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# UTILITY PATENT APPLICATION TRANSMITTAL

*(Only for new nonprovisional applications under 37 CFR 1.53(b))*

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|---|---|
| *Attorney Docket No.* | 104US2 |
| *First Inventor* | Matthew Curran |
| *Title* | Systems and Methods for Spinal Fusi |
| *Express Mail Label No.* | |

## APPLICATION ELEMENTS

*See MPEP chapter 600 concerning utility patent application contents.*

1. ☑ **Fee Transmittal Form** (e.g., PTO/SB/17)
2. ☐ **Applicant claims small entity status.** See 37 CFR 1.27.
3. ☑ **Specification** [*Total Pages* 32 ]
   Both the claims and abstract must start on a new page
   *(For information on the preferred arrangement, see MPEP 608.01(a))*
4. ☐ **Drawing(s)** (*35 U.S.C. 113*) [*Total Sheets* 20 ]
5. **Oath or Declaration** [*Total Sheets* 2 ]
   a. ☐ Newly executed (original or copy)
   b. ☑ A copy from a prior application (37 CFR 1.63(d))
   *(for continuation/divisional with Box 18 completed)*
   i. ☐ DELETION OF INVENTOR(S)
   Signed statement attached deleting inventor(s) name in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).
6. ☐ **Application Data Sheet.** See 37 CFR 1.76
7. ☐ **CD-ROM or CD-R** in duplicate, large table or Computer Program *(Appendix)*
   ☐ Landscape Table on CD
8. **Nucleotide and/or Amino Acid Sequence Submission**
   *(if applicable, items a. – c. are required)*
   a. ☐ Computer Readable Form (CRF)
   b. Specification Sequence Listing on:
      i. ☐ CD-ROM or CD-R (2 copies); or
      ii. ☐ Paper
   c. ☐ Statements verifying identity of above copies

*ADDRESS TO:* **Commissioner for Patents**
**P.O. Box 1450**
**Alexandria VA 22313-1450**

## ACCOMPANYING APPLICATION PARTS

9. ☐ **Assignment Papers** (cover sheet & document(s))
   Name of Assignee_____
10. ☐ **37 CFR 3.73(b) Statement** *(when there is an assignee)* ☐ **Power of Attorney**
11. ☐ **English Translation Document** *(if applicable)*
12. ☐ **Information Disclosure Statement** (PTO/SB/08 or PTO-1449)
    ☐ Copies of citations attached
13. ☐ **Preliminary Amendment**
14. ☐ **Return Receipt Postcard** (MPEP 503)
    (*Should be specifically itemized)*
15. ☐ **Certified Copy of Priority Document(s)**
    *(if foreign priority is claimed)*
16. ☐ **Nonpublication Request** under 35 U.S.C. 122(b)(2)(B)(i). Applicant must attach form PTO/SB/35 or equivalent.
17. ☐ Other:_____

18. If a CONTINUING APPLICATION, *check appropriate box, and supply the requisite information below and in the first sentence of the specification following the title, or in an Application Data Sheet under 37 CFR 1.76:*

☑ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No.: 11/093,409

*Prior application information*: *Examiner* Elana Beth Fisher *Art Unit:* 3733

## 19. CORRESPONDENCE ADDRESS

☑ The address associated with Customer Number: 30328 ***OR*** ☐ Correspondence address below

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| Signature | /Jennifer Risser/ | Date | April 4, 2011 |
| Name (Print/Type) | Jennifer Risser | Registration No. (Attorney/Agent) | 60,059 |





MSD 1109

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**NON-PROVISIONAL APPLICATION**

**FOR UNITED STATES LETTERS PATENT**

# SYSTEMS AND METHODS FOR SPINAL FUSION

By Inventor:

MATTHEW CURRAN

Filed:

April 4, 2011

# SYSTEMS AND METHODS FOR SPINAL FUSION

## CROSS-REFERENCE TO RELATED APPLICATION

This application is continuation of United States Patent Application Serial Number 11/093,409 filed March 29, 2005, now pending, which claims the benefit of the filing date under 35 USC 119(e) of United States Provisional Application entitled "Systems and Methods for Spinal Fusion," serial No. 60/557,536 filed March 29, 2004, the entire contents of which are incorporated herein by reference.

## BACKGROUND OF THE INVENTION

### I. Field of the Invention

The present invention relates generally to spinal surgery and, more particularly, to a system and method for spinal fusion comprising a spinal fusion implant of non-bone construction releasably coupled to an insertion instrument dimensioned to introduce the spinal fusion implant into any of a variety of spinal target sites.

### II. Discussion of the Prior Art

Currently there are nearly 500,000 spine lumbar and cervical fusion procedures performed each year in the United States. Such procedures are commonly performed to correct problems, such as chronic back or neck pain, which result from degenerated intervertebral discs or trauma. Generally, spinal fusion procedures involve removing some or all of the diseased or damaged disc, and inserting one or more intervertebral implants into the resulting disc space. Introducing the intervertebral implant serves to restore the height between adjacent vertebrae

("disc height"), which reduces if not eliminates neural impingement commonly associated with a damaged or diseased disc.

Autologous bone grafts are widely used intervertebral implant for lumbar fusion. Autologous bone grafts are obtained by harvesting a section of bone from the iliac crest of the patient and thereafter implanting the article of autologous bone graft to effect fusion. While generally effective, the use of autologous bone grafts suffers certain drawbacks. A primary drawback is the morbidity associated with harvesting the autologous graft from the patient's iliac crest. Another related drawback is the added surgical time required to perform the bone-harvesting.

Allograft bone grafts have been employed with increased regularity in an effort to overcome the drawbacks of autologous bone grafts. Allograft bone grafts are harvested from cadaveric specimens, machined, and sterilized for implantation. While allograft bone grafts eliminate the morbidity associated with iliac crest bone harvesting, as well as decrease the overall surgical time, they still suffer certain drawbacks. A primary drawback is supply constraint, in that the tissue banks that process and produce allograft bone implants find it difficult to forecast allograft given the inherent challenges in forecasting the receipt of cadavers. Another related drawback is that it is difficult to manufacture the allograft with consistent shape and strength characteristics given the variation from cadaver to cadaver.

The present invention is directed at overcoming, or at least improving upon, the disadvantages of the prior art.

## SUMMARY OF THE INVENTION

The present invention overcomes the drawbacks of the prior art by providing a spinal fusion system and related methods involving the use of a spinal fusion implant of non-bone construction. The non-bone construction of the spinal fusion implant of the present invention overcomes the drawbacks of the prior art in that it is not supply limited (as with allograft) and does not require harvesting bone from the patient (as with autograft). The spinal fusion implant of the present invention may be comprised of any suitable non-bone composition, including but not limited to polymer compositions (e.g. poly-ether-ether-ketone (PEEK) and/or poly-ether-ketone-ketone (PEKK)), ceramic, metal or any combination of these materials.

The spinal fusion implant of the present invention may be provided in any number of suitable shapes and sizes depending upon the particular surgical procedure or need. The spinal fusion implant of the present invention may be dimensioned for use in the cervical and/or lumbar spine without departing from the scope of the present invention. For lumbar fusion, the spinal fusion implant of the present invention may be dimensioned, by way of example only, having a length ranging between 9 and 18 mm, a height ranging between 8 and 16 mm, and a width ranging between 25 and 45 mm. For cervical fusion, the spinal fusion implant of the present invention may be dimensioned, by way of example only, having a length about 11 mm, a height ranging between 5 and 12 mm, and a width about 14 mm.

The spinal fusion implant of the present invention may be provided with any number of additional features for promoting fusion, such as apertures extending between the upper and lower vertebral bodies which allow a boney bridge to form through the spinal fusion implant of the present invention. Such fusion-promoting apertures may be dimensioned to receive any number of suitable osteoinductive agents, including but not limited to bone morphogenic protein (BMP) and bio-resorbable polymers, including but not limited to any of a variety of poly (D,L-lactide-co-glycolide) based polymers, such as disclosed in U.S. Patent No. 6,013,853. The spinal fusion implant of the present invention is preferably equipped with one or more lateral openings which aid it provides in visualization at the time of implantation and at subsequent clinical evaluations.

The spinal fusion implant of the present invention may be provided with any number of suitable anti-migration features to prevent spinal fusion implant from migrating or moving from the disc space after implantation. Suitable anti-migration features may include, but are not necessarily limited to, angled teeth formed along the upper and/or lower surfaces of the spinal fusion implant and/or spike elements disposed partially within and partially outside the upper and/or lower surfaces of the spinal fusion implant. Such anti-migration features provide the additional benefit of increasing the overall surface area between the spinal fusion implant of the present invention and the adjacent vertebrae, which promotes overall bone fusion rates.

The spinal implant of the present invention may be introduced into a spinal target site through the use of any of a variety of suitable instruments having the capability to releasably engage the spinal implant. In a preferred embodiment, The insertion instrument permits quick,

direct, accurate placement of the spinal implant of the present invention into the intervertebral space. According to one embodiment, the insertion instrument includes a threaded engagement element dimensioned to threadably engage into a receiving aperture formed in the spinal fusion implant of the present invention. According to another embodiment, the insertion instrument includes an elongate fork member and a generally tubular lock member.

## BRIEF DESCRIPTION OF THE DRAWINGS

Many advantages of the present invention will be apparent to those skilled in the art with a reading of this specification in conjunction with the attached drawings, wherein like reference numerals are applied to like elements and wherein:

Figure 1 is a perspective view of a spinal fusion system of the present invention, including a lumbar fusion implant releasably coupled to an insertion instrument according to one embodiment of the present invention;

Figure 2 is a perspective view of the lumbar fusion implant of FIG. 1, illustrating (among other things) fusion apertures extending between top and bottom surfaces, a plurality of visualization apertures extending through the side walls, and a variety of anti-migration features according to one embodiment of the present invention;

Figure 3 is a top view of the lumbar fusion implant of FIG. 1, illustrating (among other things) the fusion apertures and the anti-migration features according to one embodiment of the present invention;

Figure 4 is a side view of the lumbar fusion implant of FIG. 1, illustrating (among other things) the visualization apertures, the anti-migration feature, and a receiving aperture for releasably engaging the insertion instrument of FIG. 1 according to one embodiment of the present invention;

Figure 5 is an end view of the lumbar fusion implant of FIG. 1, illustrating (among other things) the receiving aperture formed in the proximal end, the anti-migration features, and the visualization apertures according to one embodiment of the present invention;

Figure 6 is an enlarged side view of the lumbar fusion implant of FIG. 1 releasably coupled to the distal end of the insertion instrument of FIG. 1 according to one embodiment of the present invention;

Figure 7 is a perspective view of the insertion instrument of FIG. 1 in a fully assembled form according to one embodiment of the present invention;

Figure 8 is an enlarged perspective view of the distal region of the insertion instrument of FIG. 1 according to one embodiment of the present invention;

Figure 9 is a perspective exploded view of the insertion instrument of FIG. 1, illustrating the component parts of the insertion instrument according to one embodiment of the present invention;

Figure 10 is a perspective view of a spinal fusion system of the present invention, including a cervical fusion implant releasably coupled to a cervical insertion instrument according to one embodiment of the present invention;

Figure 11 is a perspective view of the proximal side of the cervical fusion implant of FIG. 10, illustrating (among other things) fusion apertures extending between top and bottom surfaces, a plurality of visualization apertures extending through the lateral walls, a plurality of receiving apertures, and a variety of anti-migration features according to one embodiment of the present invention;

Figure 12 is a perspective view of the distal side cervical fusion implant of FIG. 10, illustrating (among other things) the visualization apertures and anti-migration features;

Figure 13 is a top view of the cervical fusion implant of FIG. 10, illustrating (among other things) the fusion apertures and anti-migration features according to one embodiment of the present invention;

Figure 14 is a side view of the cervical fusion implant of FIG. 10, illustrating (among other things) the visualization apertures, the anti-migration features, and one of two receiving

apertures provided in the proximal end for releasably engaging the cervical insertion instrument of FIG. 10 according to one embodiment of the present invention;

Figure 15 is a perspective view of the cervical fusion implant of the present invention just prior to attachment to the cervical insertion device according to one embodiment of the present invention;

Figure 16 is a perspective view of the insertion instrument of FIG. 10 in a fully assembled form according to one embodiment of the present invention;

Figure 17 is a perspective exploded view of the insertion instrument of FIG. 10, illustrating the component parts of the insertion instrument according to one embodiment of the present invention.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

Illustrative embodiments of the invention are described below. In the interest of clarity, not all features of an actual implementation are described in this specification. It will of course be appreciated that in the development of any such actual embodiment, numerous implementation-specific decisions must be made to achieve the developers' specific goals, such as compliance with system-related and business-related constraints, which will vary from one implementation to another. Moreover, it will be appreciated that such a development effort might be complex and time-consuming, but would nevertheless be a routine undertaking for those of ordinary skill in the art having the benefit of this disclosure. The system to facilitate

bone fusion and related methods disclosed herein boasts a variety of inventive features and components that warrant patent protection, both individually and in combination.

FIG. 1 illustrates, by way of example only, a spinal fusion system 5 for performing spinal fusion between adjacent lumbar vertebrae, including an exemplary spinal fusion implant 10 and an exemplary insertion instrument 20 provided in accordance with the present invention. The spinal fusion implant 10 may be comprised of any suitable non-bone composition having suitable radiolucent characteristics, including but not limited to polymer compositions (e.g. poly-ether-ether-ketone (PEEK) and/or poly-ether-ketone-ketone (PEKK)) or any combination of PEEK and PEKK. The spinal fusion implant 10 of the present invention may be dimensioned, by way of example only, having a length ranging between 9 and 18 mm, a height ranging between 8 and 16 mm, and a width ranging between 25 and 45 mm.

As will be described in detail below, the insertion instrument 20 is configured to releasably maintain the exemplary spinal fusion implant 10 in the proper orientation during insertion into a lumbar disc space and thereafter release to deposit the implant 10. The exemplary spinal fusion implant 10, having been deposited in the disc space, facilitates spinal fusion over time by maintaining a restored disc height as natural bone growth occurs through and/or past the implant 10, resulting in the formation of a boney bridge extending between the adjacent vertebral bodies.

The spinal fusion implant 10 of the present invention may be provided with any number of additional features for promoting fusion, such as apertures 2 extending between the upper and

lower vertebral bodies which allow a boney bridge to form through the spinal fusion implant 10. According to a still further aspect of the present invention, this fusion may be facilitated or augmented by introducing or positioning various osteoinductive materials within the apertures 2 and/or adjacent to the spinal fusion implant 10. Such osteoinductive materials may be introduced before, during, or after the insertion of the exemplary spinal fusion implant 10, and may include (but are not necessarily limited to) autologous bone harvested from the patient receiving the spinal fusion implant 10, bone allograft, bone xenograft, any number of non-bone implants (e.g. ceramic, metallic, polymer), bone morphogenic protein, and bio-resorbable compositions, including but not limited to any of a variety of poly (D,L-lactide-co-glycolide) based polymers, such as disclosed in U.S. Patent No. 6,013,853.

The spinal fusion implant 10 of the present invention is preferably equipped with one or more visualization apertures 4 situated along the lateral sides, which aid in visualization at the time of implantation and at subsequent clinical evaluations. More specifically, based on the generally radiolucent nature of the implant 10, the visualization apertures 4 provide the ability to visualize the interior of the implant 10 during X-ray and/or other suitable imaging techniques which are undertaken from the side (or "lateral") perspective of the implant 10. If fusion has taken place, the visualization apertures 4 will provide a method for the surgeon to make follow up assessments as to the degree of fusion without any visual interference from the spinal fusion implant 10. Further, the visualization apertures 4 will provide an avenue for cellular migration to the exterior of the spinal fusion implant 10. Thus the spinal fusion implant 10 will serve as additional scaffolding for bone fusion on the exterior of the spinal fusion implant 10.

FIGS. 2-5 depict various embodiments of the exemplary spinal fusion implant 10. Some common attributes are shared among the various embodiments. More specifically, each spinal fusion implant 10 has a top surface 31, a bottom surface 33, lateral sides 14, a proximal side 22, and a distal side 16. In one embodiment, the top and bottom surfaces 31, 33 are generally parallel. It can be appreciated by one skilled in the art that although the surfaces 31, 33 are generally parallel to one another, they may be provided in any number of suitable shapes, including but not limited to concave and/or convex. When provided as convex shapes, the top and bottom surfaces 31, 33 may better match the natural contours of the vertebral end plates.

The exemplary spinal fusion implant 10 also preferably includes anti-migration features designed to increase the friction between the spinal fusion implant 10 and the adjacent contacting surfaces of the vertebral bodies so as to prohibit migration of the spinal fusion implant 10 after implantation. Such anti-migration features may include ridges 6 provided along the top surface 31 and/or bottom surface 33. Additional anti-migration features may also include a pair of spike elements 7 disposed within the proximal region of the implant 10, a pair of spike elements 8 disposed within the distal region of the implant 10, and a pair of spike elements 9 disposed within the central region of the implant 10. Spike elements 7, 8, 9 may extend from the top surface 31 and/or bottom surface 33 within the respective proximal, distal and central regions of the implant 10. The spike elements 7, 8, 9 may be manufactured from any of a variety of suitable materials, including but not limited to a metal, ceramic, and/or polymer material, preferably having radiopaque characteristics. The spike elements 7, 8, 9 may also take any of a variety of suitable shapes, including but not limited to a generally elongated element disposed within the implant 10 such that the ends thereof extend generally perpendicularly from the upper and/or

lower surfaces 31, 33 of the implant 10. As best appreciated in FIG. 4, the spike elements 7, 8, 9 may each comprise a unitary element extending through upper and lower surfaces 31, 33. Alternatively, each spike element 7, 8, 9 may comprise a shorter element which only extends through a single surface 31, 33 (that is, does not extend through the entire height of the implant 10).

The spinal fusion implant 10 has two large fusion apertures 2, separated by a medial support 50, extending in a vertical fashion through the top surface 31 and bottom surface 33. The fusion apertures 2 function primarily as an avenue for bony fusion between adjacent vertebrae. The fusion apertures 2 may be provided in any of a variety of suitable shapes, including but not limited to the generally rectangular shape best viewed in FIG. 3, or a generally circular, oblong and/or triangular shape or any combination thereof. The spinal fusion implant 10 may have a plurality of visualization apertures 4 which allow a clinician to make visual observations of the degree of bony fusion un-obscured by the lateral side 14 to facilitate further diagnosis and treatment. The visualization apertures 4 may be provided in any of a variety of suitable shapes, including but not limited to the generally oblong shape best viewed in FIG. 4, or a generally circular, rectangular and/or triangular shape or any combination thereof.

The spinal fusion implant 10 may be provided with any number of suitable features for engaging the insertion instrument 20 without departing from the scope of the present invention. As best viewed in FIGS. 4-6, one engagement mechanism involves providing a threaded receiving aperture 12 in the proximal sidewall 22 of the spinal fusion implant 10 of the present invention. The threaded receiving aperture 12 is dimensioned to threadably receive a threaded

connector 24 on the insertion instrument 20 (as will be described in greater detail below). The receiving aperture 12 extends inwardly from the proximal side 22 in a generally perpendicular fashion relative to the proximal side 22. Although shown as having a generally circular cross-section, it will be appreciated that the receiving aperture 12 may be provided having any number of suitable shapes or cross-sections, including but not limited to rectangular or triangular. In addition to the receiving aperture 12, the spinal fusion implant 10 is preferably equipped with a pair of grooved purchase regions 60, 61 extending generally horizontally from either side of the receiving aperture 12. The grooved purchase regions 60, 61 are dimensioned to receive corresponding distal head slots 62, 63 on the insertion instrument 20 (as will be described in greater detail below), which collectively provide an enhanced engagement between the implant 10 and instrument 20.

FIGS. 6-9 detail the exemplary insertion instrument 20 according to one embodiment of the invention. The exemplary insertion instrument 20 includes an elongate tubular element 28 and an inserter shaft 44. The elongate tubular element 28 is constructed with a distal head 26 at its distal end, a distal head slot 62 at it s distal end, a thumbwheel housing 38 at its proximal end and a handle 42 at its proximal end. The elongate tubular element 28 is generally cylindrical and of a length sufficient to allow the device to span from the surgical target site to a location sufficiently outside the patient's body so the handle 42 and thumbwheel housing 38 can be easily accessed by a clinician or a complimentary controlling device.

The elongate tubular element 28 is dimensioned to receive a spring 46 and the proximal end of the inserter shaft 44 into the inner bore 64 of the elongate tubular element 28. The inserter

shaft 44 is dimensioned such that the threaded connector 24 at the distal end of the inserter shaft 44 just protrudes past the distal head slots 62, 63 to allow engagement with the receiving aperture 12 of the spinal fusion implant 10. It should be appreciated by one skilled in the art that such a construction allows the inserter shaft 44 to be able to rotate freely within the elongate tubular element 28 while stabilized by a spring 46 to reduce any slidable play in the insertion instrument 20.

The handle 42 is generally disposed at the proximal end of the insertion instrument 20. The handle 42 is fixed to the thumbwheel housing 38 allowing easy handling by the clinician. Because the handle 42 is fixed the clinician has easy access to the thumbwheel 34 and can stably turn the thumbwheel 34 relative to the thumbwheel housing 38. Additionally, the relative orientation of the thumbwheel housing 38 to the handle 42 orients the clinician with respect to the distal head 26 and distal head slot 62. By way of example, the thumbwheel housing 38 holds a thumbwheel 34, a set screw 32, and a spacer 36. The inserter shaft 44 is attached to the thumbwheel 34 and is freely rotatable with low friction due to the spacer 36. One skilled in the art can appreciate myriad methods of assembling a housing similar to the above described.

