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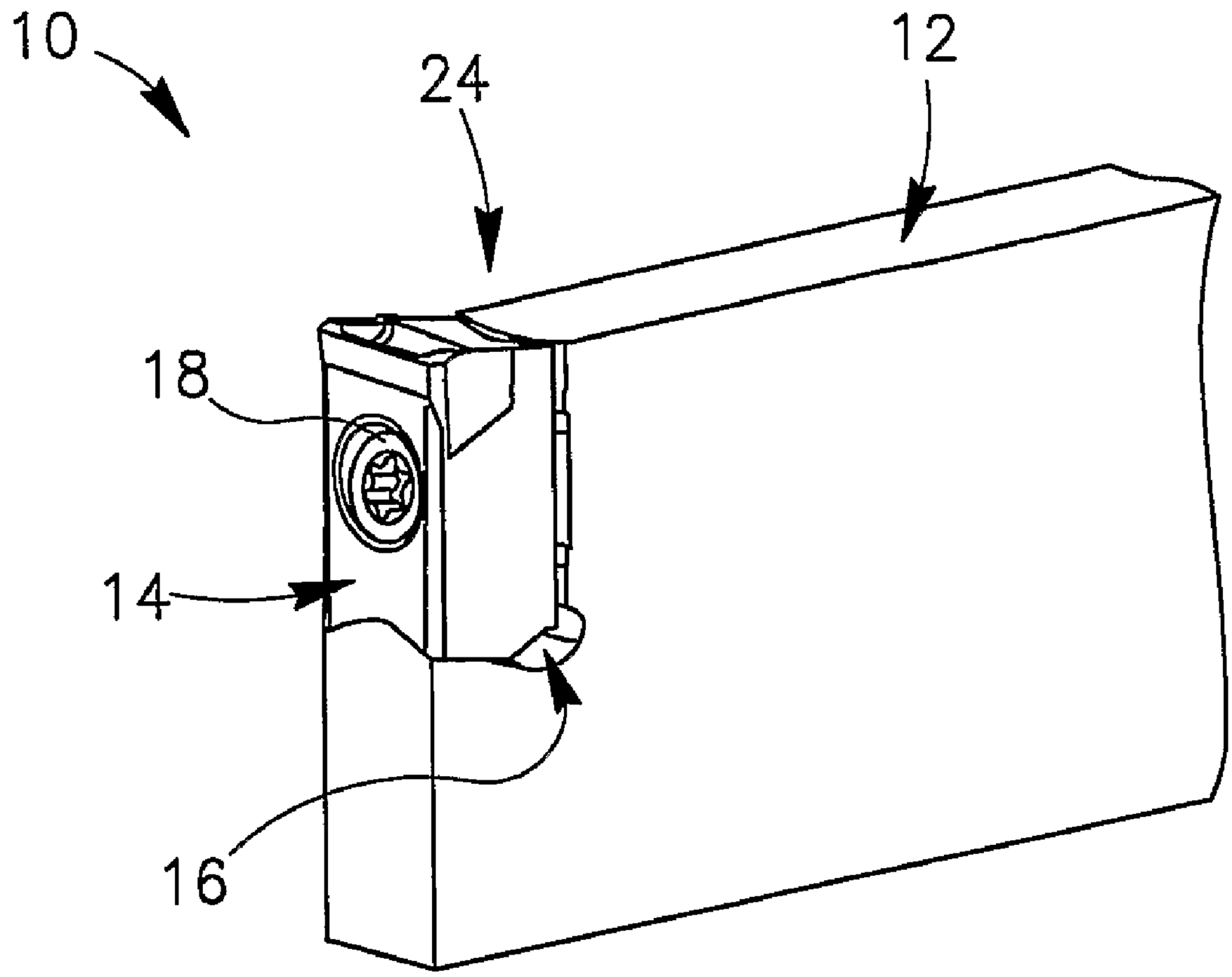

(57) Abrégé/Abstract:
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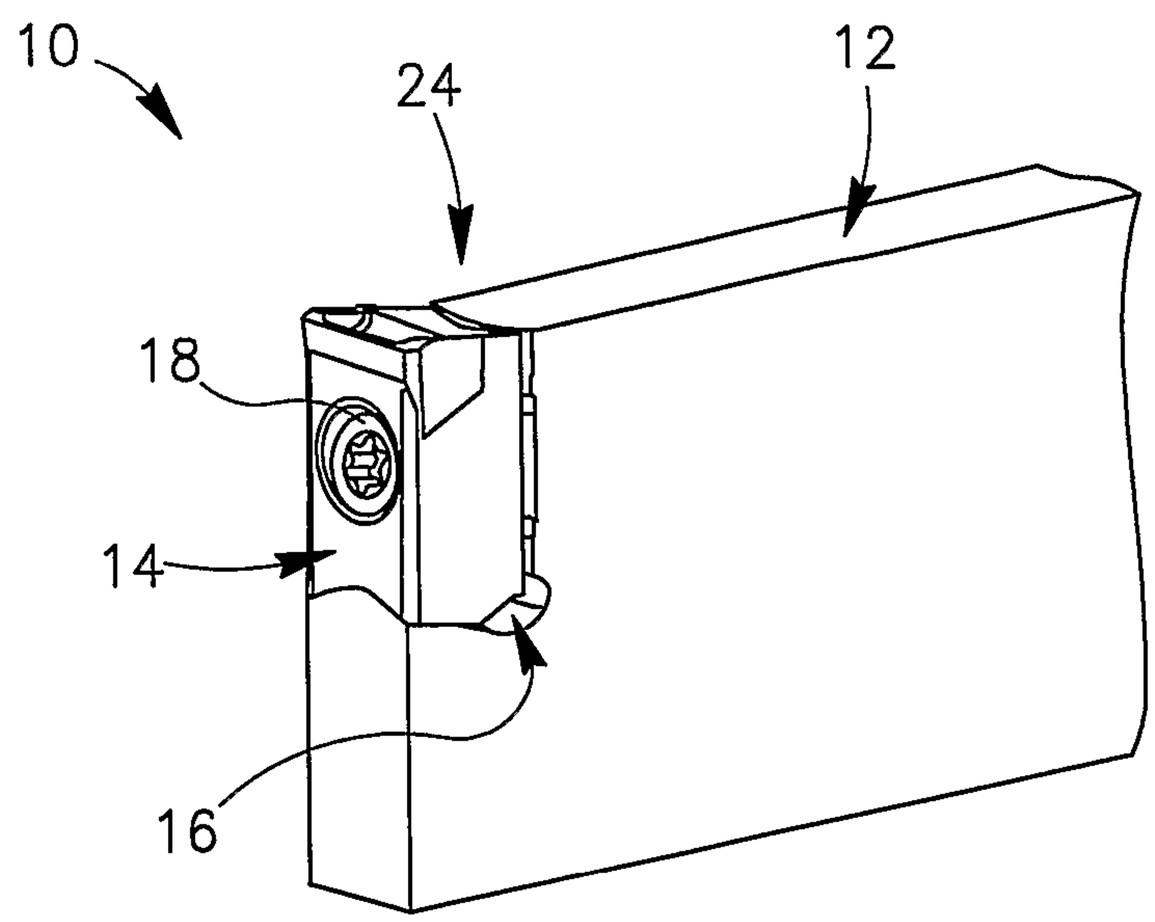
(54) **Title:** CUTTING TOOL AND CUTTING INSERT THEREFOR



