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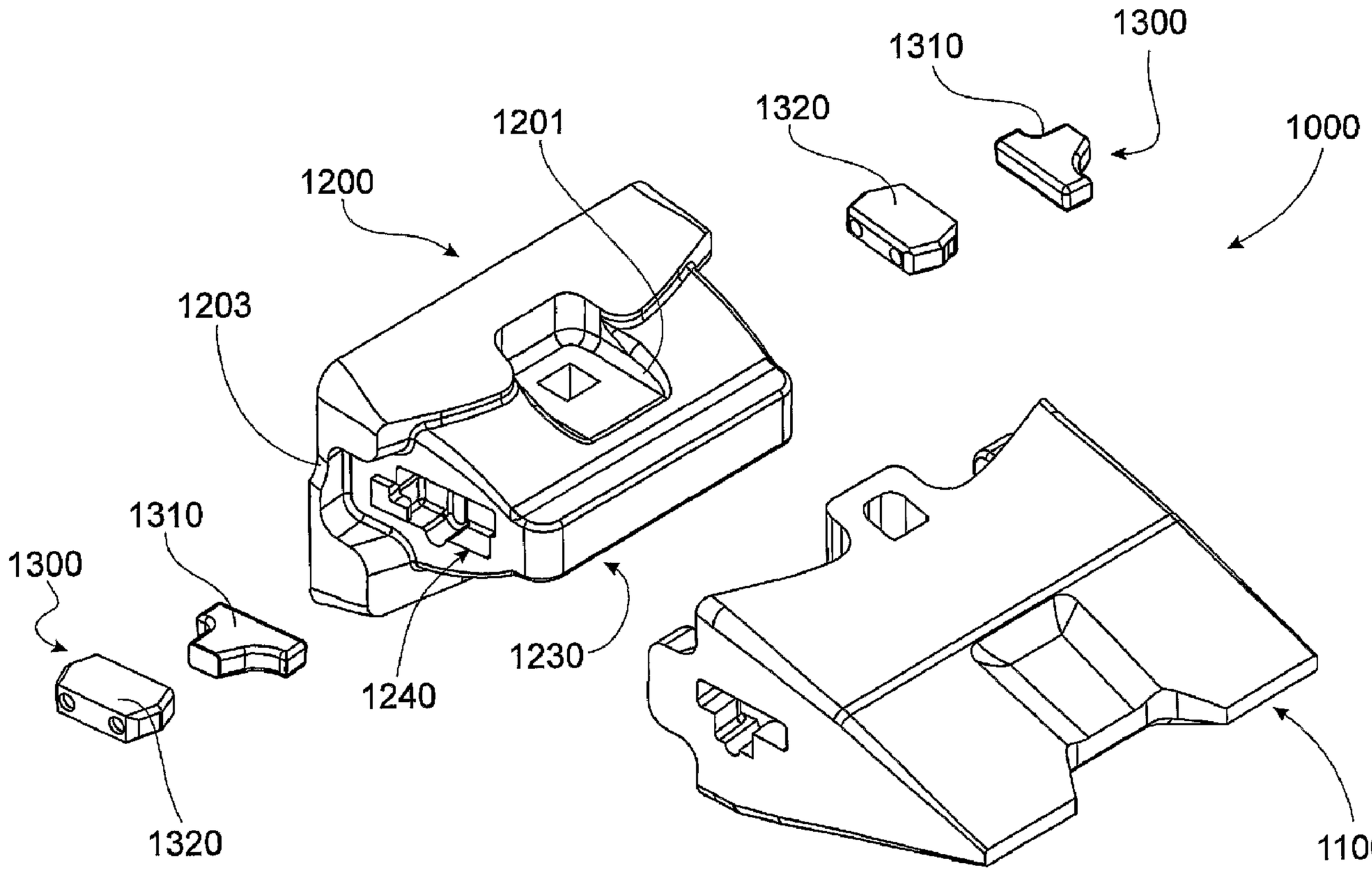
(54) Title: A LOCK ASSEMBLY FOR AN EXCAVATOR WEAR MEMBER



(57) Abrégé/Abstract:
A lock assembly for releasably securing an excavator tooth on a nose of an excavator. The lock assembly has a rigid lock member having a base portion and a retaining portion extending from the base portion. The base portion is adapted to be located in a retaining cavity of the nose and the retaining portion adapted to at least partially extend into a retaining aperture of the wear member. The lock assembly also has a resiliently deformable lock member, in use, adapted to be located within the retaining cavity

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(57) Abrégé(suite)/Abstract(continued):
of the nose to abut an upper face of the rigid lock member to thereby captively retain the base portion of the rigid lock member in the retaining cavity and the retaining portion at least partially within the retaining aperture such that side walls of the retaining portion of the rigid lock member bear against complimentary side walls of the retaining aperture of the wear member and opposed bearing faces of the base portion of the rigid lock member oppose and engage respective side walls of the retaining cavity of the nose of the excavator to thereby releasably secure the wear member on the nose of the excavator.

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(54) **Title**: A LOCK ASSEMBLY FOR AN EXCAVATOR WEAR MEMBER

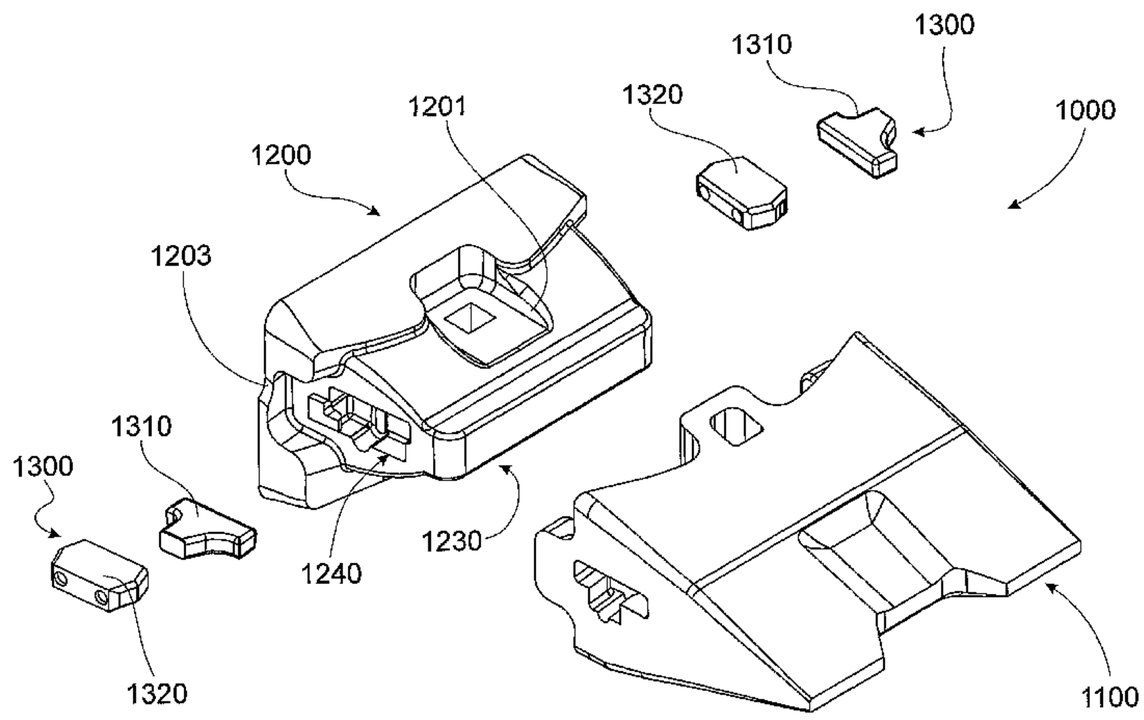


FIG. 1B

(57) **Abstract**: A lock assembly for releasably securing an excavator tooth on a nose of an excavator. The lock assembly has a rigid lock member having a base portion and a retaining portion extending from the base portion. The base portion is adapted to be located in a retaining cavity of the nose and the retaining portion adapted to at least partially extend into a retaining aperture of the wear member. The lock assembly also has a resiliently deformable lock member, in use, adapted to be located within the retaining cavity of the nose to abut an upper face of the rigid lock member to thereby captively retain the base portion of the rigid lock member in the retaining cavity and the retaining portion at least partially within the retaining aperture such that side walls of the retaining portion of the rigid lock member bear against complimentary side walls of the retaining aperture of the wear member and opposed bearing faces of the base portion of the rigid lock member oppose and engage respective side walls of the retaining cavity of the nose of the excavator to thereby releasably secure the wear member on the nose of the excavator.

WO 2009/127016 A1

"A LOCK ASSEMBLY FOR AN EXCAVATOR WEAR MEMBER"

FIELD OF THE INVENTION

The invention relates to a lock assembly for an excavator wear member. In particular, although not exclusively, the invention relates to a lock assembly for releasably securing an excavator tooth to a nose of an excavator.

BACKGROUND TO THE INVENTION

Excavator tooth assemblies mounted to the digging edge of excavator buckets and the like generally comprise a replaceable digging tooth, an adaptor body and an adaptor nose which is secured by welding or the like to the digging edge of a bucket or the like. The tooth generally has a socket-like recess at its rear end to receivably locate a front spigot portion of the adaptor nose and a removable locking pin is generally employed to releasably secure the tooth on the adaptor.

In use, excavator teeth are subjected to extensive load forces along a longitudinal axis of a tooth as well as in vertical and transverse directions. A snug fit is required between the digging point and the front portion of the adaptor and also between the adaptor socket and the nose spigot portion and their respective mounting pins to avoid premature wear between the components. As the various components wear, the locking pins can loosen thereby increasing the risk of loss of a digging point or an entire adaptor/tooth combination. This necessitates considerable downtime to replace the lost wear members and where items such as locking pins are

not recovered, these can cause damage and/or further downtime in downstream operations such as ore crushing and the like.

The greatest loads experienced by excavator tooth assemblies are vertical loads which tend to generate large moment forces capable of rotating a tooth off the front of an adaptor and/or rotating the adaptor off the adaptor nose. In addition, twisting or "yaw" loads are frequently imposed on such tooth assemblies.

Despite many prior art attempts to improve the mounting of a wear member to a nose of an excavator, most of these proposals suffer from one or more deficiencies. As described hereinafter, many of the prior art references relate to direct mounting of a tooth onto a nose without an intermediate adaptor but in those assemblies, the mounting systems for securing teeth directly onto excavator noses is considered analogous to the mounting of a tooth onto an adaptor.

United States Patent No 4,182,058 describes an excavator tooth having a rearwardly divergent tapering socket to receive a nose having a complementary-shaped front spigot portion. Resistance to rotational moment forces is borne by a resilient steel cotter pin extending through aligned vertical apertures in the socket and spigot portions.

United States Patents 3,774,324, 4,338,736, 4,481,728, 4,903,420, 5,469,648, 7,100,315 and 6,735,890 all describe nose and tooth combinations wherein the nose has a generally convergently tapering spigot portion with a forward tip having a box-like configuration with at least the upper and lower surfaces thereof having faces parallel to each other

and to a longitudinal axis of the nose portion. With the exception of Patent No 4,338,736, which describes a transverse locking pin, each of the tooth mounting arrangements is heavily reliant on a large vertical locking pin to resist rotational moment forces tending to rotate the teeth off respective noses.

United States Patent No 4,231,173 describes a tapered adaptor nose having a box-like free end, which engages in a mating box-like socket cavity to resist rotational moments. Opposed pairs of rearwardly extending tongues engage in corresponding recesses in the outer surfaces of the adaptor nose to resist rotational movements. Because the tongues themselves are unsupported, they possess a limited capacity to resist rotational moment forces.

United States Patent No 5,272,824 describes a structure similar to that of United States Patent No 4,231,173 except that the side tongues are of more robust dimensions and the upper and lower tongues are formed as box-like members with apertures to receive a vertical mounting pin passing through aligned apertures in the tooth and adaptor nose.

United States Patent No 4,404,760 provides flat rail surfaces on the adaptor nose to engage with mating grooves in the socket aperture of a corresponding tooth wherein the mating rail and groove surfaces are generally parallel to the longitudinal axis of the tooth.

United States Patent No 5,423,138 describes a generally tapered nose having a box-like front end with upper and lower transverse surfaces generally parallel to a longitudinal axis of a tooth which located directly

thereon. The parallel upper and lower transverse surfaces are contiguous with upper and lower rail surfaces on each side of the nose and parallel to the longitudinal axis of the tooth. A pair of rearwardly extending side tongues locate in recesses formed in the outer side faces of the nose, ostensibly to resist rotational moment forces in the tooth. Because the side tongues are recessed to accommodate the side rail portions, the robustness of the side tongues is somewhat compromised.

United States Patent No 4,233,761 describes a fairly stubby tapered nose having a box-like front portion with upper and lower surfaces generally parallel to a longitudinal axis of an excavator tooth, an intermediate rearwardly diverging tapered portion and a rear portion having upper and lower surfaces extending generally parallel to a longitudinal axis of the tooth. Formed on the upper and lower surfaces of the front, intermediate and rear portions of the nose are spaced parallel reinforcing ribs which are located in mating grooves in the excavator tooth. A large vertical locking pin extends through aligned apertures in the tooth and nose between the reinforcing ribs. This structure is heavily reliant on the locking pin to resist rotational moment forces however it is considered that this configuration may be prone to failure in the rear portion of the adaptor.

