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(54) Title: TISSUE GRAFT ANCHOR ASSEMBLY

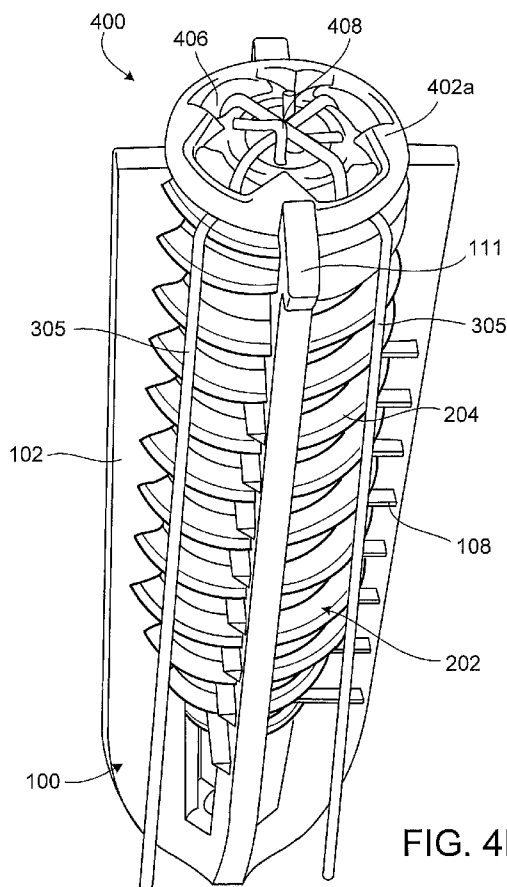


FIG. 4D

(57) Abstract: A tissue graft anchor assembly may include a tissue graft anchor, a fixation member, and a button. The tissue graft anchor includes a plurality of prongs; each prong includes a distal end and a proximal end. The prongs are coupled at their distal ends to form an inner cavity. The fixation member includes a proximal and a distal end and is configured to be disposed within the cavity of the tissue graft anchor. The button is configured to engage the proximal end of the fixation member.



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DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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TISSUE GRAFT ANCHOR ASSEMBLY

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims priority to and the full benefit of United States Provisional Application Serial Number 61/453,172, filed March 16, 2011, and titled "Tissue Graft Anchor Assembly And Instrument For Use Therewith" and United States Provisional Application Serial Number 61/572,280, filed July 12, 2011, and titled "Biosure SYNC X-Wing," the entire contents of which are incorporated herein by reference.

TECHNICAL FIELD

[0002] This application relates to the fixation of soft tissue to bone.

BACKGROUND

[0003] In many aspects of orthopaedic surgery it is necessary to fix a soft tissue to bone. In one example, a ligament, such as an anterior cruciate ligament (ACL), that has ruptured and is non-repairable, may be replaced by a soft tissue graft. The tissue graft can be harvested from various sites including, without limitation, the patellar tendon, quadriceps tendon, semitendons tendon, gracilis tendon, or a combination thereof. Alternatively, the graft may be formed from synthetic materials or from a combination of synthetic and natural materials.

[0004] The replacement tissue graft is implanted by securing one end of the tissue graft through a passage formed in the femur, and the other end of the graft through a passage formed in the tibia. Generally, an anchor (e.g., an interference screw or a post) is used to affix each end of the tissue graft to the bone.

[0005] In another example, a soft tissue may be anchored to passages in the femur and patella to reconstruct the medial patellofemoral ligament. Other examples of ligament reconstructions include, but are not limited to, elbow, and ankle ligament reconstructions. Tendons not part of a ligament reconstruction may also be anchored into bone passages. An example is fixation of the proximal biceps tendon to the proximal humerus.

[0006] Multiple grafts, which may vary in length, are often used. The graft lengths may be insufficient to fill the bone tunnel. As a result, the surgeon must place an interference screw and back up the construct with a fixation post, which must often be removed later.

[0007] There is a need for a soft tissue anchor and instrumentation for use with the anchor which is simple, easy to install, and inexpensive to manufacture, while providing secure, trouble-free anchoring of soft tissue grafts of varying lengths.

SUMMARY

[0008] A tissue graft anchor system eliminates the need to use a separate fixation post during a surgery, such as ACL repair, or other tissue repair. The system allows for the sutures or grafts to be secured to the anchor and prevented from slipping via a button. The system can be used to anchor soft tissue to bone, and can be used for any repair that takes advantage of one or more suture or graft anchoring techniques, including elbow, and ankle ligament reconstructions.

[0009] In one general aspect, a graft anchor assembly includes a button and a fixation member. The button includes a head portion, defining a plurality of through holes, and a post portion extending from the head portion. The fixation member includes a proximal and a distal end. The fixation member defines a centrally located opening in the proximal end of the fixation member and receives and engages a part of the post portion of the button when the button is brought into engagement with the fixation member.

[0010] Implementations may include one or more of the following features. For example, the graft anchor assembly may also include a tissue graft anchor. The tissue graft anchor includes a plurality of prongs, each prong including a distal end and a proximal end, wherein the prongs are coupled at their distal ends to form an inner cavity. The post portion of the button may include a plurality of barbs configured to position the post portion within the opening defined in the proximal end of the fixation member. The plurality of through holes defined in the head portion may be configured to receive one or more flexible members such that ends of the flexible members can be secured to further engage the button to the fixation member. The head portion of the button may define a pair of intersecting slots.

[0011] In another general aspect, a tissue graft anchor assembly includes a tissue graft anchor, a fixation member, and a button. The tissue graft anchor includes a plurality of prongs, each prong including a distal end and a proximal end. The prongs are coupled at their distal ends to form an inner cavity. The fixation member includes a proximal and a distal end and is configured to be disposed within the cavity of the tissue graft anchor. The button is configured to engage the proximal end of the fixation member.

[0012] Implementations may include one or more of the following features. For example, the button may include a head portion and a post extending from the head portion. The fixation member may define a centrally located opening in the proximal end of the fixation member configured to receive a portion of the post. The post of the button includes a plurality of barbs configured to position the post within the opening in the proximal end of the fixation member. The head portion of the button may define two or more through holes which are configured to receive one or more flexible members, such that ends of the flexible members can be secured to engage the button to the fixation member. The head portion of the button may define a pair of intersecting slots. The button may define two or more through holes configured to receive one or more flexible members such that ends of the flexible members can be secured to engage the button to the fixation member. The tissue graft anchor may be formed of two interlocking portions, each portion comprising at least one of the plurality of prongs. The fixation member may include a plurality of threads extending between the proximal and distal ends of the fixation member. Each of the prongs of the tissue graft anchor may include a plurality of threads configured to mate with the plurality of threads of the fixation member such that when the fixation member is inserted within the cavity of the tissue graft anchor, the prongs of the tissue graft anchor twist and expand.

[0013] In another general aspect, a method of tissue repair includes creating a tunnel in bone, inserting a soft tissue graft within the tunnel, inserting a tissue graft anchor within the tunnel, inserting a fixation member within the cavity of the tissue graft anchor, and engaging a button to a proximal end of the fixation member. The tissue graft anchor includes a plurality of prongs, each prong including a distal end and a proximal end. The prongs are coupled at their distal ends

to form an inner cavity. Inserting the fixation member into the cavity causes the prongs to twist and expand, thereby causing ends of the graft to engage a wall of the tunnel and fixate the grafts to the bone. The button defines a plurality of through holes.

[0014] Implementations may include one or more of the following features. For example, the method of tissue repair may further include passing one or more flexible members through the through holes and tying ends of the flexible members together to further secure the button to the proximal end of the fixation member.

BRIEF DESCRIPTION OF THE DRAWINGS

- [0015] FIGS. 1a and 1b are perspective views of a tissue anchor.
- [0016] FIG. 1c is a perspective view of a portion of a tissue anchor.
- [0017] FIG. 1d is a side plan view of a portion of a tissue anchor.
- [0018] FIG. 1e is a top plan view of a portion of a tissue anchor.
- [0019] FIG. 1f is a perspective view of a portion of a tissue anchor.
- [0020] FIG. 1g is a side plan view of a portion of a tissue anchor.
- [0021] FIG. 1h is a top plan view of a portion of a tissue anchor.
- [0022] FIG. 2 is an exploded view of a tissue anchor assembly.
- [0023] FIGS. 3a – 3c illustrate a method of using a tissue anchor assembly.
- [0024] FIG. 4a is a perspective view of a tissue anchor assembly.
- [0025] FIG. 4b is a side view of a tissue anchor assembly.
- [0026] FIG. 4c is a top plan view of a tissue anchor assembly.
- [0027] FIGS. 4d – 4e are perspective views of a tissue anchor assembly.
- [0028] FIGS. 5a–5c are perspective views of a tissue anchor button.
- [0029] FIGS. 6a-6b illustrate a method of using a tissue anchor assembly.