(57) **Abstract:** A cutting tool (10) in which a cutting insert (14) is retained by a retaining screw (18). The cutting insert comprises a rear surface (32) and a lower surface (28) being generally v-shaped.

WO 2006/061817 A1

CUTTING TOOL AND CUTTING INSERT THEREFOR

FIELD OF THE INVENTION

The present invention relates to cutting tools of the type in which a cutting insert is retained in an insert pocket of a cutting tool by means of a retaining screw.

BACKGROUND OF THE INVENTION

In cutting tools for grooving, turning or parting-off, and in cutting tools for rotary slot cutting, a cutting insert is often retained in an insert pocket between two generally opposing jaws. In these tools, chips flowing from the cutting insert's cutting edge along its rake surface during a cutting operation may engage the jaw adjacent the rake surface and subject it to considerable abrasive wear. This disadvantageous effect will in time reduce the jaw's ability to retain the cutting insert within the insert pocket.

One solution which significantly overcomes this disadvantageous effect is disclosed in US patent No. 5947648. A tool holder includes a holder blade having an upper jaw and base jaw wherein the upper jaw is fitted with an exchangeable hard material shield insert for protecting it against wear. However, this introduces additional maintenance of the tool.

It is an object of the present invention to provide a cutting tool with a retaining mechanism in which the above referred to disadvantage is substantially reduced or overcome.

SUMMARY OF THE INVENTION

In accordance with the present invention there is provided a cutting insert comprising

an upper surface, a lower surface and a peripheral surface therebetween, the peripheral surface comprising

opposing forward and rear surfaces and opposing side surfaces extending between the forward and rear surfaces,

a through bore extending between the forward and rear surfaces,

the upper surface comprising a rake surface, the forward surface comprising a forward relief surface and the intersection of the rake surface and the forward relief surface forming a forward cutting edge,

the lower and rear surfaces being generally v-shaped in a first and second cross section, respectively.

Preferably, the first cross section is generally perpendicular to the side surfaces and upper surface, and the second cross section is generally perpendicular to the side surfaces and forward surface.

Further preferably, the lower surface comprises a pair of insert lower faces which extend at an insert lower angle relative to each other; and the rear surface comprises a pair of insert rear faces which extend at an insert rear angle relative to each other.

If desired, the insert lower and rear angles are external non-acute angles.

Optionally, the insert lower and rear angles are internal non-acute angels.

There is also provided in accordance with the present invention a cutting tool comprising an insert holder in which a cutting insert in accordance with the present invention is retained in an insert pocket, the

insert pocket comprising a rear abutment surface and a lower abutment surface, with a threaded bore formed in the rear abutment surface,

the cutting insert is retained in the insert pocket with the rear abutment surface of the insert pocket at least partially abutting the rear surface of the cutting insert, the lower abutment surface of the insert pocket at least partially abutting the lower surface of the cutting insert, and a retaining screw passing through the through bore of the cutting insert and being threadingly received in the threaded bore of the insert pocket.

BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the present invention 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 perspective view of a first cutting tool in accordance with the present invention;

Fig. 2 is a partial perspective view of a second cutting tool in accordance with the present invention;

Fig. 3 is a perspective view of a cutting section of the first and second cutting tools showing a cutting insert retained in an insert pocket;

Fig. 4 is the view of the cutting section shown in Fig. 3 with the cutting insert removed from the insert pocket;

Fig. 5 is a perspective rear view of the cutting insert;

Fig. 6A is a partial first cross sectional view taken in the plane VI-VI in Fig. 3 showing a lower surface of the insert having a concave generally v-shaped cross-sectional surface, the insert being somewhat spaced from the insert holder for the sake of clarity;

Fig. 6B is similar to Fig. 6A but for the lower surface of the insert having a convex generally v-shaped cross-sectional surface;

Fig. 7A is a partial second cross sectional view taken in the plane VII-VII in Fig. 3 showing a rear surface of the insert having a concave generally v-shaped cross-sectional surface, the insert being somewhat spaced from the insert holder for the sake of clarity; and

Fig. 7B is similar to Fig. 7A but for the rear surface of the insert having a convex generally v-shaped cross-sectional surface.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

Attention is first drawn to Figs. 1 and 2 showing two cutting tools in accordance with the present invention. Fig. 1 shows a first cutting tool **10** used for metal cutting operations such as grooving, side turning and parting off. The first cutting tool **10** comprises an insert holder **12** in the form of a rectangular blade with a cutting insert **14** retained in an insert pocket **16** by means of a retaining screw **18**. The cutting insert **14** is typically manufactured by form-pressing and sintering carbide powders. Fig. 2 shows a second cutting tool **20**, used for rotary slot metal cutting operations. The second cutting tool **20** comprises an insert holder **22** in the form of a circular disc with cutting inserts **14** retained in identical insert pockets **16** by means of retaining screws **18** and arranged around the periphery of the disc. The cutting tools **10**, **20** comprise a cutting section **24** which includes the cutting insert **14**, the insert pocket **16** and the immediate vicinity of the insert holder **12**, **22** adjacent the insert pocket **16**. It should be noted that directional terms appearing throughout the specification and claims, e.g. “forward”, “rear”, “upper”, “lower”, etc., are used as terms of convenience to distinguish the location of various surfaces relative to each other. These terms are defined with reference to Figs. 3 and 4, however, they are used for illustrative purposes only, and are not intended to limit the scope of the appended claims.

