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Certification

Welocalize Translations

TRANSLATOR'S DECLARATION:

I, Claudine Joly-King, hereby declare, under the penalty of perjury, that:

I possess advanced knowledge of the French and English languages, the attached French into English translation has been translated by me, and to the best of my knowledge and belief, it is a true and accurate translation of: PCT/FR2018/052996, published as WO/2019/106279.

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A handwritten signature in black ink, appearing to be "CJ", written over a horizontal line.

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GLENOID IMPLANT FOR INVERTED SHOULDER PROSTHESIS

The present invention relates to a glenoid implant for an inverted shoulder prosthesis.

Conventionally, such a glenoid implant comprises a base provided to be anchored onto a
5 glenoid of a scapula, and a glenosphere mounted on the base and defining a convex articulation surface in a spherical portion.

It is known, in particular, from document EP 2 601 912, to provide mounting of the glenosphere on the base by mutual wedging between female and male conical bearing surfaces, and to provide a main anchoring screw passing through the base and shaped
10 to anchor the base on the glenoid. However, the disadvantage of the glenoid implant of document EP 2 601 912 is that the glenosphere cannot be locked on the base.

To partially resolve this disadvantage, international application WO 2015/103090 proposes, in addition to mutual wedging between conical bearing surfaces, to use a locking screw passing through the glenosphere to lock the latter on the base. In said
15 document, a main anchoring screw is introduced from below (on the side of the internal face of the base provided to be in contact with the prepared native glenoid surface) to be blocked on the base by a circlip or by a proximal threading having a left-hand thread, while the distal threading used for anchoring into the glenoid comprises a right-hand thread, and, in addition, the locking screw is screwed into the base.

However, the glenoid implant of said document WO 2015/103090 comprises a first
20 disadvantage which is the absence of guidance of the glenosphere during its positioning on the base, and a second disadvantage which is that the compressive forces in the main anchoring screw pass through the circlip or through the proximal threading, thus weakening the overall mechanical strength of the glenoid implant.

The prior art can also be illustrated by the teaching of document EP 1 332 734 which discloses a glenoid implant comprising a base provided with a fixed anchoring stud for anchoring into the glenoid, and a glenosphere mounted on the base by mutual wedging between female and male conical bearing surfaces. There is also a locking screw to lock the glenosphere to the base in a locked position. The locking screw is first hooked from
30 below onto the glenosphere by means of an upper threading screwed into an internally threaded orifice of the glenosphere, and an intermediate threading screwed into a socket which is itself screwed onto the underside of the glenosphere. It is obvious that a solution that involves these three simultaneous screwing processes is difficult to achieve, since it requires very high precision for all the screwing processes to happen simultaneously.

35 Subsequently, the locking screw is screwed in until the upper threading exits the internally

threaded orifice in the glenosphere, and the intermediate threading exits the socket to become screwed into a thread provided in the fixed anchoring stud. The disadvantage of such a glenoid implant is that anchoring is only done by a fixed anchoring stud, thus without screwing. Other disadvantages are the complexity of the process and the additional cost of the intermediate part which is the socket.

It is also known from document US 2004/0220673 to use a glenoid implant comprising a base anchored into the glenoid by means of an anchoring screw, and a glenosphere mounted on the base by mutual wedging between female and male conical bearing surfaces, and locked to the base by means of a locking screw which screws into the anchoring screw. When mounting the glenosphere on the base, said glenosphere is indexed by means of the head of the anchoring screw which is conical and which cooperates with a centring hole provided in the centre of the glenosphere. A disadvantage of said glenoid implant is that the head of the anchoring screw must protrude from the top of the base enough to be able to guide the glenosphere, and said protrusion may be obtrusive for the surgeon during additional operations to be carried out upstream of the placement of the glenosphere on the base, such as, for example, screwing peripheral anchoring screws into the glenoid.

The object of the present invention is to resolve all or part of the aforementioned disadvantages by proposing a glenoid implant which allows guiding and locking of the glenosphere on the base while offering improved mechanical strength.

Another object of the invention is to propose a glenoid implant shaped so as not to interfere with additional operations to be carried out upstream of the locking of the glenosphere on the base.

For this purpose, the invention offers a glenoid implant for inverted shoulder prosthesis, that includes:

- a base provided to be anchored onto a glenoid of a scapula and having a main orifice passing through the base;
- a glenosphere defining a convex articulation surface in a spherical portion and having a central orifice passing through the glenosphere, where said glenosphere is mounted on said base by mutual wedging between female and male conical bearing surfaces provided on the glenosphere and on the base;
- a main anchoring screw passing through the main orifice of said base and shaped for anchoring the base onto the glenoid, where said main anchoring screw comprises a main head and an anchoring stem having an end segment provided with an external threading;

- a locking screw, coaxial with the main anchoring screw, passing through the glenosphere central orifice to lock the glenosphere on the base in a locked position, where said locking screw comprises a proximal head and a locking rod having an intermediate segment provided with an external threading and extended by an end segment;

5 wherein the glenoid implant according to the invention is remarkable in that:

- the main anchoring screw comprises an internal hole opening into the main head and presenting successively, starting from its main head towards the end segment of its anchoring stem, an inlet portion shaped to cooperate with a screwing tool, an intermediate portion provided with a thread and an end portion;

10 - the length of the locking rod end segment is greater than a cumulative length of the inlet portion and the intermediate portion of the main anchoring screw internal hole, so that said end segment of the locking rod is provided to slide inside the end portion of the main anchoring screw internal hole to centre the conical bearing surfaces together, and that the intermediate segment of the locking rod is provided to then cooperate by screwing
15 with the intermediate portion of the main anchoring screw internal hole in order to lock the mutual wedging of the conical bearing surfaces, the proximal head of the locking screw being in abutment on an annular bearing surface provided inside the glenosphere central orifice.

Thus, the locking screw will guarantee both the guidance of the glenosphere on the base,
20 in order to guide the two conical bearing surfaces in mutual and centred contact, and the locking of the glenosphere on the base, with a transmission of the compression forces which pass through the central anchoring screw and also through the locking screw and the annular bearing surface provided inside the glenosphere central orifice, guaranteeing increased mechanical strength compared to the prior art.

25 Thanks to the invention, the guidance of the glenosphere will facilitate the task of the surgeon, who sometimes works while resting on retractors depending on the chosen access to the articulation, which depends on the surgical approach.

Throughout the specification, lengths are measured along the longitudinal and coaxial axes of the main anchoring screw and the locking screw, in situation and in locked
30 position.

According to one characteristic, the glenosphere central orifice comprises successively, starting from the convex articulation surface towards the base, a proximal portion shaped to fully receive the proximal head of the locking screw, and a distal portion provided with a complementary internal threading of the intermediate segment external threading of the
35 locking screw locking rod, and a distal portion provided with a complementary internal

threading of the intermediate segment external thread of the locking screw locking rod, where the annular bearing surface of the glenosphere central orifice is provided at the interface between said proximal portion and said distal portion.

Thus, the locking screw may be positioned beforehand on the glenosphere by screwing the intermediate segment of the locking screw locking rod through the threaded distal portion of the glenosphere central orifice, thus blocking the locking screw from sliding upwards (blocking with the internally threaded distal portion) and downwards (blocking with the annular bearing surface).

Advantageously, the length of the distal portion of the glenosphere central orifice is inferior to that of the intermediate segment of the locking screw locking rod.

According to another characteristic, the locking screw locking rod comprises a proximal segment extending between the proximal head and the intermediate segment.

Said intermediate segment helps to allow a certain amount of sliding to the locking screw in order to facilitate assembly and the impaction of the glenosphere necessary for assembly by mutual wedging between the female and male conical bearing surfaces.

Advantageously, the length of the threaded distal portion of the glenosphere central orifice is inferior to that of the proximal segment of the locking screw locking rod.

In a particular embodiment, the main anchoring screw and the locking screw are coaxial with the male and female conical bearing surfaces.

In a particular embodiment, in the locked position, the main head of the main anchoring screw is in abutment on an annular bearing surface provided inside the main orifice of the base, promoting transmission of compression forces in the main anchoring screw through said annular bearing surface.

According to a possibility of the invention, the main head of the main anchoring screw comprises an external threading, and the main orifice of the base comprises an inlet portion opening into an external face of the base opposite the glenosphere, where said inlet portion is provided with a complementary internal threading of said main head external threading, so that said main head is screwed into said inlet portion.

According to another possibility of the invention, the main head external threading of the main anchoring screw comprises a thread pitch lower than that of the anchoring stem end segment external threading, which allows to optimise anchoring by screwing into the glenoid of the anchoring stem end segment external threading.

Thus, the anchoring stem end segment external threading comprises a large thread pitch suitable for hooking into cancellous bone, while the main head external threading of the main anchoring screw comprises a small thread pitch (such as a metric pitch), so that

each turn of the screw does not correspond to the same screwing length for these two threads.

In accordance with another advantageous characteristic of the invention, the base comprises a central stud protruding from an internal face opposite the glenosphere, where
5 said central stud is hollow and is crossed by the main orifice and the main anchoring screw whose anchoring stem end segment protrudes from said central stud; such a hollow stud being advantageous to promote anchoring into the glenoid and enable centring of the main anchoring screw to guarantee coaxiality with the locking screw.

Advantageously, the main orifice of the base comprises an outlet portion which extends
10 the inlet portion and which passes through the central stud, and the anchoring stem comprises an intermediate segment shaped to be slidably mounted and adjusted inside the outlet portion of the main orifice of the base, guaranteeing the centring of the main anchoring screw and, incidentally, coaxiality with the locking screw.

The present invention also relates to the characteristic that the glenoid implant further
15 comprises several secondary anchoring screws shaped for anchoring the base onto the glenoid, where said secondary anchoring screws pass through the base and are arranged in periphery around the main anchoring screw.

Such peripheral anchoring screws are used to complete and reinforce the anchoring into the glenoid.

20 According to a possibility, the main head of the main anchoring screw does not protrude from an external face opposite the glenosphere.

Thus, the main anchoring screw does not extend externally from the base and will, therefore, not interfere with the additional operations to be carried out upstream of the locking of the glenosphere on the base, such as, for example, the screwing operations of
25 the secondary anchoring screws described above.

The invention also relates to an inverted shoulder prosthesis comprising a glenoid implant according to the invention, and a humeral implant provided to be anchored onto a humerus and comprising a hemispherical cap defining a concave articulation surface shaped for articulating with the convex articulation surface of the glenoid implant
30 glenosphere.

