

(86) **Date de dépôt PCT/PCT Filing Date:** 2012/12/13  
(87) **Date publication PCT/PCT Publication Date:** 2013/07/18  
(45) **Date de délivrance/Issue Date:** 2018/05/15  
(85) **Entrée phase nationale/National Entry:** 2014/07/09  
(86) **N° demande PCT/PCT Application No.:** IL 2012/050524  
(87) **N° publication PCT/PCT Publication No.:** 2013/105081  
(30) **Priorité/Priority:** 2012/01/09 (US61/584,428)

(51) **Cl.Int./Int.Cl. *B23C 5/10*** (2006.01),  
***B23C 5/20*** (2006.01)

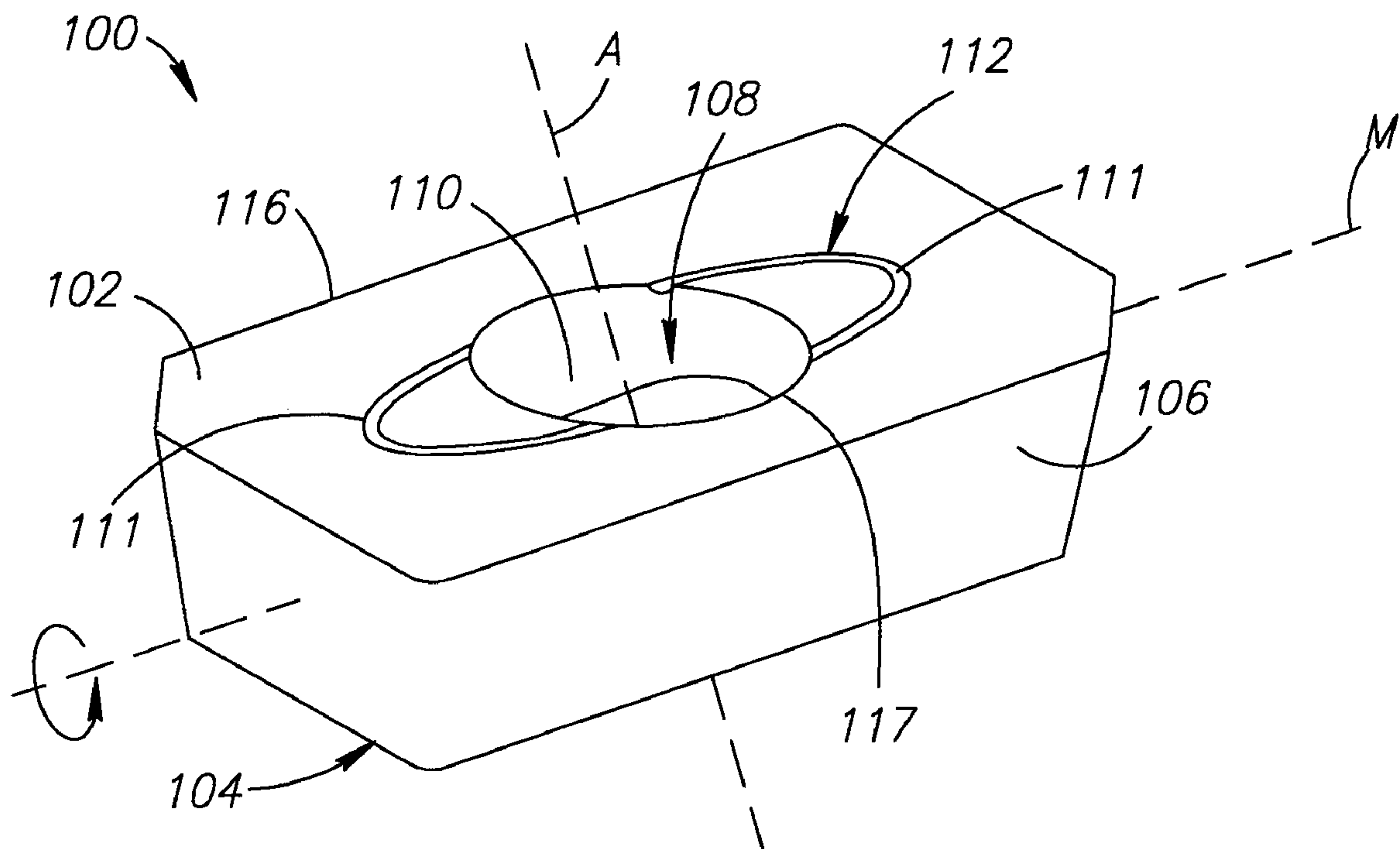
(72) **Inventeur/Inventor:**  
HECHT, GIL, IL

(73) **Propriétaire/Owner:**  
ISCAR LTD., IL

(74) **Agent:** WILSON LUE LLP

(54) **Titre : PLAQUETTE DE COUPE PRESENTANT DES REPERES D'ORIENTATION DE TROU ET PROCEDE DE FABRICATION DE CETTE PLAQUETTE**

(54) **Title: CUTTING INSERT HAVING HOLE ORIENTATION INDICIA AND METHOD FOR MAKING THEREOF**



**(57) Abrégé/Abstract:**

A cutting insert includes a first surface, a second surface and a peripheral surface extending therebetween, and an insert hole extending between the first and second surfaces and having a hole axis. A cross section of at least a portion of the insert hole taken perpendicular to the hole axis has an oval shape. The cutting insert also includes a mark provided on at least one of the first and second surfaces, indicating the orientation of the cross sectional oval shape of the at least a portion of the insert hole.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property  
Organization  
International Bureau

(10) International Publication Number

**WO 2013/105081 A1**(43) International Publication Date  
18 July 2013 (18.07.2013)

(51) International Patent Classification:

**B23C 5/10** (2006.01) **B23C 5/20** (2006.01)

(21) International Application Number:

PCT/IL2012/050524

(22) International Filing Date:

13 December 2012 (13.12.2012)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

61/584,428 9 January 2012 (09.01.2012) US

(71) Applicant: **ISCAR LTD.** [IL/IL]; P.O. Box 11, 24959 Tefen (IL).(72) Inventor: **HECHT, Gil**; 30/18 Ahad Ha'am Street, 22443 Nahariya (IL).(74) Agent: **ISCAR LTD., PATENT DEPARTMENT**; P.O. Box 11, 24959 Tefen (IL).

AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, 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, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

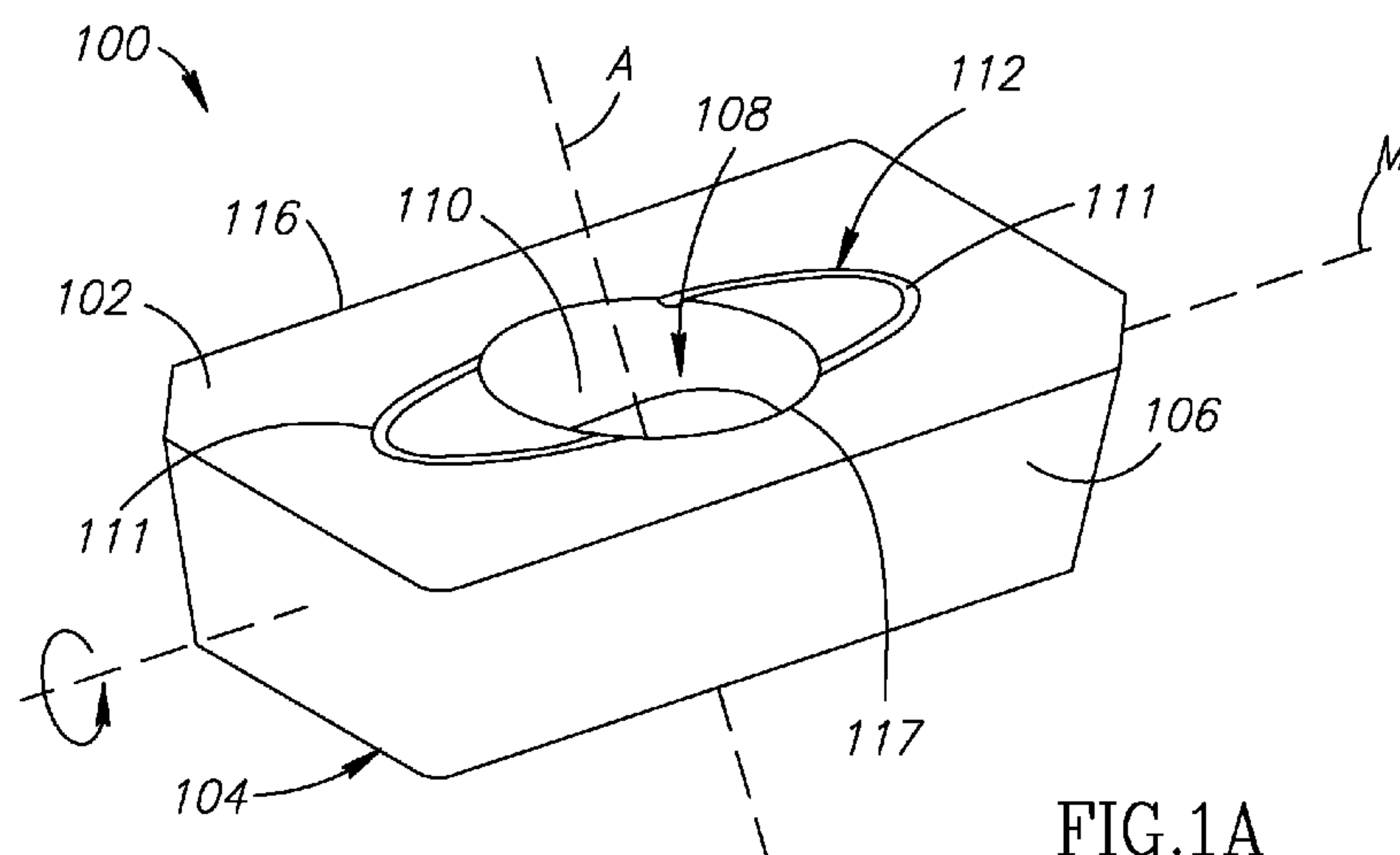
(84) **Designated States** (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