United States Patent No 5,709,043 describes a nose/adaptor combination wherein the adaptor socket tapers convergently towards a box-like front portion having upper and lower bearing surfaces generally parallel to a longitudinal axis of the tooth, a front transverse upright bearing surface and rearwardly divergent bearing surfaces formed at obtuse angles

between the converging upper and lower walls and the side walls of the socket, ostensibly to avoid areas of stress concentration.

United States Patent No 6,018,896 describes a pin/retainer system for locking an excavation tooth onto an adaptor wherein the retainer is inserted in the adaptor and a wedge-shaped pin is driven into aligned apertures in the tooth and adaptor to resiliently engage with the retainer.

United States Publication No US 2002/0000053A1 describes a mechanism for releasably retaining an adaptor into the nose of a bucket lip *or the like wherein a tapered threaded socket is non-rotatably located on* the inside of an aperture in the side wall of the adaptor. A threaded retaining pin extends through the threaded socket and locates in an aligned aperture in the bucket nose.

United States Patent No 5,337,495 describes a tooth assembly with a two-piece telescopically engageable adaptor secured to a nose with a tapered wedge pin assembly. A similar mounting system is described in United States Patent No 5,172,501 and United States Patent No 6,052,927. Other retention systems for digging points on adaptors or adaptors on noses are described in United States Patents Nos 6,119,378, 6,467,204, and 6,467,203.

Other devices for removably securing replaceable wear elements on earth working equipment such as a retaining pin, a bolt, a pin lock and locking blocks engageable in a top aperture in a wear member are described in United States Patents Nos 3,839,805, 3,982,339, 4,587,751, 5,088,214 and 5,653,048 respectively.

United States Patent No 5,937,550 describes a lock assembly for releasably securing an adaptor to a nose of an excavator support structure. The lock assembly comprises a body and a base coupled together and adapted for insertion, while coupled together, in a hole in the nose of the support structure. The length of the lock assembly is extended to secure the adaptor and is retracted to release the adaptor. While adequate for securing an adaptor to a nose of an excavator support structure, the lock described in this patent is relatively complex in design and operation leading to high costs and labour intensive extraction procedures in the field.

Canadian Patent Application No 2,161,505 describes a system for removably retaining an excavation point on an adaptor with at least one flanged sleeve having a screw-threaded aperture therein, the flanged sleeve being non-rotatably locatable in a transverse bore in the adaptor before fitment of the point onto the adaptor. A screw-threaded pin is inserted into the sleeve via an aperture in the point whereby portion of the head of the pin retains the point on the adaptor.

Australian Patent Application No 2003264586 describes a locking pin assembly comprising a body member having a non-circular cross-sectional shape locatable in a bore of complementary shape extending laterally between opposite sides of an excavator lip mounting nose. After locating the body member in the nose aperture, an adaptor can be engaged over the nose with apertures in opposite side walls aligned with the body member. Threaded bolts engage in threaded apertures in opposite ends of the body member, the bolts each having a tapered shank

portion with an enlarged boss at a free end thereof, the boss being locatable in a respective aperture in a side wall of said adaptor to prevent the adaptor from disengaging with the nose.

While generally satisfactory for their intended purpose, the abovementioned prior art all suffer from one or more shortcomings or disadvantages in terms of inadequate resistance to rotation of a tooth off a nose or an adaptor under the influence of vertical loads applying a rotational moment to the tooth, a predisposition to premature wear, difficulties in retention of the teeth on noses or adaptors, inadequate locking systems and unduly complicated configurations giving rise to increased fabrication costs. Furthermore, the prior art all generally rely on lock assemblies that require threaded components. Thread components in lock assemblies are generally disadvantageous as dirt and fines can infiltrate the threaded assembly thereby causing cementation and resulting in difficulties in removal.

OBJECT OF THE INVENTION

It is an object of the invention to overcome or at least alleviate one or more of the above problems and/or provide the consumer with a useful or commercial choice.

DISCLOSURE OF THE INVENTION

In one form, although it need not be the only or indeed the broadest form, the invention resides in a lock assembly for releasably securing an excavator tooth on a nose of an excavator, the lock assembly comprising:

a rigid lock member having a base portion and a retaining portion

extending from said base portion, the base portion adapted to be located in a retaining cavity of the nose and the retaining portion adapted to at least partially extend into a retaining aperture of the wear member

a resiliently deformable lock member, in use, adapted to be located within the retaining cavity of the nose to abut an upper face of the rigid lock member to thereby captively retain the base portion of the rigid lock member in the retaining cavity and the retaining portion at least partially within the retaining aperture such that side walls of the retaining portion of the rigid lock member bear against complimentary side walls of the retaining aperture of the wear member and opposed bearing faces of the base portion of the rigid lock member oppose and engage respective side walls of the retaining cavity of the nose of the excavator to thereby releasably secure the wear member on the nose of the excavator.

Preferably, the retaining portion of the rigid lock member has outwardly convergent side wall portions adapted to oppose and engage complimentary inwardly divergent side walls of the retaining aperture of the wear member.

Suitably, the resiliently deformable lock member is adapted to be deformed in order to allow passage through the retaining aperture into the retaining cavity. Optionally, the resiliently deformable lock member has at least one latch adapted to be located inwardly of a side wall of the retaining aperture.

Further features of the present invention will become apparent from the following detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

To assist in understanding the invention and to enable a person skilled in the art to put the invention into practical effect preferred embodiments of the invention will be described by way of example only with reference to the accompanying drawings, wherein:

FIG 1A shows a perspective view of an excavator wear assembly according to an embodiment of the invention;

FIG 1B shows an exploded perspective view of the excavator wear assembly shown in FIG 1A;

FIG 2 shows a partial front perspective view of an adaptor forming part of the excavator wear assembly shown in FIG 1A;

FIG 3A shows a rear perspective view of a tooth forming part of the excavator wear assembly shown in FIG 1A;

FIG 3B shows a sectional top view of the tooth shown in FIG 3A;

FIG 4A shows a front perspective view of a rigid lock member 1310 forming part of the excavator wear assembly of FIG 1A;

FIG 4B shows a front perspective view of a resiliently deformable lock member forming part of the excavator wear assembly of FIG 1A;

FIG 4C shows a plan view of the resiliently deformable lock member shown in FIG 4B;

FIG 4D shows a rear perspective view of the resiliently deformable lock member shown in FIG 4B;

FIG 5A shows a perspective view of the tooth shown in FIG 3A mounted upon the adaptor shown in FIG 2;

FIG 5B shows a top sectional view of the perspective view shown in FIG 5A;

FIG 6A shows a forward perspective view of the excavator wear assembly in a partially assembled position;

FIG 6B shows a rear perspective view of the excavator wear assembly shown in FIG 6A;

FIG 6C shows a top sectional view of the excavator wear assembly shown in FIG 6A;

FIG 7A shows a close up perspective view of the excavator wear assembly in a fully assembled position; and

FIG 7B shows an underside sectional view of the excavator wear assembly shown in FIG 7A.

DETAILED DESCRIPTION OF THE INVENTION

The excavator wear assembly and lock assembly therefore are described with reference to an excavator wear member in the form of a tooth releasably secured to an adaptor. The adaptor is in turn secured to a nose of an excavator bucket or the like. A skilled addressee will appreciate that the invention may be employed to releasably secure an adaptor to a nose or a tooth directly to a nose of an excavator bucket lip.

FIG 1A shows a perspective view of an excavator wear assembly 1000 according to an embodiment of the invention. FIG 1B shows an exploded perspective view of the excavator wear assembly 1000. Excavator wear assembly comprises a wear member in the form of a tooth 1100 mountable on an adaptor 1200 and a lock assembly 1300 disposed in

each opposing transverse face of the tooth 1100 and the adaptor 1200 to thereby releasably secure tooth 1100 on adaptor 1200.

Adaptor 1200 is suitably configured for mounting on a digging edge of an excavator by way of an adaptor socket 1210. Adaptor socket 1210 is formed in a shape complimentary with a nose of an excavator digging edge (not shown).

Adaptor 1200 has aligned transverse apertures 1221 each extending through a respective opposed side wall 1220. Aligned transverse apertures 1221 are adapted to receive an adaptor retaining pin (not shown) which extends through aligned transverse apertures 1221 and an adaptor retaining pin passage in the complimentary shaped nose (not shown) to thereby retain the adaptor 1200 on the excavator digging edge.

Adaptor 1200 further includes a spigot portion 1230 extending from a forward portion thereof and upper and lower mounting recesses 1201 and 1202 (lower mounting recess 1202 not shown in FIG 1A or FIG 1B) respectively. Additionally, adaptor 1200 has a pair of side wall mounting recesses 1203 and 1204 (not shown) located in a forward portion of each opposed side wall 1220.

FIG 2 shows a partial front perspective view of adaptor 1200. Spigot portion 1230 has converging upper and lower rear bearing surfaces 1231, 1232 which terminate at substantially parallel upper and lower forward bearing surfaces 1233, 1234 respectively. A front bearing face 1235 is disposed between upper forward bearing surface 1233 and lower forward bearing surface 1234.

Spigot portion 1230 also has a retaining cavity 1240 located in opposed side walls 1236 of spigot portion 1230. Each retaining cavity 1240 is formed from a lower cavity 1241 and an upper cavity 1242. Upper cavity 1242 is relatively wider than lower cavity 1242 and extends further transversely within spigot portion 1230 thereby forming a ridge 1243 between upper cavity 1242 and lower cavity 1241.

A recess 1244 is formed in a floor 1241A of lower cavity 1241 and extends through to a rear wall 1242A of upper cavity 1242 thereby forming a groove 1241B in a back wall 1241C of lower cavity 1241. The function of retaining cavity 1240 is discussed in greater detail below.

FIG 3A shows a rear perspective view of tooth 1100 and FIG 3B shows a sectional top view of a portion of tooth 1100.

Wear member in the form of tooth 1100 has a forwardly projecting working end 1101 and a socket cavity 1110 formed from converging upper and lower rear bearing surfaces 1111 (bit shown) and 1112 respectively. Each of upper and lower bearing surfaces 1111 and 1112 terminate at substantially parallel upper and lower forward bearing surfaces 1113 (not shown) and 1114 respectively. A front bearing face 1115 is disposed between upper forward bearing surface 1113 (not shown) and lower forward bearing surface 1114.

Bearing surfaces 1111, 1112, 1113, and 1114 and front bearing face 1115 of tooth socket 1110 are configured to be complimentary with bearing surfaces 1231, 1232, 1233 and 1234 and front bearing face 1235 respectively of spigot portion 1230 of adaptor 1200.

Tooth 1100 further includes upper and lower mounting projections 1101 and 1102 respectively and side mounting projections 1103 and 1104 respectively. In use, mounting projections 1101, 1102, 1103 and 1104 are adapted to be located within mounting recesses 1201, 1202, 1203 and 1204 respectively of adaptor 1200.

Additionally, a retaining aperture 1120 extends through each opposed side wall 1105 and 1106 of tooth 1100. Each retaining aperture 1120 is formed from an upper retaining aperture 1121 extending through a respective side wall 1105 and 1106. Retaining aperture 1120 also has an upper retaining aperture 1122 extending through a respective side wall 1105 and 1106.

Upper retaining aperture 1122 is relatively wider than lower aperture 1121 as shown. Furthermore, lower retaining aperture 1121 has a centre that is located rearwardly of upper retaining aperture 1122.

As will be discussed in greater detail below, upper retaining aperture 1122 is adapted to at least partially align with upper retaining cavity 1242 of adaptor 1200 when tooth 1100 is located upon spigot portion 1230 of adaptor 1200 such that side walls of upper retaining aperture 1122 are encompassed by side walls of upper retaining cavity 1242.

Retaining aperture 1120 further includes a recess 1123 extending inwardly along floor 1124 of lower retaining aperture 1121.

Lower retaining aperture 1121 has inwardly diverging side walls 1125A, 1125B such that the cross sectional area of lower retaining aperture 1121 is greater at socket cavity 1110 than at side walls 1105 and 1006.

Furthermore, retaining aperture 1120 has a longitudinal recess 1126 forming a longitudinal bench 1127 on inwardly diverging side wall 1125A of lower retaining aperture 1121. Longitudinal recess also forms a forwardly located projection 1128 in a side of upper retaining aperture 1122.

The function of retaining aperture 1120 will be discussed in greater detail below.

Excavator wear assembly 1000 further includes at least one lock assembly 1300 to releasably secure tooth 1100 on adaptor 1200. In the embodiment, excavator wear assembly has two lock assemblies 1300 each extending through at least partially aligned retaining aperture 1120 and retaining cavity 1240 in opposed side walls as will be discussed in greater detail below.

Lock assembly is formed from a rigid lock member 1310 and a resiliently deformable lock member 1320.