[0030] It should be understood that the drawings are not necessarily to scale and that the disclosed implementations are sometimes illustrated diagrammatically and in partial views. In certain instances, details which are not necessary for an understanding of the disclosure or which render other details difficult to perceive may have been omitted. It should be understood, of course, that this disclosure is not limited to the particular implementations illustrated herein.

DETAILED DESCRIPTION

[0031] FIGS. 1a and 1b show a tissue graft anchor 100. The tissue graft anchor 100 has four prongs 102 each having a proximal end 103 and a distal end 104. The prongs 102 are coupled at their distal ends 104 to form an inner cavity 106. The inner surfaces 102a of proximal ends 103 of the prongs 102 are tapered along partial lengths of the inner surfaces 102a. One or more of the prongs 102 may be formed with one or more barbs or raised ridges 108 on at least one side surface 102b of the prongs 102. One or more of the prongs 102 may have an extension or fin 111 at the proximal end 103. The fin 111 extends generally perpendicular to a longitudinal axis of prong 102 and may include a pointed portion. Additionally, the tissue graft anchor 100 includes a through hole 105 formed at the distal end 104. At least one of the prongs 102 includes threads 110, or grooves, on the inner surface 102a of the prong 102. Threads 110 are located at the proximal ends 103 of the prongs 102 and extend along a partial length of the prongs 102.

[0032] The tissue graft anchor 100 includes two interlocking parts, such as first interlocking portion 112 (FIGS. 1a, 1c-1e) and second interlocking portion 114 (FIGS. 1a, 1f-1h). Each interlocking portion 112 and 114 has two prongs 102. The interlocking portions 112 and 114 are coupled by, for example, a groove 116 (FIG. 1d) formed on the distal end 104 of the first interlocking portion 112 and tongue 118 (FIG. 1g) formed on the distal end 104 of the second interlocking portion 114, such that when the two portions 112 and 114 are assembled, they define an inner cavity 106.

[0033] FIG. 2 shows an exploded view a graft anchor assembly 200. The assembly 200 includes a tissue graft anchor 100 and a fixation member 202, which is configured to be disposed within the cavity 106 of the tissue graft anchor 100. The fixation member 202 includes a tapered

distal end 201, a proximal end 203, and an outer surface 205 including threads 204. The proximal end 203 defines an opening 206 that is configured to engage a driving or delivery device (not shown) or a button (FIG. 4), as will be further described below. The opening 206 may extend a partial length or a full length of the fixation member 202. The fixation member 202 is received within the inner cavity 106 of the tissue graft anchor 100 and the threads 204 of the fixation member 202 mate with the threads 110 of the tissue graft anchor 100. When the fixation member 202 is inserted into the inner cavity 106 of the tissue graft anchor 100 and the threads 204 of the fixation member 202 mate with the threads 110 of the tissue graft anchor 100, the prongs 102 twist or rotate and expand.

[0034] During ligament reconstruction surgery, tunnels are created in, for example, the femur and tibia, and replacement tissue graft is implanted in the tunnels by securing one end of the tissue graft in the tunnel formed within the femur and the other end of the tissue graft in the tunnel formed within the tibia. One or more replacement tissue grafts may be used. FIGS. 3a-3c illustrate use of the assembly 200 to secure tissue grafts 302 into a tunnel 304 in a bone 306, such as a tibia. A tunnel 304 is created in a bone 306 and a soft tissue graft 302 is inserted into the tunnel 304. Flexible members 305, such as sutures, may be coupled to the tissue grafts 302 by, for example, a whipstitch. Once the tissue grafts 302 are passed through the tunnel 304, the tissue graft anchor 100 is inserted into the bone tunnel 304, such that the grafts 302 are located between the prongs 102 of the anchor 100 as partially illustrated in FIGS. 3b and 3c. The prongs 102 of the tissue graft anchor 100 separate the grafts 302 and prevent them from becoming tangled or twisted within the tunnel 304.

[0035] The anchor 100 is seated within the tunnel 304 such that the fin 111 at the proximal end of the anchor 100 engages a portion of the tibia 306 (e.g., a portion of an outer surface of the tibia) outside of the tunnel 304 and acts as a depth stop to substantially reduce over insertion of the anchor 100 into the tunnel 304. In addition to acting as a depth stop, the fin 111 engages the bone and allows for cortical fixation of the anchor 100.

[0036] The fixation member 202 may then be inserted within the inner cavity 106 of the anchor 100 in a rotary manner. As mentioned above, the threads 110 of the tissue graft anchor

100 are configured for engagement with the threads 204 of the fixation member 202 to facilitate insertion of the fixation member 202 into the inner cavity 106. In addition, the tapered inner surfaces 102a at the proximal ends 103 of the prongs 102 cooperate with the tapered distal portion 201 of the fixation member 202 to allow for easier insertion of the fixation member 202. During insertion of the fixation member 202 into the inner cavity 106, the prongs 102 twist and expand, thereby forcing the ends 302a and 302b of the tissue grafts 302 against a wall 304a of the bone tunnel 304, thereby fixating the grafts 302 to the tibia. Additionally, upon insertion of the anchor 100 into the bone tunnel 304, the barbs 108 engage the ends 302a and 302b of the grafts 302 and apply compression to the ends 302a and 302b when the fixation member 202 is inserted into the inner cavity 106 to further fixate the grafts 302 to the tibia.

[0037] The assembly 200 is used to fixate soft tissue, such as tissue graft 302, within the tibial tunnel 304. However, the assembly 200 may be used to fixate soft tissue within a femoral tunnel or to bone in other parts of the body, such as described above in other types of ligament reconstructions and procedures. In addition, the assembly 200 may be used to fixate soft tissue to bone in other areas of the body. The anchor 100 and fixation member 204 could be inserted into the bone tunnel 304 via the use of a guide wire to secure the graft 302 prior to anchor 100 or fixation member 204 insertion.

[0038] FIGS. 4a-4c show a tissue graft anchor assembly 400. The assembly 400 includes the tissue graft anchor 100, the fixation member 202, which is configured to be disposed within the cavity 106 of the tissue graft anchor 100 as described above, and a button 402. The fixation member 202 includes threads 204 and is received within the inner cavity 106 of the tissue graft anchor 100. The threads 204 of the fixation member 202 engage the threads 110 of the tissue graft anchor 100, causing the prongs 102 twist and expand as described above.

[0039] The button 402 has a head portion 404, which includes through holes 406. The holes 406 are configured to receive flexible members 305, such as sutures, therethrough, which are connected to the tissue grafts 302. When sutures 305 are passed through the holes 406 and secured, such as with a knot 408, they assist in retaining the button 402 onto the graft anchor assembly 400. FIGS. 4d and 4e show the graft anchor assembly 400 with a button 402a with

four through holes 406. The suture 305 may pass through all of the holes 406, as in FIG. 4d, or only a portion of the holes 406, as in FIG. 4e.

[0040] Referring to FIGS. 5a-5c, the button 402 may also include a post portion 502, which is configured to be received within the opening 206 in the fixation member 202. The post portion 502 may include barbs or ridges 504 which can engage portions of the fixation member 202 forming the opening 206. The button 402 may be configured in a number of different ways. For example, FIG. 5a shows a button 402 with four through holes 406 in the head portion 404 configured to receive two or four sutures as described above. FIG. 5b shows a button 402 with two intersecting slots 506 and 508 configured to receive, for example, four sutures. FIG. 5c shows a button 402 with two through holes 406 in the head portion 404 configured to receive two or more sutures.

[0041] FIGS. 6a and 6b illustrate the use of the tissue anchor assembly 400 to secure tissue grafts 302 into a tibial tunnel 304, as in FIGS. 3b and 3c. A soft tissue graft 302 is inserted into a bone tunnel 304. As described above, the tissue grafts 302 are passed through the tunnel 304 and the tissue graft anchor 100 is inserted into the bone tunnel 304, such that the grafts 302 are located between the prongs 102. The prongs 102 of the tissue graft anchor 100 separate the grafts 302 and prevent them from becoming tangled or twisted.

[0042] The anchor 100 is seated within the tunnel 304 such that the fin 111 engages a portion of the tibia 306 (e.g., outer surface of the tibia) outside of the tunnel and acts as a depth stop and allowing for cortical fixation of the anchor 100.