**Published:**

— with international search report (Art. 21(3))

(81) **Designated States** (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM,

(54) Title: CUTTING INSERT HAVING HOLE ORIENTATION INDICIA AND METHOD FOR MAKING THEREOF

**FIG.1A**

(57) **Abstract:** A cutting insert includes a first surface, a second surface and a peripheral surface extending therebetween, and an insert hole extending between the first and second surfaces and having a hole axis. A cross section of at least a portion of the insert hole taken perpendicular to the hole axis has an oval shape. The cutting insert also includes a mark provided on at least one of the first and second surfaces, indicating the orientation of the cross sectional oval shape of the at least a portion of the insert hole.

WO 2013/105081 A1

## CUTTING INSERT HAVING HOLE ORIENTATION INDICIA AND METHOD FOR MAKING THEREOF

### 5 FIELD OF THE INVENTION

The present invention relates to cutting inserts, for use in metal cutting processes, and to a method for making such cutting inserts.

### BACKGROUND OF THE INVENTION

10 Cutting inserts which are removably secured in a cutting body are provided with a suitably hard material, i.e. cemented carbide, in the vicinity of the cutting edge, where the cutting body, manufactured from a less hard material, is reusable following the disposal of a worn or damaged cutting insert. Cutting inserts are clamped within an insert receiving pockets located on the periphery of the tool body, for holding and supporting the cutting inserts during operation against a  
15 workpiece. Cutting inserts are known in the art, having indicia or marking thereon, to indicate to an operator a direction of indexing of the cutting insert.

US Patent Number 7,008,146 issued to DeRoche, et al., and entitled "*Milling Cutter with Tangentially Mounted Inserts*", is directed to an indexable cutting insert for a milling cutter tool, including a first and a second face surfaces, first and second long edge surfaces, and first and second  
20 radiused shorter edge surfaces. Each long edge surface defines a primary cutting edge that extends from a substantially flat central plateau, through a first facet face, through a second facet face adjacent the first facet face, through a third facet face adjacent the second facet face to one of the first and second radiused shorter edge surfaces. The second facet face is disposed between the first facet and the third facet face. The cutting insert includes a locating dimple for assisting in the  
25 positioning of the cutting insert in the cutting tool.

US Patent Number 6,190,096 issued to Arthur, and entitled "*Indexable Cutting Insert with Indexing Marks*", is directed to an indexable cutting insert which presents a rake face and a flank face. The rake face and the flank face intersect to form a generally circular cutting edge. At least one of the flank face and the rake face has a visually perceivable indicia thereon, to indicate a  
30 plurality of discrete indexable positions of the circular cutting insert.

US Patent Number 6,123,488 issued to Kasperik et al., and entitled "*Cutting Insert with*

*Universal Identification*", is directed to a cutting insert with marks of triangular shapes imprinted on the top surface thereof. The number of triangular shapes in each mark is representative of the cutting range for which the cutting insert will function best. The mark enables the machine operator to determine if the cutting insert is suited in one extreme for roughing applications and  
5 in another extreme for fine finishing applications with intermediate uses therebetween. The mark includes geometries which are not alpha-numeric characters and preferably a single geometry is presented in different quantities to indicate uses from roughing to finishing applications. The marks are positioned approximately perpendicular to their associated cutting edges to indicate the type of usage recommended for that cutting edge. When a mark is  
10 associated with each cutting edge, such marks may be symmetrically spaced adjacent the respective cutting edge. When there is only a single mark, such a mark may be placed anywhere in the non-active region of the cutting insert.

US Patent Application Publication Number 2010/0272522 to Hecht, and entitled "*Cutting Insert and Cutting Insert Assembly*", is directed to a cutting insert assembly having an insert  
15 pocket with a pocket bore, a cutting insert and a fastening member coupling the cutting insert in the insert pocket. The cutting insert has a cutting insert bore, a first surface, a second surface and a peripheral surface extending therebetween. The first and second surfaces meet the peripheral surface at first and second peripheral edges, respectively, at least a portion of at least one of the first and second peripheral edges form a cutting edge. The cutting insert bore has at least two  
20 portions, the smallest of which having an oval cross section allowing a for quick replacing or indexing of the cutting insert, without having to completely remove the fastening member from the pocket bore.

When an operator approaches the cutting insert in order to remove it from the insert receiving pocket, there may be a difficulty in determining the orientation of the oval shape of the  
25 cutting insert bore portion, which would indicate the direction of rotation of the cutting insert required for releasing the insert from the fastening member. This difficulty may arise due to the small size of the cutting insert and the cutting insert bore, due to poor lighting conditions of the insert bore while the fastening member is still present therein, and the like.

It is an object of the present invention to provide an improved cutting insert, and a method for  
30 making thereof, the cutting insert having an indicia or a mark thereon, indicating an orientation of an non-circular cross-section of the insert hole thereof.

## SUMMARY OF THE INVENTION

In accordance with the present invention, there is provided a cutting insert comprising a first surface, a second surface and a peripheral surface extending therebetween. The cutting insert  
5 further comprises an insert hole extending between the first and second surfaces and having a hole axis. A cross section of at least a portion of the insert hole taken perpendicular to the hole axis has an oval shape. The cutting insert also includes a mark provided on at least one of the first and second surfaces, indicating the orientation of the cross sectional oval shape of the at least a portion of the insert hole.

10 In accordance with another embodiment of the present invention, there is provided a method for making a cutting insert, having a first surface, a second surface and a peripheral surface extending therebetween, and an insert hole extending between the first and second surfaces and having a hole axis. The insert hole has at least a portion with an oval shape cross section, taken perpendicular to the hole axis. The method comprises the procedure of marking at least one of the  
15 first and second surfaces of the cutting insert, with a mark for indicating the orientation of the cross sectional oval shape of the at least a portion of the insert hole.

In accordance with a further embodiment of the present invention, there is provided a cutting insert comprising a first surface, a second surface and a peripheral surface extending therebetween. The cutting insert also comprises an insert hole extending between the first and second surfaces and  
20 having a hole axis. A cross section of at least a portion of the insert hole taken perpendicular to the hole axis has an associated minimum bounding rectangle. The minimum bounding rectangle is defined by a first, maximal dimension of the insert hole cross section and a second, transverse dimension of the insert hole cross section, the transverse dimension being perpendicular to the maximal dimension. A mark is provided on at least one of the first and second surfaces, indicating  
25 the orientation of the minimum bounding rectangle.

## BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding, the invention will now be described, by way of example only, with reference to the accompanying drawings in which chain-dash lines represent cut-off boundaries for  
30 partial views of a member and in which:

**Fig. 1A** is a perspective view of a rectangular indexable cutting insert according to an

embodiment of the disclosed technique;

**Fig. 1B** is a top view of the indexable cutting insert of Fig. 1A;

**Fig. 2A** is a perspective view of a rhombus indexable cutting insert according to another embodiment of the disclosed technique;

5 **Fig. 2B** is a top view of the indexable cutting insert of Fig. 2A;

**Fig. 3A** is a perspective view of a parallelogram indexable cutting insert according to a further embodiment of the disclosed technique;

**Fig. 3B** is a top view of the indexable cutting insert of Fig. 3A;

10 **Fig. 4A** is a perspective view of a parallelogram indexable cutting insert according to another embodiment of the disclosed technique;

**Fig. 4B** is a top view of the indexable cutting insert of Fig. 4A;

**Fig. 5A** is a perspective view of a parallelogram indexable cutting insert according to a further embodiment the disclosed technique;

**Fig. 5B** is a top view of the indexable cutting insert of Fig. 5A;

15 **Fig. 6A** is a perspective view of a rectangular indexable cutting insert according to a further embodiment of the disclosed technique;

**Fig. 6B** is a top view of the indexable cutting insert of Fig. 6A, and

**Fig. 7** is a top view of an indexable cutting insert according to another embodiment of the disclosed technique.

20

## DETAILED DESCRIPTION OF THE INVENTION

The present invention relates to a cutting insert having hole orientation indicia and a method for making thereof, the cutting insert having a mark thereon, indicating an orientation of an cross-sectional oval shape of an insert hole of the cutting insert.

25 Reference is made to Figures 1A-5A and 1B-5B, depicting indexable cutting inserts **100** in accordance with embodiments of the present invention. With particular reference to Figures 1A and 1B, the cutting insert **100** includes a first surface **102**, a second surface **104**, a peripheral surface **106**, an insert hole **108**, and a mark **112**. Cutting insert **100** has an indexing axis **A**, passing through insert hole **108**, and perpendicular to first surface **102** and second surface **104**.  
30 The intersection of peripheral surface **106** with first surface **102** defines a cutting edge **116**.

Cutting insert **100** is rotated about indexing axis **A**, in order to present a new unused

cutting edge portion (not shown) to be employed against a workpiece in cutting actions. Indexing axis **A** may also be referred to as a hole axis **A**, since it presents a rotational symmetry of insert hole **108**. Insert hole **108** passes through insert **100**, and opens out to first surface **102** at an opening contour **117**, and to second surface **104**. Opening contour **117** is a circular contour  
5 having a contour diameter **L**. Insert hole **108** includes a hole portion **110** having an cross sectional oval shape **118**, when taken perpendicular to hole axis **A**, for example as viewed in Figure 1B. Oval shape **118** has a primary dimension **P1** and a secondary dimension **P2**, perpendicular to the primary dimension **P1**. Primary dimension **P1** is typically larger than secondary dimension **P2**, due to the elongated layout of oval shape **118**. Cutting insert **100**  
10 further has a screw-releasing axis **M**, passing through the center of cutting insert **100**, and parallel to primary dimension **P1**, to first surface **102** and to second surface **104**.

It should be noted, that the oval shape cross section of hole portion **110** allows for extraction of cutting insert **100** over a clamping screw head (not shown), without entirely removing the clamping screw out of a threaded bore of a insert receiving pocket (both not  
15 shown). In order to remove cutting insert **100** from the clamping screw, the screw is released to a predetermined amount, however still remaining partially threaded into the threaded bore of the insert receiving pocket, and cutting insert **100** is rotated about screw-releasing axis **M**. This allows for insert hole **108** to be passed over the clamping screw head, thereby releasing cutting insert **100** from the clamping screw, which is still partially threaded into the insert receiving  
20 pocket. Since screw-releasing axis **M** is parallel to primary dimension **P1**, the direction of turning required in order to release cutting insert **100** is indicated by orientation of primary dimension **P1**.

Mark **112** is located on first surface **102**, conforming to an oval shape imaginary line **114**, having a major dimension **D1** and a minor dimension **D2**, perpendicular to the major dimension  
25 **D1**. Major dimension **D1** is typically larger than minor dimension **D2**, due to the elongated dimension of oval shape imaginary line **114**. The orientation of major dimension **D1** is substantially similar to the orientation of primary dimension **P1** of oval shape **118**, when viewed perpendicular to hole axis **A**. Major dimension **D1** is larger than primary dimension **P1**. Mark **112** clearly indicates the orientation of major dimension **D1** to an operator of cutting insert **100**.  
30 Thus, the orientations of primary direction **P1**, and of oval shape **118**, are also clearly indicated to the operator. When required, the operator may release the clamping screw to the required

predetermined amount, and then rotate cutting insert **100** around the orientation of major dimension **D1**, which is parallel to screw-releasing axis **M**, until cutting insert is released out of the insert receiving pocket.

In cutting insert **100**, mark **112** includes two visible curved lines **111**, conforming to parts  
5 of oval shape imaginary line **114**. Minor dimension **D2** is typically smaller than contour diameter **L**. Thus, a section of oval shape imaginary line **114** lies within opening contour **117** of hole **108**, and may not be marked. In this manner, only curved lines **111** can be marked on first surface **102**, and be clearly visible to the operator.

Thus, when viewed along the hole axis **A**, the non-circular insert hole **108** may be  
10 considered to have an associated minimum bounding rectangle **113** (shown in Figure 5B), defined by a first, maximal dimension (e.g., primary dimension **P1**) of the insert hole and a second, transverse dimension (e.g., secondary dimension **P2**), which is perpendicular to the first, maximal dimension, with mark **112** on surfaces **102** and/or **104** indicating the orientation of minimum bounding rectangle **113**.

Now referring to Figures 6A and 6B, according to an alternative embodiment of the  
15 disclosed technique, in cutting insert **100**, minor dimension **D2** of oval shape imaginary line **114** is greater than the contour diameter **L** (i.e., **D2>L**). In this case, it is possible to create a mark **162** along the entirety of oval shape imaginary line **114**, surrounding the opening contour **117**.

Reference is made to Figure 7, depicting a further alternative embodiment of the disclosed  
20 invention. According to this embodiment, cutting insert **100** includes a mark **172** on the first surface thereof. Mark **172** includes two double-sided arrows **174**, located on opposite sides of hole **108**, and parallel to secondary dimension **P2** of cross sectional oval shape **118**. Double-arrows **174** indicate to the operator the orientation of cross sectional oval shape **118**, thereby indicating the direction in which the operator must rotate cutting insert **100** in order to  
25 release cutting insert **100** off of the clamping screw head, as elaborated herein above.

It is noted, that if the cutting insert according to the present invention is a reversible cutting insert, the cutting insert may include another mark, similar to marks **112**, **162** or **172**, on the second surface thereof (e.g., second surface **104**), to indicate the orientation of the oval shape cross section of the hole portion, when viewed from the second surface.

30 The cutting inserts according to the disclosed technique are employed in metal cutting actions, and are preferably constructed of a hard metal, e.g., cemented carbide, a hard material which is not

easily processed. Thus, the marks (e.g., marks **112**, **162**, **172**) on the surfaces of the cutting inserts may be provided by any known marking method, which can mark hard metal. Examples for such marking methods are laser marking or engraving. Marking may even be accomplished during the insert production process by incorporating the mark into a die used to form the cutting insert  
5 through, e.g., pressing or injection molding. In such case, the mark may constitute a raised contour on the surface of the finished insert.