FIG 4A shows a front perspective view of rigid lock member 1310. Rigid lock member 1310 is preferably formed from a rigid material such as steel or the like. Rigid lock member 1310 is formed from a base portion 1311 and a retaining portion 1312 extending from base portion 1311.

Base portion 1311 is configured to be received in lower retaining cavity 1241 in adaptor 1200 and retaining portion 1312 is configured to be received in lower retaining aperture 1121 of tooth 1100 as will be discussed in greater detail below. Base portion 1311 has opposing bearing faces 1314 and 1315.

As shown retaining portion 1312 of rigid lock member 1310 has generally outwardly converging side walls 1313A and 1313B. In use, side walls 1313A and 1313B are configured to bear against inwardly diverging side walls 1125A, 1125B of lower retaining aperture 1121 of tooth 1100.

FIG 4B shows a front perspective view of resiliently deformable lock member 1320 forming part of lock assembly 1300. FIG 4C shows a plan view of resiliently deformable lock member 1320 and FIG 4D shows a rear perspective view of resiliently deformable lock member 1320.

Suitably, resiliently deformable lock member 1320 is formed from polyurethane or similar resiliently deformable material. Resiliently deformable lock member 1320 has a front face 1321 and a rear face 1322.

Optionally, resiliently deformable lock member 1320 includes a strengthening member (not shown) located therein to provide structural support.

In the embodiment, two apertures 1323 extend from front face 1321 to rear face 1322. Each respective aperture 1323 has a piercable membrane 1324 disposed therein adjacent front face 1321 and set back within aperture 1323 as shown.

Angled shoulders 1325 extend rearwardly from opposing ends of front face 1321. Opposed rearwardly diverging side wall portions 1326 extend from a respective angled shoulder 1325.

Angled shoulders 1327 extend forwardly from opposing ends of rear face 1322. Opposed rearwardly converging side wall portions 1328 extend

from a respective angled shoulder 1327 and terminate at a respective rearwardly diverging side wall portion 1326 as shown.

Each rearwardly converging side wall portion 1328 extends forward of its intersection with each respective rearwardly diverging side wall portion 1326 to form latch 1329.

Resiliently deformable lock member 1320 further comprises a catch 1330 located in at least one of rearwardly diverging side wall portions 1326 as shown. Additionally, upper and lower shoulders 1331 and 1332 are located above and below respectively of both opposed rearwardly diverging side wall portions 1326 and opposed rearwardly converging side wall portions 1328.

Resiliently deformable lock member 1320 is adapted to be captively retained within upper retaining cavity 1242 of adaptor 1200. Furthermore, resiliently deformable lock member 1320 is adapted to deformably pass through upper retaining aperture 1122 as will be discussed further below.

In use, lock assembly 1300 releasably secures tooth 1100 on spigot portion 1230 of adaptor 1200 as discussed below.

FIG 5A shows a perspective view of tooth 1100 mounted upon adaptor 1200 and FIG 5B shows a top sectional view of tooth 1100 mounted upon adaptor 1200.

Socket cavity 1110 of tooth 1100 is mounted upon spigot portion 1230 of adaptor such that bearing surfaces 111, 1112, 1113 and 114 and front bearing face 1115 (all not shown in FIG 5A or FIG 5B) oppose and engage complimentary bearing surfaces 1231, 1232, 1233 and 1234 and

front bearing face 1235 (all not shown in FIG 5A or FIG 5B) respectively of spigot portion 1230 of adaptor 1200.

Furthermore, mounting projections 1101, 1102, 1103 *and* 1104 of tooth 1100 are located within mounting recesses 1201, 1202, 1203 and 1204 respectively of adaptor 1200.

Retaining aperture 1120 of tooth 1100 at least partially aligns with retaining cavity 1240 of adaptor 1200. Upper retaining aperture 1122 of tooth 1100 partially aligns with upper retaining cavity 1242 of adaptor 1200 *such that such that side walls of upper retaining* aperture 1122 are encompassed by side walls of upper retaining cavity 1242. Furthermore, an outer extent of inwardly diverging side walls 1125A and 1125B of lower retaining aperture 1121 are encompassed by side walls of lower retaining cavity 1241 of adaptor 1200 as shown.

In this position, recess 1123 extending inwardly along floor 1124 of lower retaining aperture generally corresponds with recess 1244 formed in floor 1241A of lower retaining cavity 1241 as shown.

FIG 6A shows a forward perspective view of the excavator wear assembly 1000 in a partially assembled position whereby rigid lock member 1310 is located within lower retaining cavity 1241. FIG 6B shows a rear perspective view of the excavator wear assembly 10000 shown in FIG 6A and FIG 6C shows a top sectional view of the excavator wear assembly 1000 shown in FIG 6A.

Rigid lock member 1310 is then located through upper retaining aperture 1122 and received in upper retaining cavity 1242. As discussed

previously, as upper retaining cavity 1242 has a greater width than lower retaining cavity 1241 and base portion 1311 of rigid lock member 1310 is configured to be received in lower retaining cavity 1241, rigid lock member 1310 drops such that base portion 1311 is received in lower retaining cavity 1241 of adaptor 1200 as shown.

In this position, retaining portion 1312 of rigid lock member 1310 extends outwardly of lower retaining cavity 1241 at least partially into lower retaining aperture 1121 of tooth 1100 such that outwardly converging side walls 1313A and 1313B of rigid lock member 1310 oppose and are engagable with inwardly diverging side walls 1125A and 1125B respectively of lower retaining aperture 1121 of tooth 1100 in order to thereby bear against inwardly diverging side walls 1125A and 1125B.

Furthermore, bearing faces 1314 and 1315 of base portion 1311 oppose and are engagable with corresponding side walls of lower retaining cavity 1241 to thereby bear against the same. In this way, tooth 1100 is releasably secured to adaptor 1200.

FIG 7A shows a close up perspective view of the excavator wear assembly 1000 in a fully assembled position and FIG 7B shows an underside sectional view of the excavator wear assembly 1000 shown in FIG 7A.

Resiliently deformable lock member 1320 is then inserted through upper retaining aperture 1122 of tooth 1100 into upper retaining cavity 1242 of spigot portion 1230 of adaptor 1200. The width of resiliently deformable lock member 1320 is greatest at the intersection of respective

rearwardly diverging side wall portions 1326 and rearwardly converging side wall portions 1328 where latch 1329 is formed. This width is greater than a width of upper retaining cavity 1242. As such, resiliently deformable lock member 1320 is deformed under a force to allow insertion into upper retaining cavity 1242.

Suitably, a tool such as a screw driver or the like, may be employed to interface with catch 1330 in order to assist in levering resiliently deformable lock member 1320 into upper retaining cavity 1242.

As resiliently deformable lock member 1320 is levered into place, each latch 1329 locates behind a respective side wall of upper retaining aperture 1122 of tooth 1100 to thereby secure resiliently deformable lock member 1320 in place. In this position, resiliently deformable lock member 1320 reverts to its relaxed position such that it is no longer deformed.

In this position, resiliently deformable lock member 1320 at least partially extends into upper retaining aperture 1122 of tooth 1100. However, due to the shape of the rearwardly diverging side wall portions 1326, the resiliently deformable lock member 1320 does not bear against side walls of upper retaining aperture 1122 of tooth 1100.

Furthermore, the resiliently deformable lock member 1320 exerts a biasing force on side walls and top wall of upper retaining cavity 1242 and on a top face of rigid lock member 1310. Optionally, resiliently deformable lock member may be retained within upper retaining cavity by way of an interference fit.

In this way, resiliently deformable lock member 1320 captively retains rigid lock member 1310 in place.

In this way, the lock assembly 1300 releasably secures wear member in the form of tooth 1100 on a nose of an excavator which, in the embodiment, is in the form of adaptor 1200.

The point and transverse forces that tooth 1100 is subjected to during use are borne by the rigid lock member 1310 such that side wall 1125A of tooth 1100 bears against side wall of 1313A of rigid lock member 1310 and this force in turn is transferred to bearing face 1314 of lock member which bears against an opposed side wall of lower retaining cavity 1241 of adaptor.

Similarly, 1125B of tooth 1100 bears against side wall of 1313B of rigid lock member 1310 and this force in turn is transferred to bearing face 1315 of lock member which bears against an opposed side wall of lower retaining cavity 1241 of adaptor.

Due to the generally corresponding tapers in side walls 1313A and 1313B and side walls 1125A and 1125B respectively, transverse loads are similarly borne. Further, these respective tapers also accommodate for manufacturing tolerances in the respective components such that the assembly remains effective.

Furthermore, resiliently deformable lock member 1320 captively retains rigid lock member 1310 in place as discussed above.

In order to remove the lock assembly 1300 and thereby remove tooth 1100 from adaptor 1200, resiliently deformable lock member 1320 is

levered out of upper retaining cavity 1242 of adaptor 1200. As before, a tool such as a screw driver or the like, may be used to assist this process through interaction with catch 1330. Furthermore, each piercable membrane 1324 may be pierced in order that a tool may be inserted through each aperture 1323 to help assist levering respective latches 1329 out from behind respective side walls of upper retaining cavity 1122.

Once the resiliently deformable lock member 1320 has been removed from upper retaining cavity 1242, rigid lock member 1310 is free to move upwardly and out through upper retaining aperture 1122. Suitably, a tool may be inserted through generally aligned recesses 1242 and 1123 to assist in this process.

Tooth 1100 is then free to be removed from adaptor 1200.

The excavator wear assembly of the invention and the lock assembly for securing the wear member in the form of tooth 1100 to adaptor 1200 avoid the need for threaded components and complex parts. Furthermore, the lock assembly avoids the need for heavy hammers and the like for mounting within the respective retaining apertures and retaining cavities. In this way, the invention provides for an effective method of releasably securing the tooth to the adaptor.

Throughout the specification the aim has been to describe the invention without limiting the invention to any one embodiment or specific collection of features. Persons skilled in the relevant art may realize variations from the specific embodiments that will nonetheless fall within the scope of the invention.

It will be appreciated that various other changes and modifications may be made to the embodiment described without departing from the spirit and scope of the invention.

CLAIMS

1. A lock assembly for releasably securing a wear member to a nose of an excavator, the lock assembly comprising:

a rigid lock member having a base portion and a retaining portion extending from said base portion, the base portion adapted to be located in a retaining cavity of the nose and the retaining portion adapted to at least partially extend into a retaining aperture of the wear member; and

a resiliently deformable lock member, in use, adapted to be located within the retaining cavity of the nose to abut an upper face of the rigid lock member to thereby captively retain the base portion of the rigid lock member in the retaining cavity and the retaining portion at least partially within the retaining aperture such that side walls of the retaining portion of the rigid lock member bear against complimentary side walls of the retaining aperture of the wear member and opposed bearing faces of the base portion of the rigid lock member oppose and engage respective side walls of the retaining cavity of the nose of the excavator to thereby releasably secure the wear member to the nose of the excavator.

2. The lock assembly of claim 1, wherein the retaining portion of the rigid lock member has outwardly convergent side wall portions adapted to oppose and engage complimentary inwardly divergent side walls of the retaining aperture of the wear member.

3. The lock assembly of claim 1, wherein the resiliently deformable lock member is adapted to deform to allow passage through the retaining aperture of the wear member.

4. The lock assembly of claim 1, wherein the resiliently deformable lock member has at least one latch adapted to be located inwardly of a side wall of the retaining aperture of the wear member.

5. The lock assembly of claim 1, wherein the resiliently deformable lock member has at least one aperture extending from a front face thereof to a rear face of resiliently deformable lock member.

6. The lock assembly of claim 5, wherein the aperture has a piercable membrane disposed therein adjacent the front face.

7. The lock assembly of claim 6, wherein the piercable membrane is set back within the aperture adjacent the front face.

8. The lock assembly of claim 1, wherein the resiliently deformable lock member has at least one latch located on a side thereof.

9. A method of releasably securing an excavator tooth to a nose of an excavator, the method including the steps of:

i. locating the excavator tooth upon the nose such that a

retaining aperture located on at least one side wall of the excavator tooth at least partially aligns with a retaining cavity located in the nose;

ii. locating a rigid lock member within the retaining cavity such that a retaining portion of the rigid lock member extends outwardly of retaining cavity into retaining aperture of excavator tooth; and

iii. locating a resiliently deformable lock member within the retaining cavity, whereby the resiliently deformable lock member exerts a biasing force on an upper face of the rigid lock member such that side walls of the retaining portion of the rigid lock member oppose and are engagable with respective sidewalls of the retaining cavity to thereby captively retain the rigid lock member within the retaining cavity.