FIG. 6 details the distal head slot of the exemplary insertion instrument 20 coupled to the spinal fusion implant 10 through the purchase regions 60, 61. The distal head slots 62, 63 are dimensioned to fit slidably into the purchase regions 60, 61 with low friction to allow accurate engagement of the threaded connector 24 to the receiving aperture 12 of the spinal fusion implant 10. In the presented embodiment, the outer dimension of the threaded connector 24 is smaller than the largest outer dimension of the distal head 26 and elongate tubular element 28.

Alternatively, other methods of creating a gripping surface are contemplated including but not limited to knurling or facets.

In order to use the system to perform a spinal fusion procedure, the clinician must first designate the appropriate implant size. After the spinal fusion implant 10 is chosen, the distal head slots 62, 63 of the inserter shaft 44 are inserted into the purchase regions 60, 61 of the spinal fusion implant 10. At that time the spinal fusion implant 10 and insertion instrument 20 are slidably engaged with one another. Before the clinician can manipulate the combined spinal fusion implant 10 and insertion instrument 20, they must be releasably secured together. In order to secure the spinal fusion implant 10 onto the threaded connector 24 of the inserter instrument 20, the clinician employs the thumbwheel 34 to rotate the inserter shaft 44 and threaded connector 24. The rotation of the threaded connector 24 will releasably engage the receiving aperture of the spinal fusion implant 10 and stabilize the insertion instrument 20 relative to the spinal fusion implant 10.

A clinician can utilize the secured system in either an open or minimally invasive spinal fusion procedure. In either type of procedure, a working channel would be created in a patient that reaches the targeted spinal level. After the creation of that channel, the intervertebral space would be prepared. After preparation the secured device is used to place a spinal fusion implant 10 into the prepared intervertebral space. Once the implant 10 is inserted into the prepared space, the implant 10 is released from the insertion instrument 20 by rotating the thumbwheel 34 to disengage the threaded connector 24 from the receiving aperture 12. That motion removes the compressive force on the purchase regions 60, 61 between the distal head 26 and the distal head

slots 62, 63 of the spinal fusion implant 10 and allows the insertion instrument to be slidably removed from the implant 10. After the threaded connector 24 is disengaged from the implant 10, the insertion instrument 20 is removed from the working channel and the channel is closed. As previously mentioned, additional materials may be included in the procedure before, during or after the insertion of the spinal fusion implant 10 to aid the natural fusion of the targeted spinal level.

FIG. 10 illustrates a spinal fusion system 105 for performing spinal fusion between adjacent cervical vertebrae, including an exemplary spinal fusion implant 110 and an exemplary cervical insertion instrument 120 provided in accordance with the present invention. The spinal fusion implant 110 may comprise of any suitable non-bone composition having suitable radiolucent characteristics, including but not limited to polymer compositions (e.g. poly-ether-ether-ketone (PEEK) and/or poly-ether-ketone-ketone (PEKK)) or any combination of PEEK and PEKK. The spinal fusion implant 110 may be provided in any number of suitable sizes, such as, by way of example only, a length ranging between 11 to 14 mm, a height ranging between 5 and 12 mm, and a width ranging from 14 and 16 mm.

As will be described in detail below, the cervical insertion instrument 120 is configured to releasably maintain the exemplary cervical fusion implant 110 in the proper orientation for insertion. The cervical fusion implant 110 may be simultaneously introduced into a disc space while locked within the cervical insertion instrument 120 and thereafter released. The exemplary cervical fusion implant 110, having been deposited in the disc space, effects spinal

fusion over time as the natural bone healing process integrates and binds the implant with the adjacent vertebral bodies. This fusion may be facilitated or augmented by introducing or positioning various materials in a space created within or adjacent to the cervical fusion implant 110. Those materials may be introduced before, during, or after the insertion of the exemplary cervical fusion implant 110. The additional material may include bone autograft harvested from the patient receiving the spinal fusion implant 10, one or more additional bone allograft, bio-resorbables or xenograft implants, any number of non-bone implants, and any number of fusion promoting compounds such as bone morphogenic protein.

FIGS. 11-14 depict various embodiments of the exemplary cervical fusion implant 110. Some common attributes are shared among the various embodiments. More specifically, each cervical fusion implant 110 has a top surface 31, a bottom surface 33, lateral sides 14, a proximal side 22, and a distal side 16. In one embodiment, the top and bottom surfaces 31, 33 are generally parallel. It can be appreciated by one skilled in the art that although the surfaces are generally parallel, that the top 31 and bottom 33 surfaces may be angled with respect to one another to match the natural curve of the spine (i.e. lordosis or kyphosis). By way of example, implants for the cervical or lumbar regions of the spine will have anterior height greater than the posterior height to match the natural lordosis in those regions. Inversely, the implants designed for implantation into the thoracic region will be manufactured with a posterior height greater than the anterior height to match the natural kyophosis in that region. Additionally, the angled surface can aid in overall fit within the vertebral disc space.

The cervical fusion implant 110 preferably includes two receiving apertures 12 which are centrally aligned on the proximal side 22. The receiving apertures 12 extend inwardly from the proximal side 22 in a generally perpendicular fashion relative to the proximal side 22. Although shown as having a generally circular cross-section, it will be appreciated that the receiving aperture 12 may be provided having any number of suitable shapes or cross-sections, including but not limited to rectangular or triangular.

The exemplary cervical fusion implant 110 also preferably includes anti-migration features such as anti-migration teeth 6 along the top surface 31 and bottom surface 33. Additional anti-migration features may include a plurality of proximal anti-migration spikes 68 and/or distal anti-migration spikes 70 integrated vertically through the cervical fusion implant 110. The anti-migration features increase the friction between the cervical fusion implant 110 and the adjacent contacting surfaces of the vertebral bodies. That friction prohibits migration of the cervical fusion implant 110 during the propagation of natural bony fusion. It should be appreciated by one skilled in the art that such anti-migration teeth 6 can be oriented in a particular direction which will stabilize the cervical fusion implant 110 in several degrees of rotation during placement.

The cervical fusion implant 110 has one large fusion aperture 2, extending in a vertical fashion through the top surface 31 and bottom surface 33 which will function primarily as the avenue for bony fusion between adjacent vertebrae. The cervical fusion implant 110 may have a plurality of visualization apertures 4 which can also serve as an avenue of bony fusion on the lateral sides 14 via cell migration or additional adjuvants. The visualization apertures 4 serve an

additional function of allowing a clinician to make visual observations of the degree of bony fusion un-obscured by the lateral side 14 to facilitate further diagnosis and treatment.

FIG. 15 illustrates, by way of example, the orientation of the cervical fusion implant 110 prior to attachment to the cervical insertion instrument 120 by a clinician. One skilled in the art would appreciate that although the current embodiment shows a slidable engagement, various other methods of engagement are contemplated; such as, threadable or hooking features.

FIGS. 16-17 detail the tubular lock member 21 of the exemplary cervical inserter instrument 110. The tubular lock member 21 includes a central bore 25 dimensioned to receive the proximal end of the elongate fork member 11 therein. The internal dimension of the central bore 25 is smaller than the largest freestanding outer dimension of the taper feature 19. As a result, the portion of the elongate fork member 11 that may be received by the central bore 25 of the tubular lock member 21 is limited by interference between the distal end of the tubular lock member 21 and the taper feature 19 of the elongate fork member 11. In the present embodiment, the outer dimension of the threaded feature 13 of the elongate fork member 11 is smaller than the largest outer dimension of the taper feature 19 on the elongate fork member 11. A thread feature 23 (not shown) at the proximal end of the tubular lock member 21 is situated inside the central bore 25. The thread feature 23 matches the thread feature 13 on the elongate fork member 11 so that they can be threadably attached to one another. To ease the rotation of the tubular lock member 21 by hand, two semi-circular wings 27 may be provided protruding laterally outward from either side of the tubular lock member 21. Alternatively, other methods of creating a gripping surface are contemplated including but not limited to knurling or facets.

A clinician can utilize the secured system in either an open or minimally invasive spinal fusion procedure. In either type of procedure, a working channel would be created in a patient that reaches the targeted spinal level. After the creation of that channel, the intervertebral space would be prepared. After preparation the secured device is used to place a cervical fusion implant 110 into the prepared intervertebral space. Once the cervical fusion implant 110 is inserted into the prepared space, the implant 110 is released from the cervical insertion instrument 120 by retracting the tubular lock member 21 from the elongate fork member 11 by rotating the tubular lock member 21 with respect to the elongate fork member 11 in the opposite direction from that used to initially secure the implant 110. That motion removes the compressive force on the purchase region 39 between the apertures 12 of the cervical fusion implant 110 and allows the engagement features 17 to be slidably removed from the apertures 12. After the engagement features 17 are disengaged from the cervical fusion implant 110, the cervical inserter instrument 120 is removed from the working channel and the channel is closed. As previously mentioned, additional materials may be included in the procedure before, during or after the insertion of the cervical fusion implant 110 to aid the natural fusion of the targeted spinal level.

In order to use the system to perform a spinal fusion procedure, the clinician must first designate the appropriate implant size. After the cervical fusion implant 110 is chosen, the engagement features 17 of the elongate fork member 11 are inserted into the apertures 12 on the implant 110. At that time the cervical fusion implant 110 and elongate fork member 11 are

slidably engaged with one another. Before the clinician can manipulate the combined cervical fusion implant 110 and elongated fork member 11, they must be releasably secured together. In order to secure the cervical fusion implant 110 onto the elongate fork member 11, the clinician would next employ the tubular lock member 21. The clinician would insert the proximal end of the elongate fork member 11 into the central bore 25 of the tubular lock member 21 at its distal end. The tubular lock member 21 would then be advanced over the elongate fork member 11 until the thread feature 13 of that member and the thread feature 23 of the tubular lock member 21 become engaged.

Once engaged, advancement of the tubular lock member requires rotation of the tubular lock member 21 with respect to the elongate fork member 11. Preferably, after only a small amount of engagement of the thread features the distal end of the tubular lock member 21 would contact the taper feature 19 of the elongate fork member 11. The tubular lock member 21 would be advanced creating greater interference as the distal end approaches the distal end of the taper feature 19 which has the larger outer dimension. The increasing interference would laterally displace the clamping arms 15 of the elongate fork member 11 towards each other. Since the engagement features 17 of the elongate fork member 11 were initially inserted into the apertures 12 of the exemplary cervical fusion implant 110, the displacement of the clamping arms 15 would create a compressive force on the purchase region 39 separating the apertures 12 of the exemplary cervical fusion implant 110. That compressive force allows a clinician to manipulate the system without the exemplary cervical fusion implant 110 becoming disengaged from the cervical inserter instrument 120.

While the invention is susceptible to various modifications and alternative forms, specific embodiments thereof have been shown by way of example in the drawings and are herein described in detail. It should be understood, however, that the description herein of specific embodiments is not intended to limit the invention to the particular forms disclosed, but on the contrary, the invention is to cover all modifications, equivalents, and alternatives falling within the spirit and scope of the invention as defined by the appended claims.

For example, while described herein primarily with reference to the lumbar and cervical spinal surgery, it is to be readily appreciated that the spinal fusion implants of the present invention may be suitable for accomplishing fusion in the thoracic spine without departing from the scope of the present invention. Moreover, it is to be readily appreciated that the insertion tools described herein may be employed with implants of any number of suitable constructions, including but not limited to metal, ceramic, plastic or composite.

## CLAIMS

What is claimed is:

1. A spinal fusion system comprising;

an interbody spinal fusion implant, including at least in part a top surface for contacting a first vertebral endplate, a bottom surface for contacting a second vertebral endplate, at least one fusion aperture extending between the top surface and the bottom surface to allow bony fusion between the first vertebral end plate and the second vertebral endplate, a distal side, a proximal side having at least one receiving aperture for engaging an insertion instrument, and two lateral sides; and

an insertion instrument, including a generally elongated tubular member having a distal opening and a proximal opening, a generally elongated shaft member having a distal end and a proximal end and being generally dimensioned to be inserted through the elongated tubular member such that the distal end extends beyond the distal opening and the proximal end extends beyond the proximal opening, and the distal end including an implant engagement feature; and

a means for releasably securing the engagement feature in one or more receiving apertures of the implant.

2. The spinal fusion system of Claim 1, wherein the implant is substantially radiolucent and composed of non-bone material.

3. The spinal fusion system of Claim 1, wherein the implant includes at least one visualization aperture extending through at least one of the lateral sides.

4. The spinal fusion system of Claim 1, wherein the top and bottom surfaces of the implant are at least one of generally parallel with respect to each other, and generally angled with respect to each other to better match the natural curvature of the spine.

5. The spinal fusion system of Claim 1, wherein the implant further includes anti-migration features to increase friction between the implant and vertebral endplate minimizing unwanted movement, the anti-migration features including at least one of ridges formed in the top surface, ridges formed in the bottom surface, one or more spike elements protruding from the top surface, one or more spike elements protruding from the bottom surface, and one or more spike elements protruding from the top and bottom surface.

6. The spinal fusion system of Claim 1, wherein the receiving aperture of the implant comprises a singular threaded aperture.

7. The spinal fusion system of Claim 6, wherein the insertion instrument engagement feature comprises a threaded connector dimensioned to engage the threaded receiving aperture of the implant.

8. The spinal fusion system of Claim 7, wherein the means for releasably securing the threaded connector to the threaded receiving aperture of the implant includes, at least in part, a rotation device attached near the proximal end of the generally elongated shaft member such that turning the rotation device causes the generally elongated shaft member to turn, and wherein turning the elongated shaft member in relation to the implant threadably engages the threaded connector and threaded receiving aperture, releasably securing the implant to the insertion instrument.

9. The spinal fusion system of Claim 8, wherein the proximal end of the implant further includes at least one purchase region adjacent to the receiving aperture and wherein the distal opening of the generally elongated tubular member is situated in a distal head, the distal head including at least one distal head slot, adjacent to the distal opening, for engaging the purchase region on the implant and enhancing the engagement between the implant and the insertion instrument.

10. The spinal fusion system of Claim 1, wherein the implant includes two receiving apertures positioned adjacent to each other on the proximal side of the implant.

11. The spinal fusion system of Claim 10, wherein the generally elongated tubular member comprises a tubular lock member, the generally elongated shaft member comprises an elongated fork member, and the engagement feature comprises two prongs extending from a pair of clamping arms and dimensioned to engage the two receiving apertures of the implant.

12. The spinal fusion system of Claim 11, wherein the elongate fork member includes a taper feature situated between the clamping arms and the proximal end of the elongate fork member and the tubular lock member includes a central bore having an internal dimension smaller than the largest outer dimension of the taper feature.

13. The spinal fusion system of Claim 12, wherein the means for releasably securing engagement features in the receiving apertures of the implant include, at least in part, a threaded region situated near the proximal end of the elongated fork member, and a complimentary threaded region near the proximal opening of the tubular lock member within the central bore, such that inserting the proximal end of the elongated fork member into the distal end of the tubular lock member will cause the complimentary threaded regions to meet as the tapered region enters the central bore at the distal opening, wherein rotating the tubular lock member in relation to the elongated fork member engages the threaded regions, advancing the central bore over the tapered region and laterally displacing the clamping arms and engagement prongs to create a compressive force on the interior surface of the receiving aperture and releasably securing the implant to the insertion device.

14. A method of spinal fusion, comprising the steps of:

(a) releasably securing a spinal fusion implant to an insertion instrument, the spinal fusion implant including a top surface for contacting a first vertebral endplate, a bottom surface for contacting a second vertebral endplate, at least one fusion aperture

extending between the top surface and the bottom surface to allow bony fusion between the first vertebral end plate and the second vertebral endplate, a distal side, a proximal side having at least one receiving aperture for engaging an insertion instrument, and two lateral sides, and the insertion instrument including a generally elongated tubular member having a distal opening and a proximal opening, a generally elongated shaft member having a distal end and a proximal end and being generally dimensioned to be inserted through the elongated tubular member such that the distal end extends beyond the distal opening and the proximal end extends beyond the proximal opening, and the distal end including an implant engagement feature

(b) introducing the spinal fusion implant to a prepared space between adjacent vertebral end plates and properly positioning the implant within the space;

(c) releasing the insertion instrument from the properly positioned implant and withdrawing the insertion instrument from the surgical corridor.

15. The spinal fusion method of Claim 14, wherein the implant is substantially radiolucent and composed of non-bone material

16. The spinal fusion method of Claim 14, wherein the implant includes at least one visualization aperture extending through at least one of the lateral sides.

17. The spinal fusion method of Claim 14, wherein the top and bottom surfaces of the implant are at least one of generally parallel with respect to each other, and generally angled with respect to each other to better match the natural curvature of the spine.

18. The spinal fusion method of Claim 14, wherein the implant further includes anti-migration features to increase friction between the implant and vertebral endplate minimizing unwanted movement, the anti-migration features including at least one of ridges formed in the top surface, ridges formed in the bottom surface, one or more spike elements protruding from the top surface, one or more spike elements protruding from the bottom surface, and one or more spike elements protruding from the top and bottom surface.

19. The spinal fusion method of Claim 14, wherein the receiving aperture of the implant comprises a singular threaded aperture.

20. The spinal fusion method of Claim 19, wherein the insertion instrument engagement feature comprises a threaded connector dimensioned to engage the threaded receiving aperture of the implant.

21. The spinal fusion method of Claim 20, wherein the means for releasably securing the threaded connector to the threaded receiving aperture of the implant includes, at least in part, a rotation device attached near the proximal end of the generally elongated shaft member such that turning the rotation device causes the generally elongated shaft member to turn, and wherein turning the elongated shaft member in relation to the implant threadably engages the threaded connector and threaded receiving aperture, releasably securing the implant to the insertion instrument.

22. The spinal fusion method of Claim 21, wherein the proximal end of the implant further includes at least one purchase region adjacent to the receiving aperture and wherein the distal opening of the generally elongated tubular member is situated in a distal head, the distal head including at least one distal head slot, adjacent to the distal opening, for engaging the purchase region on the implant and enhancing the engagement between the implant and the insertion instrument.

23. The spinal fusion method of Claim 14, wherein the implant includes two receiving apertures positioned adjacent to each other on the proximal side of the implant.

24. The spinal fusion method of Claim 23, wherein the generally elongated tubular member comprises a tubular lock member, the generally elongated shaft member comprises an elongated fork member, and the engagement feature comprises two prongs extending from a pair of clamping arms and dimensioned to engage the two receiving apertures of the implant.

25. The spinal fusion method of Claim 24, wherein the elongate fork member includes a taper feature situated between the clamping arms and the proximal end of the elongate fork member and the tubular lock member includes a central bore having an internal dimension smaller than the largest outer dimension of the taper feature.

26. The spinal fusion method of Claim 25, wherein the means for releasably securing the engagement features in the receiving apertures of the implant include, at least in part, a threaded region situated near the proximal end of the elongated fork member, and a complimentary threaded region near the proximal opening of the tubular lock member within the central bore, such that inserting the proximal end of the elongated fork member into the distal end of the tubular lock member will cause the complimentary threaded regions to meet as the tapered region enters the central bore at the distal opening, wherein rotating the tubular lock member in relation to the elongated fork member engages the threaded regions, advancing the central bore over the tapered region and laterally displacing the clamping arms and engagement prongs to create a compressive force on the interior surface of the receiving aperture and releasably securing the implant to the insertion device.

## ABSTRACT

A system and method for spinal fusion comprising a spinal fusion implant of non-bone construction releasably coupled to an insertion instrument dimensioned to introduce the spinal fusion implant into any of a variety of spinal target sites.


