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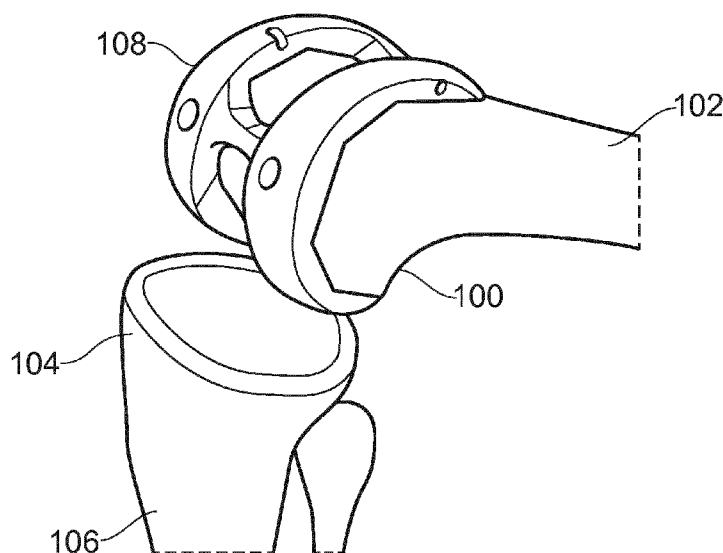


FIG. 1

[Continued on next page]



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Femoral Prosthesis Preparation

Field of the Invention

5 The present invention relates to the preparation of a femur during knee arthroplasty. In particular, but not exclusively, the present invention relates to a method and apparatus for performing the femoral component box cut.

Background to the Invention

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Joint arthroplasty is a surgical procedure by which a diseased and/or damaged natural joint is replaced by a prosthetic joint. During knee arthroplasty, a knee prosthesis which may include a tibial tray and a femoral component, is implanted. Femoral components are designed to be attached to a surgically-prepared distal end of a patient's femur, whilst tibial trays are designed to be attached to a surgically-prepared proximal end of a patient's tibia.

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Orthopaedic surgeons typically use a variety of orthopaedic surgical instruments to facilitate the replacement of the natural joint with the knee prosthesis. The surgical instruments used may be for example, prosthetic trial components, cutting blocks, drill guides and other surgical instruments.

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Currently, a femoral component of a predetermined size is selected by a surgeon following a visual determination. The distal end of the femur is then cut. Provisional components (also referred to as "trial components"), e.g. a femoral trial component and a tibial bearing trial component, may be used to size and select the components of the knee prosthesis that will replace the patient's natural joint. Provisional tibial and femoral components are respectively positioned on a resected proximal end of the tibia and a resected distal end of the femur to allow a surgeon to test a range of motion and ensure that the joint kinematics and/or component sizing is correct. During surgery, a surgeon may replace a first provisional femoral component with a second provisional femoral component of a different size to evaluate and compare the joint kinematics and/or sizing of the different femoral components to decide which final femoral component to use in the knee prosthesis. A procedure that utilizes provisional or 'trial' components to size and select the final components of the knee prosthesis is often referred to as a trial reduction.

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A particular surgical step in knee arthroplasty is preparing the distal femur after the femur has been resected, i.e. after the anterior, posterior and chamfer cuts have been made using a suitable cutting block. Femoral preparation includes removing bone to form a cavity in the resected distal end of the femur for receiving the intercondylar box of the final femoral component. The cavity formed in the distal end of the femur is often known as the 'posterior stabilized (PS) box' and the intercondylar box of the final femoral component is configured to receive the tibial post of a tibial insert component. The PS box formed in the femur can vary in size depending on the configuration of the final femoral component to be used.

It is an aim of certain embodiments of the present invention to provide a method and apparatus for preparing a PS box in a resected distal end of a femur that is quick and non-complex for a surgeon to perform and use.

It is an aim of certain embodiments of the present invention to provide a method and apparatus to enable a surgeon to accurately and efficiently prepare a PS box in a resected distal end of a femur whilst allowing a desired size of PS box to be formed in the femur.

It is an aim of certain embodiments of the present invention to provide a method and apparatus to enable a surgeon to accurately and efficiently prepare a PS box in a resected distal end of a femur whilst conserving bone.

Summary of Certain Embodiments of the Invention

According to a first aspect of the present invention there is provided a cutting guide member for preparing a resected distal end of a femur, comprising:

at least one cutting guide region for receiving a cutting tool, wherein the cutting guide member is configured to be located in a predetermined position and orientation with respect to a resected distal end of a femur to be prepared and attachable to a femoral trial component located on the femur.

Aptly, the at least one cutting guide region comprises at least one groove.

Aptly, the at least one cutting guide region comprises at least one through slot.

Aptly, the at least one cutting guide region comprises at least one through hole.

Aptly, the at least one cutting guide region comprises at least one first cutting guide region and at least one further cutting guide region.

5 Aptly, the at least one first cutting guide region is differently conformed to the at least one further cutting guide region.

Aptly, the at least one first cutting guide region comprises a through hole for receiving a drill bit and the at least one further cutting guide region comprises a through slot for receiving a chisel.

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Aptly, the at least one first cutting region comprises at least two spaced apart through holes and the at least one further cutting guide region comprises a first through slot extending into and between the at least two through holes.

15 Aptly, the at least one further cutting guide region further comprises at least two spaced apart further through slots each extending into and from a respective one of the at least two through holes.

20 Aptly, the first and further through slots each at least partially define an inner face of a box to be prepared in the distal end of the femur, and wherein each through hole defines a corner region of the box.

Aptly, the at least one first cutting region further comprises at least two further through holes each disposed along a length of a respective one of the at least two further through slots.

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Aptly, the at least two further through slots are substantially parallel.

Aptly, the cutting guide member further comprises an abutment region for abutting a mounting member attachable to a femoral trial component.

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Aptly, the abutment region comprises an outwardly extending flange portion.

Aptly, the cutting guide member further comprises at least one first securing region co-operable with at least one further securing region of a mounting member attachable to a femoral trial component.

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Aptly, the at least one first securing region comprises a groove, slot, recess, bore, scallop, hole, tab or protrusion.

5 Aptly, the outwardly extending flange portion at least partially defines the at least one securing region.

Aptly, the cutting guide member further comprises a substantially tapered lower end region.

10 According to a second aspect of the present invention there is provided a mounting member for locating a cutting guide member in a predetermined position and orientation with respect to a resected distal end of a femur to be prepared, wherein the mounting member is configured to attach to a femoral trial component located on a resected distal end of a femur to be prepared.

15 Aptly, the mounting member comprises at least one first attachment portion engageable with at least one further attachment portion of the femoral trial component.

Aptly, the at least one first attachment portion comprises at least one projection receivable in a correspondingly shaped aperture disposed in the femoral trial component.

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Aptly, the at least one projection comprises at least two spaced apart projections each receivable in a respective aperture disposed in the femoral trial component.

25 Aptly, a one of the at least two projections is substantially circular in cross section and the other of the at least two projections comprises at least one flat surface along its length.

Aptly, the mounting member further comprises at least one through hole for receiving a pin to fix the mounting member and femoral trial component to the resected distal end of the femur.

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Aptly, the at least one through hole comprises at least two spaced apart through holes.

35 Aptly, one of the at least two spaced apart through holes is configured to receive the pin responsive to the femoral trial component being for a right knee joint and the other of the at least two spaced apart through holes is configured to receive the pin responsive to the femoral trial component being for a left knee joint.

Aptly, the mounting member further comprises a locating region for receiving the cutting guide member according to the first aspect of the present invention.

- 5 Aptly, the locating region comprises a central aperture disposed between a pair of spaced apart abutment portions for abutting the femoral trial component in use.

Aptly, each abutment portion comprises a respective one of the at least two spaced apart through holes.

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Aptly, the central aperture is defined by at least one wall portion extending upwardly from the abutment portions.

- 15 Aptly, the mounting member further comprises a securing region for securely locating the cutting guide member according to the first aspect of the present invention with respect to the mounting member.

Aptly, the securing region comprises a locking element co-operable with a further securing region of the cutting guide member.

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Aptly, the locking element is mounted in the at least one wall portion of the mounting member and is movable between a locked position and an unlocked position with respect to a cutting guide member received in the central aperture.

- 25 Aptly, the locking element comprises a lever rotatably mounted in a slotted aperture disposed in the at least one wall portion.

- 30 According to a third aspect of the present invention there is provided a kit comprising a plurality of cutting guide members according to the first aspect of the present invention, wherein each cutting guide member comprises a different configuration, size, shape and/or number of the at least one cutting guide region.

- 35 According to a fourth aspect of the present invention there is provided a system comprising at least one cutting guide member according to the first aspect of the present invention and a mounting member according to the second aspect of the present invention.

Aptly, the system further comprises a femoral trial component comprising at least one attachment portion engageable with a corresponding attachment portion of the mounting member to attach the mounting member to the femoral trial component.

- 5 Aptly, the system further comprises a kit according to the third aspect of the present invention, wherein the at least one cutting guide member is selected from the plurality of differently conformed cutting guide members.