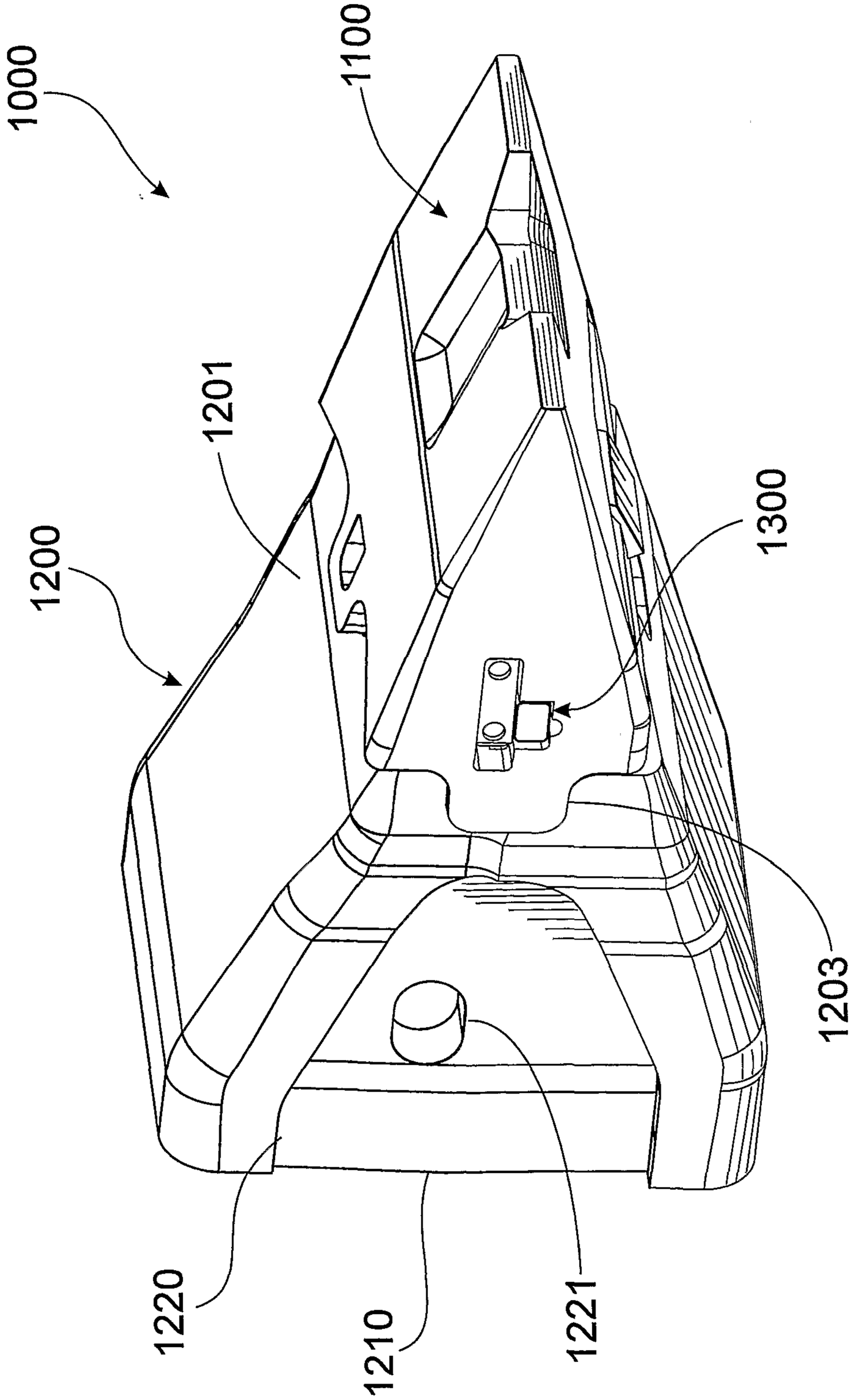


FIG. 1A

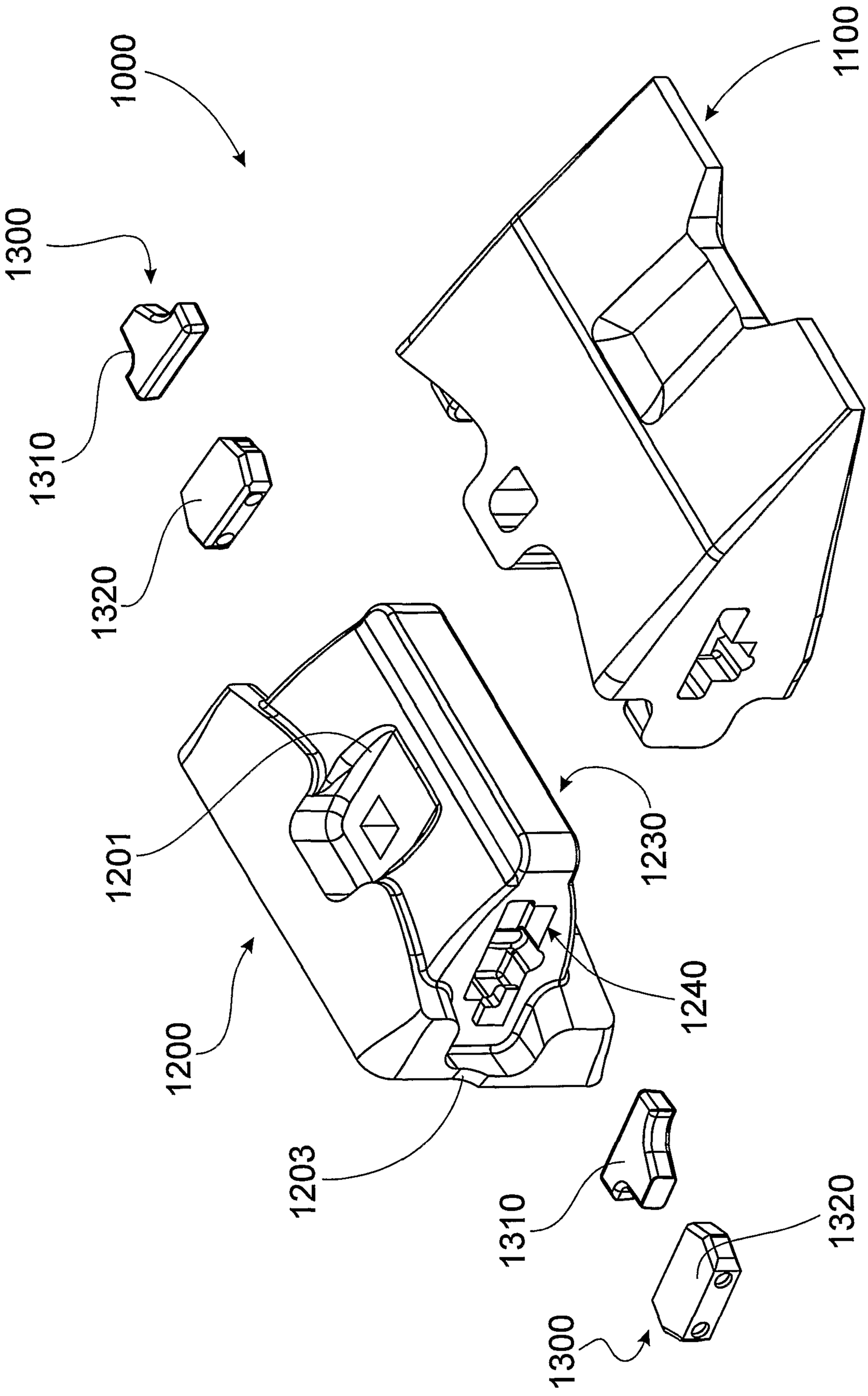


FIG. 1B

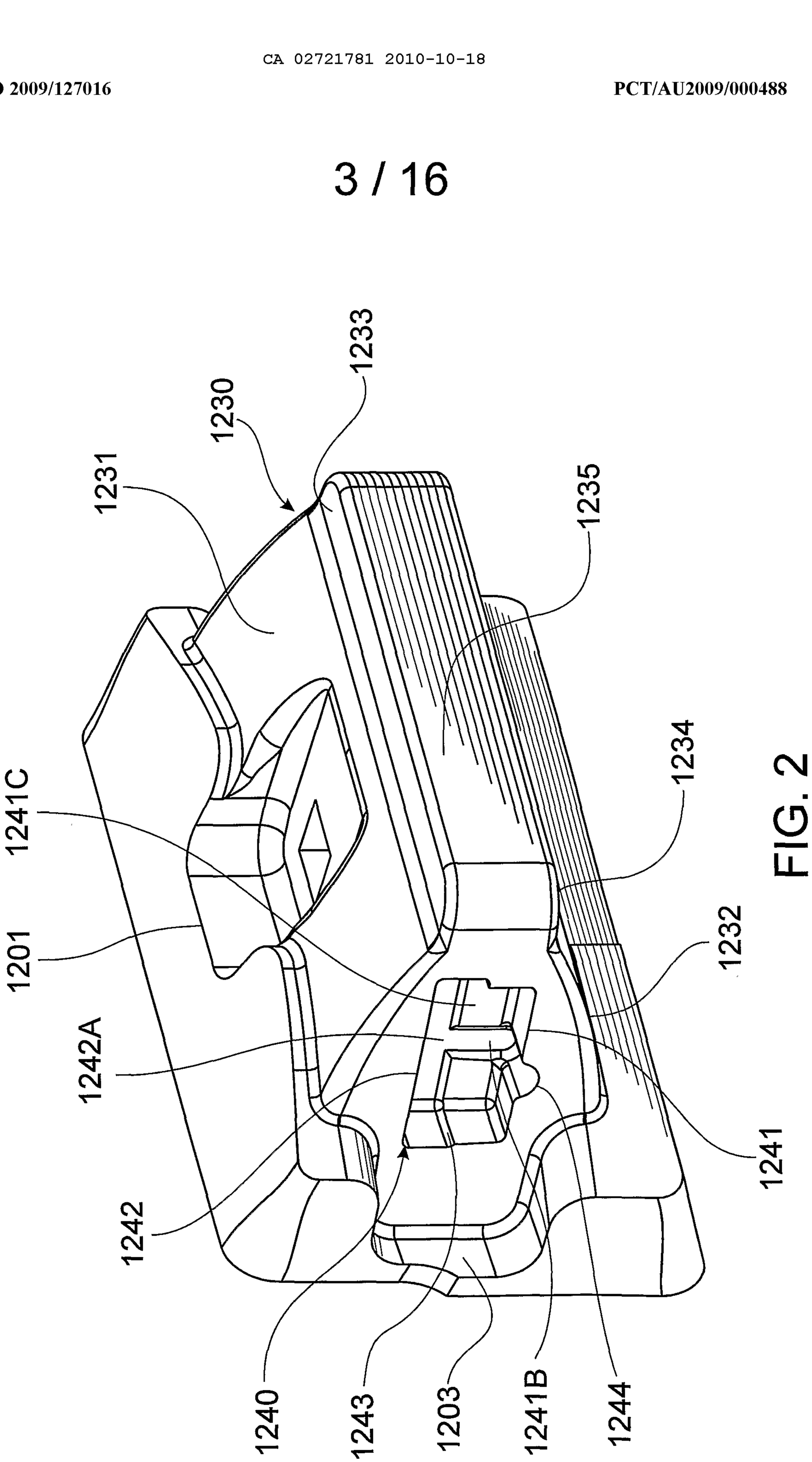

1233
1230
1231
1235
1234
1241C
1241
1201
1232
1242A
1241
1242
1240
1243
1203
1241B
1244

FIG. 2

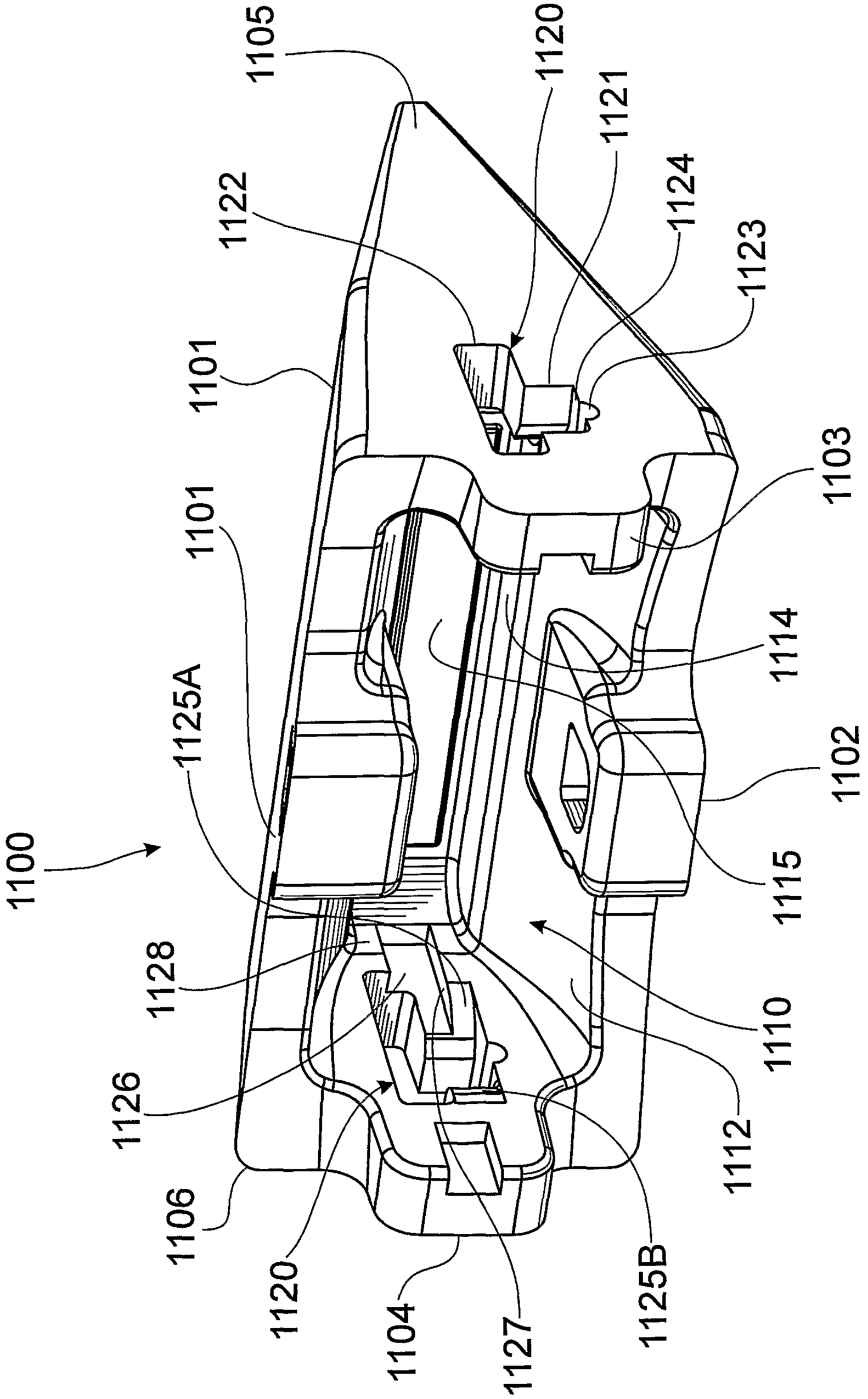

1105
1120
1121
1122
1124
1123
