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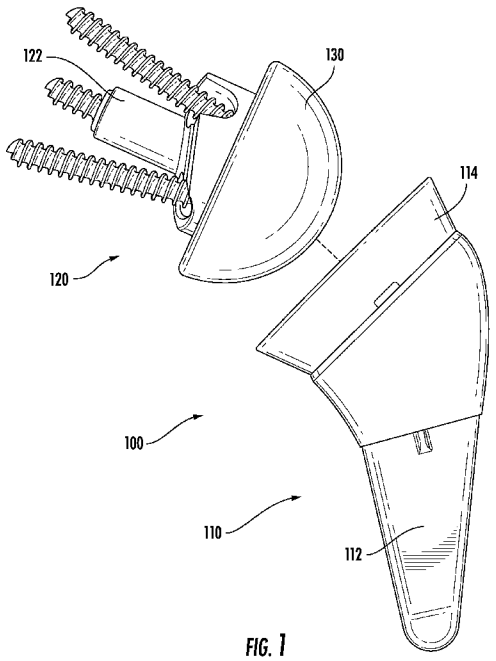


FIG. 1

(57) Abstract: A retention system (140) for coupling a glenosphere (130) to a baseplate (122) in a reverse shoulder arthroplasty including a glenosphere having a retention recess (135) formed in a base of the glenosphere and a retention fastener (141) configured to engage a threaded hole (123) of the baseplate, the retention fastener including a fastener head (142), where the fastener head is configured to be retained within the retention recess. A retention cap (143) can be configured to be coupled within the retention recess of the glenosphere, the retention cap including a body portion (144) having an opening (145) therethrough. The head of the retention fastener can then be configured to be retained within the opening of the body portion to retain the fastener head within the retention recess. Alternatively, the glenosphere can itself include a step (139) that protrudes radially inward from a wall of the retention recess to prevent the retention fastener from passing through the retention recess.

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SYSTEMS AND METHODS OF RETENTION FOR GLENOSPHERE

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This is a non-provisional of, and claims the benefit of the filing date of, U.S. provisional patent application number 63/472,694, filed June 13, 2023, entitled "RETENTION FOR GLENOSPHERE," and U.S. provisional patent application number 63/547,435, filed November 6, 2023, entitled "RETENTION FOR GLENSOPHERE," the entirety of which application is incorporated by reference herein.

FIELD OF THE DISCLOSURE

[0002] The present disclosure relates generally to medical implant devices. More particularly, the subject matter disclosed herein relates to configurations of a shoulder arthroplasty implant system.

BACKGROUND OF THE DISCLOSURE

[0003] Shoulder replacement implants are used for restoration of functionalities of shoulders as well as to treat a variety of degenerative conditions and injuries. Shoulder replacement implants typically come in two designs: anatomic and reverse. Anatomic shoulder implants are used for restoration of natural kinematics of a shoulder by replacing its humeral head and glenoid with similarly shaped prosthetic designs that recreate normal anatomy. The anatomic shoulder implant often has a spherical humeral head and a shallow concave glenoid that articulates with the spherical head. As part of an implantation procedure, an anatomic shoulder implant's stem is securely placed down the shaft of the

humerus and the spherical head is often fixed to the stem using a mechanical taper press fit. The glenoid prosthetic component (made from a polymer, e.g., ultra-high molecular weight polyethylene (UHMWPE)) is either cemented directly into the remaining intact glenoid or affixed to a metallic tray, which is secured to the native glenoid bone using bone screws, cement, or similar attachment methods.

[0004] In the reverse shoulder implant procedure, the implant's spherical surface, sometimes referred to as a glenosphere, is coupled to the remaining intact glenoid, and a concave articular surface is coupled to the humerus. The implant also includes a stem that is securely placed down the shaft of the humerus to support the concave articular surface in position, such as using a mechanical lock to fix the concave articular surface to the stem.

[0005] In existing implants having this reverse configuration, it is customary to have a retention screw which maintains the engagement between a tapered base of the glenosphere and a mating taper of the base plate mounted to the glenoid. In many situations, it is further desirable to allow the glenosphere to be repeatably removed for revision purposes. Facilitating the primary alignment of the tapered surfaces and fixation using a secondary fastener both have to be achieved, however, through a single central hole in the glenosphere. As a result, to accommodate these functions, the system often uses a short, retained screw at the most medial side of the glenosphere and open threads laterally on the glenosphere (e.g., at the crest of the sphere). This configuration poses a challenge to have multiple functional areas within one hole/opening.

[0006] It is with respect to these and other considerations that the present disclosure may be useful.

SUMMARY OF THE DISCLOSURE

[0007] This Summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This Summary is not intended to identify key features or essential features of the claimed subject matter, nor is it intended as an aid in determining the scope of the claimed subject matter.

[0008] In accordance with one or more features of the present disclosure, a retention system for coupling a glenosphere to a baseplate in a reverse shoulder arthroplasty is disclosed. The system may include a glenosphere having a retention recess formed in a base of the glenosphere and a retention fastener configured to engage a threaded hole of the baseplate, the retention fastener including a fastener head, where the fastener head is configured to be retained within the retention recess.

[0009] In accordance with one or more further features of the present disclosure, a method for coupling a glenosphere to a baseplate in a reverse shoulder arthroplasty is also disclosed. The method may include coupling a head of a retention fastener within a retention recess formed in a base of a glenosphere. The method may further include engaging the retention fastener with threaded hole of a baseplate while the fastener head of the retention fastener is retained within the retention recess.

[0010] In any preceding or subsequent example, the glenosphere may include a tapered recess formed in the base of the glenosphere, the tapered recess being configured to be coupled to a tapered protrusion of the baseplate. In some examples, the retention recess is formed at an interior end of the tapered recess.

[0011] In any preceding or subsequent example, a retention cap may be configured to be coupled within the retention recess of the glenosphere, the retention cap including a body portion having an opening therethrough. The fastener head of the retention fastener may then be configured to be retained within opening of the body portion to retain the fastener head within the retention recess.

[0012] In any preceding or subsequent example, the body portion of the retention cap may include a flange that protrudes radially inward into the opening. In some examples, the fastener head of the retention fastener has a diameter greater than a width of the opening at the ledge such that the head of the retention fastener is prevented from passing through the opening.

