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**De Wilde et al.**

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(54) **REVISION GLENOID DEVICE METHOD**

(56) **References Cited**

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(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 929 days.

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Erichsen, "Injuries of the Nervous System on Railway and Other Injuries of the Nervous System", The Classic Article in Clinical Orthopaedics and Related Research, Mar. 1997, pp. 47-51, No. 458, Walton and Moberly, London (5 pages).

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**Related U.S. Application Data**

(60) Continuation of application No. 16/214,676, filed on Dec. 10, 2018, now Pat. No. 11,076,963, which is a  
(Continued)

(51) **Int. Cl.**  
**A61F 2/40** (2006.01)  
**A61B 17/16** (2006.01)

(Continued)

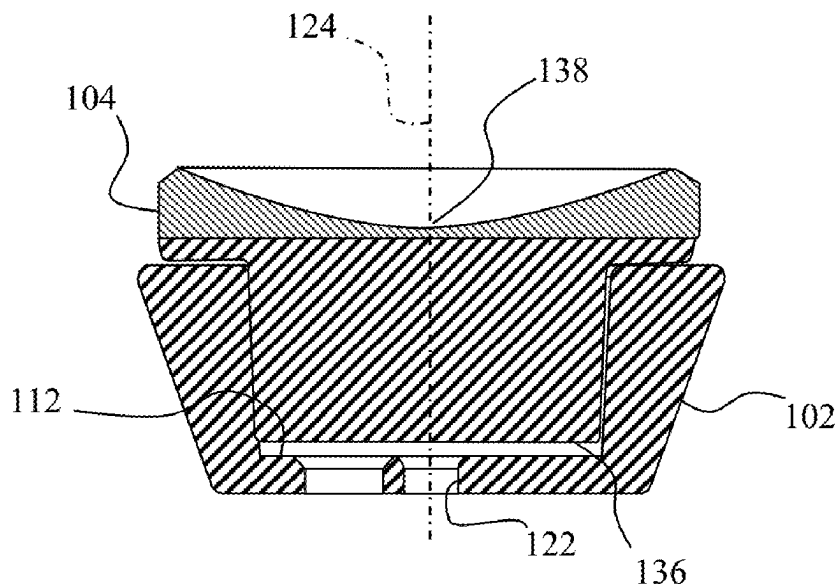
(52) **U.S. Cl.**  
CPC ..... **A61F 2/4081** (2013.01); **A61B 17/1684**  
(2013.01); **A61F 2/30771** (2013.01);  
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(58) **Field of Classification Search**  
CPC ..... A61F 2/40-4081  
See application file for complete search history.

(57) **ABSTRACT**

A glenoid component in one embodiment includes a base component with a planar upper circular rim defining a first plane, a receptacle opening to the first plane, and a lower planar circular surface defining a second plane parallel to the first plane. An articulating component of the glenoid component includes an upper articulating surface, a lower cylindrical coupling portion configured to be inserted into the receptacle, and an overhang portion located above the lower cylindrical coupling portion and beneath the upper articulating surface. The overhang portion includes a planar lower surface extending outwardly from the lower cylindrical coupling portion and configured to abut the planar upper circular rim of the base component when the articulating component is coupled to the base component.

**16 Claims, 8 Drawing Sheets**



**Related U.S. Application Data**

division of application No. 14/027,907, filed on Sep. 16, 2013, now Pat. No. 10,172,715, which is a division of application No. 13/051,062, filed on Mar. 18, 2011, now Pat. No. 8,551,177.

**(51) Int. Cl.**

**A61F 2/30** (2006.01)

**A61F 2/46** (2006.01)

**A61B 17/17** (2006.01)

**A61B 17/86** (2006.01)

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

CPC ..... *A61B 17/1778* (2016.11); *A61B 17/86* (2013.01); *A61F 2002/3021* (2013.01); *A61F 2002/30224* (2013.01); *A61F 2002/30331* (2013.01); *A61F 2002/30616* (2013.01); *A61F 2002/30617* (2013.01); *A61F 2002/3069* (2013.01); *A61F 2002/30736* (2013.01); *A61F 2002/30769* (2013.01); *A61F 2002/30784* (2013.01); *A61F 2002/3092* (2013.01); *A61F 2002/3093* (2013.01); *A61F 2002/4677* (2013.01)

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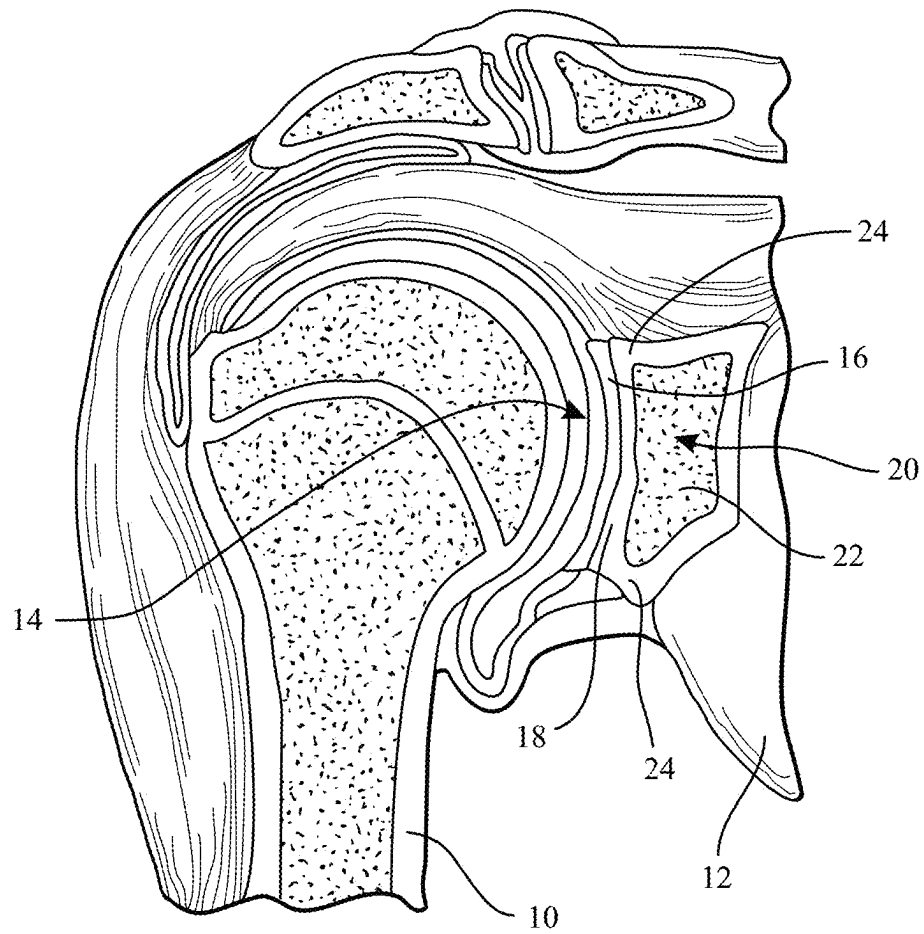


