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**McDonald**

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(45) **Date of Reissued Patent: Sep. 19, 2017**

(54) **DENTAL CONTACT MATRIX LIMITED**

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(21) Appl. No.: **12/320,112**

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(Continued)

**Related U.S. Patent Documents**

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 Issued: **Feb. 13, 2007**  
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 PCT Filed: **Nov. 19, 2002**  
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 § 371 (c)(1),  
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 PCT Pub. No.: **WO03/043521**  
 PCT Pub. Date: **May 30, 2003**

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(51) **Int. Cl.**

<b>A61C 3/00</b>	(2006.01)
<b>A61C 5/12</b>	(2006.01)
<b>A61C 5/88</b>	(2017.01)
<b>A61C 5/85</b>	(2017.01)
<b>A61C 5/04</b>	(2006.01)
<b>A61C 7/00</b>	(2006.01)

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(52) **U.S. Cl.**

CPC . **A61C 5/88** (2017.02); **A61C 5/85** (2017.02)

(58) **Field of Classification Search**

CPC ..... A61C 5/125; A61C 5/127; A61C 5/12  
USPC ..... 433/155, 153, 149, 148, 162, 156  
See application file for complete search history.

(57) **ABSTRACT**

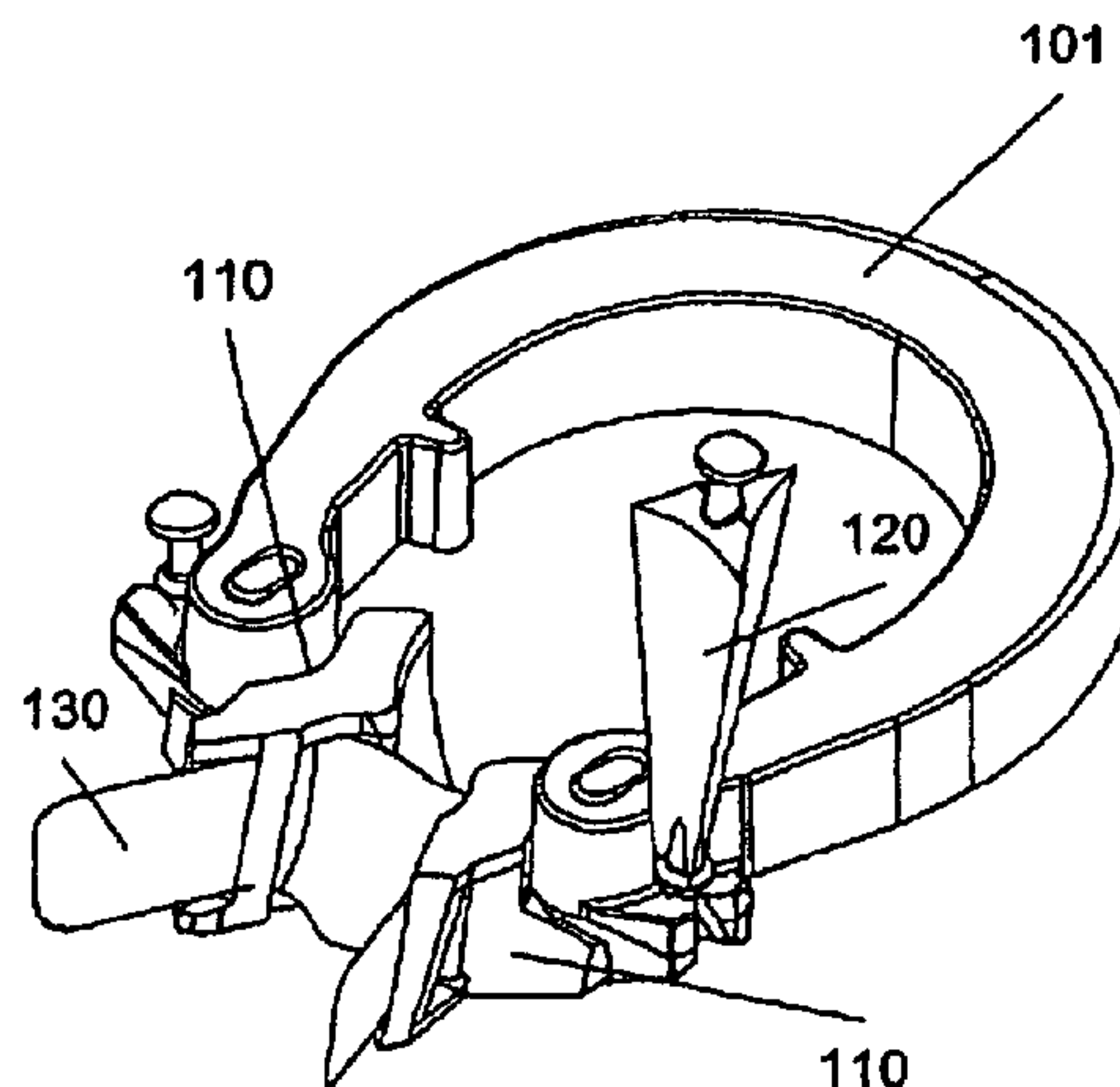
A dental contact matrix system [is described for the placement of dental fillings. The dental contact matrix system] includes a matrix, a retainer for placing and retaining the [5] matrix and an elastic wedge. The retainer includes two lugs or tines that fit between two teeth on the buccal and lingual sides of the teeth. The lugs are connected by a spring member that presses the lugs against the lingual and buccal sides of the teeth. There is an adaptation to hold the elastic wedge in a stretched condition between the lugs.

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**40 Claims, 12 Drawing Sheets**



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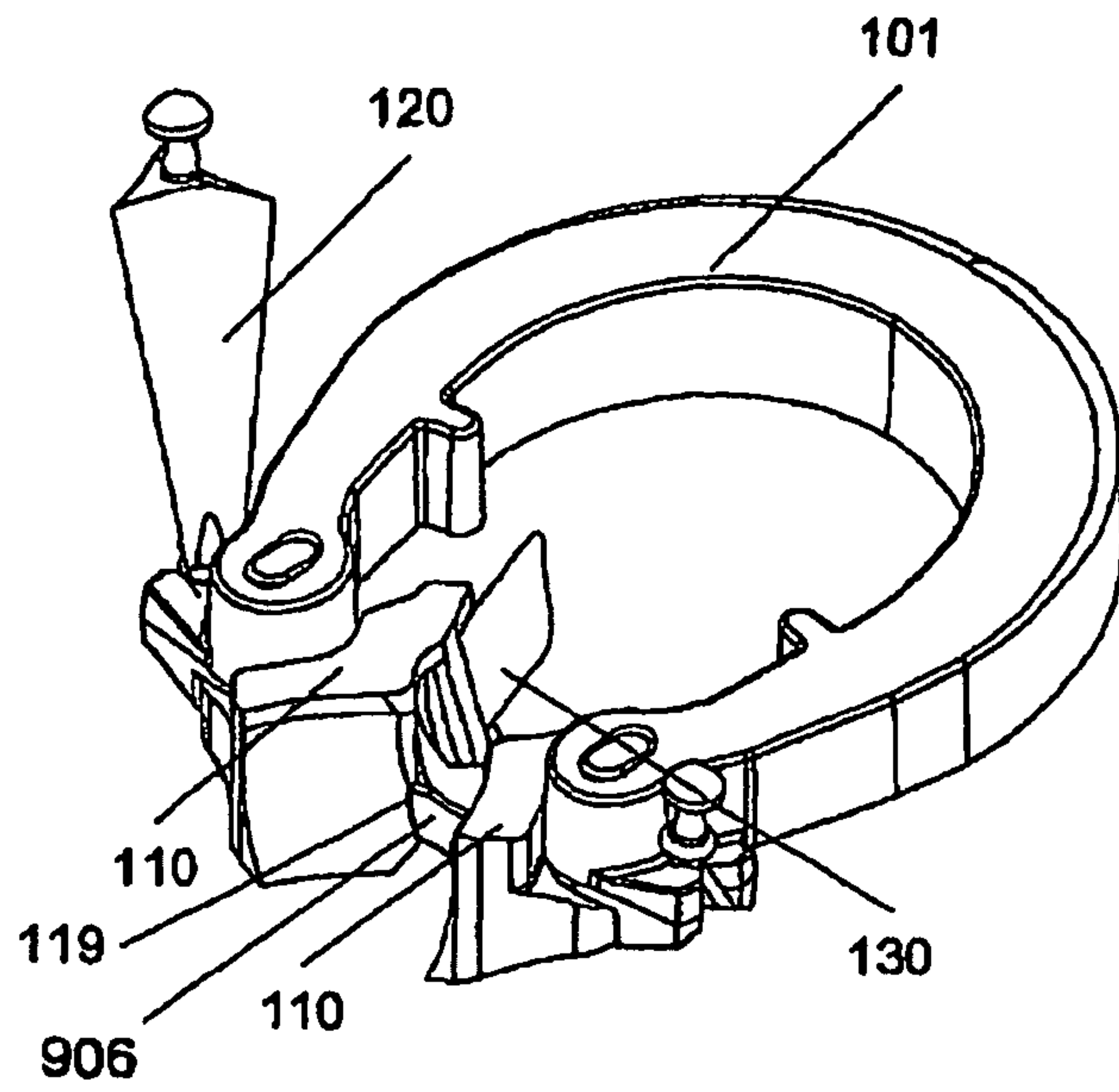