[0013] In any preceding or subsequent example, the retention cap may include a plurality of prongs extending radially outward from the body portion. In some examples, the plurality of prongs are configured to engage the retention recess of the glenosphere to couple the retention cap to the glenosphere.

[0014] In any preceding or subsequent example, the body portion of the retention cap has a height that is greater than a depth of the retention recess. With this configuration, in some examples, the plurality of prongs are configured to flex radially outward upon compression of the body portion within the retention recess.

[0015] In any preceding or subsequent examples, the retention recess includes a ledge that protrudes radially inward from a wall of the retention recess. With this configuration, in some examples, the plurality of prongs of the retention cap are configured to engage the ledge to retain the retention cap within the retention recess.

[0016] In any preceding or subsequent examples, the glenosphere includes a step that protrudes radially inward from a wall of the retention recess at an interface between the retention recess and the tapered recess. With this configuration, in some examples, the head of the retention fastener may have a diameter greater than a width of the retention recess at the step such that the head of the retention fastener is prevented from passing into the tapered recess.

[0017] In any preceding or subsequent examples, the glenosphere includes a threaded opening in communication with the retention recess and configured to be threadedly coupled to an inserter tool. With this configuration, in some examples, the head of the retention fastener may include a threaded outer surface complementary to the threaded opening in the glenosphere such that the retention fastener may be inserted through the threaded opening into the retention recess.

[0018] Examples of the present disclosure provide numerous advantages. For example, the present systems and methods provide secure fixation of the glenosphere to the baseplate while also allowing the glenosphere to be repeatably removed for revision purposes.

[0019] Further features and advantages of at least some of the examples of the present disclosure, as well as the structure and operation of various examples of the present disclosure, are described in detail below with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] By way of example, specific examples of the disclosed device will now be described, with reference to the accompanying drawings, in which:

[0021] **FIG. 1** illustrates a side view of components of a reverse shoulder replacement implant according to one or more features of the of the presently disclosed subject matter.

[0022] **FIGS. 2A and 2B** illustrate side perspective cutaway views of a retention system for coupling a glenosphere to a baseplate according to one or more features of the of the presently disclosed subject matter.

[0023] **FIG. 3A** is a side perspective view of a retention cap of a retention system according to one or more features of the of the presently disclosed subject matter.

[0024] **FIG. 3B** is a side cutaway view of the retention cap shown in **FIG. 3A**.

[0025] **FIGS. 4A and 4B** are side cutaway views of a glenosphere of a retention system according to one or more features of the of the presently disclosed subject matter.

[0026] **FIG. 5** is a side cutaway view of a glenosphere of a retention system according to one or more features of the of the presently disclosed subject matter.

[0027] The drawings are not necessarily to scale. The drawings are merely representations, not intended to portray specific parameters of the disclosure. The drawings are intended to depict various examples of the disclosure, and therefore are not considered as limiting in scope. In the drawings, like numbering represents like elements.

DETAILED DESCRIPTION

[0028] Various features or the like of a glenosphere retention system will now be described more fully herein with reference to the accompanying drawings, in which one or more features of the glenosphere retention system will be shown and described. It should be appreciated that the various features may be used independently of, or in combination, with each other. It will be appreciated that the glenosphere retention system as disclosed

herein may be embodied in many different forms and may selectively include one or more concepts, features, or functions described herein. As such, the glenosphere retention system should not be construed as being limited to the specific examples set forth herein. Rather, these examples are provided so that this disclosure will convey certain features of the glenosphere retention system to those skilled in the art.

[0029] In accordance with one or more features of the present disclosure, a retention system used to retain the glenoid screw in place is disclosed. The disclosed feature replaces a threaded washer and locking pin configuration that is used in conventional designs. In some examples, the retention system design can help to optimize thread length and head sizing.

[0030] Referring to FIG. 1, the features of the present disclosure provide improvements in the fixation of elements in a reverse shoulder replacement implant, generally designated **100**, having a humeral head component **110** including a stem **112** and an articular cup **114** and a glenoid component **120** including a baseplate **122** and a glenosphere **130**. In particular, the features of the present disclosure provide improved fixation of the glenosphere **130** to the baseplate **122**.

[0031] Referring to FIGS. 2A and 2B, in some examples, the glenosphere **130** is attachable to the baseplate **122** using a combination of features. In the illustrated example, initial fixation of the components can be achieved by engaging a tapered protrusion **124** of the baseplate **122** with a tapered recess **134** formed in a base of the glenosphere **130**. In some examples, the tapered recess **134** has a shape that substantially corresponds to a shape of the tapered protrusion **124** and that can matingly couple with the tapered protrusion **124**

to securely hold the glenosphere **130** in place with respect to the baseplate **122**. In some particular examples, the tapered protrusion **124** comprises a Morse taper which can cooperate with the tapered recess **134** to couple the glenosphere **130** to the baseplate **122**.

[0032] In some examples, assembly of the glenosphere **130** with the baseplate **122** is achieved using an inserter tool. The inserter tool can be attached to the glenosphere by engaging a threaded opening **132** in the glenosphere **130**. In addition, in some examples, the inserter tool can include a protrusion that is configured to engage a notch **133** in the glenosphere **130** that is positioned at or near the end of the threaded opening **132**, this engagement allowing enhanced rotational control while the components are engaged. Once connected, a user can position the glenosphere **130** such that the tapered recess **134** is aligned with the tapered protrusion **124**, and a force can be applied to the inserter tool (e.g., by tapping with a mallet) to secure the glenosphere **130** in place. Further engagement of the elements can be achieved using an impactor according to conventional methods.

[0033] In addition, in some examples, fixation of the glenosphere **130** to the baseplate **122** is further achieved using a retention system, generally designated **140**, which can include a retention fastener **141** that is configured to be coupled to the glenosphere **130**. The retention system **140** can be coupled to the glenosphere **130**. The retention fastener **141** can be configured to engage the baseplate **122** of the glenoid component **120** to enhance the coupling of the glenosphere **130** to the baseplate **122**. In some examples, the retention fastener **141** has a threaded configuration that corresponds to a threaded hole **123** in the baseplate **122**.