The invention finds an application in a method for use of a glenoid implant according to the invention, comprising the following steps:

- introducing the main anchoring screw into the main hole of the base;
- introducing the locking screw into the central hole of the glenosphere until the end
35 segment of the locking rod protrudes from the glenosphere;

- approaching the glenosphere to the base so that the end segment of the locking rod slides inside the end portion of the internal hole of the main anchoring screw and the conical bearing surfaces come into contact with each other;

5 - pushing in and screwing the locking rod so that the intermediate segment of the locking rod cooperates by screwing with the intermediate portion of the main anchoring screw internal hole to lock the mutual wedging of the conical bearing surfaces, the proximal head of the locking screw being in abutment on the annular bearing surface provided inside the glenosphere central orifice.

10 Other characteristics and advantages of the present invention will appear on reading the detailed description below of a non-limiting exemplary implementation, made with reference to the appended Figs. in which:

- Fig.1 is a schematic perspective and exploded view (or before assembly) of a glenoid implant according to the invention;

15 - Figs. 2 to 4 are schematic views from the side, in axial section, and from below, respectively, of the glenosphere of the glenoid implant of Fig.1;

- Fig.5 is a schematic view in axial section of the glenosphere with the locking screw screwed in the waiting position for the glenoid implant of Fig.1;

20 - Figs. 6 and 7 are schematic views in axial section and from below, respectively, of a variant of the glenosphere with its central orifice offset with respect to the axis of revolution of the convex articulation surface in spherical portion;

- Figs. 8 and 9 are schematic views from the side and in axial section, respectively, of the locking screw of the glenoid implant of Fig.1;

- Figs. 10 and 11 are schematic views from the side and in axial section, respectively, of the main anchoring screw of the glenoid implant of Fig.1;

25 - Figs. 12 to 15 are schematic views of the base of the glenoid implant of Fig.1, from the side, from above, in axial section along the section plane A-A of Fig.13 and in axial section along the plane of section B-B of Fig.13, respectively;

- Figs. 16 to 20 are schematic perspective views of the glenoid implant of Fig.1 at different stages of assembly;

30 - Figs. 21 to 23 are schematic views in axial section of the glenoid implant of Fig.1 at different stages of assembly.

With reference to Fig.1, a glenoid implant 1 according to the invention, provided for an inverted shoulder prosthesis, comprises a base 2 and a glenosphere 3.

35 The base 2 is provided to be anchored on a glenoid of a scapula. Said base 2 is a single piece of metal. The base 2 comprises a plate 4 and a central stud 5.

The plate 4 comprises:

- an external face 40 opposite the glenosphere 3,
- an internal face 41 opposite the glenosphere 3 and provided to bear on the glenoid, and, in particular, on the resected surface of the glenoid; and

- 5 - a conical peripheral face 42 forming a male conical bearing surface for assembly with the glenosphere 3.

The peripheral face 42 comprises a conicity angle AC2 of between 4 and 7 degrees, and, in particular, between 5 and 6 degrees, and forms a Morse taper for assembly.

The central stud 5 is an anchoring stud provided to be anchored into the glenoid, and said
10 central stud 5 protrudes from the internal face 41 of the plate 4. This central stud 5 being hollow is thus in the form of a tubular sleeve, and comprises a conical peripheral surface. The central stud 5 comprises a free termination 50.

The base 2 comprises a main orifice 20 passing through the base 2, where said main orifice 20 opens into the external face 40 of the plate 4 and passes through the entire
15 thickness of plate 4 and further through the central stud 5 to open into its termination 50. The central orifice 20 is centred on a central axis 21. The central stud 5 is also centred on said same central axis 21, and, in particular, comprises a symmetry of revolution centred on said same central axis 21.

The main orifice 20 comprises successively, starting from the external face 40 towards
20 the termination 50:

- an inlet portion 201 provided with an internal threading and opening into the external face 40;
- a cylindrical and non-internally threaded (for example, smooth) outlet portion 202 opening into the termination 50, where said outlet portion 202 extends over at least the
25 entire length of the central stud 5.

The outlet portion 202 has a reduced diameter compared to that of the inlet portion 201, so that the main orifice 20 comprises an annular bearing surface 203 between the end of the internal threading of the inlet portion 201 and the start of the outlet portion 202.

The glenoid implant 1 further comprises a main anchoring screw 6 provided to pass
30 through the main orifice 20 of the base 2, and even be fixed inside said main orifice 20, and emerge from the base 2 in order to ensure the main anchoring of the base 2 and, therefore, of the glenoid implant 1 into the glenoid.

This main anchoring screw 6 comprises a main head 60 and an anchoring stem 61 centred on a longitudinal axis 69.

35 The main head 60 is an enlarged head which comprises an external threading 62 which

is complementary to the internal threading of the inlet portion 201 of the main orifice 20, so that said main head 60 can be screwed into said inlet portion 201 until it is in abutment on the annular bearing surface 203 in a locked position, as shown in Figs. 21 to 23.

Furthermore, as shown in Figs. 21 to 23 and 17 and 18, once the main anchoring screw 6 is in place, the main head 60 does not protrude from the external face 40 of the plate 4 of the base 2. The main head 60 even comes flush with said external face 40 of the plate 4. Thus, the main anchoring screw 6 does not interfere with the screwing processes of the secondary anchoring screws 7 described below.

The anchoring stem 61 comprises successively, starting from the main head 60:

- 10 - an intermediate segment 63 that is cylindrical and non-threaded (for example, externally smooth); and
- an end segment 64 provided with an external threading 65 and ending with a free end 66 in a point.

The intermediate segment 63 is provided to be slidably mounted and adjusted inside the 15 outlet portion 202 of the main orifice 20 of the base 2. Thus, the intermediate segment 63 comprises an external diameter substantially equivalent to the internal diameter of the outlet portion 202, to the nearest mounting clearance.

As to the end segment 64, it is provided to protrude from the termination 50 of the central stud 5 in order to anchor into the glenoid.

20 The external threading 62 of the main head 60 comprises a lower threading pitch than that of the external threading 65 of the end segment 64 of the anchoring stem 61. The external threading 62 is suitable for hooking into spongy bone, and may have a thread pitch of the order of 2 millimetres, while the external threading 62 of the main head 60 comprises a metric thread pitch, such as an M10 thread with a pitch of 1.5 millimetres.

25 The main anchoring screw 6 also comprises an internal blind hole 67 opening into the main head 60 and stopping substantially at the end of the intermediate segment 63.

This internal hole 67 is centred on the longitudinal axis 69 and comprises successively, starting from the main head 60 towards the end segment 64 of the anchoring stem 61:

- an inlet portion 670 shaped to cooperate with a screwing tool, such an inlet portion 30 670 which may, for example, have a polygonal section and, in particular, a hexagonal section to cooperate with a hex key;
- an intermediate portion 671 provided with an internal threading; and
- a cylindrical and non-internally threaded (for example, smooth) end portion 672.

The base 2 comprises secondary orifices 22 arranged on the periphery, around the main 35 orifice 20, where said secondary orifices 22 pass through the entire thickness of plate 4

and open into the external face 40 and the internal face 41 at the periphery of the central stud 5. In the example shown, there are four secondary orifices 22 which are distributed angularly every 90 degrees.

Each secondary orifice 22 comprises successively, starting from the external face 40 towards the internal face 41:

- an inlet portion 221 provided with an internal threading and opening into the external face 40, where axial grooves 223 are provided in the inlet portion 221, forming interruptions in the internal threading; and
- a tapered outlet portion 222.

The glenoid implant 1 further comprises secondary anchoring screws 7 provided to pass through the secondary orifices 22 of the base 2, and even be fixed inside said secondary orifices 22, and emerge from the plate 4 in order to ensure secondary anchoring of the base 2 and, therefore, of the glenoid implant 1 into the glenoid.

Each secondary anchoring screw 7 comprises a secondary head 70 and an anchoring stem 71 which protrudes from the plate 4 in order to anchor into the glenoid.

The secondary head 70 is an enlarged head which comprises an external threading 72 complementary to the internal threading of the inlet portion 221 of the secondary orifice 22, so that said secondary head 70 can be screwed into said inlet portion 221. The secondary head 70 comprises a dome shape which allows, in addition to the axial grooves 223, to adjust the inclination of the anchoring stem 71.

The glenosphere 3 defines a convex articulation surface 30 in a spherical portion which is provided for articulating on a concave articulation surface of a hemispherical cap of a humeral implant provided to be anchored onto a humerus.

This glenosphere 3 comprises a main cavity 31 open on the underside, opposite the base 2, where said main cavity 31 is delimited by an internal peripheral face 33 of a peripheral wall 32, where said internal peripheral face 33 forms a female conical bearing surface for assembly with the base 2.

More precisely, the glenosphere 3 is mounted on the base 2 using a Morse taper assembly, by mutual wedging between:

- the peripheral face 42 of the plate 4 of the base 2 forming a male conical bearing surface; and
- the internal peripheral face 33 of the glenosphere 3 forming a female conical bearing surface.

Thus, the internal peripheral face 33 comprises a conicity angle AC3 equivalent to the conicity angle AC2 of the peripheral face 42.

The glenosphere 3 also comprises a central orifice 34 passing through the glenosphere 3 and opening, on one side, into the convex articulation surface 30 and, on the other side, into the main cavity 31.

This central orifice 34 is centred on a central axis 35 which is coaxial with the conical internal peripheral face 33. In other words, the conical internal peripheral face 33 is

centred on an axis of revolution which is coincident or coaxial with said central axis 35. In the example of Figs. 2 to 5, said central axis 35 also coincides with the axis of revolution of the convex articulation surface 30, while in the example of Figs. 6 and 7 said central axis 35 is offset and parallel to the axis of revolution 300 of the convex articulation surface 30.

The central orifice 34 comprises successively, starting from the convex articulation surface 30 towards the main cavity 31 (and, therefore, towards the base 2):

- a proximal portion 340 that is cylindrical and non-internally threaded (for example, smooth) and opens into the convex articulation surface 30; and
- an internally threaded distal portion 341 opening into the main cavity 31.

The distal portion 341 has a reduced diameter compared to that of the proximal portion 340, so that the central orifice 34 comprises an annular bearing surface 342 between the end of the proximal portion 340 and the start of the internal threading of the distal portion 341.

The glenoid implant 1 further comprises a locking screw 8 provided to pass through the central orifice 34 of the glenosphere 3 in order to:

- guide the glenosphere 3 on the base 2 to make the internal peripheral face 33 and the peripheral face 42 of the plate 4 cooperate for a Morse taper assembly; and
- lock the glenosphere 3 on the base 2 in a locked position.