Figure 1

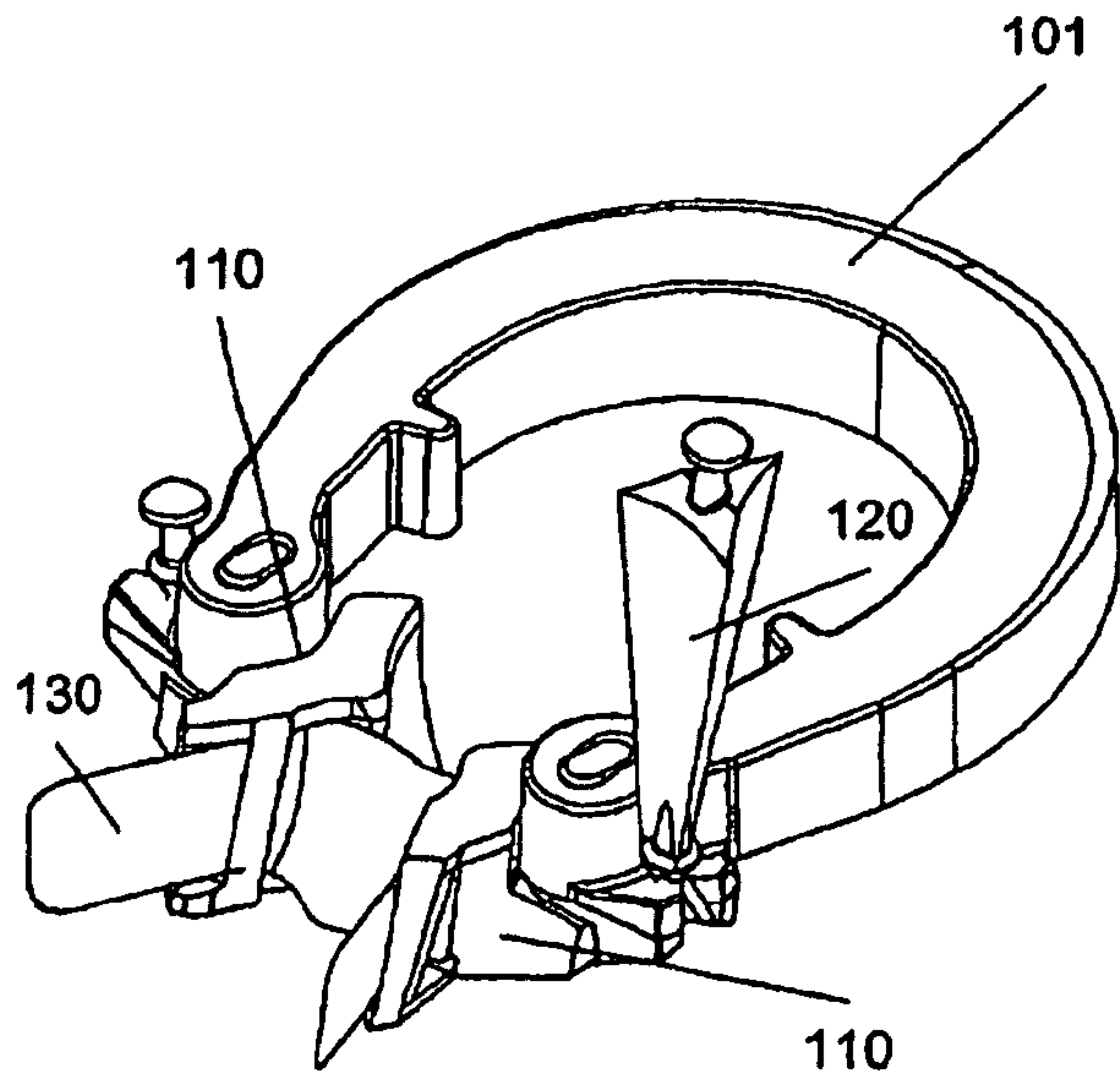


Figure 2

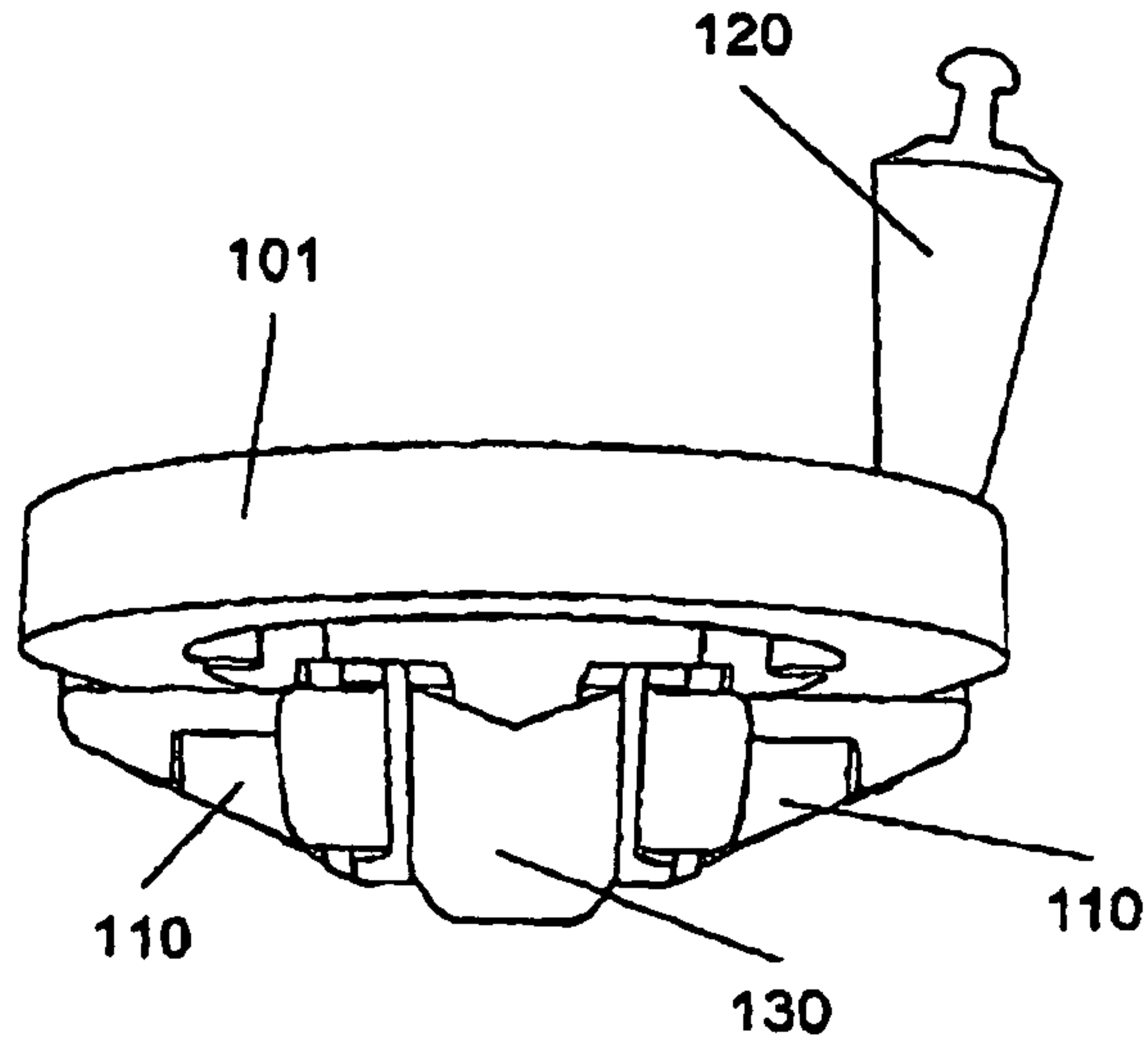


Figure 3

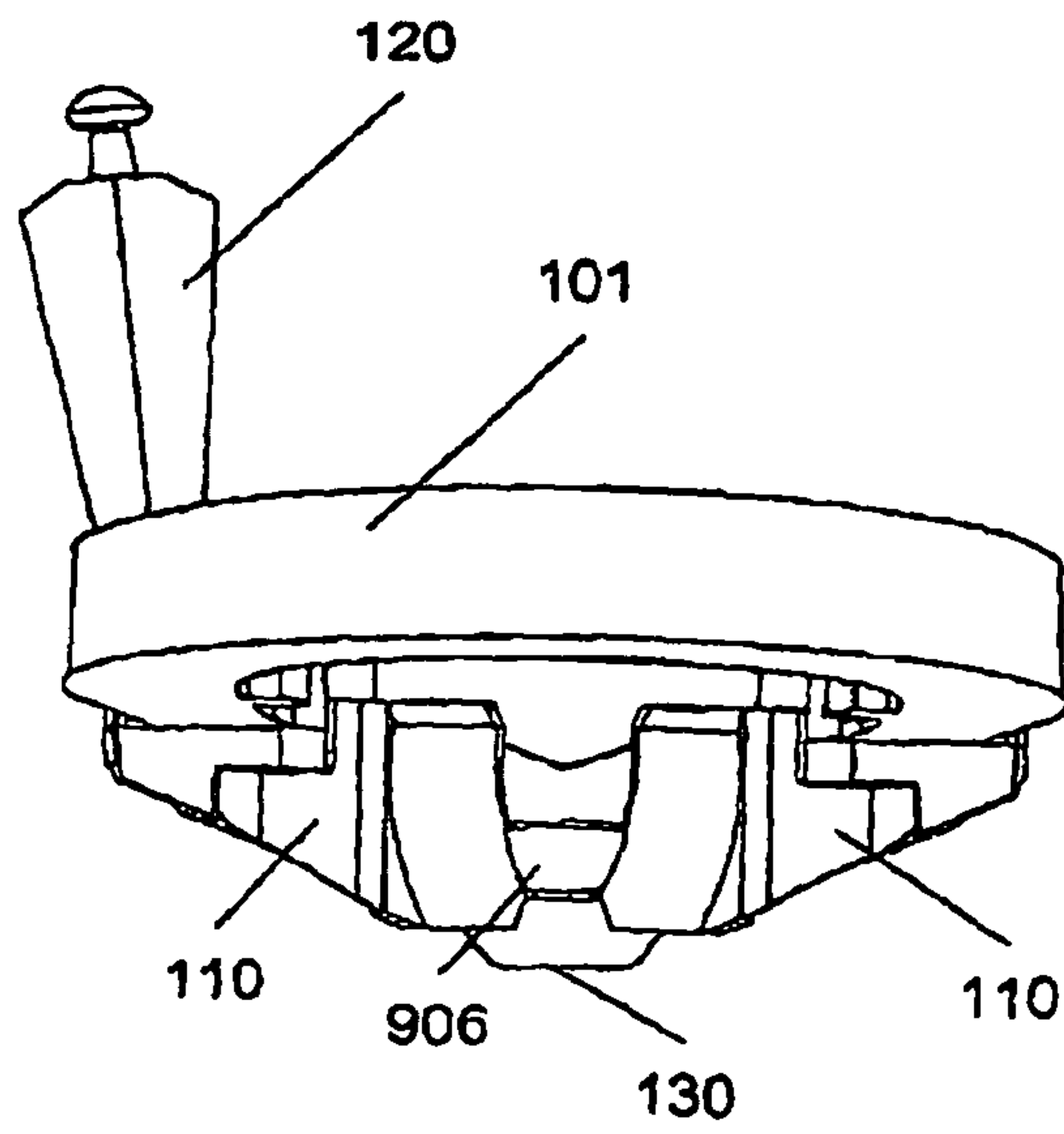


Figure 4

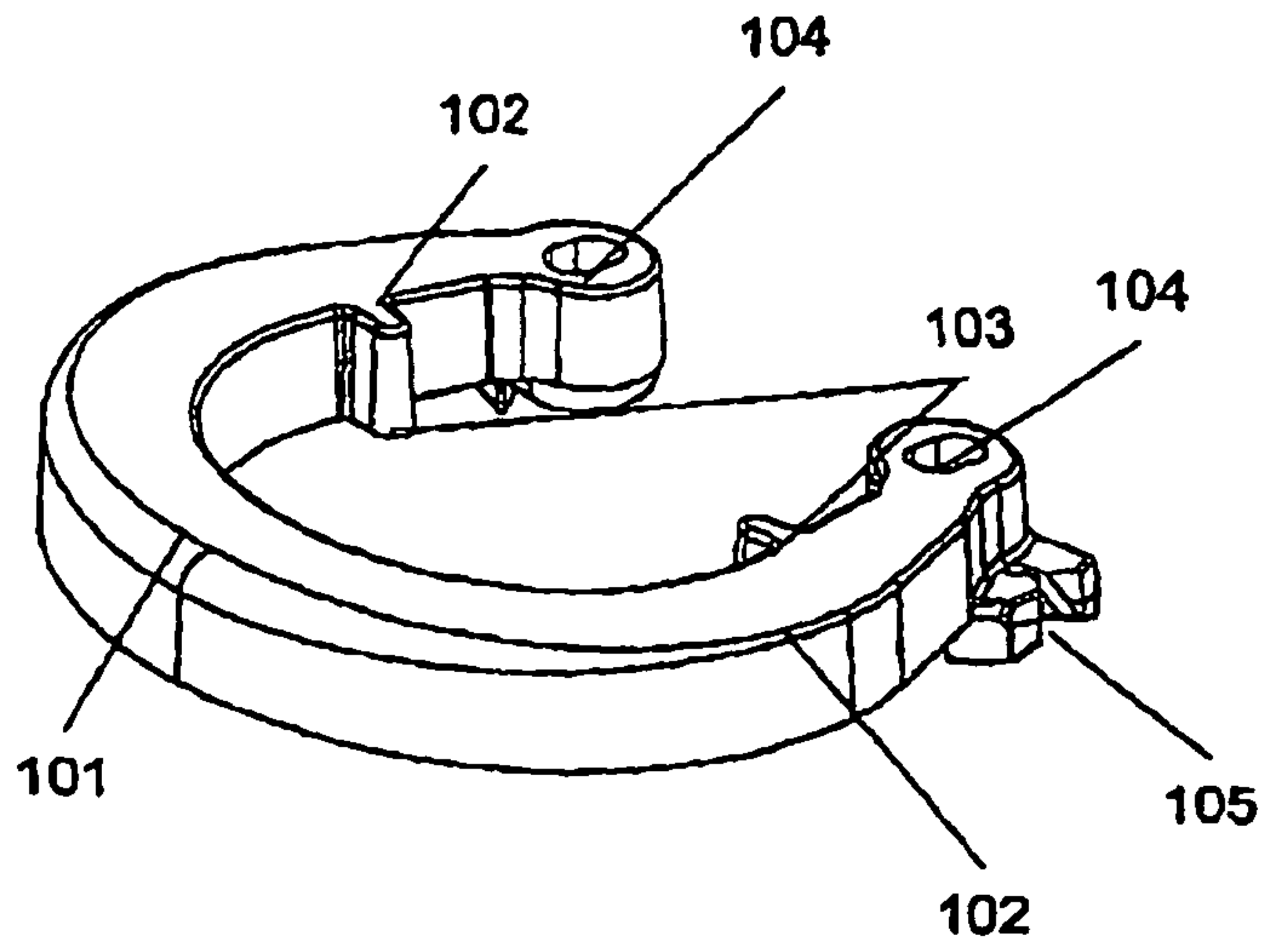


Figure 5

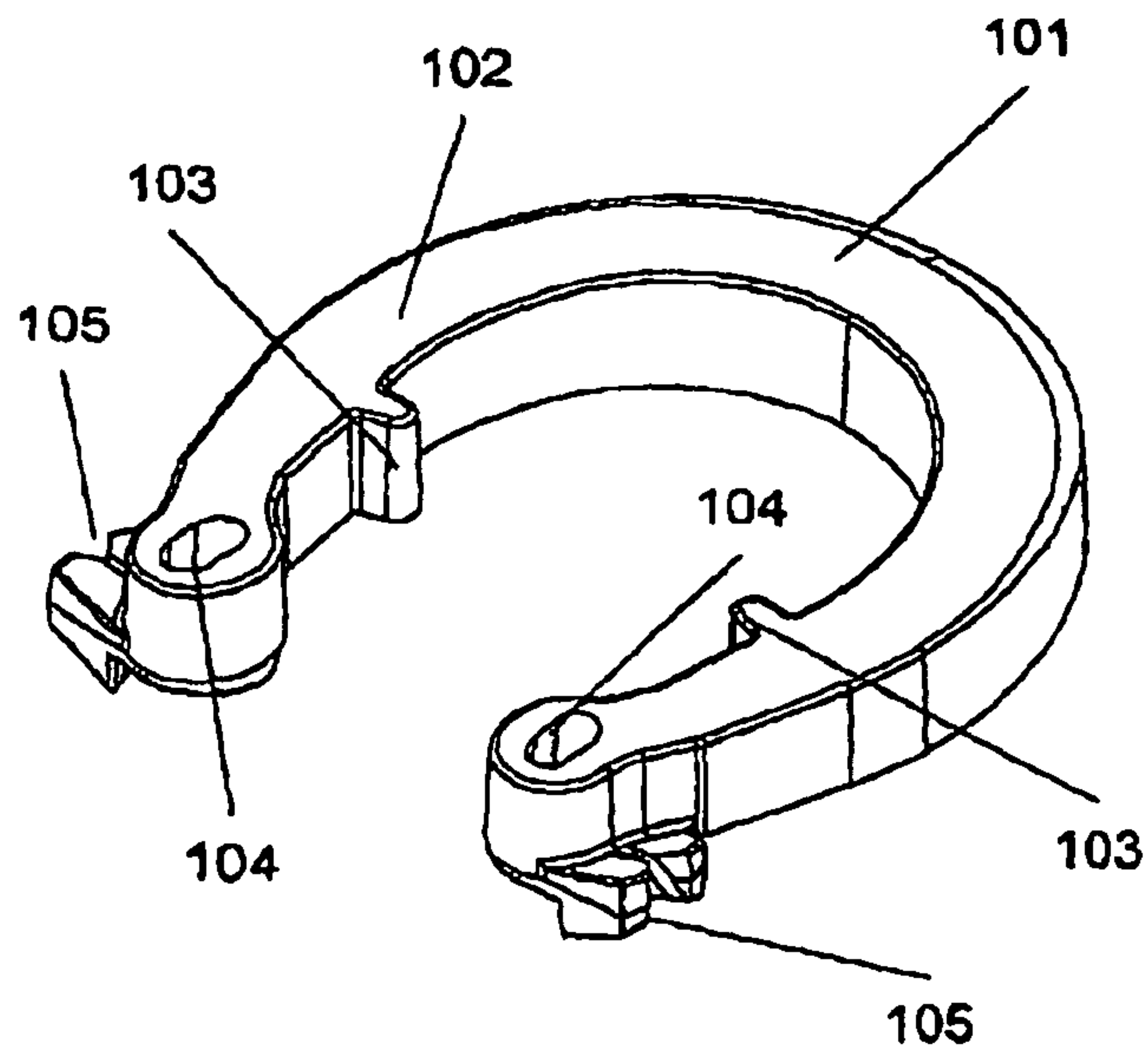


Figure 6

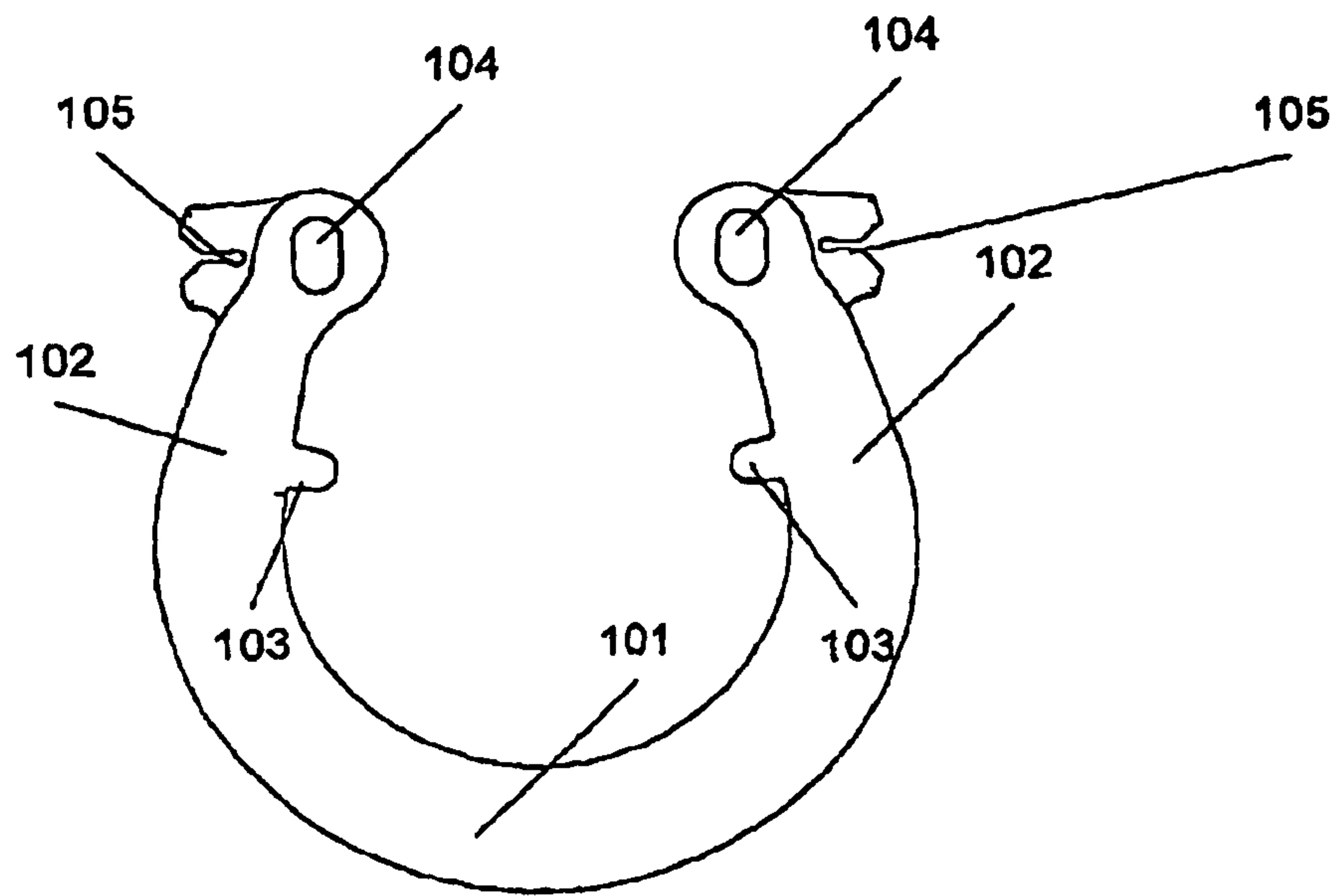


Figure 7

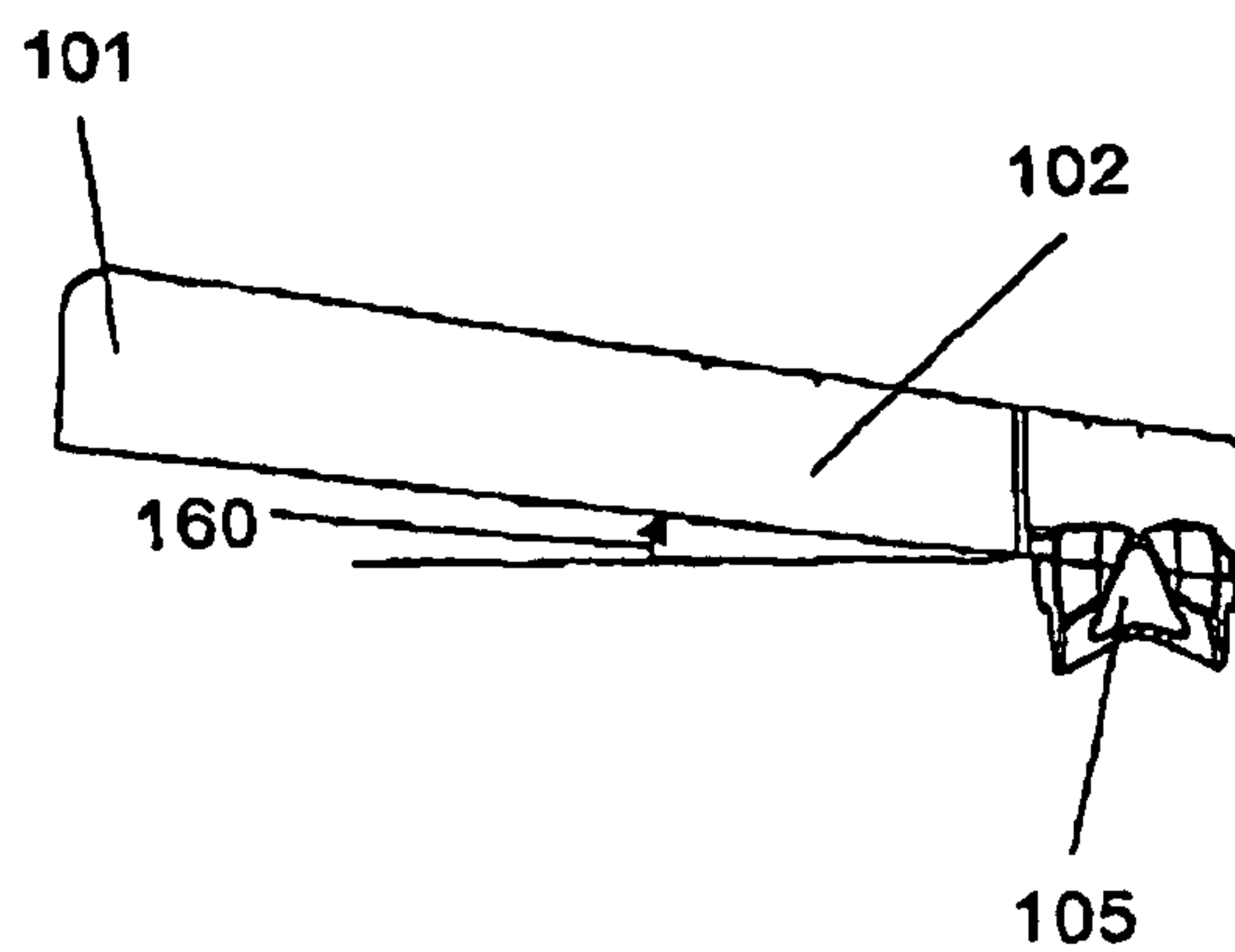


Figure 8



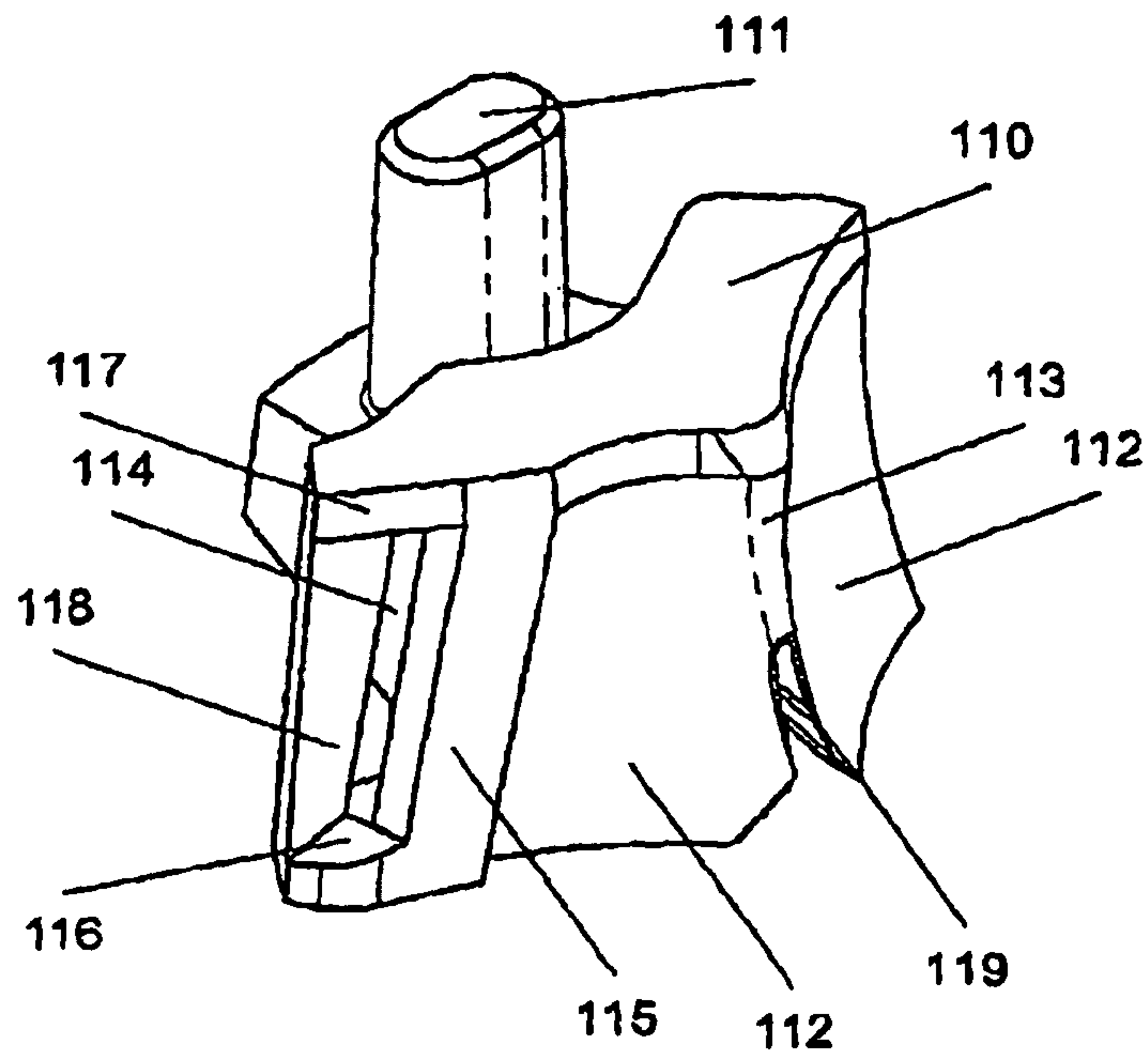


Figure 9

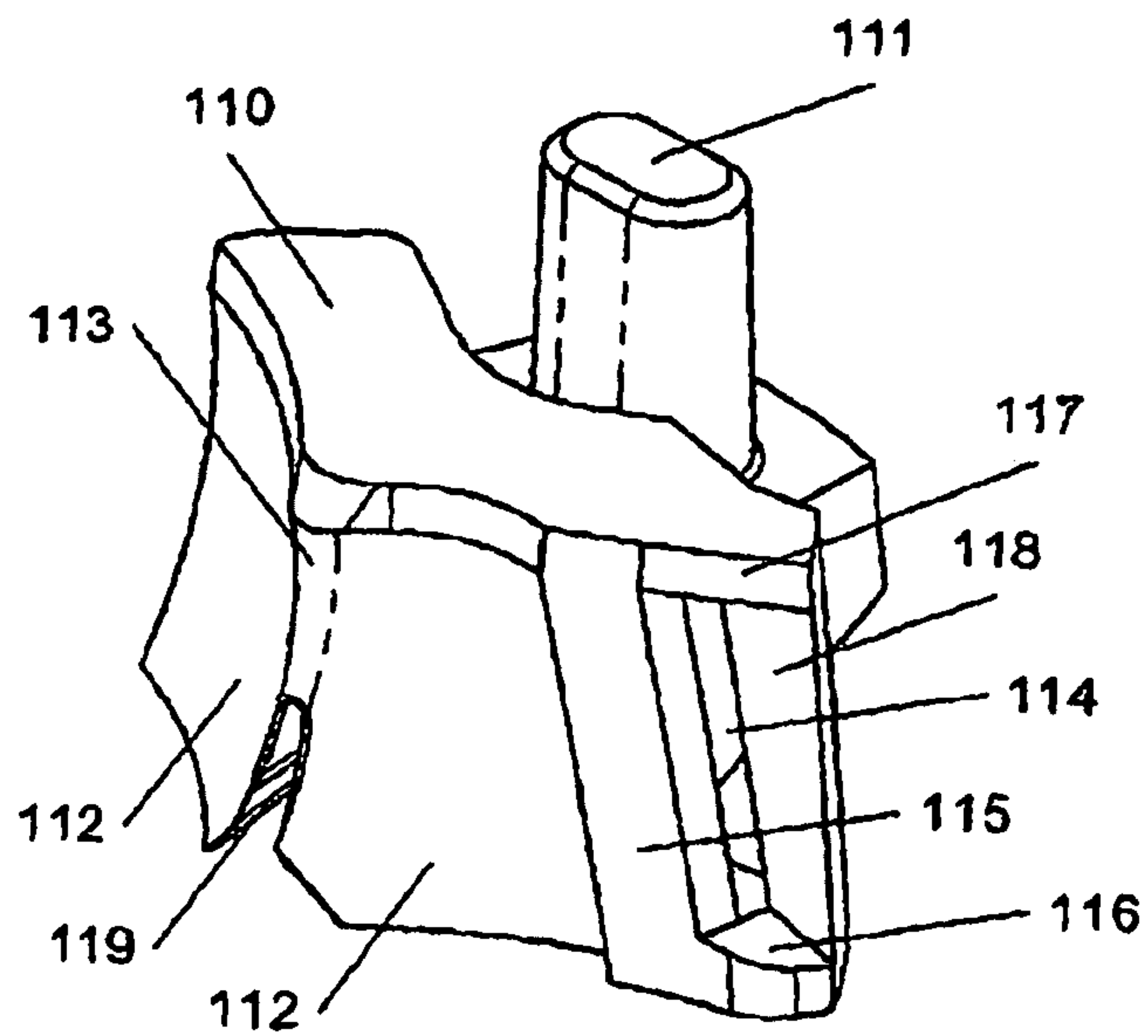


Figure 10

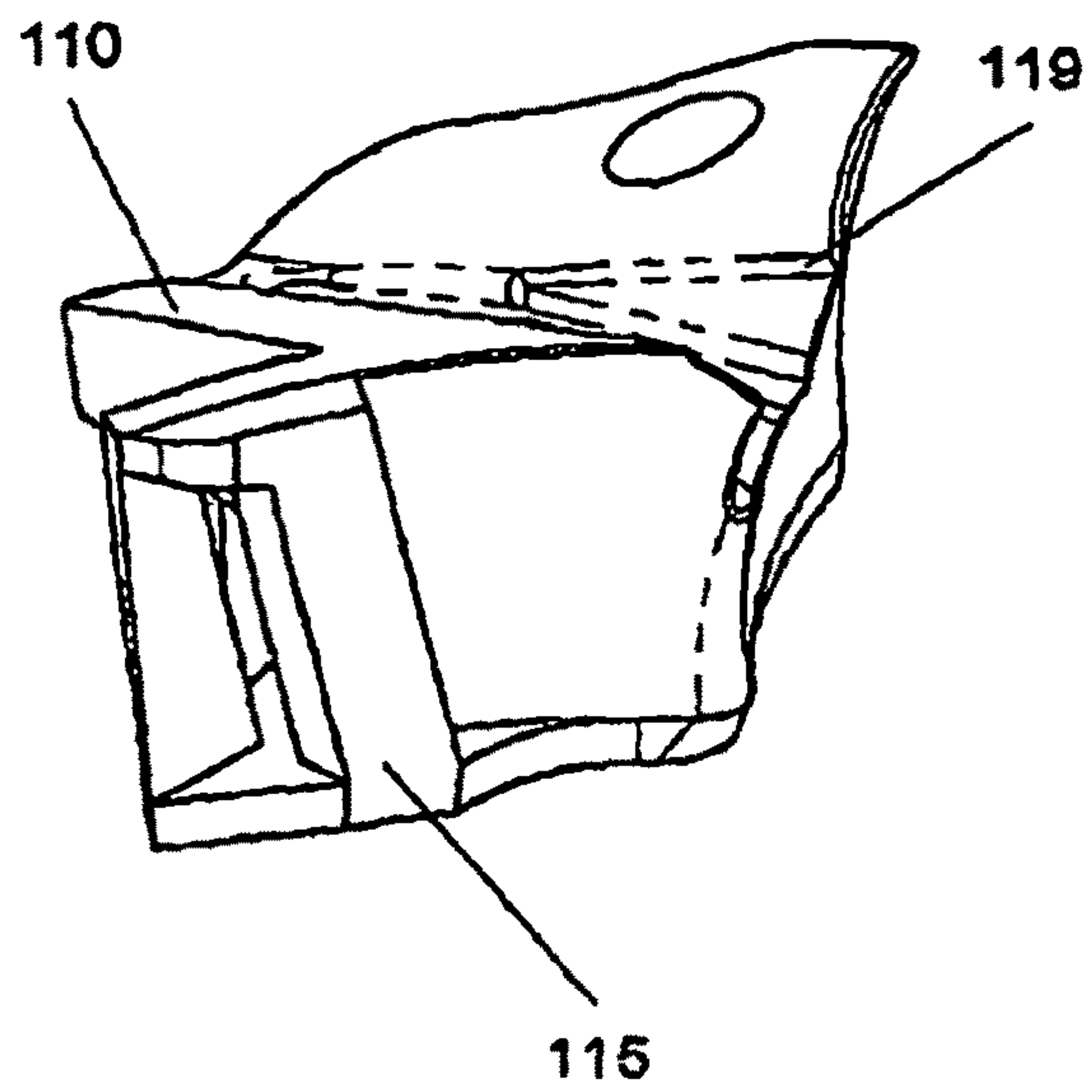


Figure 11

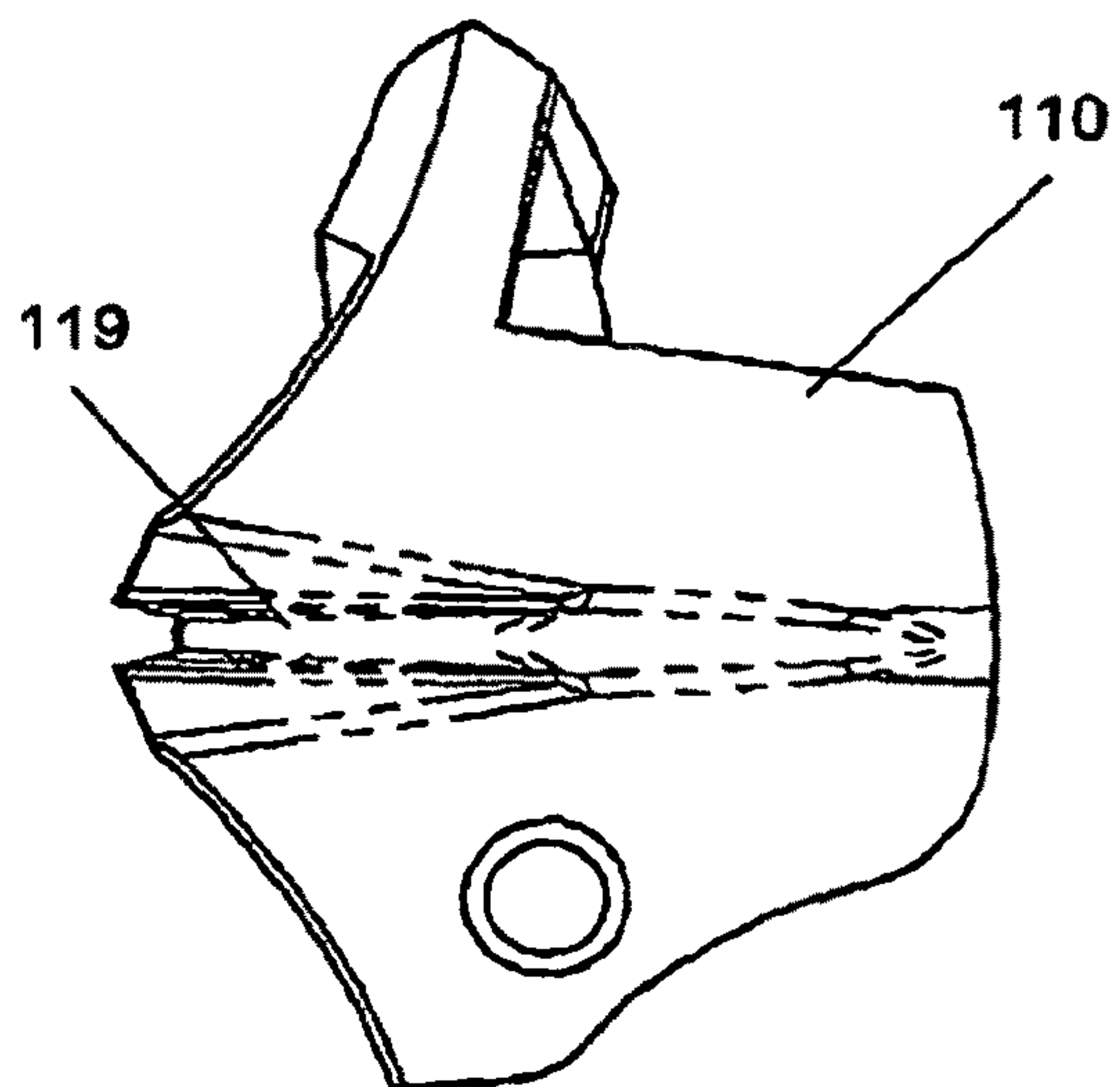


Figure 12



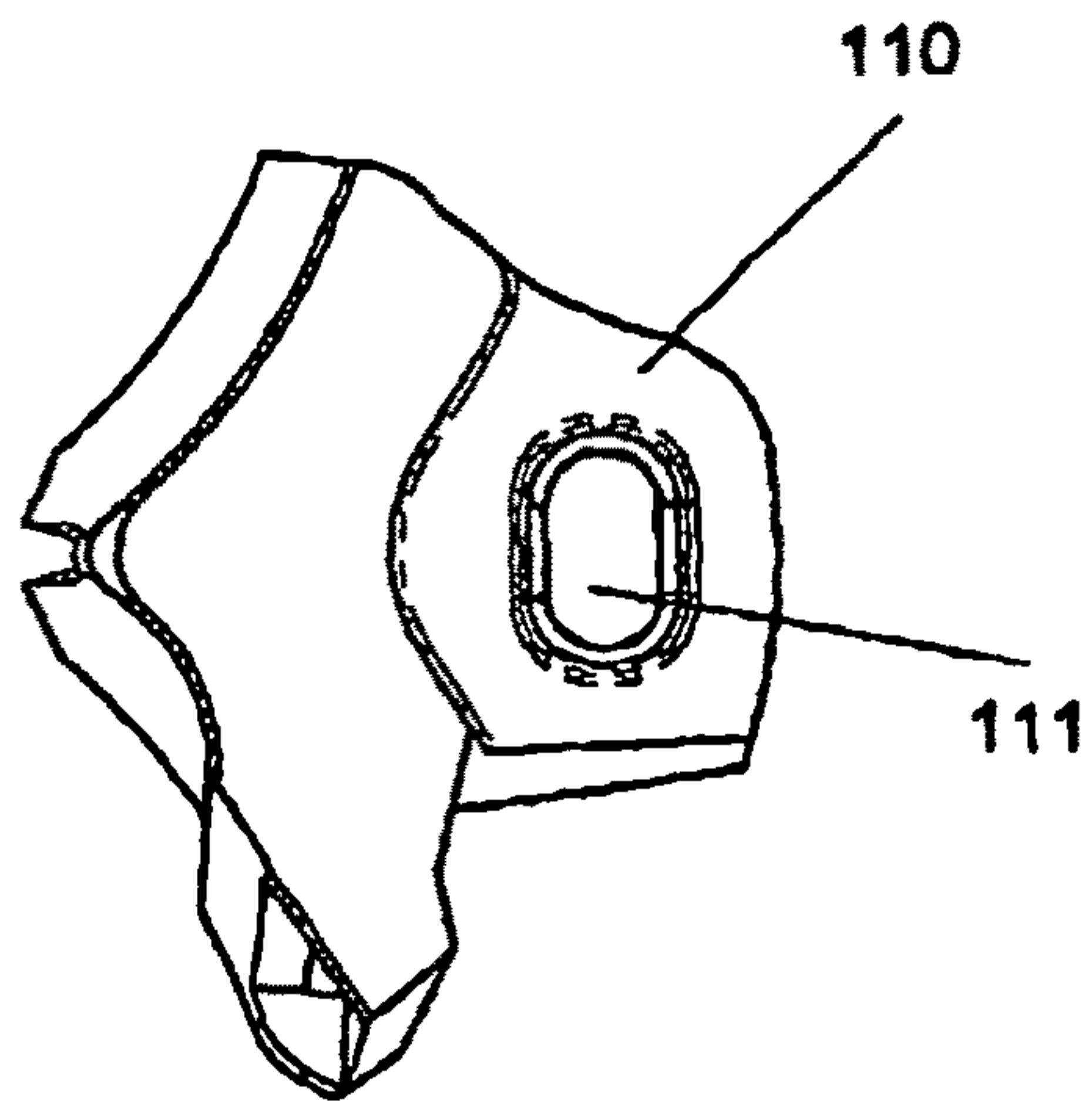


Figure 13

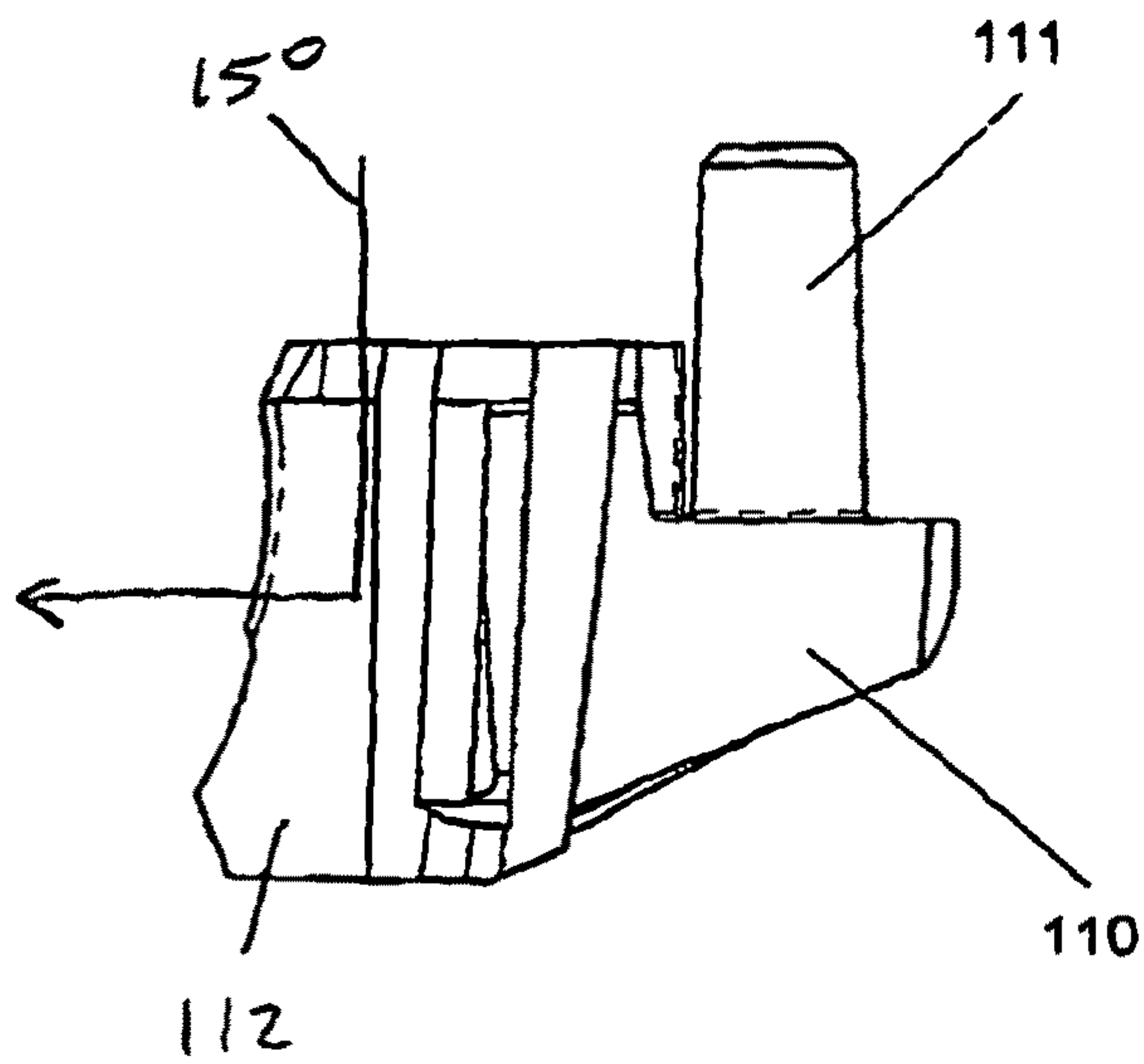


Figure 14

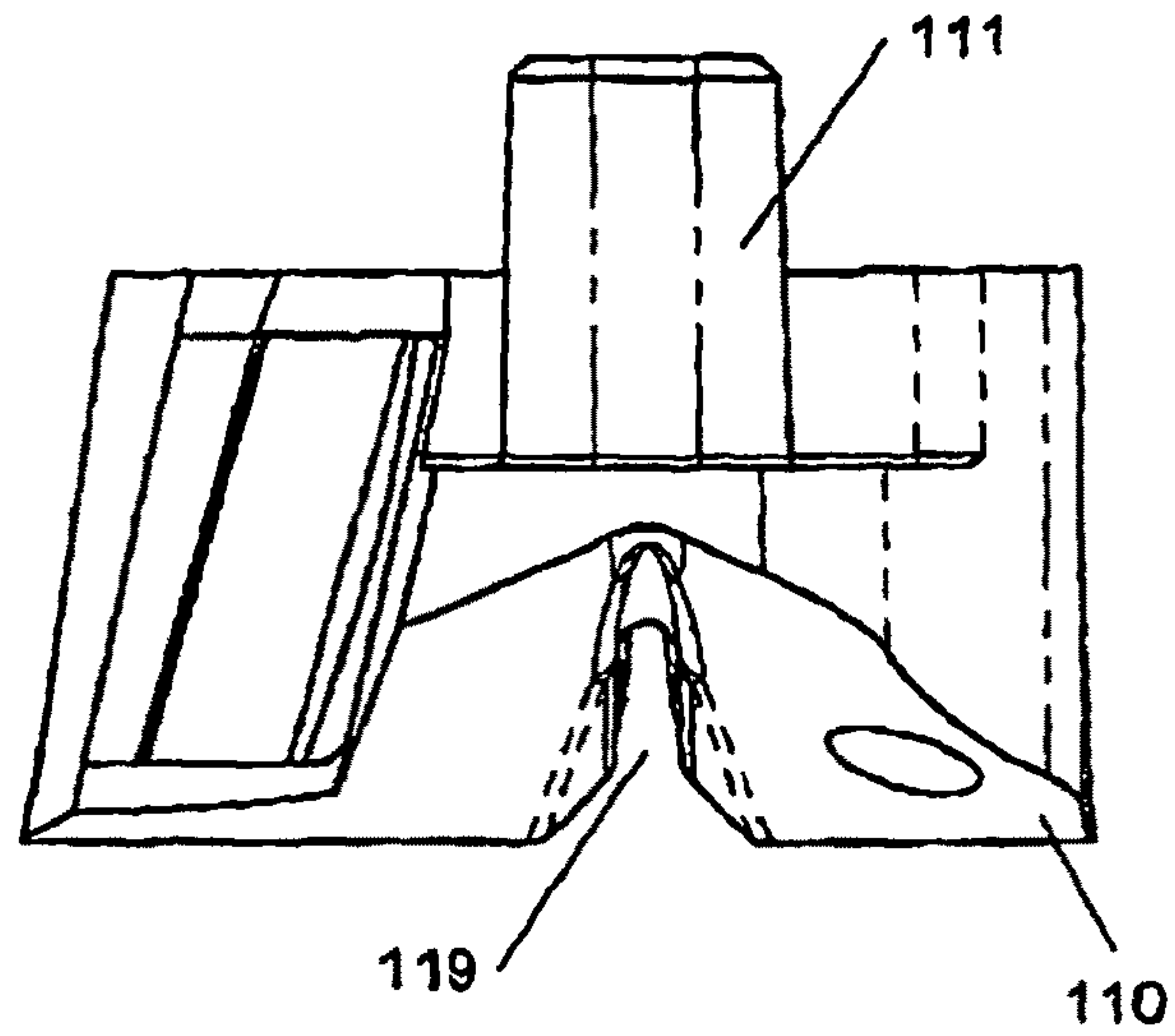


Figure 15

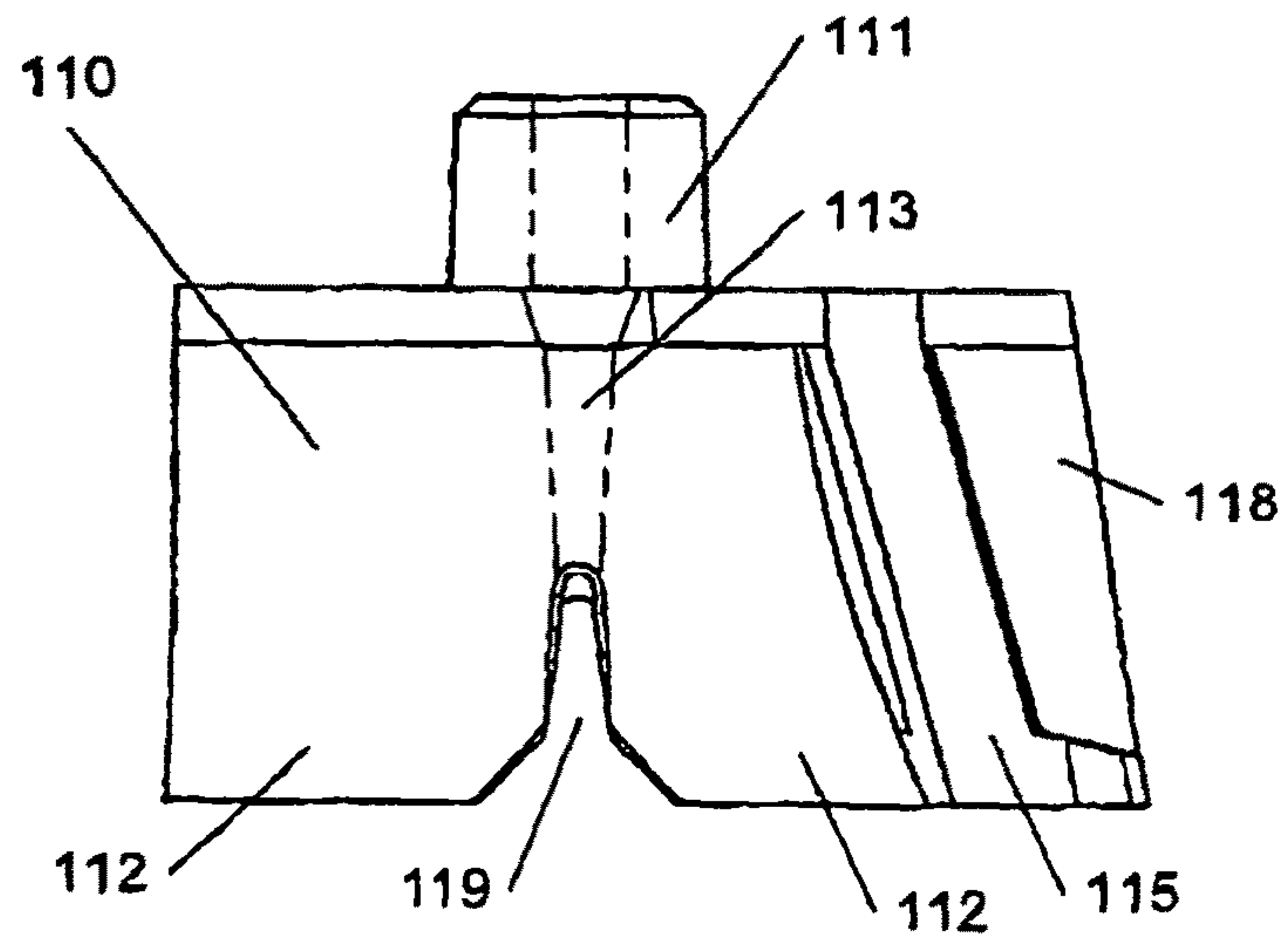


Figure 16

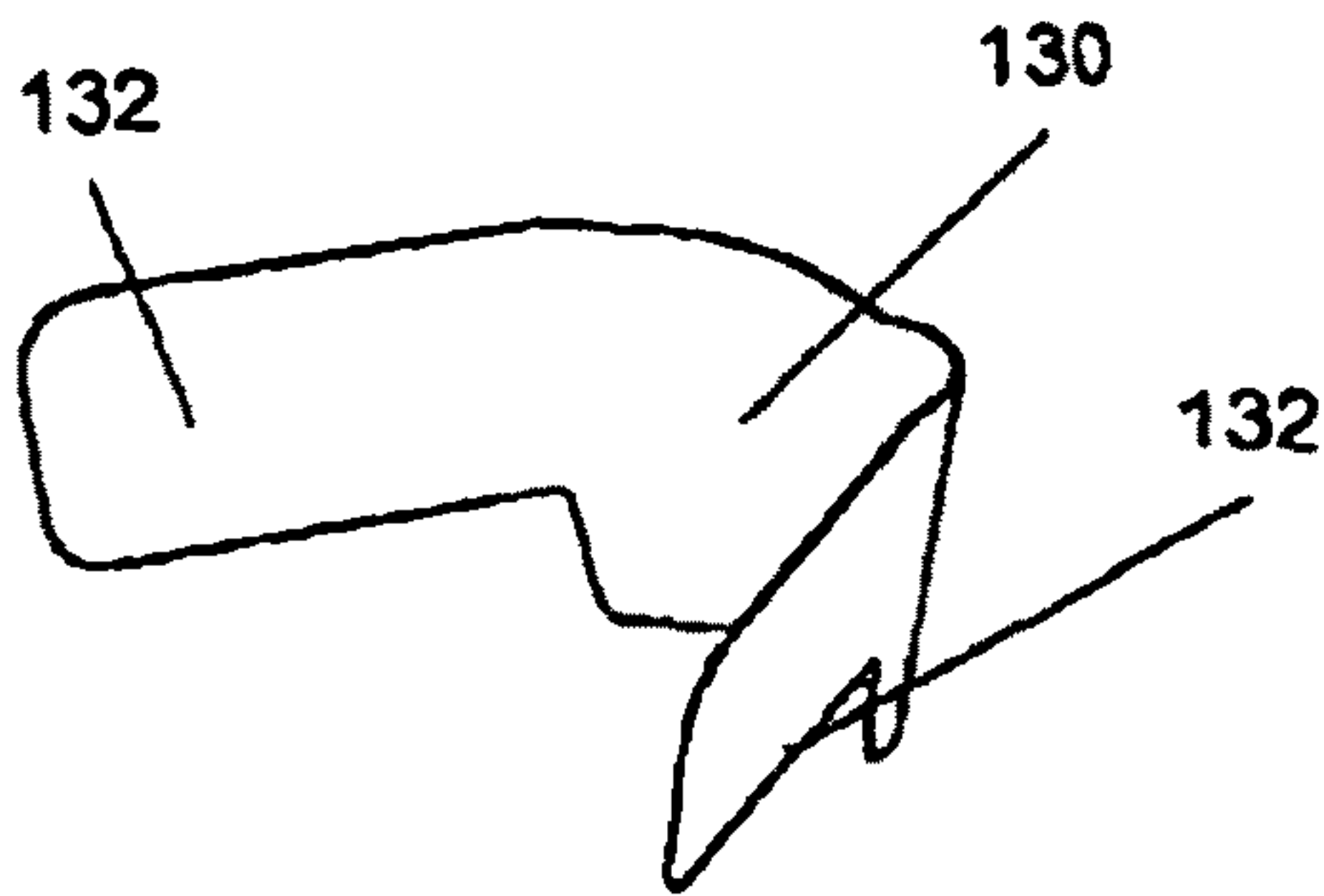


Figure 17

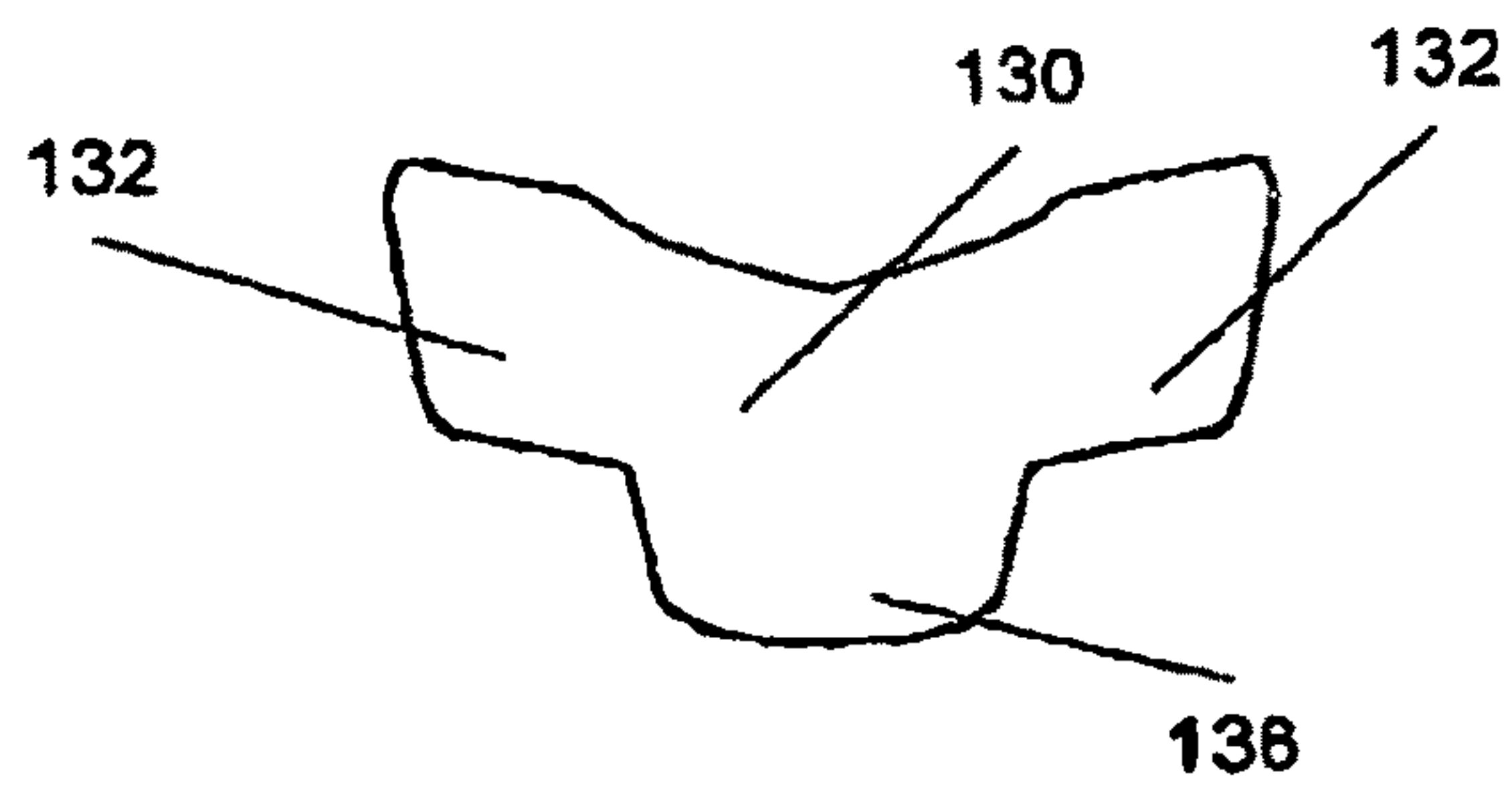


Figure 18

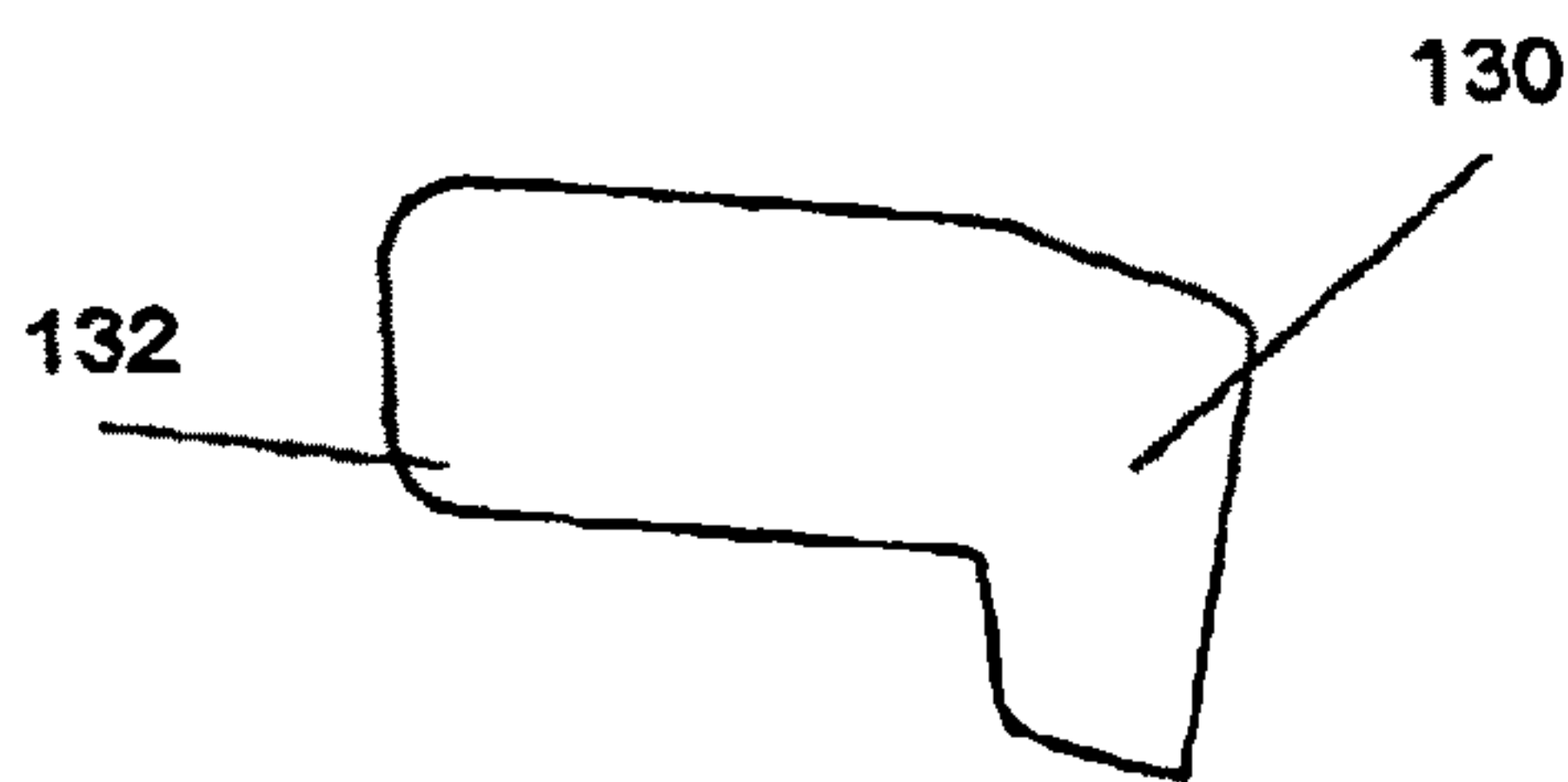


Figure 19

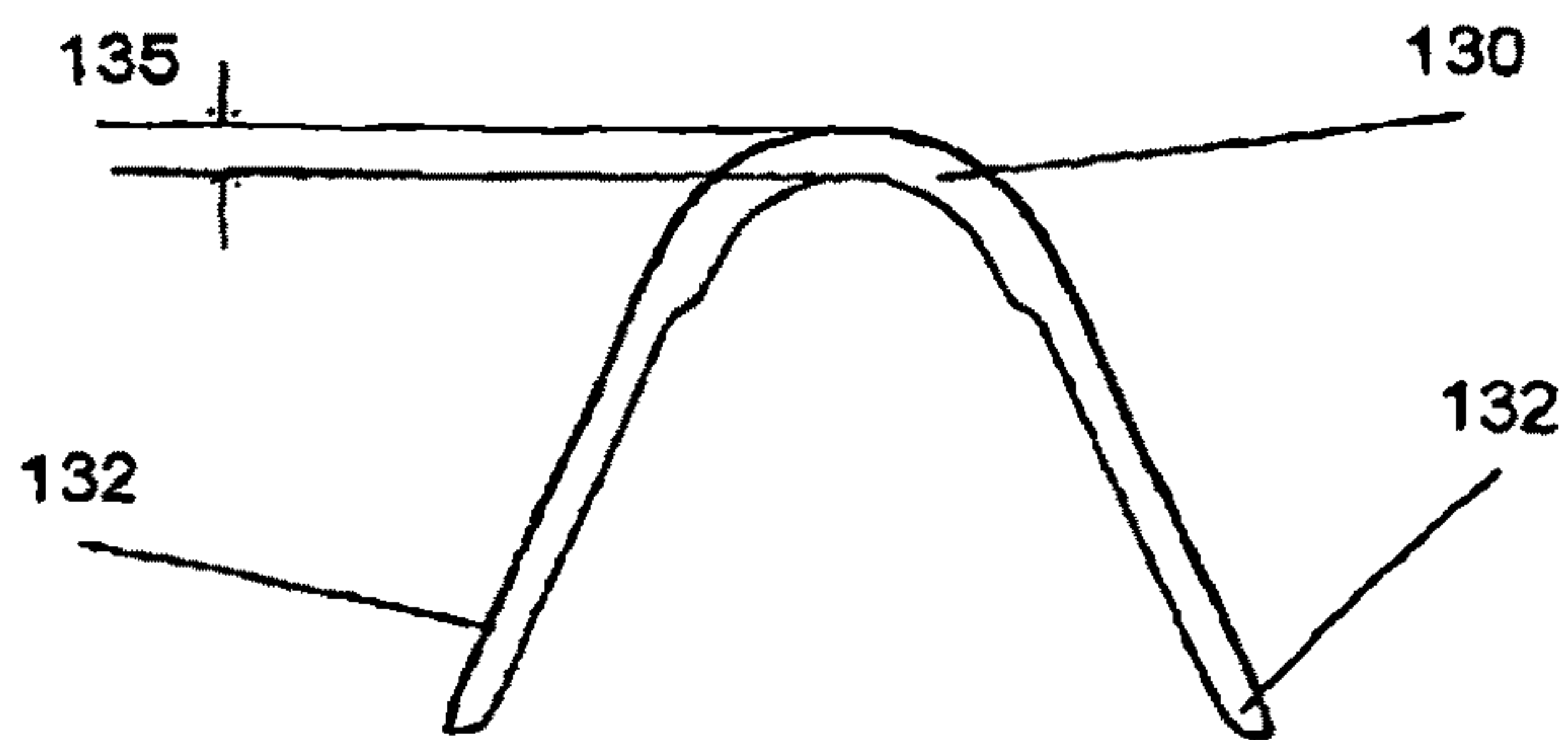


Figure 20

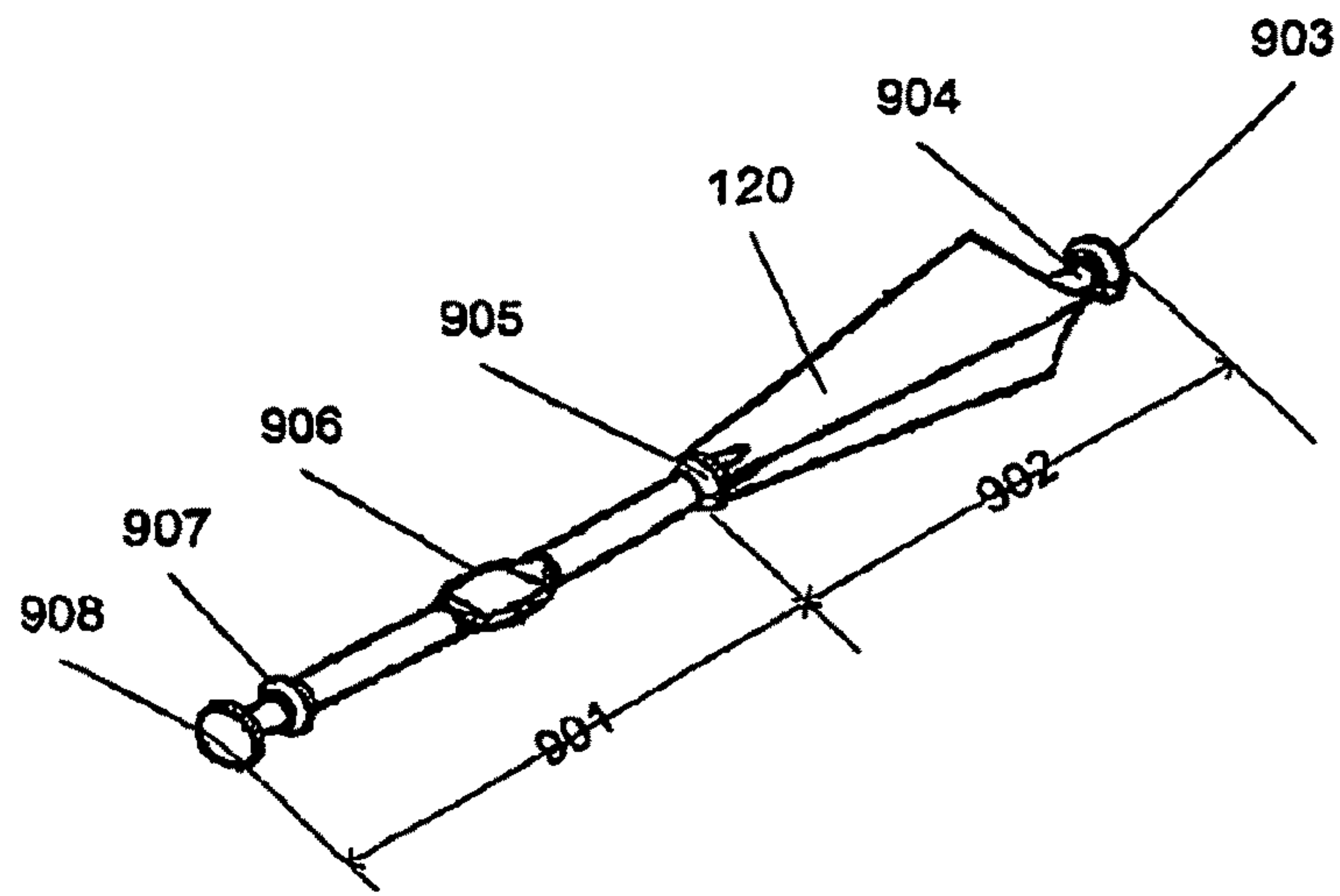


Figure 21

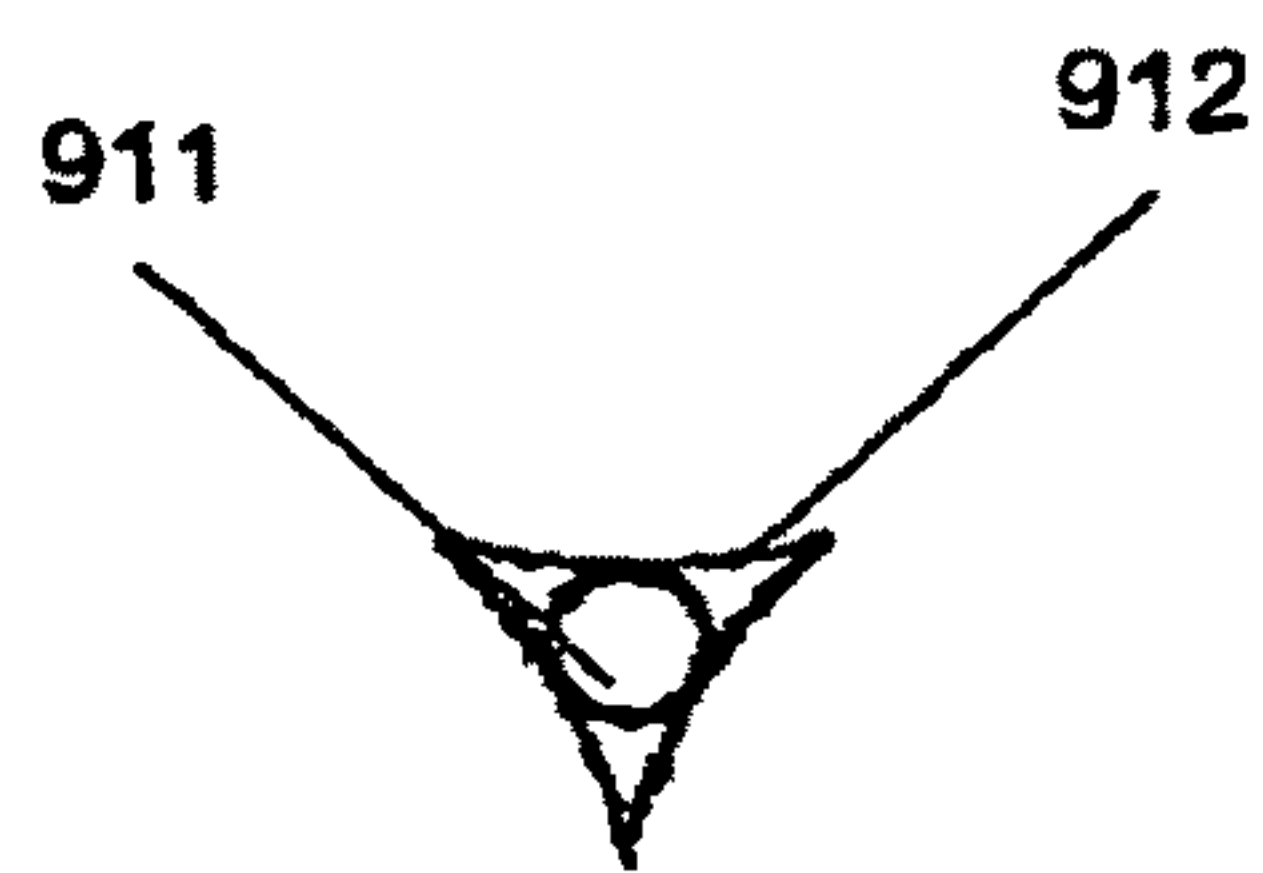


Figure 22

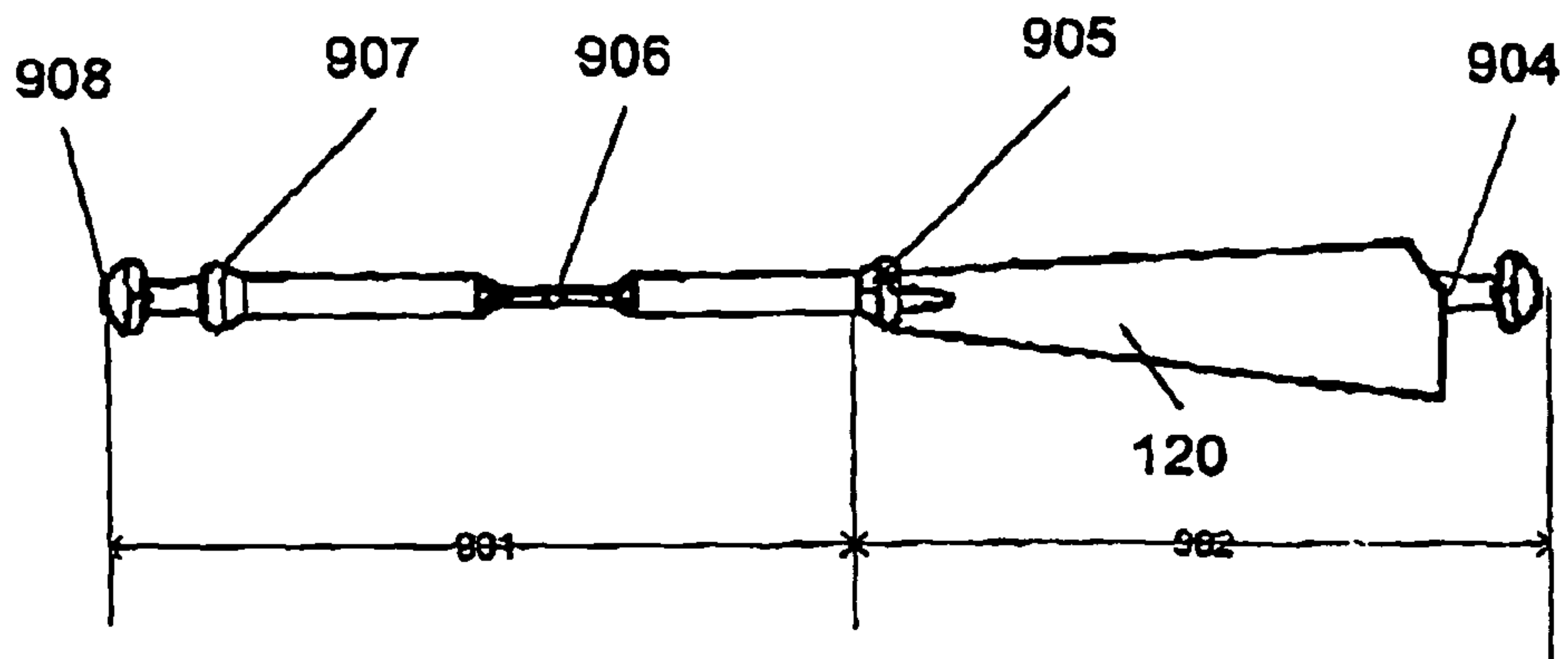


Figure 23

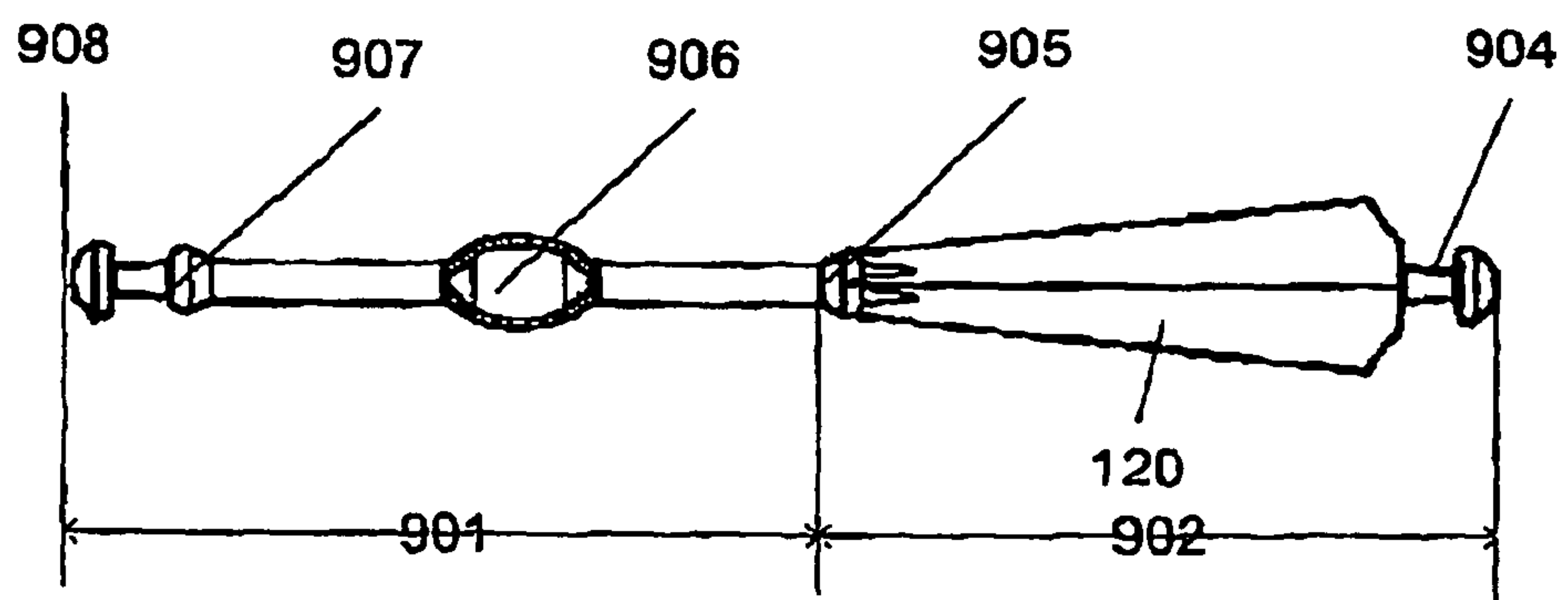


Figure 24

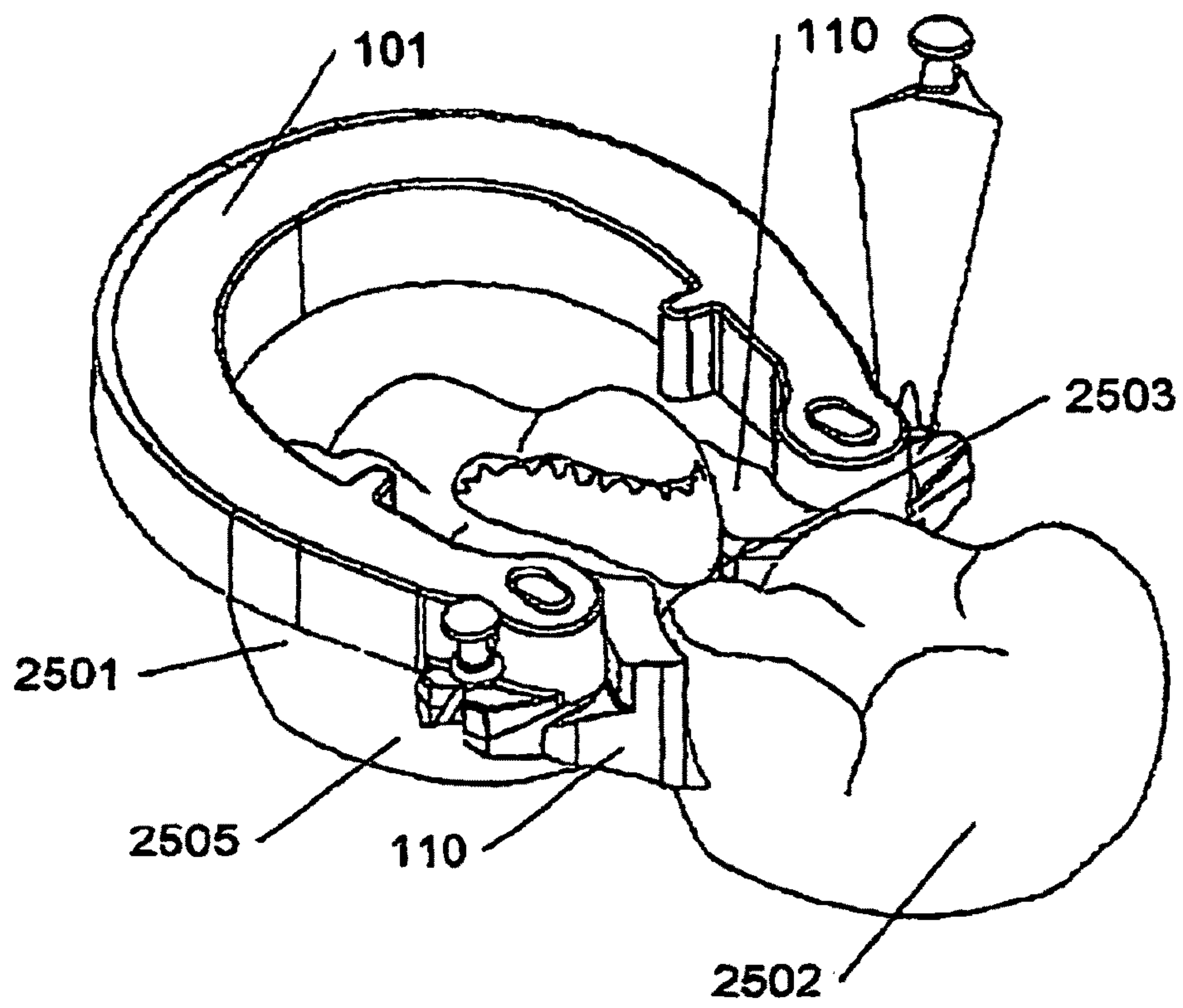


Figure 25



## DENTAL CONTACT MATRIX LIMITED

**Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue; a claim printed with strikethrough indicates that the claim was canceled, disclaimed, or held invalid by a prior post-patent action or proceeding.**

This is a nationalization of PCT/IB02/04824 filed Nov. 19, 2002 and published in English.

## 1. Field of the Invention

The present invention relates to an apparatus for the placement of dental fillings and in particular light curable dental fillings.

## 2. Summary of the Prior Art

The dental profession has moved over the last two or so decades from the use of mercury based fillings to the use of composite resins that are used to provide natural looking fillings. Composite resin is cured by the application of concentrated light. To enable the dental professional to place composite resin fillings matrixes are used. A matrix which is a device which wraps around the tooth and acts as a mould to contain the composite resins before they are cured. Matrixes are generally formed of plastic or stainless steel and are either circumferential or sectional. Sectional matrixes fit only in one proximal area of the tooth while circumferential matrix bands fit around the entire circumference of the tooth. In the prior art matrixes are secured in place by the use of wedges and/or clamps. Wedges are generally made of wood or plastic and are placed between the matrix and an adjacent tooth. Wedges are used to hold the matrix against the tooth being filled and to temporarily separate the tooth being filled and the adjacent tooth.

