IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent of: Michelson
U.S. Patent No.: 8,444,696 Attorney Docket No.: 13958-0113IP2
Issue Date: May 21, 2013
Appl. Serial No.: 13/235,998
Filing Date: September 19, 2011
Title: ANATOMIC SPINAL IMPLANT HAVING ANATOMIC BEARING SURFACES

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PETITION FOR *INTER PARTES* REVIEW OF UNITED STATES PATENT NO. 8,444,696 PURSUANT TO 35 U.S.C. §§ 311–319, 37 C.F.R. § 42

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NuVasive, Inc. ("Petitioner") petitions for *Inter Partes* Review ("IPR") under 35 U.S.C. §§ 311–319 of claims 7-12 of the `696 patent, and below demonstrates there is a reasonable likelihood of prevailing ("RLP") in its validity challenge against at least one claim.

I. MANDATORY NOTICES UNDER 37 C.F.R § 42.8

A. Real Party-In-Interest Under 37 C.F.R. § 42.8(b)(1)

NuVasive, Inc. is the real party-in-interest for this Petition.

B. Related Matters Under 37 C.F.R. § 42.8(b)(2)

Petitioner is not aware of any reexamination certificate for the '696 patent; there is a certificate of correction. Petitioner is concurrently filing another IPR petition for claims 1-6 of the '696 patent. A parent patent (US 8,021,430) is engaged in *inter partes* reexamination in which all claims stand rejected in a Right of Appeal Notice. *See* NUVASIVE1110. The Patent Owner has asked the Court for permission to add the '696 patent in an ongoing patent lawsuit against the Petitioner (*Warsaw Orthopedic, Inc. et al. v. NuVasive, Inc.*, S.D. Cal., Case No. 3:12-cv-02738-CAB (MDD)), but the Patent Owner's request remains pending and the '696 patent has not yet been added to the lawsuit.

C. Lead And Back-Up Counsel Under 37 C.F.R. § 42.8(b)(3)

Petitioner provides the following designation of counsel.

LEAD COUNSEL	BACK-UP COUNSEL
Stephen R. Schaefer, Reg. No. 37,927 3200 RBC Plaza 60 South Sixth Street Minneapolis, MN 55402 Tel: 612-337-2508 / Fax: 612-288-9696	Michael T. Hawkins, Reg. No. 57,867 3200 RBC Plaza 60 South Sixth Street Minneapolis, MN 55402 Tel: 612-337-2569 / Fax: 612-288-9696

D. Service Information

Please address all correspondence and service to the address of both counsel listed above. Petitioner also consents to electronic service by email at APSI@fr.com (referencing No. 13958-0113IP2 and cc'ing schaefer@fr.com and hawkins@fr.com).

II. PAYMENT OF FEES – 37 C.F.R. § 42.103

Petitioner authorizes the Patent and Trademark Office to charge Deposit Account No. 06-1050 for the petition fee set in 37 C.F.R. § 42.15(a) and for any other required fees.

III. REQUIREMENTS FOR IPR UNDER 37 C.F.R. § 42.104

A. Grounds for Standing Under 37 C.F.R. § 42.104(a)

Petitioner certifies that the `696 patent is eligible for IPR and that Petitioner is not barred or estopped from requesting IPR.

B. Challenge Under 37 C.F.R. § 42.104(b) and Relief Requested

Petitioner requests IPR of claims 7-12 of the `696 patent on the grounds listed in the table below. In support, this Petition includes claim charts for each of these grounds and a supporting evidentiary declaration of Dr. John W. Brantigan, M.D. (NUVASIVE1001).

Ground	`696 Claims	Basis for Rejection
1	**7-8 and 10-11**	Obvious under § 103 by Tropiano in view of Michelson '247 and Brantigan '035
2	**9 and 12**	Obvious under § 103 by Tropiano in view of Michelson '247, Brantigan '035, and Beckers
3	**7-12**	Obvious under § 103 by Beckers in view of Michelson '247 and Brantigan '035
4	**7-12**	Obvious under § 103 by Steffee in view of Michelson '037 and Kim

Assuming entitlement to the earliest claimed priority, June 7, 1995, Beckers is prior art under at least §102(a), and Tropiano, Steffee and Kim qualify under at least §102(e); all other references above were published more than a year before the earliest priority and thus qualify under §102(b). Tropiano, Michelson '247, Beckers, Steffee, and Kim were of record in the original prosecution; Brantigan '035 and Michelson '037 were not. Although Patent Owner submitted, in an IDS after allowance, invalidity claim charts prepared by Petitioner (NUVASIVE1111), those claim chart grounds were significantly different from the grounds in this Petition and were not considered in light of the pertinent evidence submitted in this IPR.

C. Claim Construction under 37 C.F.R. §§ 42.104(b)(3)

Petitioner submits that, for purposes of this IPR, all claim terms should be given their plain meaning under the proper broadest reasonable construction standard, and provides the following specific constructions for terms where the plain meaning may not be not entirely clear. First, for purposes of this IPR, the phrase **"substantially flat"** in relation to the "**first side**" and the "**second side**" of the implant (claims 7 and 10) is interpreted to include sides that are either planar or outwardly bowed. *See* NUVASIVE1101 at ¶13. While the '696 patent discloses only implants with planar sides (*see* FIGS. 1-32), Patent Owner's infringement allegations against Petitioner's implants with outwardly bowed sides, as well as the non-quantified "substantially" modifier used in the claim, forces this construction. *See* NUVASIVE1112 at Ex. A, pp. 6-8; NUVASIVE1101 at ¶ 13. Second, the phrase "**upper and lower bearing surfaces … being convex along the <u>entire length of said upper and</u>**

lower bearing surfaces" (claims 1 and 4) does **not** require that the claimed convexity be present along the entire length of the implant (or in other words, from the implant's "trailing face" to its "insertion face"), although that configuration also is within the scope of the claims. Instead, the claimed convexity, as recited, need only be "along the entire length of **said upper and lower bearing surfaces.**" Indeed, both independent claims 7 and 10 define "a length" for the "upper and lower bearing surfaces" (*see* claim 7, col. 15:51-53), and separately define a different "length" for the overall implant that is "**between said trailing face and … said insertion face**" (see claim 7, col. 15: 24-25). In addition, claims 1 and 4 recite four more "bearing surfaces" – first, second, third and fourth bearing surfaces (also labeled in FIGS. 13-14) – that are on the end-parts of the implant, namely, on the "first terminal part" and the "second terminal part." As such, the claimed "upper and lower bearing surfaces" may include only the bearing surface portions that are entirely between the first and second terminal parts (i.e., including only the region between the two vertical lines in FIGS. 13-14).

IV. SUMMARY OF THE `696 PATENT

A. Brief Description

Spinal fusion implants like those described in the '696 patent were invented in the early 1980's. *See* NUVASIVE1101 at ¶¶ 6-7. Claims 7-12, the subject of this IPR, describe a spinal implant that is "adapted to be **inserted** . . . and then **rotated** ninety degrees into an upright position." The "insert-and-rotate" technique was well known before the '696 patent,

as evidenced by Tropiano, Beckers, and Steffee. *See also* NUVASIVE1101 at ¶ 11.

The two independent claims 7 and 10 at issue here have cobbled-together features not found in any one embodiment of the '696 patent. For example, claims 7 and 10 define upper and lower bearing surfaces that are "convex" (outwardly bowing), a feature present only in FIGS. 13-17. Other recited features are absent from FIGS. 13-17, and only present in implants with upper/lower bearing surfaces that are flat. For example, the claimed insertion tool engagement mechanism (i.e., the claimed "recessed portion"/"threaded opening") is only in the implants of FIGS. 18-29, and the claimed "ratchetings" are only in the implant of FIGS. 8-12. Patent Owner's picking and choosing features from different embodiments of the '696 patent and cobbling them together in a single claim indeed highlights the "design option well within the skill of the art" nature of the features included in the claims.

B. Summary of the Original Prosecution and *Inter Partes* Reexamination of the Related U.S. Patent No. 8,021,430

The relevant prosecution history begins with the immediate parent, the '430 patent, which attempted to broadly claim an implant design with "convex" upper and lower bearing surfaces, as shown in FIG. 14. The original examiner allowed the '430 claims over the cited art in a first action that gave no reasons for allowance, and was subject only to an obviousness-type double patenting rejection over an earlier family member. On Aug. 17, 2012, Patent Owner filed a lawsuit against Petitioner, alleging infringement of the '430 patent by Petitioner's implants that had been on the market five years before the '430 patent issued.

In response, Petitioner sought *inter partes* reexamination of the '430 patent, and, on

Nov. 29, 2012, the Central Reexamination Unit ("CRU") rejected all claims on seven separate and independent grounds, including four anticipation grounds based on prior art that was of record in the original prosecution and thus presumably considered by the original examiner. The Patent Owner responded on Feb. 19, 2013, abandoning its defense of the "convex" claims, and submitting narrowing amendments to include well-known implant features described in the prior art Michelson '037. The CRU issued an action closing prosecution ("ACP") and right of appeal notice ("RAN") rejecting the amended claims (and indeed all pending claims) as obvious over the "convex" implant prior art, in view of Michelson '037.

C. Summary of the Original Prosecution on the '696 Patent (Serial No. 13/225,998)

It was "déjà vu all over again" in the '696 patent's prosecution. Initially in the '696 prosecution, the Patent Owner advanced claims that, like the '430 patent, were directed to a "convex" implant design. On Dec. 7, 2012 (eight days after the CRU rejected the '430 "convex" claims), the '696 patent's examiner (the same examiner from the '430 patent's original prosecution) allowed the claims in a first action that was strikingly similar to the first action in the '430 patent prosecution; he allowed the claims giving no reasons for allowance, subject only to an obviousness-type double patenting obviousness rejection based on the '430 patent and another family member. Notably, the examiner at that time gave no indication he knew about the CRU's recent rejection of all of the '430 patent in the reexamination.