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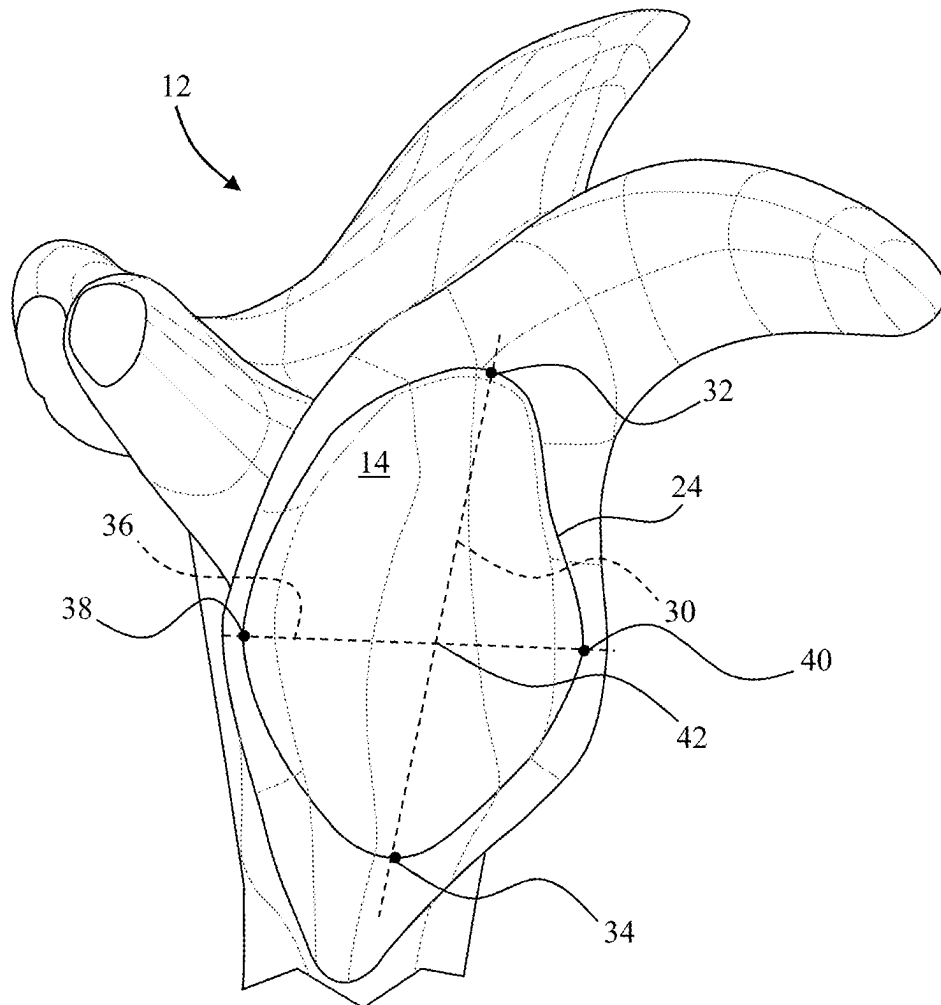


FIG. 2

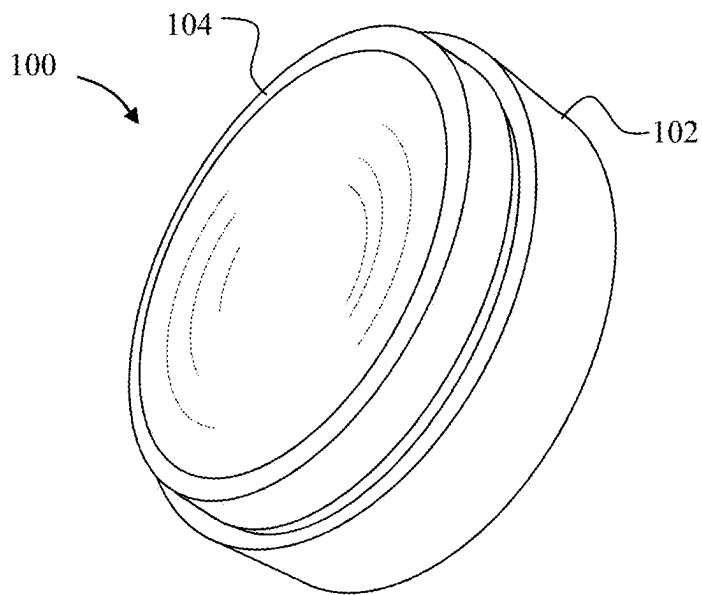


FIG. 3

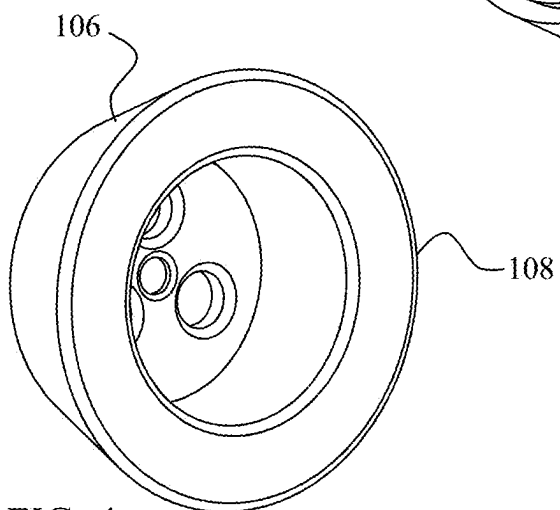


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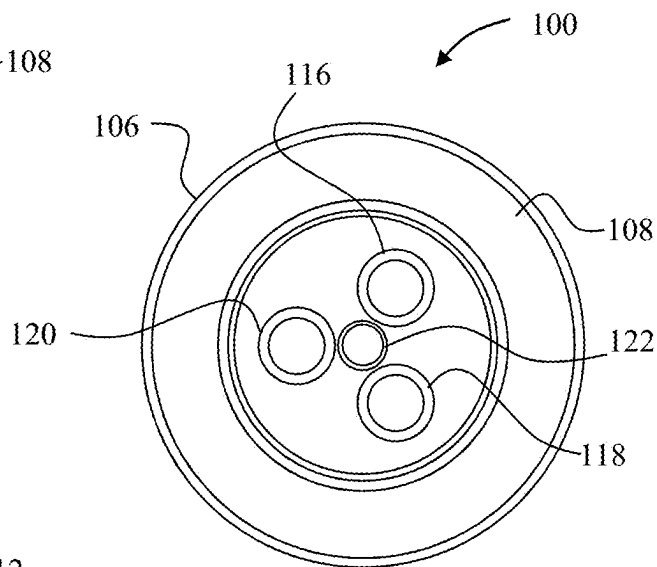


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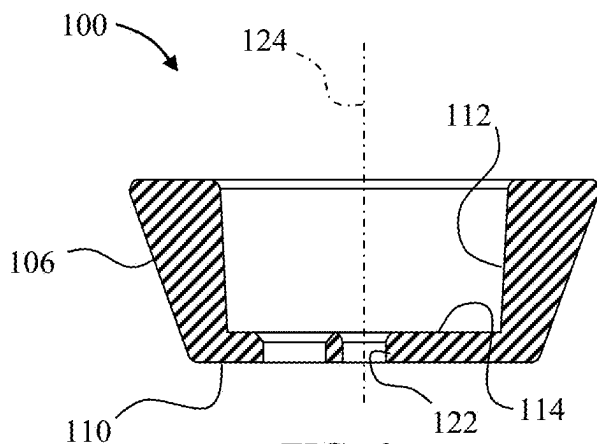


FIG. 6

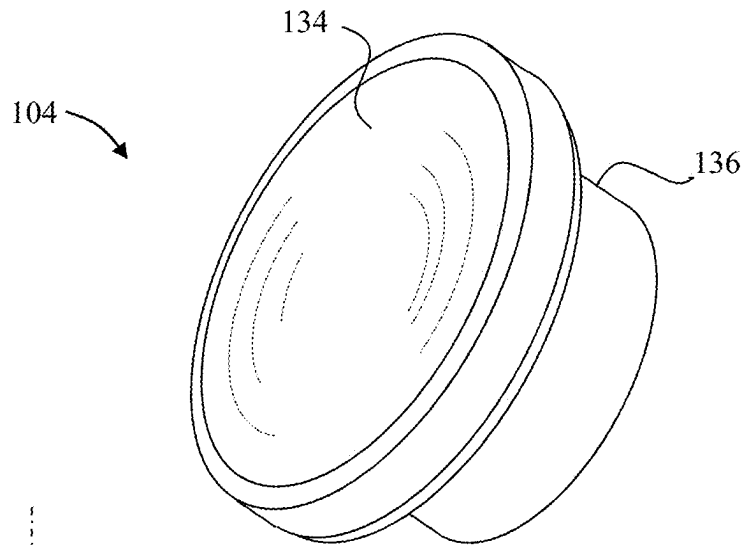


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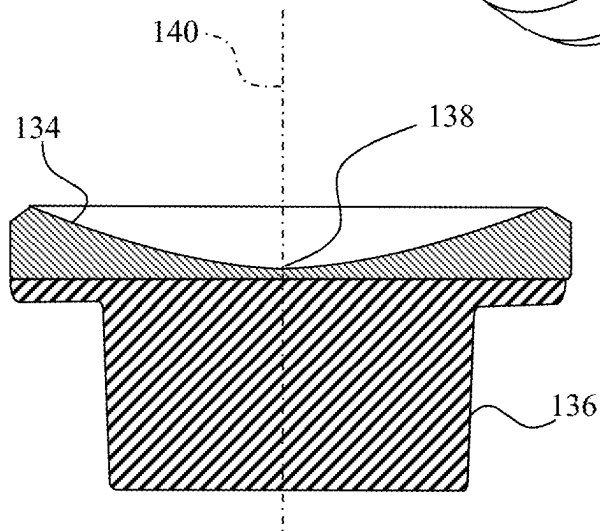