In the prior art wedges and other matrix support means are used to hold the matrixes in place. The use of separate components makes it cumbersome to place matrixes and requires the dental professional to undertake multiple steps in order to secure the matrix.

## SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a system for securing dental matrixes which is an improvement on the prior art systems and devices or which will at least provide the industry with a useful choice.

In a first aspect the present invention consists in a retainer for placing and retaining a matrix in a dental contact matrix system, and for use in conjunction with an elastic "wedge", said retainer comprising:

a first lug, to fit on one side of a proximal contact between two teeth,

a second lug to fit on the other side of said proximal contact,

a spring member connecting between said first lug and said second lug, said spring member holding said lugs such that they must be separated to fit over said proximal contact, wherein the spring member applies a restorative force pressing said lugs against opposed sides of said proximal contact, and

means for receiving and holding an elastic wedge in a stretched condition to span between said first lug and said second lug.

Elastic "wedge" refers to any resilient elastic member for introduction into the inter-proximal space between two teeth

in a stretched condition, subsequent release of the stretched condition leading to a lateral expansion of the wedge within the inter-proximal space.

In a second aspect the present invention consists in a dental contact matrix system including a retainer for placing and retaining a matrix in a dental contact matrix system, an elastic "wedge" and a matrix, said retainer comprising:

a first lug, to fit on one side of a proximal contact between two teeth and

a second lug to fit on the other side of said proximal contact,

a spring member connecting between said first lug and said second lug, said spring member holding said lugs such that they must be separated to fit over said proximal contact, wherein the spring member applies a restorative force pressing said lugs against opposed sides of said proximal contact, said elastic wedge being held in a stretched condition spanning between said first lug and said second lug.

In a third aspect the present invention consists in a retainer for placing and retaining a matrix in a dental contact matrix system, and for use in conjunction with an elastic "wedge", said retainer comprising:

a first lug, to fit on one side of a proximal contact between two teeth,

a second lug to fit on the other side of said-proximal contact,

a first matrix support member positioned to retain a matrix against said first lug,

a second matrix support member positioned to retain a matrix against said second lug, and

a spring member connecting between said first lug and said second lug, said spring member holding said lugs such that they must be separated to fit over said proximal contact, wherein the spring member applies a restorative force pressing said lugs against opposed sides of said proximal contact.