Said locking screw 8 comprises a proximal head 80 and a locking rod 81 centred on a longitudinal axis 89. In situation, the locking screw 8 is coaxial with the main anchoring screw 6, i.e., the longitudinal axis 89 and the longitudinal axis 69 are coaxial or coincident. The proximal head 80 comprises a cylindrical and non-threaded (for example, smooth) external peripheral face 82, whose external diameter is substantially equivalent (except for mounting clearance) to the internal diameter of the proximal portion 340 of the central orifice 34 so that said proximal head 80 may be guided and closely fitted inside said proximal portion 340. The proximal portion 340 is shaped to fully receive the proximal head 80 so that it does not protrude from the convex articulation surface 30.

The proximal head 80 also comprises a blind hole 83 shaped to cooperate with a screwing tool, such a blind hole 83 having, for example, a polygonal section and, in particular, a

hexagonal section to cooperate with a hex key.

The locking rod 81 comprises successively, starting from the proximal head 80:

- a cylindrical and non-threaded (for example, smooth) proximal segment 83;
- an intermediate segment 84 provided with an external threading which is complementary to both the internal threading of the intermediate portion 671 of the internal hole 67 of the main anchoring screw 6, and the internal threading of the distal portion 341 of the central orifice 34 of the glenosphere 3; and
- a cylindrical and non-threaded (for example, smooth) end segment 85 which ends in a free end 86.

The end segment 85 comprises a length LE which is greater than a cumulative length LC of the inlet portion 670 and the intermediate portion 671 of the internal hole 67 of the main anchoring screw 6, so that said end segment 85 is intended to slide inside the end portion 672 of the internal hole 67 of the main anchoring screw 6. In addition, the end segment 85 comprises a substantially equivalent (except for mounting clearance) external diameter to the internal diameter of the end portion 672 of the internal hole 67 so that said end segment 85 may be guided and closely fitted inside said end portion 672.

Thus, by sliding inside the end portion 672 of the internal hole 67, the end segment 85 makes it possible to centre the conical bearing surfaces (i.e. the internal peripheral face 33 and the peripheral face 42) together, subsequently allowing the intermediate segment 84 to cooperate by screwing with the intermediate portion 671 of the internal hole 67 of the main anchoring screw 6 in order to lock the mutual wedging of the conical bearing surfaces 33, 42 until the proximal head 80 of the locking screw 8 is in abutment on the annular bearing surface 342 provided inside the central orifice 34 of the glenosphere 3.

It should be noted that the length of the distal portion 341 of the central orifice 34 of the glenosphere 3 is less than that of the intermediate segment 84 of the locking rod 81 of the locking screw 8, and also less than that of the proximal segment 83 of the locking rod 81.

The remainder of the specification relates to the method of using a glenoid implant 1 as described above.

In a first step, shown in Fig.16, the main anchoring screw 6 is introduced in the main orifice 20 of the base 2 until the main head 60 is screwed into the inlet portion 201 of the main orifice 20 and it is abutment on the annular bearing surface 203 in a locked position, as shown in Figs. 21 to 23.

In a second step, shown in Fig.17, the main anchoring screws 6 are introduced in the secondary orifices 22 of the base 2 until the secondary heads 70 are screwed into the

inlet portions 221 of the secondary orifices 22.

In a third step, shown in Fig. 21, the locking screw 8 is introduced in the central orifice 34 of the glenosphere 3 until the intermediate segment 84 enters the distal portion 341 of the central orifice 34, said locking screw 8 being subsequently screwed until the intermediate
 5 segment 84 protrudes from the distal portion 341 so that the end segment 85 of the locking rod 81 protrudes from the glenosphere 3 outside the main cavity 31.

In this way, the locking screw 8 is blocked in the central orifice 34 of the glenosphere 3. This third step may be carried out after positioning the glenosphere 3 on the base 2, as shown in Figs. 18 to 20.

10 In a fourth step (which may precede or follow the third step), shown in Fig.22, the glenosphere 3 is moved closer and mounted on the base 2 so that:

- the female and male conical bearing surfaces (i.e. the internal peripheral face 33 and the peripheral face 42) come into contact with each other; and

- the end segment 85 of the locking rod 81 passes through the inlet portion 670 and
 15 the intermediate portion 671 of the internal hole 67 of the main anchoring screw 6 to slide inside the end portion 672 of the internal hole 67, thus providing a central location for the female and male conical bearing surfaces 33, 42.

At this stage, the proximal head 80 of the locking screw 8 is moved away from the annular bearing surface 342 provided inside the central orifice 34 of the glenosphere 3, which
 20 allows impaction on the glenosphere 3.

Thus, in a fifth step, the glenosphere 3 is impacted to ensure stable and reliable mutual wedging between the female and male conical bearing surfaces 33, 42.

Finally, in a fifth step *[sic]*, shown in Fig.23, the locking rod 81 is pushed in until the intermediate segment 84 enters the intermediate portion 671 of the internal hole 67 of the
 25 main anchoring screw 6, subsequently allowing the locking screw 8 to be screwed so that said intermediate segment 84 cooperates by screwing with said intermediate portion 671 of the internal hole 67 of the main anchoring screw 6 until the proximal head 80 of the locking screw 8 is in abutment on the annular bearing surface 342 provided inside the central orifice 34 of the glenosphere 3. During said screwing process, the end segment
 30 85 of the locking rod 81 continues to slide inside the end portion 672 of the internal hole 67.

Ultimately, the locking screw 8 makes it possible to lock the mutual wedging of the female and male conical bearing surfaces 33, 42. In addition, it should be noted that the plate 4 extends at least partially inside the main cavity 31 of the glenosphere 3.

CLAIMS

1. A glenoid implant (1) for inverted shoulder prosthesis, comprising:

- a base (2) provided to be anchored on a glenoid of a scapula and having a main orifice

5 (20) passing through the base (2);

- a glenosphere (3) defining a convex articulation surface (30) in a spherical portion and having a central orifice (34) passing through the glenosphere (3), wherein said glenosphere (3) is mounted on said base (2) by mutual wedging between female and male conical bearing surfaces (33, 42) provided on the glenosphere (3) and on the base

10 (2);

- a main anchoring screw (6) passing through the main orifice (20) of said base (2) and shaped for anchoring the base (2) onto the glenoid, wherein said main anchoring screw (6) comprises a main head (60) and an anchoring stem (61) having an end segment (64) provided with an external threading (65);

15 – a locking screw (8), coaxial with the main anchoring screw (6), passing through the central orifice (34) of the glenosphere (3) to lock the glenosphere (3) on the base (2) in a locked position, wherein said locking screw (8) comprises a proximal head (80) and a locking rod (81) having an intermediate segment (84) provided with an external threading and extended by an end segment (85);

20 said glenoid implant (1) being **characterised in that:**

– the main anchoring screw (6) comprises an internal hole (67) opening into the main head (60) and presenting successively, starting from the main head (60) towards the end segment (64) of the anchoring stem (61), an inlet portion (670) shaped to cooperate with a screwing tool, an intermediate portion (671) provided with a thread, and an end portion

25 (672);

– the end segment (85) of the locking rod (81) comprises a length (LE) greater than a cumulative length (LC) of the inlet portion (670) and the intermediate portion (671) of the internal hole (67) of the main anchoring screw (6), so that said end segment (85) of the locking rod (81) is provided to slide inside the end portion (672) of the internal hole (67) of the main anchoring screw (6) to centre the female and male conical bearing surfaces (33, 42) together, and that the intermediate segment (84) of the locking rod (81) is provided for subsequently cooperating by screwing with the intermediate portion (671) of the internal hole (67) of the main anchoring screw (6) in order to lock the mutual wedging of the female and male conical bearing surfaces (33, 42), the proximal head (80)

35 of the locking screw (8) being in abutment on an annular bearing surface (342) provided

inside the central orifice (34) of the glenosphere (3).

2. The glenoid implant (1) according to claim 1, wherein the central orifice (34) of the glenosphere (3) comprises successively, starting from the convex articulation surface (30) towards the base (2), a proximal portion (340) shaped to fully receive the proximal head (80) of the locking screw (8), and a distal portion (341) provided with an internal threading complementary to the external threading of the intermediate segment (84) of the locking rod (81) of the locking screw (8), wherein the annular bearing surface (342) of the central orifice (34) of the glenosphere (3) is provided at the interface between said proximal portion (340) and said distal portion (341).
3. The glenoid implant (1) according to the preceding claim, wherein the length of the distal portion (341) of the central orifice (34) of the glenosphere (3) is less than that of the intermediate segment (84) of the locking rod (81) of the locking screw (8).
4. The glenoid implant (1) according to any of the preceding claims, wherein the locking rod (81) of the locking screw (8) comprises a proximal segment (83) extending between the proximal head (80) and the intermediate segment (84).
5. The glenoid implant (1) according to claims 2 and 4, wherein the length of the distal portion (341) of the central orifice (34) of the glenosphere (3) is less than that of the proximal segment (83) of the locking rod (81) of the locking screw (8).
6. The glenoid implant (1) according to any of the preceding claims, wherein the main anchoring screw (6) and the locking screw (8) are coaxial with the female and male conical bearing surfaces (33, 42).
7. The glenoid implant (1) according to any of the preceding claims, wherein, in the locked position, the main head (60) of the main anchoring screw (6) is in abutment on an annular bearing surface (203) provided inside the main orifice (20) of the base (2).
8. The glenoid implant (1) according to any of the preceding claims, wherein the main head (60) of the main anchoring screw (6) comprises an external threading (62), and the main orifice (20) of the base (2) comprises an inlet portion (201) opening into an external face (40) of the base (2) opposite the glenosphere (3), wherein said inlet portion (201) is

provided with a complementary internal threading of said external threading (62) of said main head (60), so that said main head (60) is screwed into said inlet portion (201).

5 9. The glenoid implant (1) according to the preceding claim, wherein the external threading (62) of the main head (60) of the main anchoring screw (6) comprises a thread pitch lower than that of the external threading (65) of the end segment (64) of the anchoring stem (61).

10 10. The glenoid implant (1) according to any of the preceding claims, wherein the base (2) comprises a central stud (5) protruding from an internal face (41) opposite the glenosphere (3), wherein said central stud (5) is hollow and is crossed by the main orifice (20) and the main anchoring screw (6) whose end segment (64) of the anchoring stem (61) protrudes from said central stud (5).