10 According to a fifth aspect of the present invention there is provided a method for locating a cutting guide member in a predetermined position and orientation with respect to a resected distal end of a femur to be prepared, comprising:

attaching a mounting member to a femoral trial component located on a resected distal end of a femur to be prepared; and

- 15 mounting a cutting guide member to the mounting member to locate the cutting guide member in a predetermined position and orientation with respect to the resected distal end of the femur to be prepared.

Aptly, the method further comprises receiving the cutting guide member in a locating region of the mounting member.

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Aptly, the method further comprising locking the cutting guide member to the mounting member via a locking element.

- 25 Aptly, the method further comprises selecting the cutting guide member from a plurality of differently conformed cutting guide members.

According to a sixth aspect of the present invention there is provided a cutting guide member substantially as hereinbefore described with reference to the accompanying figures.

- 30 According to a seventh aspect of the present invention there is provided a mounting member substantially as hereinbefore described with reference to the accompanying figures.

According to an eighth aspect of the present invention there is provided a system or kit as hereinbefore described with reference to the accompanying figures.

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According to a ninth aspect of the present invention there is provided a method as hereinbefore described with reference to the accompanying figures.

Detailed Description of Embodiments of the Invention

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Embodiments of the present invention will now be described hereinafter, by way of example only, with reference to the accompanying drawings in which:

Figure 1 illustrates a knee joint including a tibia having a resected proximal end and a femur
10 having a resected distal end, wherein a femoral trial component is located on the resected distal end of the femur;

Figure 2 illustrates a mounting member in accordance with certain embodiments of the present invention attached to the femoral trial component of Figure 1;

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Figure 3 illustrates a PS box cutting guide member in accordance with certain embodiments of the present invention located on the mounting member of Figure 2;

Figure 4 illustrates the PS box cutting guide member of Figure 3 being used to guide a drill bit
20 to prepare the PS box in the resected distal end of the femur;

Figure 5 illustrates the PS box cutting guide of Figure 3 being used to guide a chisel to further prepare the PS box in the resected distal end of the femur;

25 Figure 6 illustrates the PS box formed in the resected distal end of the femur between the condylar portions of the femoral trial component;

Figure 7 illustrates the femoral trial component including a PS trial insert, and a tibial tray and a tibial trial insert located on the resected proximal end of the tibia;

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Figure 8 illustrates a trial range of motion being performed on the knee joint;

Figures 9 and 10 illustrate a mounting member in accordance with certain embodiments of the present invention;

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Figures 11 and 12 illustrate a PS box cutting guide member in accordance with certain embodiments of the present invention; and

Figures 13 and 14 illustrate a prepared distal end of a femur in accordance with certain
5 embodiments of the present invention.

The terms “proximal” and “distal” have been used herein with reference the heart of a patient, e.g. “proximal” refers to a feature of the knee joint that is close to the heart of the patient and “distal” refers to a feature of the knee joint that is distant from the heart of a patient.
10 Additionally, as used herein, the term “anterior” refers to the front of a patient, and the term “posterior” refers to the back of a patient. In addition, as used herein, the term “medial” refers to the middle of a patient, and the term “lateral” refers to the side of a patient.

The term “cutting” has been used herein to include any process or procedure where bone is
15 removed from a femur, such as by drilling, milling, grinding, sanding, chiseling, or the like. Similarly, a “cutting tool” shall include all tools that are suitable for removing bone a femur such as a drill or drill bit, a chisel, a blade, a disc, a cutter, a saw, a file, or the like.

As illustrated in Figure 1, during a knee arthroplasty (TKA) procedure, the distal end 100 of
20 the femur 102 is resected using a suitable cutting guide to engage with corresponding abutment surfaces of a final femoral component (not shown). The femoral resections include anterior, posterior and chamfer resections. The proximal end 104 of the tibia 106 is also resected to engage with a corresponding surface of a final tibial component (not shown). A first femoral trial component 108 is located on the resected distal end 100 of the femur to
25 evaluate bone coverage, medial/lateral overhang, or the like.

As illustrated in Figure 2, a mounting member 250 in accordance with certain embodiments of the present invention is mounted on the first femoral trial component 108 and the mounting member 250 and first femoral trial component 108 are attached to the resected distal end 100
30 of the femur 102 by pins 270 located in respective through holes of the first femoral trial component 108 and the mounting member 250.

As illustrated in Figure 3, a cutting guide member 350 selected from a plurality of differently configured cutting guide members is mounted on the mounting member 250 and is locked in
35 position on the mounting member by a locking element 930 as described further below. The cutting guide member 350 includes a plurality of spaced apart and substantially circular drill

guide holes 322, 324, 326, 328 and a plurality of substantially linear chisel guide slots 330, 332, 334. The three chisel guide slots define the boundaries and substantially flat inner faces of a PS box to be formed in the distal end of the femur, as described further below. A first one 332 of the chisel guide slots extends between two of the drill guide holes 324, 326 to define an anterior inner face of the PS box to be formed in the femur. A second one 330 of the chisel guide slots extends between two of the drill guide holes 322, 324 and beyond one of those two drill guide holes 322 to define the medial or lateral inner face of the PS box to be formed depending on whether the femur is part of the right or left leg of the patient, as will be described further below. A third one 334 of the chisel guide slots extends between two of the drill guide holes 326, 328 and beyond one of those drill guide holes 328 to define the other of the medial and lateral inner faces of the PS box to be formed in the femur. The side chisel guide slots 330, 334 each include an inwardly extending slot/notch 335, 337 at one end (as best shown in Figure 11). As illustrated in Figure 5, the chisel 550 has a substantially channel-like cross section defined by a substantially flat base portion and spaced apart relatively small side portions upstanding from the base portion. The working end of the chisel includes a cutting edge and is substantially tapered. In use, the chisel 550 is received and guided by the correspondingly configured chisel guide slots 330, 332, 334. The small upstanding side portions of the chisel 550 are received in the two drill holes 324, 326 when the anterior face of the PS box is being formed, and in one of the drill holes 324, 326 and a respective one of the inwardly extending slots/notches 335, 337 when the medial or lateral face of the PS box is being formed.

A handle member 360 is attachable to each medial and lateral side of the mounting member 250 to aid the surgeon to stabilise the femur during the preparation step. One or both handle members 360 may be attached to the mounting member 250 as desired. Each handle member 360 includes a threaded end region that corresponds to a threaded hole in a respective side region of the mounting member 250. Other arrangements for mechanically attaching each handle member 360 to the mounting member 250 can be used, such as a pin, grub screw, interference fit, or the like.

As illustrated in Figure 4, a drill bit 450 is inserted in each of the drill guide holes 322, 324, 326, 328 and driven by a suitable driver, such as a drill, to remove bone from between the condylar portions of the femoral trial component 108 located on the resected distal end 100 of the femur 102. The mounting member 250 securely locates the selected cutting guide member 350 in the predetermined and desired position and orientation with respect to the femur such that the drill bit 450 is accurately guided into the femur 102 during drilling and any

undesirable drift of the drill bit during drilling is prevented. The handle member/s 360 may be used by the surgeon to stabilise the femur during drilling.

As illustrated in Figure 5, a chisel 550 is then inserted in each of the chisel guide slots 330, 332, 334 and impacted by a suitable impactor, such as a manual hammer or hammer-action power tool, to remove femoral bone between the holes formed in the femur by the drilling step. The chisel cuts form the substantially flat anterior, lateral and medial inner faces of the PS box being formed in the resected distal end of the femur. The drill guide holes 322, 324, 326, 328 allow a substantial portion of the bone to be removed easily and efficiently by drilling which subjects the femur to lower forces and reduces the risk of damage or excess bone being removed during the preparation step. In turn, the drilling step results in less bone having to be removed by a chisel which thus requires a lower impact force to be applied to the chisel compared with conventional methods. In addition, the more accurate drilling step forms the corners of the PS box in the femur rather than the less accurate chiselling step which can have a greater impact on the femur.

As illustrated in Figure 6, the cutting guide member 350 is then removed from the mounting member 250 and the pins 270 are removed from the femur 102 to detach the mounting member 250 from the femoral trial component 108. Residual bone in the formed PS box cavity is then removed if required, such as a posterior region of the distal end of the femur, to complete the formation of the PS box 600 in the femur 102 between the condylar portions of the femoral trial component 108. The trochlear fossa is then prepared with a suitable chisel. The prepared distal end of the femur with the femoral trial component removed is illustrated in Figures 13 and 14.

As illustrated in Figure 7, a PS trial insert 750 is selected from a plurality of PS trial inserts and inserted between the condylar portions of the femoral trial component 108. The femoral trial component 108 closely, if not exactly, replicates a final femoral component to be implanted.

As illustrated in Figure 8, a tibial trial tray component 760 is attached to the resected proximal end 104 of the tibia 106 and a tibial trial insert 770 is selected from a plurality of tibial trial inserts and located in the trial tray component 760 for trial reduction. A trial range of motion is performed to evaluate the mobility, implant fit and stability of the knee joint. The selected tibial trial insert 770 may be replaced with a differently sized tibial trial insert until the surgeon is content with the mobility, fit and stability of the knee joint. For example, if the knee prosthesis is too loose, the selected tibial trial insert 770 is replaced with a thicker tibial trial

insert until correct kinematics/stability of the knee prosthesis is achieved. Patella tracking is also verified if required.