This invention may also be said broadly to consist in the parts, elements and features referred to or indicated in the specification of the application, individually or collectively, and any or all combinations of any two or more of said parts, elements or features, and where specific integers are mentioned herein which have known equivalents in the art to which this invention relates, such known equivalents are deemed to be incorporated herein as if individually set forth.

## BRIEF DESCRIPTION OF THE DRAWINGS

One preferred form of the present invention will now be described with reference to the accompanying drawings in which;

FIG. 1 is a three-dimensional view of the dental matrix system according to the present invention.

FIG. 2 is a three-dimensional view of the dental matrix system according to the present invention showing the lugs mounted an alternative way.

FIG. 3 is an end view of the dental contact matrix system of the present invention.

FIG. 4 is an alternative end view of the dental contact matrix system of the present invention.

FIG. 5 is a three-dimensional view of the spring of the present invention.

FIG. 6 is an alternative three-dimensional view of the spring of the present invention

FIG. 7 is a top plan view of the spring of the present invention.

FIG. 8 is a side view of the spring of the present invention.

FIG. 9 is a three dimensional view of one of the lugs of the present invention.



FIG. 10 is a three dimensional view of the other lug of the present invention.

FIG. 11 is a three dimensional view of the lug of the present invention viewing the lug from the bottom.

FIG. 12 is a plan view of the bottom of the lug of the present invention.

FIG. 13 is a top plan view of the lug of the present invention.

FIG. 14 is a side view of the lug of the present invention.

FIG. 15 is a back-view of the lug of the present invention.

FIG. 16 is a front view of the lug of the present invention.

FIG. 17 is a three dimensional view of the matrix of the present invention.

FIG. 18 is a front view of the matrix of the present invention.

FIG. 19 is a side view of the matrix of the present invention.

FIG. 20 is a top plan view of the matrix of the present invention.

FIG. 21 is a three dimensional view of the wedge of the present invention.

FIG. 22 is an end view of the wedge of the present invention.

FIG. 23 is a side view of the wedge of the present invention.

FIG. 24 is an alternative side view of the wedge of the present invention.

FIG. 25 shows the contact matrix dental system of the present invention in place.

#### DETAILED DESCRIPTION OF THE PRESENT INVENTION

Referring to FIGS. 1 and 4 there is shown the dental contact matrix system according to the most preferred embodiment of the present invention. The dental contact matrix system includes a retainer with a spring 101 and two lugs 110 attached to the spring 101. A matrix 130 is held in place by lugs 110 and an elastic wedge 120 is wrapped under the two lugs 110 and the spring 101.