[0043] The fixation member 202 is then inserted within the inner cavity 106 of the anchor 100 in a rotary manner. The threads 110 of the tissue graft anchor 100 and the tapered inner surfaces 102a at the proximal ends 103 of the prongs 102 cooperate with the tapered distal portion 201 of the fixation member 202 to allow for insertion of the fixation member 202. During insertion of the fixation member 202 into the inner cavity 106, the prongs 102 are caused to twist or rotate and expand, thereby forcing the ends 302a and 302b of the grafts 302 against a wall of the bone tunnel 304 and fixating the grafts 302 to the tibia. Additionally, upon insertion of the anchor 100 into the bone tunnel 304, the barbs 108 engage the ends 302a and 302b of the grafts 302 and

apply compression to the ends 302a and 302b when the fixation member 202 is inserted into the inner cavity 106 to further fixate the grafts 302 to the tibia 306. The anchor 100 and fixation member 204 could be inserted into the bone tunnel 304 via the use of a guide wire to secure the graft 302 prior to anchor 100 or fixation member 204 insertion.

[0044] The button 402 is coupled to the fixation member 202 by, for example, inserting the post portion 502 of the button 402 into the opening 206 at the proximal end 208 of the fixation member 202 and passing the sutures 305, through the holes 406 in the head portion 404 of the button 402. The sutures 305 can then be secured on top of the button 402. The barbs 504 of the post portion 502 engage the sides of the opening 206, securing the button 402 to the fixation member 202.

[0045] Tying the sutures 305 on top of the button 402 limits the sutures 305 and tissue grafts 302, which they are coupled to, from slipping after implantation without the need to use a separate post or other fixation member.

[0046] While only certain implementations have been set forth, alternatives and modifications will be apparent from the above description to those skilled in the art. For example, tissue graft anchor 100 may have any number of prongs. Likewise, there may be more than two interlocking parts. In addition, the present implementations also are not limited to buttons with posts, but may include buttons with a flat bottom side. The button 402 may be configured to interact with the prongs 102 of the tissue anchor 100. In addition, the proximal ends 103 of the prongs 102 may vary in shape. For example, they may be substantially rounded, rather than tapered

[0047] In addition, the barbs 108 may vary in size and shape. Barbs 108 may be on any number of prongs 102 or be absent altogether. Likewise, the threads 110 on the prongs 102 may be present on only two of the prongs 102, rather than four, as in anchor 100. The tissue graft anchor 100 illustrated in this disclosure shows threads 110 located at the proximal ends 103 of the prongs 102 and extending a partial length of the prongs 102, but the threads 110 may be located anywhere along the inner surface 102a, including along the entire inner surface 102a of the prongs 102. It is also within the scope of this disclosure for the prongs 102 to not have any threads 110.

[0048] The anchor 100 may be made from a non-metal material, including, but not limited to a polymer material. However, it may be made from a metal material. Also, the anchor 100 may be made via an injection molding process, but may be made via another process known to one of skill in the art. The fixation member 202 may be made from a non-metal material, including, but not limited to a polymer material and may made via an injection molding process. However, other materials and processes known to one of skill in the art are also possible. The anchor 100 or the fixation member, or both, may be made of a bio-absorbable material.

[0049] The tissue graft anchor 100 may be made of more than two interlocking parts, each interlocking portion having at least one prong 102, or the tissue graft anchor 100 may be a single piece.

[0050] These and other alternatives are considered equivalents and within the spirit and scope of this disclosure and the appended claims.

CLAIMS:

1. A graft anchor assembly comprising:
a button comprising a head portion and a post portion extending from the head portion, the head portion defining a plurality of through holes therethrough; and
a fixation member comprising a proximal and a distal end, the fixation member defining a centrally located opening in the proximal end of the fixation member and configured to receive and engage a part of the post portion of the button when the button is brought into engagement with the fixation member.
2. The assembly of claim 1, further comprising a tissue graft anchor comprising a plurality of prongs, each prong including a distal end and a proximal end, wherein the prongs are coupled at their distal ends to form an inner cavity.
3. The assembly of claim 1, wherein the post portion comprises a plurality of barbs configured to position the post portion within the opening defined in the proximal end of the fixation member.
4. The assembly of claim 1, wherein the plurality of through holes defined in the head portion are configured to receive one or more flexible members therethrough such that ends of the flexible members can be secured to further engage the button to the fixation member.
5. The assembly of claim 1, wherein the head portion defines a pair of intersecting slots.
6. A tissue graft anchor assembly comprising:
a tissue graft anchor comprising a plurality of prongs, each prong including a distal end and a proximal end, wherein the prongs are coupled at their distal ends to form an inner cavity;
a fixation member comprising a proximal and a distal end, the fixation member configured to be disposed within the cavity of the tissue graft anchor; and

a button configured to engage the proximal end of the fixation member.

7. The assembly of claim 6, wherein the button comprises a head portion and a post extending from the head portion.

8. The assembly of claim 7, wherein the fixation member defines a centrally located opening in the proximal end of the fixation member, the opening configured to receive a portion of the post therein.

9. The assembly of claim 8, wherein the post comprises a plurality of barbs configured to position the post within the opening in the proximal end of the fixation member.

10. The assembly of claim 7, wherein the head portion defines two or more through holes therethrough, wherein the two or more through holes are configured to receive one or more flexible members therethrough such that ends of the flexible members can be secured to engage the button to the fixation member.

11. The assembly of claim 7, wherein the head portion defines a pair of intersecting slots.

12. The assembly of claim 6, wherein the button defines two or more through holes therethrough configured to receive one or more flexible members therethrough such that ends of the flexible members can be secured to engage the button to the fixation member.

13. The assembly of claim 6, wherein the tissue graft anchor is formed of two interlocking portions, each portion comprising at least one of the plurality of prongs.

14. The assembly of claim 6, wherein the fixation member comprises a plurality of threads extending between the proximal and distal ends of the fixation member and wherein each of the prongs of the tissue graft anchor comprises a plurality of threads configured to mate with the plurality of threads of the fixation member such that when the fixation member is inserted

within the cavity of the tissue graft anchor, the prongs of the tissue graft anchor twist and expand.

15. A method of tissue repair comprising:
creating a tunnel in bone;
inserting a soft tissue graft within the tunnel;
inserting a tissue graft anchor within the tunnel, the tissue graft anchor comprising a plurality of prongs, each prong including a distal end and a proximal end, wherein the prongs are coupled at their distal ends to form an inner cavity;
inserting a fixation member within the cavity of the tissue graft anchor, whereby inserting the fixation member into the cavity causes the prongs to twist and expand, thereby causing ends of the graft to engage a wall of the tunnel and fixate the grafts to the bone; and
engaging a button to a proximal end of the fixation member, the button defining a plurality of through holes therethrough.

16. The method of claim 15, further comprising passing one or more flexible members through the through holes and tying ends of the flexible members together to further secure the button to the proximal end of the fixation member.

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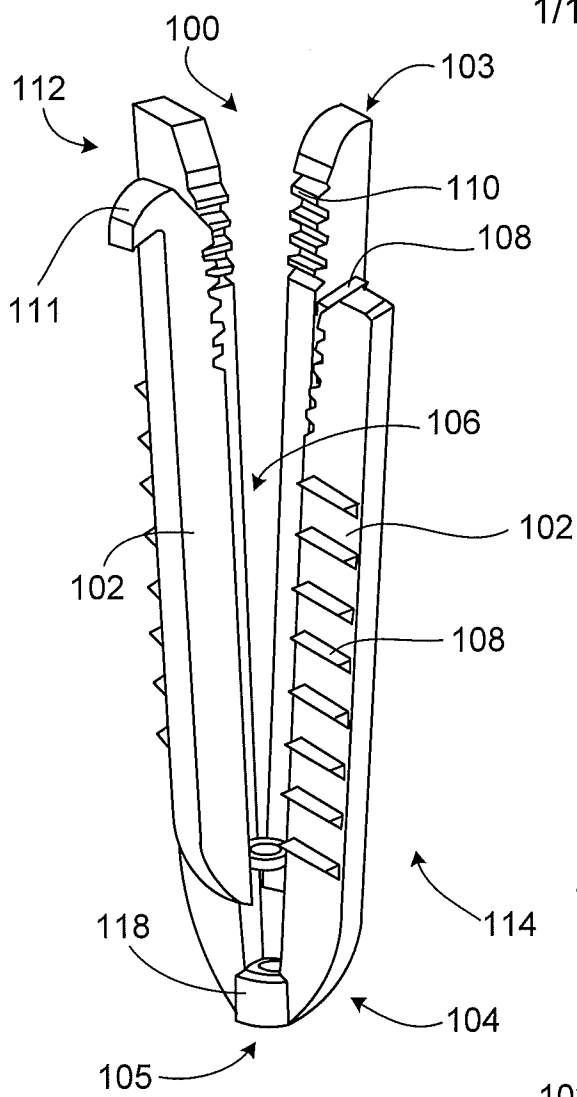