On Feb. 25, 2013, six days after the Patent Owner's extensive amendments in the '430 reexamination abandoning any defense of the original '430 "convex" claims, the Patent

Owner in the ‘696 prosecution amended the previously allowed claim 1 (which became issued claim 1), canceled claims 2-20, added new claims 21-38 (which became issued claims 2-19), and made further specification amendments. The claim amendments to the ‘696 claims kept the “convex” implant design, and, just as the Patent Owner had done in the ‘430 reexamination amendment, added various implant features that were all well known in the art (including in Michelson ‘037). At the same time, the Patent Owner filed a terminal disclaimer to overcome the obviousness-type double patenting rejection over the ‘430 claims, and submitted an IDS that provided copies of two papers from the ‘430 reexamination.

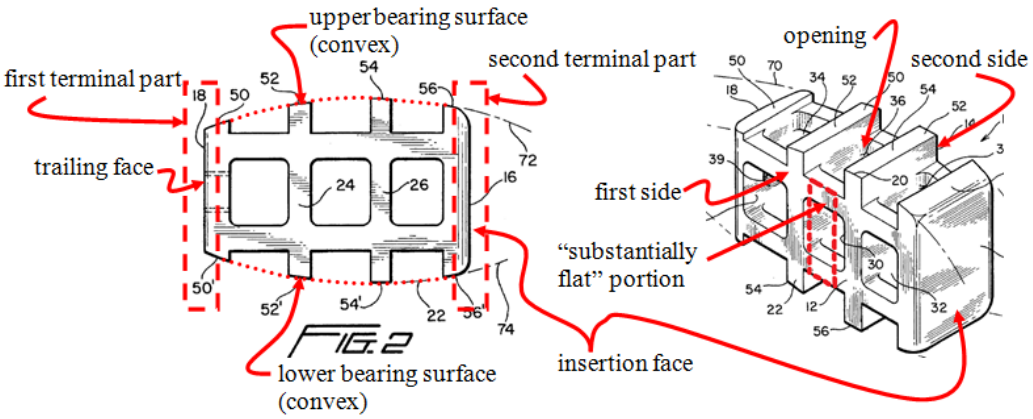
Thereafter, on March 27, 2013, the examiner allowed the ‘696 claims as amended (again providing no reasons for allowance), accepted the terminal disclaimer, and noted his consideration of the IDS that had included the ‘430 reexamination materials. Shortly thereafter (Apr. 5, 2013), the Patent Owner submitted another IDS, providing a copy of invalidity claim charts for the allowed ‘696 claims that the Petitioner had recently prepared. On Apr. 19, 2013, the examiner made an entry that the IDS had been considered, although made no substantive comment on these materials. On the next business day, the Patent Owner paid the issue fee. After that, on Apr. 30, 2013, the examiner made a brief comment on the record, stating, in effect, that the invalidity claim charts from the ‘430 patent reexamination were considered but not enough to pull this case from issue. Although the examiner made general reference to Patent Owner’s Feb. 25, 2013 claim amendments, he again provided no substantive reasons for allowance, and nothing in the record indicates what claim limita-

tions in the allowed claims were different from the prior art. The '696 issued thereafter.

V. THERE IS A REASONABLE LIKELIHOOD THAT AT LEAST ONE CLAIM OF THE `696 PATENT IS UNPATENTABLE

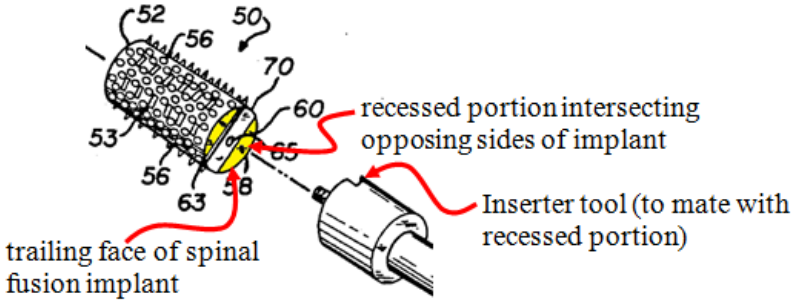
As detailed below and in the following claim charts, three different obviousness grounds (1, 3 and 4) show that independent claims 7 and 10 are unpatentable, and merely a combination of "prior art elements according to known methods to yield predictable results" and/or the "[u]se of known technique[s] to improve similar devices . . . in the same way." MPEP § 2143(A) and (C). These three obviousness grounds are not cumulative, but instead all rely upon different primary references that individually disclose unique benefits to the patient, the practitioner, or both. Here, there is a reasonable likelihood that at least one claim of the '696 patent is unpatentable.

Referring to Ground 1 (charted below), Tropiano discloses an implant having "an arcuate structure that will stabilize the adjacent vertebrae" and that has openings to "contain a large amount of bone graft." NUVASIVE1104 at 2:22-42; 3:45-50; FIGS. 1-3. Tropiano discloses nearly all of the implant structures recited in claims 7 and 10, including the claimed "first terminal part," "second terminal part," "first side and an opposite second side" with "insert" and "rotate" capability, the "opening . . . for the growth of bone," and "upper and lower bearing surfaces" with the required "converging angular relationship [wedge shape]":



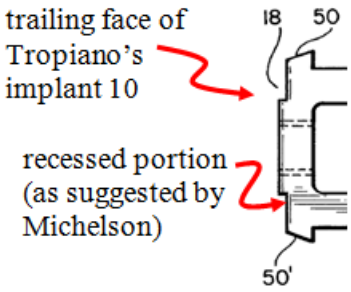
Id. at FIGS. 1-3; *see also* cols. 3-4; NUVASIVE1101 at ¶¶ 16-19 & 22-25.

To the extent Tropiano does not describe the claimed features of (i) a "trailing face having a recessed portion intersecting each of said first and second sides," or (ii) "ratchetings on each of said upper and lower bearing surfaces," such traditional structures were widely known in similar spinal implants. For example, regarding the "recessed portion," Michelson '247 describes a similar spinal fusion implant and plainly teaches the well-known option for equipping spinal fusion implants with a recessed portion in the trailing face so as to mate with an inserter tool:

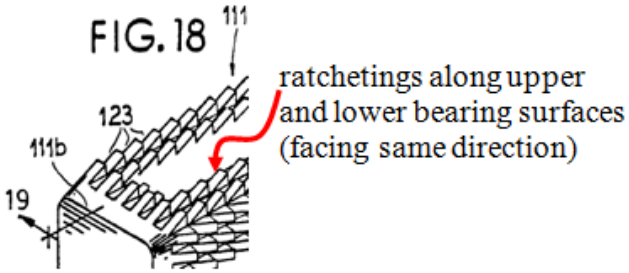


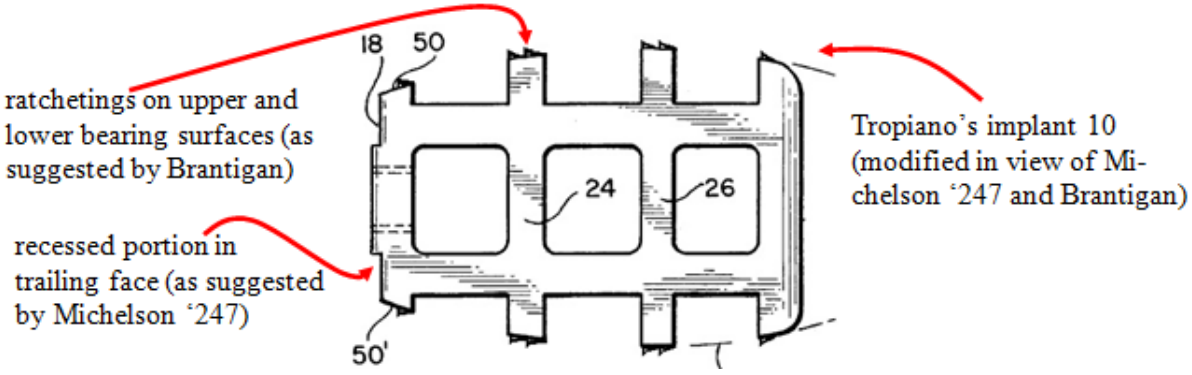
NUVASIVE1105 at FIG. 4; col. 8:52 to col. 9:3; 10:15-17. As described in the charts below, a skilled artisan would have been prompted to modify Tropiano's spinal fusion implant to include this ordinary design option taught by Michelson '247 so as to achieve the known

advantages (described below) associated with such mating structures. NUVASIVE1104 at FIG. 3 (modified at right to include a traditional option suggested by Michelson '247); *see also* NUVASIVE1101 at ¶¶ 20-21.