The retainer includes means for receiving and holding the elastic wedge in a stretched condition. The preferred means include a guide on each lug in the form of channels 119. Preferably the means also include a wedge engagement associated with each lug. In the preferred embodiment these are cleats 105.

Referring to FIG. 7 spring 101 is generally semi circular or U-shaped in plane view. Referring to FIGS. 5 to 8 the spring has two arms 102 under tension. The arms 102 require force to push them apart. The dental professional pushes the arms 102 apart using rubber dam forceps or another similar tool. Each arm 102 has a protrusion 103 to stop the rubber dam forceps from slipping while they are used to expand the spring 101. Each arm 102 has an oval shaped hole or socket 104 to enable the lugs 110 to be attached to the spring 101. The use of an oval shape hole 104 prevents the lugs from rotating relative to the arms 102. A channel 105 in each arm allows for the elastic wedge 120 to be attached to the spring 101 and cleated. The channel 105 includes a narrow neck through which narrow sections of the wedge can squeeze. Many alternative forms of connection for the ends of the wedge to the retainer can also be envisaged, including connection to the lugs rather than the spring member. However with lugs that are not integral with the spring member, the present form provides the advantage that the

elastic wedge also serves to secure the lugs to the spring member when assembled Spring 101 is formed of material such as plastic or metal.

Referring to FIGS. 9 to 16 the lugs 110 are connected to the spring 101 by an oval shaped plug or dowel 111 that fits into the socket 104 in the arms 102 of the spring 101. Each lug 110 is detachable from the spring 101 but in use each lug is attached to a spring arm 102. The lugs are mirror images of each other. FIG. 9 shows one lug 110 and FIG. 10 shows the mirror image lug. In the preferred embodiment each lug 110 is wedge shaped to enable it to fit in proximal contact between two teeth.

Lug faces 112 in use abut the tooth being filled and the neighbouring tooth. The lug faces are in the preferred embodiment concave so as to adapt to the inter-proximal space between teeth. A ridge 113 at the intersection of the faces projects into the inter-proximal space between the two teeth. In use one lug fits on the lingual side and the other lug on the buccal side.

The lugs 110 connect to the spring 101, so that in general the placement of the spring path is substantially perpendicular to the line of ridge 113. However the sockets 104 in the spring are offset at an angle 160 shown in FIG. 8 so that the spring slopes up slightly from perpendicular. This enables the spring in use to be above neighbouring teeth to the tooth being filled. In an alternative embodiment the lugs could be taller so that the spring would clear neighbouring teeth. The path and position of the spring allow unobstructed viewing of the proximal contact.