As illustrated in Figures 9 and 10, the mounting member 250 in accordance with certain
5 embodiments of the present invention includes a main body portion 902 comprising a walled region 904 and a pair of opposed lug regions 906, 908 that each extends substantially perpendicularly and outwardly from opposed sides of the walled region 904. In use, when the mounting member 250 is attached to the first femoral trial component (as described above with reference to Figure 2), the opposed sides of the mounting member 250 are medial and
10 lateral sides. Each lug region 906, 908 provides an abutment surface 910 for abutting the first femoral trial component 108 when the mounting member 250 is attached thereto as shown in Figure 2. A pair of spaced apart and elongate connecting portions 912 extend at an angle from a respective one of the lug regions 906, 908. The angle between the connecting portions 912 and the lug regions 906, 908 is about around 120 degrees. However, the angle between
15 the connecting portions and the lug regions may be from about around 70 degrees to about around 170 degrees. A tie portion 914 extends substantially perpendicularly between end regions 916 of the connecting portions 912 such that the connecting portions 912 connect the tie portion 914 to the main body portion 902 to define a mounting frame.

20 The tie portion 914 includes a pair of spaced apart and inwardly extending projections 916, 917 that are located adjacent to a respective one of the connecting portions 912. Each projection 916, 917 extends substantially perpendicularly with respect to the connecting portions 912 and is configured to be received in a respective recess 630 in the first femoral trial component 108 (as best shown in Figure 6). One of the projections 916 is substantially
25 circular in cross section whilst the other projection 917 includes opposed flat surfaces 918 along its length. The flat surfaces 918 on the non-circular projection 917 are configured to compensate for any tolerances and to enable a surgeon to efficiently mount the mounting member 250 on the femoral trial component 108. The flat surfaces 918 as illustrated are medial/lateral flat surfaces to compensate for tolerances in the medial-lateral direction.
30 Alternatively or additionally, the non-circular projection 917 may include anterior/posterior flat surfaces to compensate for tolerances in the anterior-posterior direction. The tie portion 914 also includes a threaded aperture 919 in each end to receive a respective one of the handle members 360 for the surgeon to stabilise the femur during the drilling and chiselling steps as described above with respect to Figures 4 and 5. Each threaded aperture 919 may be a
35 closed bore or a through hole.

Each of the opposed lug regions 906, 908 includes a pair of spaced apart through holes 920, 922. One of the through holes 920 in each lug region is inwardly and rearwardly located, i.e. offset, with respect to the other of the through holes 922 as best illustrated in Figures 9 and 10. The through holes 920, 922 are each configured to selectively receive one of the pins 270
5 used to attach the first femoral trial component 108 and the mounting member 250 to the resected distal end of the femur, as described above with respect to Figure 2. As shown in Figure 9, the inwardly located through hole 920 in a first one 906 of the lug regions is referenced 'L' and the outwardly located through hole 922 of the first lug region 906 is referenced 'R', whilst the inwardly located through hole 920 in the second lug region 908 is
10 referenced 'R' and the outwardly located through hole 922 of the second lug region 908 is referenced 'L'. The references or indices 'R' and 'L', which are machined, stamped, etched or the like into the upper surface of each lug region adjacent a respective one of the through holes, provide a visual guide and indicator to the surgeon to ensure the mounting member 250 is correctly oriented with respect to the first femoral trial component 108 depending on whether
15 the first femoral trial component is for a right (R) or left (L) knee joint. As shown in Figure 2, the pins 270 are located in the through holes referenced 'L' (as illustrated in Figure 9) which thereby indicates the femur shown in Figure 2 is the left femur of the patient. If the right knee joint was being replaced, the pins 270 would be inserted in the through holes referenced with an 'R' to correctly orient the mounting member 250 with respect to the right femur. The
20 projections 916 and the through holes 920, 922 provide a secure and stable arrangement for attaching the mounting member 250 to the first femoral trial component 108 in a quick and efficient manner.

As illustrated in Figure 9, the walled region 904 of the mounting member 250 includes four
25 distinct wall portions 921, 923, 924, 926 to define a substantially orthogonal aperture 929 in the centre of the main body portion 902 of the mounting member 250. The wall portions include two opposed side wall portions 921, 923 and two opposed end wall portions 924, 926. In the illustrated embodiment, the aperture 929 is substantially rectangular in profile but other differently shaped apertures, such as substantially square, oval or circular, or the like, may be
30 defined by the walled region 904. If the aperture 929 was substantially oval or circular, for example, the walled region 904 would include a single curved wall portion. The wall portions 921, 923, 924, 926 are joined by substantially curved corner portions 931. One of the end wall portions 926 (as shown in Figure 9) includes a slotted through aperture 928 which extends substantially along the length of the end wall portion 926. A locking element 930 is mounted
35 in the slotted aperture 928 by a hinge pin 932 such that the locking element 930 is rotatably moveable in the slotted aperture 928 about an axis of the hinge pin 932. The locking element

930 illustrated in Figures 9 and 10 is in the form of a lever and includes a handle region 934 at one end and a securing region 936 at the other end. In a locked position, as shown in Figure 9, the securing region 936 extends substantially into the boundaries of the central aperture 929 defined by the walled region 904 of the mounting member 250. In an unlocked position, the securing region 936 does not extend substantially into the boundaries of the central aperture 929.

As described above and illustrated in Figure 3, the central aperture 929 of the mounting member 250 is configured to receive a cutting guide member 350. As illustrated in Figure 11, a cutting guide member 350 according to certain embodiments of the present invention includes a substantially rectangular main body portion 1100 having an upper region 1102 and a lower region 1104. The upper region 1102 includes a continuous flange 1105 extending therearound to define a shoulder for abutting an upper surface of the walled region 904 of the mounting member 250 when the cutting guide member 350 is mounted on the mounting member 250. Whilst the flange 1105 is shown as continuous in the illustrated embodiment, the flange may comprise at least one or a plurality of spaced apart flange portions for abutting the walled region 904 of the mounting member 250. The flange 1105 provides a stop to limit movement of the cutting guide member 350 when inserted into the central aperture 929 of the mounting member 250 and thus the cutting guide member 350 effectively hangs in the mounting member 250. The lower region 1104 of the cutting guide member 350 is substantially tapered to aid a surgeon to locate the cutting guide member 350 in the central aperture 930 of the mounting member 250.

An end region 1106 of the cutting guide member 350 includes a notched recess 1108 that extends into the main body portion 1100 from the end and underside faces thereof. Alternatively, the notched recess 1108 may be a recess that extends only into the end of the main body region 1100 and not into the underside of the main body region 1100. The notched recess 1108 helps to reduce the weight of the cutting guide element 350 and the material used. The end region 1106 also includes a scalloped recess 1110 located between the notched recess 1108 and the flange 1102. The scalloped recess 1110 and flange 1105 are configured to receive and retain the securing region 936 of the locking element 930 when in the locked position to thereby securely locate the cutting guide member 350 in the mounting member 250 particularly when the femur is being prepared as described above. The locking element 930 is moved to the unlocked position to release the securing region 936 from the scalloped recess 1110 to allow the cutting guide member 350 to be lifted out of the mounting member 250.

According to certain embodiments of the present invention, other suitable mechanisms and arrangements for securely locating the cutting guide member 350 in the mounting member 250 can be used. Such alternative mechanisms and arrangements may include a biased pin and recess wherein the locking element 928 comprises at least one pin which is slidably
5 mounted in one of the wall portions 921, 923, 924, 926 and is biased towards the central aperture 930 by a spring. The cutting guide member 350 may comprise a recess, such as a hole, groove or slot, for receiving the pin when in the locked position to securely locate the cutting guide member 350 in the mounting member 250. To remove the cutting guide member
10 350 from the mounting member 250, the surgeon would simply pull the pin to release the same from the recess in the cutting guide member 350.

As illustrated in Figures 11 and 12, the cutting guide member 350 further includes the four drill guide holes 322, 324, 326, 328 and the three chisel guide slots 330, 332, 334 as described
15 above with reference to Figures 3 to 5.

The cutting guide member 350 is illustrated in Figures 11 and 12 as a substantially rectangular block but may be any suitable size and shape to correspond with the central aperture 930 of the mounting member 250 into which it is mounted in use and/or with the dimensions of the
20 PS box to be formed in the femur. Furthermore, the cutting guide member 350 may be selected from a plurality of differently configured cutting guide members depending on the dimensions of the PS box to be formed in the femur. Each cutting guide member in accordance with certain embodiments of the present invention may include a different configuration, number, size and/or shape of drill guide holes and chisel guide slots, and each
25 cutting guide region (hole, slot, groove, or the like) may be suitably formed to receive a correspondingly conformed cutting tool, such as a drill bit, chisel, milling tool, cutting blade, saw, scribe, or the like.

Although the mounting member 250 and the selected cutting guide member 350 according to
30 certain embodiments of the present invention as described above and as illustrated in the accompanying figures are separate components, a mounting member and a cutting guide member according to further embodiments of the present invention may be an integral one-piece component such that a cutting guide member comprises a mounting member for mounting the cutting guide member to a femoral trial component to aid a surgeon in preparing
35 the PS box in a resected femur. The integral mounting member may take a similar form to the mounting member illustrated in Figures 9 and 10 for example.