1101
1103
1101
1125A
1114
1100
1102
1115
1128
1110
126
1106
1120
1104
1127
1125B
1112

FIG. 3A

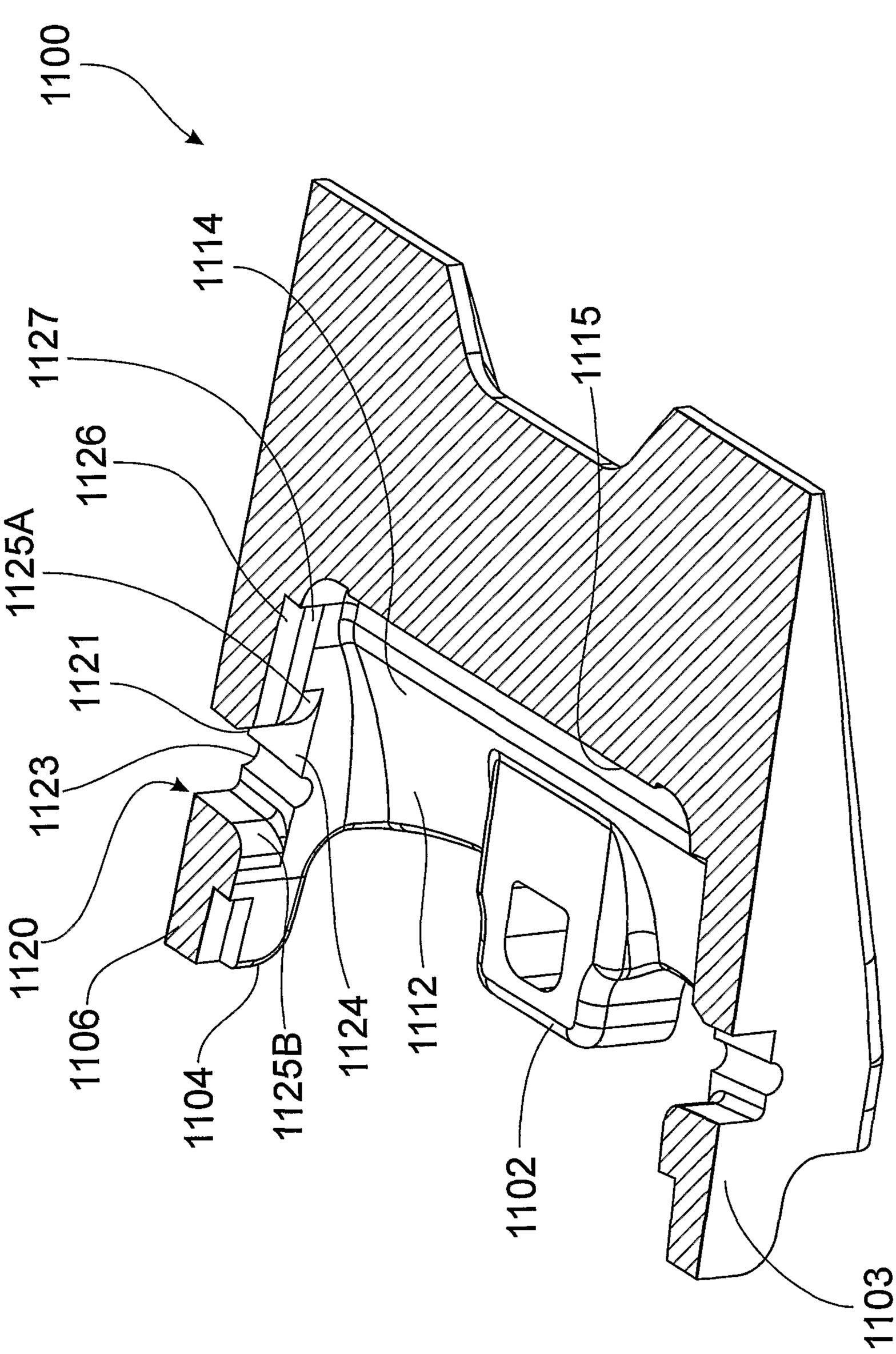

1100
1114
1127
1126
1115
1125A
1121
1123
1120
106
1104
1125B
1124
1112
1102
1103

FIG. 3B

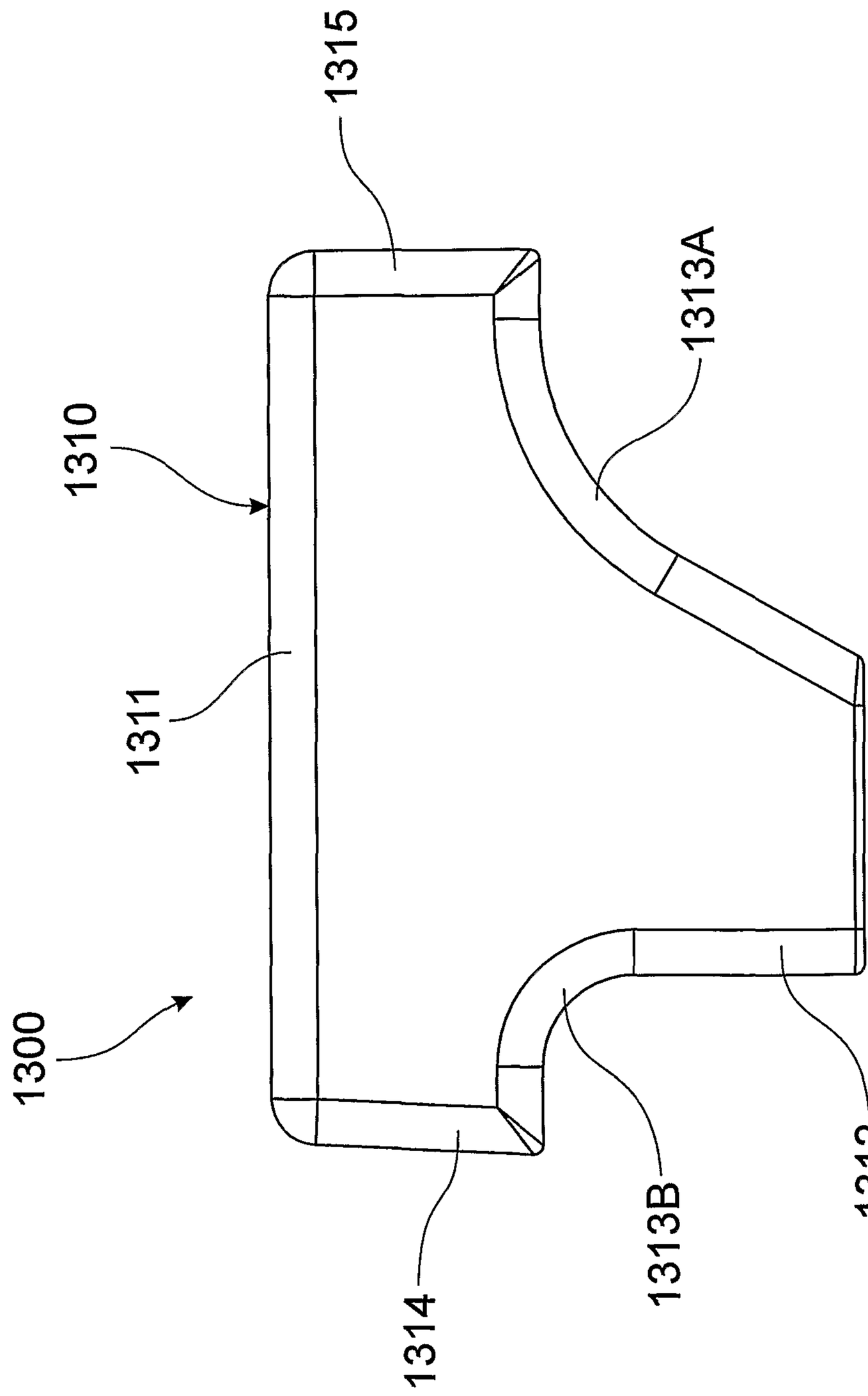
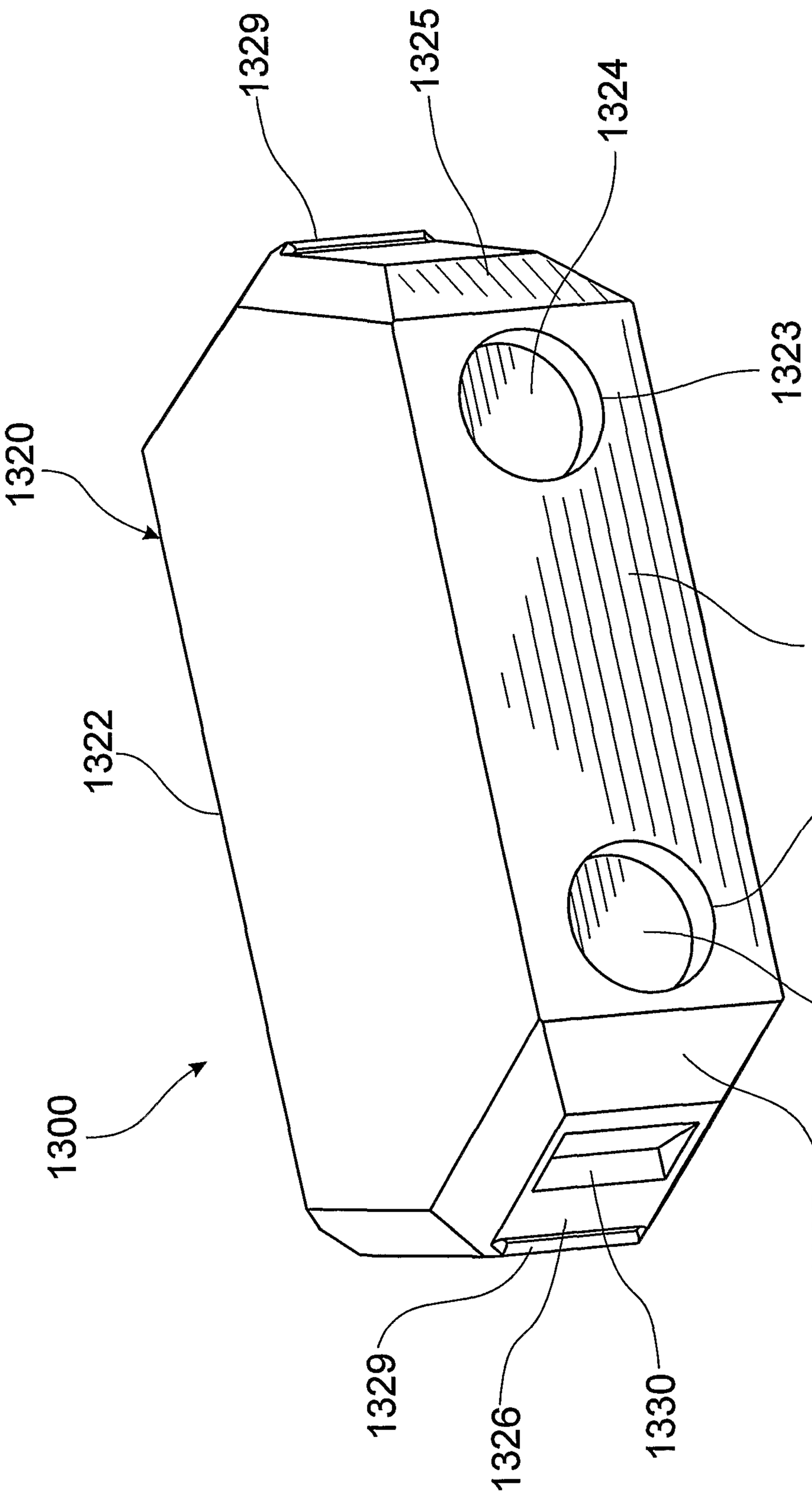