Each lug 110 has a matrix holder to hold the matrix 130 in place. In the preferred embodiment the holder is a slot 114 used to retain the matrix 130. A support member 115 and a bottom 116 and top ledge 117 create the slot and retain the matrix 130. The support member 115 retains the matrix 130 against the tooth abutting face 112. A top ledge [115] 117 enables pressure to be applied to the matrix 130 as the matrix is inserted into the inter-proximal space. The top ledge, [115] 117 runs from the support member 115 towards the ridge 113.

The matrix 130 is able to horizontally slide within the slot 114 in the lugs 110. A further support member 118 aids in the retention to the matrix 130 by increasing the resistance to the matrix falling out of the slot. To increase the resistance the face of the support member 118 that contacts the matrix 130 is further towards the face of support member 115 that contacts the matrix than the face 112 of the lug 110, requiring the matrix to follow a controlled path between them.

The lugs 110 additionally have a channel 119 that in use runs from the ridge 113. When the lugs 110 are assembled with the spring 101 the slot is substantially perpendicular to the spring arms 102. Referring to FIG. 1 in use the wedge 120 is threaded through channels 119 of each lug to span across the gap between the lugs. Outward portions of the wedge 120 pass through channels 105 of the spring arm 102 and are cleated thereby. The channel 119 of each lug is contoured in a "V" shape to enable the wedge to be inserted or threaded into the channel.

The lugs 110 are made of acetyl but could be made of any suitable plastic or metal in particular stainless steel. In the preferred embodiment the lugs 110 are transparent to enable light used to cure acrylic filling. A light shined from above the lugs will be reflected towards the filling to be cured as shown by arrow 150 in FIG. 14.

Referring to FIGS. 21 to 24 the wedge 120 comprises a one piece member of elastic material such as rubber, polyurethane or other suitable material. In the preferred embodi-



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ment polyurethane is used as it has suitable elasticity properties but any other material that has like elasticity properties would be suitable. Suitable elasticity properties require the wedge to stretch approximately 40%. The elastic wedge **120** has an elongate narrow section marked **901** and elongate tapered section marked **902**. The narrow section **901** is a cylindrical section as seen in FIG. **22**. The narrow section **901** has a diameter of 0.5 to 1.5 and a length of 10 to 15 millimeters. In an alternative embodiment an oval or other cross sectional shape could be used, but it is preferred that the shape is in general "round". For example in the preferred circular form it has an aspect ratio of 1, and the minimum perimeter squared to area ratio of  $4\pi$ .