The mounting member 250 and cutting guide member 350 may be a metal or plastics material. Aptly, the mounting member and cutting guide member are made from a medical grade stainless steel material, and at least the cutting guide member is made from a hardened stainless steel material.

Certain embodiments of the present invention provide a mounting member for use with a femoral trial component to efficiently and securely locate and orient a cutting guide member with respect to a femur to be prepared during a knee arthroplasty procedure. Certain
10 embodiments of the present invention provide a cutting guide member for efficiently and securely locating on a mounting member attachable to a femoral trial component, such that the cutting guide member is securely located in a predetermined position and orientation relative to the femur during a knee arthroplasty procedure. Certain embodiments of the present invention provide a system including a femoral trial component, a mounting member
15 and at least cutting guide member for preparing a femur as part of a knee arthroplasty procedure. Certain embodiments of the present invention provide a system including universal mounting member that is configured to mount to a femoral trial component and to securely locate a selected one of a plurality of differently conformed cutting guide members with respect to the femoral trial component and a femur on which the femoral trial component is located.
20 The selected cutting guide member can be chosen by the surgeon responsive to the size and shape of the PS box to be formed in the femur and can easily and quickly be replaced with another one of the plurality of cutting guide members if a different configuration of PS box is desired depending on, for example, the configuration of the final femoral component to be implanted. Such an arrangement significantly improves the efficiency of the PS box
25 preparation procedure and the separate mounting member is configured for use with one of a plurality of differently conformed cutting guide members thus requiring the surgeon to only attach and remove the mounting member once to the femoral trial component during the PS box preparation step. The separate mounting member and cutting guide members also provides for easy and thorough sterilisation and therefore reuse of the system.

30 Throughout the description and claims of this specification, the words “comprise” and “contain” and variations of them mean “including but not limited to” and they are not intended to (and do not) exclude other moieties, additives, components, integers or steps. Throughout the description and claims of this specification, the singular encompasses the plural unless the
35 context otherwise requires. In particular, where the indefinite article is used, the specification

is to be understood as contemplating plurality as well as singularity, unless the context requires otherwise.

5 Features, integers, characteristics or groups described in conjunction with a particular aspect, embodiment or example of the invention are to be understood to be applicable to any other aspect, embodiment or example described herein unless incompatible therewith. All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of the features and/or steps are
10 mutually exclusive. The invention is not restricted to any details of any foregoing embodiments. The invention extends to any novel one, or novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

15

The reader's attention is directed to all papers and documents which are filed concurrently with or previous to this specification in connection with this application and which are open to public inspection with this specification, and the contents of all such papers and documents are incorporated herein by reference.

CLAIMS:

1. A cutting guide member for preparing a resected distal end of a femur, comprising:
at least one cutting guide region for receiving a cutting tool, wherein the
5 cutting guide member is configured to be located in a predetermined position and
orientation with respect to a resected distal end of a femur to be prepared and
attachable to a femoral trial component located on the femur.
2. The cutting guide member as claimed in claim 1, wherein the at least one cutting
10 guide region comprises at least one groove.
3. The cutting guide member as claimed in claim 1 or 2, wherein the at least one cutting
guide region comprises at least one through slot.
- 15 4. The cutting guide member as claimed in any preceding claim, wherein the at least
one cutting guide region comprises at least one through hole.
5. The cutting guide member as claimed in any preceding claim, wherein the at least
one cutting guide region comprises at least one first cutting guide region and at least
20 one further cutting guide region.
6. The cutting guide member as claimed in claim 5, wherein the at least one first cutting
guide region is differently conformed to the at least one further cutting guide region.
- 25 7. The cutting guide member as claimed in claim 6, wherein the at least one first cutting
guide region comprises a through hole for receiving a drill bit and the at least one
further cutting guide region comprises a through slot for receiving a chisel.
8. The cutting guide member as claimed in claim 7, wherein the at least one first cutting
30 region comprises at least two spaced apart through holes and the at least one further
cutting guide region comprises a first through slot extending into and between the at
least two through holes.
9. The cutting guide member as claimed in claim 8, wherein the at least one further
35 cutting guide region further comprises at least two spaced apart further through slots
each extending into and from a respective one of the at least two through holes.

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10. The cutting guide member as claimed in claim 9, wherein the first and further through slots each at least partially define an inner face of a box to be prepared in the distal end of the femur, and wherein each through hole defines a corner region of the box.
- 5 11. The cutting guide member as claimed in claim 9 or 10, wherein the at least one first cutting region further comprises at least two further through holes each disposed along a length of a respective one of the at least two further through slots.
- 10 12. The cutting guide member as claimed in any of claims 9 to 11, wherein the at least two further through slots are substantially parallel.
13. The cutting guide member as claimed in any preceding claim, further comprising an abutment region for abutting a mounting member attachable to a femoral trial component.
- 15 14. The cutting guide member as claimed in claim 13, wherein the abutment region comprises an outwardly extending flange portion.
- 20 15. The cutting guide member as claimed in any preceding claim, further comprising at least one first securing region co-operable with at least one further securing region of a mounting member attachable to a femoral trial component.
- 25 16. The cutting guide member as claimed in claim 15, wherein the at least one first securing region comprises a groove, slot, recess, bore, scallop, hole, tab or protrusion.
17. The cutting guide member as claimed in claim 14 and 15, wherein the outwardly extending flange portion at least partially defines the at least one securing region.
- 30 18. The cutting guide member as claimed in any preceding claim, further comprising a substantially tapered lower end region.
- 35 19. A mounting member for locating a cutting guide member in a predetermined position and orientation with respect to a resected distal end of a femur to be prepared, wherein the mounting member is configured to attach to a femoral trial component located on a resected distal end of a femur to be prepared.

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20. The mounting member as claimed in claim 19, comprising at least one first attachment portion engageable with at least one further attachment portion of the femoral trial component.
- 5 21. The mounting member as claimed in claim 20, wherein the at least one first attachment portion comprises at least one projection receivable in a correspondingly shaped aperture disposed in the femoral trial component.
- 10 22. The mounting member as claimed in claim 21, wherein the at least one projection comprises at least two spaced apart projections each receivable in a respective aperture disposed in the femoral trial component.
- 15 23. The mounting member as claimed in claim 22, wherein a one of the at least two projections is substantially circular in cross section and the other of the at least two projections comprises at least one flat surface along its length.
- 20 24. The mounting member as claimed in any of claims 19 to 23, further comprising at least one through hole for receiving a pin to fix the mounting member and femoral trial component to the resected distal end of the femur.
- 25 25. The mounting member as claimed in claim 24, wherein the at least one through hole comprises at least two spaced apart through holes.
- 30 26. The mounting member as claimed in claim 25, wherein one of the at least two spaced apart through holes is configured to receive the pin responsive to the femoral trial component being for a right knee joint and the other of the at least two spaced apart through holes is configured to receive the pin responsive to the femoral trial component being for a left knee joint.
- 35 27. The mounting member as claimed in any of claims 19 to 26, further comprising a locating region for receiving the cutting guide member as claimed in any of claims 1 to 18.
28. The mounting member as claimed in claim 27, wherein the locating region comprises a central aperture disposed between a pair of spaced apart abutment portions for abutting the femoral trial component in use.

29. The mounting member as claimed in claim 25 or 26, and 28, wherein each abutment portion comprises a respective one of the at least two spaced apart through holes.
30. The mounting member as claimed in claim 28 or 29, the central aperture is defined by at least one wall portion extending upwardly from the abutment portions.
31. The mounting member as claimed in claim 30, further comprising a securing region for securely locating the cutting guide member as claimed in any of claims 1 to 18 with respect to the mounting member.
32. The mounting member as claimed in claim 31, wherein the securing region comprises a locking element co-operable with a further securing region of the cutting guide member.
33. The mounting member as claimed in claim 32, wherein the locking element is mounted in the at least one wall portion of the mounting member and is movable between a locked position and an unlocked position with respect to a cutting guide member received in the central aperture.
34. The mounting member as claimed in claim 33, wherein the locking element comprises a lever rotatably mounted in a slotted aperture disposed in the at least one wall portion.
35. A kit comprising a plurality of cutting guide members as claimed in any of claims 1 to 18, wherein each cutting guide member comprises a different configuration, size, shape and/or number of the at least one cutting guide region.
36. A system comprising at least one cutting guide member as claimed in any of claims 1 to 18 and a mounting member as claimed in any of claims 19 to 34.
37. The system as claimed in claim 35, further comprising a femoral trial component comprising at least one attachment portion engageable with a corresponding attachment portion of the mounting member to attach the mounting member to the femoral trial component.

38. The system as claimed in claim 36 or 37, further comprising the kit as claimed in claim 35, wherein the at least one cutting guide member is selected from the plurality of differently conformed cutting guide members.

5 39. A method for locating a cutting guide member in a predetermined position and orientation with respect to a resected distal end of a femur to be prepared, comprising:

attaching a mounting member to a femoral trial component located on a resected distal end of a femur to be prepared; and

10 mounting a cutting guide member to the mounting member to locate the cutting guide member in a predetermined position and orientation with respect to the resected distal end of the femur to be prepared.