[0034] In some examples, the retention system **140** further includes a retention cap **143** that is coupled to the retention fastener **141** to secure the retention fastener **141** to the glenosphere **130**. In this configuration, the retention cap **143** serves both to couple the retention system **140** to the glenosphere **130** and to act as a washer to distribute the load of the retention fastener **141** when engaged with the baseplate **122**. In some examples, the retention cap **143** is composed of a resilient material that is configured to be elastically deformable. In some specific examples, the retention cap **143** is composed of a flexible, implant grade material, including but not limited to 316 stainless steel.

[0035] Referring to FIGS. 3A and 3B, in some examples, the retention cap **143** has a body portion **144** having a central opening **145** through which the retention fastener **141** can be received. In some examples, the body portion **144** has a substantially cylindrical shape extending from a first end **146a** to a second end **146b** substantially opposing the first end **146a**. The opening **145** can extend through a center of the substantially cylindrical shape from the first end **146a** to the second end **146b**. In some examples, the second end **146b** of the body portion defines a flange **147** that surrounds the opening **145** and is sized and configured to support a head **142** of the retention fastener **141** thereon.

[0036] The retention cap **143** can further include a plurality of prongs or fingers **148** that extend from the body portion **144**. In some examples, the prongs **148** extend from the first end **146a** of the body portion **144**. The prongs **148** are configured to engage the glenosphere **130** to retain the retention cap **143** in a substantially fixed position. In some examples, the prongs **148** are configured to be resiliently bendable such that they act as spring elements that resist deflection. Referring to FIGS. 4A and 4B, the glenosphere can

include a retention recess **135** within the glenosphere **130** that is sized and configured to receive the retention cap **143** therein. In the illustrated example, the retention recess **135** is formed at an interior end of the tapered recess **134** such that, when the tapered recess **134** is engaged with the tapered protrusion **124** of the glenoid component **120**, the retention system **140** is positioned adjacent to the baseplate **122**.

[0037] In some examples, the retention cap **143** is sized and configured to nest within the retention recess **135**. In some specific examples, the retention recess **135** comprises a ledge **138** that protrudes radially inward from a wall of the retention recess **135**. In this arrangement, positioning the retention cap **143** within the retention recess **135** can involve positioning the retention fastener **141** within the opening **145** of the retention cap **143** and moving the first end **146a** of the retention cap **143** into the retention recess **135** such that the protruding ledge **138** presses the prongs **148** radially inward. As discussed above, the material composition of the retention cap **143** and/or the design and configuration of the prongs **148** can allow the prongs **148** to resiliently flex to accommodate this inward pressure applied by the ledge **138**. Once the prongs **148** are inserted past the ledge **138**, the prongs **148** can spring back radially outward toward the inner wall of the retention recess **135**. In this position, the prongs **148** can be configured to exert a force against the wall of the retention recess **135** to help hold the retention system **140** in place within the retention recess **135**. In addition, in some examples, the ledge **138** is configured to engage the prongs **148** of the retention cap **143** when the retention cap **143** is positioned within the retention recess **135**. In this way, the ledge **138** can act as a stop to prevent the retention cap **143**

from easily backing out of the retention recess **135** (e.g., unless the prongs **148** of the retention cap **143** are again flexed radially inward).

[0038] In this configuration, the retention system **140** can be coupled to the glenosphere **130** prior to its initial engagement with the glenoid component **120**. As the tapered protrusion **124** of the baseplate **122** is engaged with the tapered recess **134** of the glenosphere **130**, the retention fastener **141** can slide within the opening **145** within the retention cap **143** so that it does not impede the alignment and engagement of the tapered protrusion **124** with the tapered recess **134**. Upon fixation of the tapered protrusion **124** with the tapered recess **134**, a driver can be inserted through the threaded opening **132** of the glenosphere **130**, engaged with the retention fastener **141**, and operated to couple the retention fastener **141** with the threaded hole **123** of the baseplate **122**. In this arrangement, when the retention fastener **141** is coupled to the baseplate **122**, such as by engaging with the threaded hole **123** in the baseplate **122**, and the retention cap **143** is coupled to the retention fastener, such as via the bearing surface of the flange **147**, the engagement of the prongs **148** with the glenosphere **130** completes the chain of connection between the baseplate **122** and the glenosphere **130**.

[0039] In addition, in some examples, the engagement of the retention fastener **141** with the baseplate **122** can capture the flange **147** therebetween. Further, in some examples, the body portion **144** of the retention cap **143** can have a thickness that is larger than a depth of the retention recess **135**. In this configuration, fixation of the retention fastener **141** with the baseplate **122** can compress the body portion **144** within the retention recess **135**. Further, in some examples, this compression of the body portion **144** can be

configured to cause the prongs **148** to flare radially outwardly and/or axially toward the baseplate **122**. This flexion can urge the prongs **148** to engage the wall of the retention recess **135** and/or the ledge **138** to hold the retention cap **143** in position within the retention recess **135**. In addition, in some examples, flexion of the retention cap **143** can correspondingly apply tension to the retention fastener **141** to prevent loosening of the retention fastener **141**.

[0040] In accordance with one or more further features of the present disclosure, an alternative configuration of a retention mechanism is disclosed. Referring to FIG. 5, in some examples, the retention recess **135** is provided in the form of a stepped opening **136** in communication with the threaded opening **132** in the glenosphere **130**. In some examples, the stepped opening **136** narrows at a step **139** that protrudes radially inward from a wall of the stepped opening **136** at an interface between the stepped opening **136** and the tapered recess **134**. In this arrangement, the threaded opening **132** can be configured to receive a fastener **151** therethrough. In some examples, the fastener **151** can include a fastener body **152** and a threaded screw head **154** that allows the fastener **151** to pass the threads of the threaded opening **132**. The width of the threaded screw head **154** can be wider than the diameter of the stepped opening **136** at the step **139**. In this way, the fastener **151** can pass into the stepped opening **136** and extend toward the tapered recess **134**, but the threaded screw head **154** of the fastener **151** can become retained on the step **139**. In this configuration, the fastener **151** can be positioned to engage the threaded hole **123** of the baseplate **122**, and upon fixation of the tapered protrusion **124** with the tapered recess **134**, a driver can be inserted through the threaded opening **132** of the glenosphere **130**,

engaged with the fastener **151**, and operated to couple the fastener **151** with the threaded hole **123** of the baseplate **122**. In this configuration, the function of the retention cap **143** discussed above is effectively integrated into the internal construction of the glenosphere **130**.