Regarding the "ratchetings," Brantigan '035 also describes a similar spinal fusion implant and illustrates the well-known option for equipping spinal fusion implants with "ratchetings" on the upper and lower bearing surfaces. NUVASIVE1106 at FIGS. 18-19 (FIG. 18 shown at right); pp. 19-21. As described in the charts below, a person of ordinary skill in the art would have been prompted to modify the combination of Tropiano and Michelson '247 to include this conventional design option taught by Brantigan '035 so as to achieve the known advantages (expressly detailed below) associated with such ratchetings:

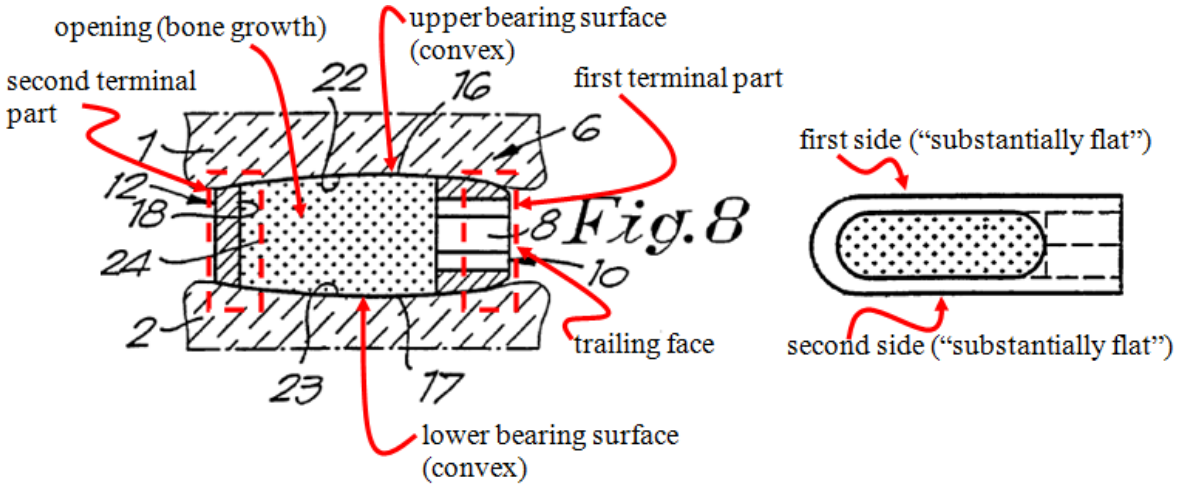




NUVASIVE1104 at FIG. 3 (modified above to include traditional options suggested by Michelson '247 and Brantigan '035); *see also* NUVASIVE1101 at ¶¶ 26-27. As such, there is

a reasonable likelihood that independent claims 7 and 10 of the `696 patent are unpatentable based upon Tropiano in view of Michelson '247 and Brantigan '035.

Referring to Ground 3 (charted below), Beckers also discloses nearly all limitations of independent claims 7 and 10. For example, Beckers discloses "an implant for the intervertebral space," which is intended to be "filled with bone graft material 24." *See* NUVASIVE1107 at pp. 2 and 10-11; FIG. 8. Becker's implant 6 provides the claimed "first terminal part," "second terminal part," "first side and an opposite second side," "opening . . . to permit for the growth of bone," and "upper and lower bearing surfaces":



Id. at FIGS. 7-8; NUVASIVE1101 at ¶¶ 31-33 & 36-38.

To the extent Beckers does not expressly describe the claimed features of (i) the trailing face having "a recessed portion intersecting each of said first and second sides," or (ii) the "ratchetings" (even though Beckers arguably discloses "ratchetings"), such traditional structures were widely known in conventional spinal implants. Again, as discussed above, these features are taught by Michelson '247 and Brantigan '035. As described in the charts

below, a skilled artisan would have been prompted to modify the combination of Beckers to include the conventional design options taught by Michelson '247 ("recessed portion" for inserter tool) and Brantigan '035 ("ratchetings") so as to achieve the known advantages (detailed below) associated with such structures:

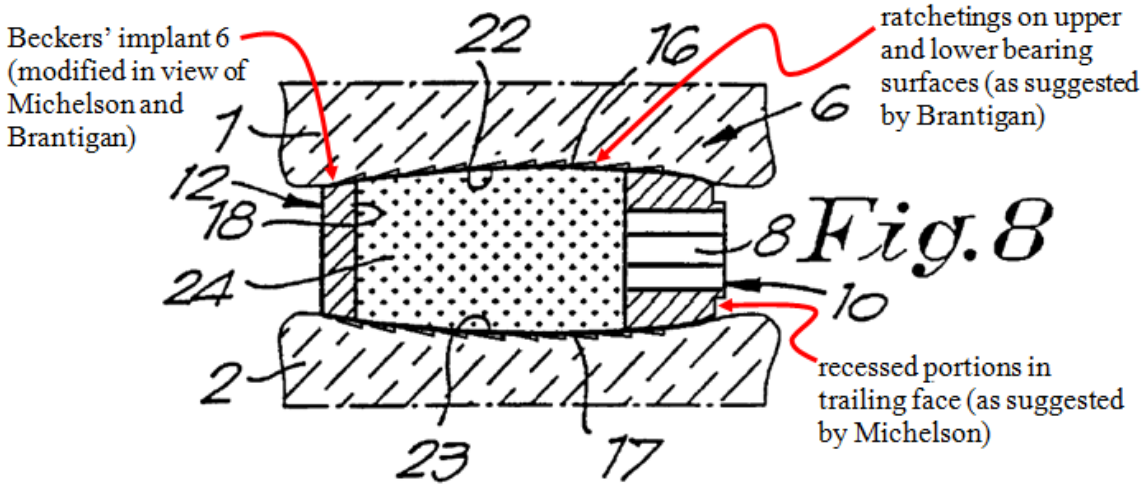
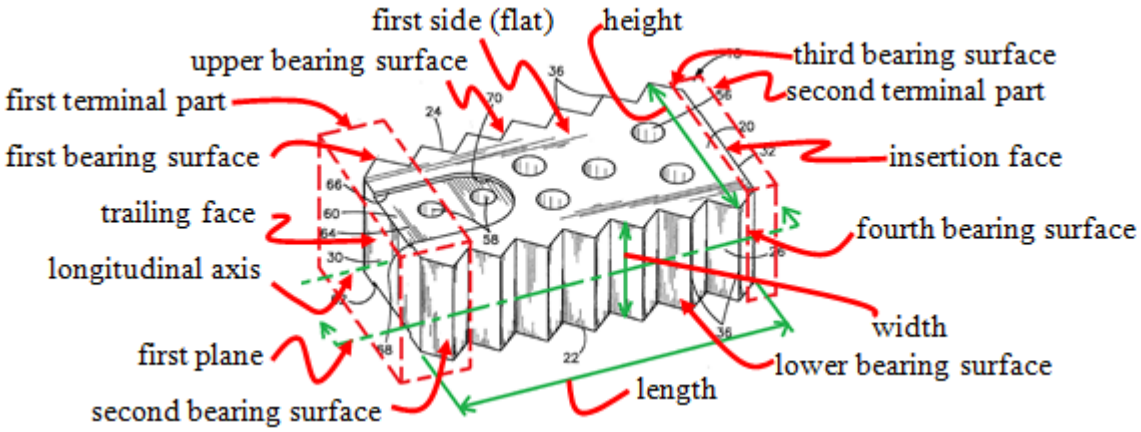


Fig. 8

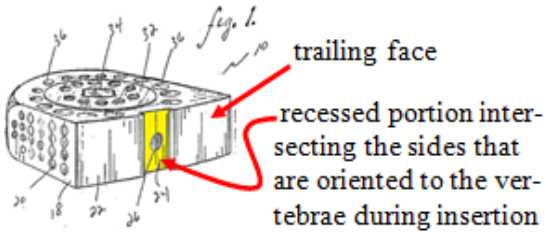
NUVASIVE1107 at FIG. 8 (modified above to include traditional options suggested by Michelson '247 and Brantigan); *see also* NUVASIVE1101 at ¶¶ 34-35 & 39-40. As such, there is a reasonable likelihood that claims 7 and 10 of the '696 patent are unpatentable based upon Beckers in view of Michelson '247 and Brantigan '035.

Referring to Ground 4 (charted below), Steffee also discloses or suggests nearly all limitations of independent claims 7 and 10. For example, Steffee's "insert-and-rotate" implant provides the claimed "first terminal part," "second terminal part," "first side and an opposite second side," "opening . . . to permit for the growth of bone," "upper and lower bearing surfaces . . . disposed in a converging angular relationship," and "ratchetings":



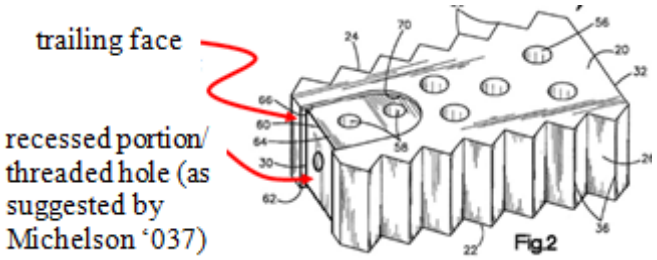
See NUVASIVE1108 at FIG. 2; NUVASIVE1101 at ¶¶ 41-44 & 47.

To the extent Steffee does not expressly describe the claimed features of (i) the "trailing face having a recessed portion intersecting each of said first and second sides," or (ii) the upper and lower bearing surfaces being "convex," such traditional structures were widely known in the prior art. For example, Michelson '037 describes a similar spinal fusion implant and teaches the traditional design choice for equipping the implant with a "recessed portion" 24 in the trailing face so as to mate with an inserter tool. NUVASIVE1109 at p. 11; FIGS. 1 and 5 (at right, also showing the traditional option for bone growth openings through the bearings surfaces).