40. The method as claimed in claim 39, further comprising:

15 receiving the cutting guide member in a locating region of the mounting member.

41. The method as claimed in claim 39 or 40, further comprising:

20 locking the cutting guide member to the mounting member via a locking element.

42. The method as claimed in any of claims 39 to 41, further comprising:

25 selecting the cutting guide member from a plurality of differently conformed cutting guide members.

43. A cutting guide member substantially as hereinbefore described with reference to the accompanying figures.

30 44. A mounting member substantially as hereinbefore described with reference to the accompanying figures.

45. A system or kit as hereinbefore described with reference to the accompanying figures.

35 46. A method as hereinbefore described with reference to the accompanying figures.

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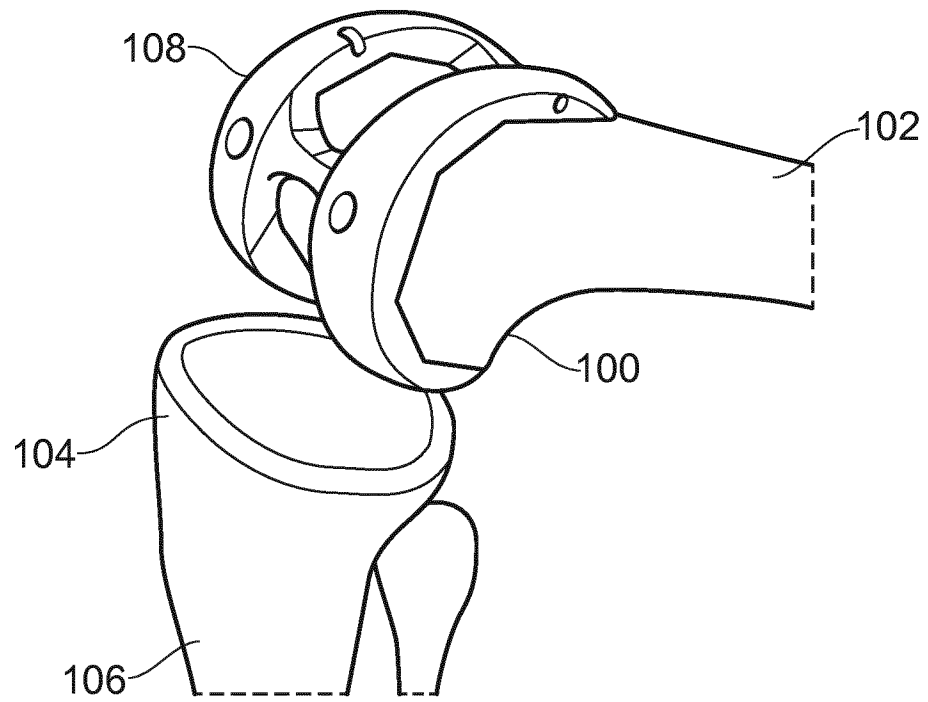


FIG. 1

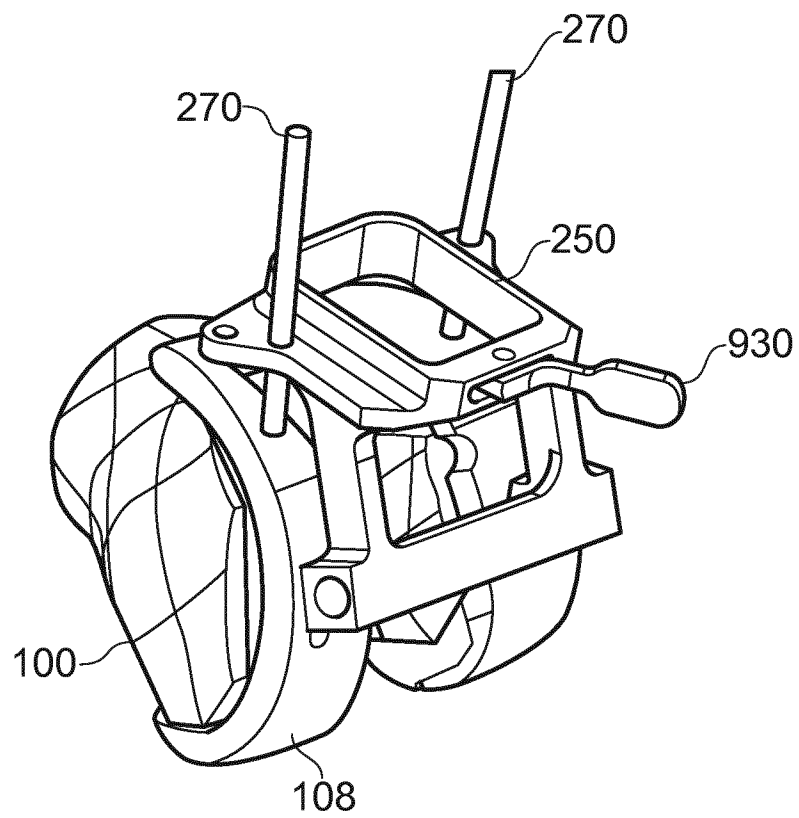


FIG. 2

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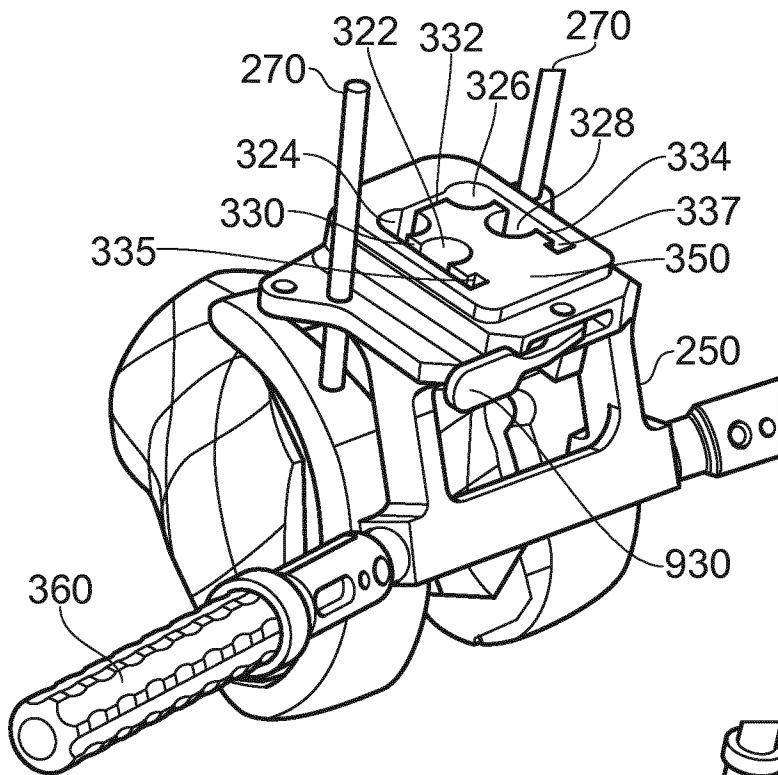