FIG. 8

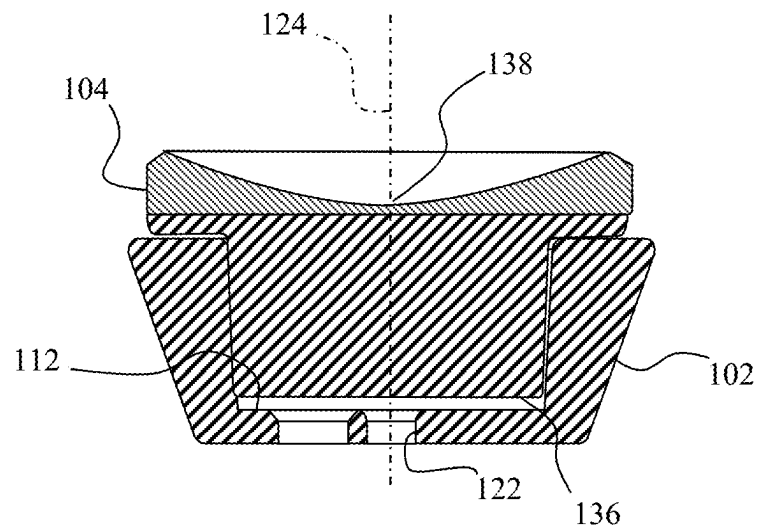


FIG. 9



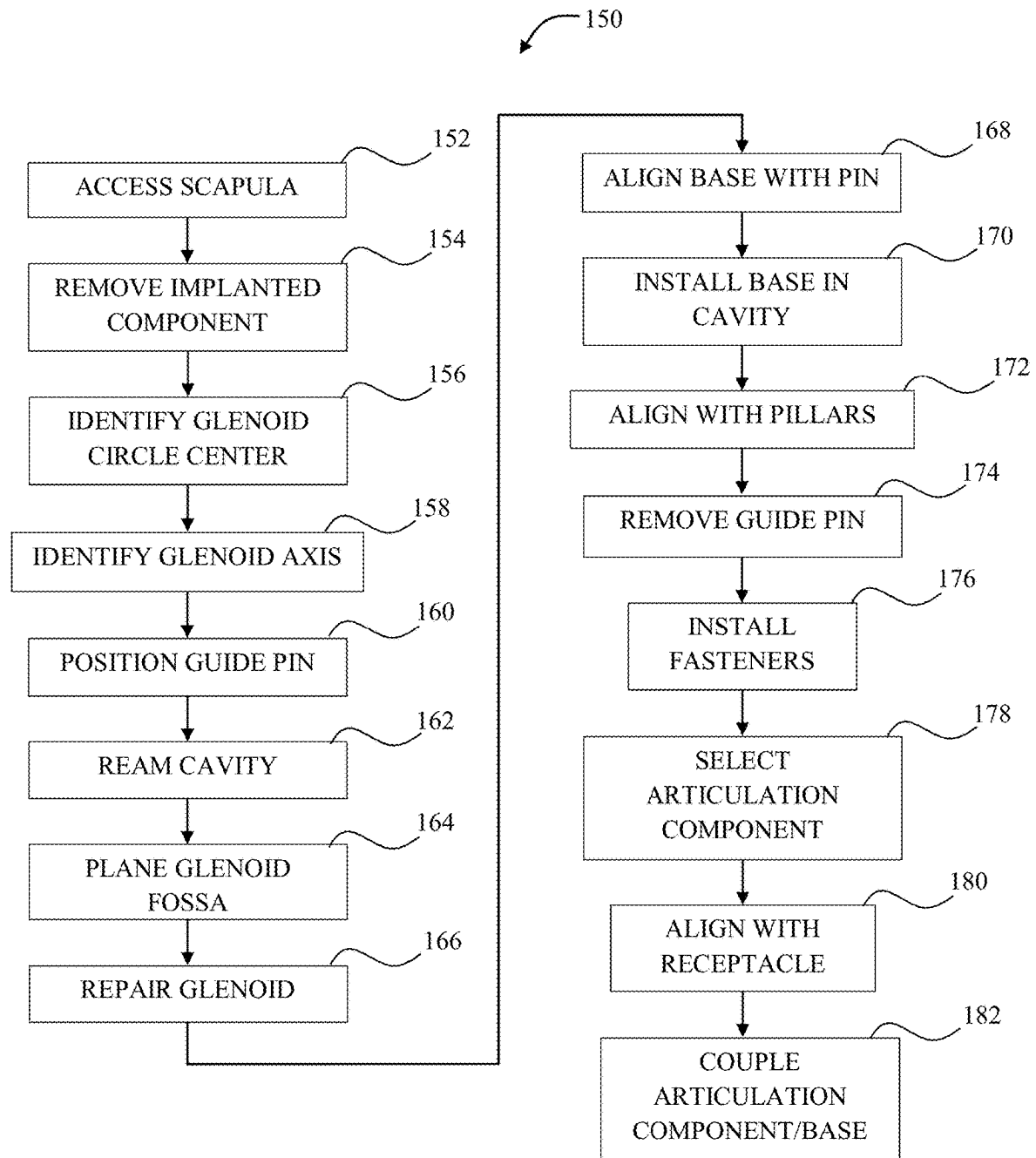


FIG. 10

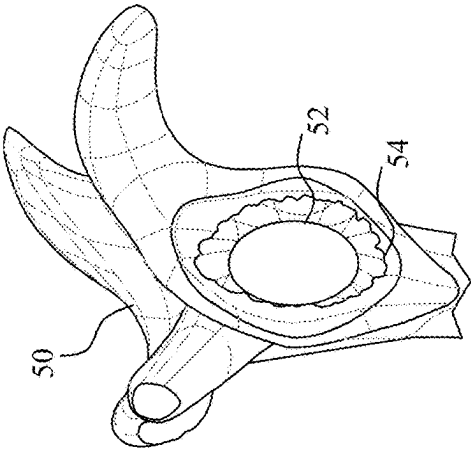


FIG. 11

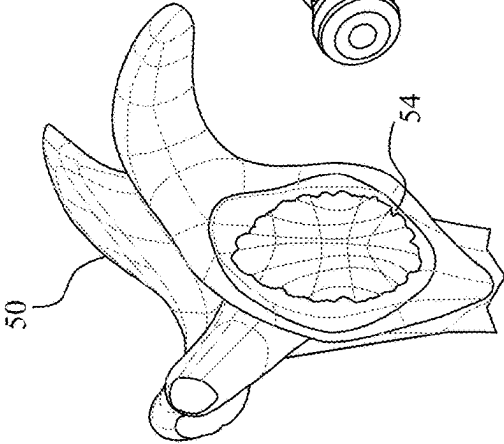


FIG. 12

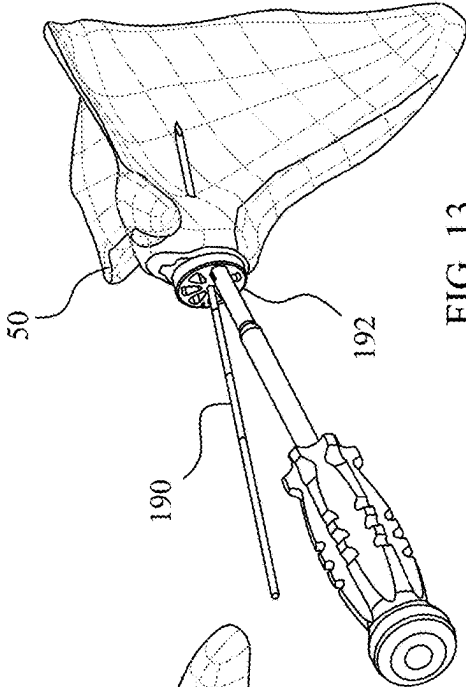


FIG. 13

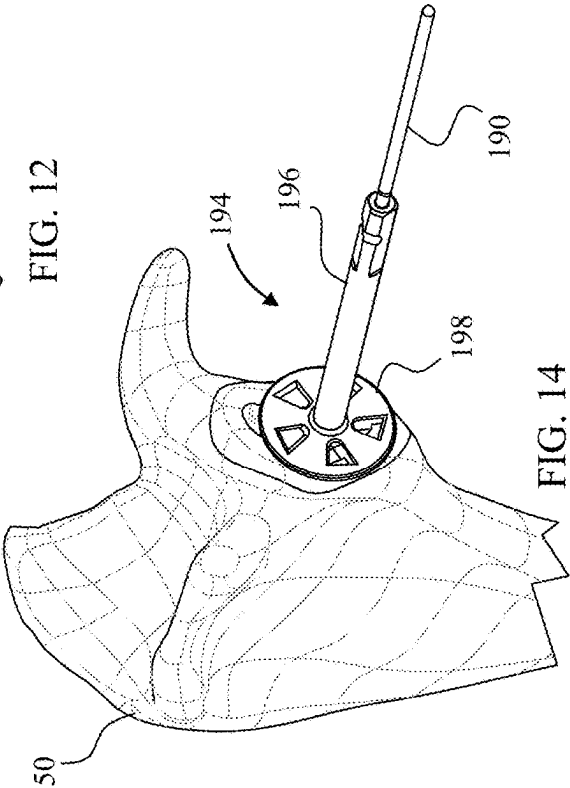


FIG. 14

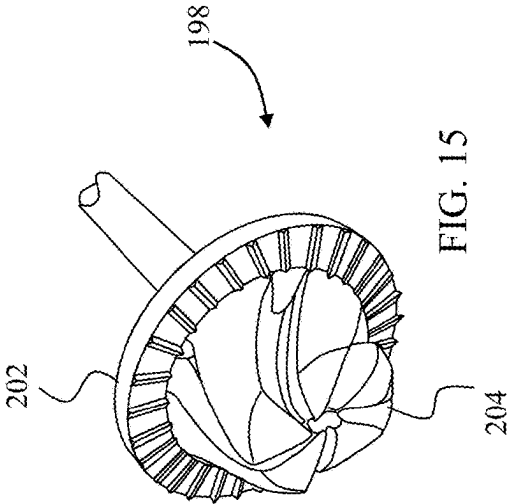


FIG. 15

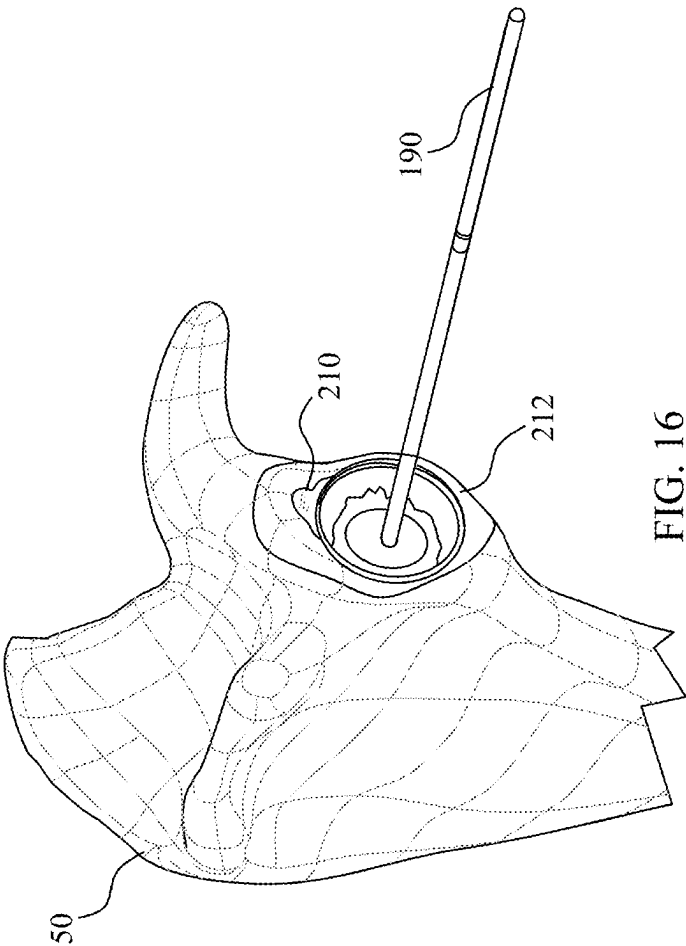


FIG. 16

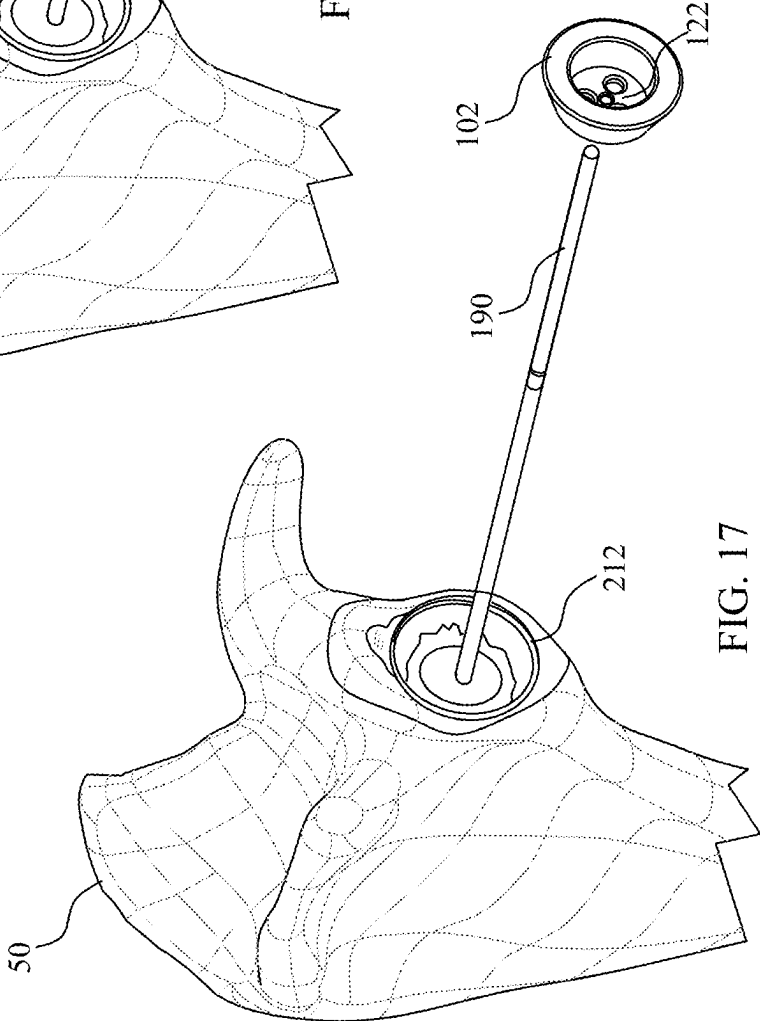


FIG. 17

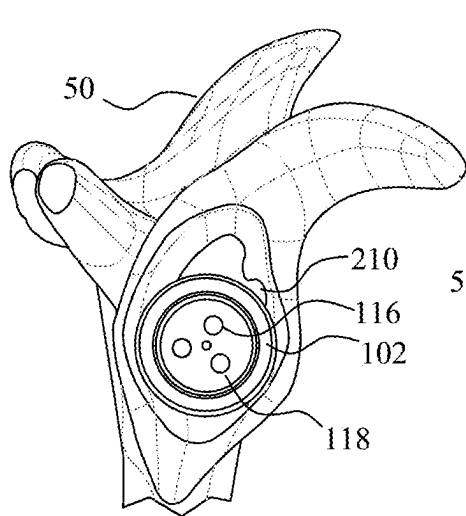


FIG. 18

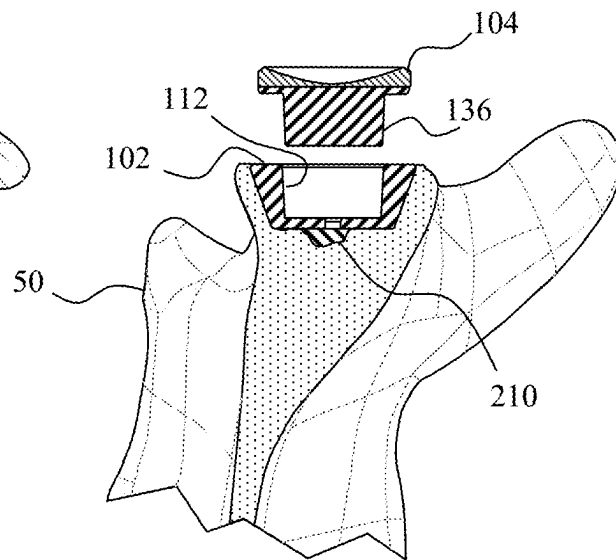


FIG. 19

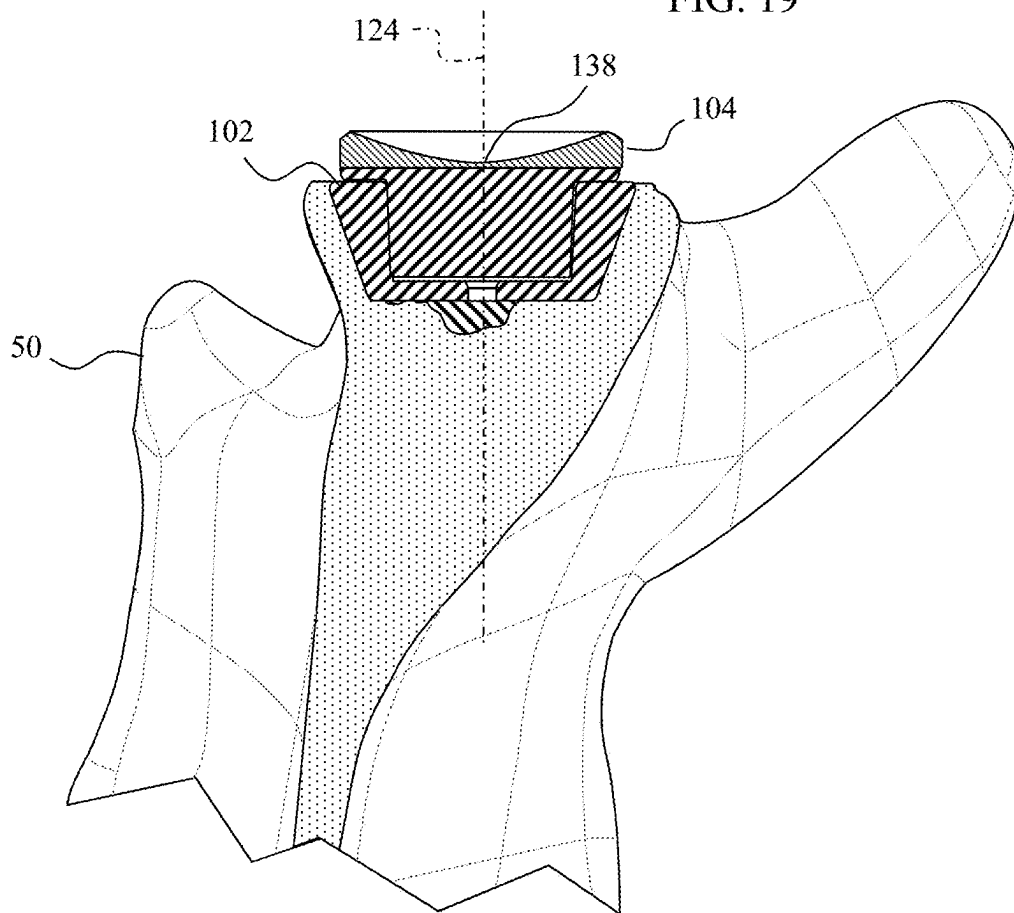


FIG. 20

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## REVISION GLENOID DEVICE METHOD

## CROSS-REFERENCE TO RELATED APPLICATIONS

This is a continuation of co-pending U.S. application Ser. No. 16/214,676, filed on Dec. 10, 2018, which issued Aug. 3, 2021 as U.S. Pat. No. 11,076,963, which is a divisional application of U.S. application Ser. No. 14/027,907, filed on Sep. 16, 2013, now U.S. Pat. No. 10,172,715 which issued Jan. 8, 2019 and which is a divisional application of U.S. application Ser. No. 13/051,062, filed on Mar. 18, 2011, now U.S. Pat. No. 8,551,177 which issued Oct. 8, 2013, the entire disclosures of which are incorporated herein by reference, which references U.S. patent application Ser. No. 13/051,011, entitled "Circular Glenoid Method for Shoulder Arthroscopy", which was filed on Mar. 18, 2011, U.S. patent application Ser. No. 13/051,026, entitled "Combination Reamer/Drill Bit for Shoulder Arthroscopy", which was also filed on Mar. 18, 2011, and U.S. patent application Ser. No. 13/051,041, entitled "Device and Method for Retroversion Correction Cone for Shoulder Arthroscopy", which was also filed on Mar. 18, 2011, the contents of which are each incorporated herein by reference.