15 11. The glenoid implant (1) according to claims 8 and 10, wherein the main orifice (20) of the base (2) comprises an outlet portion (202) which extends the inlet portion (201) and which passes through the central stud (5), and the anchoring stem (61) comprises an intermediate segment (63) shaped to be slidably mounted and adjusted inside the outlet portion (202) of the main orifice (20) of the base (2).

20 12. The glenoid implant (1) according to any of the preceding claims, further comprising several secondary anchoring screws (7) shaped for anchoring the base (2) onto the glenoid, wherein said secondary anchoring screws (7) pass through the base (2) and are arranged on the periphery around the main anchoring screw (6).

25 13. The glenoid implant (1) according to any of the preceding claims, wherein the main head (60) of the main anchoring screw (6) does not protrude from an external face (40) opposite the glenosphere (3).

30 14. An inverted shoulder prosthesis comprising a glenoid implant (1) according to any of the preceding claims, and a humeral implant provided to be anchored onto a humerus and comprising a hemispherical cap defining a concave articulation surface shaped for articulating with the convex articulation surface (30) of the glenosphere (3) of the glenoid implant (1).

ABSTRACT

A glenoid implant (1) for an inverted shoulder prosthesis, comprising: - a base (2); - a glenosphere (3) having a central orifice (34) and being mounted on the base by mutual
5 wedging between conical bearing surfaces; - a main anchoring screw (6) passing through the base and having an anchoring stem with a threaded end segment (64), and an internal hole (67) having an internally threaded intermediate portion and an end portion; - a locking screw (8) passing through the central orifice and comprising a proximal head (80) and a
locking rod (81) having an end segment (85) provided to slide in the end portion of the
10 internal hole, and a threaded intermediate segment (84) provided to cooperate by screwing with the intermediate portion of the internal hole in order to lock the mutual wedging of the conical bearing surfaces, the proximal head being in abutment on an annular bearing surface in the central orifice.