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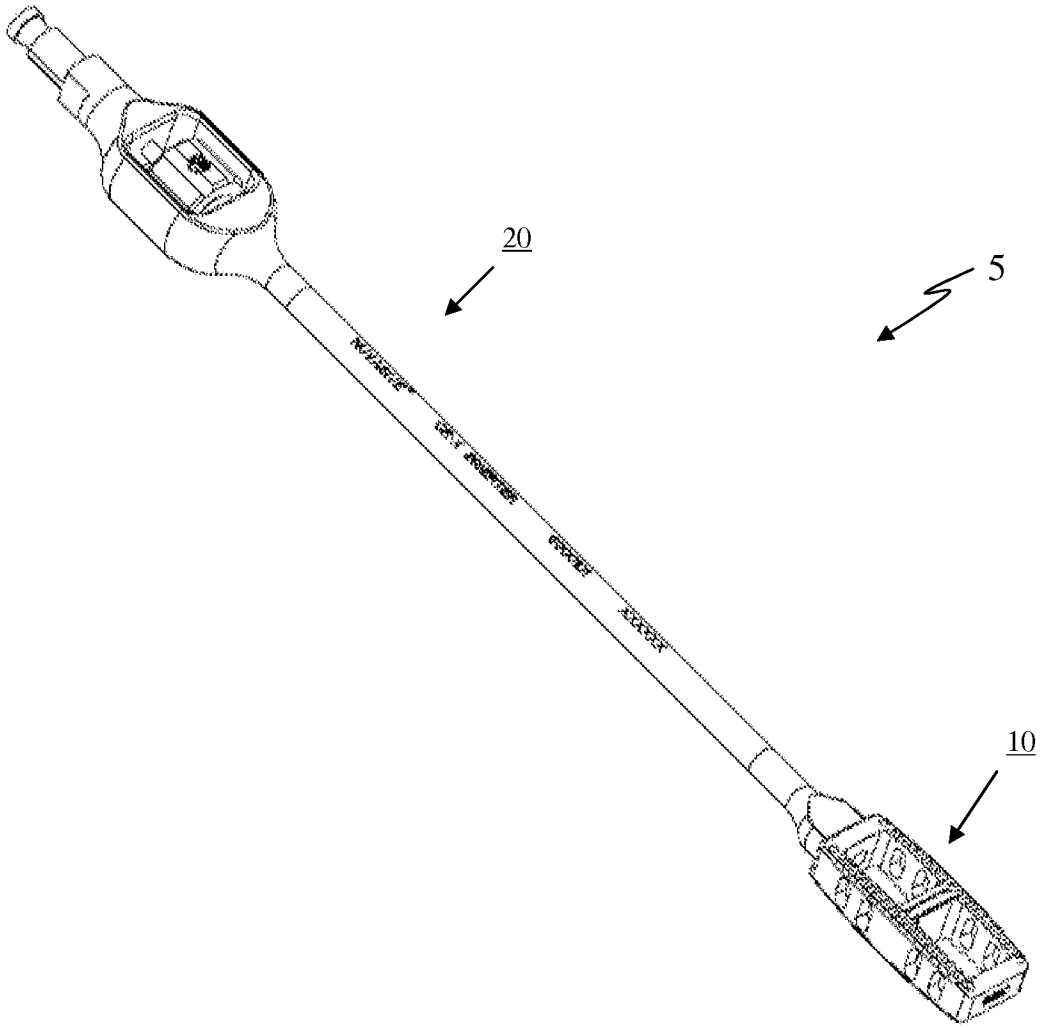


**FIG. 1**

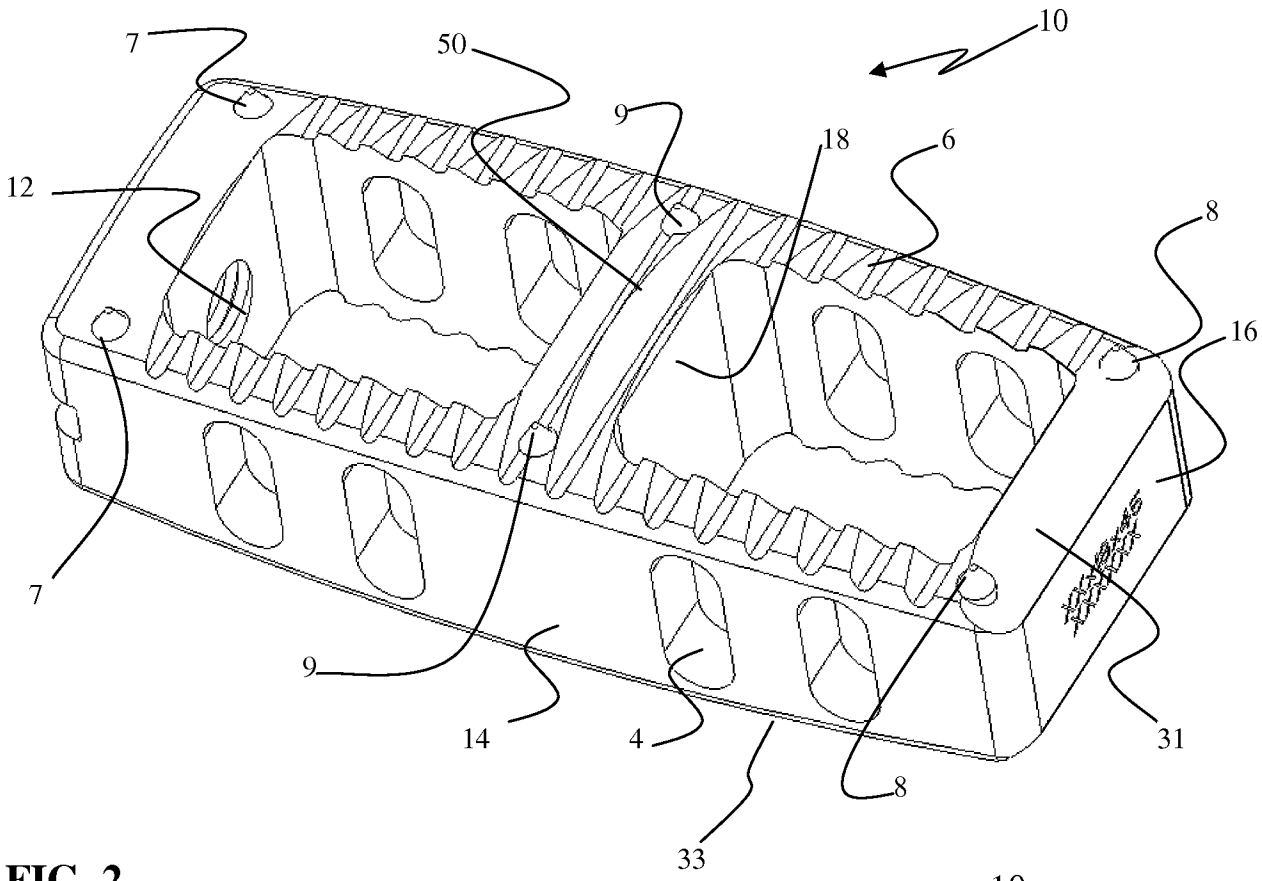


**FIG. 2**

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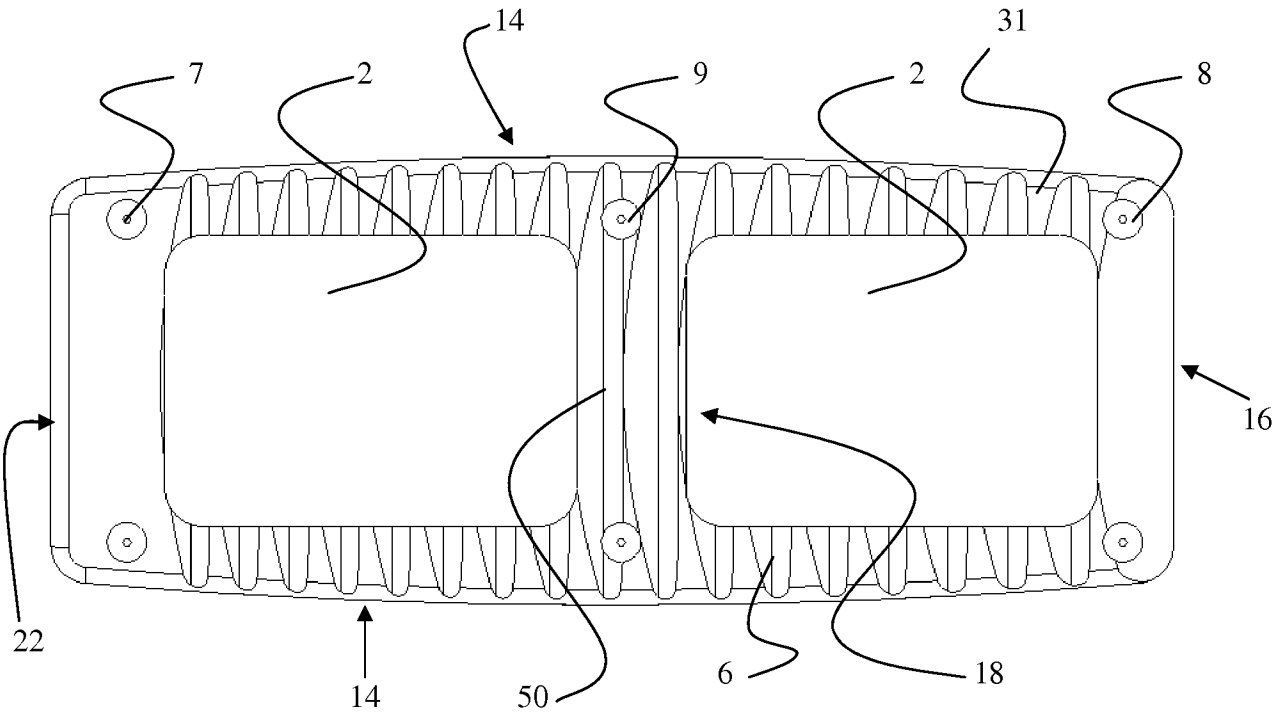


**FIG. 3** 10

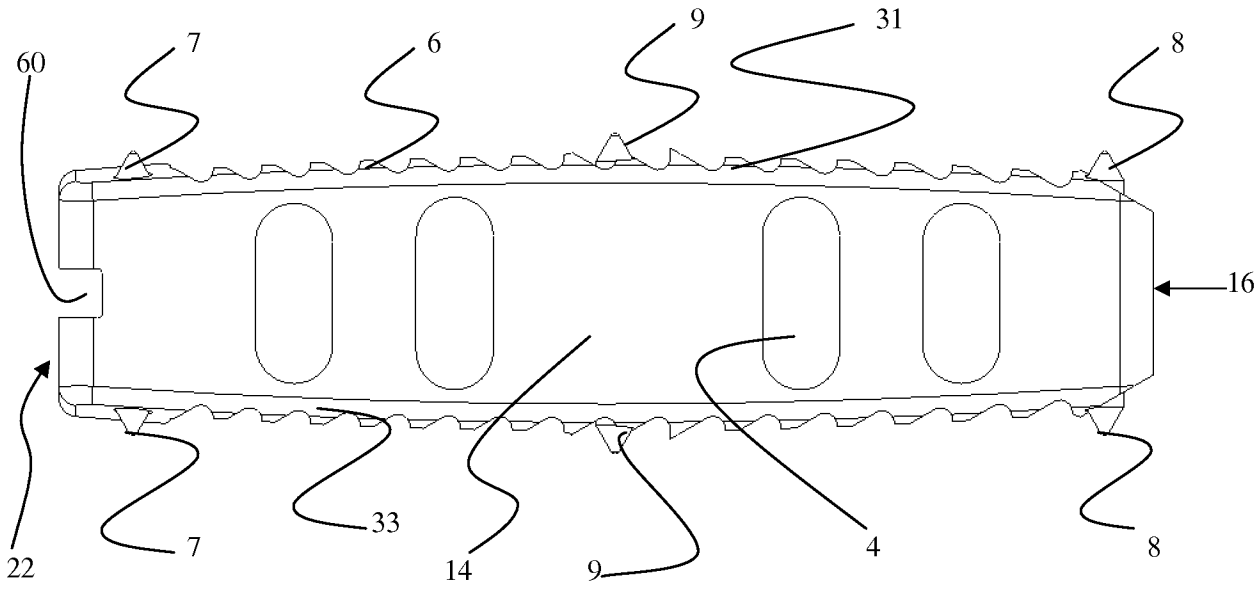


**FIG. 4** 10

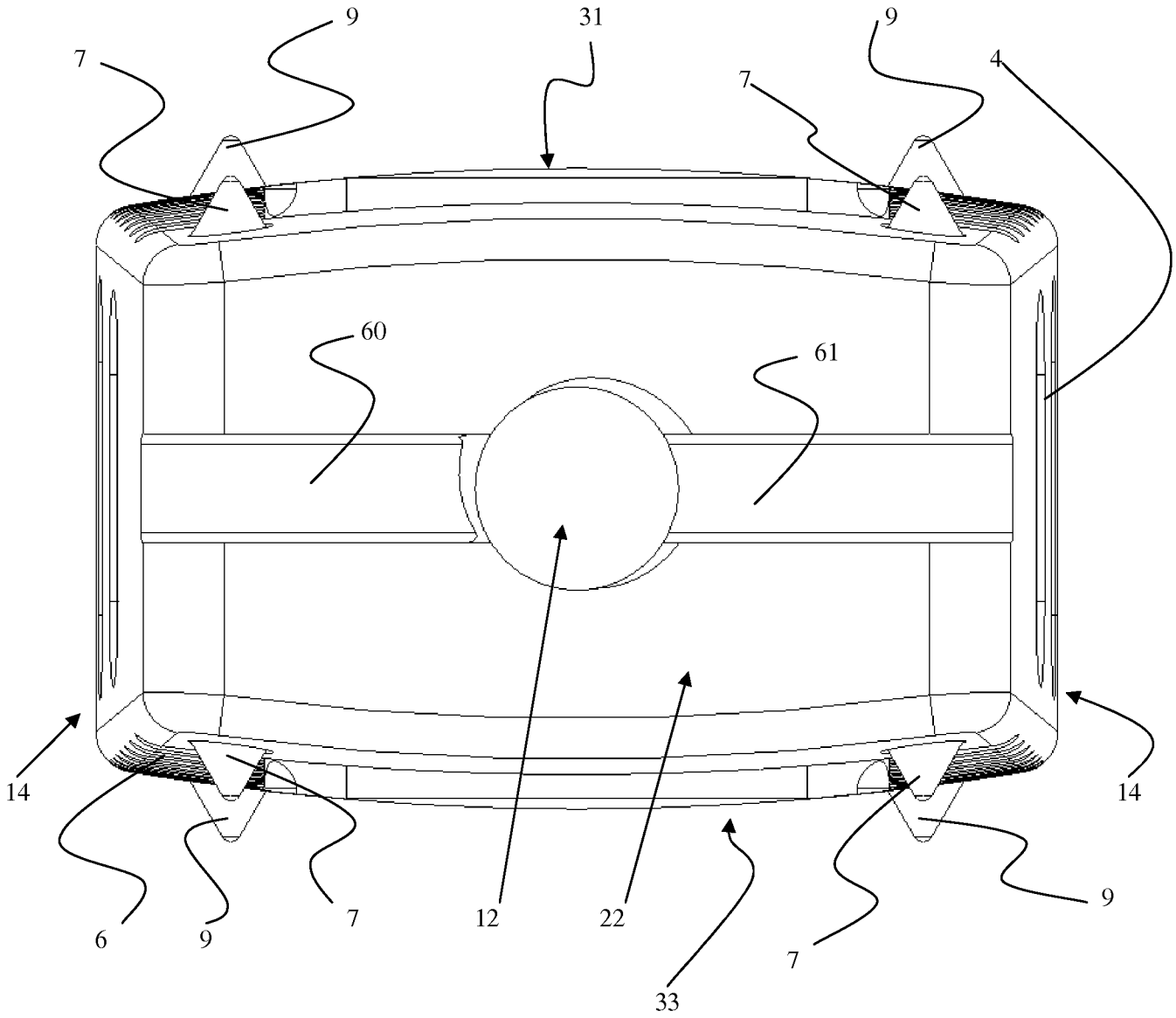


**FIG. 5**

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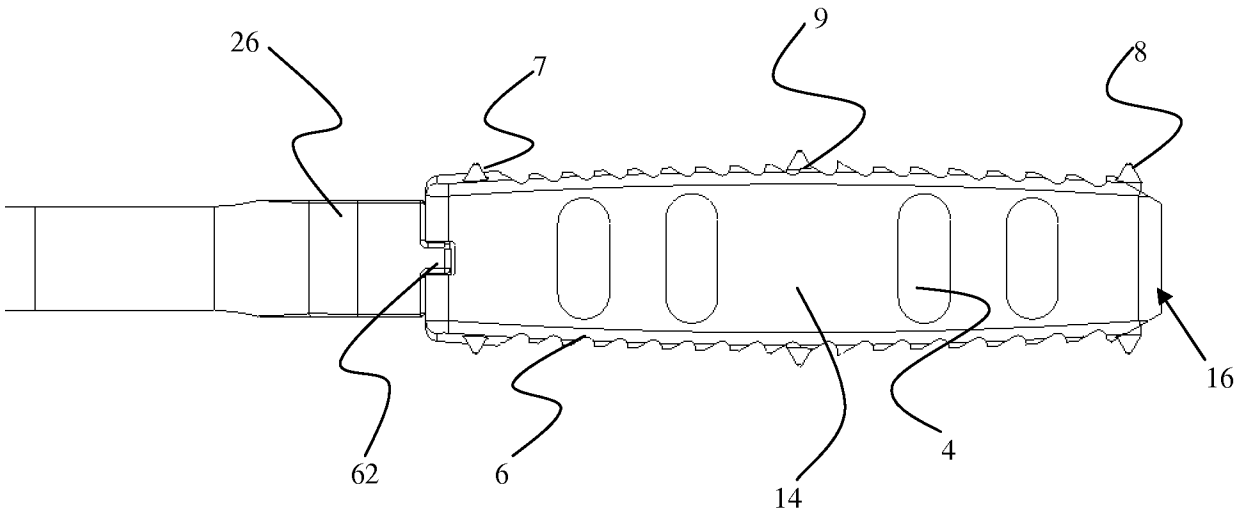