Attention is drawn to Figs. 3 to 5. The cutting insert **14** comprises an upper surface **26**, a lower surface **28** and a peripheral surface therebetween. The peripheral surface comprises opposing forward and rear surfaces **30, 32** and opposing side surfaces **34** extending between the forward and rear surfaces **30, 32**. A through bore **36** extends between the forward and rear surfaces **30, 32**. A rake surface **38**, over which chips cut from a workpiece flow, is located on the upper surface **26**, a forward relief surface **40** is located on the forward surface **30** and a side relief surface **42** is located on each side surface **34**. A forward cutting edge **44** is formed at the intersection of the rake surface **38** with the forward relief surface **40** and a side cutting edge **46** is formed at the intersection of the rake surface **38** with each side relief surface **42**. The cutting insert **14** has a first dimension **D1** measured between the upper and lower surfaces **26, 28** that is greater than a second dimension **D2** measured between the forward and rear surfaces **30, 32**.

The insert pocket **16** has a rear abutment surface **48** which extends between an upper end **50** and a lower end **52** thereof. The rear abutment surface **48** is connected at its lower end **52** via a pocket recess **54** to a lower abutment surface **56**. An upper holder surface **58** extends rearwardly from the upper end **50** of the rear abutment surface **48**. The rear abutment surface **48** is divided by a rear recess **60** into a first abutment surface **62** along an upper portion thereof distal the lower abutment surface **56** and a second abutment surface **64** along a lower portion thereof proximal the lower abutment surface **56**. A threaded bore **66** is formed in the rear recess **60** and extends rearwardly and downwardly into the insert holder **12, 22**.

Lateral stability of the cutting insert **14** relative to the insert holder **12, 22** is provided by the lower and rear surfaces **28, 32** of the cutting insert **14** having generally v-shape concave (or convex) cross sections, which mate

corresponding generally v-shape convex (or concave) cross sections of the lower and rear abutment surfaces **56, 48** of the insert pocket **16**.

Figs. 1 to 5 and specifically Figs. 6A and 7A show the cutting insert **14** having concave lower and rear surfaces **28, 32** and the insert pocket **16** having mating convex lower and rear abutment surfaces **56, 48**.

The lower surface **28** of the cutting insert **14** comprises a pair of insert lower faces **68** which extend rearwardly from the forward surface **30** at an external non-acute insert lower angle α_L to each other (Fig. 6A). The lower abutment surface **56** of the insert pocket **16** comprises a pair of holder lower faces **70** which extend forwardly from the pocket recess **54** at an internal holder lower angle β_L to each other (Fig. 6A). The internal holder lower angle β_L is equal or slightly smaller than the external insert lower angle α_L.

The rear surface **32** of the cutting insert **14** comprises a pair of insert rear faces **72** which extend downwardly from the upper surface **26** at an external non-acute insert rear angle α_R to each other (Fig. 7A). The rear abutment surface **48** of the insert pocket **16** comprises a pair of holder rear faces **74** which extend upwardly from the pocket recess **54** along the second and first abutment surfaces **64, 62** at an internal holder rear angle β_R to each other (Fig. 7A). The internal holder rear angle β_R is equal or slightly smaller than the external insert rear angle α_R.

Figs. 6B and 7B show an alternative of a cutting insert **14** having convex lower and rear surfaces **28, 32** and an insert pocket **16** having mating concave lower and rear abutment surfaces **56, 48**. In this alternative, the insert lower angle α_L' is an internal non-acute angle (Fig. 6B), and the holder lower angle β_L' is an external non-acute angle equal to or slightly larger than the internal insert lower angle α_L'. Additionally, the insert rear angle α_R' is an internal non-acute angle (Fig. 7B), and the holder rear angle β_R' is an external non-acute angle equal to or slightly larger than the internal insert rear angle α_R'.

Preferably, the upper limit of the insert lower and rear angles α_L, α_R, α_L', α_R' and the holder lower and rear angles β_L, β_R, β_L', β_R' is 150°.

For those cases in which the lower surface **28** of the cutting insert **14** or lower abutment surface **56** of the insert pocket **16** are convex, a lower planar face **76** is located between each pair of insert or holder lower faces **68**, **70**. Similarly, for those cases in which the rear surface **32** of the cutting insert **14** or rear abutment surface **48** of the insert pocket **16** are convex, a rear planar face **78** is located between each pair of insert or holder rear faces **72**, **74**. This is to ensure that, inter alia, when the cutting insert **14** is mounted in the insert pocket **16** each insert rear face **72** will abut a corresponding holder rear face **74**, and each insert lower face **68** will abut a corresponding holder lower face **70**.

It is noted that when the cutting insert **14** is mounted in the insert pocket **16**, the upper surface **26** of the cutting insert **14** and the upper holder surface **58** adjacent the insert pocket **16** are generally coplanar. As a result, chips flowing rearwardly from the forward cutting edge **44**, during a cutting operation, will not engage any portion of the insert holder **12**, **22** adjacent the insert pocket **16** and thereby will not effect the retainment of the cutting insert **14** within the insert pocket **16**.

Although the present invention 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 scope of the invention as hereinafter claimed.

CLAIMS:

1. A cutting insert (14) comprising

an upper surface (26), a lower surface (28) and a peripheral surface therebetween, the peripheral surface comprising

opposing forward and rear surfaces (30, 32) and opposing side surfaces (34) extending between the forward and rear surfaces (30, 32),

a through bore (36) extending between the forward and rear surfaces (30, 32),

the upper surface (26) comprising a rake surface (38), the forward surface (30) comprising a forward relief surface (40) and the intersection of the rake surface (38) and the forward relief surface (40) forming a forward cutting edge (44),

the lower and rear surfaces (28, 32) being generally v-shaped in a first and second cross section, respectively.

2. The cutting insert (14) according to claim 1, wherein the first cross section is generally perpendicular to the side surfaces (34) and upper surface (26), and the second cross section is generally perpendicular to the side surfaces (34) and forward surface (30).

3. The cutting insert (14) according to claim 1, wherein the lower surface (28) comprises a pair of insert lower faces (68) which extend at an insert lower angle (α_L, α_L') relative to each other; and the rear surface (32) comprises a pair of insert rear faces (72) which extend at an insert rear angle (α_R, α_R') relative to each other.

4. The cutting insert (14) according to claim 3, wherein the insert lower and rear angles are external non-acute angles (α_L, α_R).

5. The cutting insert (14) according to claim 3, wherein the insert lower and rear angles are internal non-acute angels (α_L', α_R').