## TECHNICAL FIELD OF THE INVENTION

The present invention relates generally to the field of orthopedics, and, more particularly, to glenoid component apparatuses for shoulder arthroplasty and methods for using them.

## BACKGROUND

As depicted in FIG. 1, a typical shoulder or glenohumeral joint is formed in a human body where the humerus 10 movably contacts the scapula 12. The scapula 12 includes a glenoid fossa 14 that forms a socket against which the head of the humerus 10 articulates. At this socket, the scapula 12 includes cartilage 16 that facilitates such articulation. Beneath the cartilage is subchondral bone 18 that forms a wall of a glenoid vault 20 that defines a cavity which contains cancellous bone 22. The subchondral bone 18 that forms the glenoid vault 20 defines a glenoid rim 24 at a periphery of the glenoid vault 20 that is attached to the cartilage 16. During the lifetime of a patient, the glenoid fossa 14 may become worn, especially at its posterior and/or superior portions thereby causing severe shoulder pain and limiting the range of motion of the patient's shoulder joint. To alleviate such pain and increase the patient's range of motion, a shoulder arthroplasty may be performed. Arthroplasty is the surgical replacement of one or more bone structures of a joint with one or more prostheses.

Shoulder arthroplasty often involves replacement of the glenoid fossa of the scapula with a prosthetic glenoid component. The conventional glenoid component typically provides a generally laterally or outwardly facing generally concave bearing surface against which a prosthetic humeral head (or, alternatively, the spared natural humeral head in the case of a glenoid hemi-arthroplasty) may bear during operation of the joint. The conventional glenoid component typically also includes a generally medially or inwardly projecting stem for fixing the glenoid component in a cavity constructed by suitably resecting the glenoid fossa 14 and suitably resecting cancellous bone 22 from the glenoid vault 20.