**FIG. 6**

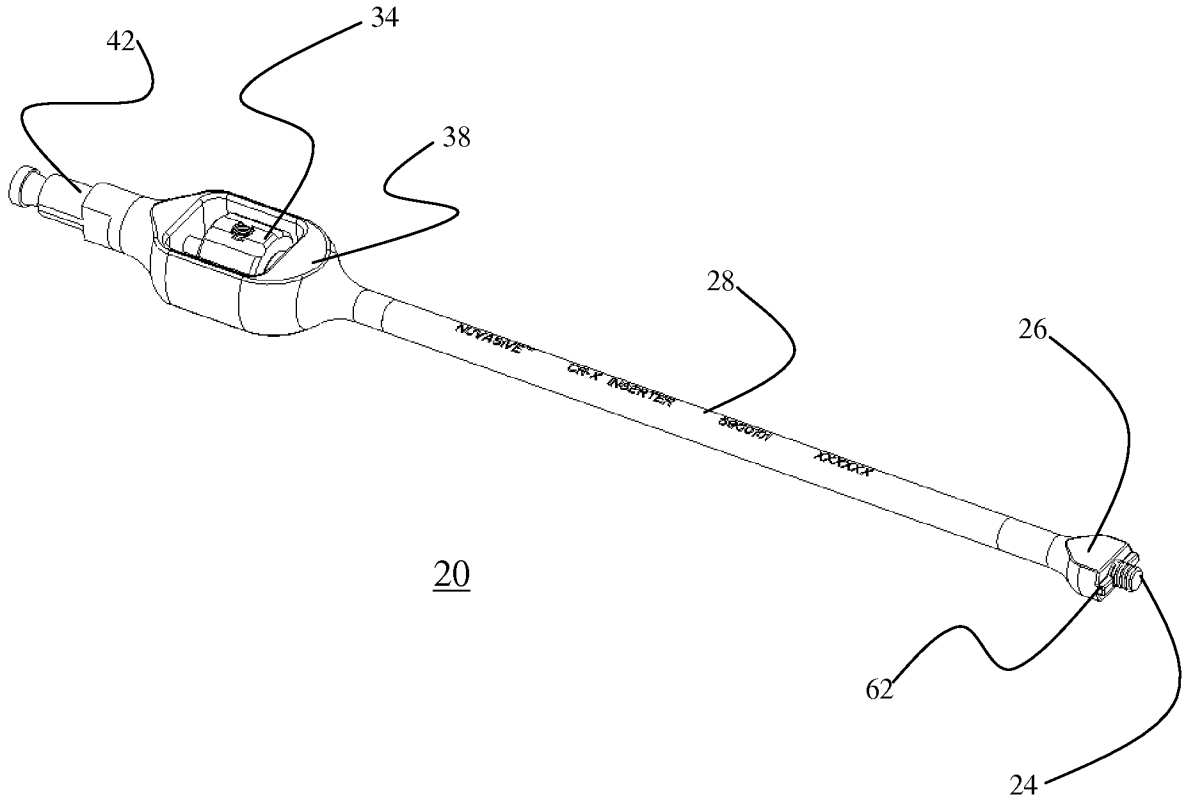



**FIG. 7**

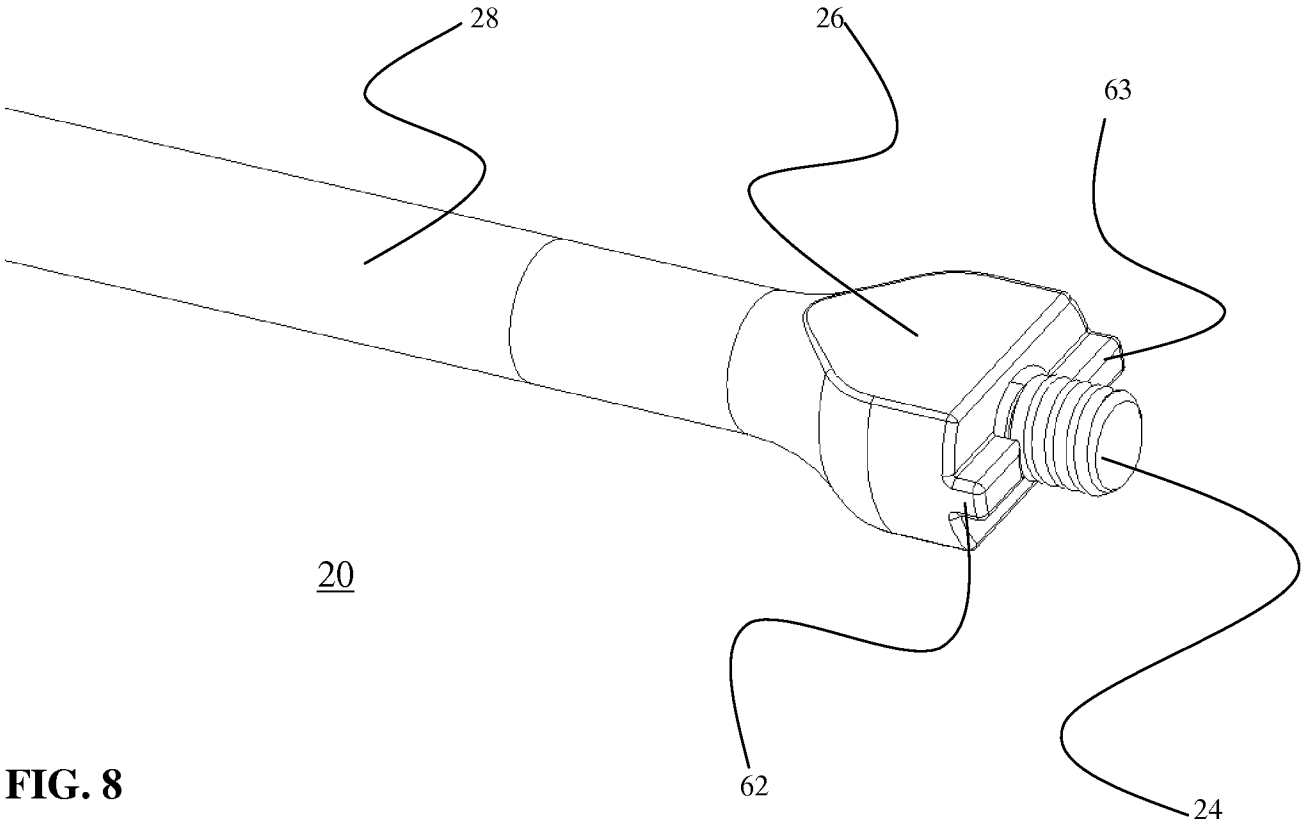



**FIG. 8**

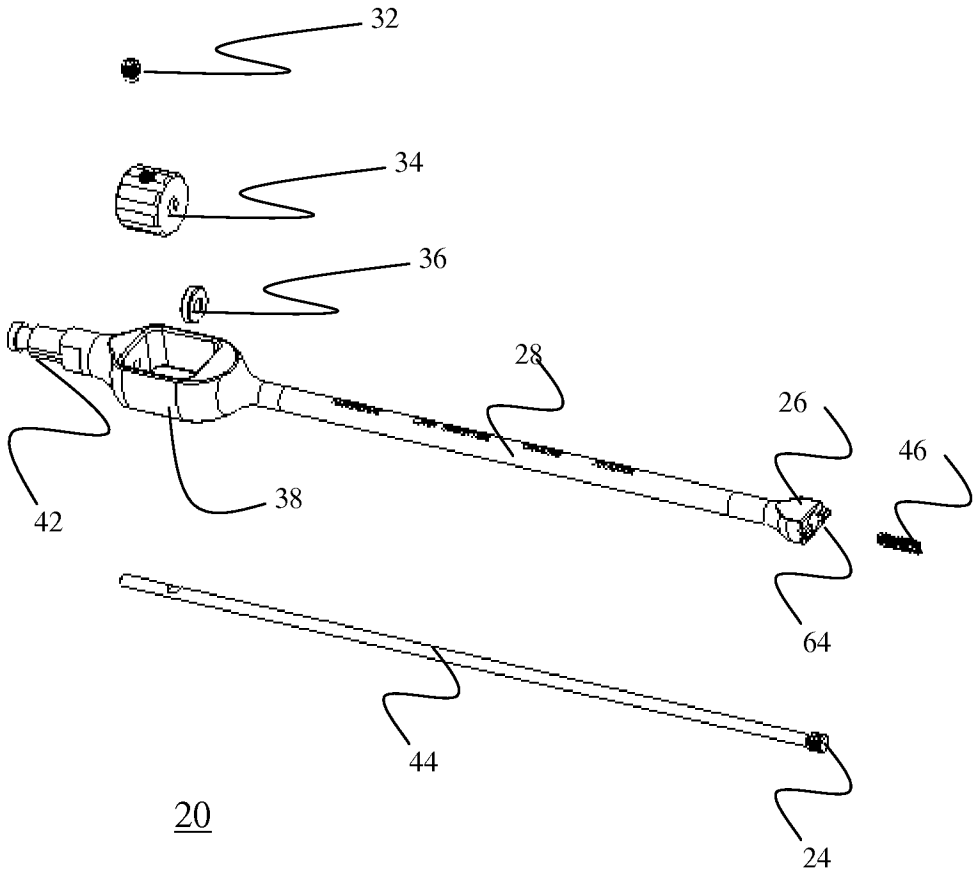



**FIG. 9**

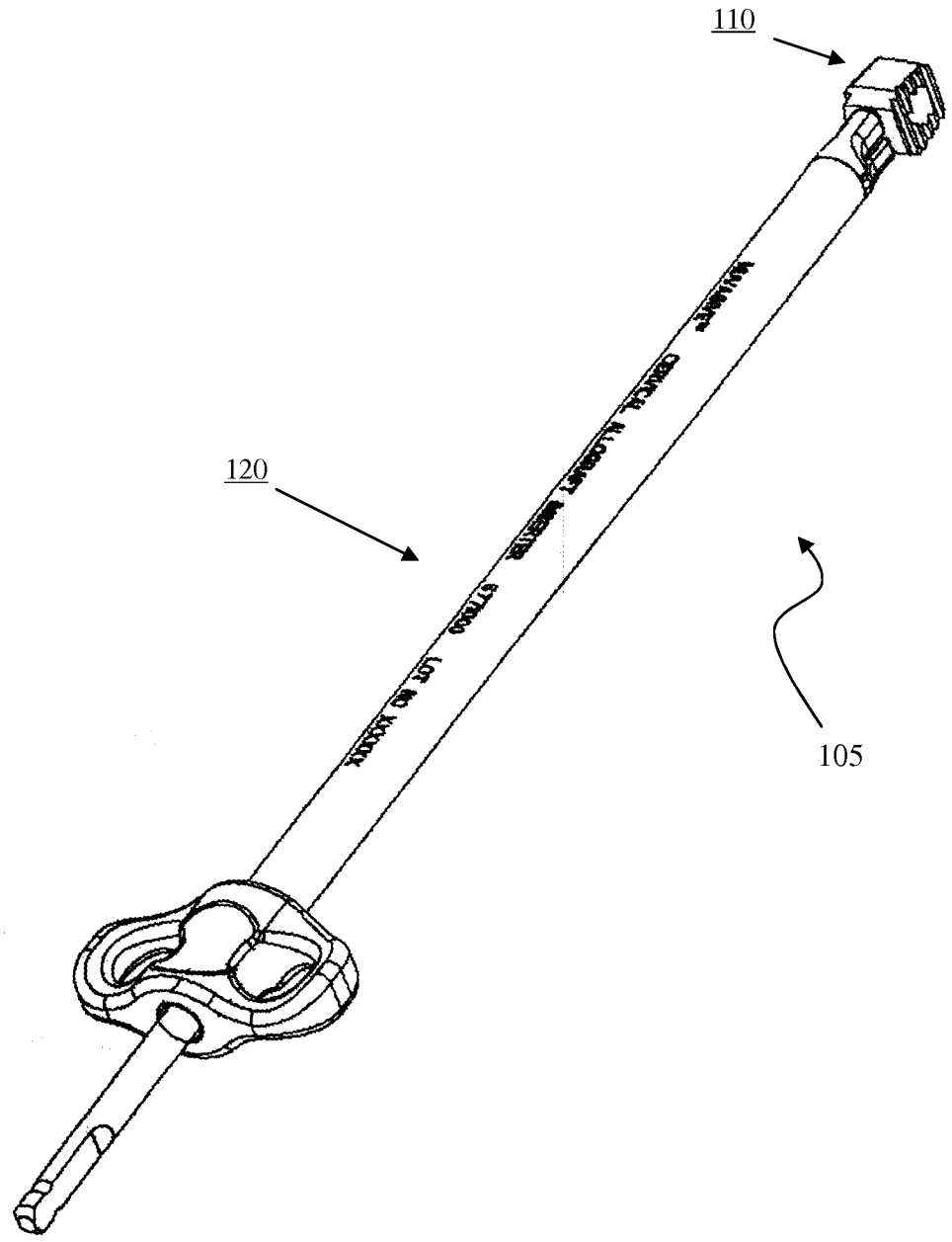



**FIG. 10**

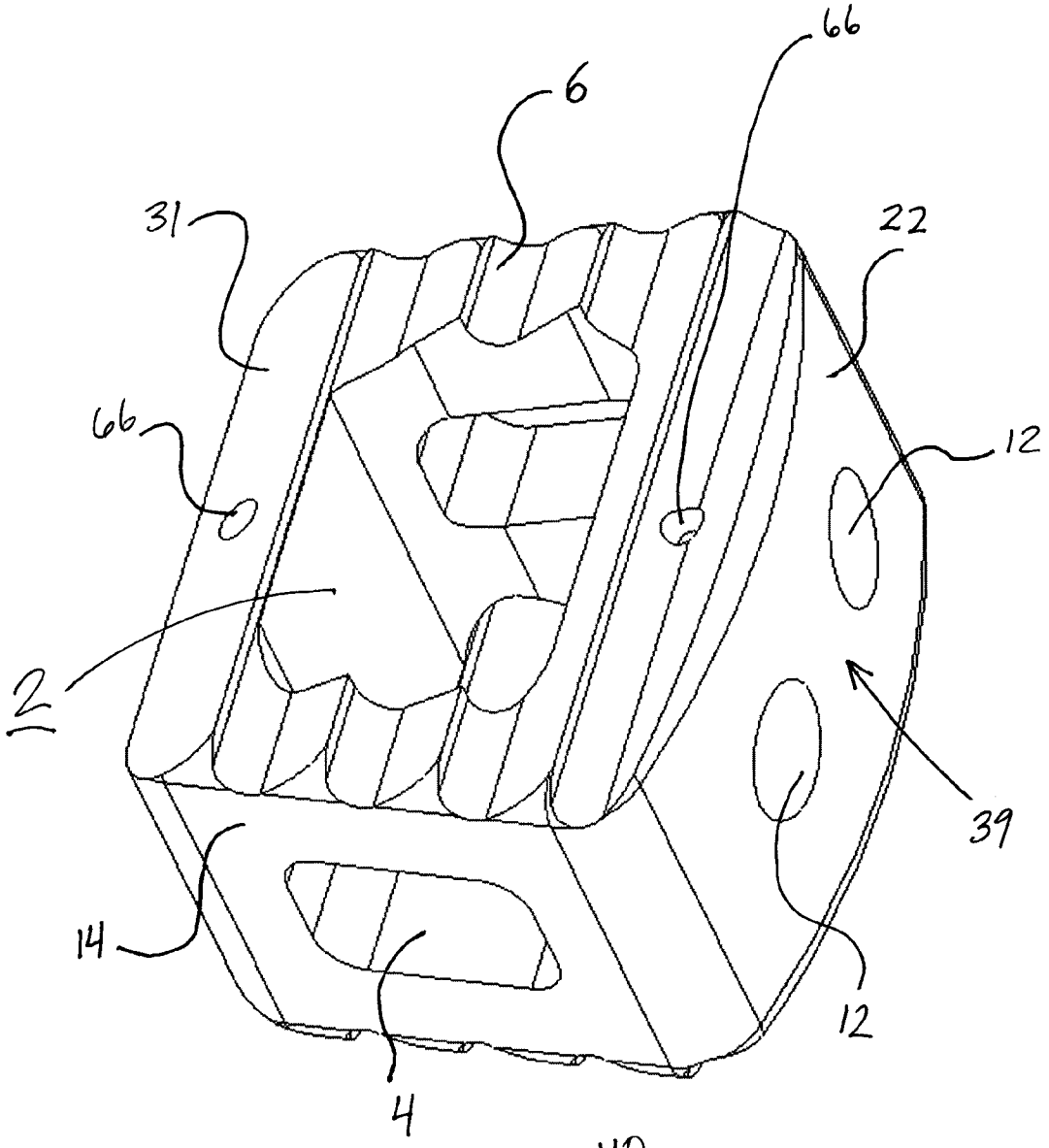



Fig. 11

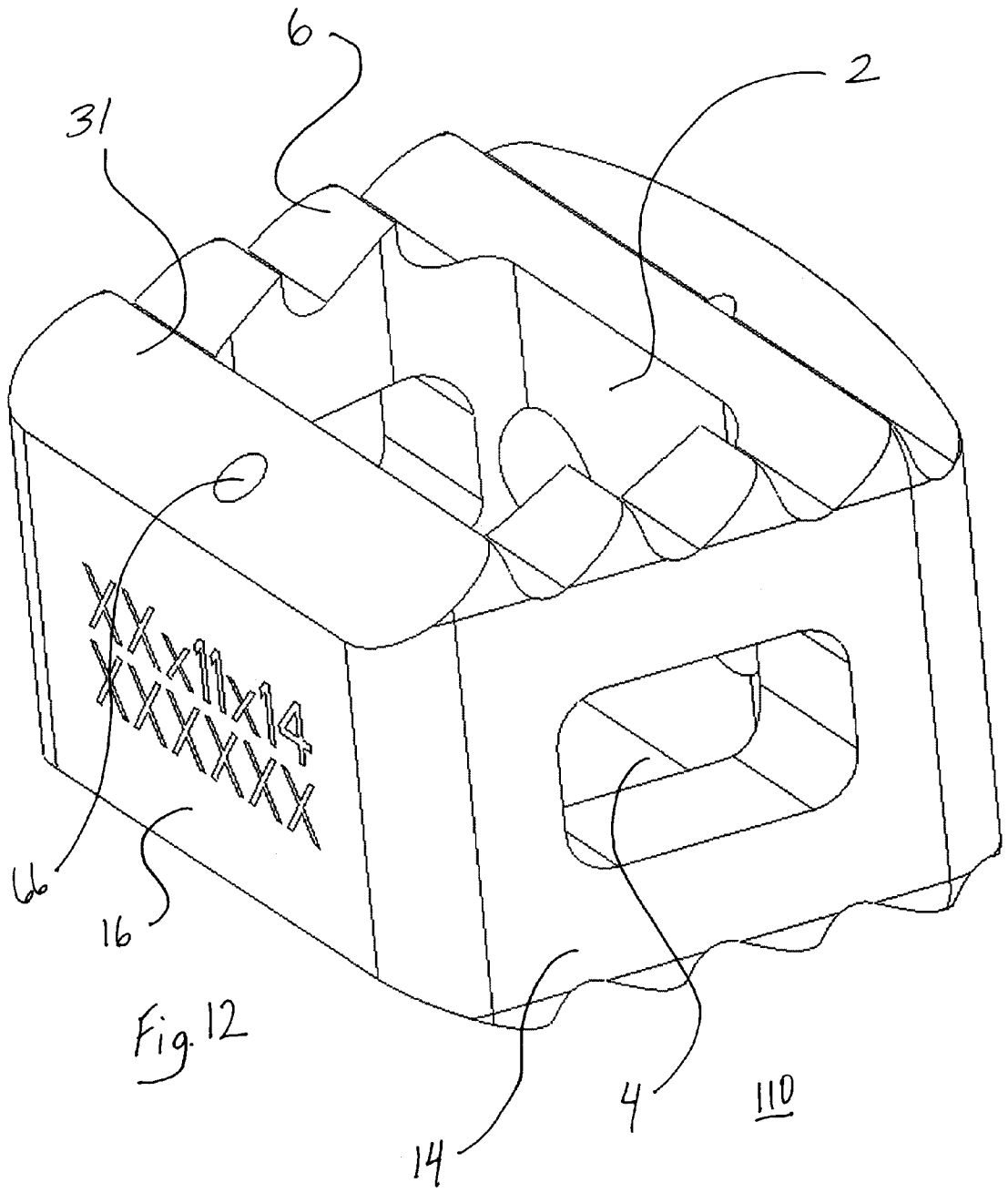



Fig. 12

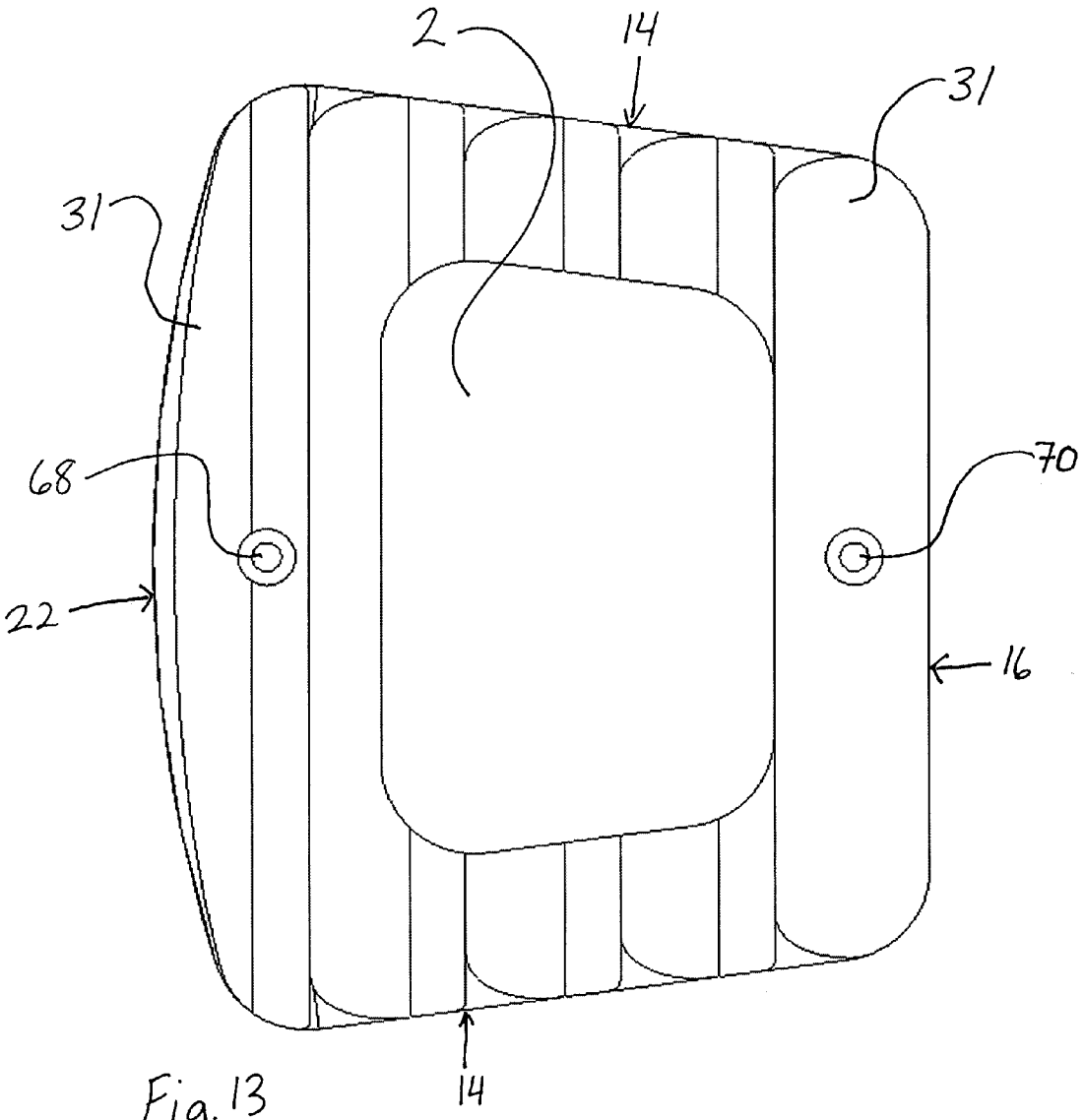



Fig. 13

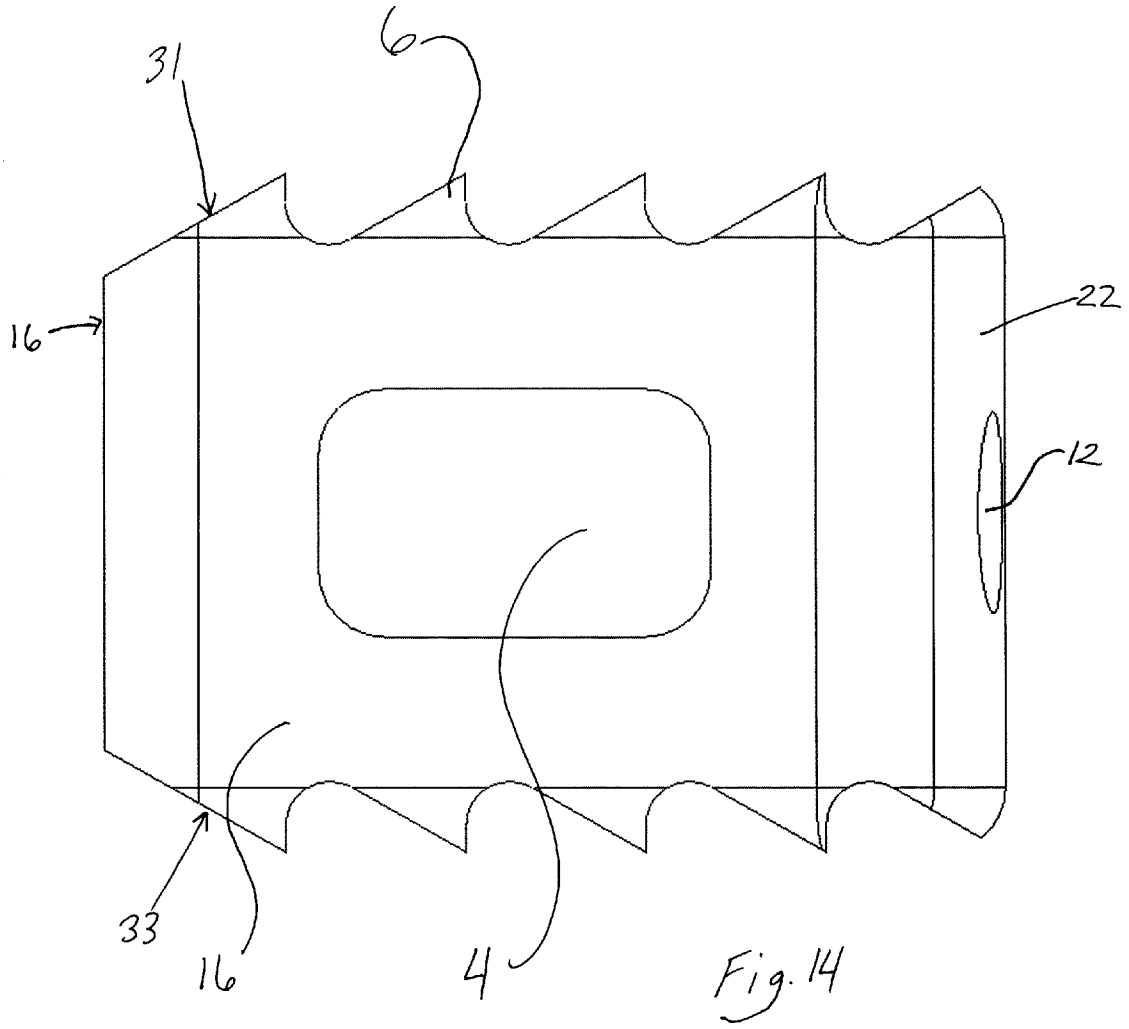



Fig. 14

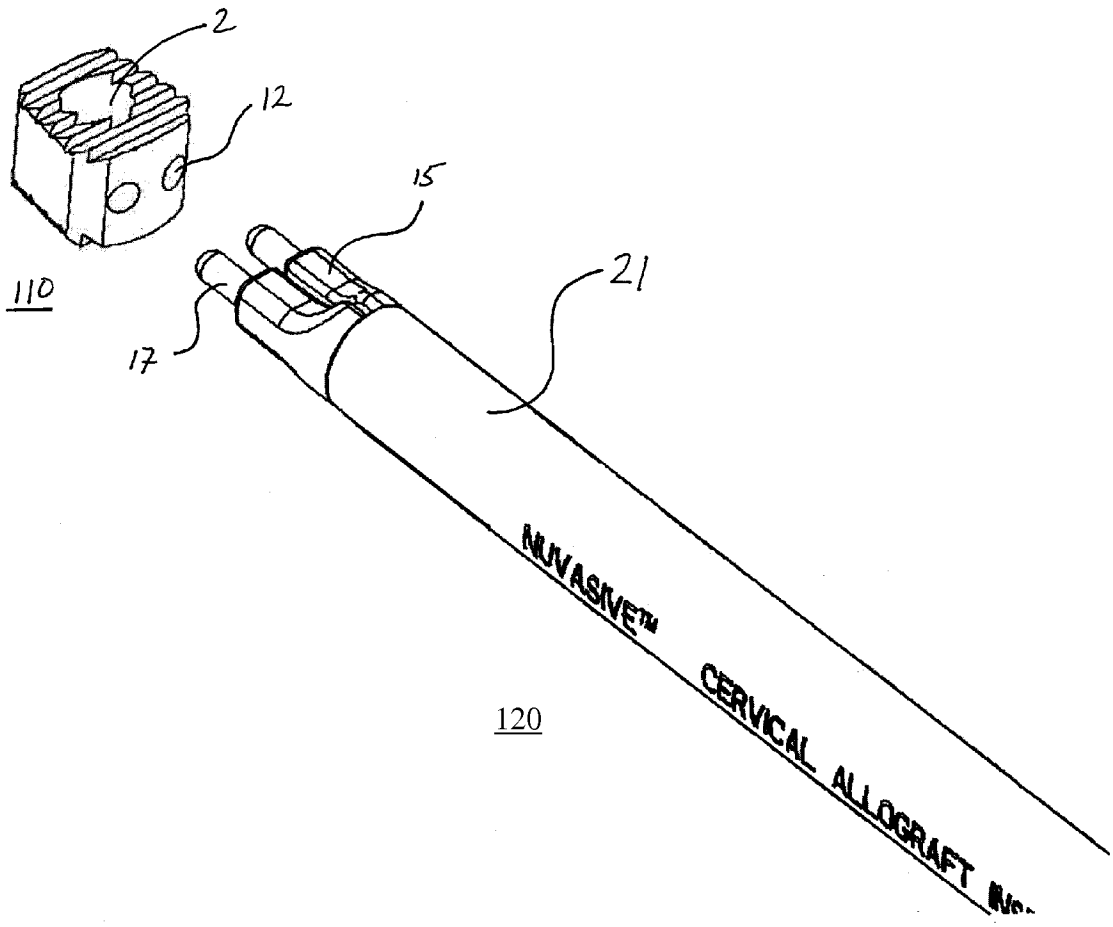



**FIG. 15**

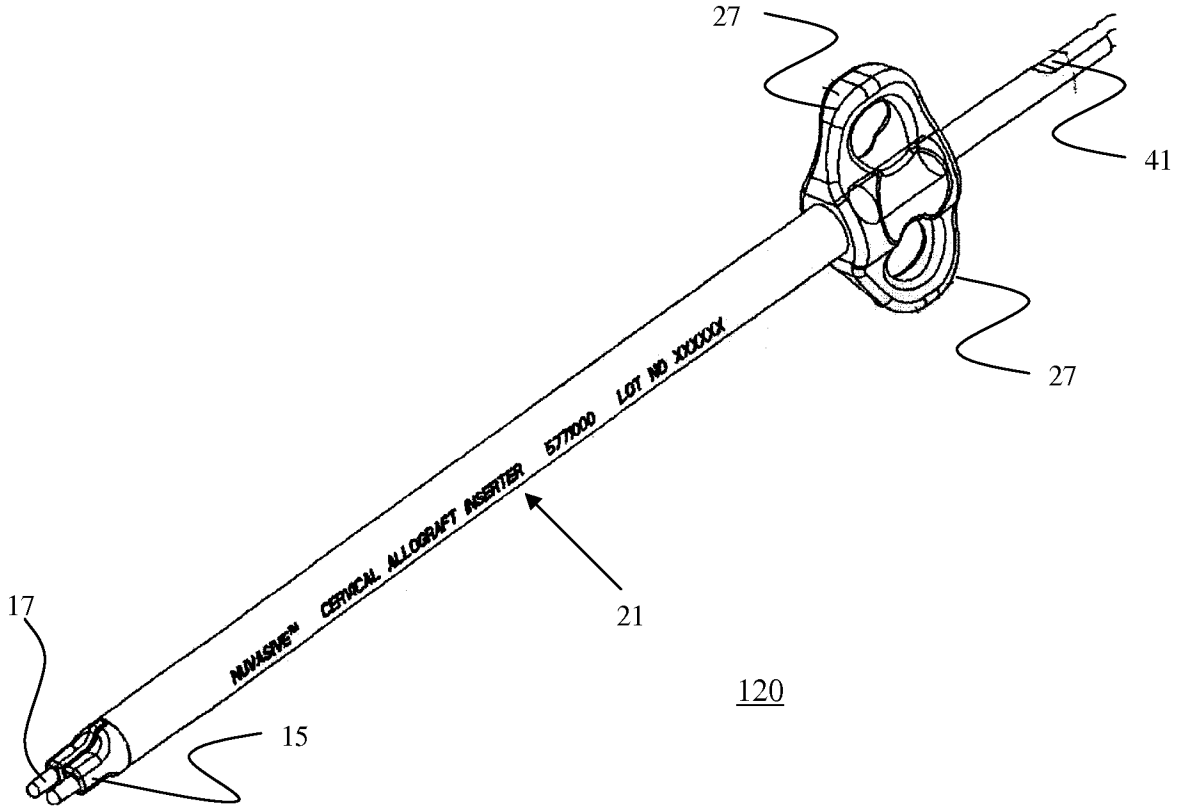



**FIG. 16**

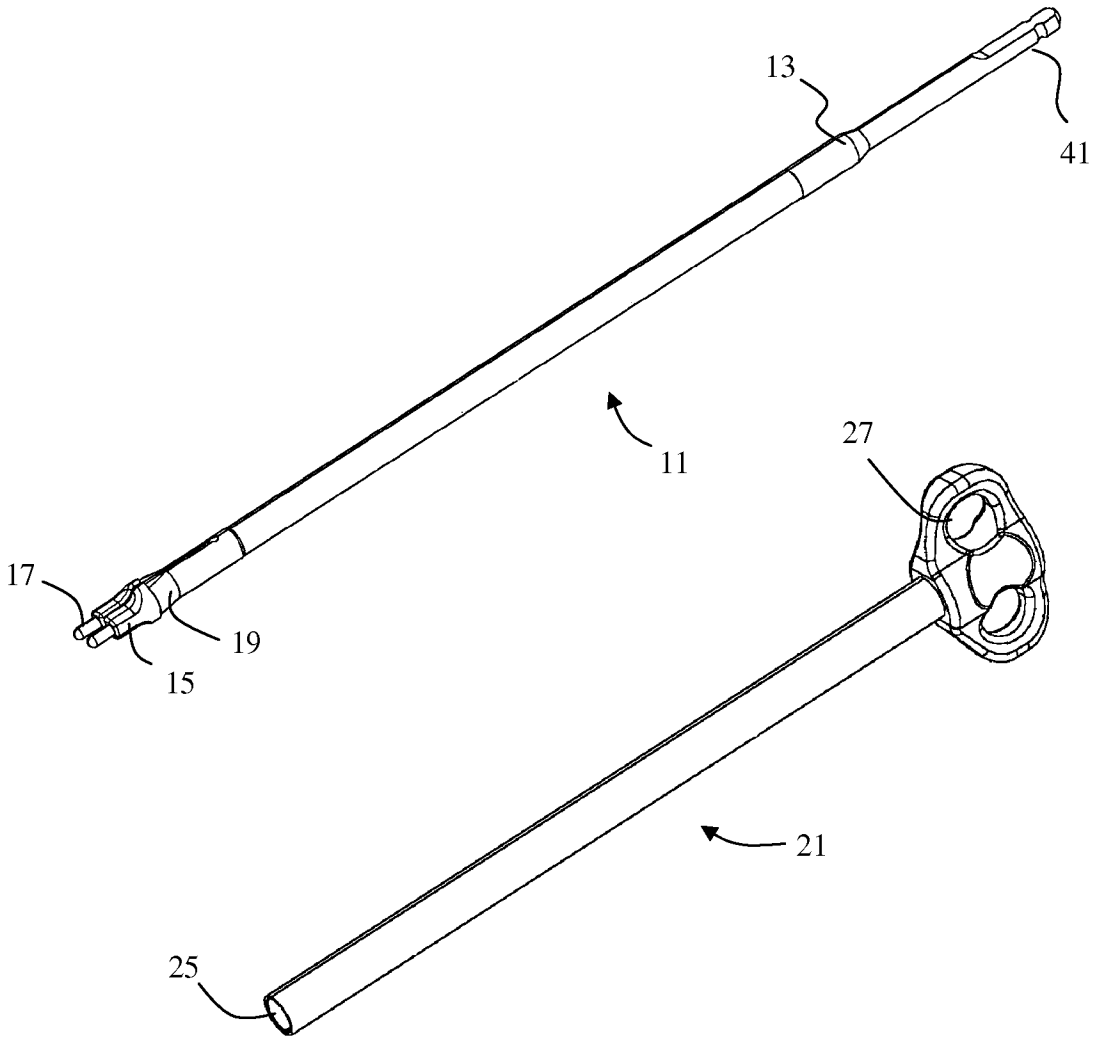



**FIG. 17**

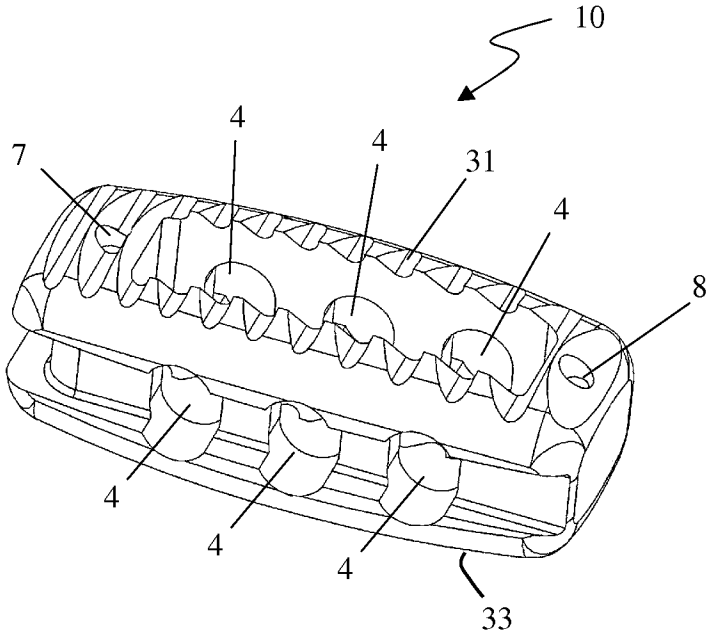



**FIG. 18**

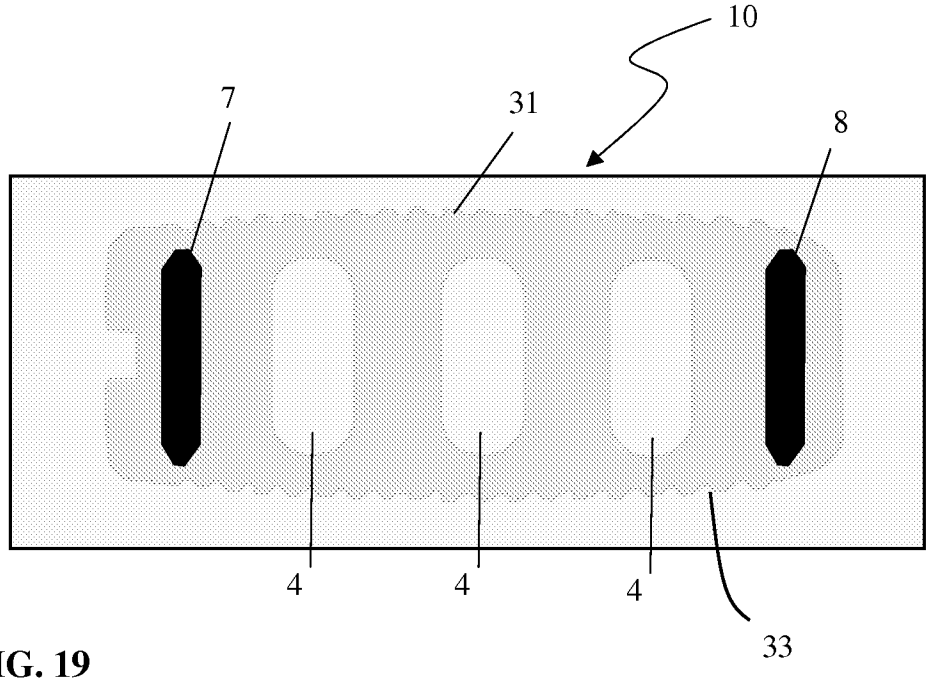
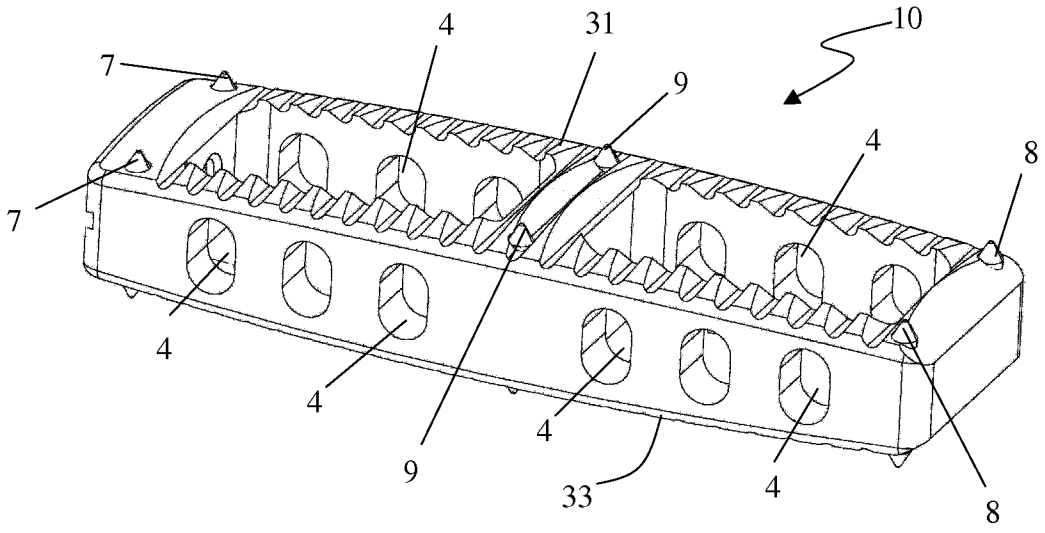



**FIG. 19**

**FIG. 20**



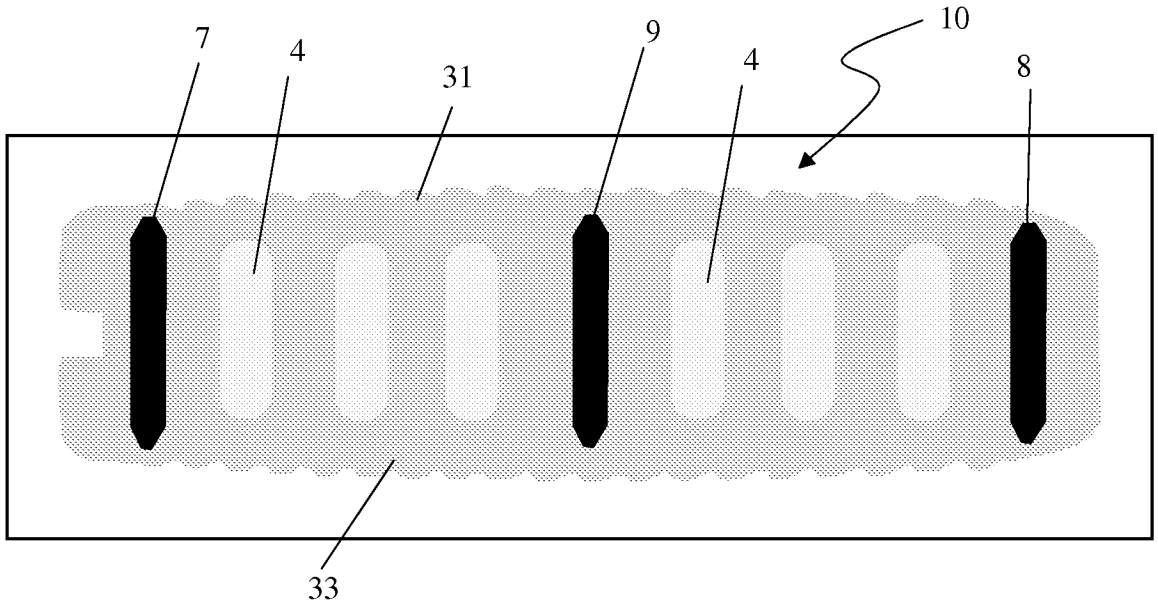