6. A cutting tool (10, 20) comprising an insert holder (12, 22) in which a cutting insert (14) in accordance with claim 1 is retained in an insert pocket (16), the insert pocket (16) comprising a rear abutment surface (48) and a lower abutment surface (56), with a threaded bore (66) formed in the rear abutment surface (48),

the cutting insert (14) is retained in the insert pocket (16) with the rear abutment surface (48) of the insert pocket (16) at least partially abutting the rear surface (32) of the cutting insert (14), the lower abutment surface (56) of the insert pocket (16) at least partially abutting the lower surface (28) of the cutting insert (14), and a retaining screw (18) passing through the through bore (36) of the cutting insert (14) and being threadingly received in the threaded bore (66) of the insert pocket (16).

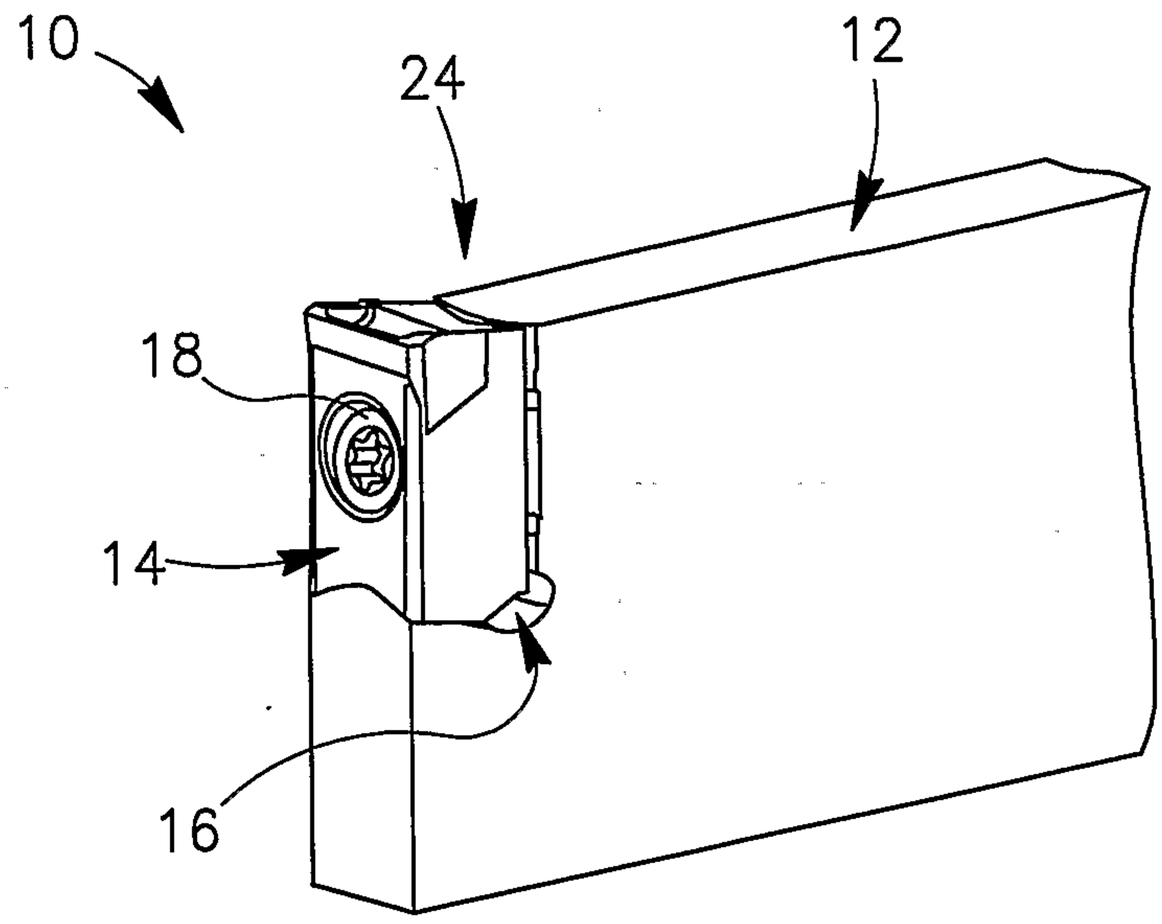


FIG.1

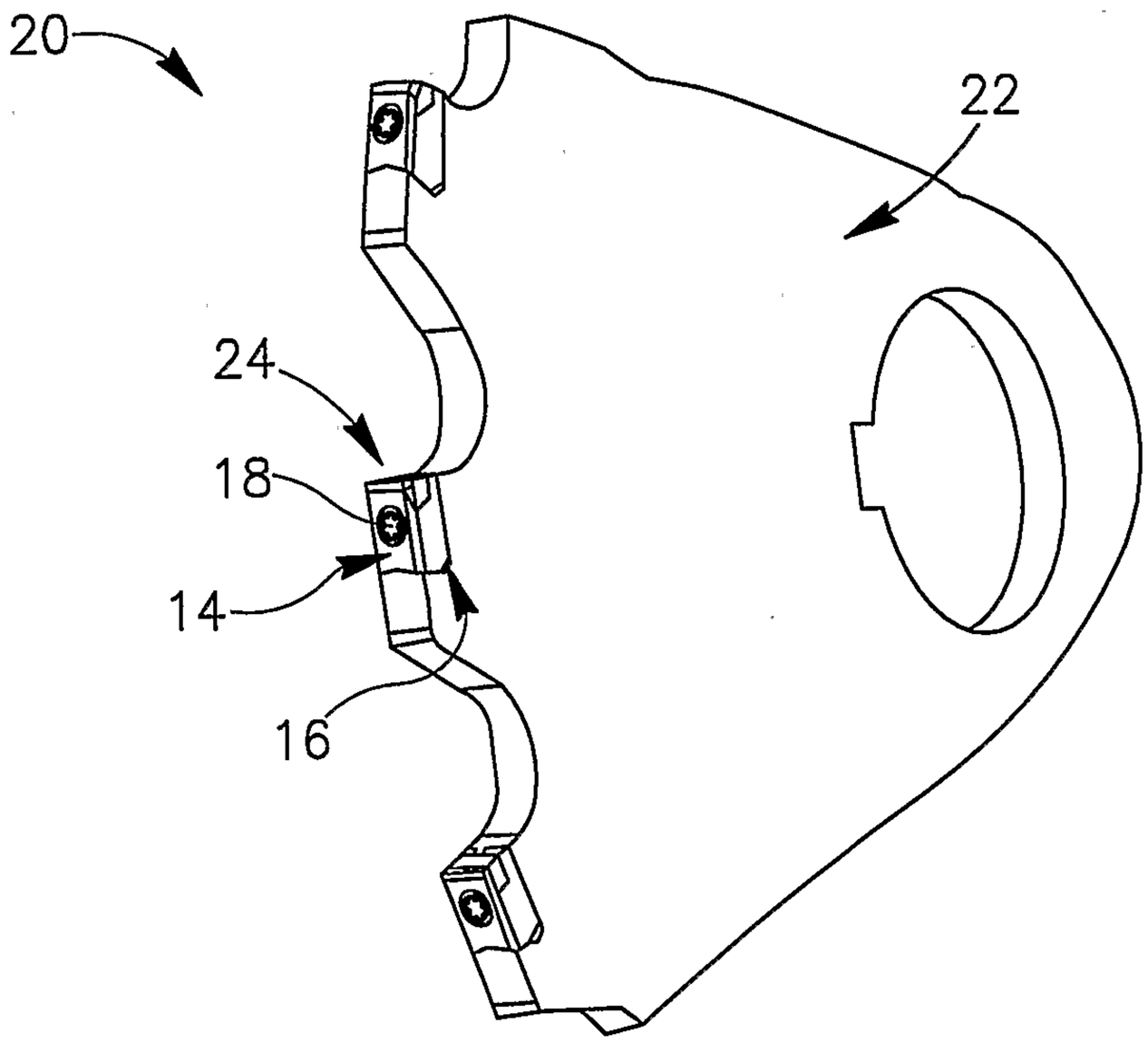


FIG.2

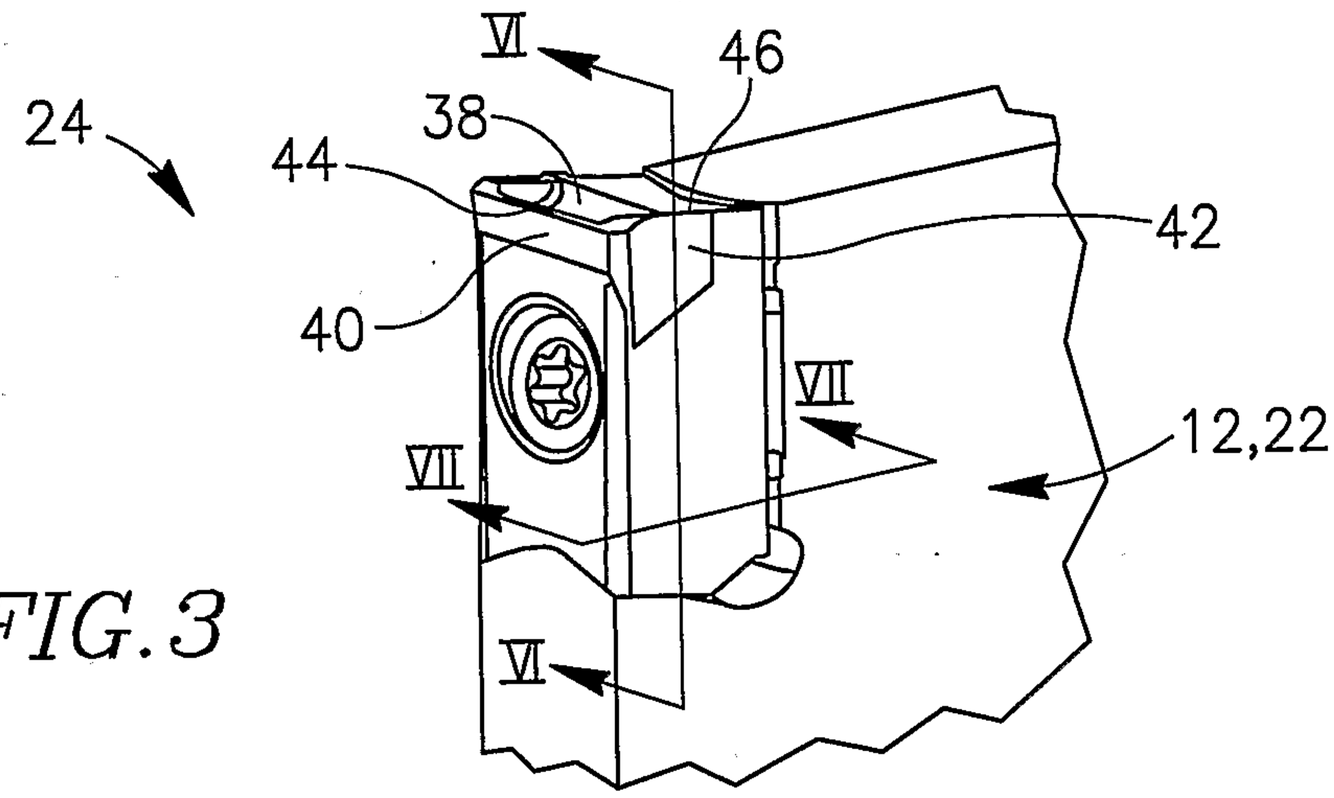
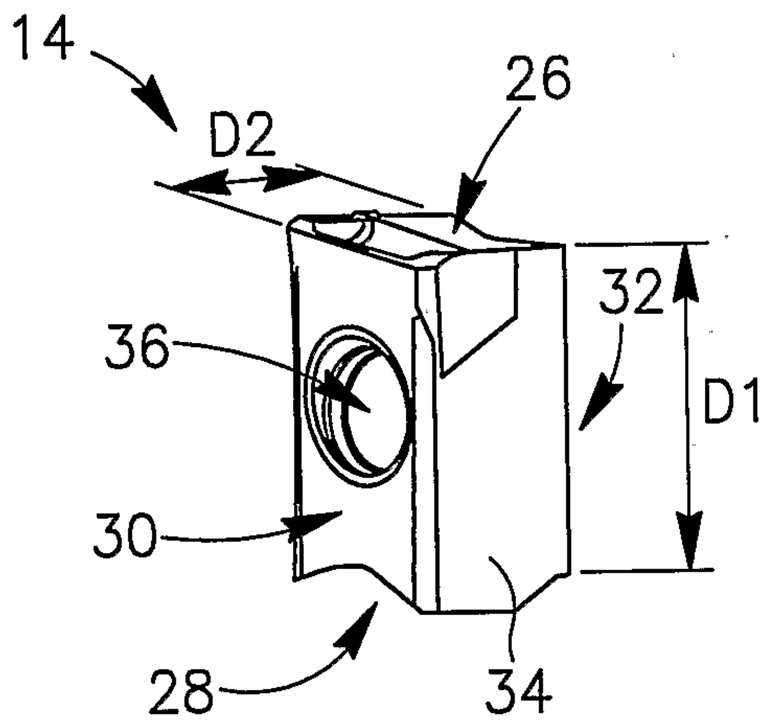