[0041] While the present disclosure refers to certain examples, numerous modifications, alterations, and changes to the described examples are possible without departing from the sphere and scope of the present disclosure, as defined in the appended claim(s). Accordingly, it is intended that the present disclosure not be limited to the described examples, but that it has the full scope defined by the language of the following claims, and equivalents thereof. The discussion of any example is meant only to be explanatory and is not intended to suggest that the scope of the disclosure, including the claims, is limited to these examples. In other words, while illustrative examples of the disclosure have been described in detail herein, it is to be understood that the inventive concepts may be otherwise variously embodied and employed, and that the appended claims are intended to be construed to include such variations, except as limited by the prior art.

[0042] The foregoing discussion has been presented for purposes of illustration and description and is not intended to limit the disclosure to the form or forms disclosed herein. For example, various features of the disclosure are grouped together in one or more examples or configurations for the purpose of streamlining the disclosure. However, it should be understood that various features of the certain examples or configurations of the disclosure may be combined in alternate examples, or configurations. Any example or

feature of any section, portion, or any other component shown or particularly described in relation to various examples of similar sections, portions, or components herein may be interchangeably applied to any other similar example or feature shown or described herein. Additionally, components with the same name may be the same or different, and one of ordinary skill in the art would understand each component could be modified in a similar fashion or substituted to perform the same function.

[0043] Moreover, the following claims are hereby incorporated into this Detailed Description by this reference, with each claim standing on its own as a separate example of the present disclosure.

[0044] As used herein, an element or step recited in the singular and proceeded with the word "a" or "an" should be understood as not excluding plural elements or steps, unless such exclusion is explicitly recited. Furthermore, references to "one example" of the present disclosure are not intended to be interpreted as excluding the existence of additional examples that also incorporate the recited features.

[0045] The phrases "at least one," "one or more," and "and/or," as used herein, are open-ended expressions that are both conjunctive and disjunctive in operation. The terms "a" (or "an"), "one or more" and "at least one" can be used interchangeably herein. All directional references (e.g., proximal, distal, upper, lower, upward, downward, left, right, lateral, longitudinal, front, back, top, bottom, above, below, vertical, horizontal, radial, axial, clockwise, and counterclockwise) are only used for identification purposes to aid the reader's understanding of the present disclosure, and do not create limitations, particularly as to the position, orientation, or use of this disclosure. Connection references (e.g.,

engaged, attached, coupled, connected, and joined) are to be construed broadly and may include intermediate members between a collection of elements and relative to movement between elements unless otherwise indicated. As such, connection references do not necessarily infer that two elements are directly connected and in fixed relation to each other. All rotational references describe relative movement between the various elements. Identification references (e.g., primary, secondary, first, second, third, fourth, etc.) are not intended to connote importance or priority but are used to distinguish one feature from another. The drawings are for purposes of illustration only and the dimensions, positions, order and relative to sizes reflected in the drawings attached hereto may vary.

CLAIMS

We claim:

1. A retention system for coupling a glenosphere to a baseplate in a reverse shoulder arthroplasty, the system comprising:

a glenosphere comprising a retention recess formed in a base of the glenosphere; and

a retention fastener configured to engage a threaded hole of the baseplate, the retention fastener comprising a fastener head;

wherein the fastener head is configured to be retained within the retention recess.

2. The retention system of claim 1, wherein the glenosphere comprises a tapered recess formed in the base of the glenosphere, the tapered recess being configured to couple to a tapered protrusion of the baseplate;

wherein the retention recess is formed at an interior end of the tapered recess.

3. The retention system of claim 1, further comprising a retention cap configured to be coupled within the retention recess of the glenosphere, the retention cap comprising a body portion having an opening therethrough;

wherein the fastener head of the retention fastener is configured to be retained within opening of the body portion to retain the fastener head within the retention recess.

4. The retention system of claim 3, wherein the body portion of the retention cap comprises a flange that protrudes radially inward into the opening, wherein the fastener head of the retention fastener has a diameter greater than a width of the opening at the ledge such that the fastener head of the retention fastener is prevented from passing through the opening.

5. The retention system of claim 3, wherein the retention cap comprises a plurality of prongs extending radially outward from the body portion, the plurality of prongs being configured to engage the retention recess of the glenosphere.

6. The retention system of claim 5, wherein the body portion of the retention cap has a height that is greater than a depth of the retention recess;

wherein the plurality of prongs are configured to flex radially outward upon compression of the body portion within the retention recess.

7. The retention system of claim 5, wherein the retention recess comprises a ledge that protrudes radially inward from a wall of the retention recess;

wherein the plurality of prongs of the retention cap are configured to engage the ledge to retain the retention cap within the retention recess.

8. The retention system of claim 1, wherein the glenosphere comprises a step that protrudes radially inward from a wall of the retention recess at an interface between the retention recess and the tapered recess;

wherein the fastener head of the retention fastener has a diameter greater than a width of the retention recess at the step such that the fastener head of the retention fastener is prevented from passing into the tapered recess.

9. The retention system of claim 8, wherein the glenosphere comprises a threaded opening in communication with the retention recess and configured to be threadedly coupled to an inserter tool; and

wherein the fastener head of the retention fastener comprises a threaded outer surface complementary to the threaded opening in the glenosphere such that the retention fastener can be inserted through the threaded opening into the retention recess.

10. A method for coupling a glenosphere to a baseplate in a reverse shoulder arthroplasty, the method comprising:

coupling a head of a retention fastener within a retention recess formed in a base of a glenosphere; and

engaging the retention fastener with threaded hole of a baseplate, wherein a fastener head of the retention fastener is retained within the retention recess.

11. The method of claim 10, wherein coupling the fastener head of the retention fastener within the retention recess comprises:

positioning the fastener head of the retention fastener within an opening of a body portion of a retention cap; and

coupling the retention cap within the retention recess of the glenosphere.

12. The method of claim 11, wherein engaging the retention fastener with threaded hole of a baseplate causes flexion of the retention cap, wherein the flexion of the retention cap applies tension to the retention fastener.

13. The method of claim 11, wherein the retention cap comprises a plurality of prongs extending radially outward from the body portion;

wherein coupling the retention cap within the retention recess of the glenosphere comprises engaging the retention recess of the glenosphere with the plurality of prongs.