**FIG. 21**

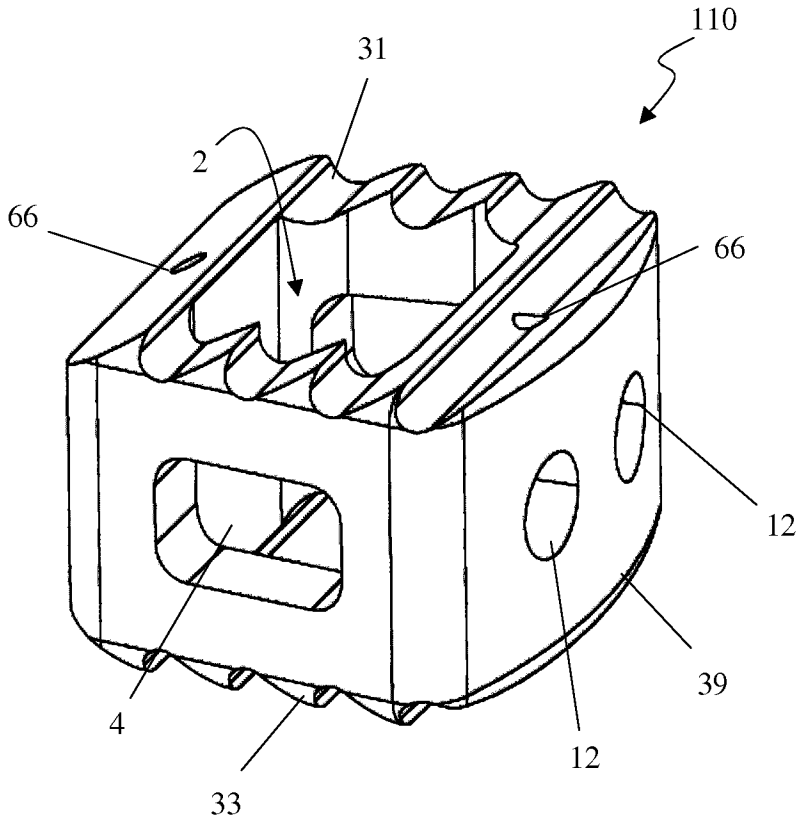



**FIG. 22**

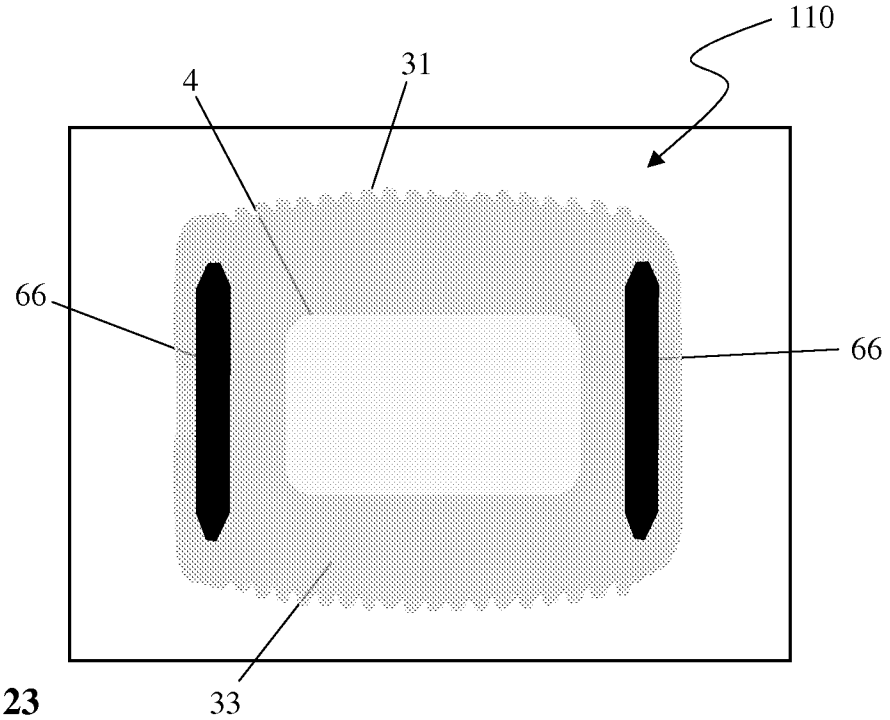



**FIG. 23**

PTO/SB/01 (09-04)
Approved for use through 07/31/2006. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE


# DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (37 CFR 1.63)

☑ Declaration Submitted With Initial Filing *OR* ☐ Declaration Submitted after Initial Filing (surcharge (37 CFR 1.16 (e)) required)

| | |
|---|---|
| Attorney Docket Number | 104US1 |
| First Named Inventor | Matthew Curran |
| *COMPLETE IF KNOWN* | |
| Application Number | N/A |
| Filing Date | N/A |
| Art Unit | N/A |
| Examiner Name | N/A |

**I hereby declare that:**

Each inventor's residence, mailing address, and citizenship are as stated below next to their name.