FIG. 3

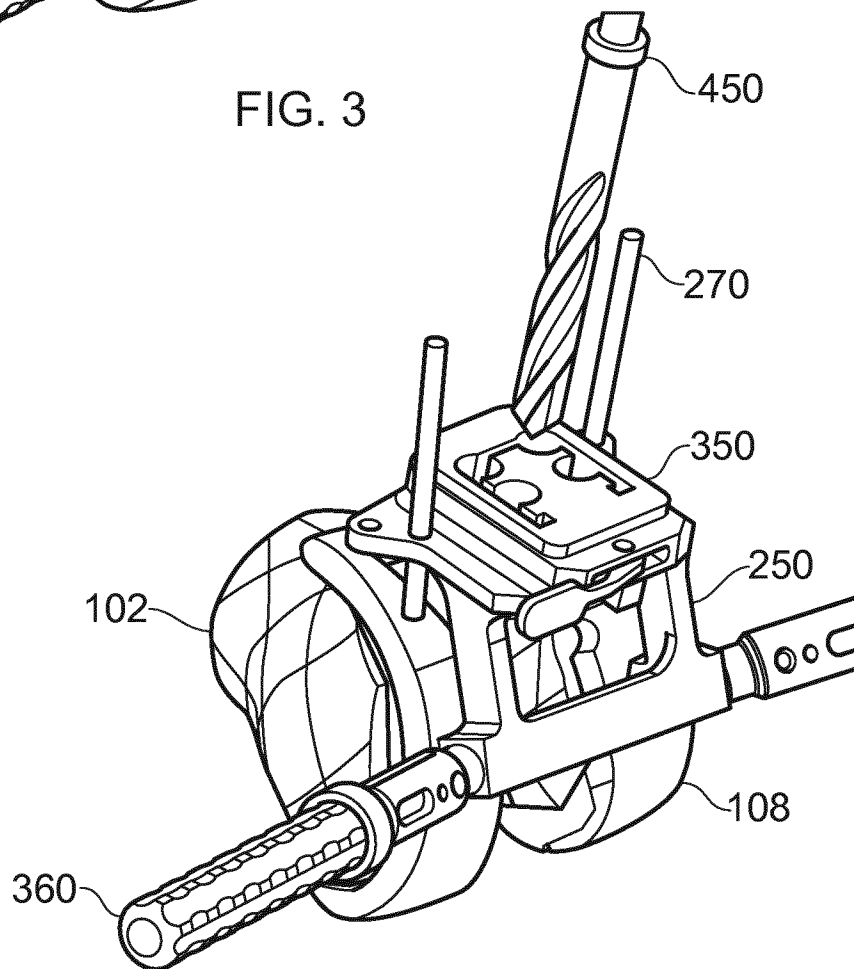


FIG. 4

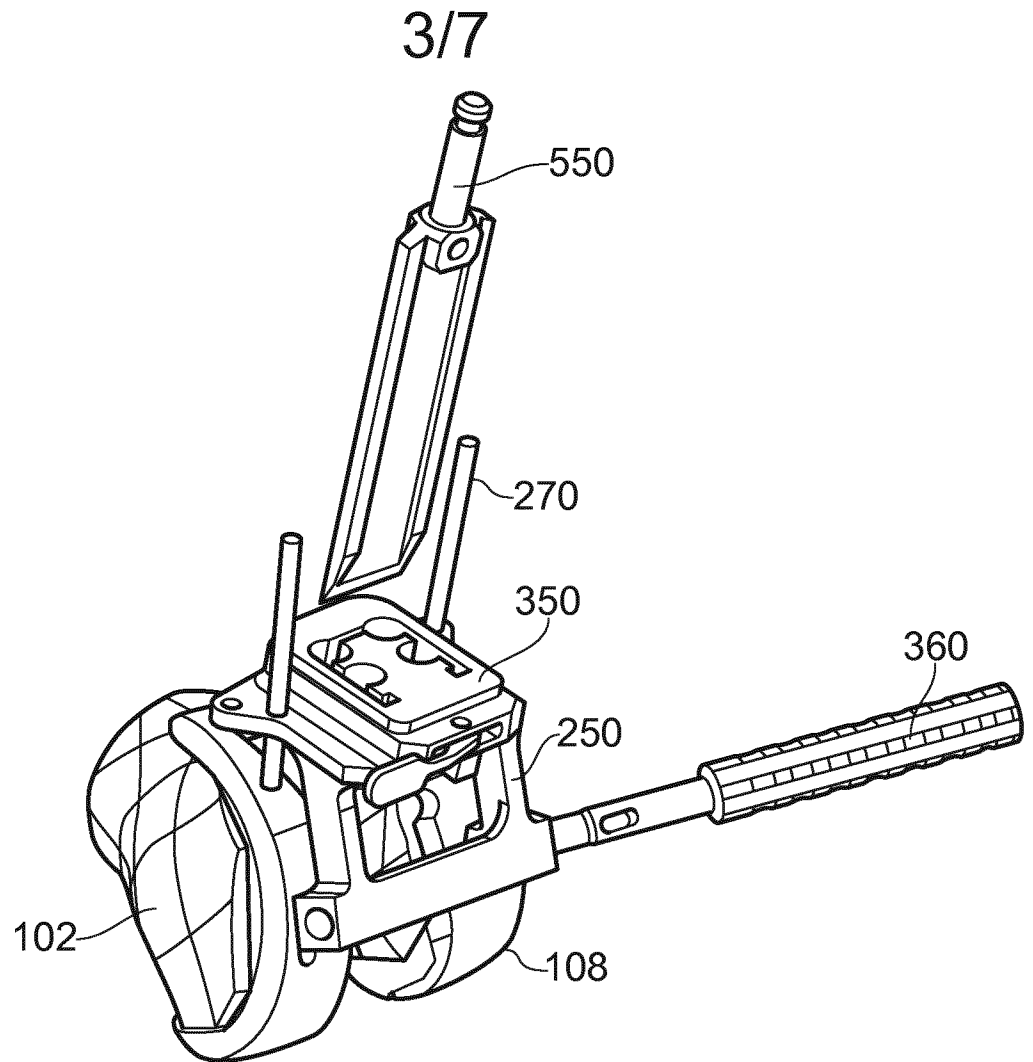


FIG. 5

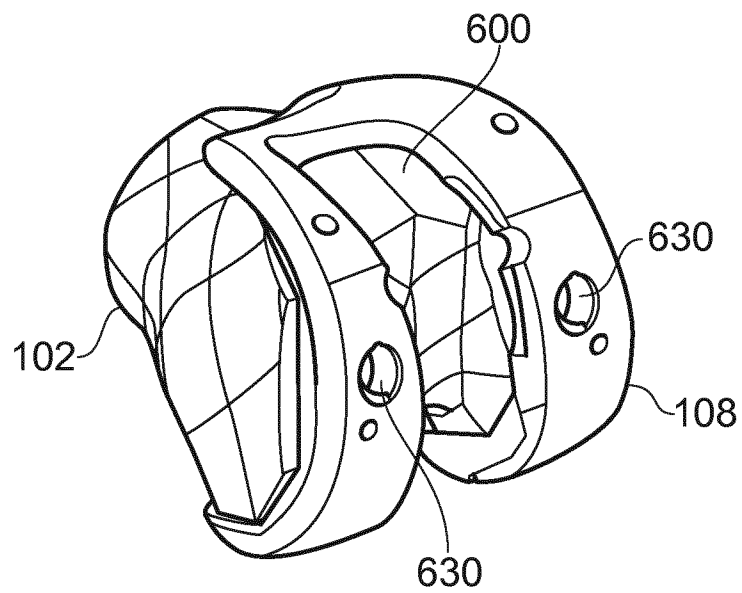


FIG. 6

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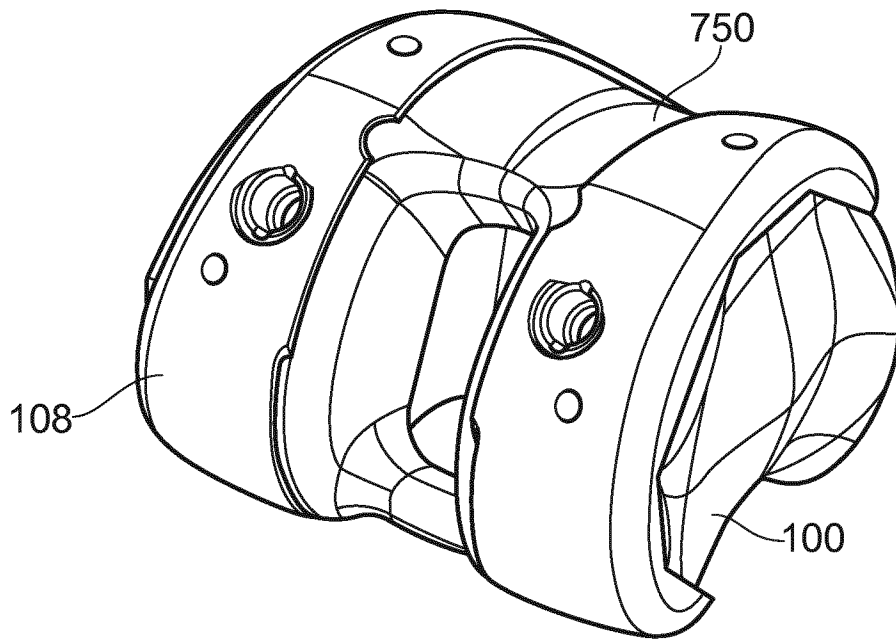