## CLAIMS

1. A cutting insert comprising:
  - a first surface, a second surface and a peripheral surface extending therebetween;
  - an insert hole extending between the first and second surfaces and having a hole axis (A), a cross section of at least a portion of the insert hole taken perpendicular to the hole axis (A) having an oval shape which has a primary dimension (P1);
  - a screw-releasing axis (M) passing through the center of the cutting insert and being parallel to the primary dimension (P1) of the oval shape, to the first surface and to the second surface; and
  - a mark provided on at least one of the first and second surfaces, indicating the orientation of the primary dimension (P1) of the cross sectional oval shape of the at least a portion of the insert hole.
2. The cutting insert according to claim 1, wherein the mark is in the form of at least one curved line.
3. The cutting insert according to claim 2, wherein the at least one curved line conforms to at least a part of an oval shaped imaginary line.
4. The cutting insert according to claim 3, wherein
  - the insert hole opens out to the first surface in a circular opening contour having a contour diameter (L),
  - the oval shape imaginary line has a major dimension (D1) and a perpendicular minor dimension (D2), the major dimension (D1) being larger than the minor dimension (D2), the orientation of the major dimension (D1) being similar to the orientation of the primary dimension (P1), the minor dimension (D2) being smaller than the contour diameter (L), and
  - the mark includes two curved lines, located on the oval shaped imaginary line, on opposite sides of the insert hole.
5. The cutting insert according to claim 3, wherein the oval shape of the cross section of the at least a portion of the insert hole has a primary dimension (P1),
  - the insert hole opens out to the first surface in a circular opening contour having a contour diameter (L),

the oval shape imaginary line has a major dimension (D1) and a perpendicular minor dimension (D2), the major dimension (D1) being larger than the minor dimension (D2), the orientation of the major dimension (D1) being similar to the orientation of the primary dimension (P1), the minor dimension (D2) being greater than the contour diameter (L), and

the mark is located on the oval shaped imaginary line, surrounding the opening contour.

6. The cutting insert according to claim 1, wherein the oval shape of the cross section of the at least a portion of the insert hole has a secondary dimension (P2) that is perpendicular to the primary dimension (P1), the primary dimension (P1) being larger than the secondary dimension (P2), and

wherein the mark includes at least one arrow, the arrow being substantially parallel to the secondary dimension (P2).

7. A method for making a cutting insert, having a first surface, a second surface and a peripheral surface extending therebetween, an insert hole extending between the first and second surfaces and having a hole axis (A), with a cross section of at least a portion of the insert hole taken perpendicular to the hole axis (A) having an oval shape which has a primary dimension (P1), and a screw-releasing axis (M) passing through the center of the cutting insert and being parallel to the primary dimension (P1) of the oval shape, to the first surface and to the second surface, the method comprising the procedure of:

marking at least one of the first and second surfaces of the cutting insert, with a mark for indicating the orientation of the primary dimension (P1) of the cross sectional oval shape of the at least a portion of the insert hole.

8. The method for making a cutting insert according to claim 7, wherein the procedure of marking is performed by laser marking.

9. The method for making a cutting insert according to claim 7, wherein the procedure of marking is performed by engraving.

10. The method for making a cutting insert according to claim 7, wherein the procedure of marking is performed by incorporating the mark into a die used to form the cutting insert.

11. A cutting insert comprising:

a first surface, a second surface and a peripheral surface extending therebetween;

an insert hole extending between the first and second surfaces and having a hole axis (A), a cross section of at least a portion of the insert hole taken perpendicular to the hole axis (A) having an associated minimum bounding rectangle defined by a first, maximal dimension of the insert hole cross section and a second, transverse dimension of the insert hole cross section, the transverse dimension being perpendicular to the maximal dimension; and

a mark provided on at least one of the first and second surfaces, indicating the orientation of the maximal dimension.