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The goal of shoulder arthroplasty is to restore normal kinematics to the shoulder. Accordingly, known systems attempt to replicate the normal kinematics by carefully controlling the geometry of the articulating surfaces in the joint as well as the positioning of the prostheses in the bones in which the prostheses are implanted. Thus, the articulating surface of a humeral component is typically spherical and positioning of the humeral component is accomplished by using the anatomical neck of the humerus as the reference plane for reconstruction of the humeral head.

In known systems, the glenoid component is positioned in the geometric center of the glenoid fossa. The geometric center is established by generating a line from the most superior point of the glenoid rim to the most inferior point of the glenoid rim ("Saller's line"). A second line is generated between the most posterior point of the glenoid rim and the most anterior point of the glenoid rim. The intersection of the two generated lines is considered to be the geometric center of the area circumscribed by the glenoid rim. By way of example, FIG. 2 depicts a sagittal view of the scapula 12. In FIG. 2, Saller's line 30 extends between the most superior point 32 of the glenoid rim 24 and the most inferior point 34 of the glenoid rim 24. A second line 36 extends from the most posterior point 38 of the glenoid rim 24 and the most anterior point 40 of the glenoid rim. The geometric center 42 of the glenoid fossa 14 is located at the intersection of the line 36 and Saller's line 30. As used herein, the terms anterior, posterior, superior, and inferior, unless otherwise specifically described, are used with respect to the orientation of the scapula 12 as depicted in FIG. 2.