FIG. 7

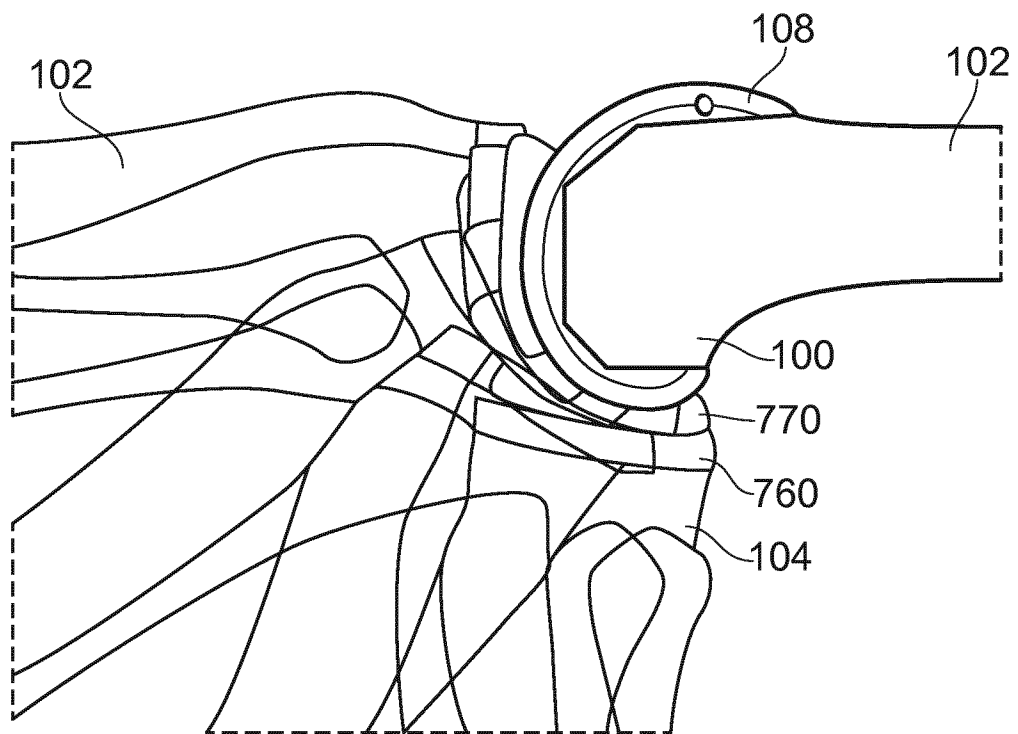


FIG. 8

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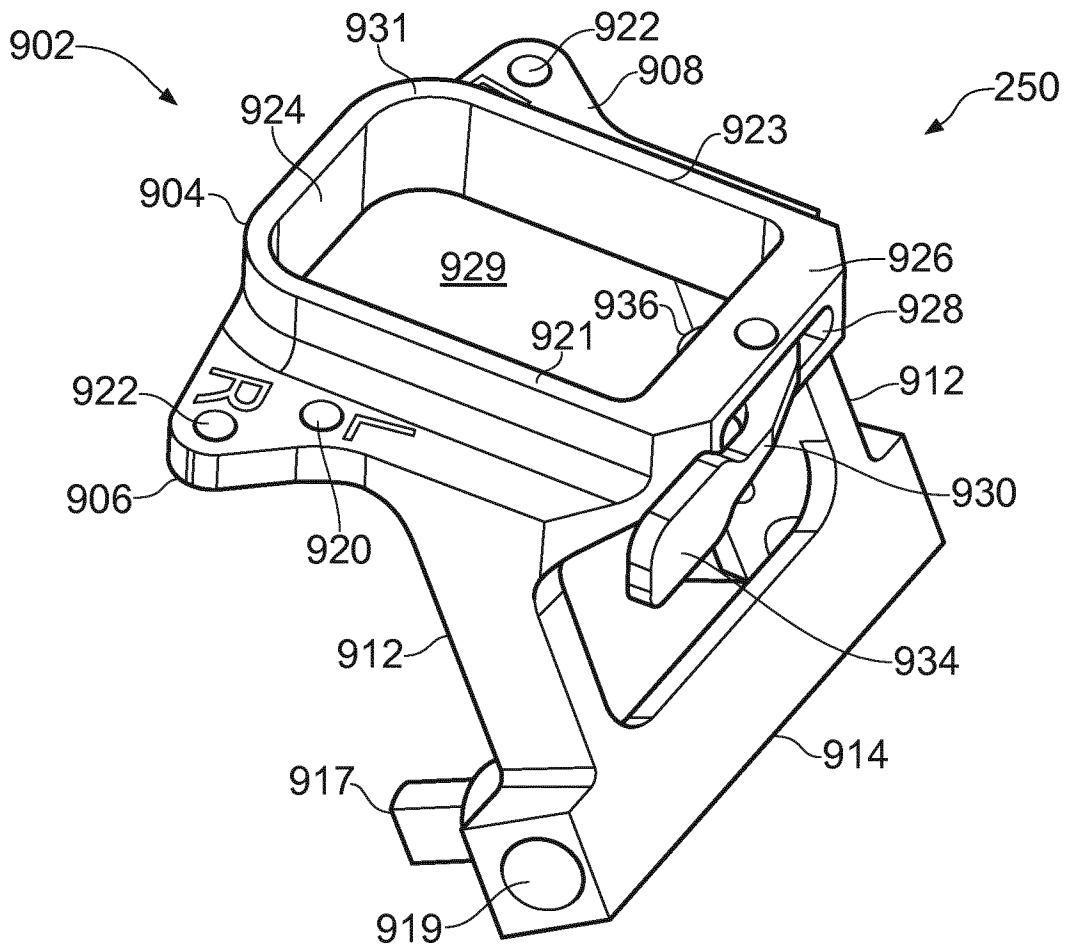


FIG. 9

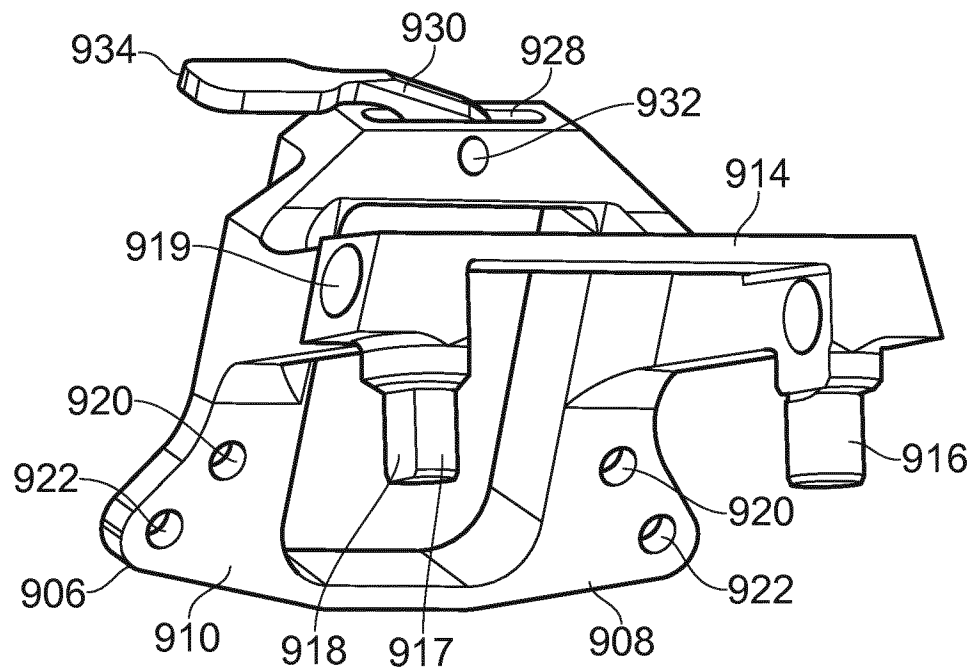


FIG. 10

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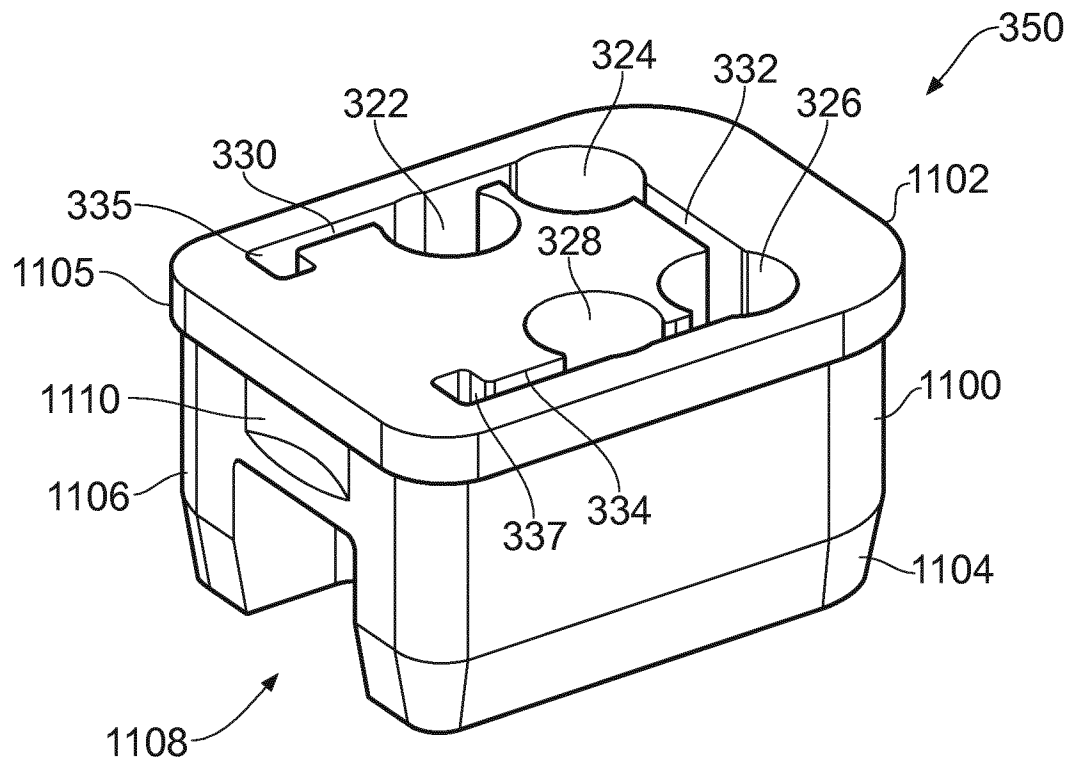