FIG.3



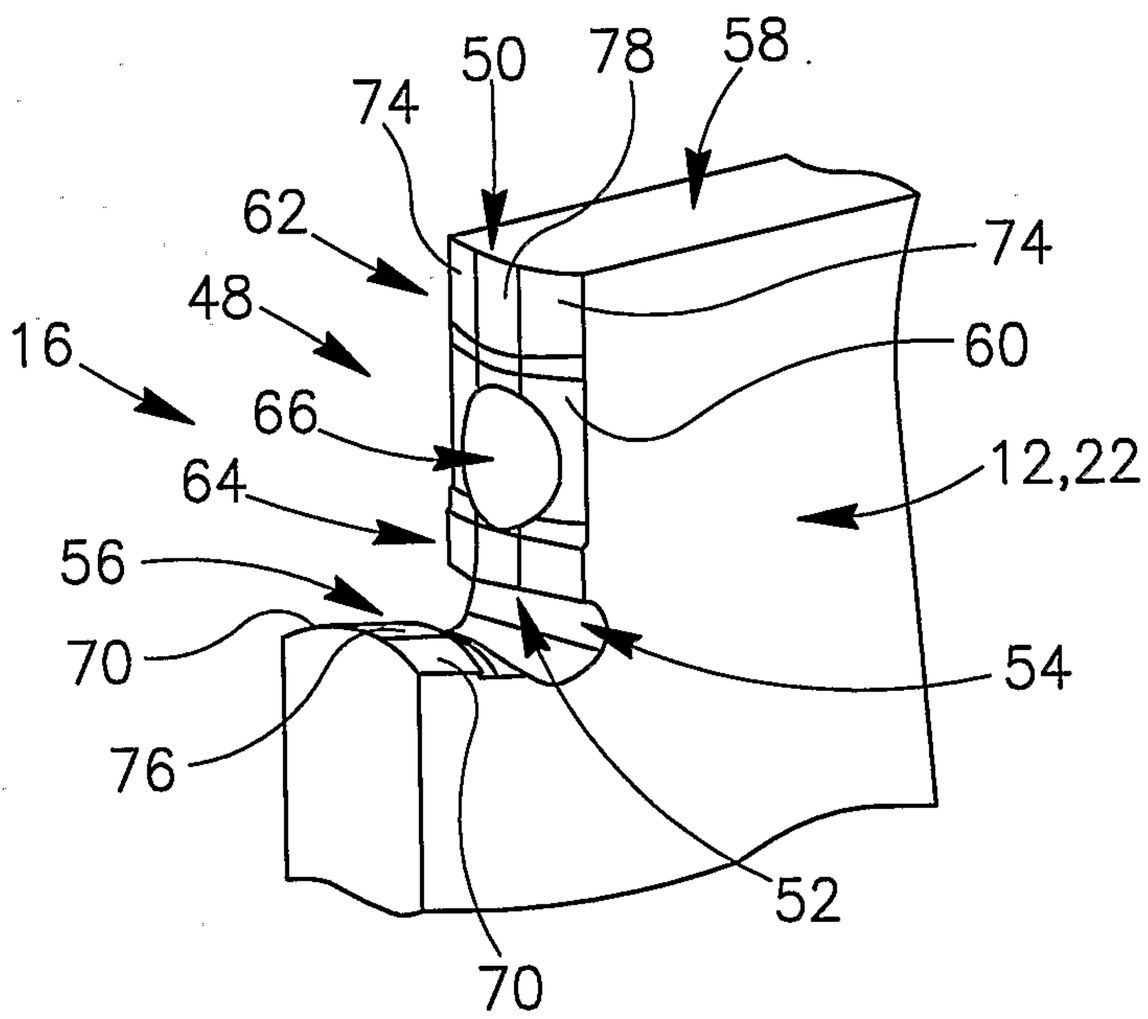


FIG.4

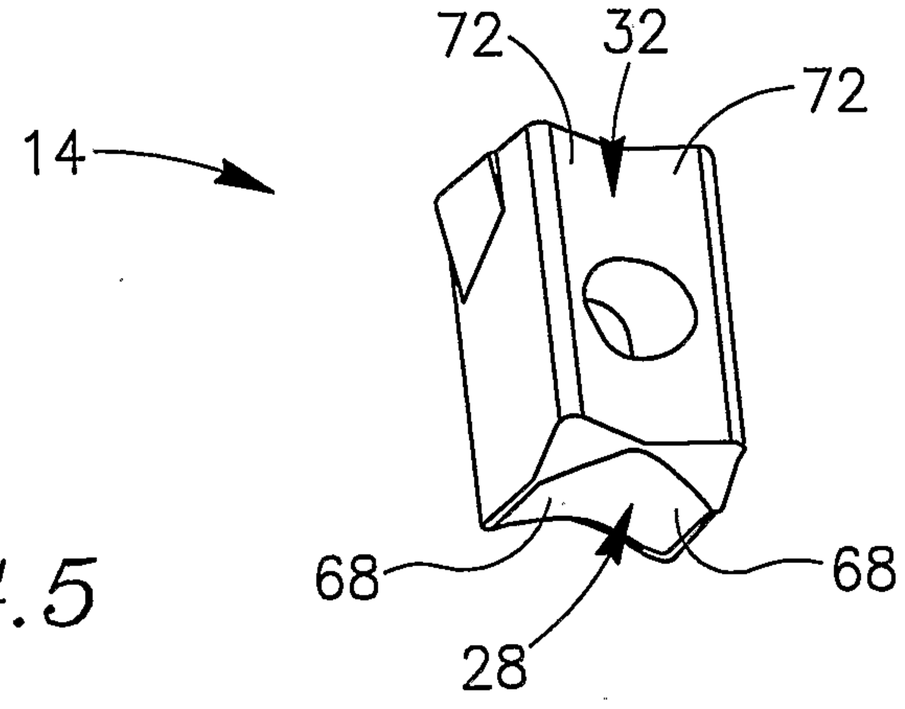


FIG.5

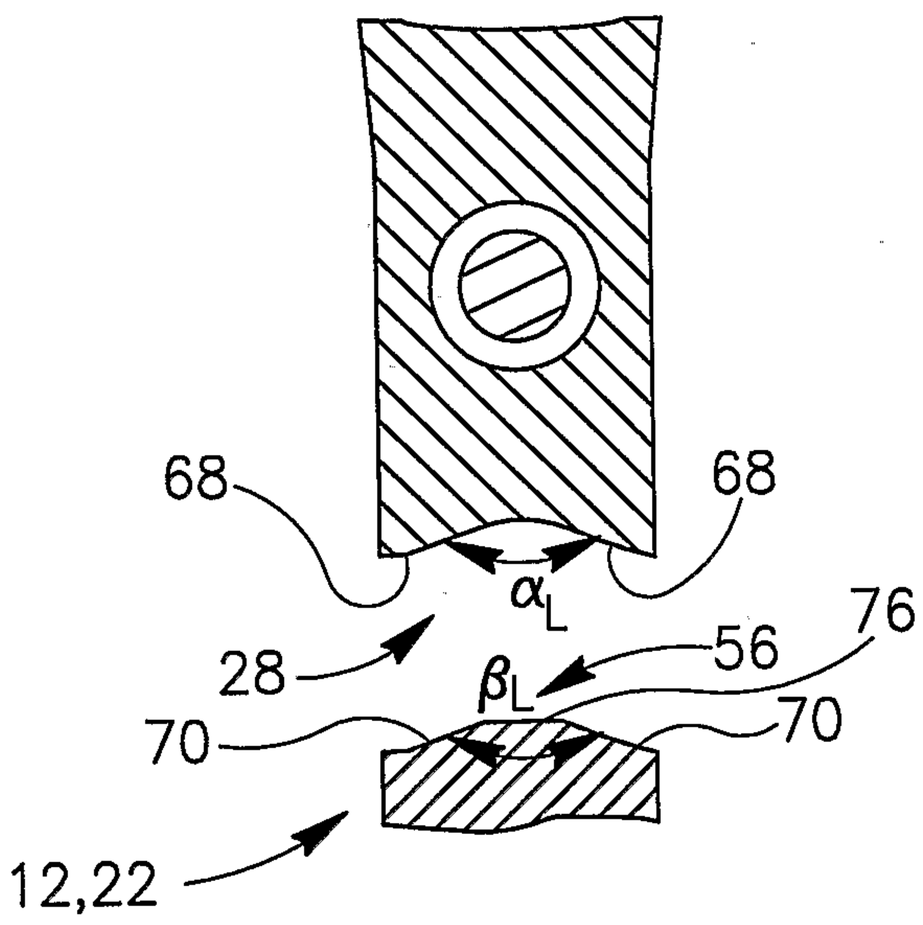