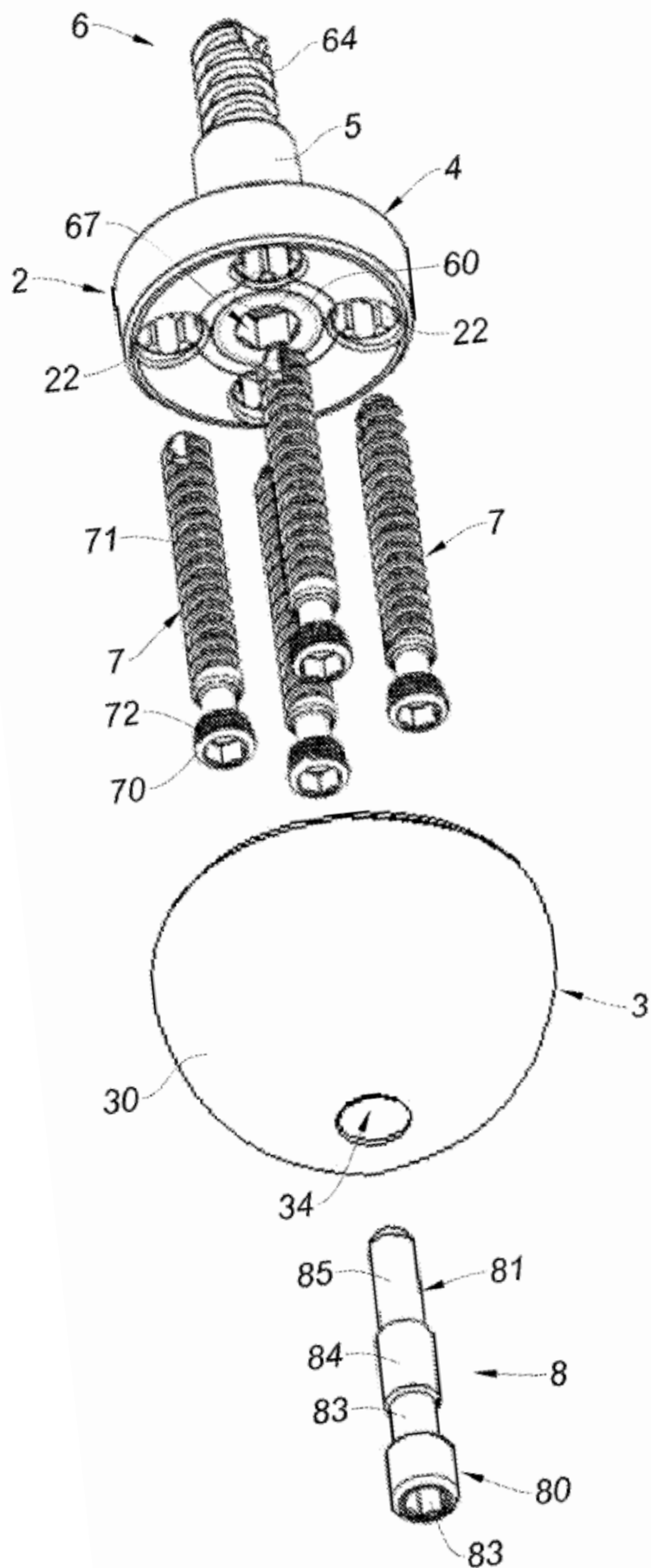


Fig. 1

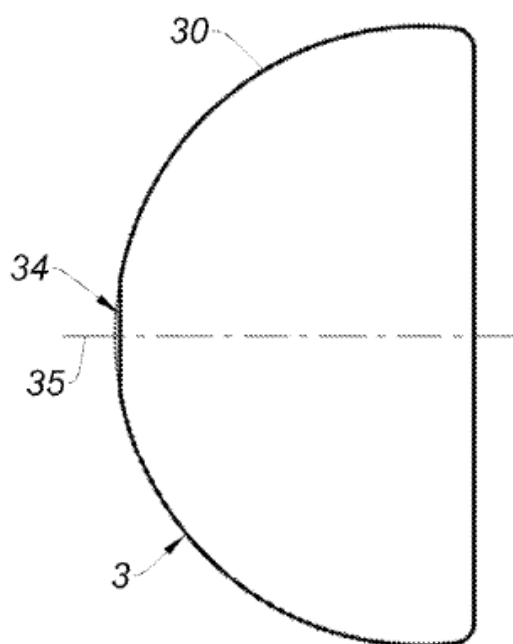


Fig. 2

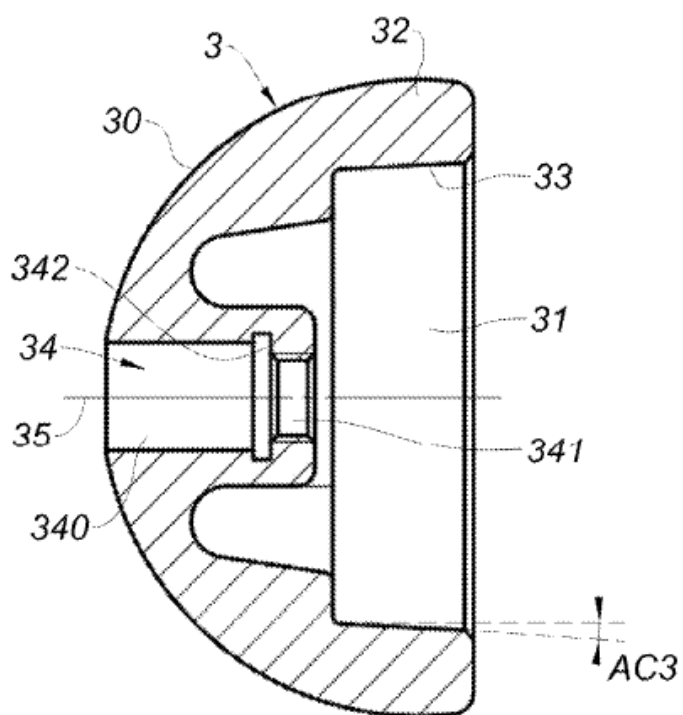


Fig. 3

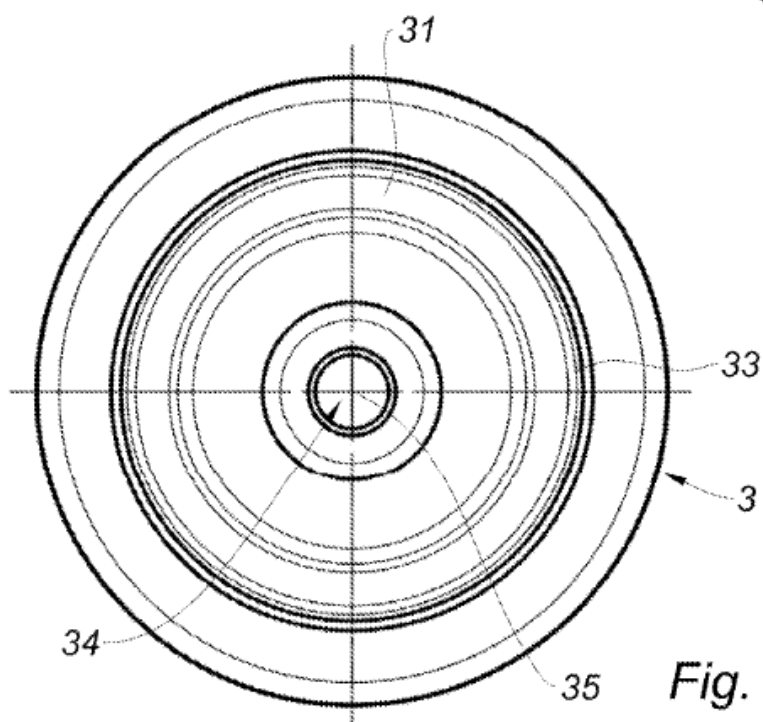
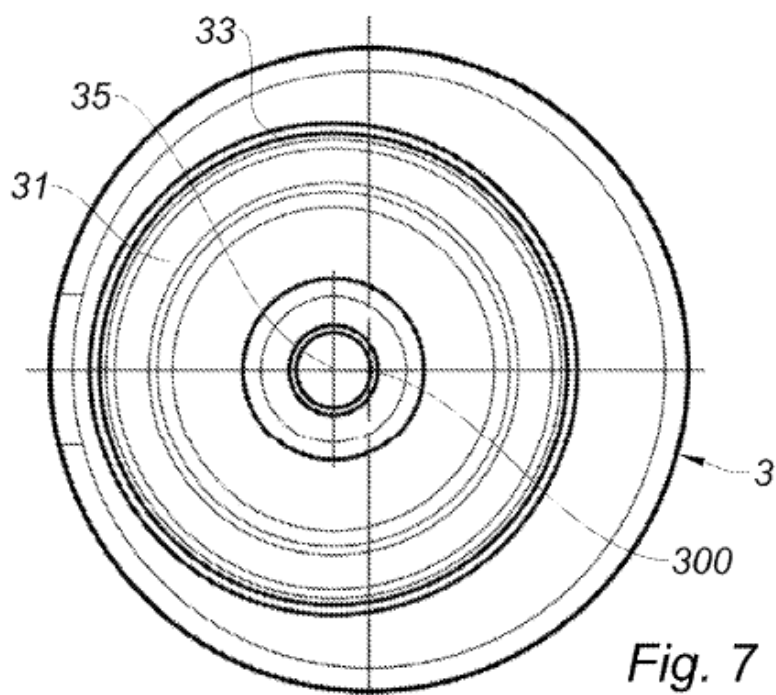
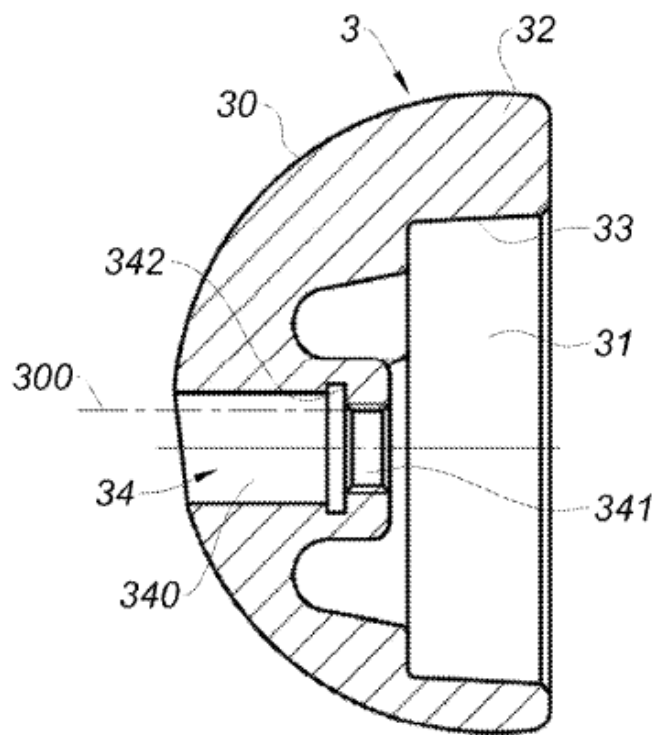
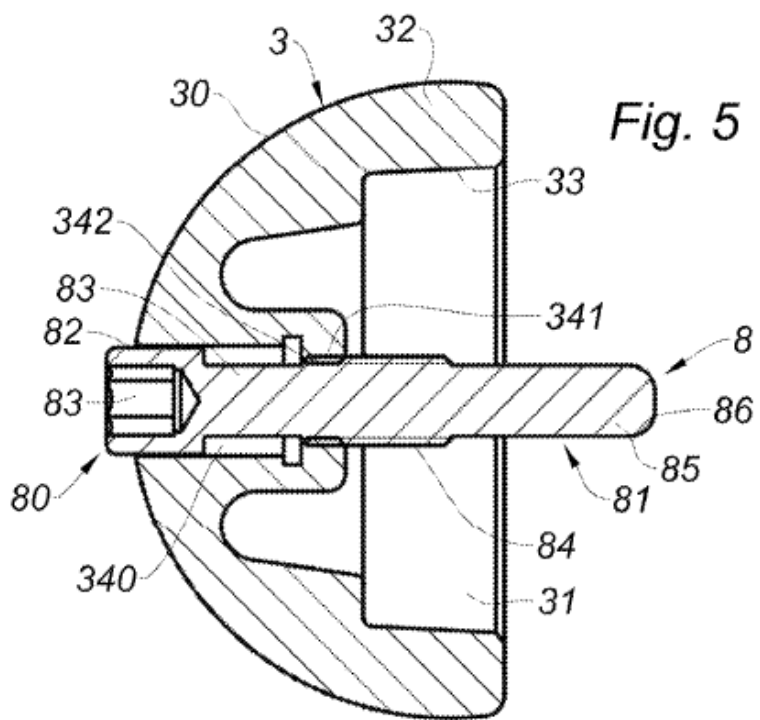