FIG. 1A

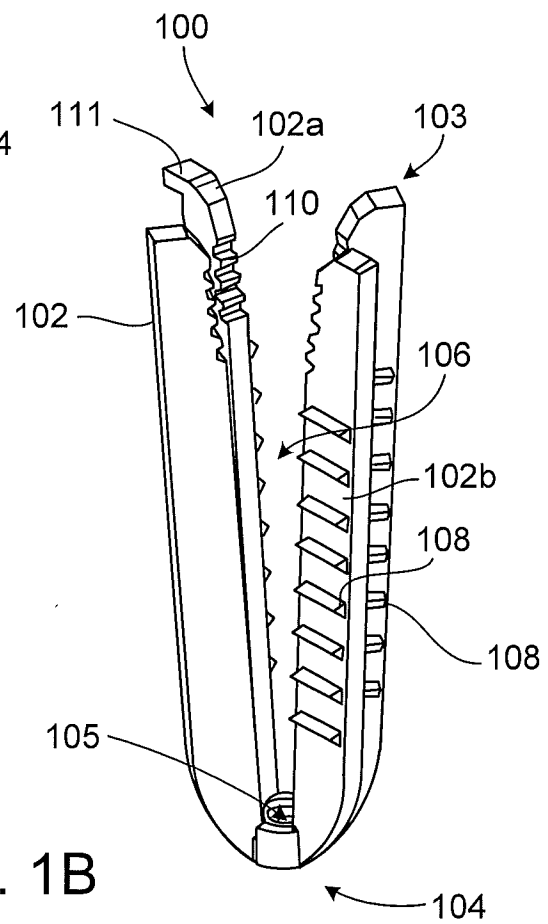


FIG. 1B

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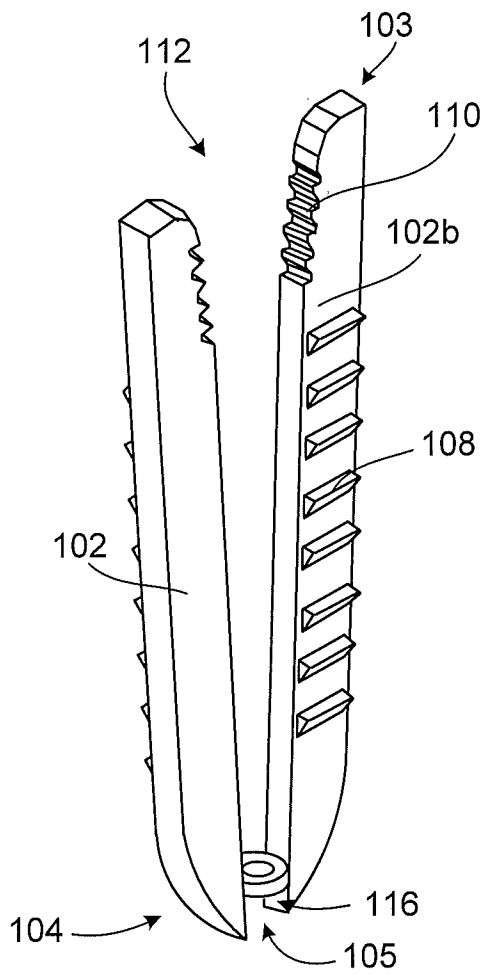


FIG. 1C

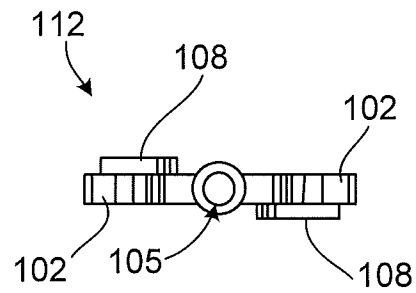


FIG. 1E

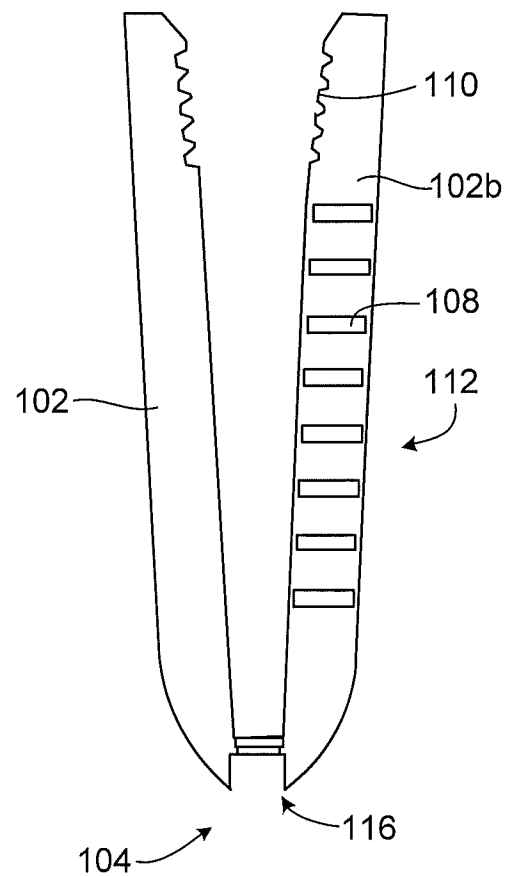


FIG. 1D

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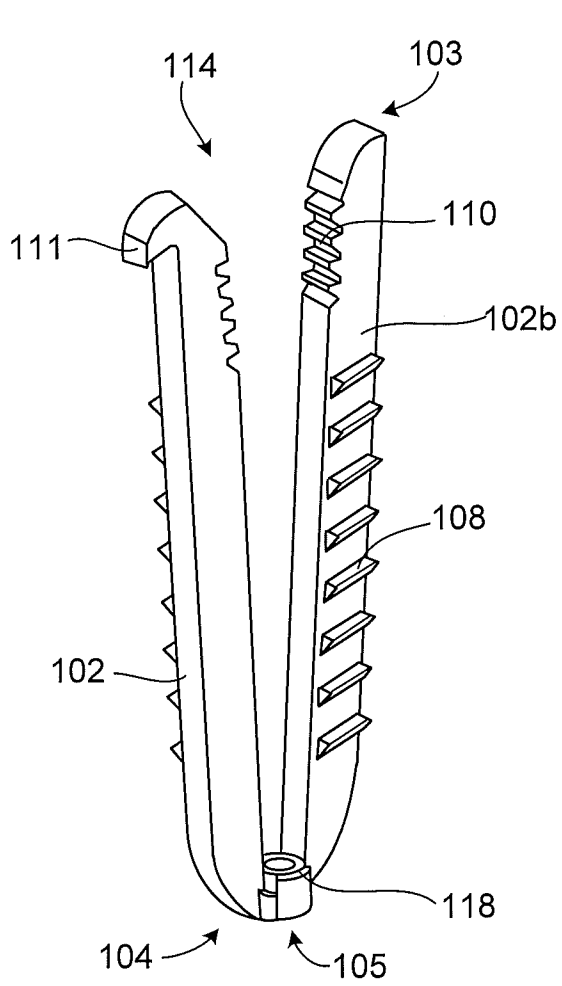