1/3

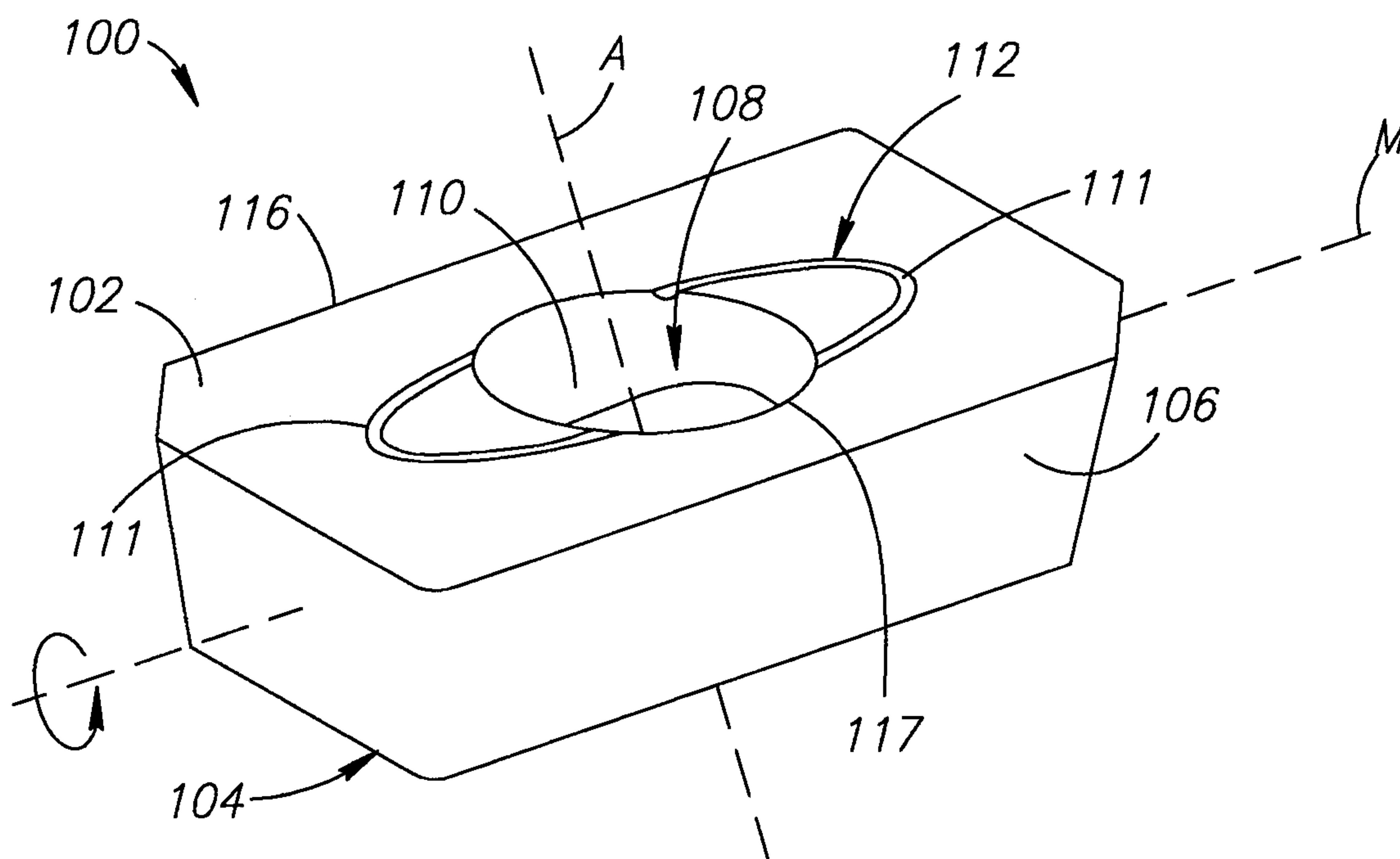


FIG.1A

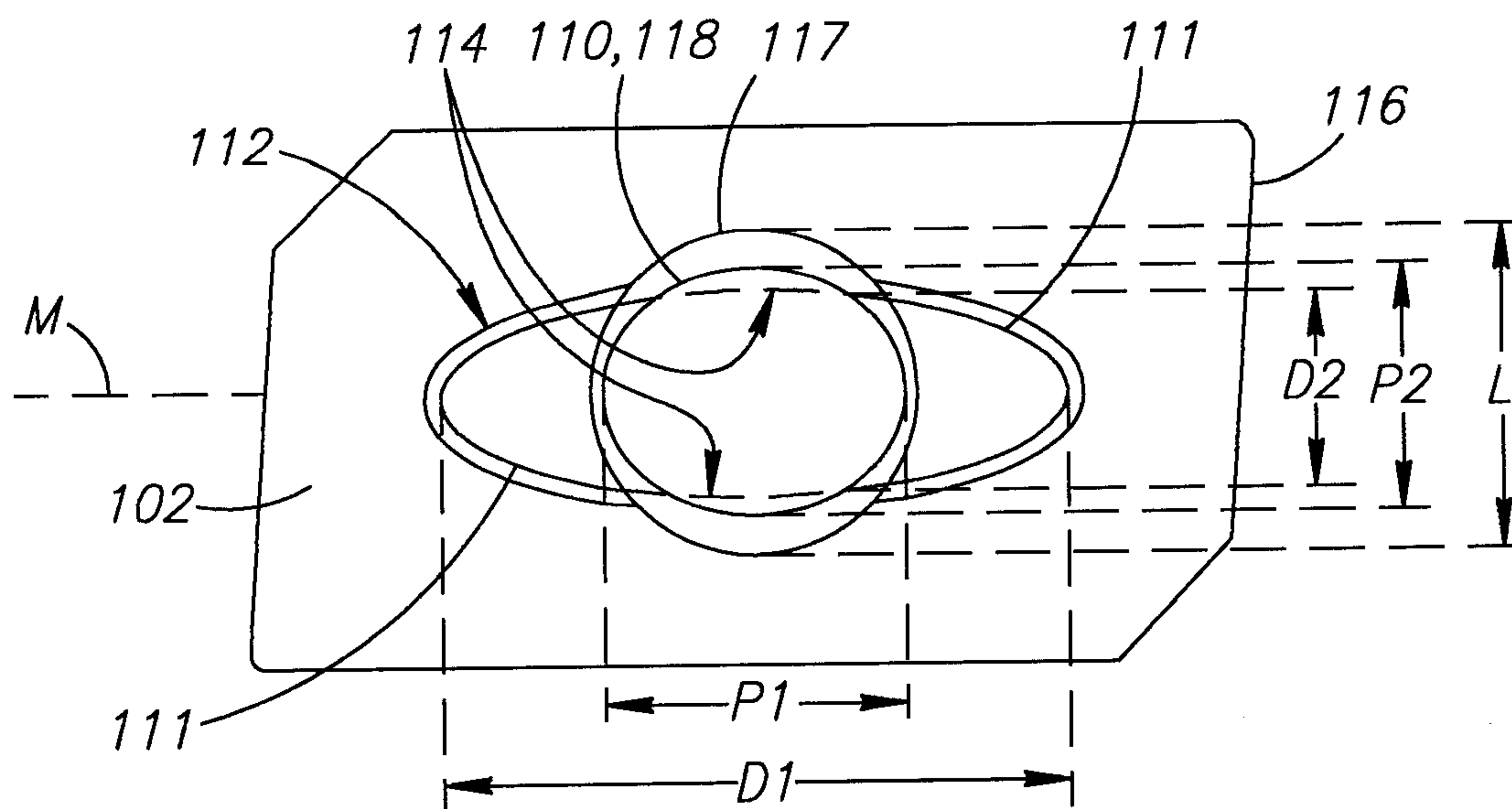


FIG.1B

2/3

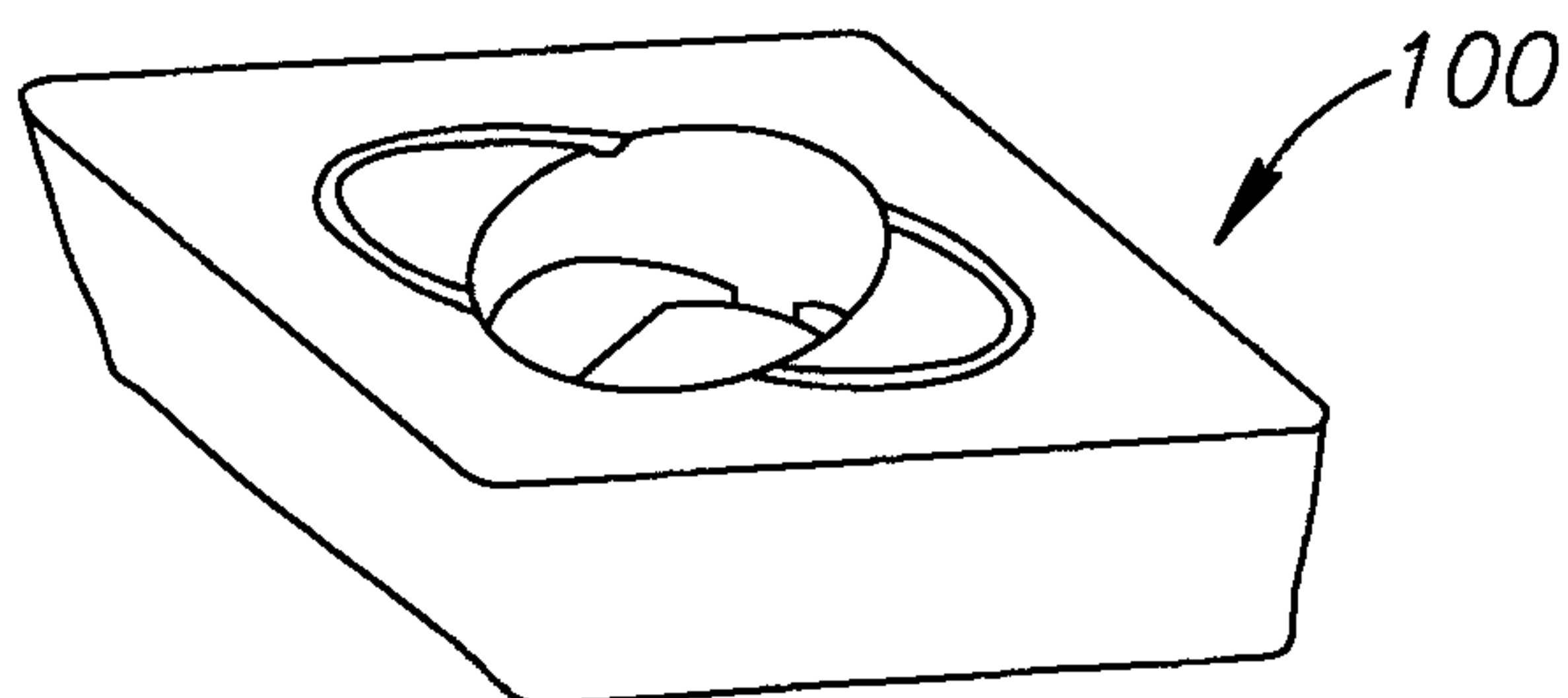