FIG. 4A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1329
1326
1330

FIG. 4B

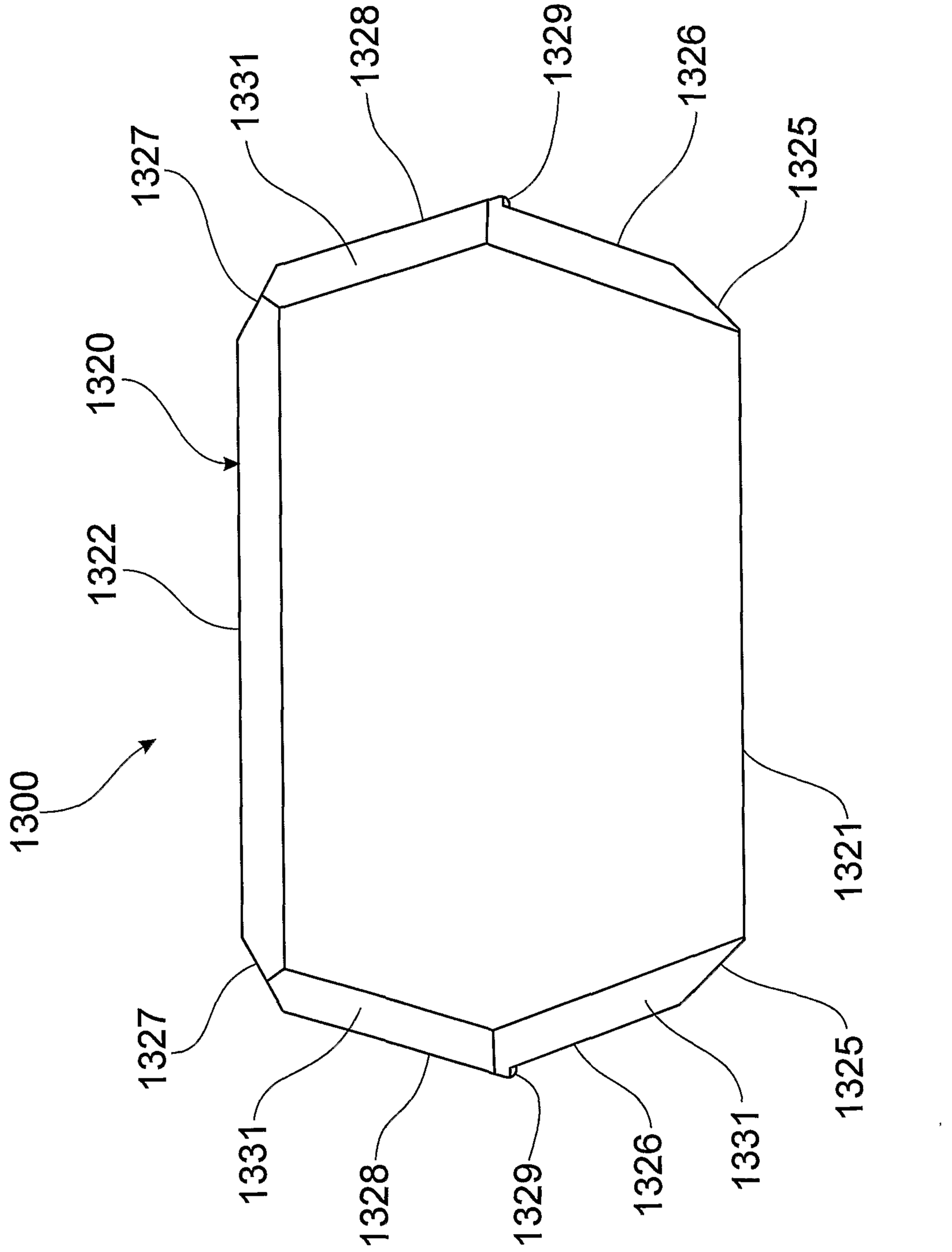


FIG. 4C

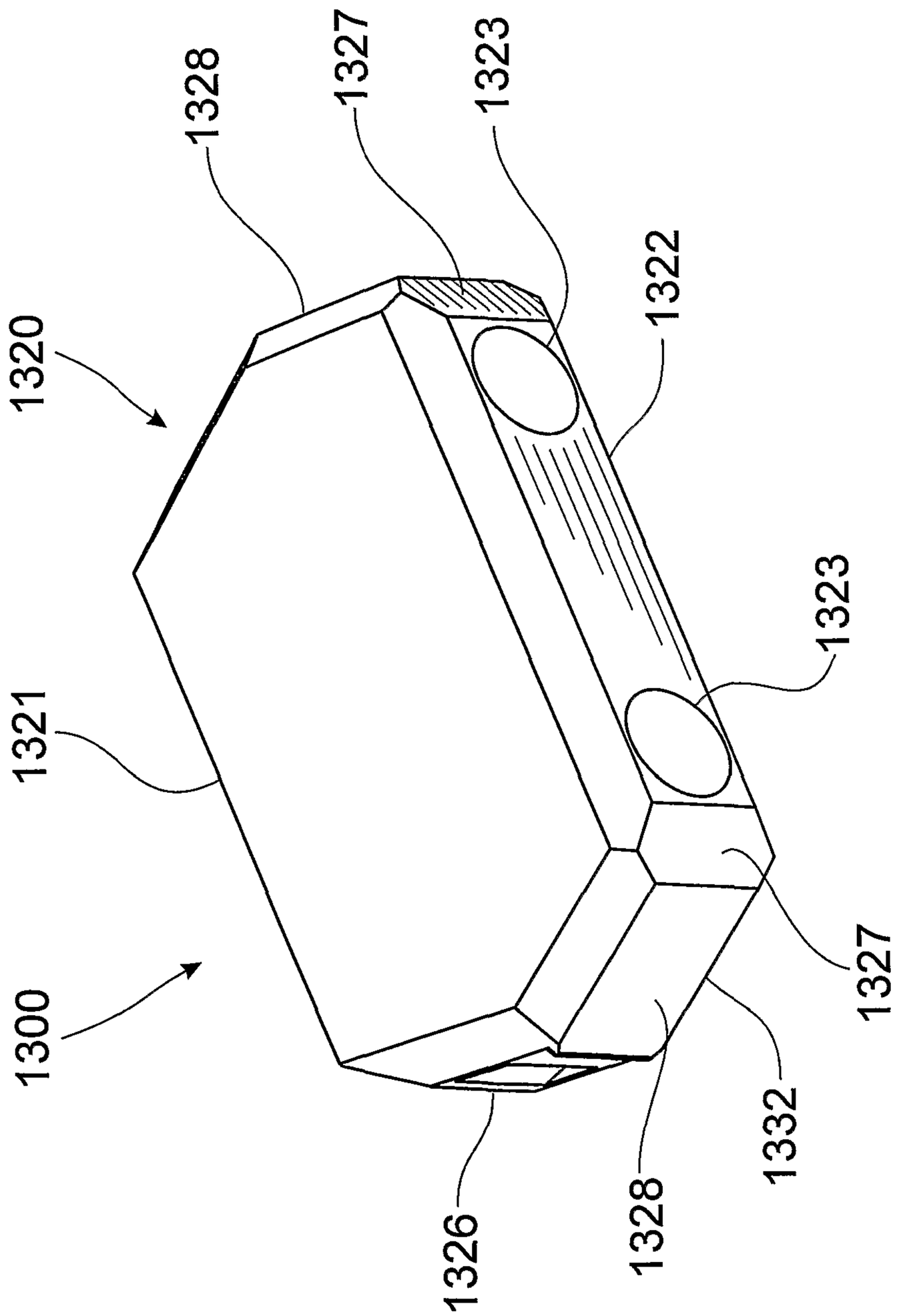


FIG. 4D

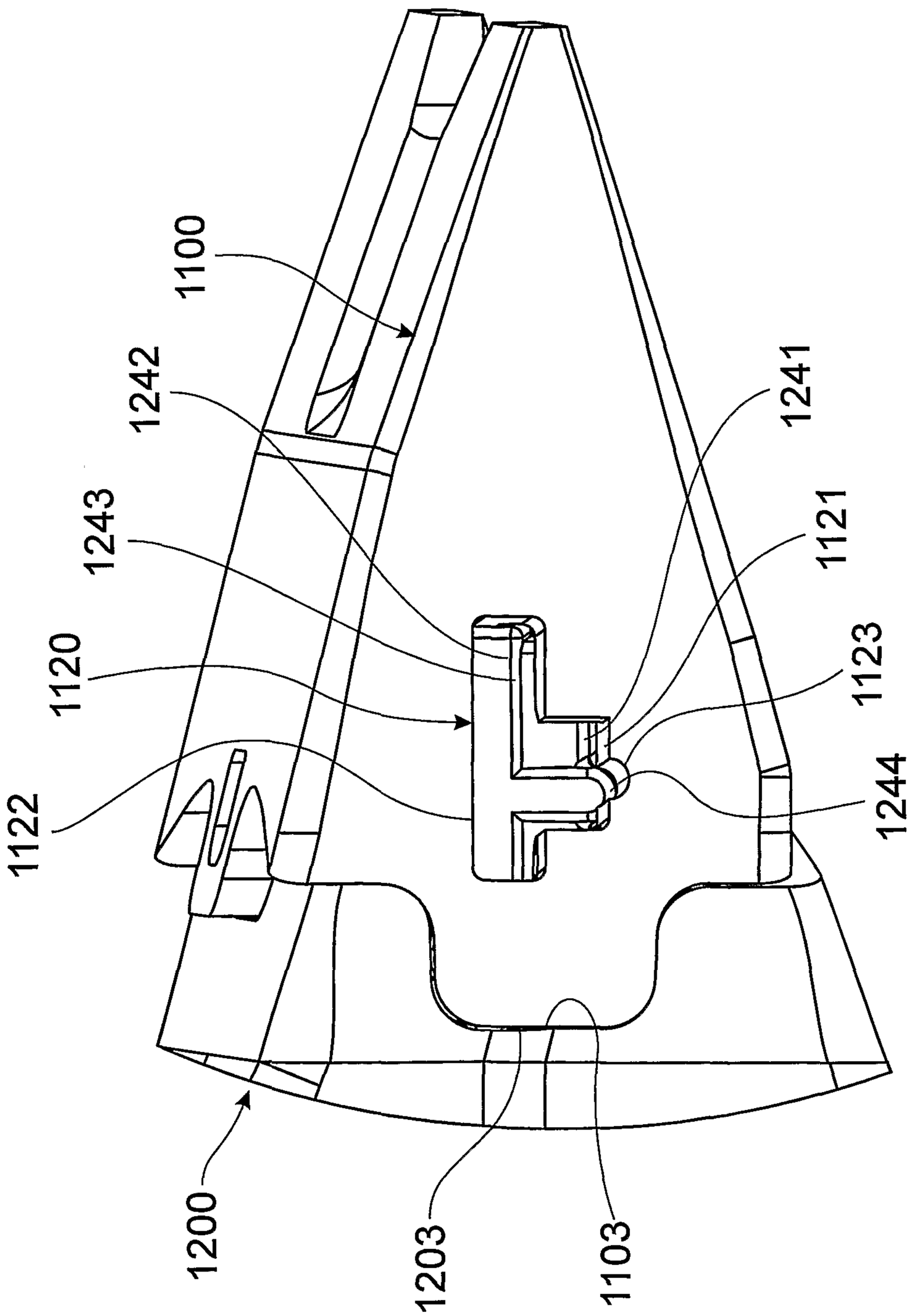


FIG. 5A

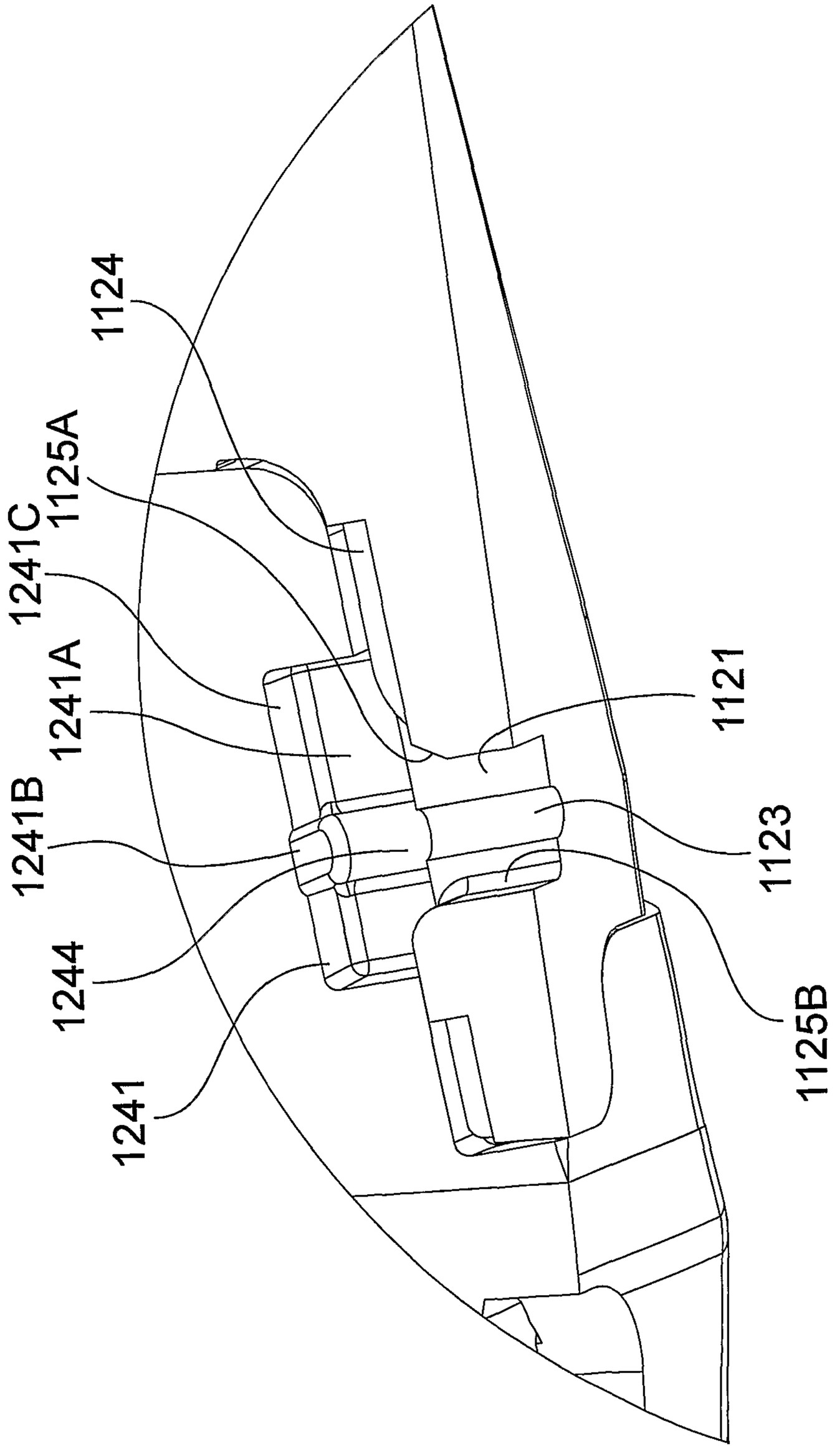