I believe the inventor(s) named below to be the original and first inventor(s) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

Systems and Methods for Spinal Fusion

*(Title of the Invention)*

the specification of which

☑ is attached hereto

*OR*

☐ was filed on (MM/DD/YYYY) ☐ as United States Application Number or PCT International Application Number ☐ and was amended on (MM/DD/YYYY) ☐ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or (f), or 365(b) of any foreign application(s) for patent, inventor's or plant breeder's rights certificate(s), or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent, inventor's or plant breeder's rights certificate(s), or any PCT international application having a filing date before that of the application on which priority is claimed.

| Prior Foreign Application Number(s) | Country | Foreign Filing Date (MM/DD/YYYY) | Priority Not Claimed | Certified Copy Attached? YES | NO |
|---|---|---|---|---|---|
| | | | ☐ | ☐ | ☐ |
| | | | ☐ | ☐ | ☐ |
| | | | ☐ | ☐ | ☐ |
| | | | ☐ | ☐ | ☐ |

☐ Additional foreign application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

PTO/SB/01 (09-04)
Approved for use through 07/31/2006. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE


# DECLARATION — Utility or Design Patent Application

| | | | | | |
|---|---|---|---|---|---|
| Direct all correspondence to: | ☑ The address associated with Customer Number: | 30,328 | OR | ☐ | Correspondence address below |

| | | |
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| Name | | |
| Address | | |
| City | State | ZIP |
| Country | Telephone | Fax |

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

**NAME OF SOLE OR FIRST INVENTOR:** ☐ A petition has been filed for this unsigned inventor

| Given Name (first and middle [if any]) | Family Name or Surname |
|---|---|
| Matthew | Curran |

| Inventor's Signature | Date |
|---|---|
| | March 29, 2005 |

| Residence: City | State | Country | Citizenship |
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3218 Rancho Quartillo

| City | State | Zip | Country |
|---|---|---|---|
| Carlsbad | CA | 92009 | USA |

**NAME OF SECOND INVENTOR:** ☐ A petition has been filed for this unsigned inventor

| Given Name (first and middle [if any]) | Family Name or Surname |
|---|---|
| MARK | PETERSON |

| Inventor's Signature | Date |
|---|---|
| | |

| Residence: City | State | Country | Citizenship |
|---|---|---|---|
| MEDFORD | OREGON | | US |

Mailing Address

| City | State | Zip | Country |
|---|---|---|---|
| | | | |

☐ Additional inventors or a legal representative are being named on the _____ supplemental sheet(s) PTO/SB/02A or 02LR attached hereto.

# Electronic Patent Application Fee Transmittal

| | |
|---|---|
| **Application Number:** | |
| **Filing Date:** | |
| **Title of Invention:** | System and Methods for Spinal Fusion |
| **First Named Inventor/Applicant Name:** | Matthew Curran |
| **Filer:** | Jennifer Lynn Risser |
| **Attorney Docket Number:** | 104US2 |

Filed as Large Entity

## Utility under 35 USC 111(a) Filing Fees

| Description | Fee Code | Quantity | Amount | Sub-Total in USD($) |
|---|---|---|---|---|
| **Basic Filing:** | | | | |
| Utility application filing | 1011 | 1 | 330 | 330 |
| Utility Search Fee | 1111 | 1 | 540 | 540 |
| Utility Examination Fee | 1311 | 1 | 220 | 220 |
| **Pages:** | | | | |
| **Claims:** | | | | |
| **Miscellaneous-Filing:** | | | | |
| **Petition:** | | | | |
| **Patent-Appeals-and-Interference:** | | | | |

| Description | Fee Code | Quantity | Amount | Sub-Total in USD($) |
|---|---|---|---|---|
| **Post-Allowance-and-Post-Issuance:** | | | | |
| **Extension-of-Time:** | | | | |
| **Miscellaneous:** | | | | |
| | | | **Total in USD ($)** | **1090** |

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 9806663 |
| **Application Number:** | 13079645 |
| **International Application Number:** | |
| **Confirmation Number:** | 1151 |
| **Title of Invention:** | System and Methods for Spinal Fusion |
| **First Named Inventor/Applicant Name:** | Matthew Curran |
| **Customer Number:** | 30328 |
| **Filer:** | Jennifer Lynn Risser |
| **Filer Authorized By:** | |
| **Attorney Docket Number:** | 104US2 |
| **Receipt Date:** | 04-APR-2011 |
| **Filing Date:** | |
| **Time Stamp:** | 18:36:30 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

| | |
|---|---|
| Submitted with Payment | yes |
| Payment Type | Deposit Account |
| Payment was successfully received in RAM | $1090 |
| RAM confirmation Number | 5324 |
| Deposit Account | 502040 |
| Authorized User | |

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| 1 | Transmittal of New Application | 2011-04-04-Transmittal104US2.pdf | 274669<br>22dfc261eada117c7f33badc240996c3fdbacf10 | no | 2 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 2 | | 2011-04-04-SpecificationasFiled104US2.pdf | 104535<br>94a1d8649d9fef9a8d363fe2fe35aaa7cccf3467 | yes | 32 |
| | **Multipart Description/PDF files in .zip description** | | | | |
| | **Document Description** | | **Start** | **End** | |
| | Specification | | 1 | 23 | |
| | Claims | | 24 | 31 | |
| | Abstract | | 32 | 32 | |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 3 | Drawings-only black and white line drawings | 2011-04-04-FiguresasFiled104US2.pdf | 1480015<br>43b626205fac356d39447131ffe21aeedcd9192b | no | 20 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 4 | Oath or Declaration filed | 2005-03-29-OathDecFromParent104US2.pdf | 99398<br>2b2e5b3be07ee25ed9d4b3a7836297fd3ae3549d | no | 2 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 5 | Fee Worksheet (PTO-875) | fee-info.pdf | 32095<br>8b36d4f1e492b031528c21bdc3bc58ce29edc71e | no | 2 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| | | **Total Files Size (in bytes):** | 1990712 | | |

**This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.**

**New Applications Under 35 U.S.C. 111**

**If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.**

**National Stage of an International Application under 35 U.S.C. 371**

**If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.**

**New International Application Filed with the USPTO as a Receiving Office**

**If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.**

## PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 13/079,645

### APPLICATION AS FILED - PART I

| FOR | (Column 1) NUMBER FILED | (Column 2) NUMBER EXTRA | SMALL ENTITY RATE($) | SMALL ENTITY FEE($) | OR | OTHER THAN SMALL ENTITY RATE($) | OTHER THAN SMALL ENTITY FEE($) |
|---|---|---|---|---|---|---|---|
| BASIC FEE (37 CFR 1.16(a), (b), or (c)) | N/A | N/A | N/A | | | N/A | 330 |
| SEARCH FEE (37 CFR 1.16(k), (i), or (m)) | N/A | N/A | N/A | | | N/A | 540 |
| EXAMINATION FEE (37 CFR 1.16(o), (p), or (q)) | N/A | N/A | N/A | | | N/A | 220 |
| TOTAL CLAIMS (37 CFR 1.16(i)) | 26 minus 20 = | * 6 | | | OR | x 52 = | 312 |
| INDEPENDENT CLAIMS (37 CFR 1.16(h)) | 2 minus 3 = | * | | | | x 220 = | 0.00 |
| APPLICATION SIZE FEE (37 CFR 1.16(s)) | If the specification and drawings exceed 100 sheets of paper, the application size fee due is $270 ($135 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s). | | | | | | 0.00 |
| MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j)) | | | | | | | 0.00 |
| * If the difference in column 1 is less than zero, enter "0" in column 2. | | | TOTAL | | | TOTAL | 1402 |

### APPLICATION AS AMENDED - PART II

| | | (Column 1) CLAIMS REMAINING AFTER AMENDMENT | | (Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR | (Column 3) PRESENT EXTRA | SMALL ENTITY RATE($) | SMALL ENTITY ADDITIONAL FEE($) | OR | OTHER THAN SMALL ENTITY RATE($) | OTHER THAN SMALL ENTITY ADDITIONAL FEE($) |
|---|---|---|---|---|---|---|---|---|---|---|
| AMENDMENT A | Total (37 CFR 1.16(i)) | * | Minus | ** | = | x = | | OR | x = | |
| | Independent (37 CFR 1.16(h)) | * | Minus | *** | = | x = | | OR | x = | |
| | Application Size Fee (37 CFR 1.16(s)) | | | | | | | | | |
| | FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j)) | | | | | | | OR | | |
| | | | | | | TOTAL ADD'L FEE | | OR | TOTAL ADD'L FEE | |

| | | (Column 1) CLAIMS REMAINING AFTER AMENDMENT | | (Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR | (Column 3) PRESENT EXTRA | SMALL ENTITY RATE($) | SMALL ENTITY ADDITIONAL FEE($) | OR | OTHER THAN SMALL ENTITY RATE($) | OTHER THAN SMALL ENTITY ADDITIONAL FEE($) |
|---|---|---|---|---|---|---|---|---|---|---|
| AMENDMENT B | Total (37 CFR 1.16(i)) | * | Minus | ** | = | x = | | OR | x = | |
| | Independent (37 CFR 1.16(h)) | * | Minus | *** | = | x = | | OR | x = | |
| | Application Size Fee (37 CFR 1.16(s)) | | | | | | | | | |
| | FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j)) | | | | | | | OR | | |
| | | | | | | TOTAL ADD'L FEE | | OR | TOTAL ADD'L FEE | |

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NUMBER | FILING or 371(c) DATE | GRP ART UNIT | FIL FEE REC'D | ATTY.DOCKET.NO | TOT CLAIMS | IND CLAIMS |
|---|---|---|---|---|---|---|
| 13/079,645 | 04/04/2011 | 3733 | 1090 | 104US2 | 26 | 2 |

**CONFIRMATION NO. 1151**

30328
NuVasive
c/o CPA Global
P.O. Box 52050
Minneapolis, MN 55402

**FILING RECEIPT**

*OC000000047142350*

Date Mailed: 04/18/2011

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

**Applicant(s)**

Matthew Curran, Carlsbad, CA;
Mark Peterson, Medford, OR;

**Power of Attorney:** None

**Domestic Priority data as claimed by applicant**

This application is a CON of 11/093,409 03/29/2005 PAT 7,918,891
which claims benefit of 60/557,536 03/29/2004

**Foreign Applications** (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.)

**If Required, Foreign Filing License Granted:** 04/13/2011

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 13/079,645**

**Projected Publication Date:** To Be Determined - pending completion of Missing Parts

**Non-Publication Request:** No

**Early Publication Request:** No

**Title**

System and Methods for Spinal Fusion

**Preliminary Class**

623

## PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4158).

## LICENSE FOR FOREIGN FILING UNDER

## Title 35, United States Code, Section 184

## Title 37, Code of Federal Regulations, 5.11 & 5.15

**GRANTED**

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as

set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

**NOT GRANTED**

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NUMBER | FILING OR 371(C) DATE | FIRST NAMED APPLICANT | ATTY. DOCKET NO./TITLE |
|---|---|---|---|
| 13/079,645 | 04/04/2011 | Matthew Curran | 104US2 |

**CONFIRMATION NO. 1151**

30328
NuVasive
c/o CPA Global
P.O. Box 52050
Minneapolis, MN 55402

**FORMALITIES LETTER**

*OC000000047142351*

Date Mailed: 04/18/2011

# NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

**FILED UNDER 37 CFR 1.53(b)**

***Filing Date Granted***

**Items Required To Avoid Abandonment:**

An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing. Applicant is given **TWO MONTHS** from the date of this Notice within which to file all required items below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- The oath or declaration is unsigned.

The applicant needs to satisfy supplemental fees problems indicated below.

The required item(s) identified below must be timely submitted to avoid abandonment:

- Additional claim fees of $**312** as a non-small entity, including any required multiple dependent claim fee, are required. Applicant must submit the additional claim fees or cancel the additional claims for which fees are due.
- A surcharge (for late submission of filing fee, search fee, examination fee or oath or declaration) as set forth in 37 CFR 1.16(f) of $**130** for a non-small entity, must be submitted.

**SUMMARY OF FEES DUE:**

Total fee(s) required within **TWO MONTHS** from the date of this Notice is $**442** for a non-small entity
- $**130** Surcharge.
- Total additional claim fee(s) for this application is $**312**
  - $**312** for **6** total claims over 20.

**Items Required To Avoid Processing Delays:**

The item(s) indicated below are also required and should be submitted with any reply to this notice to avoid further processing delays.

- A new oath or declaration, identifying this application number is required. The oath or declaration does not comply with 37 CFR 1.63 in that it:
- does not identify the complete mailing or post office address of each inventor.

Replies should be mailed to:

Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

Registered users of EFS-Web may alternatively submit their reply to this notice via EFS-Web.
https://sportal.uspto.gov/authenticate/AuthenticateUserLocalEPF.html

For more information about EFS-Web please call the USPTO Electronic Business Center at **1-866-217-9197** or visit our website at http://www.uspto.gov/ebc.

If you are not using EFS-Web to submit your reply, you must include a copy of this notice.

/bzewdie/

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Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

| | | | |
|---|---|---|---|
| Applicant: | Matthew Curran | Art Unit: | 3733 |
| Serial No.: | 13/079,645 | Examiner: | Unknown |
| Filing Date: | April 4, 2011 | | |
| Title: | System and Methods for Spinal Fusion | | |

**Certificate of Transmission:** I hereby certify that this correspondence is being transmitted to the United States Patent and Trademark Office, via EFS-Web, on **October 18, 2011.**

/Jennifer Russell/

Jennifer Russell, Reg. No. 60,059

## RESPONSE TO NOTICE TO FILE MISSING PARTS

Mail Stop Missing Parts
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

In response to a Notice to File Missing Parts mailed on April 18, 2011, having a two-month period for response that expired June 18, 2011, the applicants respectfully submit the Oath from the parent application, as required by the Notice to File Missing Parts.

Applicants authorize the payment of $2470 in fees for a late filed declaration, excess claims fees and a 4-month extension of time. However, in the event that there are any additional fees to be charged or payments to be credited, the Applicants hereby request that any charges or credits be made to Deposit Account No.: 50-2040 for Customer No.: 30,328. In the event that there are any questions concerning the remarks above or the application in general, the Examiner is cordially invited to telephone the undersigned attorney so that prosecution may be expedited.

Respectfully submitted,
NUVASIVE, INC.

Date: October 18, 2011

/Jennifer Russell/
Jennifer Russell, Esq.
Registration No. 60,059

NuVasive, Inc.
7475 Lusk Boulevard
San Diego, CA 92121
Tel.: (858) 320-4537

PTO/SB/01 (04-05)
Approved for use through 07/31/2006. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE


# DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (37 CFR 1.63)

☐ Declaration Submitted With Initial Filing **OR** ☑ Declaration Submitted after Initial Filing (surcharge (37 CFR 1.16 (e)) required)

| | |
|---|---|
| Attorney Docket Number | 104US1 |
| First Named Inventor | Matthew Curran |
| *COMPLETE IF KNOWN* | |
| Application Number | 11/093,409 |
| Filing Date | March 29, 2005 |
| Art Unit | 3738 |
| Examiner Name | n/a |

**I hereby declare that:**

Each inventor's residence, mailing address, and citizenship are as stated below next to their name.

I believe the inventor(s) named below to be the original and first inventor(s) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

Systems and Methods for Spinal Fusion

*(Title of the Invention)*

the specification of which

☐ is attached hereto

***OR***

☑ was filed on (MM/DD/YYYY) 03/29/2005 as United States Application Number or PCT International Application Number 11/093,409 and was amended on (MM/DD/YYYY) _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or (f), or 365(b) of any foreign application(s) for patent, inventor's or plant breeder's rights certificate(s), or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent, inventor's or plant breeder's rights certificate(s), or any PCT international application having a filing date before that of the application on which priority is claimed.

| Prior Foreign Application Number(s) | Country | Foreign Filing Date (MM/DD/YYYY) | Priority Not Claimed | Certified Copy Attached? YES | NO |
|---|---|---|---|---|---|
| | | | ☐ | ☐ | ☐ |
| | | | ☐ | ☐ | ☐ |
| | | | ☐ | ☐ | ☐ |
| | | | ☐ | ☐ | ☐ |

☐ Additional foreign application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

PTO/SB/01 (04-05)
Approved for use through 07/31/2006. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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# DECLARATION — Utility or Design Patent Application

| | | | | | |
|---|---|---|---|---|---|
| Direct all correspondence to: | ☑ The address associated with Customer Number: | 30,328 | OR | ☐ | Correspondence address below |

| | | |
|---|---|---|
| Name | | |
| Address | | |
| City | State | ZIP |
| Country | Telephone | Email |

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

**NAME OF SOLE OR FIRST INVENTOR:** ☐ A petition has been filed for this unsigned inventor

| Given Name (first and middle [if any]) | Family Name or Surname |
|---|---|
| Matthew | Curran |

| Inventor's Signature | Date |
|---|---|
| | 7/26/05 |

| Residence: City | State | Country | Citizenship |
|---|---|---|---|
| Carlsbad | CA | USA | US |

Mailing Address
3218 Rancho Quartillo

| City | State | Zip | Country |
|---|---|---|---|
| Carlsbad | CA | 92009 | USA |

**NAME OF SECOND INVENTOR:** ☐ A petition has been filed for this unsigned inventor

| Given Name (first and middle [if any]) | Family Name or Surname |
|---|---|
| Mark | Peterson |

| Inventor's Signature | Date |
|---|---|
| | |

| Residence: City | State | Country | Citizenship |
|---|---|---|---|
| Medford | OR | USA | US |

Mailing Address
840 Royal Avenue Suite #1

| City | State | Zip | Country |
|---|---|---|---|
| Medford | OR | 97504 | USA |

☐ Additional inventors or a legal representative are being named on the _____ supplemental sheet(s) PTO/SB/02A or 02LR attached hereto.

PTO/SB/01 (04-05)
Approved for use through 07/31/2006. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

# DECLARATION — Utility or Design Patent Application

| | | | |
|---|---|---|---|
| Direct all correspondence to: ☑ The address associated with Customer Number: | 30,328 | OR ☐ | Correspondence address below |

| | | |
|---|---|---|
| Name | | |
| Address | | |
| City | State | ZIP |
| Country | Telephone | Email |

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

**NAME OF SOLE OR FIRST INVENTOR:** ☐ A petition has been filed for this unsigned inventor

| | | | |
|---|---|---|---|
| Given Name (first and middle [if any]) | | Family Name or Surname | |
| Matthew | | Curran | |
| Inventor's Signature | | | Date |
| Residence: City | State | Country | Citizenship |
| Carlsbad | CA | USA | US |
| Mailing Address | | | |
| 3218 Rancho Quartillo | | | |
| City | State | Zip | Country |
| Carlsbad | CA | 92009 | USA |

**NAME OF SECOND INVENTOR:** ☐ A petition has been filed for this unsigned inventor

| | | | |
|---|---|---|---|
| Given Name (first and middle [if any]) | | Family Name or Surname | |
| Mark | | Peterson | |
| Inventor's Signature | Mark Peterson | | Date 7/26/05 |
| Residence: City | State | Country | Citizenship |
| Medford | OR | USA | US |
| Mailing Address | | | |
| 840 Royal Avenue Suite #1 | | | |
| City | State | Zip | Country |
| Medford | OR | 97504 | USA |

☐ Additional inventors or a legal representative are being named on the _____ supplemental sheet(s) PTO/SB/02A or 02LR attached hereto.