FIG. 2A

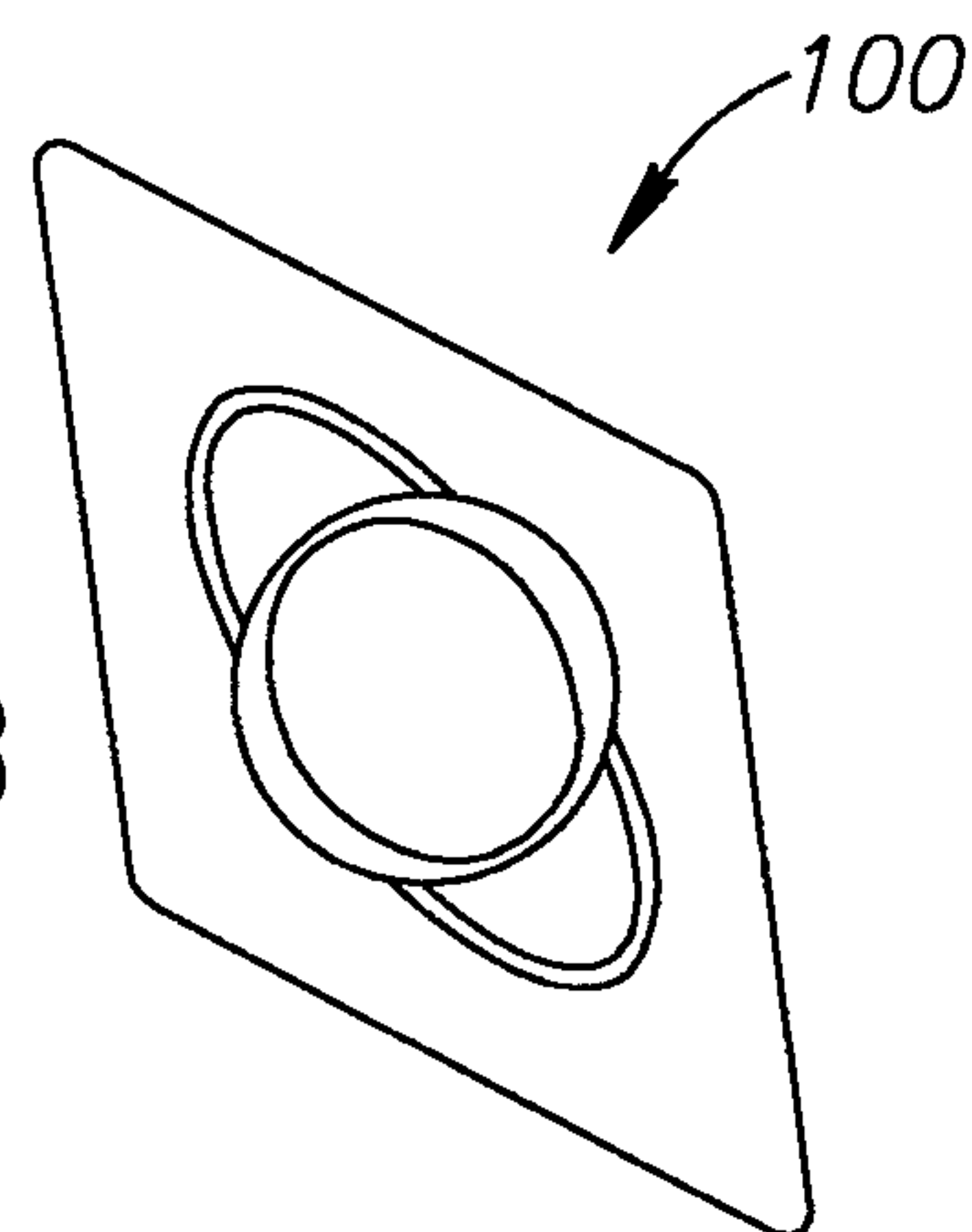


FIG. 2B

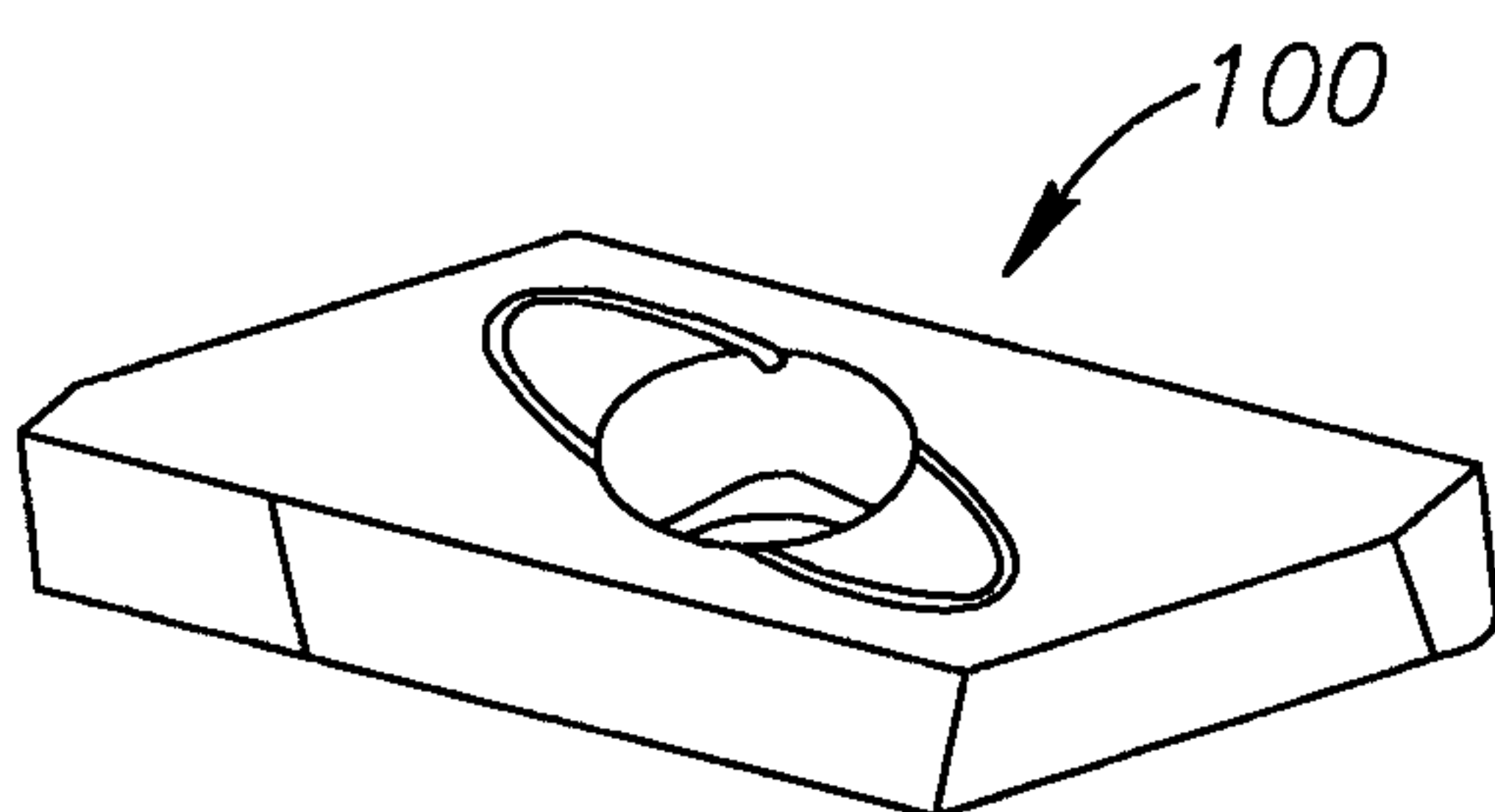


FIG. 3A

