT MATTER
INV. B23B31/107 B23B29/04 B23B29/06
ADD.

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)
B23B

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2012/260778 A1 (UNO TETSUYA [JP]) 18 October 2012 (2012-10-18) abstract figures 1-3,5,7,12	1-3,6-9, 11,13-15
A	DE 10 2004 033929 B3 (SIMTEK PRAEZ SWERKZEUGE GMBH [DE]) 12 January 2006 (2006-01-12) abstract figure 1	1,2,6,7, 9,11,13
A	US 8 549 965 B2 (ERICKSON CARLA [US]; KENNAMETAL INC [US]) 8 October 2013 (2013-10-08) abstract figures 1,2,5	1,7,9, 10,13-16

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
5 October 2021	15/10/2021

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Baumgärtner, Ruth

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IL2021/050674

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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