FIG. 6A

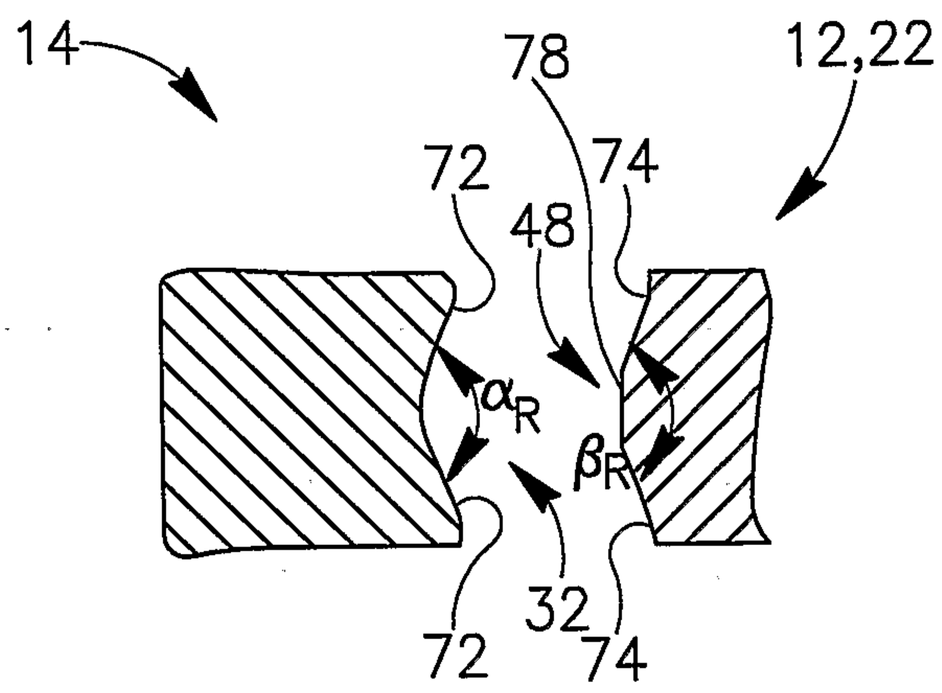


FIG. 7A

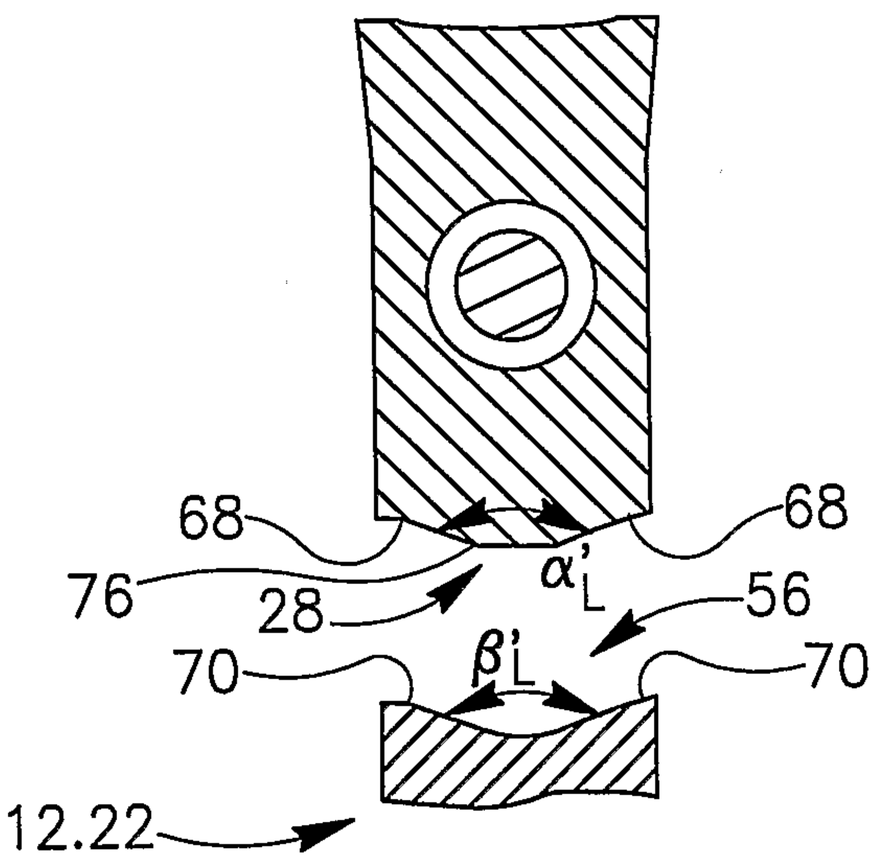


FIG. 6B