The elongated tapered section **902** has a maximum thickness of 3 to 5 millimeters and an approximate length of 10 to 15 millimeters. In the preferred embodiment the cross section shown in FIG. **22** is an equilateral triangle but any triangular or other shape would be also be suitable. In the preferred embodiment the faces of the tapered section are concave.

At the end of the elongated taper section **902** at the point where it joins the elongated narrow section **901** there is an integrated bead **905** which is wider than the elongated narrow section **901**. At the free end of the elongated tapered section **902** there is a small elongated narrow section **904** and intrinsic bead **903**. The integrated bead **903** is wider in cross section than the narrow section **904**.

The elongated narrow section **901** has at the free end a bead **908** which is wider in cross section than the elongated narrow section. A short distance from the free end of the elongated narrow section **901** and from bead **908** there is an additional bead **907** which is wider in cross section than the elongate narrow section. In the preferred embodiment this bead is 3 to 5 millimeters from the bead **908** at the end of the narrow section **901**.

In approximately the middle of the elongate narrow section **901** there is a flattened section **906**. In its narrowest orientation flat section **906** shown in FIG. **23** has a thickness smaller than the thickness of the elongate narrow section **901**. In the broadest orientation of the flat section **906** shown in FIG. **24** the flat section **906** is wider than the thickness of the elongated narrow section **901**. In the preferred embodiment the flat section **906** of the elongated narrow section **901** is 3 to 8 millimeters long. The flat section **906** makes it easier for the dental professional to use the wedge of the present invention as it passes more easily between two teeth.

The wedge **120** is attached to the lugs **110** and the spring **101** in the following manner. The narrow section **901** is fed through the cleat **105** in a first lug **110** with head **907** above the cleat **105**. The wedge is passed across the channels **119** in the lugs **110** with the flat section **906** spanning the gap between the lugs. The flat section **906** of the wedge will only fit into the channel **119** slot one way so that the flat section **906** is parallel to the matrix **130**. This can be seen in FIG. **4**. The remaining portion of the narrow section **901** is laid across the channel **119** of the other lug **110** and forced into the cleat **105** with the bead **905** above the cleat **105**. This leaves the tapered section **902** of the wedge **120** free. The use of bulbous members or beads on the ends of the wedge makes it easier for the dental professional to grip the ends of the wedge either with fingers or with tweezers for later release.