Over time, implanted glenoid components can become loosened. Loosened components can result in increased pain for an individual. Correction of the problem, however, may be problematic. For example, replacement of components which are loosened may be complicated by a number of different glenoid deficiencies. Glenoid deficiencies may be classified as central (a void area in the central region of the glenoid fossa), peripheral (a void area in the glenoid rim area), or combined (a void area extending from the central region of the glenoid fossa to the glenoid rim area). Replacement of components in the presence of mild or moderate deficiencies, particularly when limited to the central region, may be accomplished using known components with or without bone grafting to fill remaining void areas. In cases involving large central deficiencies and combined deficiencies, however, other procedures such as allografting are required. Once the grafted material has been incorporated into the glenoid, a second surgery is performed to implant a replacement component into the allograft.

An alternative to grafting procedures is customization of components for the particular patient deficiency. Of course, customization increases the costs for a given procedure. Moreover, obtaining reproducible results is difficult when each procedure is unique.

There remains a need for a glenoid component that allows for establishing normal kinematics in revision procedures. There is a further need for a technique, instrumentation, and implant that facilitates positioning of such a component even when the glenoid has a variety of deficiencies. A glenoid component that can be positioned in a manner that reduces the amount of bone that is required to be removed without overly complicating the implant procedure is also needed.

## SUMMARY OF THE INVENTION

The present invention in one embodiment provides a method of implanting a revision glenoid component includ-

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ing accessing a previously implanted glenoid component in a scapula, removing the previously implanted glenoid component, identifying an inferior glenoid circle center of the scapula, preparing a glenoid fossa of the scapula to receive a revision glenoid component, selecting a revision glenoid component, and implanting the selected revision glenoid component based upon the identified inferior glenoid circle center in the prepared glenoid fossa.

In another embodiment, a method of implanting a revision glenoid component includes obtaining an image of a scapula, identifying an inferior glenoid circle center of the scapula based upon the image, selecting a revision glenoid component, removing a previously implanted glenoid component from the scapula, preparing a glenoid fossa of the scapula to receive a prosthesis, and implanting the selected revision glenoid component in the prepared glenoid fossa based upon the identified inferior glenoid circle center.

In a further embodiment a glenoid component includes a base component with a planar upper circular rim defining a first plane, a receptacle opening to the first plane, a lower planar circular surface defining a second plane parallel to the first plane, and a conical outer wall extending from the upper circular rim to the lower planar circular surface. The glenoid component includes an articulating component with an upper articulating surface and a lower coupling portion configured to be inserted into the receptacle.

The above-noted features and advantages of the present invention, as well as additional features and advantages, will be readily apparent to those skilled in the art upon reference to the following detailed description and the accompanying drawings, which include a disclosure of the best mode of making and using the invention presently contemplated.

#### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 depicts a coronal view of an anatomically normal shoulder joint.

FIG. 2 depicts a sagittal view of the shoulder joint of FIG. 1;

FIG. 3 depicts a front perspective view of a retroversion glenoid component that may be implanted in a scapula in accordance with principles of the invention;

FIG. 4 depicts a front perspective view of the base of the retroversion glenoid component of FIG. 3 that may be implanted in a scapula in accordance with principles of the invention;

FIG. 5 depicts a top plan view of the base of the retroversion glenoid component of FIG. 3;

FIG. 6 depicts a side cross-sectional view of the base of the retroversion glenoid component of FIG. 3;

FIG. 7 depicts a front perspective view of the articulating component of the retroversion glenoid component of FIG. 3;

FIG. 8 depicts a side cross-sectional view of the articulation component of the retroversion glenoid component of FIG. 3;

FIG. 9 depicts a side cross-sectional view of the retroversion glenoid component of FIG. 3;

FIG. 10 depicts a medical procedure that may be used to implant the retroversion glenoid component base of FIG. 3 into a scapula using a kit that includes a guide pin and a combined reaming/planning tool;

FIG. 11 depicts a sagittal view of a scapula with an implanted glenoid component which exhibits severe central bone loss resulting in undesired movement of the implanted glenoid component and which has been accessed in accordance with the procedure of FIG. 10;

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FIG. 12 depicts a sagittal view of the scapula of FIG. 11 after the previously implanted glenoid component has been removed;

FIG. 13 depicts a front perspective view of the scapula of FIG. 11 with a guide pin placement guide positioned to guide placement of the guide pin such that the guide pin is aligned with the glenoid axis of the scapula;

FIG. 14 depicts a side perspective view of the guide pin of FIG. 13 used to guide a combined reaming/planning device that may be included in a kit;

FIG. 15 depicts a partial bottom perspective view of the combined reaming/planning device of FIG. 14 showing a planning portion and a reaming portion;

FIG. 16 depicts a side perspective view of the scapula of FIG. 14 after a cavity has been reamed and after the glenoid has been repaired by using bone graft and a compactor to replace bone loss areas about the cavity;

FIG. 17 depicts the side perspective view of the scapula of FIG. 16 with the guide hole of a base component aligned with the guide pin such that the base component will be positioned in alignment with the glenoid axis of the scapula;

FIG. 18 depicts a sagittal plan view of the scapula of FIG. 17 with the base component rotated such that fasteners inserted into two of the fastener holes of the base can access a lateral pillar and a spina pillar of the scapula;

FIG. 19 depicts a cross-sectional view of the scapula of FIG. 18 with the coupling portion of the selected articulation component aligned with the receptacle of the base component; and

FIG. 20 depicts a cross-sectional view of the scapula of FIG. 19 with the articulation component coupled with the base component such that the nadir of the articulation component is positioned at the glenoid axis of the scapula.

#### DETAILED DESCRIPTION

Like reference numerals refer to like parts throughout the following description and the accompanying drawings.

FIG. 3 depicts a retroversion glenoid component 100. The glenoid component 100 includes a base component 102 and an articulation component 104. With further reference to FIGS. 4-6, the base component 102 includes a wall 106 which extends between a lip 108 and a bottom surface 110. At the lip 108, the wall 106 defines a circular outer periphery that is slightly larger than the circular outer periphery of the wall 106 at the bottom surface 110.

The lip 108 defines a receptacle 112 which is substantially cylindrical. The receptacle 112 extends from the lip 108 to a lower surface 114. Three fastener holes 116, 118, and 120 extend through the lower surface 114 and the bottom surface 110. A guide hole 122 also extends through the lower surface 114 and the bottom surface 110. The guide hole 122 and the receptacle 112 are centrally located. Accordingly, the guide hole 122, the receptacle 112, and the outer wall 106 define a unitary axis 124.

The articulating component 104, depicted in FIGS. 6 and 7, includes a spherical articulating surface 134 and a coupling portion 136. The coupling portion 136 is substantially cylindrical in shape and sized with a diameter slightly larger than the diameter of the receptacle 112. The articulating surface is positioned with a nadir 138 located on a central axis 140 of the articulating component 104. Accordingly, when the articulation component 104 is coupled with the base component 102 as depicted in FIG. 9, the nadir 138 is located on the axis 124 of the base component.

The glenoid component 100 in this embodiment is modular, but in other embodiments may be integrally formed.

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Integrally formed units may be made from a durable biocompatible plastic or any other suitable durable biocompatible material. For example, the glenoid component **100** may be made from a polyethylene. One particular polyethylene that is well suited for glenoid component **100** is a high molecular weight polyethylene, for example ultra-high molecular weight polyethylene ("UHMWPE"). One such UHMWPE is sold as by Johnson & Johnson of New Brunswick, New Jersey as MARATHON™ UHMWPE and is more fully described in U.S. Pat. Nos. 6,228,900 and 6,281,264 to McKellop, which are incorporated herein by reference.