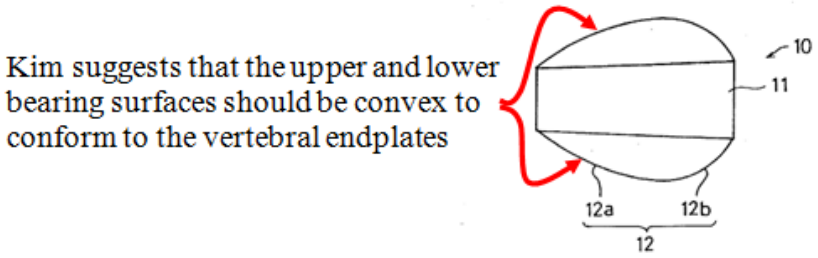


As described in the charts below, a person of ordinary skill in the art would have been prompted to modify the combination of Steffee to include this conventional design options taught by Michelson '037 ("recessed portion" for inserter tool) so as to achieve the known advantages (expressly detailed below) associated with such structures. NUVA-

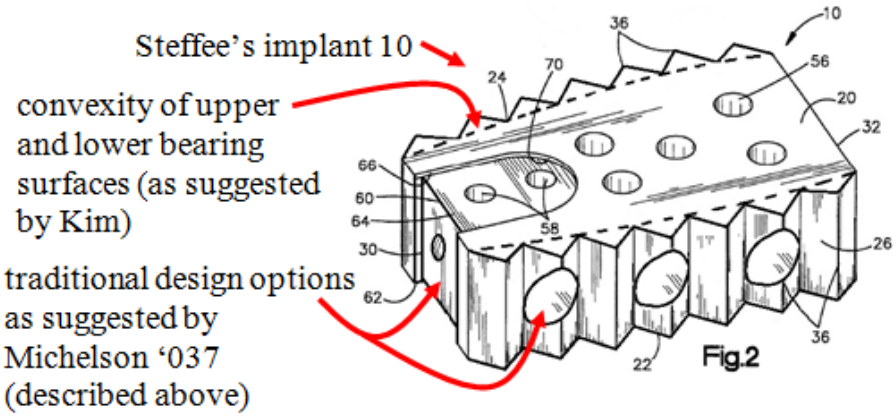
SIVE1101 at ¶¶ 45-46. Here, a skilled artisan would recognize that Michelson '037 suggests the recessed portion intersects the particular sides that face toward the vertebrae during the insertion step, so the resulting combination of Steffee in view of Michelson '037 would likewise provide such an orientation for the recessed portion (also suggested by the orientation of Steffee's inserter tool). NUVASIVE1101 at ¶ 46; NUVASIVE1108 at FIG. 2 (modified at right to show the recessed portion/ hole suggested by Michelson '037).



Regarding the claim "convex" upper and lower bearing surfaces, the prior art includes numerous teachings that it was a common design option for bearing surfaces to be "convex" as claimed. *See* NUVASIVE1101 at ¶ 10. For example, Kim discloses the known configuration in which the upper and lower bearings surfaces are "convex" so as to correspond with the "concave contact surfaces" of the vertebrae. NUVASIVE1110 at 2:28-37; 5:61; FIGS. 4 and 2 (below).

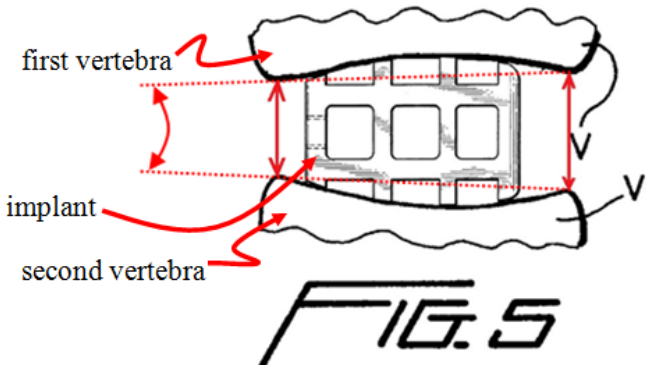


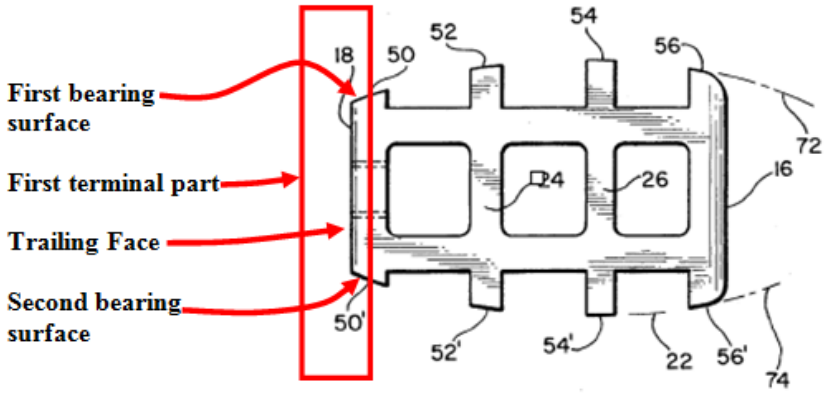
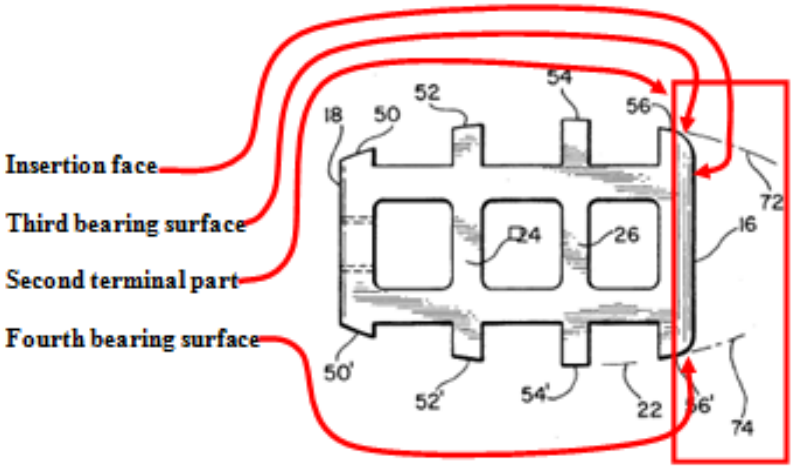
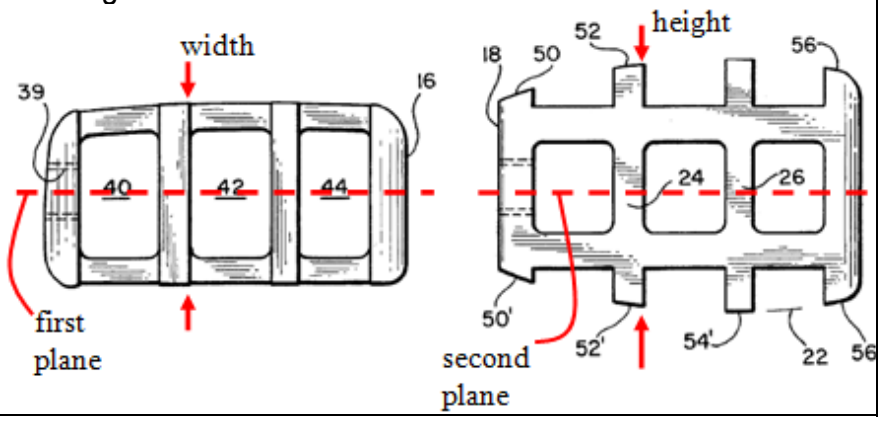
A skilled artisan would have been prompted to modify Steffee's implant 10 to provide a convex curvature along the length of the upper and lower bearing surfaces (suggested by Kim) for the specific advantages described by Kim (detailed below) and known in the prior art:

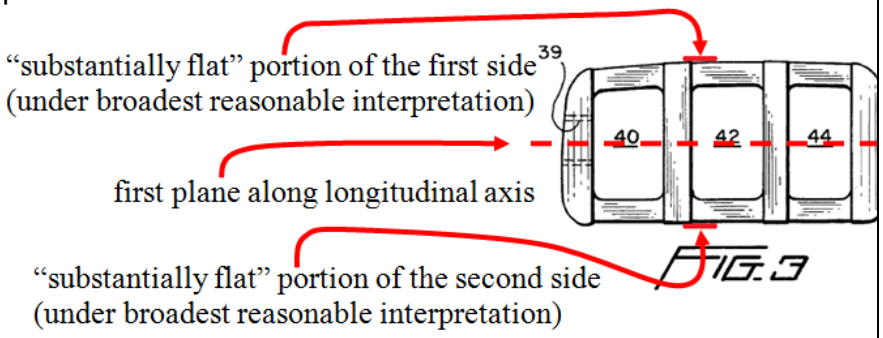


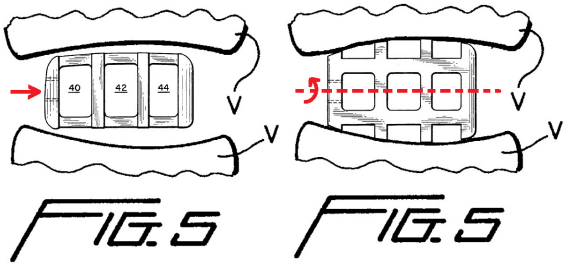
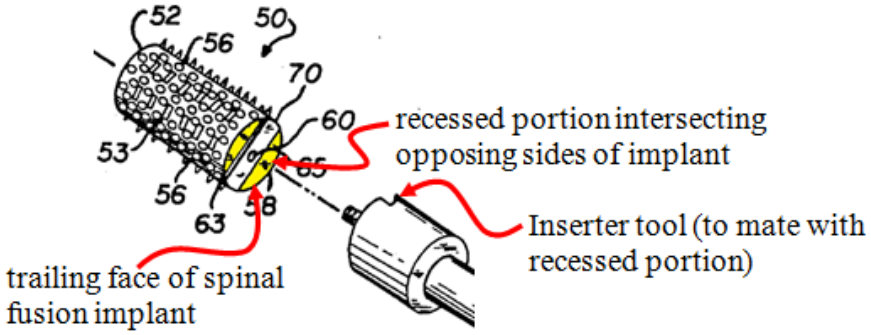
NUVASIVE1108 at FIG. 2 (modified in view of Michelson '037 (described above) and furthermore to show the convexity of the upper and lower bearing surfaces as suggested by Kim); *see also* NUVASIVE1101 at ¶¶ 49-50. As such, there is a reasonable likelihood that independent claims 7 and 10 of the '696 patent are unpatentable based upon Steffee in view of Michelson '037 and Kim.