Referring to FIGS. **17** to **20** the matrix **130** of the present invention is formed of materials such as acrylic, thermoplastic or stainless steel. Matrix **130** is formed such that an edge is shaped to conform to the contours of the inter-proximal gingival margin and in particular edge **136** which

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contacts the gum is curved outwardly from the centre of the matrix to enable the matrix to be used to file deep cavities. The thickness **135** of the matrix **130** is selected so that it is suitable for insertion inter-proximal between teeth. The thickness should be selected so that it provides sufficient rigidity to permit insertion without damage to the matrix **130**. In the preferred embodiment the matrix of the present invention is between 0.2 and 0.7 millimeters. In the preferred embodiment the matrix **130** of the present invention has wings **132** that slide into the slots **114** of the lugs **110** so that the matrix **130** is held in place on the retainer.

In the preferred embodiment the matrix **130** is made of stainless steel but brass or another suitable metal could be used. In an alternative embodiment a clear matrix or matrix that transmits light could be used. Clear matrices have the advantage that they transmit light to assist in the curing of filling. A clear matrix could be made of polyester or other suitable plastic.

The dental contact matrix system of the present invention can be assembled either with the matrix facing into the centre of the U-shape seen generally in FIG. **1** or with the matrix facing away from the U-shape seen generally in FIG. **2**. The ability to face the matrix either way makes it easier for the dental professional to use the system as the appropriate assembly for the tooth to be filled can be selected. While the present invention has been described with the spring **101** and lugs **110** as separate components it would be possible to manufacture the components as one piece.

To use the assembled contact matrix system of the present invention the dental professional expands the spring arms **102**. This also stretches the narrow section of the wedge **120**. In particular the narrow flat section **906** of the wedge **120** is stretched. The retainer is then manipulated to place the narrow section of the wedge **901** and the matrix **130** into the inter-proximal space between two teeth. When the dental professional removes the rubber dam forceps the spring **101** contracts and the lugs **110** provide pressure to hold the matrix **130** against the lingual and buccal sides of the tooth to be filled.

The dental contact matrix system of the preferred embodiment of the present invention is shown in FIG. **25** in place. The tooth to be filled **2501** and the adjacent tooth **2502** are shown. The matrix **130** and narrow portion of the wedge **120** are between the teeth in the inter-proximal space **2503**. The lugs **110** are pressing the matrix **130** (not visible) against the tooth surface **2505** thereby holding the matrix **130** in place.

Once in place the dental professional can use tweezers or another suitable tool to detach the ends of the elastic wedge from the cleats **105** of the spring **101**. Beads **908** and **903** make this process easier by preventing the tweezers from slipping off the wedge **120**.

Then using tweezers or other suitable tool, the dental professional pulls on the elongated narrow section **902** and in particular bead **908**. This pulls the tapered section **902** into the inter-proximal space between the two teeth to better secure the matrix **130** against the tooth to be filled. The elastic wedge causes continuous lateral pressure.

In the preferred embodiment the lugs, wedge and matrix all transmit light enabling light used to cure the filling to reach the filling material. This has the advantage of enabling the filling to cure faster and to ensure a more complete cure.

While use of the wedge **120** has been described with reference to the dental contact matrix system of the present invention the wedge **120** of the present invention can be used separately to hold various types of matrix bands in place. To use the wedge **120** of the present invention the dental professional would position their preferred matrix band or



sectional matrix on the tooth to be filled in the usual manner using fingers and/or tweezers.

The dental professional would then elongate the narrow elongated section **901** of the wedge **120** by stretching it and placing the wedge between the matrix band and the adjacent tooth. The wedge is placed in a similar fashion to the use of dental floss. The dental professional then releases both ends and pulls on the narrow elongated section **901** to pull the elongated tapered section **902** through the gap so that the tapered section passes inter-proximally until the space is tight.

The present invention has the advantage that when the tension on the wedge **120** is released the elastic wedge **120** expands further increasing the pressure on the matrix band and on the adjacent teeth, thereby causing them to separate. The elastic wedge of the present invention, because it does not have a point and is pulled or threaded into the inter-proximal space, is gentler on the gingival tissue and thereby less traumatic for dental patients.

The present dental contact matrix system of the invention can be assembled before being placed in the patients mouth saving the dental professional time and reducing the chance of dropping a matrix or wedges into a patients mouth.

The invention claimed is:

**1.** A retainer for placing and retaining a matrix in a dental contact matrix system, and for use in conjunction with an elastic "wedge", said retainer comprising:

a first lug, to fit on one side of a proximal contact between two teeth,

a second lug to fit on the other side of said proximal contact,

a spring member connecting between said first lug and said second lug, said spring member holding said lugs such that they must be separated to fit over said proximal contact, wherein the spring member applies a restorative force pressing said lugs against opposed sides of said proximal contact, and

means for receiving and holding an elastic wedge in a stretched condition to span between said first lug and said second lug.

**2.** The retainer as claimed in claim **1** for use in conjunction with a wedge comprising a one piece member of elastic material and having:

an elongate narrow section, and

an elongate tapered section with a triangular cross section, said elongate narrow section extending from the narrow end of said tapered section;

wherein each said lug of said retainer includes a ridge for projecting into the proximal contact, and said means for receiving and holding an elastic wedge receives and holds said wedge with said elongate narrow section spanning between said ridge of said first lug and said ridge of said second lug.

**3.** The retainer as claimed in claim **2** wherein said means for receiving and holding an elastic wedge comprises:

a first wedge engagement associated with said first lug, a guide on said first lug to have said wedge exit from underneath said first lug at said ridge,

a second wedge engagement associated with said second lug,

a guide on said second lug to have said wedge exit from underneath said second lug at said ridge.

**4.** The retainer as claimed in claim **3** wherein said first and second wedge engagements each comprise a cleat formed in an end of said spring member adjacent the connection between said spring member and the respective said lug.

**5.** A dental contact matrix system including a retainer for placing and retaining a matrix in a dental contact matrix system, an elastic "wedge" and a matrix, said retainer comprising:

a first lug, to fit on one side of a proximal contact between two teeth,

a second lug to fit on the other side of said proximal contact, and

a spring member connecting between said first lug and said second lug, said spring member holding said lugs such that they must be separated to fit over said proximal contact, wherein the spring member applies a restorative force pressing said lugs against opposed sides of said proximal contact;

said elastic wedge being held in a stretched condition spanning between said first lug and said second lug.

**6.** The dental contact matrix system as claimed in claim **5** wherein said wedge has:

an elongate narrow section, and

an elongate tapered section with a triangular cross section, said elongate narrow section extending from the narrow end of said tapered section;

each said lug includes a ridge for projecting into the proximal contact,

and said means for receiving and holding an elastic wedge holds said wedge with said elongate narrow section spanning between said ridge of said first lug and said ridge of said second lug.

**7.** The dental contact matrix system as claimed in claim **6** wherein said means for receiving and holding an elastic wedge comprises:

a first wedge engagement associated with said first lug,

a guide on said first lug to have said wedge exit from underneath said first lug at said ridge,

a second wedge engagement associated with said second lug,

a guide on said second lug to have said wedge exit from underneath said second lug at said ridge.

**8.** The dental contact matrix system as claimed in claim **7** wherein said first and second wedge engagements each comprise a cleat formed in an end of said spring member adjacent the connection between said spring member and the respective said lug, said narrow section of said wedge engaging in each said cleat.

**9.** A retainer for placing and retaining a matrix in a dental contact matrix system, and for use in conjunction with an elastic "wedge", said retainer comprising:

a first lug, to fit on one side of a proximal contact between two teeth,

a second lug to fit on the other side of said proximal contact,

a first matrix-support member positioned to retain a matrix against said first lug,

a second matrix support member positioned to retain a matrix against said second lug, and

a spring member connecting between said first lug and said second lug, said spring member holding said lugs such that they must be separated to fit over said proximal contact, wherein the spring member applies a restorative force pressing said lugs against opposed sides of said proximal contact.

**10.** The retainer as claimed in claim **9** wherein: said first lug includes a pair of tooth abutting faces, said tooth abutting faces meeting at a ridge for projecting into the proximal contact between two teeth,



said first matrix support member is positioned to retain a matrix against one said tooth abutting face, being a support face,

said second lug includes a pair of tooth abutting faces opposing said tooth abutting faces of said first lug, said tooth abutting faces meeting at a ridge for projecting into proximal contact between two teeth, said ridge opposing said ridge of said first lug, and

said second matrix support member is positioned to retain a matrix against the said tooth abutting face of said second lug that is opposed to said support face of said first lug, being a support face of said second lug.

**11.** The retainer as claimed in claim **10** wherein each said lug includes a ledge extending forward from said support face along an upper edge of said support face, to in use bear against the upper edge of a dental contact matrix held against said support face by a respective support member.

**12.** The retainer as claimed in claim **10** wherein said spring member follows an open loop path largely in a plane substantially perpendicular to the direction of said ridges of said lugs and above said lugs, to leave the space between said lugs unobscured by said spring member when viewed from above said plane.

**13.** The retainer as claimed in claim **12** including a releasable engagement between each said first and second lug and said spring member, each said releasable engagement allowing for connection of each of said first lug and said second lug, such that said first and second lugs may be mounted to said spring member in:

a first condition wherein said support faces of said first lug and said second lug face away from said open loop path of said spring member, and

a second condition wherein said support faces of said first lug and said second lug face toward said open loop path of said spring member.

**14.** The retainer as claimed in claim **13** wherein said releasable engagement comprises a plug and socket, engageable along an engagement axis, said engagement axis being parallel with said ridges of said first and second lugs, and being near perpendicular to said plane of said open loop path.

**15.** The retainer as claimed in claim **12**, for use in conjunction with a wedge comprising a one piece member of elastic material, and having:

an elongate narrow section, and

an elongate tapered section with a triangular cross section, said elongate narrow section extending from the narrow end of said tapered section,

wherein said retaining member includes means for receiving and holding said wedge with said elongate narrow section spanning between said ridge of said first lug and said ridge of said second lug.

**16.** The retainer as claimed in claim **15** wherein said means for receiving-and holding an elastic wedge comprises:

a first wedge engagement associated with said first lug, a guide on said first lug to have said wedge exit from underneath said first lug at said ridge,

a second wedge engagement associated with said second lug, and

a guide on said second lug to have said wedge exit from underneath said second lug at said ridge.

**17.** The retainer as claimed in claim **16** wherein said first and second wedge engagements each comprise a cleat formed in an end of said spring member adjacent the connection between said spring member and the respective said lug.

**18.** The retainer as claimed in claim **12** including an arrangement for enabling an expansion tool to expand said spring member, said arrangement including a pair of engagements on said spring member, each engagement near a respective said lug.

**19.** The retainer as claimed in claim **18** wherein each said engagement comprises an inward protrusion from said spring member.

**20.** The retainer as claimed in claim **9** wherein said first matrix support member is connected with said first lug, and is spaced from a support face of said first lug.

**21.** The retainer as claimed in claim **20** wherein said first matrix support member is substantially parallel with said support face, and is spaced forward of said support face, and outward of an edge of said support face away from said ridge.

**22.** The retainer as claimed in claim **21** including a further support member connected with said first lug, parallel with said first support member, and spaced further out and behind said first support member.

**23.** The retainer as claimed in claim **20** wherein said second matrix support member is connected with said second lug, and is spaced from said support face of said second lug.

**24.** The retainer as claimed in claim **23** wherein said second matrix support member is substantially parallel with said support face, and is spaced forward of said support face, and outward of an edge of support face away from said ridge.

**25.** The retainer as claimed in claim **24** including a further support member connected with said second lug, parallel with said second support member, and spaced further out and behind said second support member.

**26.** The retainer as claimed in claim **9** wherein at least one said lug is formed from a light transmissive material.

**27.** The retainer as claimed in claim **26** wherein said light transmissive lug is formed such that at least a good proportion of light entering said lug from above exits said lug toward said teeth.

**28.** *A retainer for retaining a matrix, the retainer comprising:*

*a first lug to fit on a first side of a proximal contact between two teeth, said first lug having a first and second tooth abutting face, said first and second tooth abutting faces of said first lug diverging from a first ridge between said first and second tooth abutting faces of said first lug and substantially normal to the gingival margins of said two teeth throughout the length of said first ridge, said first tooth abutting face of said first lug configured to abut the first of said two teeth and said second tooth abutting face of said first lug configured to abut the second of said two teeth,*

*a second lug to fit on a second side of the proximal contact, said second lug having a first and second tooth abutting face, said first and second tooth abutting faces of said second lug diverging from a second ridge between said first and second faces of said second lug and substantially normal to the gingival margins of said two teeth throughout the length of said second ridge, said first tooth abutting face of said second lug configured to abut the first of said two teeth and said second tooth abutting face of said second lug configured to abut the second of said two teeth,*

*a first dental wedge receiving notch in said first lug, the said first dental wedge receiving notch adjacent to and extending from said first ridge in said first lug towards the gingival margins of said two teeth and a second*



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dental wedge receiving notch in said second lug, the second dental wedge receiving notch adjacent to and extending from said second ridge in said second lug towards said gingival margins of said two teeth, said first and second dental wedge receiving notches aligned to receive and position a dental wedge across the interproximal space between said two teeth, wherein the first dental wedge receiving notch and second dental wedge receiving notch correspond in size and dimension; and

a spring member connecting between the first and the second lug, the spring member holding said first and second lugs such that the lugs are separated to fit over the proximal contact, the spring member applying a restorative force pressing said first and second lugs against opposed sides of the proximal contact.

29. The retainer for retaining the matrix of claim 28 wherein said first and second ridges are rounded.

30. The retainer for retaining a matrix of claim 28 wherein said first and second dental wedge receiving notches consist of a generally inverted V-shape contour wherein the top of said first dental wedge receiving notch is adjacent to said first ridge and the top of said second dental wedge receiving notch is adjacent to said second ridge.

31. The retainer for retaining a matrix of claim 28 wherein said first ridge in said first lug consists of a curved contour and wherein said second ridge in said second lug consists of a curved contour.

32. The retainer for retaining a matrix of claim 28 wherein a first and second arm of the spring member has a protrusion for engaging a tool used to expand the spring.

33. The retainer for retaining a matrix of claim 28 wherein the spring member is generally U-shaped in plan view.

34. The retainer for retaining a matrix of claim 28 wherein at least one of said lugs is substantially transparent.

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35. The retainer for retaining a matrix of claim 34 wherein both said lugs are substantially transparent.

36. The retainer for retaining a matrix of claim 28 wherein said first and second tooth abutting faces of said first lug each consist of curved contour as each face extends between the top and bottom of said first lug wherein said first and second tooth abutting faces of said second lug each consist of curved contour as each face extends between the top and bottom of said second lug.

37. The retainer for retaining a matrix of claim 36, wherein at least one of the first or second tooth abutting faces of the first lug has a curved contour across that tooth abutting face as it diverges from the first ridge.

38. The retainer for retaining a matrix of claim 28 wherein each of said two teeth on opposite sides of the proximal contact comprise a mesial, a distal, a lingual and a buccal surface, and said first tooth abutting face of said first lug is configured to abut the first of said two teeth at the distal and buccal surfaces of said first tooth, and said second tooth abutting face of said first lug configured to abut the second of said two teeth at mesial and buccal surfaces of said second tooth, and wherein said first tooth abutting face of said second lug configured to abut the first of said two teeth at distal and lingual surfaces of said first tooth and said second tooth abutting face of said second lug configured to abut the second of said two teeth at mesial and lingual surfaces of said second tooth.

39. The retainer for retaining a matrix of claim 28, wherein the tooth abutting faces, ridge, and dental wedge receiving notch of the second lug are a mirror image of the tooth abutting faces, ridge, and dental wedge receiving notch of the first lug.

40. The retainer for retaining a matrix of claim 28, wherein the lugs are constructed of a plastic material, the lugs being attached to metal arms of the spring member.

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