Fig. 4



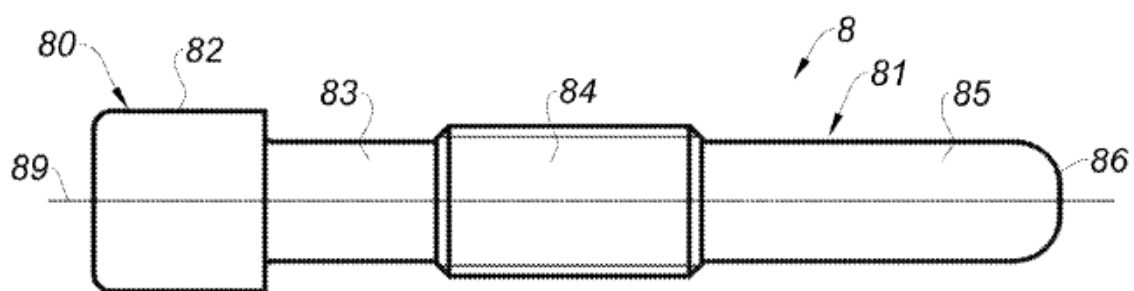


Fig. 8

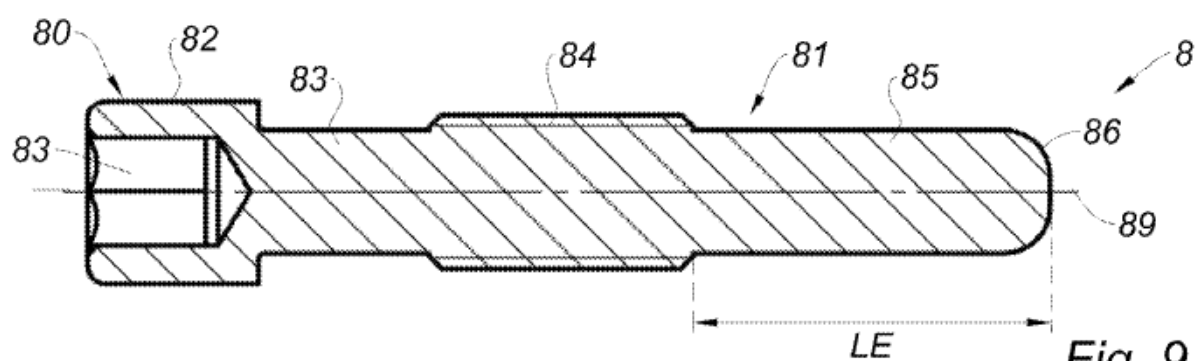


Fig. 9

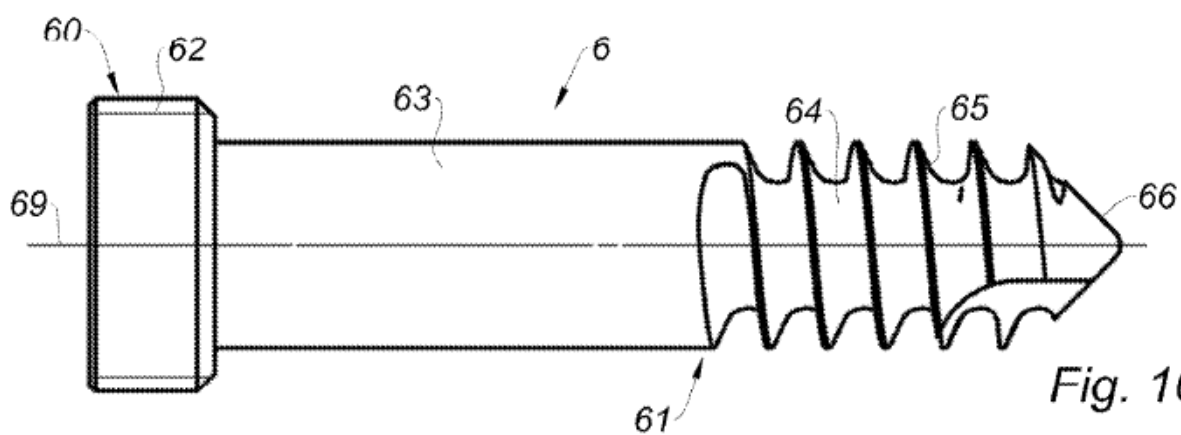


Fig. 10

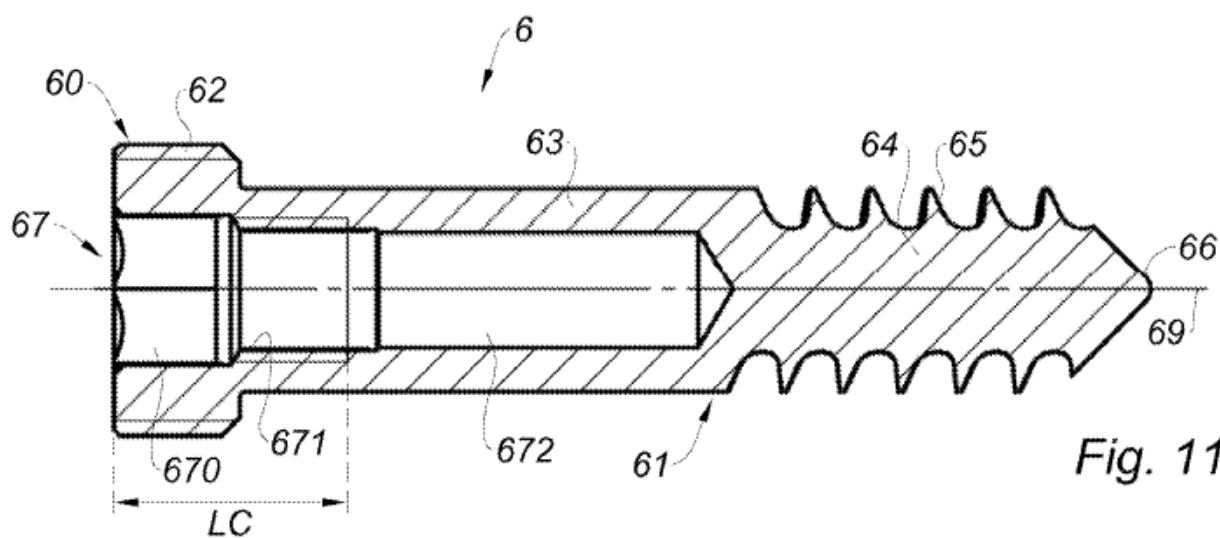
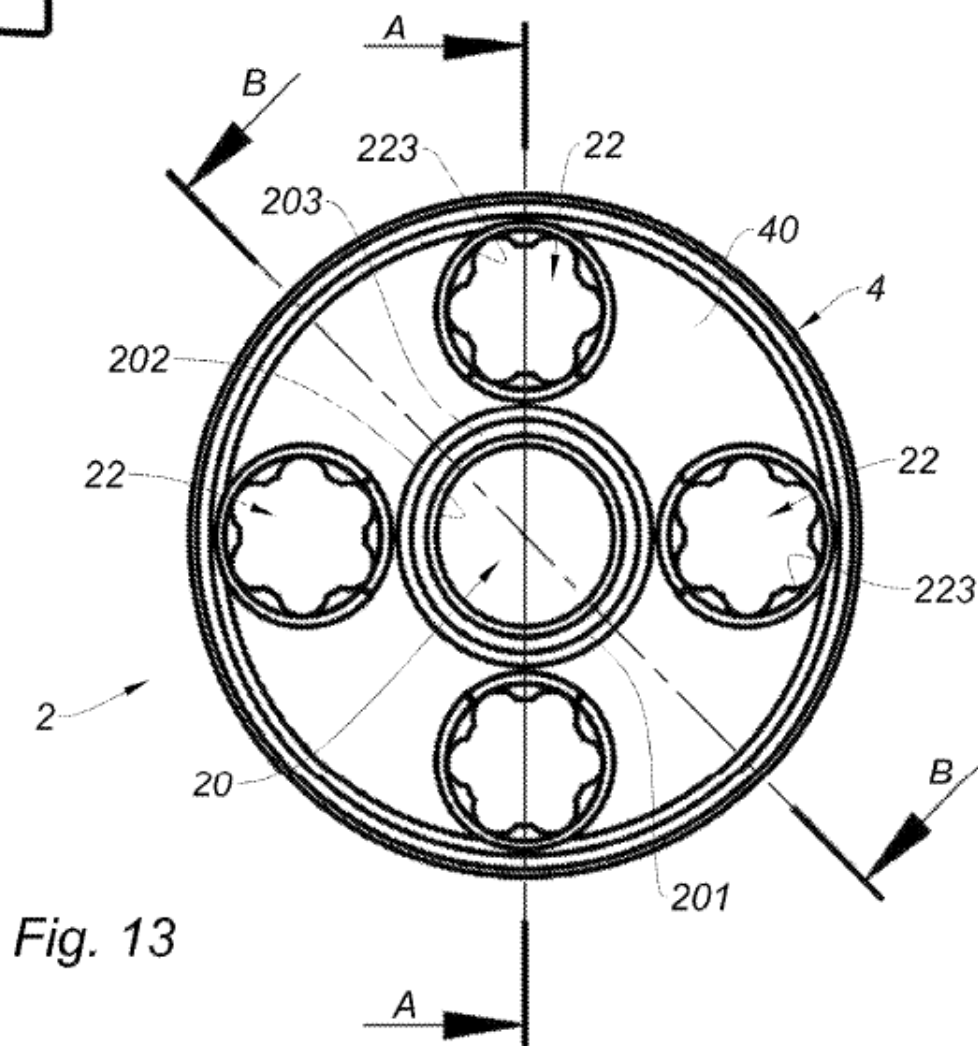
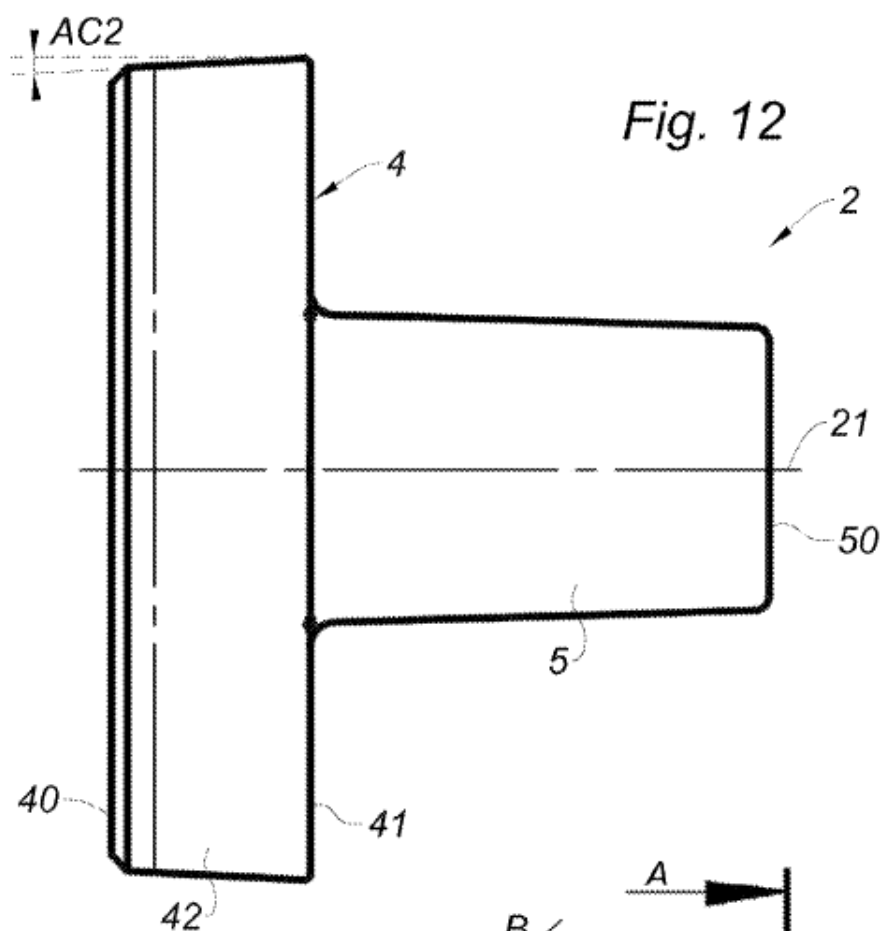
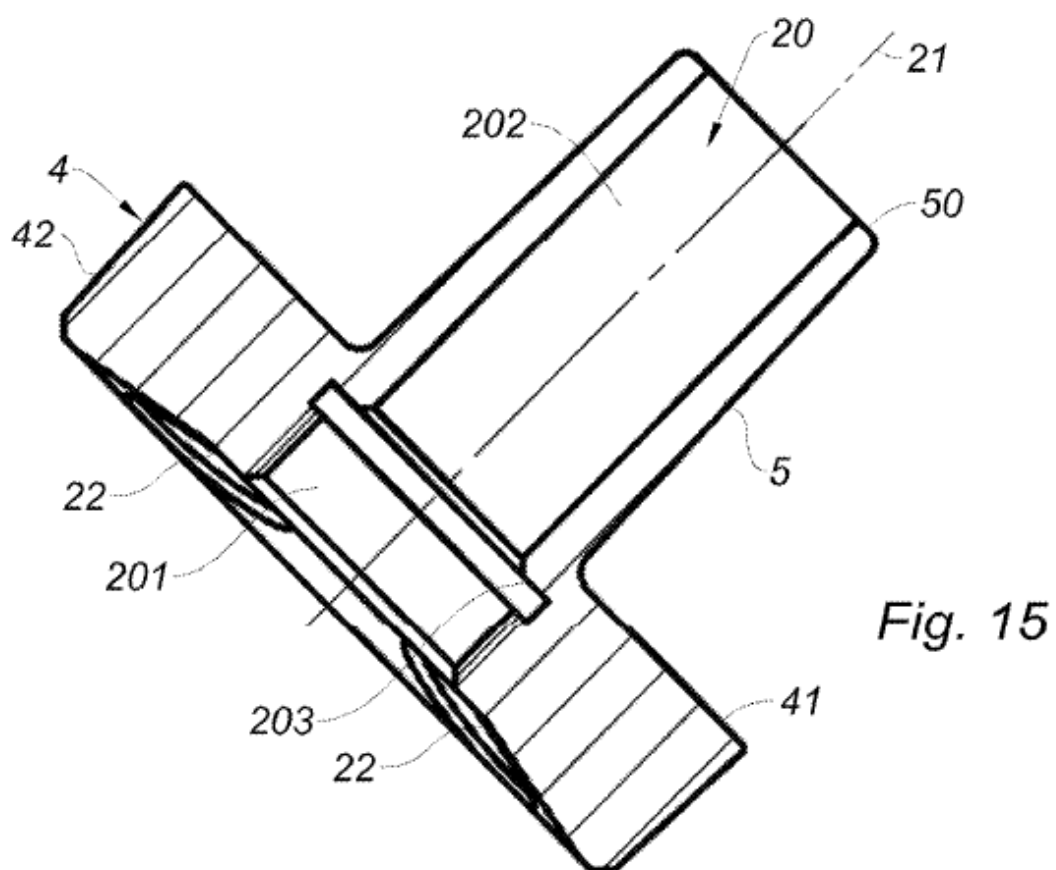
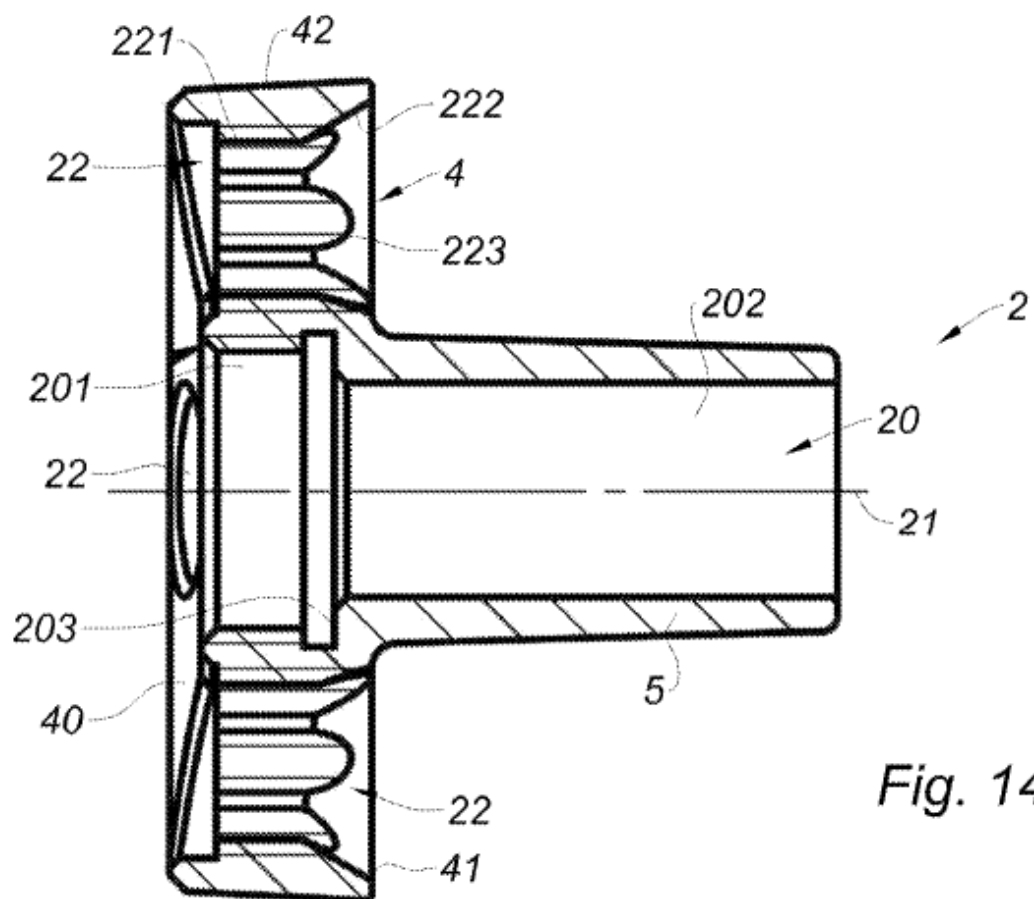