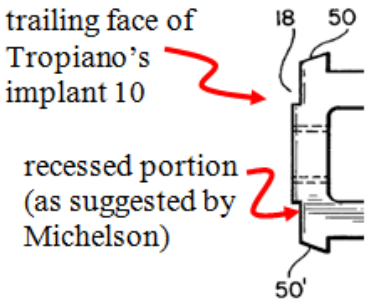
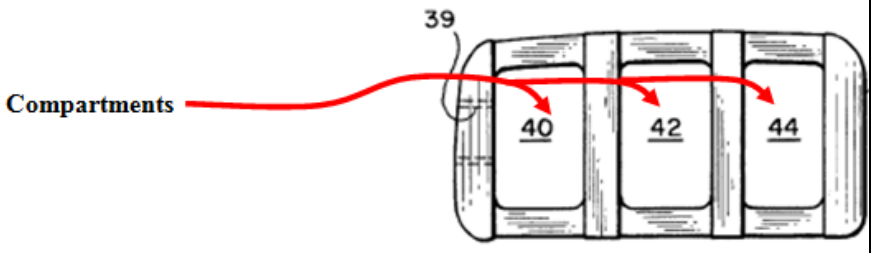
VI. [GROUND 1 CLAIM CHARTS] – Obviousness of Claims 7-8 and 10-11 under §103 by Tropiano in view of Michelson '247 and Brantigan '035

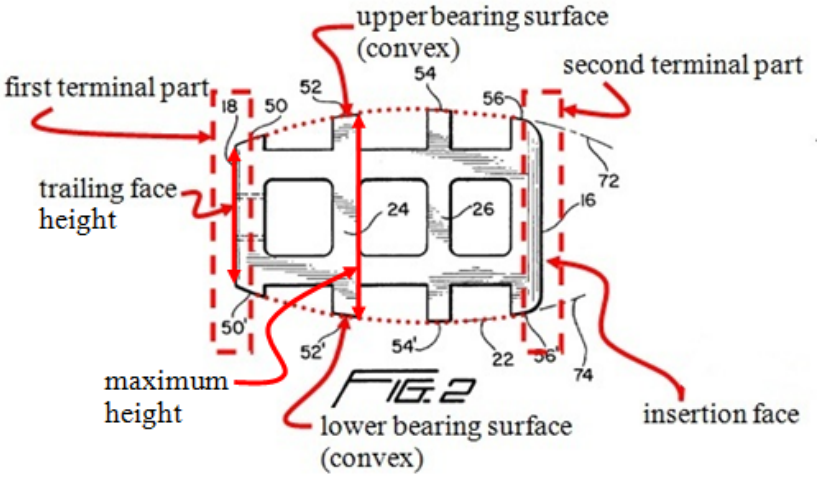
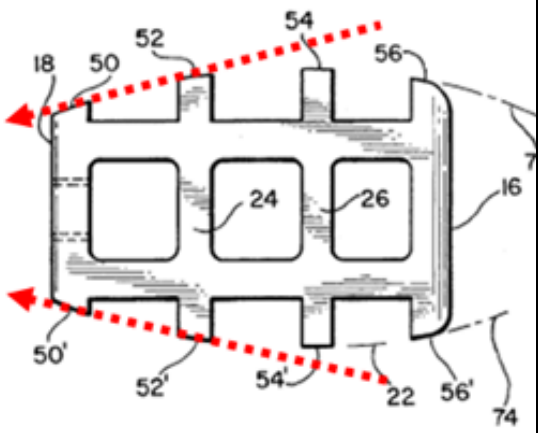
U.S. Pat. 8,444,696	Tropiano in view of Michelson '247 and Brantigan '035
7. A lordotic spinal fusion implant for insertion between a first vertebra and a second vertebra adjacent the first vertebra, the first vertebra having a generally vertically extending first peripheral wall and a first end plate and the second vertebra having a generally vertically extending second peripheral wall and a second endplate, wherein the implant comprises:	Tropiano discloses a lordotic spinal fusion implant for insertion between first and second vertebrae as recited in the preamble. For example, Tropiano discloses an implant design to provide "fusion between adjacent vertebrae" that is "open enough to contain a large amount of bone graft." NUVASIVE1104 at col. 2:32-38; cols. 3-4; Abstract.  FIG. 5 *Id.* at FIG. 5 (modified to show the implant of FIG. 2). *See also*

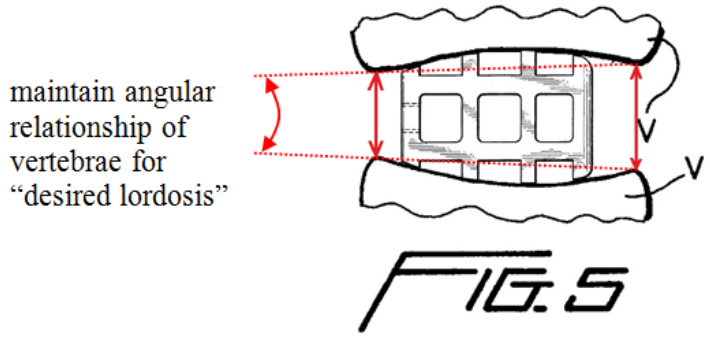
	generally NUVASIVE1101 at ¶¶ 16-27.
a first terminal part defining a trailing face, a first bearing surface adapted to bear against a portion of the first end plate, and an opposite second bearing surface adapted to bear against a portion of the second end plate, said trailing face extending between said first bearing surface and second bearing surface;	Tropiano discloses the claimed first terminal part.  *Id.* at FIG. 2
a second terminal part opposite said first terminal part, said second terminal part having an insertion face extending between a third bearing surface and a fourth bearing surface,	Tropiano discloses the claimed second terminal part.  *Id.* at FIG. 2.
said implant having a longitudinal axis extending through said trailing face of said first terminal part and said insertion face of said second terminal part, and having a cross section in a first plane extending through said first bearing surface and said second bearing surface, and along the longitudinal	Tropiano's implant provides these claimed features, including the longitudinal axis, first plane, second plane, length, width, and height. 

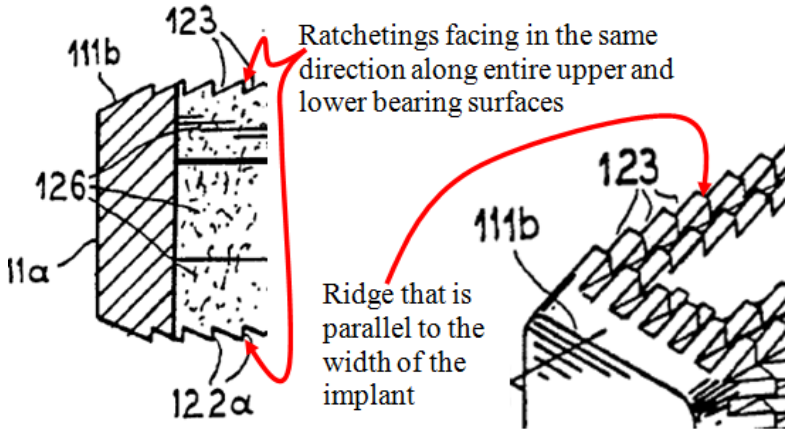
axis, said implant having a length between said trailing face of said first terminal part and said insertion face of said second terminal part and parallel to the longitudinal axis, said implant having a width and a height each perpendicular to the length of said implant;	*Id.* at FIGS. 2-3 (illustrating the implant 10 having the claimed length, width, and height limitations).
a first side and an opposite second side, said first side and said second side extending from said first terminal part to said second terminal part, portions of said first side and said second side being substantially flat, said substantially flat portions intersecting a second plane that is perpendicular to the first plane and extends through said insertion face and said trailing face, wherein said substantially flat portions of said first side and said second side are symmetrical about the first plane,	Under the broadest reasonable interpretation standard for "substantially flat," Tropiano's sides 12 and 14 each include substantially flat portions (examples shown below in FIG. 3) that intersect a second plane (illustrated above in depiction of Tropiano's FIG. 2) and that are symmetrical about the first plane.  FIG. 3 *Id.* at FIG. 3; *see also* FIG. 1.
said implant being adapted to be inserted between the first vertebra and the second vertebra with said first side and said second side of said implant being oriented toward the first end plate and the second end plate,	According to the broadest reasonable interpretation of "adapted to," Tropiano discloses an implant structure (implant 10) that is capable of being inserted with the first side and the second side of the implant being oriented toward the first and second end plates, and then rotated ninety degrees into an upright position. *See* MPEP §§ 2114. For example, Tropiano's implant 10 has the same structural features as the insert-and-rotate embodiments in the '696 patents in that the width of the implant 10 is substantially less than the height of the implant 10 (as shown

respectively, and then rotated ninety degrees into an upright position,	by FIGS. 2-3) and that the implant 10 is configured to be oriented in a final upright position in the disc space (as shown in FIG. 4). Thus, as illustrated below, Tropiano's implant provides the claimed structure and furthermore has the capability to be inserted with the first and second sides being oriented toward the first and second end plates, and then rotated ninety degrees into final upright position  FIG. 5 FIG. 5 NUVASIVE1104 at FIG. 5 (modified to shown the view of the implant from FIG. 3 (at left) and the view of the implant 10 from FIG. 2 (at right)).
said trailing face having a recessed portion intersecting each of said first and second sides and being configured to receive an insertion instrument for inserting said implant between the first vertebra and the second vertebra;	To the extent that Tropiano does not expressly disclose the trailing face having a recessed portion "intersecting each of said first and second sides and being configured to receive an insertion instrument for inserting said implant between the first vertebra and the second vertebra," such a configuration was traditionally employed in prior art spinal implants, as evidenced by the Michelson '247 reference. Michelson '247 discusses a spinal implant 50 as shown in FIGS. 4 and 4A-D that includes a driver engaging element 70 comprising "a raised rectangular portion 63 and a central threaded opening 65, for engaging the driver apparatus, shown in FIG. 4c and FIG. 4d." NUVASIVE1105 at 8:52-61. 