FIG. 5B

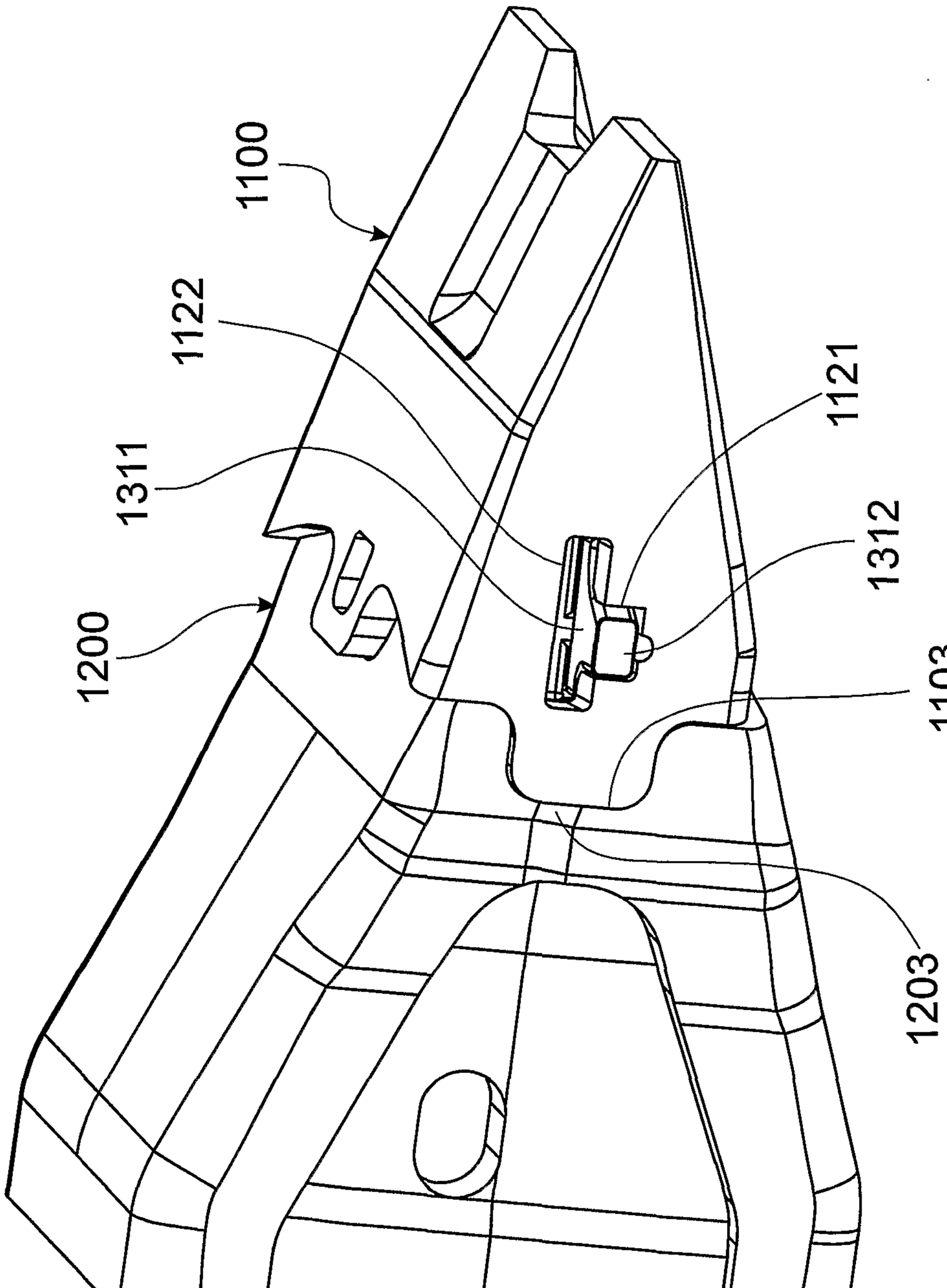


FIG. 6A

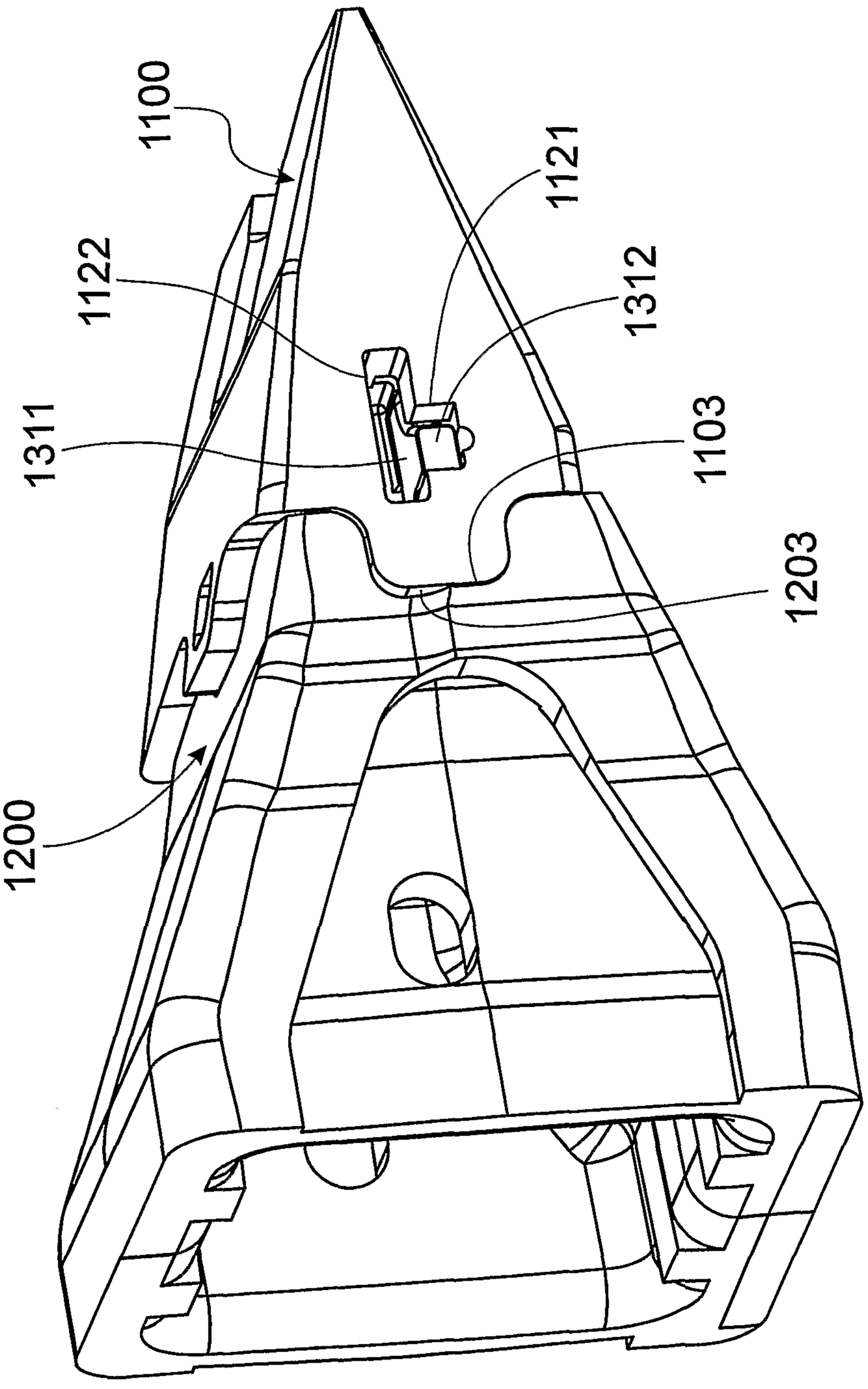


FIG. 6B

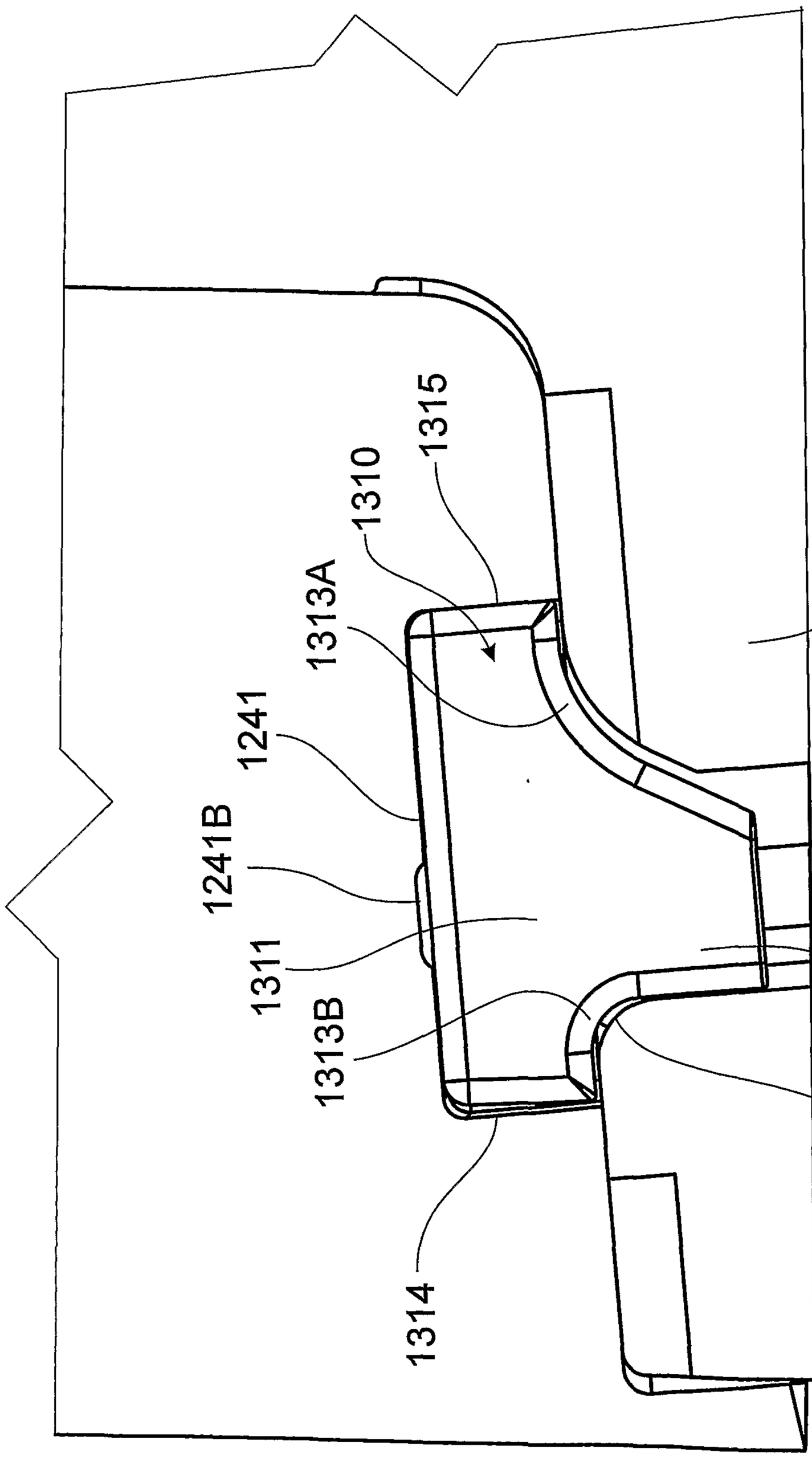

1310
1315
1313A
1241
1241B
1311
1313B
1314
1125A
1121
1123
1312
1125B

FIG. 6C

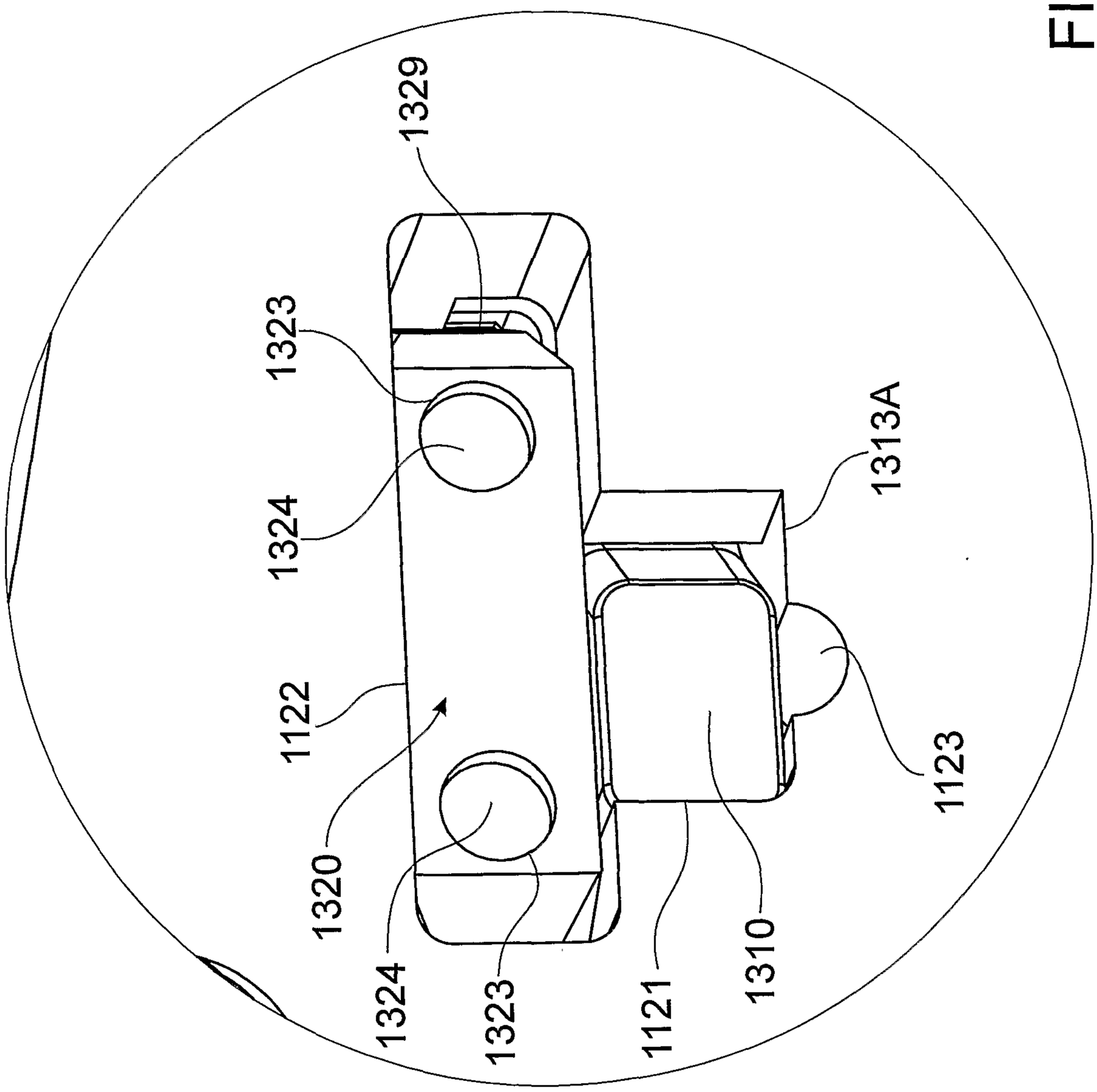