Fig. 11





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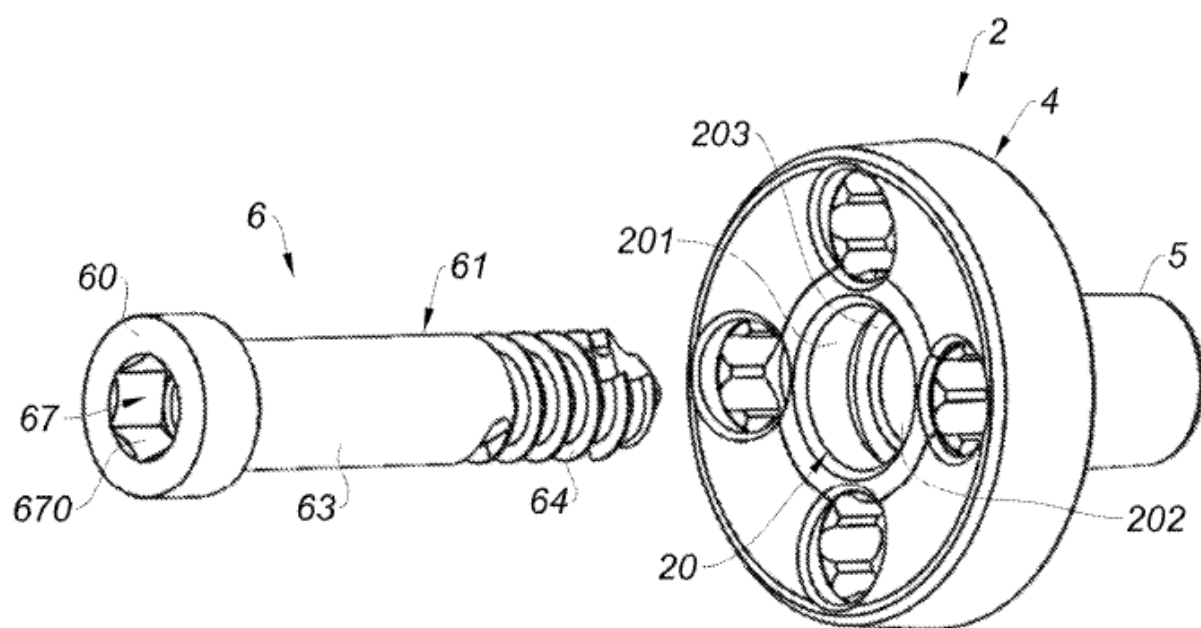


Fig. 16

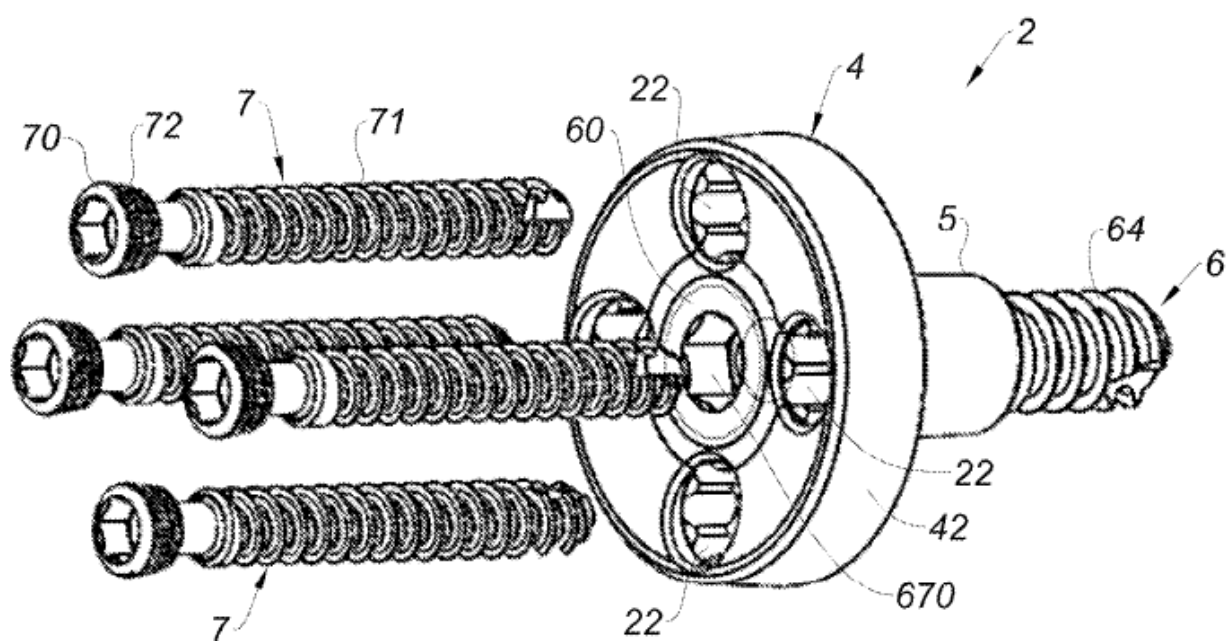
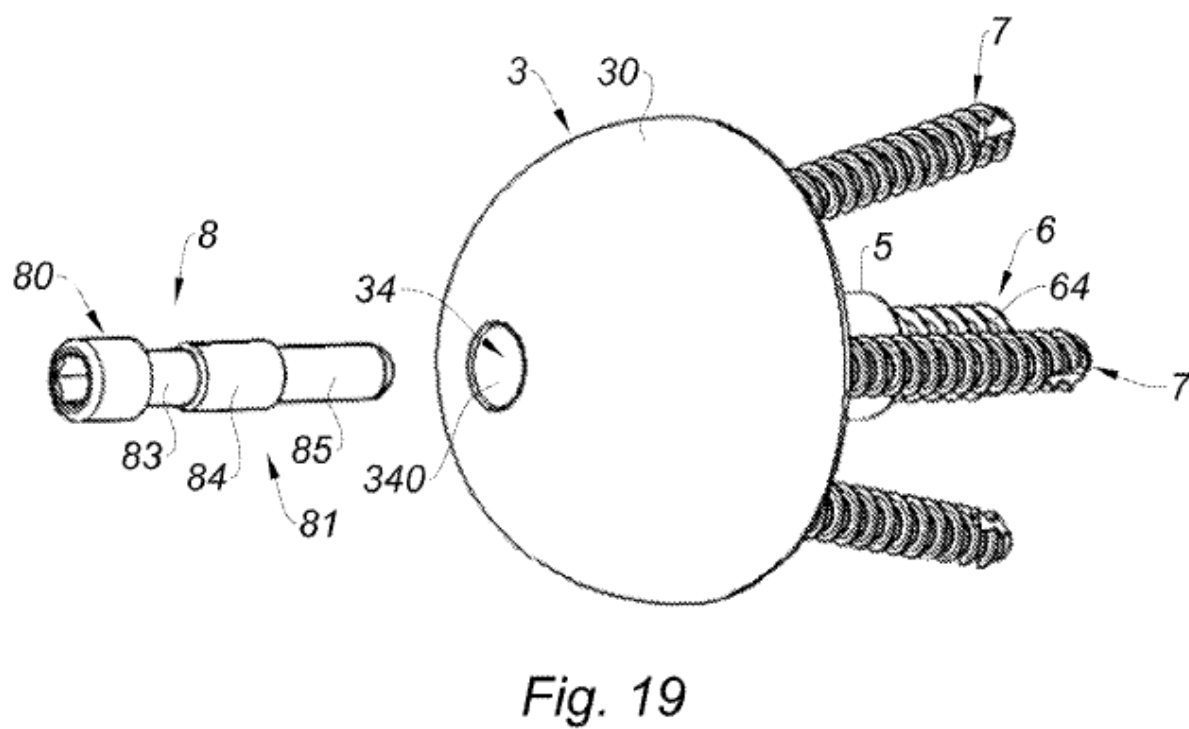