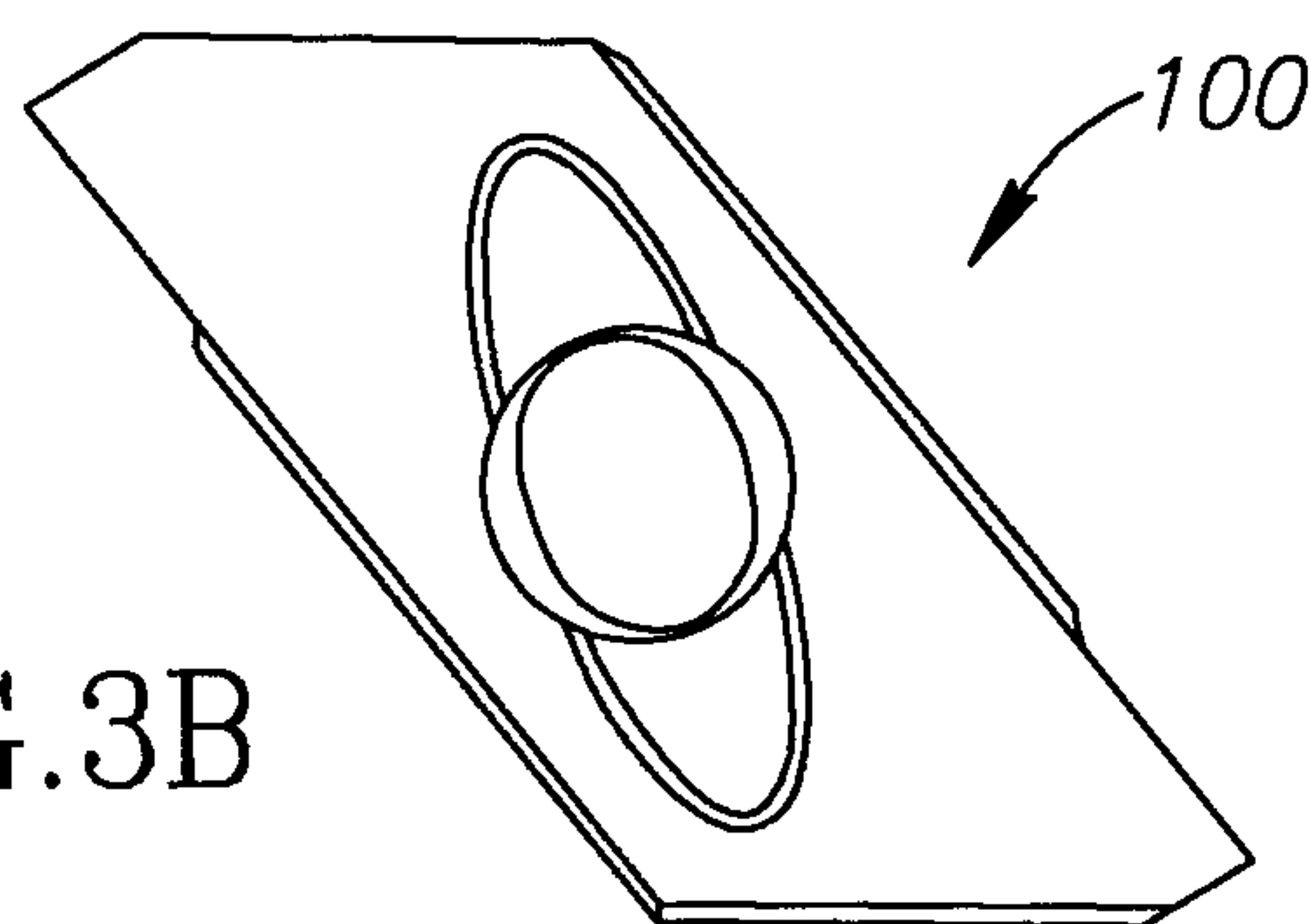


FIG. 3B

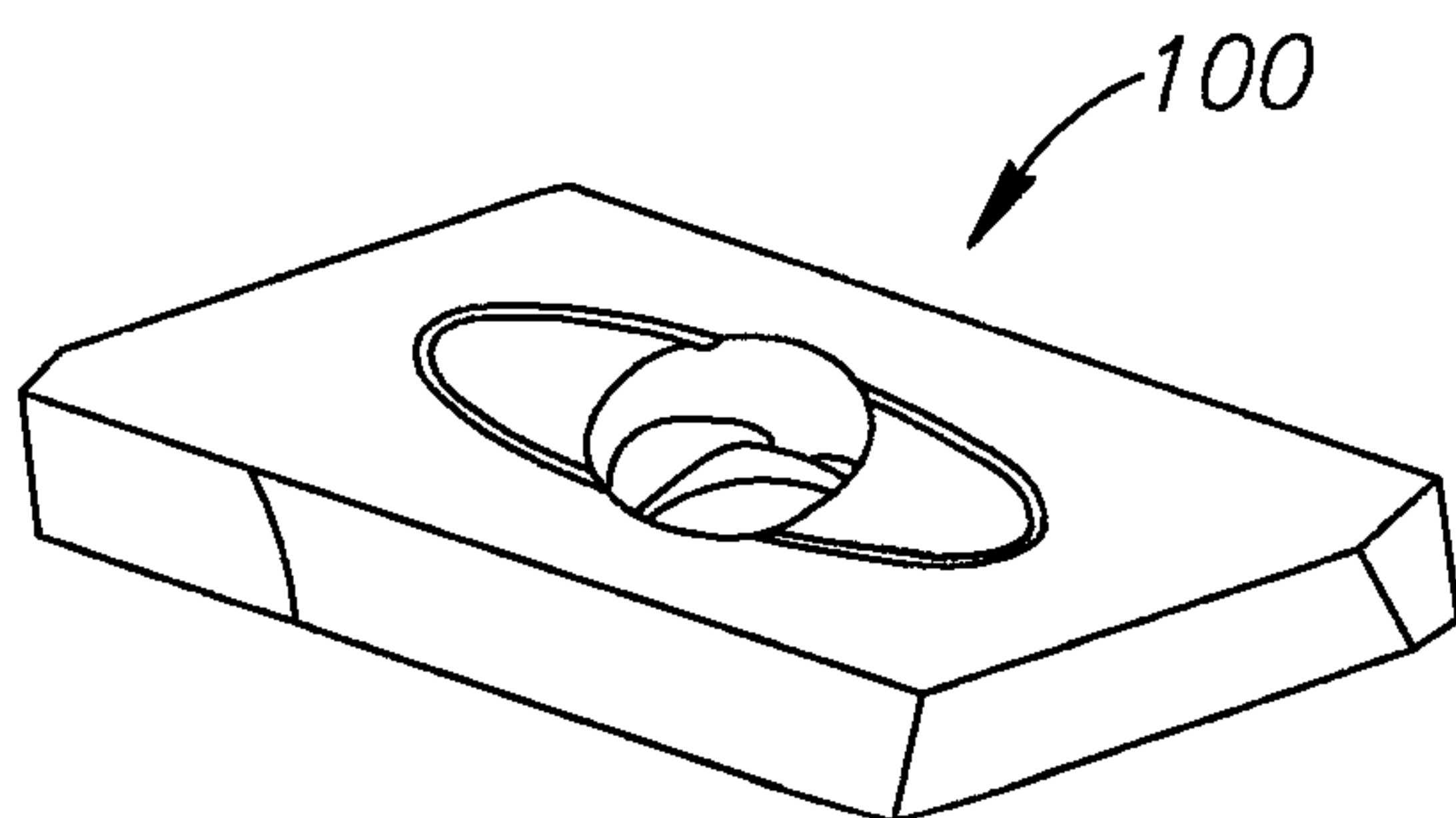


FIG. 4A

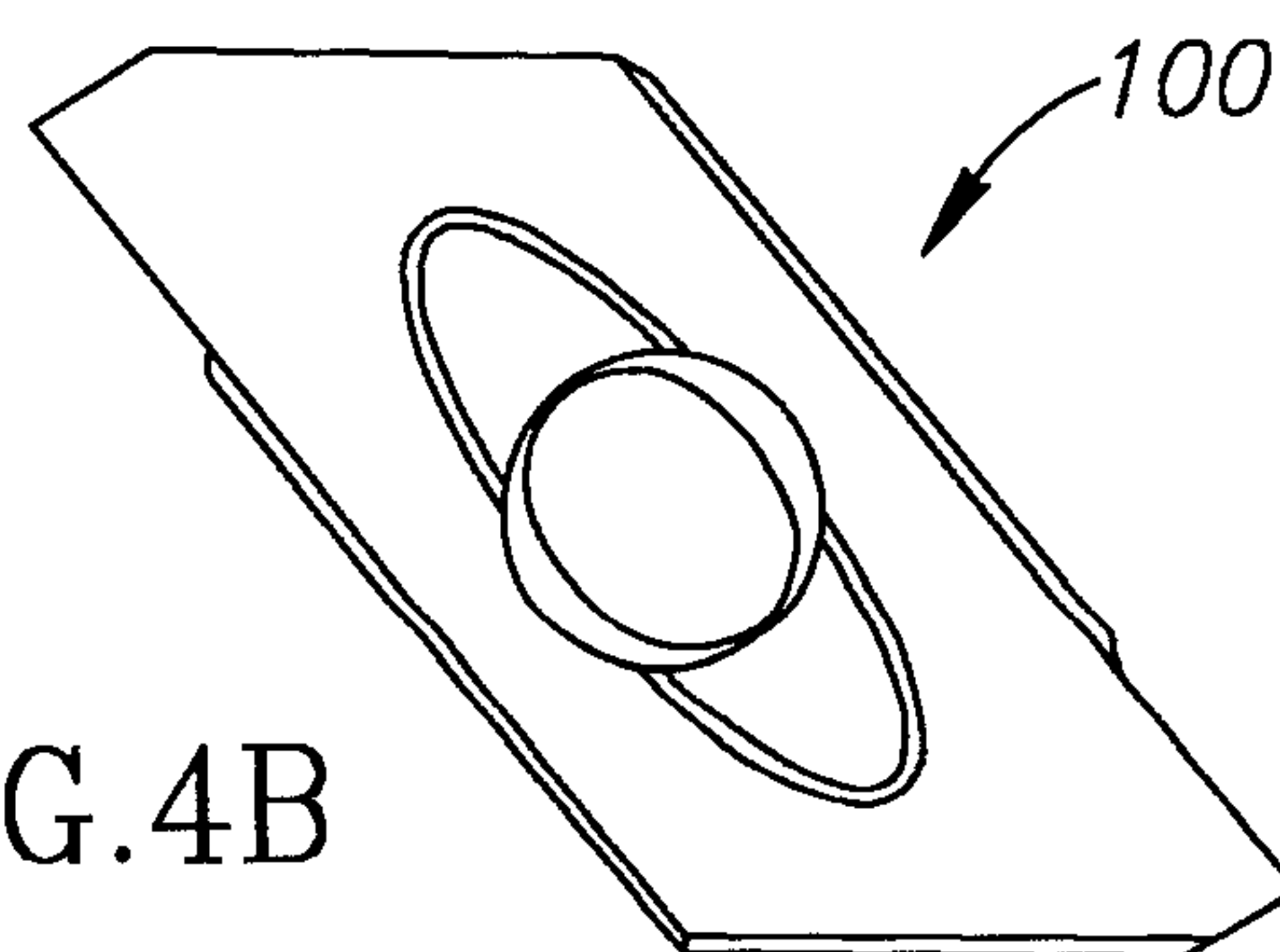