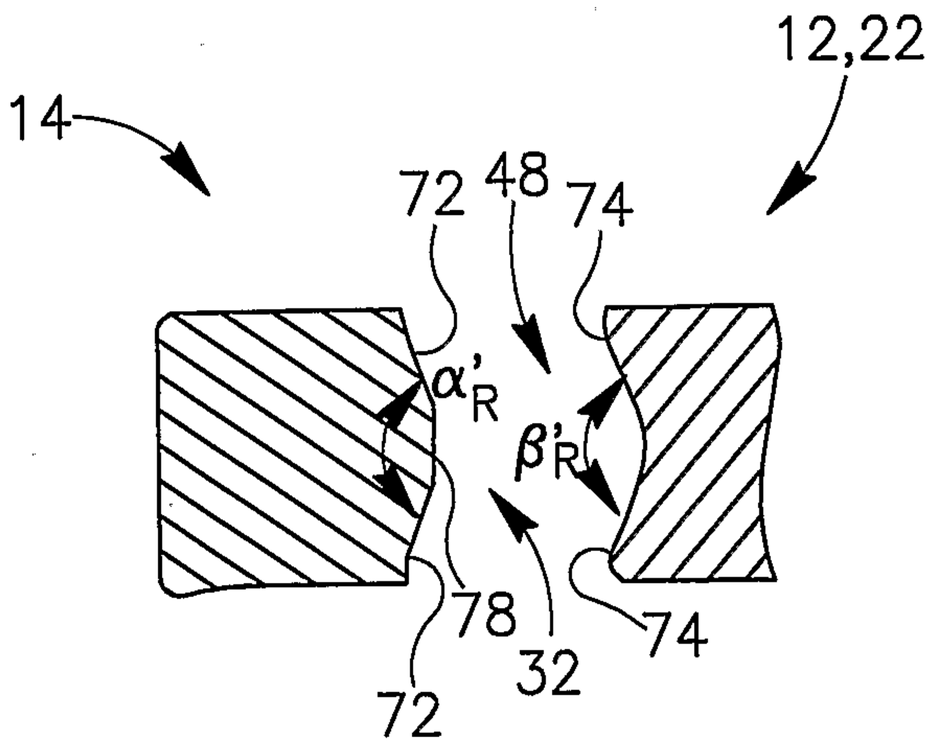
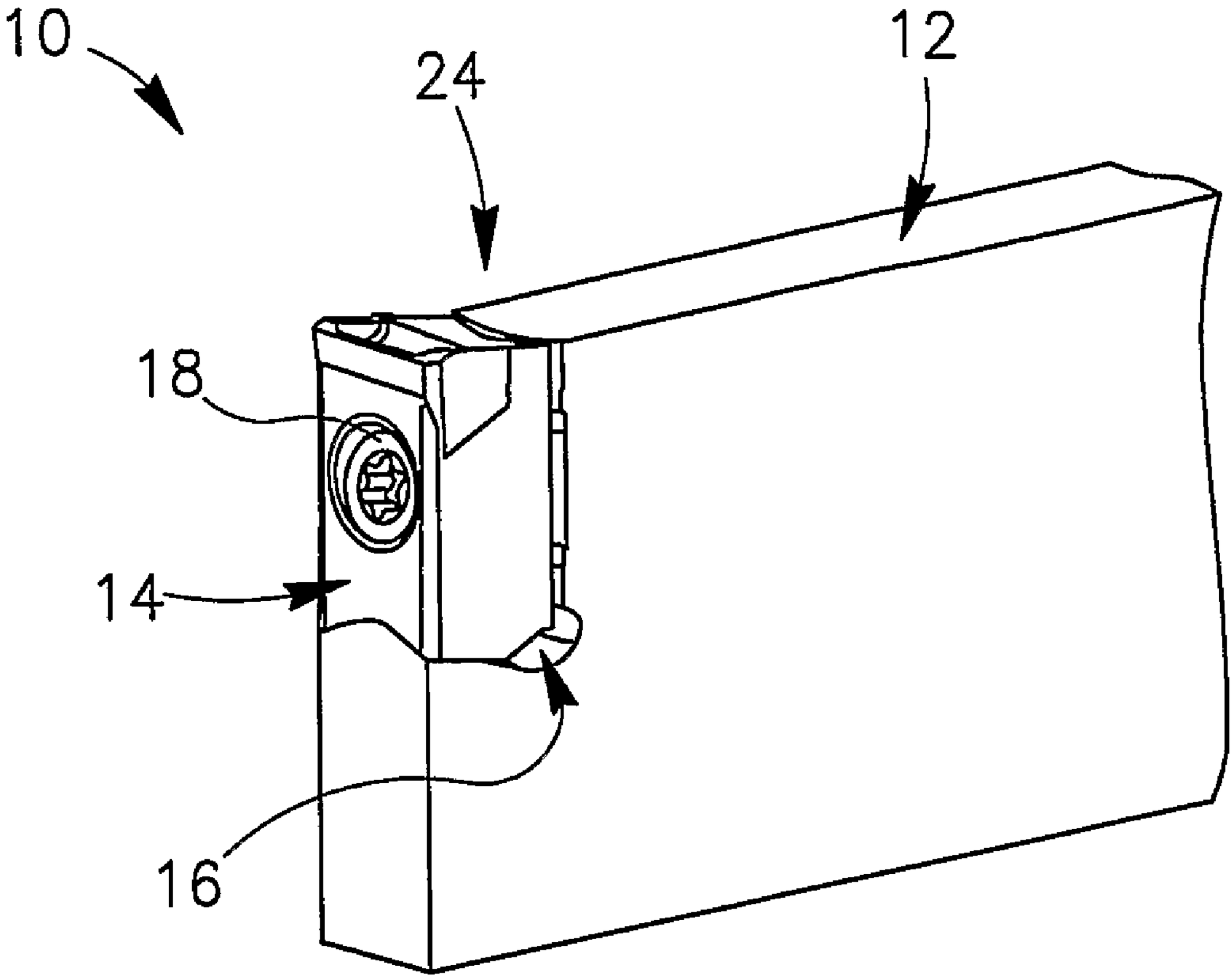


FIG. 7B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