	Id. at FIG. 4. A person of ordinary skill in the art would have been prompted to modify Tropiano's implant so that the implant includes recessed portions along the trailing face of the implant (example illustrated at right) so that the insertion and removal tool "locks onto the implant" and allows for greater mechanical advantage during manipulation and installation of the implant. *Id.* at 9:1-3 & 10:15-17. Additionally, a skilled artisan would have been prompted to modify Tropiano's implant so that the implant includes recessed portions along the trailing face of the implant (in addition to Tropiano's threaded opening 39) so that a surgeon could readily engage/disengage a threaded tool into the central threaded opening 39 while maintaining the orientation of the implant (with the portion of the inserter tool that mates with the recessed portions). See NUVASIVE1101 at ¶¶ 20-21. Finally, a skilled artisan would have been prompted to modify Tropiano's implant to include recessed portions in the trailing face because to do so would be merely "[u]se of known technique to improve similar devices . . . in the same way." MPEP § 2143(C). 
an opening between said trailing face and said insertion face and between said first and second sides to permit for the growth of bone through said implant from the first vertebra to the second vertebra;	Tropiano discloses these claim features. For example, Tropiano discloses that "[p]artitions or struts 24 and 26 divide the cage 10 into three compartments; namely, 40, 42 and 44." NUVASIVE11014 at 3:39-40. Stated another way, the surfaces are formed with large openings so that maximum bone graft material can be received and placed in contact with graft material outside the cage." *Id.* at 2:50-54.  NUVASIVE1104 at FIG. 3
upper and lower bearing each surfaces having a length measured parallel	Tropiano discloses these claim features.

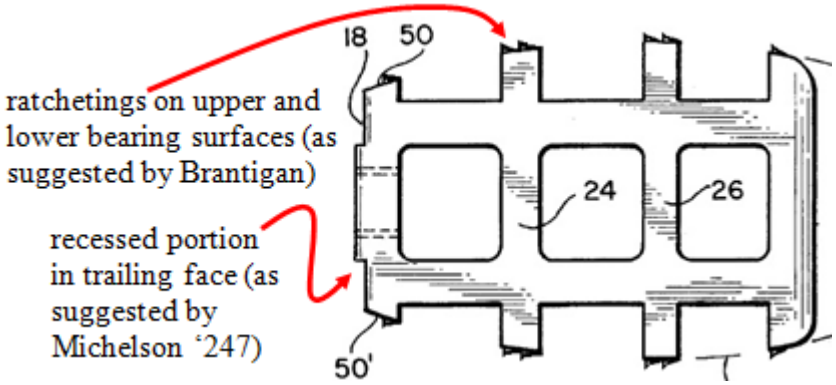
to the longitudinal axis of said implant, said upper and lower bearing surfaces having portions proximate each of said first and second sides and being convex along the entire length of said upper and lower bearing surfaces relative to the second plane and in a direction parallel to the longitudinal axis, said trailing face having a height less than and measured parallel to a maximum height measured between said upper and lower bearing surfaces proximate one of said first and second sides,	 FIG. 2 *Id.* at FIG. 2. (*See also* the analysis dependent claim 9 (Ground 2) in which the "convex portions of said . . . bearing surfaces are convex along a continuous uninterrupted majority of the lengths of said . . . bearing surfaces.")
said upper and lower bearing surfaces being disposed in a converging angular relationship toward each other such that said implant appears wedge-shaped from a side view, the converging angular relationship of said upper and lower bearing surfaces maintaining the first vertebra and the second vertebra adjacent to said upper and lower bearing surfaces in an angular relationship to maintain the desired lordosis between the first vertebra and the second vertebra;	To the extent the unclear phrase "appears wedge-shaped" can be understood, Tropiano discloses that the upper and lower bearing surfaces are disposed in a converging angular relationship toward each other such that said implant "appears wedge-shaped" (under a broadest reasonable interpretation standard) from a side view. **Upper and lower bearing surfaces being disposed in a converging angular relationship toward each other such that the implant appears wedge-shaped from a side view**  *Id.* at FIG. 2. Also, to the extent the unclear phrase "desired lordosis" can be understood, Tropiano discloses that the converging angular relationship of the upper and lower bearing surfaces (shown above) is configured to maintain the first and se-

	cond vertebrae in an angular relationship to maintain the "desired lordosis" (under a broadest reasonable interpretation standard).  FIG. 5 *Id.* at FIG. 5 (modified to show the implant 10 of FIG. 2 in the final upright orientation); *see also* 2:38-42 (teaching that the implant has an "arcuate structure that will stabilize the adjacent vertebrae. This structure will cause these generally concave surfaces to better mate with the generally convex surfaces of the adjacent vertebral surfaces"). One of skill in the art at the time of Tropiano's disclosure would have understood the wedge-shaped form of Tropiano's implant 10 as providing an angular relationship to maintain the "desired lordosis" between the first and second vertebrae because implant 10 should be a "better mate" with the adjacent vertebral structures. NUVASIVE1101 at ¶¶ 16 & 25.
ratchetings on each of said upper and lower bearing surfaces adapted to engage the first vertebra and the second vertebra, respectively, each of said ratchetings having a ridge oriented in a direction generally parallel to the width of said implant, said ratchetings on each of said upper and lower bearing surfaces facing one direction; and	To the extent that Tropiano does not expressly describe the claimed ratchetings, this feature was traditionally employed in prior art spinal fusion implants. For example, Brantigan '035 describes the well-known design option for spinal fusion implants in which the bearing surfaces of the implant have "a pattern of raised annular nubs." NUVASIVE1106 at FIGS. 18-19; 19:25 to 20:3; 20:30-33, & 21:1-5. Brantigan '035 expressly teaches that these projections 122 can be in the form of ratchetings having a triangular cross-sectional shape oriented toward the same direction (e.g., oriented toward the trailing face):

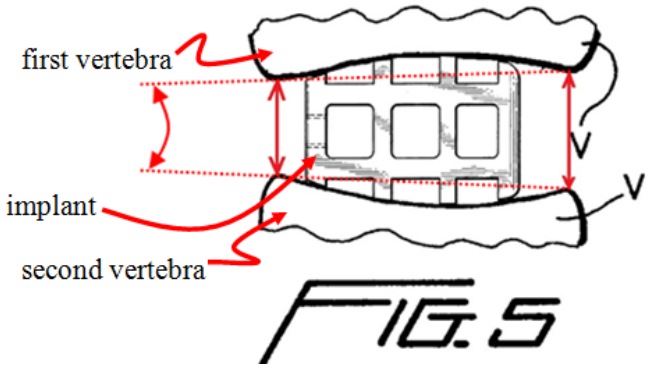


Id. at FIG. 19(above left). Further, each of these projections 122 includes a ridge that is "generally parallel" to the width of the implant. *Id.* at FIG. 18 (above right). Brantigan '035 explains that these traditional ratchetings on the upper and lower bearing surfaces "will accommodate the forward moving" of the implant during insertion and "will prevent retraction" of the implant after full insertion. *Id.* at 20:30 to 21:3.

One having ordinary skill in the art would have been prompted to modify Tropiano's implant to include the ratcheting projections on the upper and lower bearing surfaces (as suggested by Brantigan) so that the implant can resist retraction and thus "once the plugs are seated in the proper position, they will not shift from this position". *Id.* at 21:1-5. Here, a skilled artisan would have readily understood that the size/orientation angle of the ratchetings of the resulting implant would be selected to permit the implant to "provide stability between adjacent vertebrae" (NUVASIVE1104 at 2:44-45) while also improving Tropiano's objective for an "apparatus which will aid in fixing appropriate elements in place" (*id.* at 2:48-49):