FIG. 4B

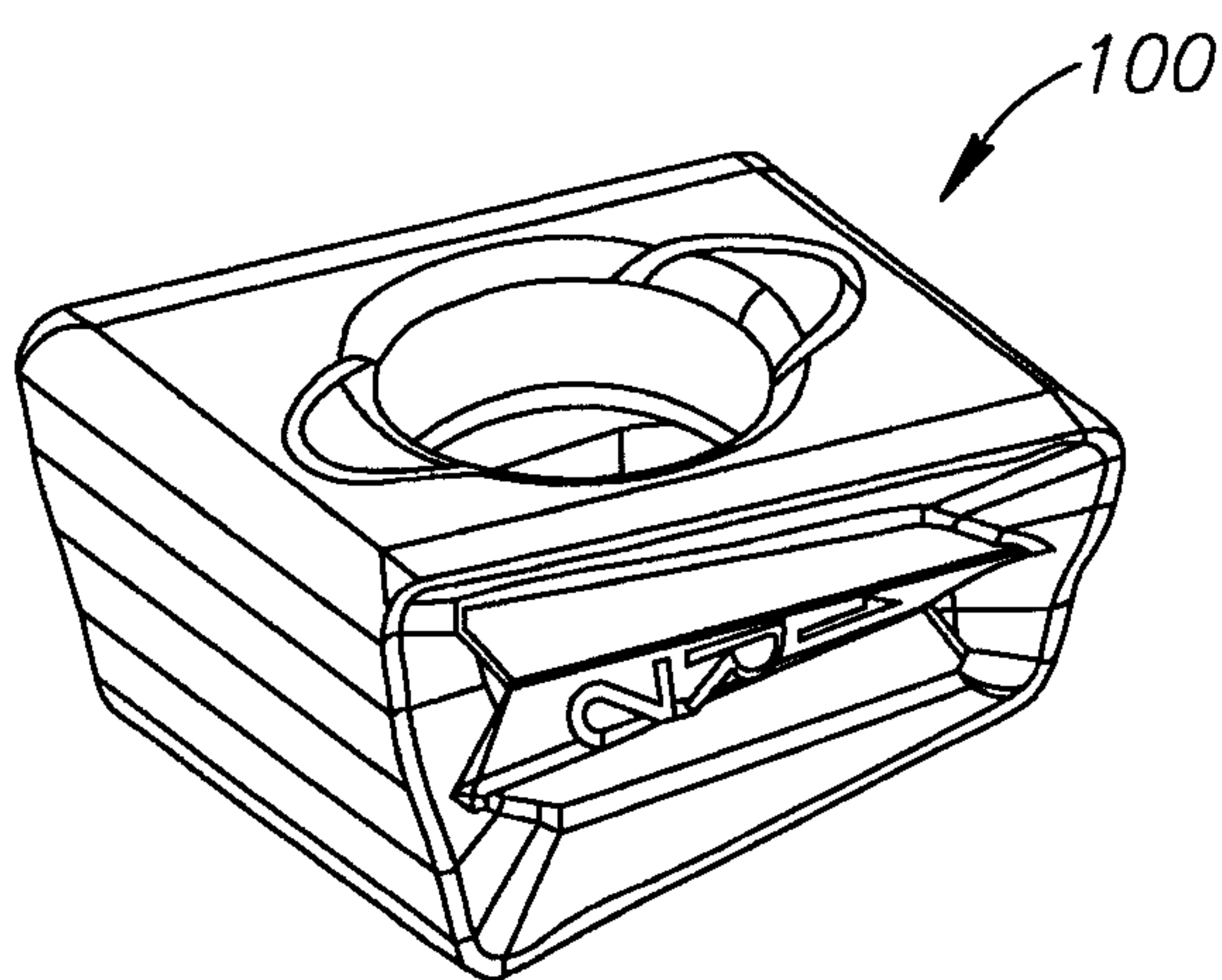


FIG. 5A

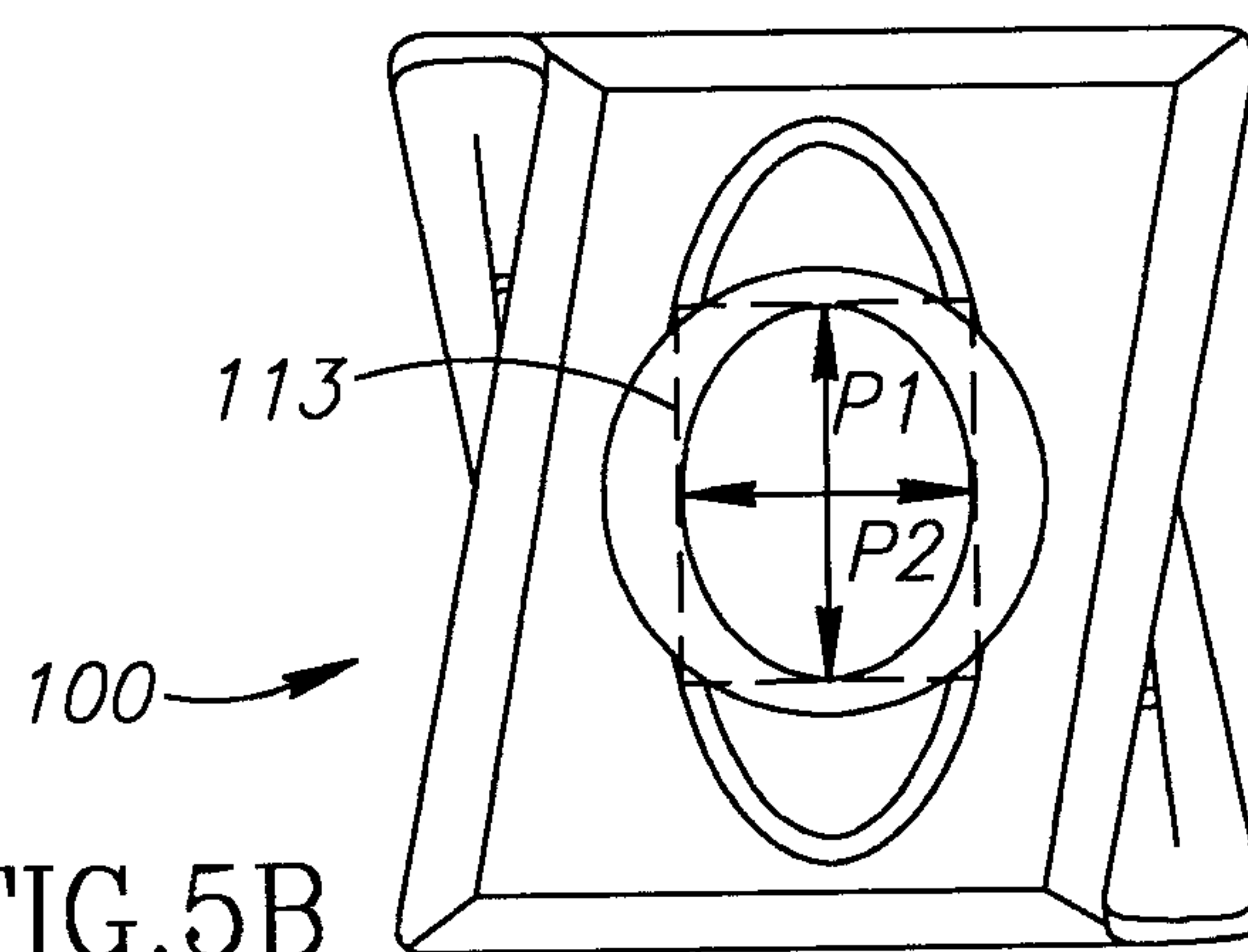


FIG. 5B

3/3