FIG. 1F

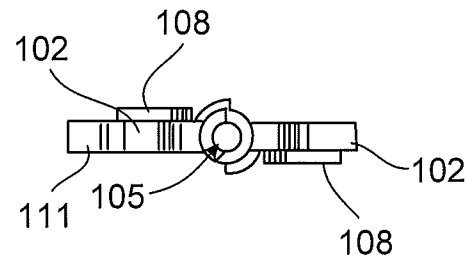


FIG. 1H

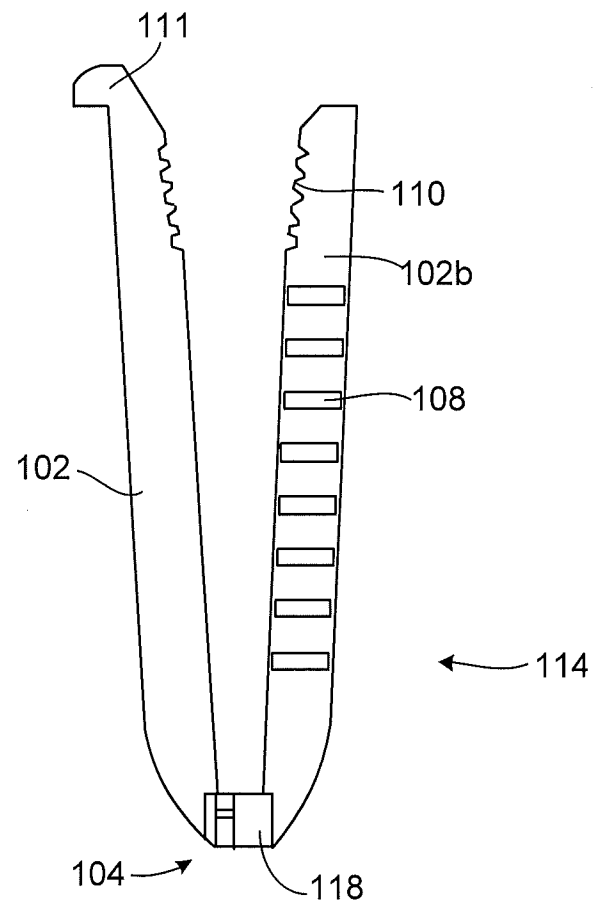


FIG. 1G

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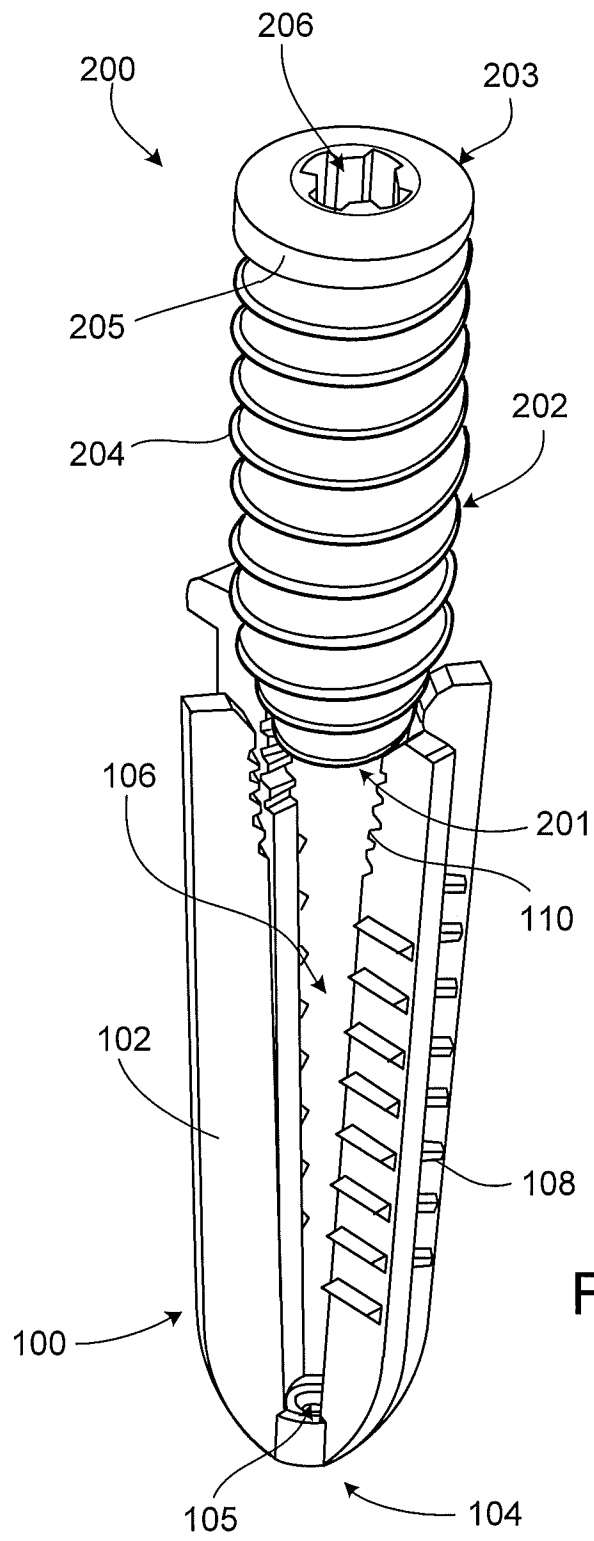


FIG. 2

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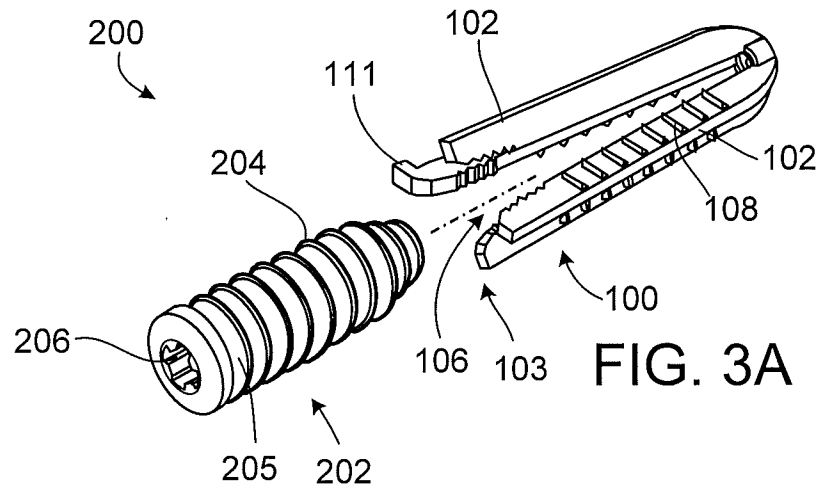


FIG. 3A

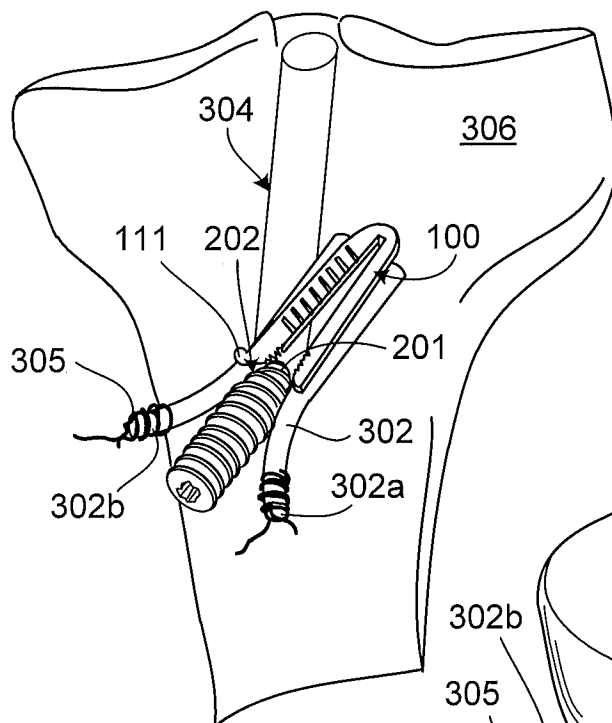


FIG. 3B

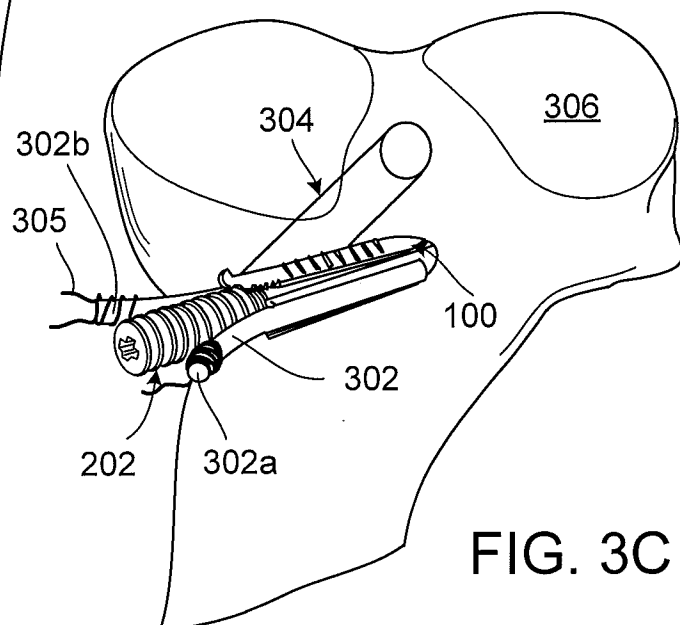


FIG. 3C

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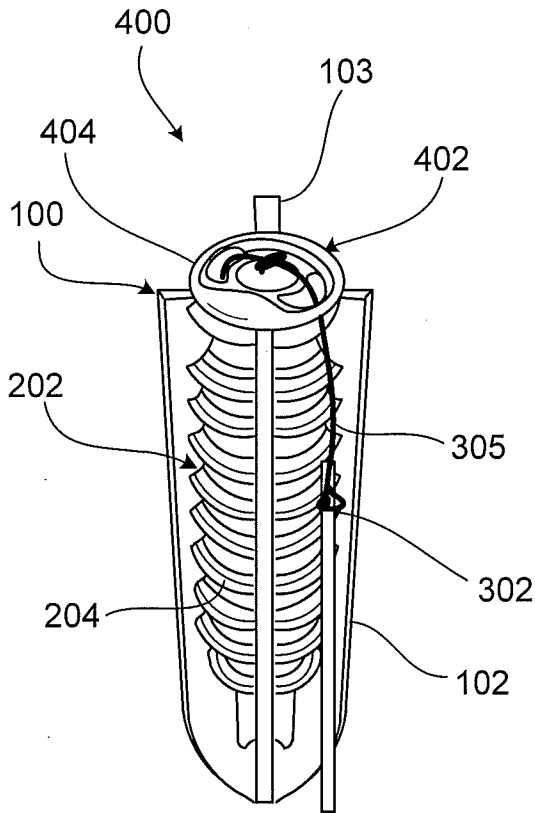