14. The method of claim 13, wherein the body portion of the retention cap has a height that is greater than a depth of the retention recess;

wherein engaging the retention fastener with threaded hole of the baseplate comprises compressing the body portion of the retention cap within the retention recess; and

wherein compressing the body portion causes the plurality of prongs to flex radially outward against the retention recess.

15. The method of claim 13, wherein the retention recess comprises a ledge that protrudes radially inward from a wall of the retention recess;

wherein coupling the retention cap within the retention recess comprises engaging the plurality of prongs with the ledge to retain the retention cap within the retention recess.

16. The method of claim 10, wherein the glenosphere comprises a step that protrudes radially inward from a wall of the retention recess at an interface between the retention recess and the tapered recess;

wherein coupling the fastener head of the retention fastener within the retention recess comprises positioning the fastener head of the retention fastener against the step.

17. The method of claim 16, wherein the glenosphere comprises a threaded opening in communication with the retention recess and configured to be threadedly coupled to an inserter tool;

wherein the fastener head of the retention fastener comprises a threaded outer surface complementary to the threaded opening in the glenosphere; and

wherein coupling the fastener head of the retention fastener within the retention recess comprises inserting the retention fastener through the threaded opening into the retention recess.

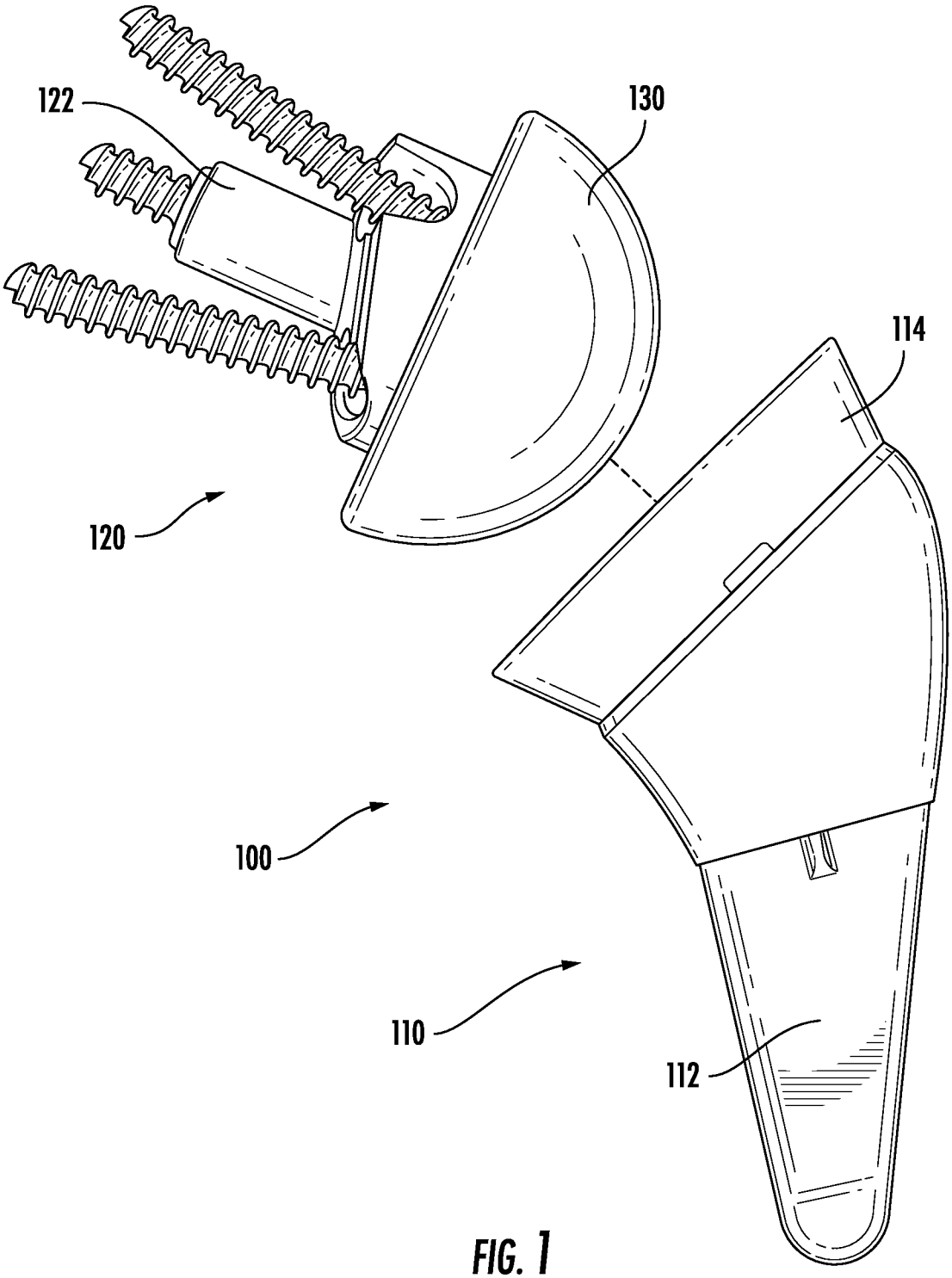


FIG. 1

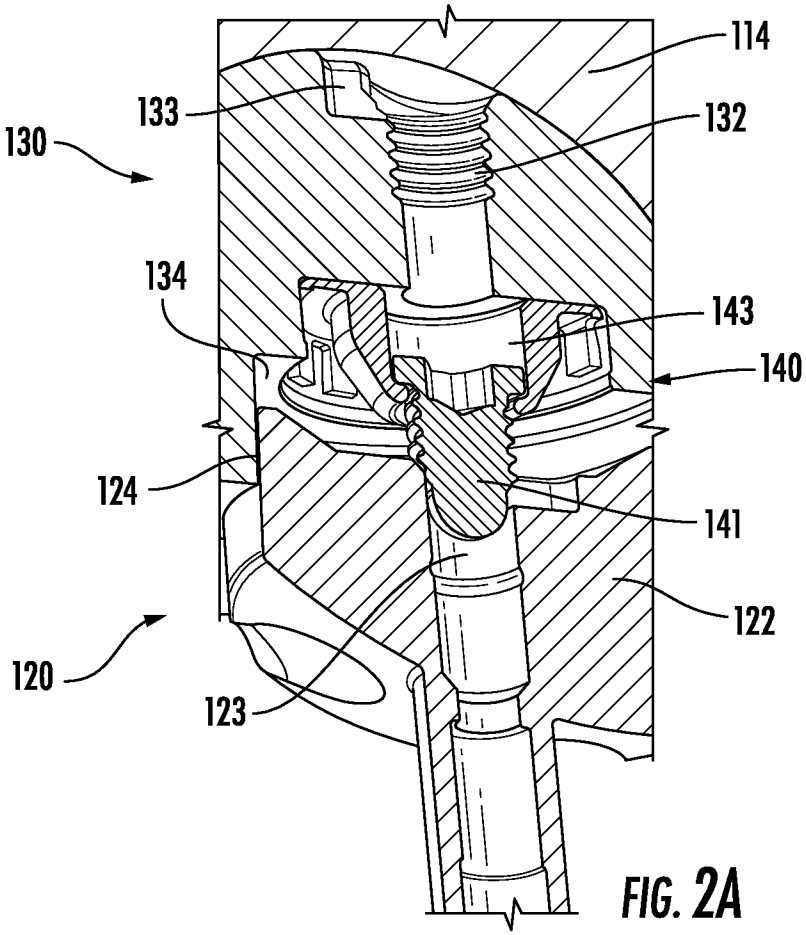

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FIG. 2A

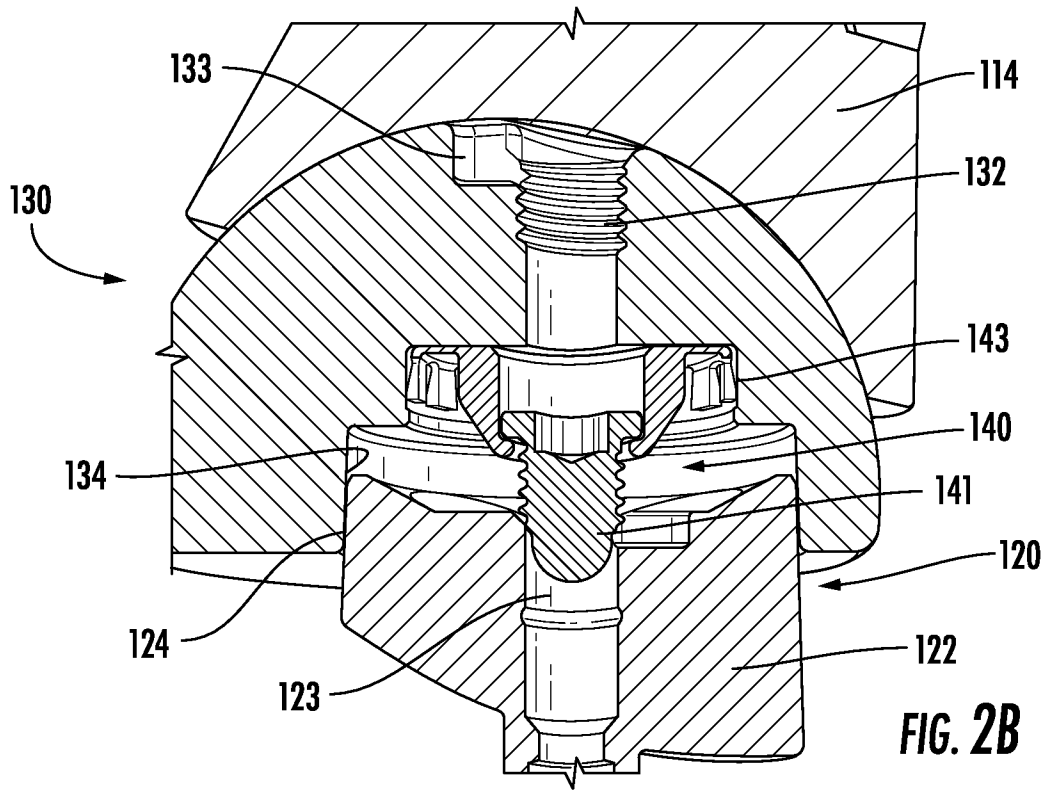

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FIG. 2B

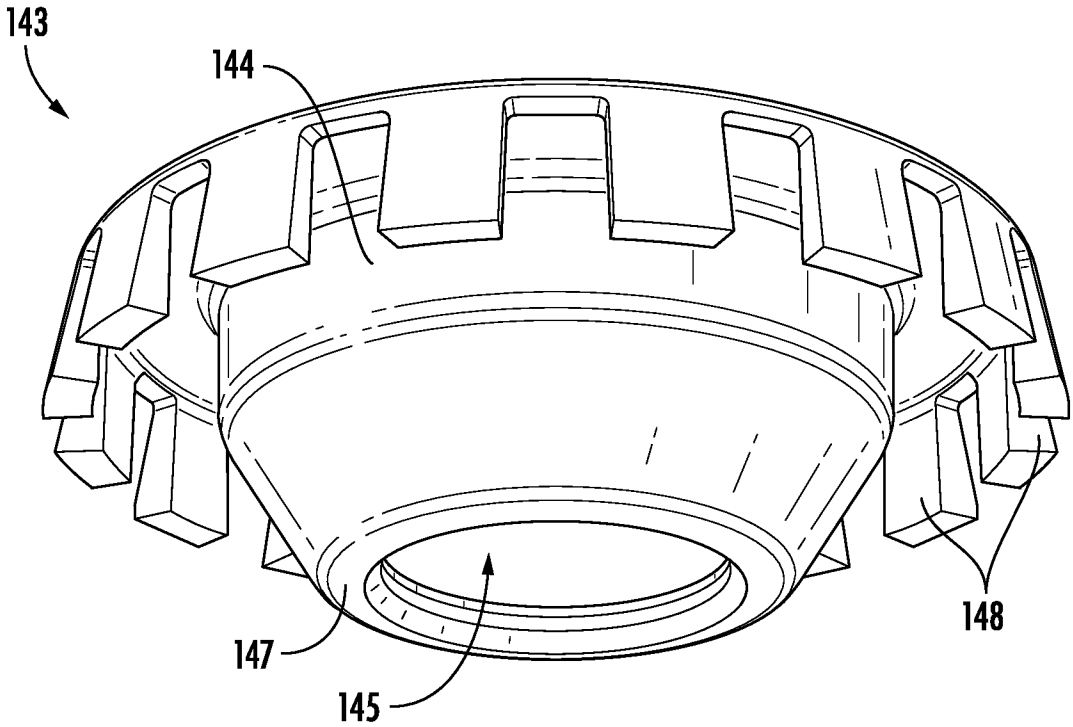


FIG. 3A

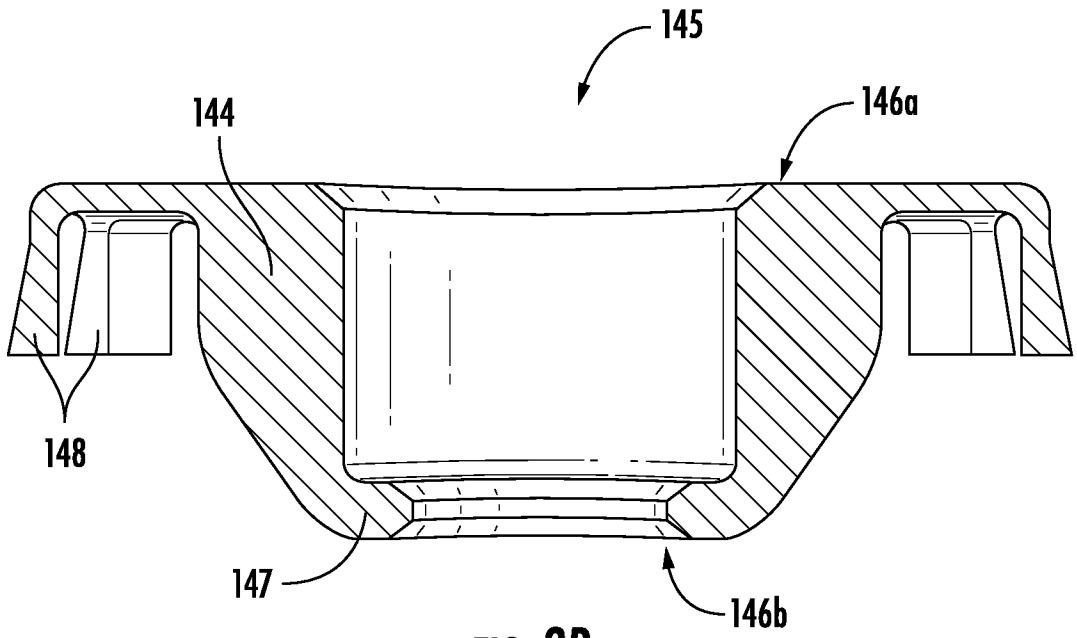


FIG. 3B