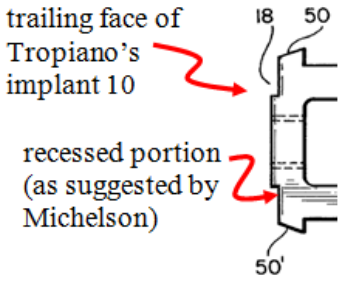


NUVASIVE1101 at ¶¶ 26-27; NUVASIVE1104 at FIG. 2 (modi-

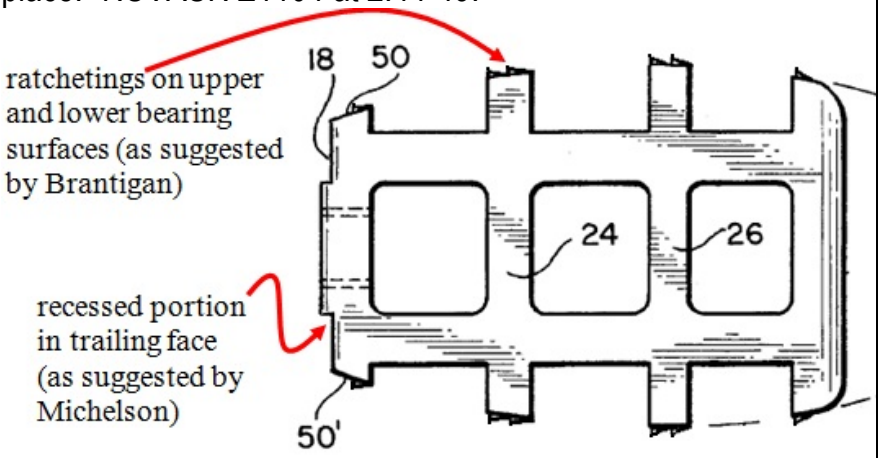
	fied above to include traditional options suggested by Michelson '247 and Brantigan). Also, a skilled artisan would have been prompted to modify Tropiano's implant to include ratchetings because to do so would be merely "[u]se of known technique to improve similar devices . . . in the same way." MPEP § 2143(C).
said implant being adapted to hold bone fusion promoting materials.	As discussed above, Tropiano discloses that the upper and lower surfaces "are formed with large openings so that maximum bone graft material can be received and placed in contact with graft material outside the cage." NUVASIVE1104 at 2:50-54; FIGS. 1 and 3.
8. The implant of claim 7, wherein said implant has a plurality of openings between said trailing face and said insertion face and between said first and second sides to permit for the growth of bone through said implant from the first vertebra to the second vertebra.	As discussed above, Tropiano discloses that the implant 10 has a plurality of openings 40, 42, and 44 (FIG. 3) through the implant 10. *Id.* at FIGS. 1 and 3; 2:50-54.
10. A spinal fusion implant for insertion between a first vertebra and a second vertebra adjacent the first vertebra, the first vertebra having a generally vertically extending first peripheral wall and a first end plate and the second vertebra having a generally vertically extending second peripheral wall and a second endplate, wherein the implant comprises:	As previously described (see analysis of the preamble in claim 7), Tropiano discloses a spinal infusion implant for insertion between a first vertebra and a second vertebra adjacent the first vertebra as recited in this claim. *Id.* at Abstract; FIG. 5 (shown below, modified to include the implant of FIG. 2); FIG. 1.  FIG. 5 *See also generally* NUVASIVE1101 at ¶¶ 16-27.
a first terminal part defining a trailing face, a first bearing surface adapted	As previously described (see analysis of this same element in claim 7), Tropiano discloses that the implant comprises a first terminal part defining a trailing face, a first bearing surface

to bear against a portion of the first endplate, and an opposite second bearing surface adapted to bear against a portion of the second endplate, said trailing face extending between said first bearing surface and second bearing surface;	adapted to bear against a portion of the first endplate, and an opposite second bearing surface adapted to bear against a portion of the second endplate. *Id.* at FIG. 2 (reproduced above in the analysis of claim 7).
a second terminal part opposite said first terminal part, said second terminal part having an insertion face extending between a third bearing surface and a fourth bearing surface,	As previously described (see analysis of this same element in claim 7), Tropiano discloses that the implant comprises a second terminal part opposite the first terminal part, the second terminal part having an insertion face extending between a third bearing surface and a fourth bearing surface. *Id.* at FIG. 2 (reproduced above in the analysis of claim 7).
said implant having a longitudinal axis extending through said trailing face of said first terminal part and said insertion face of said second terminal part, and having a cross section in a first plane extending through said first bearing surface and said second bearing surface, and along the longitudinal axis, said implant having a length between said trailing face of said first terminal part and said insertion face of said second terminal part and parallel to the longitudinal axis, said implant having a width and a height each perpendicular to the length of said implant;	As previously described (see analysis of this same element in claim 7), Tropiano discloses that the implant 10 provides these claimed features, including the longitudinal axis, first plane, second plane, length, width, and height. *Id.* at FIGS. 2-3 (reproduced above in the analysis of claim 7).

a first side and an opposite second side, said first side and said second side extending from said first terminal part to said second terminal part, portions of said first side and said second side being substantially flat, said substantially flat portions intersecting a second plane that is perpendicular to the first plane and extends through said insertion face and said trailing face, wherein said substantially flat portions of said first side and said second side are symmetrical about the first plane,	As previously described (see analysis of this same element in claim 7), Tropiano's sides 12 and 14 each include "substantially flat" portions (under the broadest reasonable interpretation standard) that intersect a second plane that is perpendicular to the first plane. *Id.* at FIG. 3 (reproduced above in the analysis of claim 7, and showing examples of "substantially flat" portions that are symmetrical about the first plane); FIG. 2 (reproduced above in the analysis of claim 7 to show the location of the second plane).
said implant being adapted to be inserted between the first vertebra and the second vertebra with said first side and said second side of said implant being oriented toward the first end plate and the second endplate, respectively, and then rotated ninety degrees into an upright position,	As previously described (see analysis of this same element in claim 7), according to the broadest reasonable interpretation of "adapted to," Tropiano discloses an implant 10 that provides a structure that is capable of being inserted with the first side and the second side of the implant being oriented toward the first and second end plates, and then rotated ninety degrees into an upright position. *See* MPEP §§ 2114; 2111.04. NUVASIVE1104 at FIG. 5 (reproduced above in the analysis of claim 7, and modified to show the view of the implant from FIG. 3 and the view of the implant 10 from FIG. 2); *see also* NUVASIVE1101 at ¶ 19.
said trailing face having a recessed portion intersecting each of said first and second sides and being configured to receive an insertion instrument for inserting said implant between the first vertebra	As previously described (see analysis of this same element in claim 7), to the extent that Tropiano's implant structure does not include a trailing face having a recessed portion intersecting each of the first and second sides and configured to receive an insertion instrument, such a design choice was well known in similar prior art spinal fusion implants. For example, Michelson '247 discusses a spinal implant 50 as shown in FIGS. 4 and 4A-D that includes a cap 52 with a driver engaging element

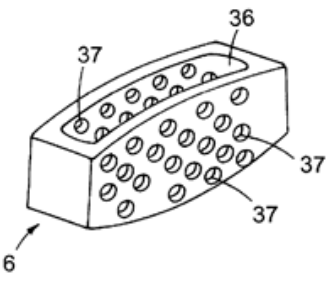
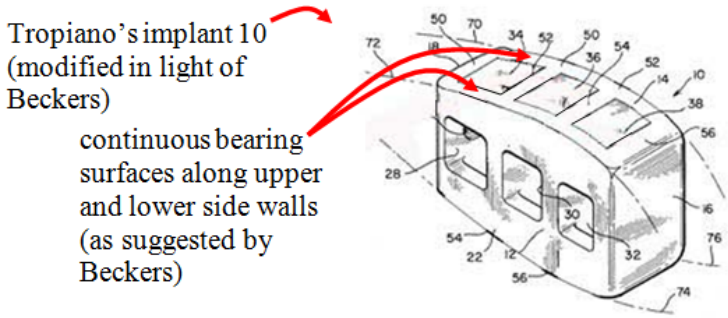
and the second vertebra;	70 comprising "a raised rectangular portion 63 and a central threaded opening 65, for engaging the driver apparatus, shown in FIG. 4c and FIG. 4d." NUVASIVE1105 at 8:52-61; FIG. 4 (showing two recessed portions in the trailing face so as to mate with the insertion instrument). A person of ordinary skill in the art would have been prompted to modify Tropiano's implant so that the implant includes recessed portions along the trailing face of the implant (example illustrated at right) so that the insertion and removal tool "locks onto the implant" and allows for greater mechanical advantage during manipulation and installation of the implant. *Id.* at 9:1-3 & 10:15-17. Additionally, a skilled artisan would have been prompted to modify Tropiano's implant so that the implant includes recessed portions along the trailing face of the implant (in addition to Tropiano's threaded opening 39) so that a surgeon could readily engage/disengage a threaded tool into the central threaded opening 39 while maintaining the orientation of the implant (with the portion of the inserter tool that mates with the recessed portions). See NUVASIVE1101 at ¶¶ 20-21. Finally, a skilled artisan would have been prompted to modify Tropiano's implant to include recessed portions in the trailing face because to do so would be merely "[u]se of known technique to improve similar devices . . . in the same way." MPEP § 2143(C). 
an opening between said trailing face and said insertion face and between said first and second sides to permit for the growth of bone through said implant from the first vertebra to the second vertebra;	As previously described (see analysis of this same element in claim 7), Tropiano's implant 10 includes an opening between the trailing face and the insertion face and between the first and second sides to permit for the growth of bone through the implant. NUVASIVE1104 at FIG. 3 (showing openings 40, 42 and 44); 3:39-40; 2:50-54.
upper and lower bearing surfaces each having a length measured parallel to the longitudinal axis of	As previously described (see analysis of the "upper and lower bearing surfaces" recitation in claim 7), Tropiano's implant 10 includes portions of the upper and lower bearings surfaces that are proximate each of the first and second sides and convex

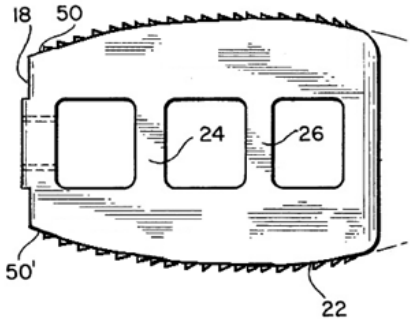
said implant, said upper and lower bearing surfaces having portions proximate each of said first and second sides and being convex along the entire length of said upper and lower bearing surfaces relative to the second plane and in a direction parallel to the longitudinal axis, said trailing face having a height less than and measured parallel to a maximum height measured between said upper and lower bearing surfaces proximate one of said first and second sides;	along the entire length of the upper and lower bearing surfaces. *Id.* at FIG. 2 (reproduced above in the analysis of claim 7, and showing the convexity of the upper and lower bearing surfaces such that the maximum height is greater than the height of the trailing face). (*See also* the analysis of dependent claim 12 (Ground 2) in which the "convex portions of said . . . bearing surfaces are convex along a continuous uninterrupted majority of the lengths of said . . . bearing surfaces.")
ratchetings on each of said upper and lower bearing surfaces adapted to engage the first vertebra and the second vertebra, respectively, each of said ratchetings having a ridge oriented in a direction generally parallel to the width of said implant, said ratchetings on each of said upper and lower bearing surfaces facing one direction; and	As previously described (see analysis of this same element in claim 7), to the extent that Tropiano does not expressly describe the claimed ratchetings, this feature was traditionally employed in prior art spinal fusion implants. For example, Brantigan '035 describes the well-known design option for spinal fusion implants in which the bearing surfaces of the implant have "a pattern of raised annular nubs." *See* NUVASIVE1106 at FIGS. 18-19; 19:25 to 20:3; 20:30-33, & 21:1-5. Brantigan '035 expressly teaches that these projections 122 can be in the form of ratchetings having a triangular cross-sectional shape oriented toward the same direction (e.g., oriented toward the trailing face). *Id.* at FIG. 19 (reproduced above in the analysis of claim 7); FIG. 18 (showing that each ratcheting includes a ridge that is parallel to the implant width). Brantigan '035 explains that these traditional ratchetings on the upper and lower bearing surfaces "will accommodate the forward moving" of the implant during insertion and "will prevent retraction" of the implant after full insertion. *Id.* at 20:30 to 21:3. One having ordinary skill in the art would have been prompted to modify Tropiano's implant to include the ratcheting projections on the upper and lower bearing surfaces (as sug-