FIG. 4A

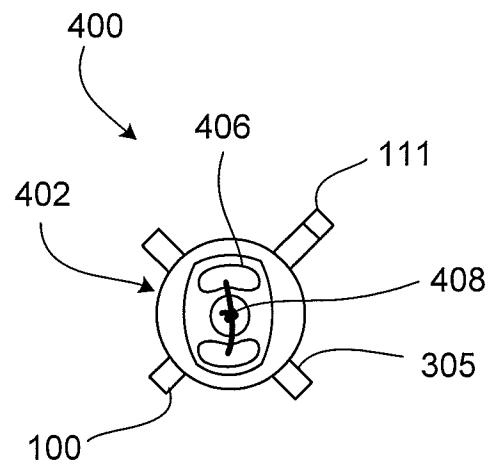


FIG. 4C

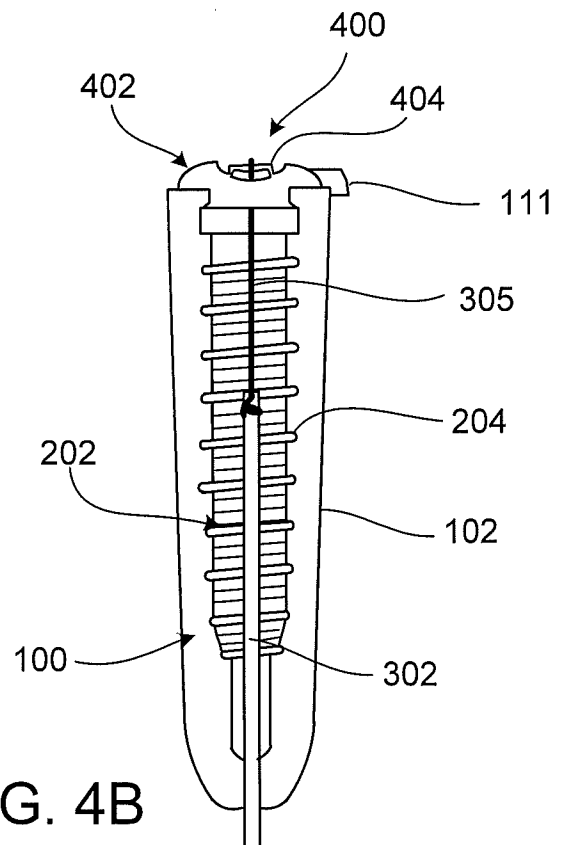
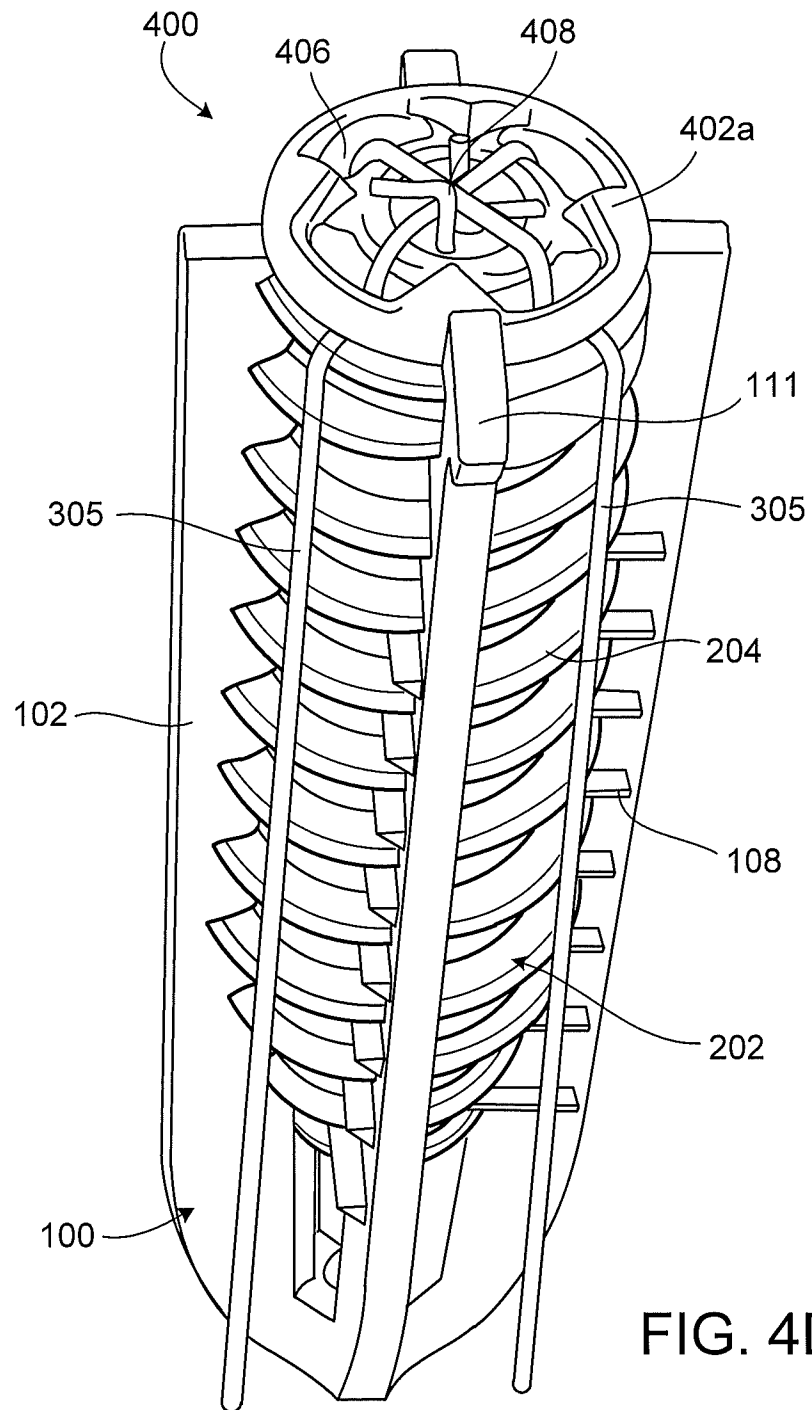