FIG. 11

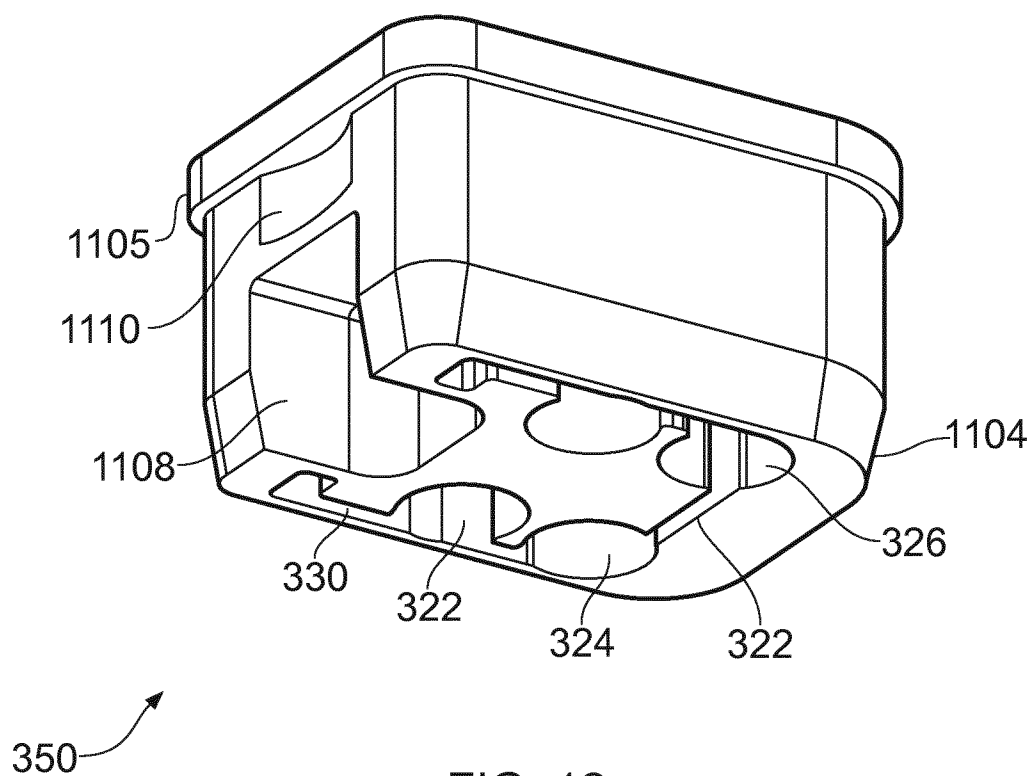


FIG. 12

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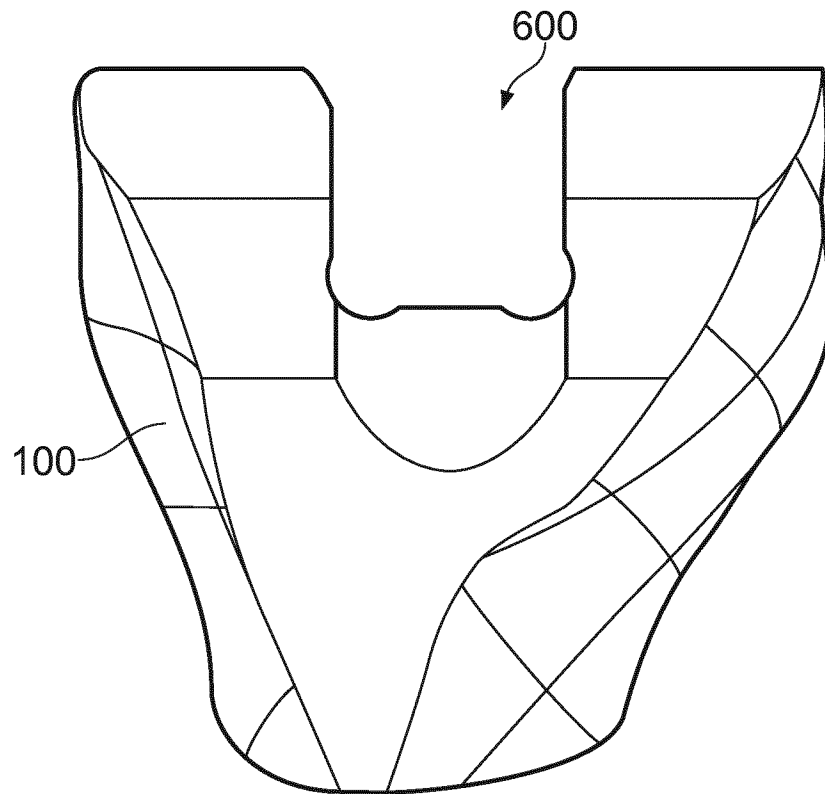


FIG. 13

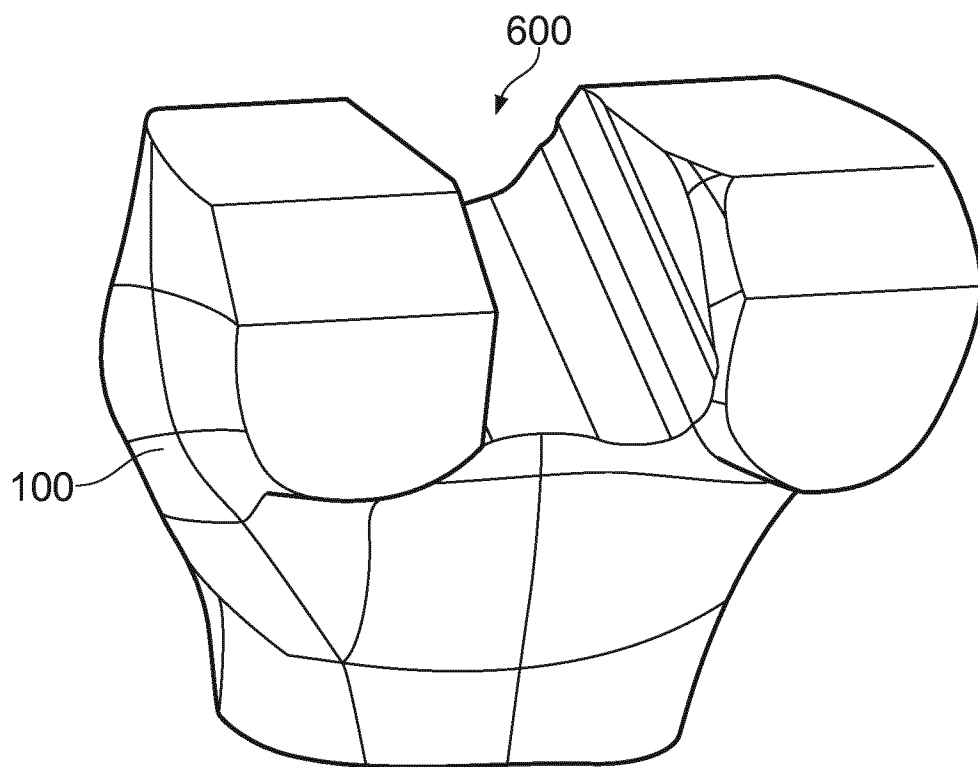


FIG. 14

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2016/081905

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61B17/15 A61B17/17 A61F2/46
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A61B A61F

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2012/310246 A1 (BELCHER NATHAN [US] ET AL) 6 December 2012 (2012-12-06)	1,4, 13-17, 19-22, 24, 27-33, 35-38
A	paragraph [0126] - paragraph [0129] figures 48-52	8-12,18, 23,34
X	US 2006/173463 A1 (DEES ROGER R JR [US]) 3 August 2006 (2006-08-03)	1,3-6, 13-17, 19-21, 27,28, 30-33, 36,37
	paragraph [0027] - paragraph [0035] figures 5A-7 ----- -/-	



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

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

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

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

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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

"&" document member of the same patent family

Date of the actual completion of the international search

28 February 2017

Date of mailing of the international search report

10/03/2017

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
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Authorized officer

Storer, John

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2016/081905

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2011/218541 A1 (BAILEY AARON M [US] ET AL) 8 September 2011 (2011-09-08) paragraph [0033] - paragraph [0056] figures 3-8B -----	1-7,13, 14, 19-22, 24-26, 29,35-37
X	US 2004/153087 A1 (SANFORD ADAM H [US] ET AL) 5 August 2004 (2004-08-05) paragraph [0043] - paragraph [0046] paragraph [0058] - paragraph [0062] figures 1-16 -----	1-7,13, 19-21, 27,36,37

INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP2016/081905

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☒ Claims Nos.: 39-46
because they relate to subject matter not required to be searched by this Authority, namely:
Rule 39.1(iv) PCT - Method for treatment of the human or animal body by surgery.
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2016/081905

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2012310246 A1	06-12-2012	US 2012310246 A1 US 2015157472 A1	06-12-2012 11-06-2015
US 2006173463 A1	03-08-2006	AU 2005319139 A1 CA 2591977 A1 CN 101083944 A EP 1845869 A1 JP 4995097 B2 JP 2008523962 A US 2006173463 A1 US 2011213378 A1 US 2014309645 A1 US 2015257900 A1 WO 2006069260 A1	29-06-2006 29-06-2006 05-12-2007 24-10-2007 08-08-2012 10-07-2008 03-08-2006 01-09-2011 16-10-2014 17-09-2015 29-06-2006
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US 2004153087 A1	05-08-2004	NONE	