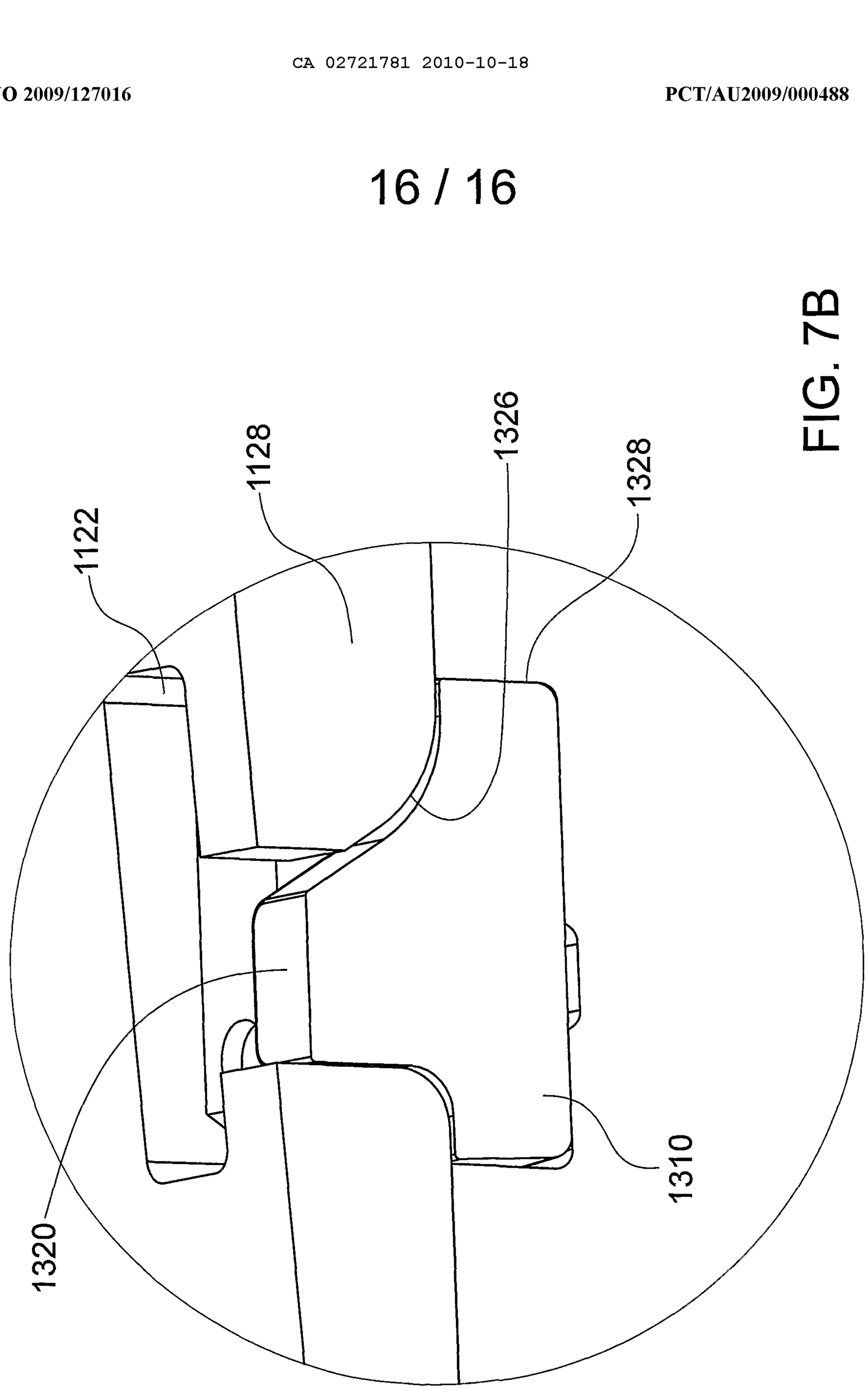
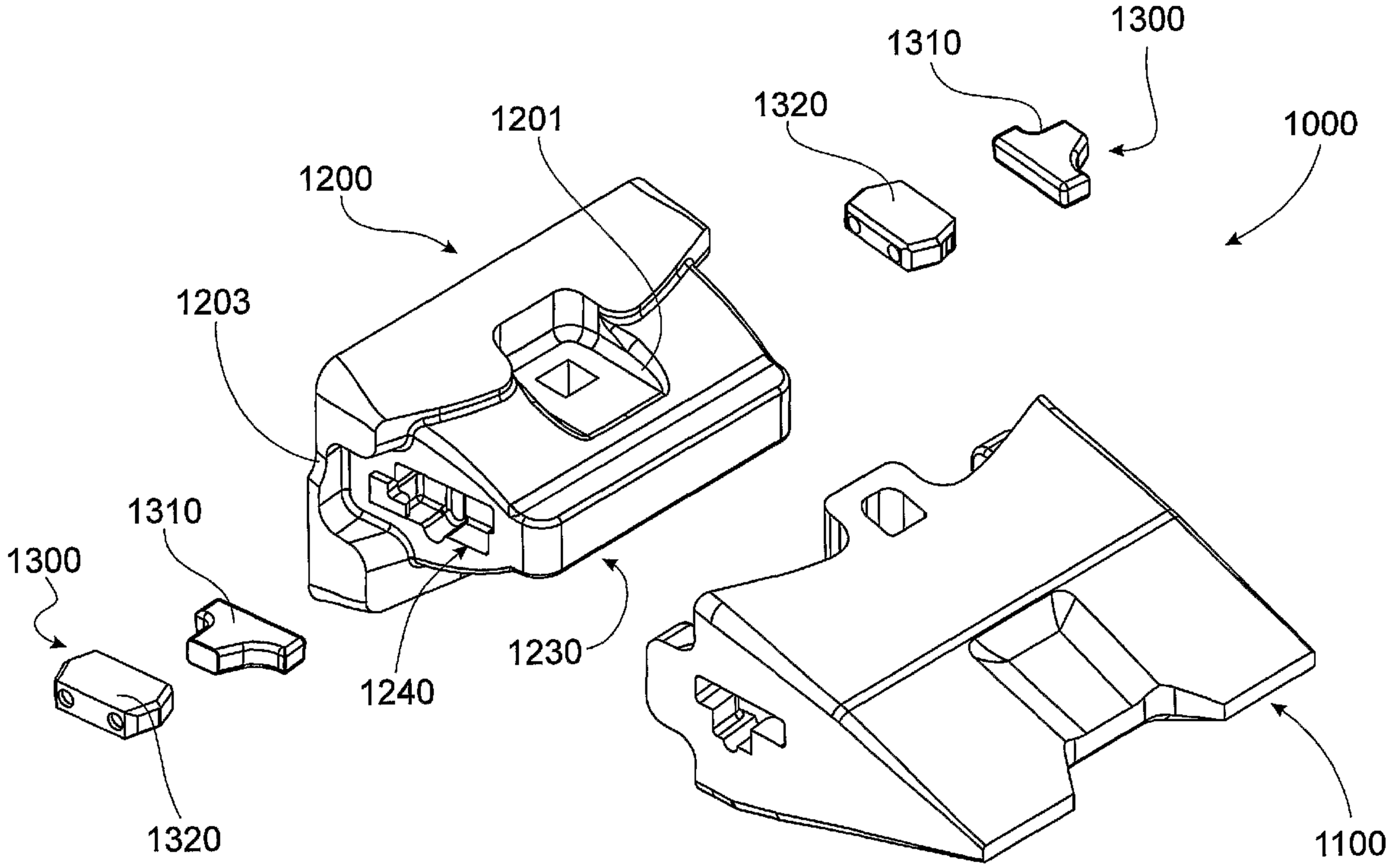


FIG. 7A

FIG. 7B




1300
1310
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1201
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1203
1310
1300
1320
1240
1230
1100