FIG. 4B

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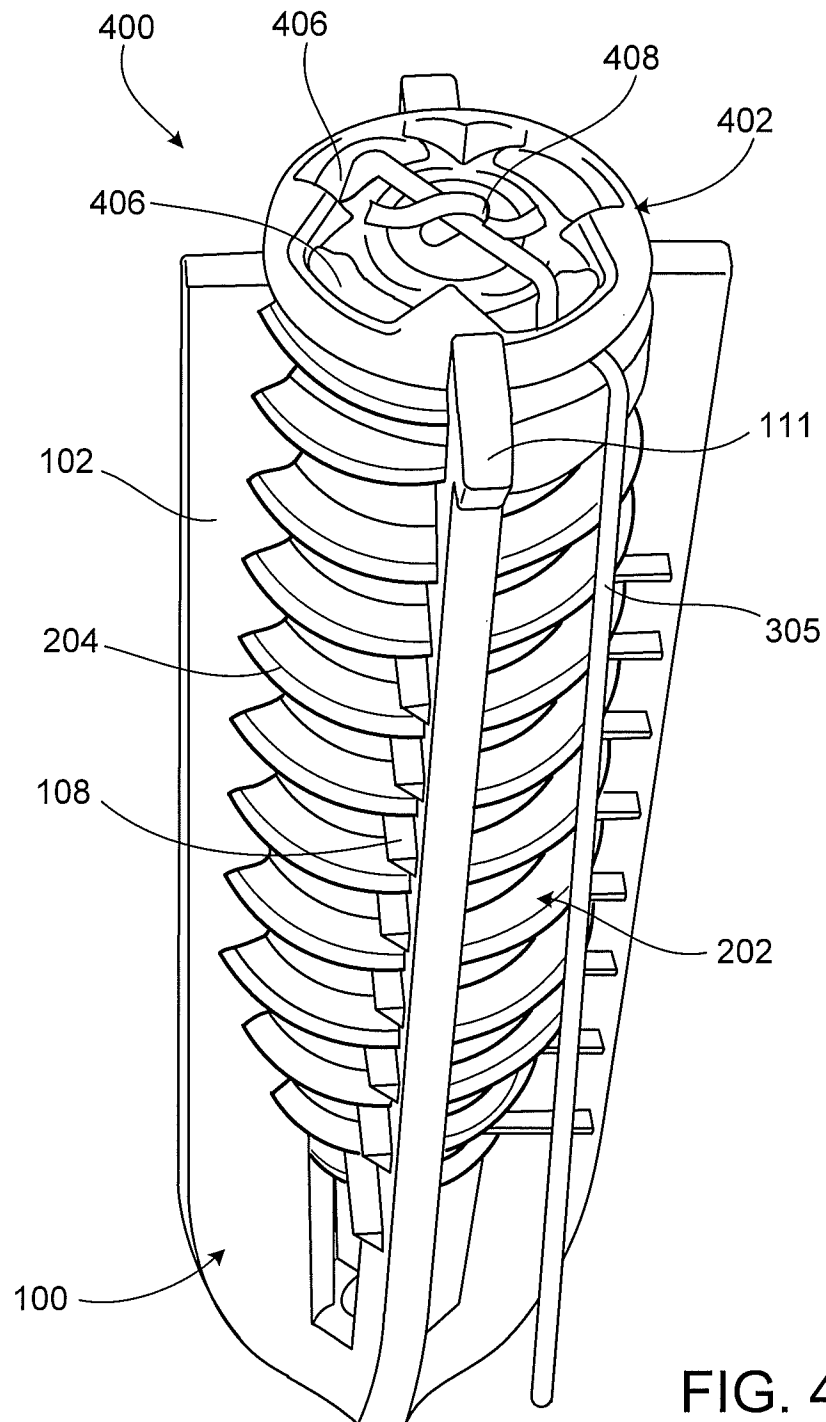


FIG. 4E

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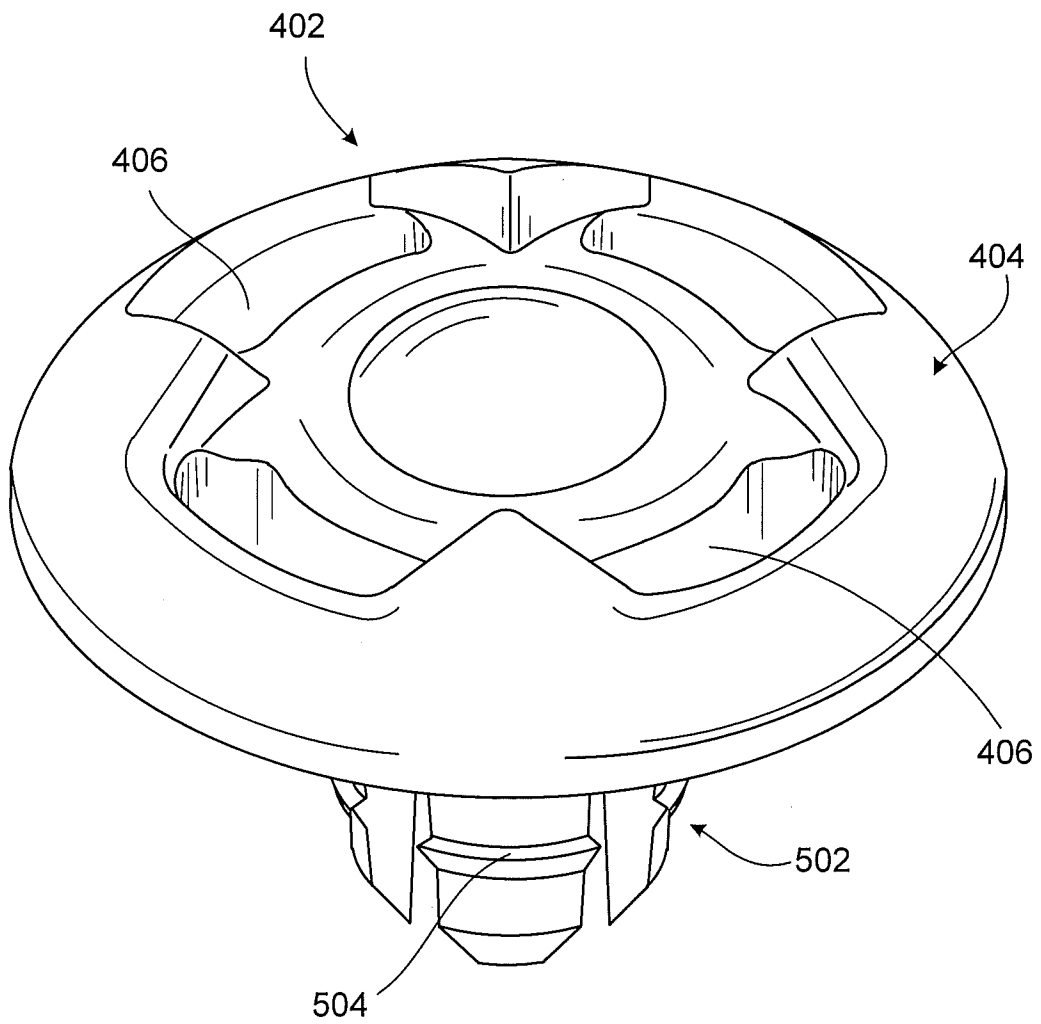


FIG. 5A

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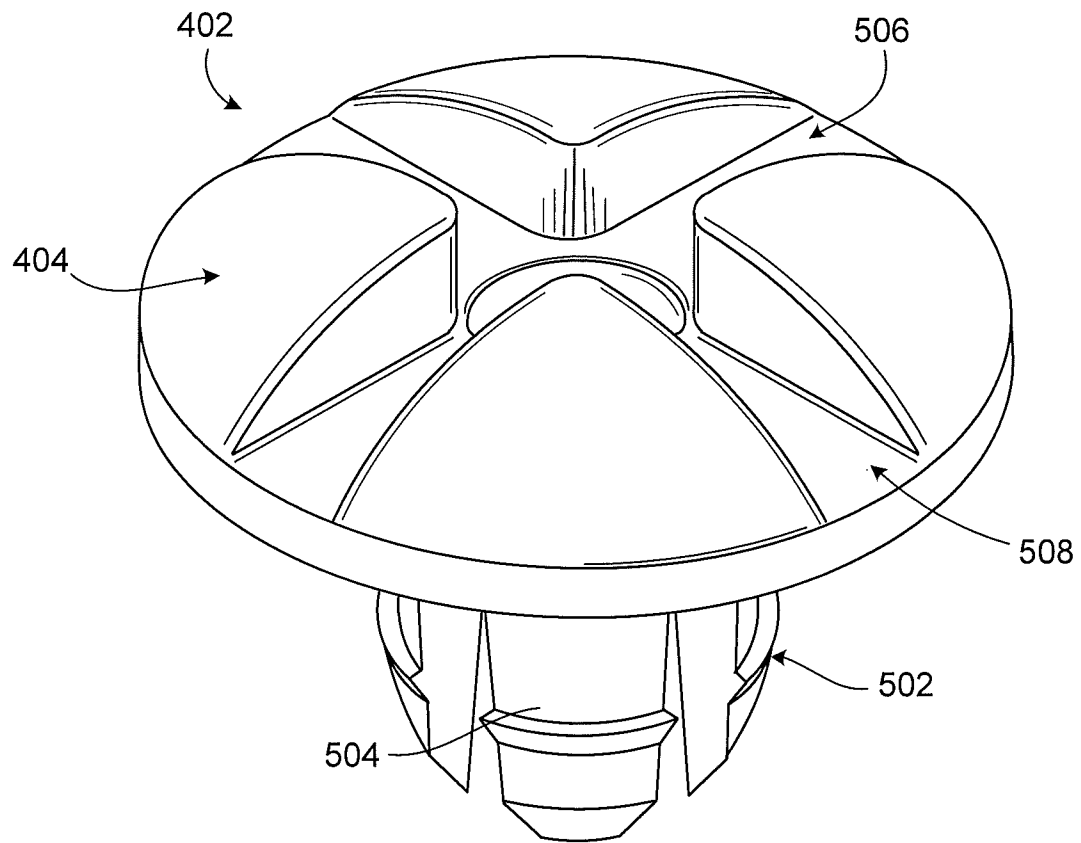