In the embodiment of FIG. 3 wherein the articulation component **104** and the base component **102** are separately formed, the various components may be made from different materials. Thus, the articulating surface **134** may be made from UHMWPE, while the coupling portion **136** and the base component **102** may be made from a suitable biocompatible metal such as, for example, a cobalt chromium alloy, a stainless steel alloy, a titanium alloy, or any other suitable durable material. In this embodiment, the articulating surface **134** is secured to the coupling portion **136** in any suitable manner. For example, articulating surface **134** may be bonded to coupling portion **136**, or articulating surface **134** could be made from polyethylene and compression molded to coupling portion **136**. Alternately, the articulating surface **134** may be glued to the coupling portion **136**, for example, an adhesive. Alternatively, articulating surface **134** may be mechanically interlocked to the coupling portion **136** by taper locking or otherwise press-fitting the articulating surface **134** into the coupling portion **136** and the coupling portion **136** may include any other suitable interlocking features, for example, rib(s), lip(s), detent(s), and/or other protrusion(s) and mating groove(s), channel(s), or indent(s) (not shown).

In alternative embodiments, one or more of the outer wall **106** and the bottom surface **110** may include a porous coating to facilitate bone in-growth into the glenoid component **100**. The porous coating may be any suitable porous coating and may for example be POROCAT®, a product of Johnson & Johnson of New Brunswick, New Jersey and more fully described in U.S. Pat. No. 3,855,638 to Pilliar, which is incorporated herein by reference.

The glenoid component **100** may be included in a kit incorporating instrumentation that may be used to facilitate implantation of the glenoid component **100**. Such instrumentation may include reamers and guide pins, as discussed more fully below. Additionally, the kit may include base components having different heights and widths. Typical heights may range between 10 and 30 millimeters (mm). The kit may further include articulation components having different diameters. In one embodiment, a kit includes articulation components having a variety of diameters ranging from about 23 mm to about 30 mm.

Preferably, each of the base components in a kit has a receptacle **112** that is shaped and dimensioned the same as the receptacle **112** of each of the other base components **102** while each of the articulation components **104** has a coupling portion **136** that is shaped and dimensioned the same as the coupling portion **136** of each of the other articulation components **104**. Accordingly, any of the articulation components **104** may be coupled with any of the base components **102** in the kit.

A kit including the glenoid component **100** may be used to implant the glenoid component **100** into a scapula that has previously received a glenoid component in accordance with a procedure **150** depicted in FIG. 10. In accordance with the

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procedure **150**, a scapula is accessed at block **152** in accordance with a desired surgical approach. The previously implanted glenoid component is then removed at block **154**. At block **156**, the center of an inferior glenoid circle, further described in co-pending U.S. patent application Ser. No. 13/051,011, is identified for the scapula. While visual identification of the inferior glenoid circle and hence the center of the inferior glenoid circle is possible once the scapula is accessed at block **152**, the center of the inferior glenoid circle may alternatively be identified prior to or after incising a patient with the aid of imaging or other techniques.

Once the center of the inferior glenoid circle is identified at block **156**, a glenoid axis which extends through the center of the inferior glenoid circle and is perpendicular to the articulating surface of the glenoid is identified (block **158**). In alternative approaches, the glenoid axis may extend through the scapula at locations other than the center of the inferior glenoid circle. The glenoid axis may be identified prior to or after incising a patient with the aid of imaging or other techniques.

Next, a guide pin is positioned in the scapula such that the longitudinal axis of the guide pin is coextensive with the glenoid axis (block **160**). A circular cavity is then reamed in the glenoid (block **162**) and the glenoid surface is planed (block **164**). The circular cavity is preferably slightly larger than the diameter of the revision glenoid base component **102**. This allows for positioning of the base component **102** without placing stress on the glenoid which may be significantly compromised as discussed more fully below. At block **166**, a bone graft compactor is used over the guide pin, if needed, to fill in void areas of the glenoid which are not needed for receiving the revision glenoid component. The guide hole **122** of the base component **102** is then aligned with and inserted onto the guide pin (block **168**).

Using the guide pin as a guide, the base component **102** is then implanted in the prepared glenoid (block **170**). Because the guide pin is positioned on the glenoid axis and because the guide pin is positioned within the guide hole **122**, using the guide pin ensures that the central axis **124** of the base component (see FIG. 6) is aligned with the glenoid axis. At block **172**, the base component **122** may further be rotated about the guide pin to align one or more of the fastener holes **116**, **118**, and **120** with a respective one of the pillars of the scapula as described by A. Karellse, et al., "Pillars of the Scapula", *Clinical Anatomy*, vol. 20, pp. 392-399 (2007). Typically, at least two of the fastener holes **116**, **118**, and **120** may be positioned so as to access the lateral and spina pillars. Rotation of the base component **102** is facilitated since the cavity in the glenoid is slightly larger than the base component **102** as discussed above.

The guide pin may then be removed (block **174**) and one or more fasteners may be inserted through fastener holes **116**, **118**, and **120** to affix the base component **102** to the scapula (block **176**). To ensure firm fixation of the base component **102**, it is preferred that one or even two fasteners extend into solid bone material within one or more of the pillars of the scapula. The fastener holes **116**, **118**, and **120** may be configured to allow for variable angle fastener placement to assist in achieving a firm fixation. A desired articulation component is then obtained (block **178**) and the coupling portion **136** is aligned with the receptacle **112** (block **180**). The coupling portion **136** is then moved into the receptacle **112** and the articulation component **104** is coupled to the base component **102** (block **182**). Coupling may be facilitated by forming the coupling portion **136** and the receptacle **112** to form a friction fit, Morse taper, etc. Once the articulation component **104** is coupled to the base

component **102**, the nadir **138** will be aligned with the glenoid axis since the articulation component **104** is configured to couple with the base component **102** such that the nadir **138** is on the axis **140** as discussed above.

FIGS. **11-20** depict a scapula **50** at various points of the procedure **220**. In FIG. **11**, the scapula **12** is depicted after block **152** with a previously implanted glenoid component **52**. FIG. **12** depicts the scapula **50** after the component **52** has been removed. The scapula **50** in FIG. **12** exhibits severe central bone loss which has resulted in instability of the glenoid component **52**. The methods and devices disclosed herein may be used in performing a retroversion glenoid implantation in the presence of a variety of glenoid deficiencies including central, peripheral, and combined deficiencies ranging from mild to severe. Because the base component **102** is not press fit in to the scapula as discussed above, the potential of fracturing a portion of the scapula even in the presence of severe deficiencies is reduced.

FIG. **13** depicts a guide pin **190** and a guide pin placement guide **192** that may be included in a kit used to perform a revision glenoid component implantation procedure. The guide pin placement guide **192** is positioned on the scapula **50** substantially centered upon the inferior glenoid circle. The guide pin **190** is thus positioned in the scapula **50** with the longitudinal axis of the guide pin **190** aligned with the glenoid axis.

FIG. **14** depicts the scapula **50** with the guide pin **190** used to guide a combination reaming device **194** that may also be included in a kit in accordance with the present disclosure. The combination reaming device **194** includes a shaft **196** and a working portion **198**. The shaft **196** and the working portion **198** are cannulated to allow the guide pin **190** to be used to precisely position the combination device **194**. The working portion **198** includes an outer planing portion **202** and a central reaming portion **204**. The planing portion **202** and the central reaming portion **204** allow for simultaneous reaming and planing of the glenoid surface. Alternatively, two separate devices may be used sequentially.

Once the scapula **50** has been reamed and planed, some areas of deficiency may be present. Accordingly, bone grafting material may be used to fill the void areas. In one embodiment, a kit includes a cannulated compactor which is shaped like the reaming portion **204**. The cannulated compactor may be guided by the guide pin **190** to compact bone graft material **210** (see FIG. **16**) while maintaining or finally forming a cavity **212** that is shaped slightly larger than the outer wall **106** of the base component **102**.

The guide hole **202** is then aligned with the guide pin **190** as depicted in FIG. **17** and the base component **102** is guided by the pin **190** into the cavity **212**. The base component **102** is then rotated within the cavity **212** as desired to position the fastener holes **116**, **118**, or **120** to allow a fastener passed therethrough to be fixed into solid bone. By way of example, FIG. **18** depicts the base component **102** positioned such that a fastener passing through the fastener hole **116** may be fixed in the lateral pillar while a fastener passing through the fastener hole **118** may be fixed in the spina pillar. Thus, even though some or all of the base component **102** may be positioned on bone graft **210** (see, e.g., FIG. **19**), the base component may be solidly fixed to the scapula **50**. Thus, even when bone graft material **210** is used to fill in deficient areas of the scapula **50**, a second surgery is not required.