Fig. 17



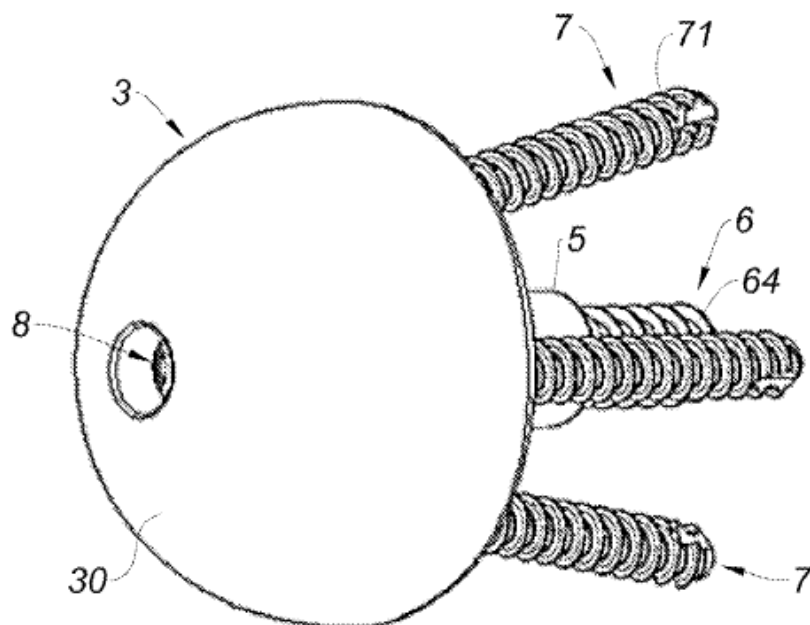


Fig. 20

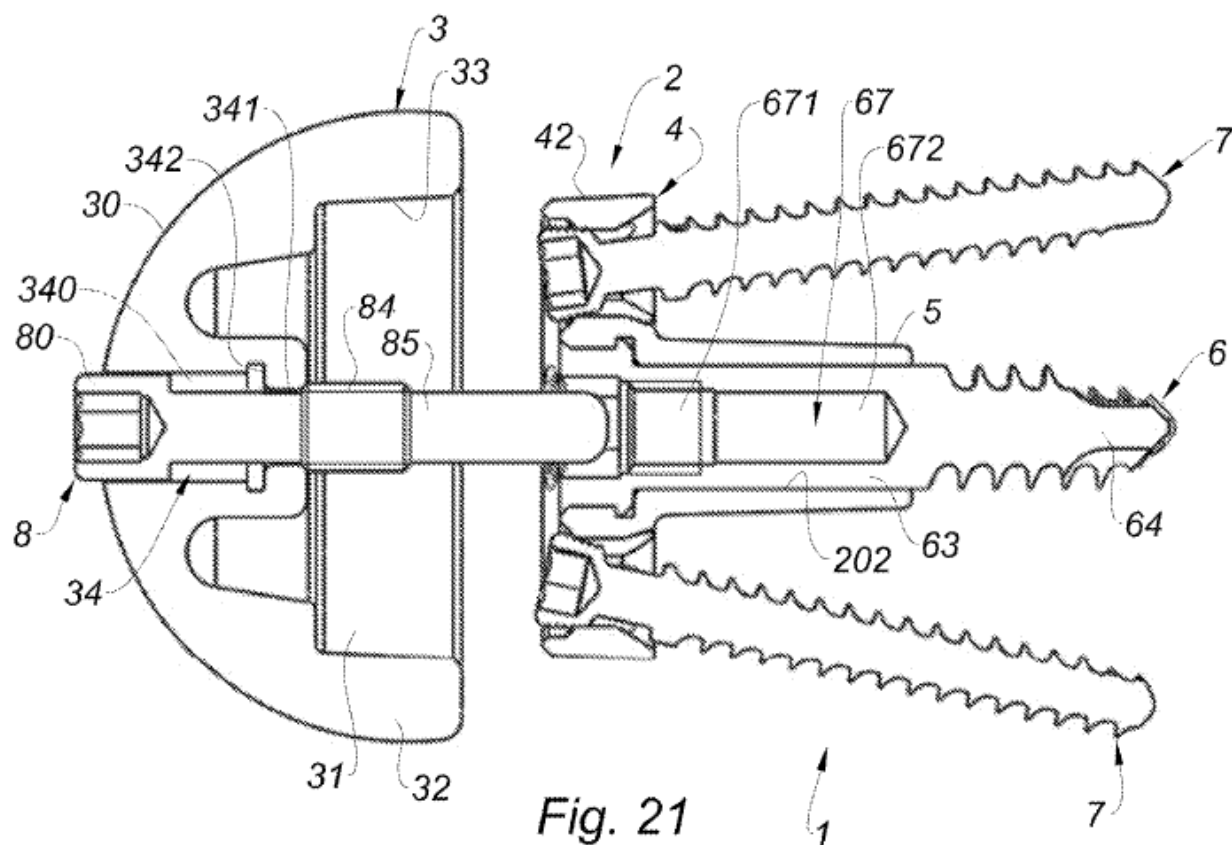


Fig. 21

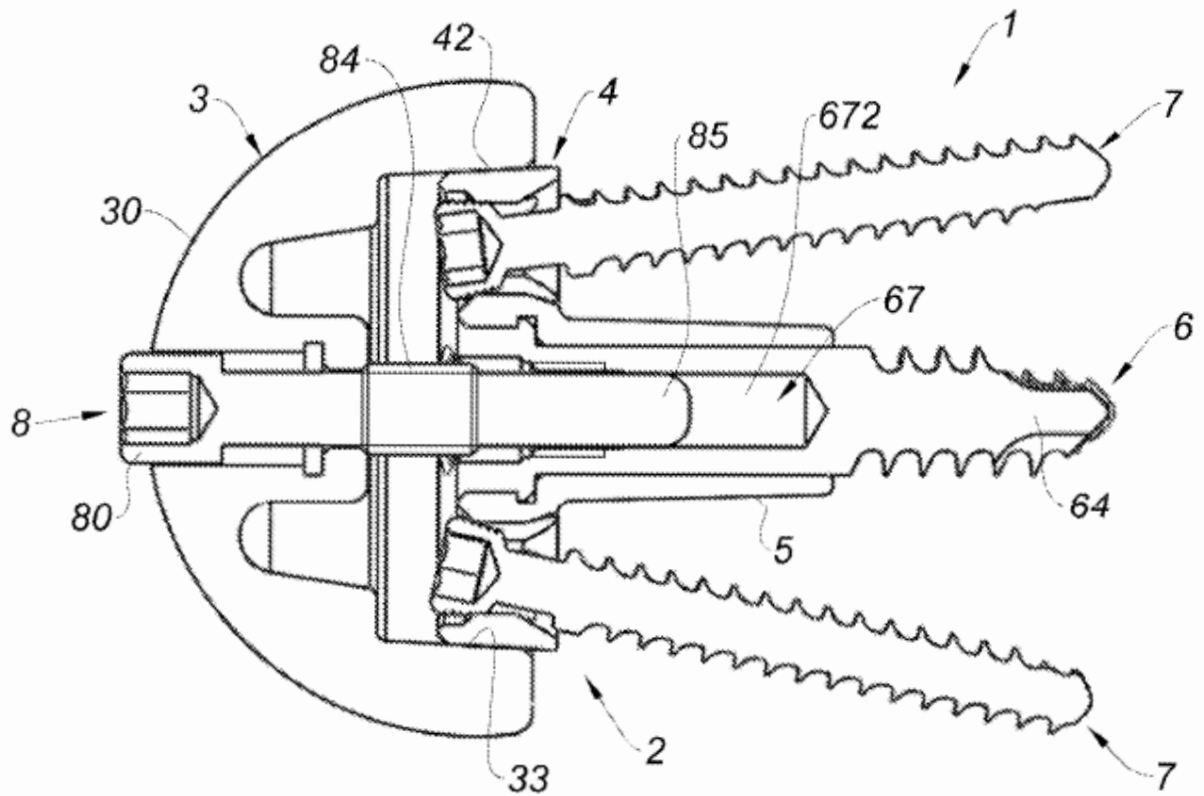


Fig. 22

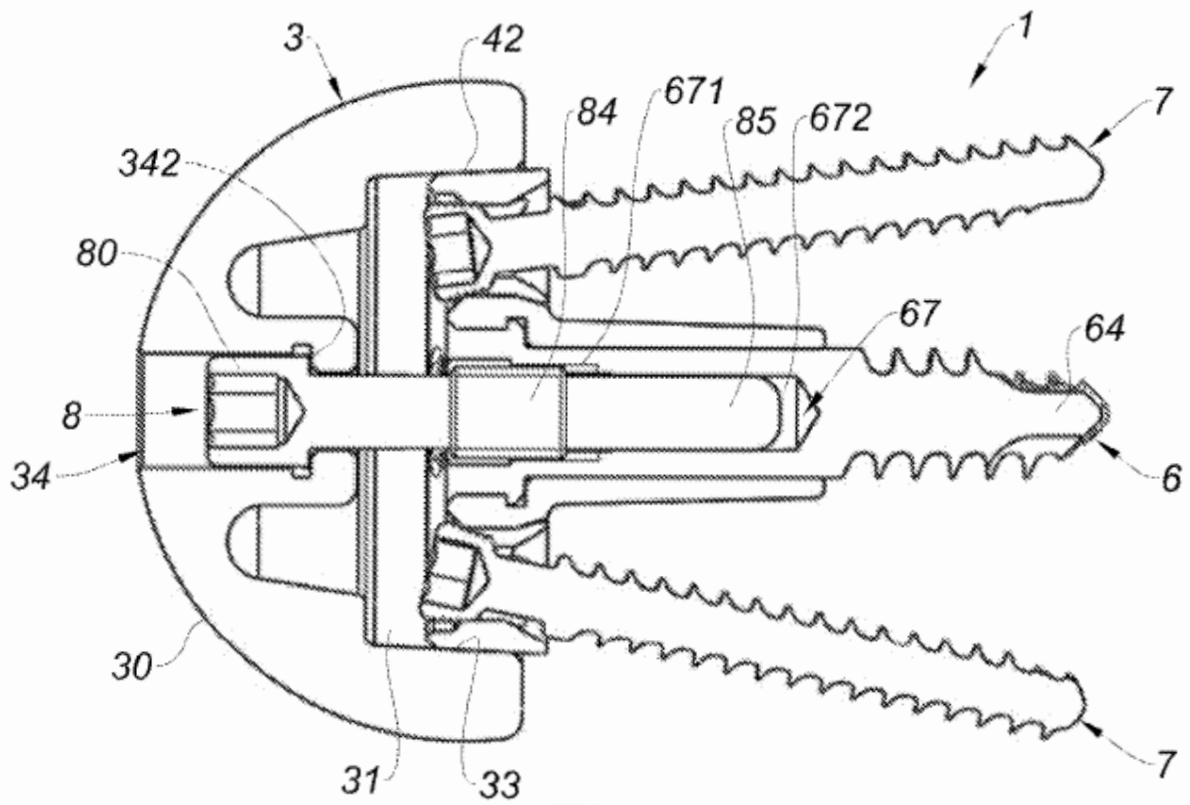


Fig. 23