# Electronic Patent Application Fee Transmittal

| | |
|---|---|
| **Application Number:** | 13079645 |
| **Filing Date:** | 04-Apr-2011 |
| **Title of Invention:** | System and Methods for Spinal Fusion |
| **First Named Inventor/Applicant Name:** | Matthew Curran |
| **Filer:** | Jennifer Lynn Risser |
| **Attorney Docket Number:** | 104US2 |

Filed as Large Entity

## Utility under 35 USC 111(a) Filing Fees

| Description | Fee Code | Quantity | Amount | Sub-Total in USD($) |
|---|---|---|---|---|
| **Basic Filing:** | | | | |
| **Pages:** | | | | |
| **Claims:** | | | | |
| Claims in excess of 20 | 1202 | 6 | 60 | 360 |
| **Miscellaneous-Filing:** | | | | |
| Late filing fee for oath or declaration | 1051 | 1 | 130 | 130 |
| **Petition:** | | | | |
| **Patent-Appeals-and-Interference:** | | | | |
| **Post-Allowance-and-Post-Issuance:** | | | | |

| Description | Fee Code | Quantity | Amount | Sub-Total in USD($) |
|---|---|---|---|---|
| **Extension-of-Time:** | | | | |
| Extension - 4 months with $0 paid | 1254 | 1 | 1980 | 1980 |
| **Miscellaneous:** | | | | |
| | | | **Total in USD ($)** | **2470** |

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 11215105 |
| **Application Number:** | 13079645 |
| **International Application Number:** | |
| **Confirmation Number:** | 1151 |
| **Title of Invention:** | System and Methods for Spinal Fusion |
| **First Named Inventor/Applicant Name:** | Matthew Curran |
| **Customer Number:** | 30328 |
| **Filer:** | Jennifer Lynn Risser |
| **Filer Authorized By:** | |
| **Attorney Docket Number:** | 104US2 |
| **Receipt Date:** | 18-OCT-2011 |
| **Filing Date:** | 04-APR-2011 |
| **Time Stamp:** | 23:57:46 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

| | |
|---|---|
| Submitted with Payment | yes |
| Payment Type | Deposit Account |
| Payment was successfully received in RAM | $2470 |
| RAM confirmation Number | 6456 |
| Deposit Account | 502040 |
| Authorized User | |

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| 1 | Extension of Time | 2011-10-18-MPR-EOT104US2.pdf | 285597<br>781de69562be376f9a55ec811791f78e234d184e | no | 2 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 2 | Applicant Response to Pre-Exam Formalities Notice | 2011-10-18-MissingPartsResponse104US2.pdf | 19168<br>82a95d83906991cb3c652bc78cc046487b4d4280 | no | 2 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 3 | Oath or Declaration filed | 2005-08-04-OathDecFromParent104US2.pdf | 149435<br>b988f2f64960b1170dc5c3b906601238090d2afd | no | 3 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| 4 | Fee Worksheet (SB06) | fee-info.pdf | 33214<br>6324bb2b060f7a7e0f0660fcd3053de9e421d73f | no | 2 |
| **Warnings:** | | | | | |
| **Information:** | | | | | |
| | | **Total Files Size (in bytes):** | 487414 | | |

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**New Applications Under 35 U.S.C. 111**

**If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.**

**National Stage of an International Application under 35 U.S.C. 371**

**If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.**

**New International Application Filed with the USPTO as a Receiving Office**

**If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.**

PTO/SB/22 (09-11)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARMENT OF COMMERCE


| **PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)** | Docket Number (Optional) 104US2 |
|---|---|
| Application Number 13/079,645 | Filed April 4, 2011 |
| For System and Methods for Spinal Fusion | |
| Art Unit 3733 | Examiner |

This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above identified application.

The requested extension and fee are as follows (check time period desired and enter the appropriate fee below):

| | Fee | Small Entity Fee | |
|---|---|---|---|
| ☐ One month (37 CFR 1.17(a)(1)) | $150 | $75 | $ |
| ☐ Two months (37 CFR 1.17(a)(2)) | $560 | $280 | $ |
| ☐ Three months (37 CFR 1.17(a)(3)) | $1270 | $635 | $ |
| ☑ Four months (37 CFR 1.17(a)(4)) | $1980 | $990 | $ 1980 |
| ☐ Five months (37 CFR 1.17(a)(5)) | $2690 | $1345 | $ |

☐ Applicant claims small entity status. See 37 CFR 1.27.

☐ A check in the amount of the fee is enclosed.

☐ Payment by credit card. Form PTO-2038 is attached.

☐ The Director has already been authorized to charge fees in this application to a Deposit Account.

☑ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account Number 50-2040.

**WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.**

I am the

☐ applicant/inventor.

☐ assignee of record of the entire interest. See 37 CFR 3.71.
Statement under 37 CFR 3.73(b) is enclosed (Form PTO/SB/96).

☐ attorney or agent of record. Registration Number _____

☐ attorney or agent under 37 CFR 1.34.
Registration number if acting under 37 CFR 1.34 _____

/Jennifer Russell/ — Signature

October 18, 2011 — Date

Jennifer Russell — Typed or printed name

858-320-4537 — Telephone Number

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below.

☑ Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.136(a). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 6 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

*If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.*

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**The Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

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7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

## PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 13/079,645

### APPLICATION AS FILED - PART I

| FOR | (Column 1) NUMBER FILED | (Column 2) NUMBER EXTRA | SMALL ENTITY RATE($) | SMALL ENTITY FEE($) | OR | OTHER THAN SMALL ENTITY RATE($) | OTHER THAN SMALL ENTITY FEE($) |
|---|---|---|---|---|---|---|---|
| BASIC FEE (37 CFR 1.16(a), (b), or (c)) | N/A | N/A | N/A | | | N/A | 380 |
| SEARCH FEE (37 CFR 1.16(k), (i), or (m)) | N/A | N/A | N/A | | | N/A | 620 |
| EXAMINATION FEE (37 CFR 1.16(o), (p), or (q)) | N/A | N/A | N/A | | | N/A | 250 |
| TOTAL CLAIMS (37 CFR 1.16(i)) | 26 minus 20 = | * 6 | | | OR | x 60 = | 360 |
| INDEPENDENT CLAIMS (37 CFR 1.16(h)) | 2 minus 3 = | * | | | | x 250 = | 0.00 |
| APPLICATION SIZE FEE (37 CFR 1.16(s)) | If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s). | | | | | | 0.00 |
| MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j)) | | | | | | | 0.00 |
| * If the difference in column 1 is less than zero, enter "0" in column 2. | | | TOTAL | | | TOTAL | 1610 |

### APPLICATION AS AMENDED - PART II

| | | (Column 1) CLAIMS REMAINING AFTER AMENDMENT | | (Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR | (Column 3) PRESENT EXTRA | SMALL ENTITY RATE($) | SMALL ENTITY ADDITIONAL FEE($) | OR | OTHER THAN SMALL ENTITY RATE($) | OTHER THAN SMALL ENTITY ADDITIONAL FEE($) |
|---|---|---|---|---|---|---|---|---|---|---|
| AMENDMENT A | Total (37 CFR 1.16(i)) | * | Minus | ** | = | x = | | OR | x = | |
| | Independent (37 CFR 1.16(h)) | * | Minus | *** | = | x = | | OR | x = | |
| | Application Size Fee (37 CFR 1.16(s)) | | | | | | | | | |
| | FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j)) | | | | | | | OR | | |
| | | | | | | TOTAL ADD'L FEE | | OR | TOTAL ADD'L FEE | |

| | | (Column 1) CLAIMS REMAINING AFTER AMENDMENT | | (Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR | (Column 3) PRESENT EXTRA | SMALL ENTITY RATE($) | SMALL ENTITY ADDITIONAL FEE($) | OR | OTHER THAN SMALL ENTITY RATE($) | OTHER THAN SMALL ENTITY ADDITIONAL FEE($) |
|---|---|---|---|---|---|---|---|---|---|---|
| AMENDMENT B | Total (37 CFR 1.16(i)) | * | Minus | ** | = | x = | | OR | x = | |
| | Independent (37 CFR 1.16(h)) | * | Minus | *** | = | x = | | OR | x = | |
| | Application Size Fee (37 CFR 1.16(s)) | | | | | | | | | |
| | FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j)) | | | | | | | OR | | |
| | | | | | | TOTAL ADD'L FEE | | OR | TOTAL ADD'L FEE | |

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

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www.uspto.gov

| APPLICATION NUMBER | FILING or 371(c) DATE | GRP ART UNIT | FIL FEE REC'D | ATTY.DOCKET.NO | TOT CLAIMS | IND CLAIMS |
|---|---|---|---|---|---|---|
| 13/079,645 | 04/04/2011 | 3733 | 1580 | 104US2 | 26 | 2 |

**CONFIRMATION NO. 1151**

**UPDATED FILING RECEIPT**

30328
NuVasive
c/o CPA Global
P.O. Box 52050
Minneapolis, MN 55402

*OC000000050570005*

Date Mailed: 10/26/2011

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

**Applicant(s)**

Matthew Curran, Carlsbad, CA;
Mark Peterson, Medford, OR;

**Power of Attorney:** None

**Domestic Priority data as claimed by applicant**

This application is a CON of 11/093,409 03/29/2005 PAT 7,918,891
which claims benefit of 60/557,536 03/29/2004

**Foreign Applications** (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.)

**If Required, Foreign Filing License Granted:** 04/13/2011

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 13/079,645**

**Projected Publication Date:** 02/02/2012

**Non-Publication Request:** No

**Early Publication Request:** No

**Title**

System and Methods for Spinal Fusion

**Preliminary Class**

623

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## Title 37, Code of Federal Regulations, 5.11 & 5.15

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Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NUMBER | FILING OR 371(C) DATE | FIRST NAMED APPLICANT | ATTY. DOCKET NO./TITLE |
|---|---|---|---|
| 13/079,645 | 04/04/2011 | Matthew Curran | 104US2 |

**CONFIRMATION NO. 1151**

**PUBLICATION NOTICE**

30328
NuVasive
c/o CPA Global
P.O. Box 52050
Minneapolis, MN 55402

*OC000000052361257*

**Title:**System and Methods for Spinal Fusion

**Publication No.**US-2012-0029641-A1
**Publication Date:**02/02/2012

## NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Office of Public Records. The Office of Public Records can be reached by telephone at (703) 308-9726 or (800) 972-6382, by facsimile at (703) 305-8759, by mail addressed to the United States Patent and Trademark Office, Office of Public Records, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently http://pair.uspto.gov/. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

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Office of Data Managment, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

| | | | |
|---|---|---|---|
| Applicant: | Matthew Curran | Art Unit: | 3733 |
| Serial No.: | 13/079,645 | Examiner: | Bray, Stuart Samuel |
| Filing Date: | April 4, 2011 | Conf. No.: | 1151 |
| Title: | System and Method for Spinal Fusion | | |

Mail Stop Amendment
Commissioner for Patents
PO Box 1450
Alexandria VA 22313-1450

**PRELIMINARY AMENDMENT**

Prior to commencing examination of the above-captioned application, please amend the application as follows:

## Amendments to the Claims

1.-26. (Cancelled)

27. (New) A spinal fusion implant of non-bone construction positionable via a lateral trans-psoas surgical approach to the spine into a position within an interbody space between a first vertebra and a second vertebra, said interbody space being at least partially defined by a posterior aspect, an anterior aspect, and opposing lateral aspects, said implant comprising:

an upper surface including anti-migration elements to contact said first vertebra when said implant is positioned within the interbody space, a lower surface including anti-migration elements to contact said second vertebra when said implant is positioned within the interbody space, a distal wall, a proximal wall, a first sidewall to face said anterior aspect of said disc space when said implant is positioned within the interbody space and a second sidewall to face said posterior aspect of said disc space when said implant is positioned within the interbody space, said distal wall, proximal wall, first sidewall, and second sidewall comprising a radiolucent material;

wherein said implant has a longitudinal length extending from a proximal end of said proximal wall to a distal end of said distal wall;

wherein a central region of said implant includes portions of the first and second sidewalls positioned generally centrally between the proximal wall and the distal wall, at least a portion of the central region defining a maximum lateral width of said implant extending from said first sidewall to said second sidewall, wherein said longitudinal length is at least two and half times greater than said maximum lateral width;

at least a first fusion aperture extending through said upper surface and lower surface and configured to permit bone growth between the first vertebra and the second vertebra when said implant is positioned within the interbody space, said first fusion aperture having: a longitudinal aperture length extending generally parallel to the longitudinal length of said implant, and a lateral aperture width extending between said

first sidewall to said second sidewall, wherein the longitudinal aperture length is greater than the lateral aperture width; and

at least three radiopaque markers; wherein a first of the at least three radiopaque markers is at least partially positioned in said distal wall, a second of said at least three radiopaque markers is at least partially positioned in said proximal wall, and a third of said at least three radiopaque markers is at least partially positioned in said central region.

28. (New) The spinal fusion implant of claim 27, further comprising a fourth radiopaque marker situated within said implant, said fourth radiopaque marker positioned in said central region at a position spaced apart from said third radiopaque marker.

29. (New) The spinal fusion implant of claim 27, wherein said first radiopaque marker has an elongate body oriented generally perpendicular to said longitudinal length and extending entirely through a height of said distal wall, and wherein said second radiopaque marker has an elongate body oriented generally perpendicular to said longitudinal length and entirely through a height of said proximal wall.

30. (New) The spinal fusion implant of claim 27, further including at least one receiving aperture position is said proximal wall.

31. (New) The spinal fusion implant of claim 30, wherein said receiving aperture is configured to releasably mate with an inserter tool.

32. (New) The spinal fusion implant of claim 31, wherein said receiving aperture comprises a threaded receiving aperture extending into said proximal wall and having a central axis generally parallel to said longitudinal length of said implant.

33. (New) The spinal fusion implant of claim 32, further comprising a pair of lateral grooves positioned in said proximal wall and extending laterally of said threaded receiving aperture.

34. (New) The spinal fusion implant of claim 27, wherein said maximum lateral width of said implant is approximately 18 mm.

35. (New) The spinal fusion implant of claim 27, wherein said radiolucent material comprises PEEK.

36. (New) The spinal fusion implant of claim 27, wherein said implant includes at least one visualization aperture extending through at least one of said first sidewall and said second sidewall.

37. (New) The spinal fusion implant of claim 27, wherein said upper and lower surfaces are generally parallel to one another.

38. (New) The spinal fusion implant of claim 27, wherein said upper and lower surfaces are generally angled relative to one another to approximately correspond to lordosis of a lumbar spine when said implant is positioned within the interbody space.

39. (New) The spinal fusion implant of claim 27, wherein said first fusion aperture is one of generally rectangular and generally oblong in shape.

40. (New) The spinal fusion implant of claim 27, further comprising a medial support extending between the first and second sidewalls

41. (New) The spinal fusion implant of claim 40, wherein said medial support is positioned along said central region.

42. (New) The spinal fusion implant of claim 27, further including a second fusion aperture extending through said upper surface and lower surface and configured to permit

bone growth between the first vertebra and the second vertebra when said implant is positioned within the interbody space.

43. (New) The spinal fusion implant of claim 42, wherein said second fusion aperture is separated from said first fusion aperture by a medial support.

44. (New) The spinal fusion implant of claim 27, wherein said anti-migration elements of said upper surface comprise a plurality of ridges.

45. (New) The spinal fusion implant of claim 44, wherein said plurality of ridges extend generally perpendicular to said longitudinal length.

46. (New) The spinal fusion implant of claim 27, wherein said anti-migration elements of said upper surface comprise spike elements.

47. (New) The spinal fusion implant of claim 46, wherein said spike elements protrude to pointed tips configured to engage said first vertebra.

48. (New) The spinal fusion implant of claim 27, wherein said maximum lateral width of said implant is greater than a lateral width of the distal end of said distal wall and is greater than a lateral width of the proximal end of said proximal wall.

49. (New) The spinal fusion implant of claim 27, wherein said implant has a height extending from said upper surface to said lower surface, wherein said maximum lateral width is greater than said height.

50. (New) The spinal fusion implant of claim 27, wherein said central region includes a maximum height of said implant extending from said upper surface to said lower surface, wherein said maximum height is greater than a height of said distal wall and is greater than a height of said proximal wall.

51. (New) The spinal fusion implant of claim 27, wherein the lateral aperture width of said first fusion aperture is more than two time greater than a lateral thickness of said first sidewall and is more than two time greater than a lateral thickness of said second sidewall.

52. (New) The spinal fusion implant of claim 27, wherein at least one of said three radiopaque markers comprises an elongate body extending generally perpendicular to said longitudinal length.

53. (New) The spinal fusion implant of claim 52, wherein aid elongate body of at least one of said three radiopaque markers is shorter than a height extending from said upper surface to said lower surface.

54. (New) The spinal fusion implant of claim 54, further comprising an osteoinductive material positioned with said first fusion aperture.

## REMARKS

Claims 1-26 have been cancelled without prejudice. New claims 27-54 have been added. Written description support for these amendments is found throughout the original specification. No new subject matter has been added.

Claims 27-54 are believed to be patentable over all the prior art references cited in the record and favorable consideration and allowance of the claims is respectfully requested. **Applicant respectfully requests that the Examiner telephone the undersigned attorney prior to mailing the next communication so as to expedite prosecution and avoid unnecessary delays (unless the next communication is a Notice of Allowance).**

Applicants authorize the $120.00 fee for 2 excess claims to be charged to Deposit Account 50-2040. No other fees are believed due at this time, nevertheless, please apply any necessary charges or credits to Deposit Account 50-2040.

Respectfully submitted,

Date: March 20, 2012

/Rorv Schermerhorn/

Rory Schermerhorn, Esq.
Registration No. 58,148

Customer Number 30328
NuVasive
c/o CPA Global
P.O. Box 52050
Minneapolis, MN 55402
Telephone: (858) 909-1845

# Electronic Patent Application Fee Transmittal

| | |
|---|---|
| **Application Number:** | 13079645 |
| **Filing Date:** | 04-Apr-2011 |
| **Title of Invention:** | System and Methods for Spinal Fusion |
| **First Named Inventor/Applicant Name:** | Matthew Curran |
| **Filer:** | Rory A. Schermerhorn |
| **Attorney Docket Number:** | 104US2 |

Filed as Large Entity

## Utility under 35 USC 111(a) Filing Fees

| Description | Fee Code | Quantity | Amount | Sub-Total in USD($) |
|---|---|---|---|---|
| **Basic Filing:** | | | | |
| **Pages:** | | | | |
| **Claims:** | | | | |
| Claims in excess of 20 | 1202 | 2 | 60 | 120 |
| **Miscellaneous-Filing:** | | | | |
| **Petition:** | | | | |
| **Patent-Appeals-and-Interference:** | | | | |
| **Post-Allowance-and-Post-Issuance:** | | | | |
| **Extension-of-Time:** | | | | |

| Description | Fee Code | Quantity | Amount | Sub-Total in USD($) |
|---|---|---|---|---|
| **Miscellaneous:** | | | | |
| | | | **Total in USD ($)** | **120** |

# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 12352743 |
| **Application Number:** | 13079645 |
| **International Application Number:** | |
| **Confirmation Number:** | 1151 |
| **Title of Invention:** | System and Methods for Spinal Fusion |
| **First Named Inventor/Applicant Name:** | Matthew Curran |
| **Customer Number:** | 30328 |
| **Filer:** | Rory A. Schermerhorn |
| **Filer Authorized By:** | |
| **Attorney Docket Number:** | 104US2 |
| **Receipt Date:** | 20-MAR-2012 |
| **Filing Date:** | 04-APR-2011 |
| **Time Stamp:** | 23:19:09 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

| | |
|---|---|
| Submitted with Payment | yes |
| Payment Type | Deposit Account |
| Payment was successfully received in RAM | $120 |
| RAM confirmation Number | 7131 |
| Deposit Account | 502040 |
| Authorized User | |

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | | 2012-03-20_PreliminaryAmendment_104US2.pdf | 36206<br>f65239ba025527c2453a2ba719af1b9f031e7a5d | yes | 7 |

| | Multipart Description/PDF files in .zip description | | |
|---|---|---|---|
| | **Document Description** | **Start** | **End** |
| | Preliminary Amendment | 1 | 1 |
| | Claims | 2 | 6 |
| | Applicant Arguments/Remarks Made in an Amendment | 7 | 7 |

**Warnings:**

**Information:**

| | | | | | |
|---|---|---|---|---|---|
| 2 | Fee Worksheet (SB06) | fee-info.pdf | 29669<br>4a369640af3b5edfb46064b38f6114a924943261 | no | 2 |

**Warnings:**

**Information:**

| **Total Files Size (in bytes):** | 65875 |
|---|---|

**This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.**

**New Applications Under 35 U.S.C. 111**

**If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.**

**National Stage of an International Application under 35 U.S.C. 371**

**If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.**

**New International Application Filed with the USPTO as a Receiving Office**

**If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.**

PTO/SB/06 (07-06)
Approved for use through 1/31/2007. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

# PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

| Application or Docket Number | Filing Date | ☐ To be Mailed |
|---|---|---|
| 13/079,645 | 04/04/2011 | |

## APPLICATION AS FILED – PART I

| FOR | (Column 1) NUMBER FILED | (Column 2) NUMBER EXTRA | SMALL ENTITY ☐ RATE ($) | SMALL ENTITY ☐ FEE ($) | OR | OTHER THAN SMALL ENTITY RATE ($) | OTHER THAN SMALL ENTITY FEE ($) |
|---|---|---|---|---|---|---|---|
| ☐ BASIC FEE (37 CFR 1.16(a), (b), or (c)) | N/A | N/A | N/A | | | N/A | |
| ☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m)) | N/A | N/A | N/A | | | N/A | |
| ☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q)) | N/A | N/A | N/A | | | N/A | |
| TOTAL CLAIMS (37 CFR 1.16(i)) | minus 20 = | * | X $ = | | OR | X $ = | |
| INDEPENDENT CLAIMS (37 CFR 1.16(h)) | minus 3 = | * | X $ = | | | X $ = | |
| ☐ APPLICATION SIZE FEE (37 CFR 1.16(s)) | If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s). | | | | | | |
| ☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j)) | | | | | | | |
| * If the difference in column 1 is less than zero, enter "0" in column 2. | | | TOTAL | | | TOTAL | |

## APPLICATION AS AMENDED – PART II

| AMENDMENT 03/20/2012 | (Column 1) CLAIMS REMAINING AFTER AMENDMENT | | (Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR | (Column 3) PRESENT EXTRA | SMALL ENTITY RATE ($) | SMALL ENTITY ADDITIONAL FEE ($) | OR | OTHER THAN SMALL ENTITY RATE ($) | OTHER THAN SMALL ENTITY ADDITIONAL FEE ($) |
|---|---|---|---|---|---|---|---|---|---|
| Total (37 CFR 1.16(i)) | * 28 | Minus | ** 26 | = 2 | X $ = | | OR | X $60= | 120 |
| Independent (37 CFR 1.16(h)) | * 1 | Minus | ***3 | = 0 | X $ = | | OR | X $250= | 0 |
| ☐ Application Size Fee (37 CFR 1.16(s)) | | | | | | | | | |
| ☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j)) | | | | | | | OR | | |
| | | | | | TOTAL ADD'L FEE | | OR | TOTAL ADD'L FEE | **120** |

| AMENDMENT | (Column 1) CLAIMS REMAINING AFTER AMENDMENT | | (Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR | (Column 3) PRESENT EXTRA | RATE ($) | ADDITIONAL FEE ($) | | RATE ($) | ADDITIONAL FEE ($) |
|---|---|---|---|---|---|---|---|---|---|
| Total (37 CFR 1.16(i)) | * | Minus | ** | = | X $ = | | OR | X $ = | |
| Independent (37 CFR 1.16(h)) | * | Minus | *** | = | X $ = | | OR | X $ = | |
| ☐ Application Size Fee (37 CFR 1.16(s)) | | | | | | | | | |
| ☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j)) | | | | | | | OR | | |
| | | | | | TOTAL ADD'L FEE | | OR | TOTAL ADD'L FEE | |

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/MAMYE WAGSTAFF/

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 13/079,645 | 04/04/2011 | Matthew Curran | 104US2 | 1151 |

30328 7590 03/21/2012

NuVasive
c/o CPA Global
P.O. Box 52050
Minneapolis, MN 55402

| EXAMINER | |
|---|---|
| BRAY, STUART SAMUEL | |
| ART UNIT | PAPER NUMBER |
| 3733 | |

| MAIL DATE | DELIVERY MODE |
|---|---|
| 03/21/2012 | PAPER |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 13/079,645 | CURRAN ET AL. | |
| | Examiner | Art Unit | |
| | STUART S. BRAY | 3733 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *1* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *04 April 2011*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

5)☒ Claim(s) *1-26* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☐ Claim(s) _____ is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☒ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

12)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Election/Restrictions*

Restriction to one of the following inventions is required under 35 U.S.C. 121:

I. Claims 1-13, drawn to a system, classified in class 606, subclass 90.

II. Claim 14-26, drawn to a method of spinal fusion, classified in class 623, subclass 17.16.

The inventions are distinct, each from the other because of the following reasons:

Inventions II and I are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another and materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case the process can be used to distract adjacent vertebrae.