FIG. 5B

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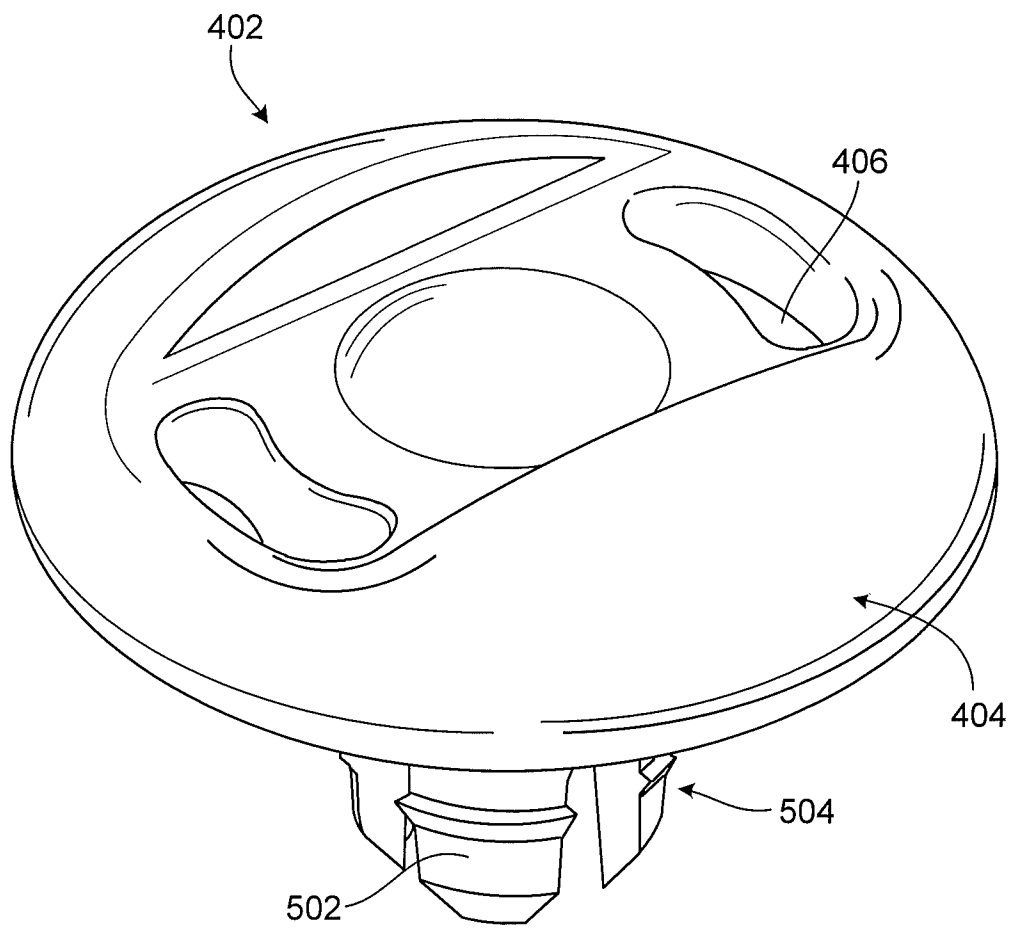


FIG. 5C

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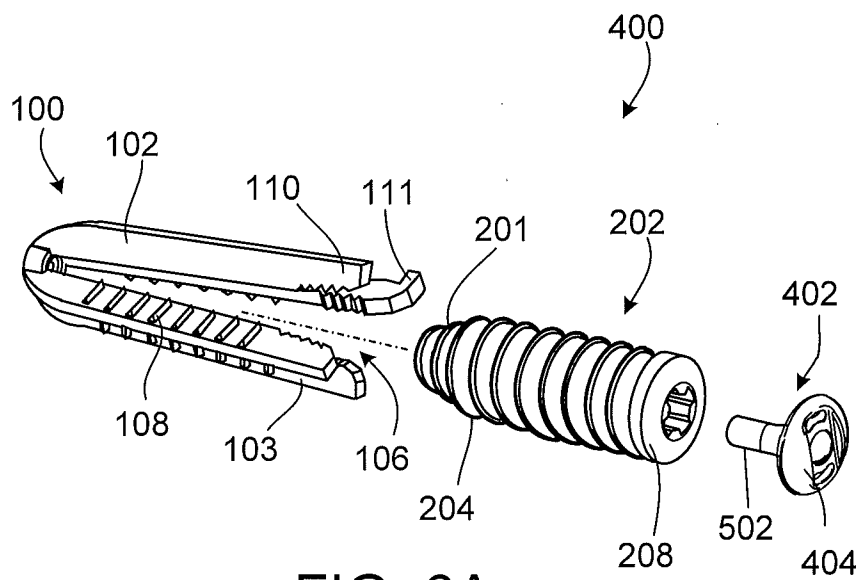


FIG. 6A

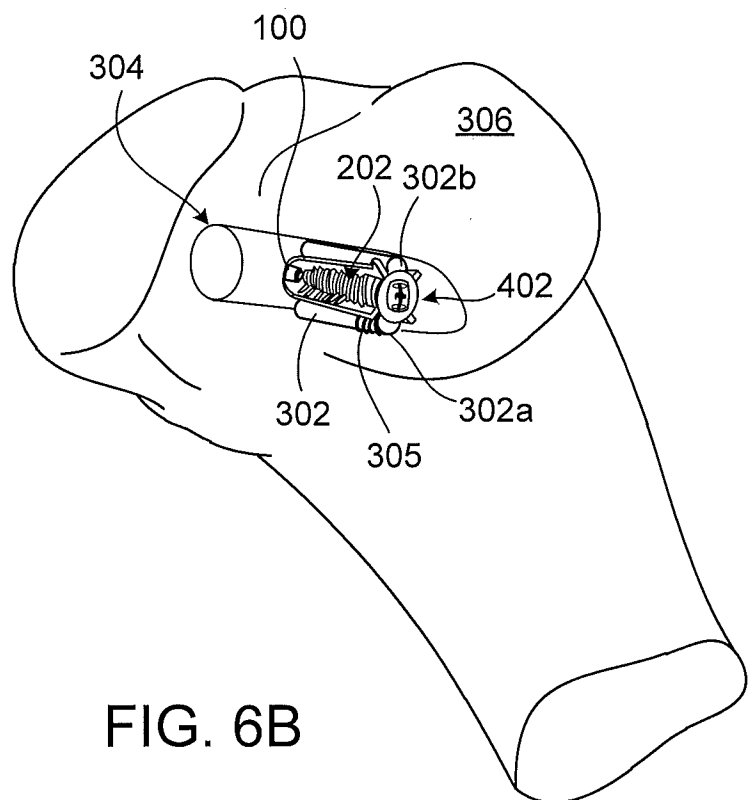


FIG. 6B

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2012/029390

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61F2/08
ADD.

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

B. FIELDS SEARCHED

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

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

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

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 584 835 A (GREENFIELD JON B [US]) 17 December 1996 (1996-12-17)	1,3-5
Y	column 7, line 17 - column 8, line 42; figures 1,2	2
Y	----- US 2011/009885 A1 (GRAF BEN K [US] ET AL) 13 January 2011 (2011-01-13) paragraphs [0031] - [0033]; figure 5	2
A	----- US 2007/156153 A1 (JIANG CHING-CHUAN [TW] ET AL) 5 July 2007 (2007-07-05) paragraphs [0055] - [0057]; figure 1	1-5



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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

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

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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

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

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

"&" document member of the same patent family

Date of the actual completion of the international search

18 May 2012

Date of mailing of the international search report

28/08/2012

Name and mailing address of the ISA/

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

Espuch, Antonio

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/029390

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

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

1. ☒ Claims Nos.: 15, 16
because they relate to subject matter not required to be searched by this Authority, namely:
Rules 39.1 (iv) and 67.IV PCT - Method for treatment of the human or animal body by surgery. The feature "creating a tunnel in a bone" in claim 15 implies surgery.
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

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

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

see additional sheet

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

1-5

Remark on Protest

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

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2012/029390

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5584835	A	17-12-1996	NONE

US 2011009885	A1	13-01-2011	AU 2010271431 A1 19-01-2012
			EP 2451379 A2 16-05-2012
			US 2011009885 A1 13-01-2011
			WO 2011005966 A2 13-01-2011

US 2007156153	A1	05-07-2007	US 2007156153 A1 05-07-2007
			US 2012004675 A1 05-01-2012

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-5

fixation member and button with holes and post

2. claims: 6-14

anchor with prongs, fixation member and button.