Once the base **102** is fixed to the scapula **50** and the guide pin **190** is removed, in any desired sequence, the coupling portion **136** of the selected articulation component **104** is aligned with the receptacle **112** of the base component **102** as depicted in FIG. **19**. The coupling portion **136** is then

moved into the receptacle **112** and the articulation component **104** is coupled to the base component **102** in any desired manner, such as by a Morse taper fit between the coupling portion **136** and the receptacle **112**, resulting in the configuration of FIG. **20**. In FIG. **20**, the nadir **138** is located on the glenoid axis since the base component **102** was fixed with the axis **124** of the guide hole **122** aligned with the glenoid axis as discussed above.

While the foregoing examples detailed only a single glenoid component **100**, a kit may incorporate a number of different glenoid components. Each glenoid component in the kit may be of a different diameter. Additionally, the procedure **150** may be modified in a number of ways in addition to those discussed above. By way of example, while in the above example the glenoid component **100** was implanted with the nadir **138** aligned with the inferior glenoid circle center at block **182**, the nadir **138** may alternatively be offset from the inferior glenoid circle center. For example, the nadir **138** may be offset from the inferior glenoid circle center by about 1.1 mm in a direction superiorly and posteriorly from the inferior glenoid circle center by positioning the guide pin **190** at the offset location at block **160**. Imaging and computer based systems may be used to assist in the positioning of the glenoid component at this location.

Moreover, while a specific sequence was described in the procedure **150**, many of the steps may be performed in a different order and/or simultaneously with other of the steps.

In accordance with the methods described above, a glenoid component with a spherical articulating surface is implanted at or very near to the spinning point of a shoulder in a revision procedure. Because of the location of the glenoid component, a humeral component with a radius of curvature matched to the radius of curvature of the articulating surface may be used to provide a constrained fit. As used herein, the term "matched" means a difference in the radii of curvature of the articulating surfaces of less than 2 mm.

The foregoing description of the invention is illustrative only, and is not intended to limit the scope of the invention to the precise terms set forth. Further, although the invention has been described in detail with reference to certain illustrative embodiments, variations and modifications exist within the scope and spirit of the invention as described and defined in the following claims.

What is claimed is:

1. A method of implanting a glenoid component, comprising:
  - selecting a base component including a planar upper circular rim defining a first plane, a receptacle opening to the first plane, and a lower planar circular surface defining a second plane parallel to the first plane;
  - preparing a glenoid fossa of a scapula to receive the selected base component;
  - implanting the selected base component in the prepared glenoid fossa;
  - selecting an articulating component with an upper articulating surface, a lower cylindrical coupling portion, and an overhang portion located above the lower cylindrical coupling portion and beneath the upper articulating surface, the overhang portion including a planar lower surface extending outwardly from the lower cylindrical coupling portion;
  - inserting the lower cylindrical coupling portion into the receptacle; and
  - abutting the planar upper circular rim of the base component with the planar lower surface,



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wherein

a portion of the planar lower surface abutting the planar upper circular rim defines an abutting portion maximum diameter,

the upper articulating surface defines an articulating surface maximum diameter,

the abutting portion maximum diameter is larger than the articulating surface maximum diameter,

the planar upper circular rim defining a rim maximum diameter, and

the rim maximum diameter is greater than the abutting portion maximum diameter.

2. The method of claim 1, wherein implanting the selected base component comprises:

implanting the selected base component such that the first plane is coplanar with a surface of the glenoid fossa.

3. The method of claim 2, wherein implanting the selected base component further comprises:

fastening the base component to the glenoid fossa using a plurality of fasteners, each of the plurality of fasteners extending through a respective one of a plurality of fastener holes extending from the receptacle through the lower planar circular surface.

4. The method of claim 1, wherein preparing the glenoid fossa of the scapula to receive the base component comprises:

forming a cavity in the glenoid fossa using a reamer, the cavity shaped complementary to, and larger than, the base component.

5. The method of claim 1, wherein:

selecting the base component includes selecting a base component having a first maximum height in a direction perpendicular to the first plane, and a receptacle with a receptacle maximum diameter along the first plane; and

the receptacle maximum diameter is greater than the first maximum height.

6. The method of claim 5, wherein:

selecting the articulating component includes selecting an articulating component with a second maximum height in the direction perpendicular to the first plane when the articulating component is inserted into the receptacle; and

the receptacle maximum diameter is greater than the second maximum height.

7. The method of claim 6, wherein:

selecting the articulating component further includes selecting an articulating component with an articulating component maximum diameter along the first plane; and

the rim maximum diameter is larger than the articulating component maximum diameter.

8. A method of implanting a glenoid component, comprising:

selecting a base component including a planar upper circular rim defining a first plane, a receptacle opening to the first plane, and a lower planar circular surface defining a second plane parallel to the first plane;

preparing a glenoid fossa of a scapula to receive the selected base component by forming a cavity in the glenoid fossa using a reamer, the cavity shaped complementary to, and larger than, the base component; implanting the selected base component in the prepared glenoid fossa;

selecting an articulating component with an upper articulating surface, a lower cylindrical coupling portion, and an overhang portion located above the lower cylindrical

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coupling portion and beneath the upper articulating surface, the overhang portion including a planar lower surface extending outwardly from the lower cylindrical coupling portion;

inserting the lower cylindrical coupling portion into the receptacle; and

abutting the planar upper circular rim of the base component with the planar lower surface.

9. The method of claim 8, wherein implanting the selected base component comprises:

implanting the selected base component such that the first plane is coplanar with a surface of the glenoid fossa.

10. The method of claim 9, wherein implanting the selected base component further comprises:

fastening the base component to the glenoid fossa using a plurality of fasteners, each of the plurality of fasteners extending through a respective one of a plurality of fastener holes extending from the receptacle through the lower planar circular surface.

11. The method of claim 10, wherein:

selecting the base component includes selecting a base component having a first maximum height in a direction perpendicular to the first plane, and a receptacle with a receptacle maximum diameter along the first plane; and

the receptacle maximum diameter is greater than the first maximum height.

12. The method of claim 11, wherein:

selecting the articulating component includes selecting an articulating component with a second maximum height in the direction perpendicular to the first plane when the articulating component is inserted into the receptacle; and

the receptacle maximum diameter is greater than the second maximum height.

13. The method of claim 12, wherein:

selecting the articulating component further includes selecting an articulating component with an articulating surface that defines an articulating surface maximum diameter along the first plane;

selecting the base component includes selecting a base component having an upper circular rim that defines a rim maximum diameter along the first plane; and the rim maximum diameter is larger than the articulating surface maximum diameter.

14. The method of claim 13, wherein:

selecting the articulating component further includes selecting an articulating component with an articulating component maximum diameter along the first plane; and

the rim maximum diameter is larger than the articulating component maximum diameter.

15. The method of claim 8, wherein selecting the articulating component comprises:

selecting an articulating component with an overhang portion that defines an overhang maximum diameter and an upper articulating surface that defines an articulating surface maximum diameter, wherein the overhang maximum diameter is larger than the articulating surface maximum diameter.

16. A method of implanting a glenoid component, comprising:

selecting a base component including a planar upper circular rim defining a first plane, a receptacle opening to the first plane, and a lower planar circular surface defining a second plane parallel to the first plane;

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preparing a glenoid fossa of a scapula to receive the selected base component;  
implanting the selected base component in the prepared glenoid fossa such that the first plane is coplanar with a surface of the glenoid fossa;  
selecting an articulating component with an upper articulating surface, a lower cylindrical coupling portion, and an overhang portion located above the lower cylindrical coupling portion and beneath the upper articulating surface, the overhang portion including a planar lower surface extending outwardly from the lower cylindrical coupling portion;  
inserting the lower cylindrical coupling portion into the receptacle; and  
abutting the planar upper circular rim of the base component with the planar lower surface.

\* \* \* \* \*

**12**