Restriction for examination purposes as indicated is proper because all these inventions listed in this action are independent or distinct for the reasons given above and there would be a serious search and/or examination burden if restriction were not required because at least the following reason(s) apply:

Restriction for examination purposes as indicated is proper because all these inventions listed in this action are independent or distinct for the reasons given above and there would be a serious search and/or examination burden if restriction were not required because at least the following reason(s) apply the inventions require a different

field of search (e.g., searching different classes /subclasses or electronic resources, or employing different search strategies or search queries).

**Applicant is advised that the reply to this requirement to be complete must include (i) an election of a invention to be examined** even though the requirement may be traversed (37 CFR 1.143) **and (ii) identification of the claims encompassing the elected invention**.

The election of an invention may be made with or without traverse. To reserve a right to petition, the election must be made with traverse. If the reply does not distinctly and specifically point out supposed errors in the restriction requirement, the election shall be treated as an election without traverse. Traversal must be presented at the time of election in order to be considered timely. Failure to timely traverse the requirement will result in the loss of right to petition under 37 CFR 1.144. If claims are added after the election, applicant must indicate which of these claims are readable upon the elected invention.

Should applicant traverse on the ground that the inventions are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing the inventions to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the inventions unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C. 103(a) of the other invention.

This application contains claims directed to the following patentably distinct species

A) Figures 1-9, 18-21

B) Figures 10-17, 22-23

The species are independent or distinct because claims to the different species recite the mutually exclusive characteristics of such species. In addition, these species are not obvious variants of each other based on the current record.

Applicant is required under 35 U.S.C. 121 to elect a single disclosed species, or a single grouping of patentably indistinct species, for prosecution on the merits to which the claims shall be restricted if no generic claim is finally held to be allowable. Currently, no claims are generic.

There is a search and/or examination burden for the patentably distinct species due to their mutually exclusive characteristics. The species require a different field of search (e.g., searching different classes/subclasses or electronic resources, or employing different search queries); and/or the prior art applicable to one species would not likely be applicable to another species; and/or the species are likely to raise different non-prior art issues under 35 U.S.C. 101 and/or 35 U.S.C. 112, first paragraph.

**Applicant is advised that the reply to this requirement to be complete must include (i) an election of a species or a grouping of patentably indistinct species to be examined** even though the requirement may be traversed (37 CFR 1.143) **and (ii) identification of the claims encompassing the elected species or grouping of**

**patentably indistinct species**, including any claims subsequently added. An argument that a claim is allowable or that all claims are generic is considered nonresponsive unless accompanied by an election.

The election may be made with or without traverse. To preserve a right to petition, the election must be made with traverse. If the reply does not distinctly and specifically point out supposed errors in the election of species requirement, the election shall be treated as an election without traverse. Traversal must be presented at the time of election in order to be considered timely. Failure to timely traverse the requirement will result in the loss of right to petition under 37 CFR 1.144. If claims are added after the election, applicant must indicate which of these claims are readable on the elected species or grouping of patentably indistinct species.

Should applicant traverse on the ground that the species, or groupings of patentably indistinct species from which election is required, are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing them to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the species unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C. 103(a) of the other species.

Upon the allowance of a generic claim, applicant will be entitled to consideration of claims to additional species which depend from or otherwise require all the limitations of an allowable generic claim as provided by 37 CFR 1.141.

A telephone call was made to Jennifer Russell on 3/13/2012 to request an oral election to the above restriction requirement, but did not result in an election being made.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to STUART S. BRAY whose telephone number is (571)270-7648. The examiner can normally be reached on Mon-Thurs 7:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, ***please contact the examiner's supervisor, Eduardo C. Robert, at* 571-272-4719**. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

***If there are any inquiries that are not being addressed by first contacting the Examiner or the Supervisor, you may send an email inquiry to*** TC3700_Workgroup_D_Inquiries@uspto.gov.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/STUART S BRAY/
Examiner, Art Unit 3733
/EDUARDO C. ROBERT/
Supervisory Patent Examiner, Art Unit 3733

| Index of Claims | Application/Control No. | Applicant(s)/Patent Under Reexamination |
|---|---|---|
| | 13079645 | CURRAN ET AL. |
| | Examiner | Art Unit |
| | STUART S BRAY | 3733 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ✓ | Rejected | - | Cancelled | N | Non-Elected | A | Appeal |
| = | Allowed | ÷ | Restricted | I | Interference | O | Objected |

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

| CLAIM | | DATE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Final | Original | 03/13/2012 | | | | | | | | |
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PTO/SB/81 (01-09)
Approved for use through 11/30/2011. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE


# POWER OF ATTORNEY OR REVOCATION OF POWER OF ATTORNEY WITH A NEW POWER OF ATTORNEY AND CHANGE OF CORRESPONDENCE ADDRESS

| | |
|---|---|
| **Application Number** | 13/079,645 |
| **Filing Date** | April 4, 2011 |
| **First Named Inventor** | Curran |
| **Title** | System and Methods for Spinal Fusion |
| **Art Unit** | 3733 |
| **Examiner Name** | Bray, Stuart S. |
| **Attorney Docket Number** | 104US2 |

I hereby revoke all previous powers of attorney given in the above-identified application.

☐ A Power of Attorney is submitted herewith.

*OR*

☒ I hereby appoint Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s) to prosecute the application identified above, and to transact all business in the United States Patent and Trademark Office connected therewith: **26191**

*OR*

☐ I hereby appoint Practitioner(s) named below as my/our attorney(s) or agent(s) to prosecute the application identified above, and to transact all business in the United States Patent and Trademark Office connected therewith:

| Practitioner(s) Name | Registration Number |
|---|---|
| | |
| | |
| | |
| | |

Please recognize or change the correspondence address for the above-identified application to:

☐ The address associated with the above-mentioned Customer Number.

*OR*

☒ The address associated with Customer Number: **26191**

*OR*

| | | | | | |
|---|---|---|---|---|---|
| ☐ Firm or Individual Name | | | | | |
| Address | | | | | |
| City | | State | | Zip | |
| Country | | | | | |
| Telephone | | Email | | | |

I am the:

☐ Applicant/Inventor.

*OR*

☒ Assignee of record of the entire interest. See 37 CFR 3.71.
*Statement under 37 CFR 3.73(b) (Form PTO/SB/96) submitted herewith or filed on* _____.

**SIGNATURE of Applicant or Assignee of Record**

| | | | |
|---|---|---|---|
| Signature | | Date | March 20, 2012 |
| Name | Jonathan Spangler | Telephone | (858) 909-1800 |
| Title and Company | Vice President and Chief Patent Counsel, NuVasive Inc. | | |

**NOTE**: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below*.

☐ *Total of _____ forms are submitted.

## STATEMENT UNDER 37 CFR 3.73(b)

Applicant/Patent Owner: Matthew Curran et al.

Application No./Patent No.:13/079,645 Filed/Issue Date: 4/4/2011

Entitled: System and Methods for Spinal Fusion

NuVasive, Inc., a corporation
(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that it is:

1. ☒ the assignee of the entire right, title, and interest; or
2. ☐ an assignee of less than the entire right, title and interest.
The extent (by, percentage) of its ownership interest is _____%

in the patent application/patent identified above by virtue of either:

A. ☐ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel (), Frame (), or for which a copy thereof is attached.

**OR**

B. ☐ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as shown below:

1. From: _____ To _____
The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

2. From: _____ To _____
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☐ Additional documents in the chain of title are listed on a supplemental sheet.

☒ As required by 37 CFR 3.73(b)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.
[NOTE: A separate copy (*i.e.*, a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, if the assignment is to be recorded in the records of the USPTO. See MPEP 302.8]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

| /Michael T. Hawkins/ | March 21, 2012 |
|---|---|
| Signature | Date |
| Michael T. Hawkins , 57,867 | (612) 335-5070 |
| Printed or Typed Name | Telephone Number |
| Attorney for Applicant | |
| Title | |

60759550.doc

NUVASIVE™
Creative Spine Technology

# Fax

| | | | |
|---|---|---|---|
| **To:** | Shelley Cape | **From:** | Alonzo Branch |
| **Company:** | US Patent Office | | 858-909-1902 |
| **Fax:** | 612-677-3572 | **Pages:** | 6 |
| **Phone:** | 619-522-8134 | **Date:** | 07/29/05 |
| **Re:** | | **CC:** | |

- **Comments:**

Hi Shelly,

Sorry for the PDF's. I'm faxing everything now. Standby!!!

Pls give me a call or email when you get this.

Thanks, Al

NuVasive™, Inc.
4545 Towne Centre Court
San Diego, CA 92121
t: 858.909.1878
f: 858.909-2078
Toll Free: 800.455.1476
*www.nuvasive.com*

Form PTO-1595 (Rev. 07/05)
OMB No. 0651-0027 (exp. 6/30/2008)

U.S. DEPARTMENT OF COMMERCE
United States Patent and Trademark Office

# RECORDATION FORM COVER SHEET
# PATENTS ONLY

To the Director of the U.S. Patent and Trademark Office: Please record the attached documents or the new address(es) below.

**1. Name of conveying party(ies)**

Matthew Curran
Mark Peterson

Additional name(s) of conveying party(ies) attached? ☐ Yes ☑ No

**2. Name and address of receiving party(ies)**

Name: NuVasive, Inc.
Internal Address:
Street Address: 4545 Towne Centre Court
City: San Diego
State: CA
Country: United States Zip: 92121

Additional name(s) & address(es) attached? ☐ Yes ☑ No

**3. Nature of conveyance/Execution Date(s):**

Execution Date(s) 26-Jul-2005

☑ Assignment ☐ Merger
☐ Security Agreement ☐ Change of Name
☐ Joint Research Agreement
☐ Government Interest Assignment
☐ Executive Order 9424, Confirmatory License
☐ Other

**4. Application or patent number(s):** ☐ This document is being filed together with a new application.

A. Patent Application No.(s)
11/093,409

B. Patent No.(s)

Additional numbers attached? ☐ Yes ☑ No

**5. Name and address to whom correspondence concerning document should be mailed:**

Name: Jonathan Spangler
Internal Address: NuVasive, Inc.
Street Address: 4545 Towne Centre Court
City: San Diego
State: CA Zip: 92121
Phone Number: 858-243-0029
Fax Number: 858-909-2007
Email Address: jspangler@nuvasive.com

**6. Total number of applications and patents involved:** 1

**7. Total fee** (37 CFR 1.21(h) & 3.41) $ 40.00

☐ Authorized to be charged by credit card
☑ Authorized to be charged to deposit account
☐ Enclosed
☐ None required (government interest not affecting title)

**8. Payment Information**

a. Credit Card Last 4 Numbers
Expiration Date

b. Deposit Account Number 50-2040

Authorized User Name Jonathan Spangler

**9. Signature:**

August 1, 2005
Signature Date

Jonathan Spangler
Name of Person Signing

Total number of pages including cover sheet, attachments, and documents: 4

Documents to be recorded (including cover sheet) should be faxed to (571) 273-0140, or mailed to:
Mail Stop Assignment Recordation Services, Director of the USPTO, P.O.Box 1450, Alexandria, V.A. 22313-1450

Application No. 11/093,409
Attorney Docket No. 104US1

# ASSIGNMENT OF PATENT APPLICATION

WHEREAS, *Matthew Curran*, of 3218 Rancho Quartillo, Carlsbad CA, 92009; and *Mark Peterson, M.D.*, of 840 Royal Avenue Suite #1, Medford OR, 97504; hereinafter referred to as "Assignors," are the inventors of the invention described and set forth in the below-identified application for United States Letters Patent:

Title of Invention: SYSTEMS AND METHODS FOR SPINAL FUSION

Date(s) of execution of Declaration: 7-26-05

Filing Date: March 29, 2005

Application No.: 11/093,409

WHEREAS, *NuVasive, Inc.*, a Corporation of the State of Delaware, located at 4545 Towne Centre Court, San Diego, CA, 92121, hereinafter referred to as "Assignee," is desirous of acquiring an interest in the invention and application and in any U.S. Letters Patent and Registrations which may be granted on the same;

For good and valuable consideration, receipt of which is hereby acknowledged by Assignors, Assignors have assigned, and by these presents do assign to Assignee all right, title and interest in and to the invention and application and to all foreign counterparts (including patent, utility model and industrial designs), and in and to any Letters Patent and Registrations which may hereafter be granted on the same in the United States and all countries throughout the world, and to claim the priority from the application as provided by the Paris Convention. The right, title and interest is to be held and enjoyed by Assignee and Assignee's successors and assigns as fully and exclusively as it would have been held and enjoyed by Assignors had this Assignment not been made, for the full term of any Letters Patent and Registrations which may be granted thereon, or of any division, renewal, continuation in whole or in part, substitution, conversion, reissue, prolongation or extension thereof.

Assignors further agree that they will, without charge to Assignee, but at Assignee's expense, (a) cooperate with Assignee in the prosecution of U.S. Patent applications and foreign counterparts on the invention and any improvements, (b) execute, verify, acknowledge and deliver all such further papers, including patent applications and instruments of transfer, and (c) perform such other acts as Assignee lawfully may request to obtain or maintain Letters Patent and Registrations for the invention and improvements in any and all countries, and to vest title thereto in Assignee, or Assignee's successors and assigns.

Assignors hereby authorize and request Jonathan Spangler, Esq. 4545 Towne Centre Court, San Diego, CA, 92121, to insert herein above the application number and filing date of said application when known.

IN TESTIMONY WHEREOF, Assignors have signed their names on the dates indicated.

Dated: 7/26/05

Matthew Curran

Dated: _____

Mark Peterson, M.D.

Application No. 11/093,409
Attorney Docket No. 104US1

# ASSIGNMENT OF PATENT APPLICATION

WHEREAS, *Matthew Curran*, of 3218 Rancho Quartillo, Carlsbad CA, 92009; and *Mark Peterson, M.D.*, of 840 Royal Avenue Suite #1, Medford OR, 97504; hereinafter referred to as "Assignors," are the inventors of the invention described and set forth in the below-identified application for United States Letters Patent:

Title of Invention: SYSTEMS AND METHODS FOR SPINAL FUSION

Date(s) of execution of Declaration: 7-26-05

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WHEREAS, *NuVasive, Inc.*, a Corporation of the State of Delaware, located at 4545 Towne Centre Court, San Diego, CA, 92121, hereinafter referred to as "Assignee," is desirous of acquiring an interest in the invention and application and in any U.S. Letters Patent and Registrations which may be granted on the same;

For good and valuable consideration, receipt of which is hereby acknowledged by Assignors, Assignors have assigned, and by these presents do assign to Assignee all right, title and interest in and to the invention and application and to all foreign counterparts (including patent, utility model and industrial designs), and in and to any Letters Patent and Registrations which may hereafter be granted on the same in the United States and all countries throughout the world, and to claim the priority from the application as provided by the Paris Convention. The right, title and interest is to be held and enjoyed by Assignee and Assignee's successors and assigns as fully and exclusively as it would have been held and enjoyed by Assignors had this Assignment not been made, for the full term of any Letters Patent and Registrations which may be granted thereon, or of any division, renewal, continuation in whole or in part, substitution, conversion, reissue, prolongation or extension thereof.

Assignors further agree that they will, without charge to Assignee, but at Assignee's expense, (a) cooperate with Assignee in the prosecution of U.S. Patent applications and foreign counterparts on the invention and any improvements, (b) execute, verify, acknowledge and deliver all such further papers, including patent applications and instruments of transfer, and (c) perform such other acts as Assignee lawfully may request to obtain or maintain Letters Patent and Registrations for the invention and improvements in any and all countries, and to vest title thereto in Assignee, or Assignee's successors and assigns.

Assignors hereby authorize and request Jonathan Spangler, Esq. 4545 Towne Centre Court, San Diego, CA, 92121, to insert herein above the application number and filing date of said application when known.

IN TESTIMONY WHEREOF, Assignors have signed their names on the dates indicated.

Dated: _____

Matthew Curran

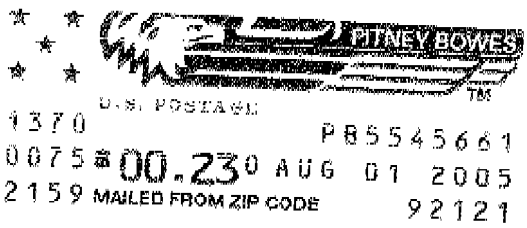
Dated: 7/26/05

Mark Peterson

Mark Peterson, M.D.

Please date stamp this postcard evidencing receipt by the US Patent and Trademark Office of the following materials deposited in First Class Mail on August 1, 2005 regarding App. Ser. No. 11/093,409 (104US1):

1. Recordation Form Cover Sheet, Patents (1 pg);
2. Assignment of Patent Application (2 pgs); and
3. Return Postcard (1 pg).




Jonathan Spangler, Esq.
Chief Patent Counsel
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San Diego, CA 92121

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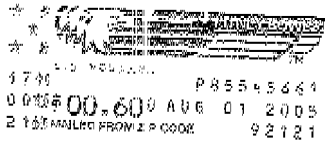
San Diego, CA 92121

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ALEXANDRIA VA 22313-1450

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# Electronic Acknowledgement Receipt

| | |
|---|---|
| **EFS ID:** | 12353692 |
| **Application Number:** | 13079645 |
| **International Application Number:** | |
| **Confirmation Number:** | 1151 |
| **Title of Invention:** | System and Methods for Spinal Fusion |
| **First Named Inventor/Applicant Name:** | Matthew Curran |
| **Customer Number:** | 30328 |
| **Filer:** | Michael T. Hawkins/Jodi Budge |
| **Filer Authorized By:** | Michael T. Hawkins |
| **Attorney Docket Number:** | 104US2 |
| **Receipt Date:** | 21-MAR-2012 |
| **Filing Date:** | 04-APR-2011 |
| **Time Stamp:** | 10:45:17 |
| **Application Type:** | Utility under 35 USC 111(a) |

## Payment information:

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| Submitted with Payment | no |

## File Listing:

| Document Number | Document Description | File Name | File Size(Bytes)/ Message Digest | Multi Part /.zip | Pages (if appl.) |
|---|---|---|---|---|---|
| 1 | Power of Attorney | 104US2POA.PDF | 53035<br>64570f722921cbbefab6f46b5f5608809893d755 | no | 1 |

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**Information:**

| | | | | | |
|---|---|---|---|---|---|
| 2 | Assignee showing of ownership per 37 CFR 3.73(b). | 373Statement.pdf | 265651<br>3f3cdca8d6c3fd02e677bb735266ae5fb67fb286 | no | 8 |

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**Information:**

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| **Total Files Size (in bytes):** | 318686 |

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**New Applications Under 35 U.S.C. 111**

**If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.**

**National Stage of an International Application under 35 U.S.C. 371**

**If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.**

**New International Application Filed with the USPTO as a Receiving Office**

**If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.**