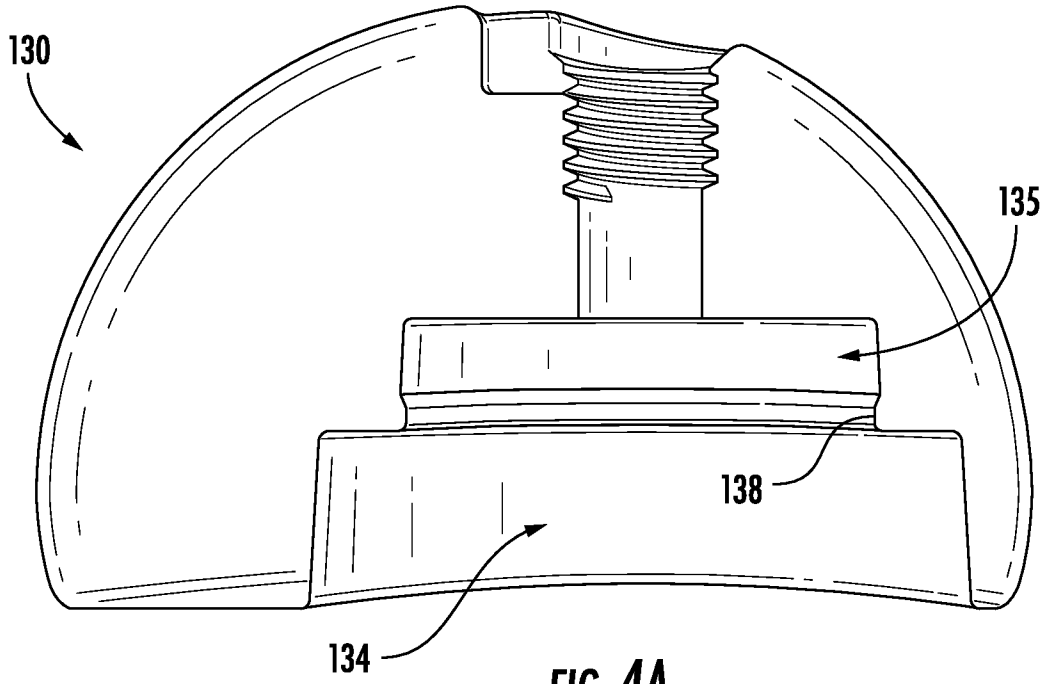


FIG. 4A

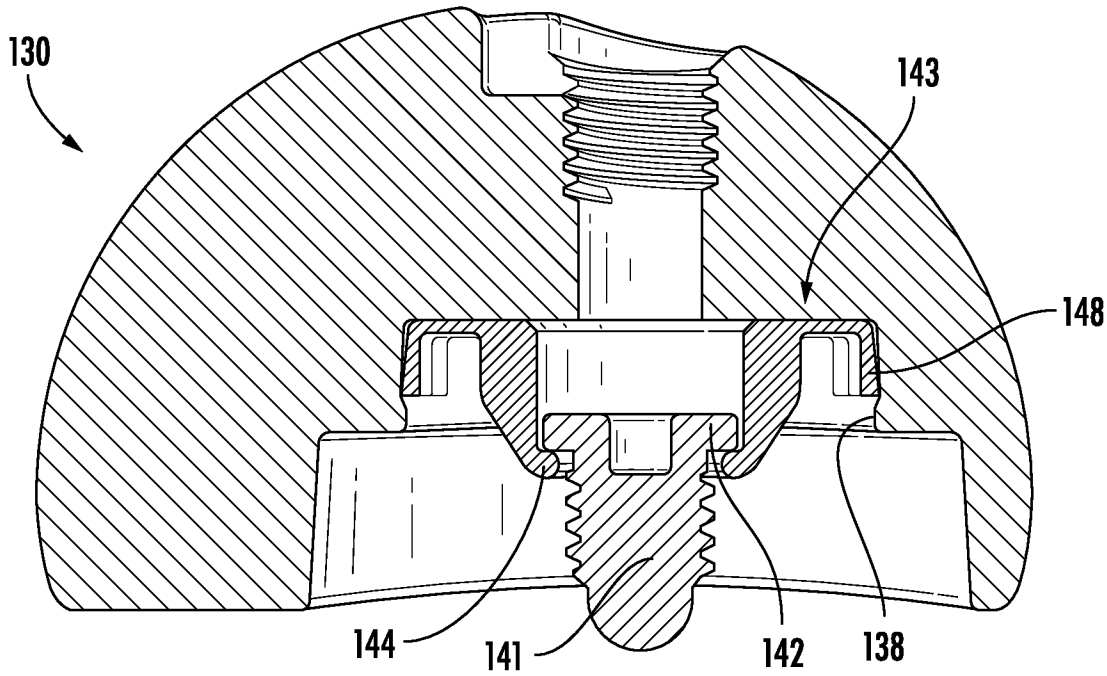


FIG. 4B

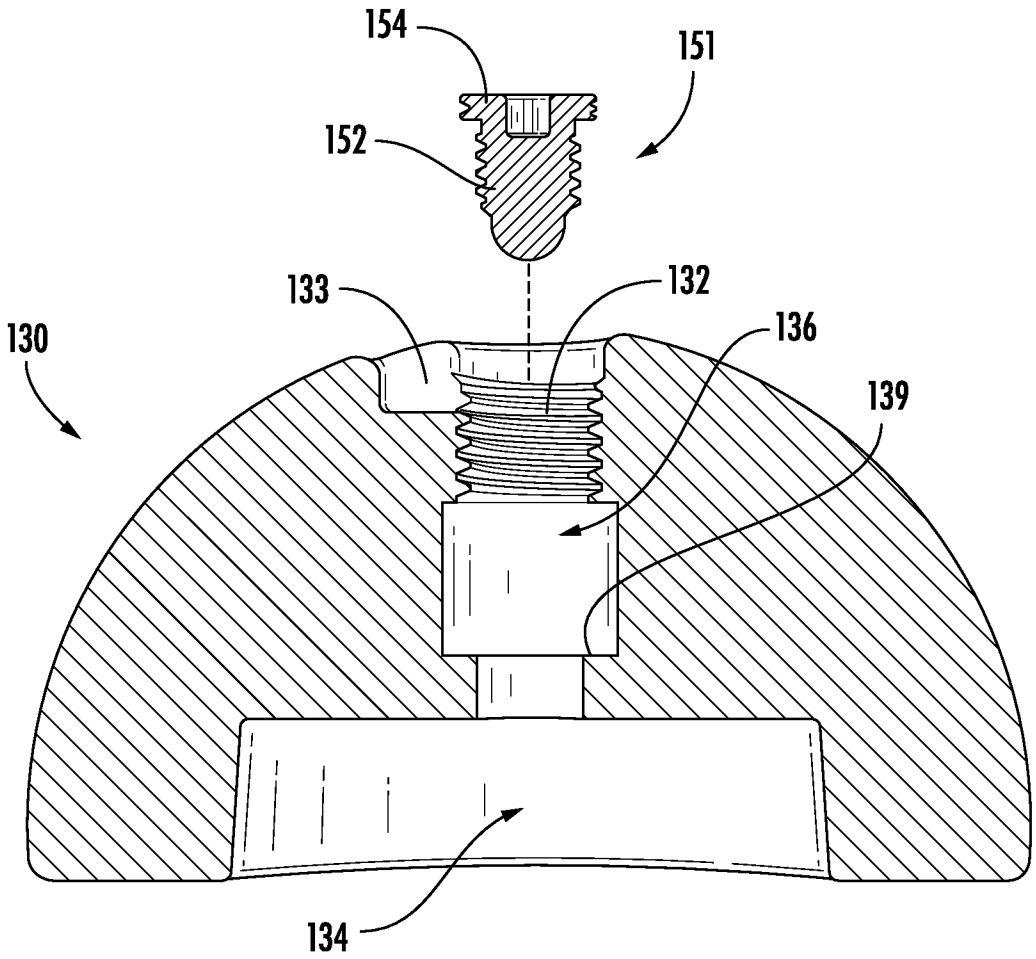


FIG. 5

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2024/032544

A. CLASSIFICATION OF SUBJECT MATTER

INV. A61F2/40
ADD. A61F2/46 A61F2/30

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)
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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2023/122922 A1 (DAUDET JEAN-MARIE [FR]) 20 April 2023 (2023-04-20) paragraphs [0038] - [0049] figure 2	1-7, 10-15
X	US 2018/161169 A1 (CARDON JEAN-EMMANUEL [FR] ET AL) 14 June 2018 (2018-06-14) paragraphs [0040] - [0069] figures 1-9	1,3-7, 10-15
X	US 2003/149485 A1 (TORNIER ALAIN [FR]) 7 August 2003 (2003-08-07)	1-4, 10-12
Y	paragraphs [0037] - [0083] figures 1-7	9,17
X	US 2020/289282 A1 (LEFEBVRE YVES [FR] ET AL) 17 September 2020 (2020-09-17)	1,2,8, 10,16
Y	paragraphs [0068] - [0141] figures 1-23	9,17

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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"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

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Date of the actual completion of the international search	Date of mailing of the international search report
20 August 2024	18/09/2024

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Felkel, Bernd

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2024/032544

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2023122922 A1	20-04-2023	EP 4166114 A1	19-04-2023
		US 2023122922 A1	20-04-2023
US 2018161169 A1	14-06-2018	EP 3332750 A1	13-06-2018
		US 2018161169 A1	14-06-2018
US 2003149485 A1	07-08-2003	AT E344647 T1	15-11-2006
		DE 60309520 T2	05-07-2007
		EP 1332734 A1	06-08-2003
		ES 2276030 T3	16-06-2007
		FR 2835425 A1	08-08-2003
		US 2003149485 A1	07-08-2003
US 2020289282 A1	17-09-2020	AU 2018376924 A1	11-06-2020
		EP 3716917 A1	07-10-2020
		FR 3074035 A1	31-05-2019
		US 2020289282 A1	17-09-2020
		WO 2019106279 A1	06-06-2019