	gested by Brantigan) so that the implant can resist retraction and thus "once the plugs are seated in the proper position, they will not shift from this position". *Id.* at 21:1-5. Here, a skilled artisan would have readily understood that the size/orientation angle of the ratchetings of the resulting implant would be selected to permit the implant to "provide stability between adjacent vertebrae" while also improving Tropiano's objective for an "apparatus which will aid in fixing appropriate elements in place." NUVASIVE1104 at 2:44-49.  *Id.* at FIG. 3 (modified above to include traditional options suggested by Michelson '247 and Brantigan); see also NUVASIVE1101 at ¶¶ 26-27. Also, a skilled artisan would have been prompted to modify Tropiano's implant to include ratchetings because to do so would be merely "[u]se of known technique to improve similar devices . . . in the same way." MPEP § 2143(C).
said implant being adapted to hold bone fusion promoting materials.	As discussed above, Tropiano discloses that the upper and lower surfaces "are formed with large openings so that maximum bone graft material can be received and placed in contact with graft material outside the cage." NUVASIVE1104 at 2:50-54; FIGS. 1 and 3.
11. The implant of claim 29, wherein said implant has a plurality of openings between said trailing face and said insertion face and between said first and second sides to permit for	As described in detail above, Tropiano discloses that the implant 10 has a plurality of openings 40, 42, and 44 (FIG. 3) through the implant 10 to permit for the growth of bone. *Id.* at FIGS. 1 and 3; 2:50-54.

the growth of bone through said implant from the first vertebra to the second vertebra.	

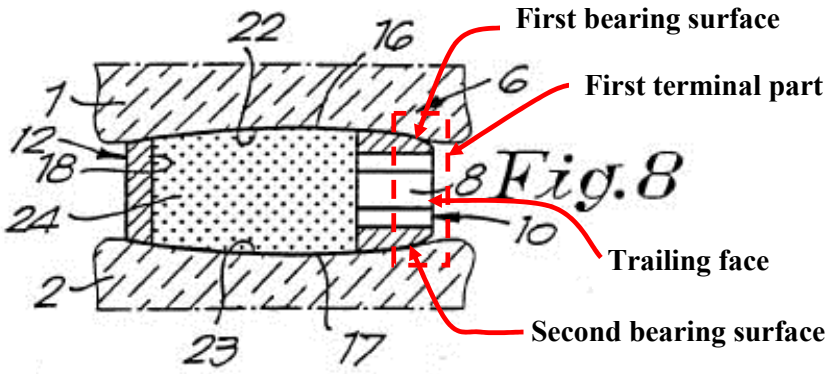
VII. [GROUND 2 CLAIM CHARTS] – Obviousness of Claims 9 and 12 under §103 by Tropiano in view of Michelson '247, Brantigan '035, and Beckers

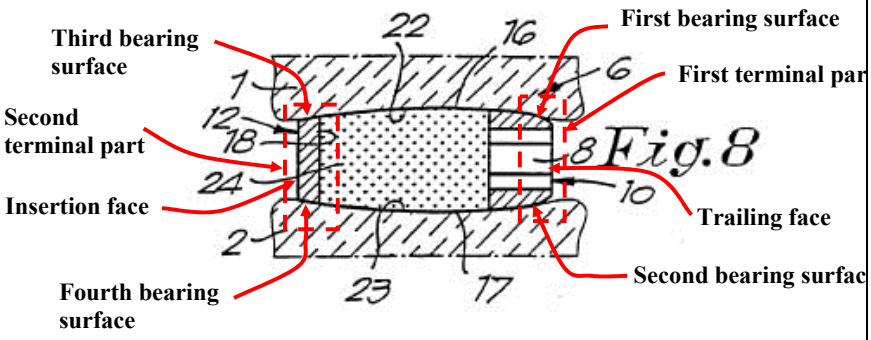
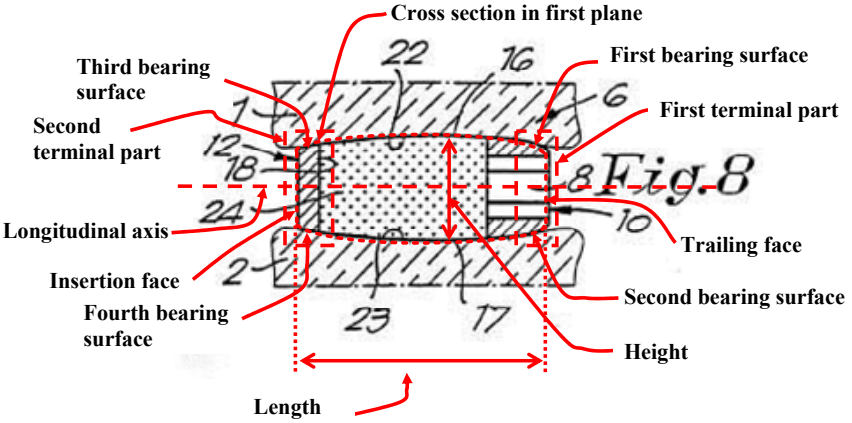
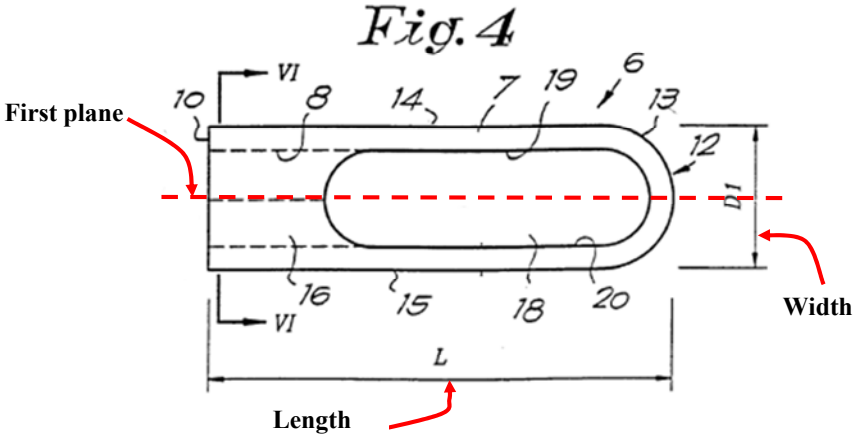
U.S. Pat. 8,444,696	Tropiano in view of Michelson '247, Brantigan '035 & Beckers
9. The implant of claim 7, wherein said convex portions of said upper and lower bearing surfaces are convex along a continuous uninterrupted majority of the lengths of said upper and lower bearing surfaces.	As previously described, the teachings of Tropiano in view of Michelson '247 and Brantigan '035 provide all elements of claim 7. To the extent that Tropiano does not expressly describe that the convex portions of the upper and lower bearing surfaces are convex along a continuous uninterrupted majority of the lengths of said upper and lower bearing surfaces, this feature was traditionally employed in prior art spinal fusion implants. *See generally* NUVASIVE1101 at ¶¶ 28-30. For example, Beckers discloses "an implant for the intervertebral space." NUVASIVE1107 at p. 2. Beckers' implant includes upper and lower bearing surfaces that are convex along a continuous uninterrupted majority of the lengths of said upper and lower bearing surfaces. *Id.* at FIG. 15 (at right). A person of ordinary skill in the art would have been prompted to modify the Tropiano implant to include upper and lower bearing surfaces that are convex along an uninterrupted majority of the lengths to provide more contact surface with the end plates so as to more evenly distribute the load along the upper and lower bearing surface. NUVASIVE1101 at ¶¶ 29-30. The resulting implant would retain Tropiano's struts and edges (e.g., struts 24 and 25 and edges 54, 54', 56, and 56') that provide the bone growth compartments through the implant.  

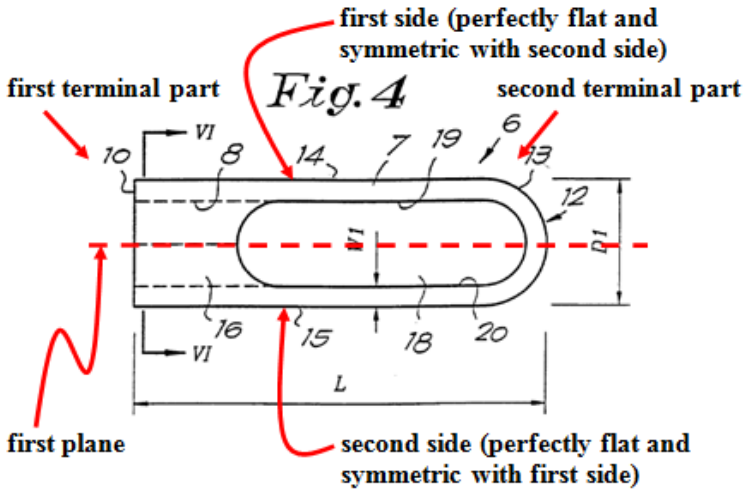
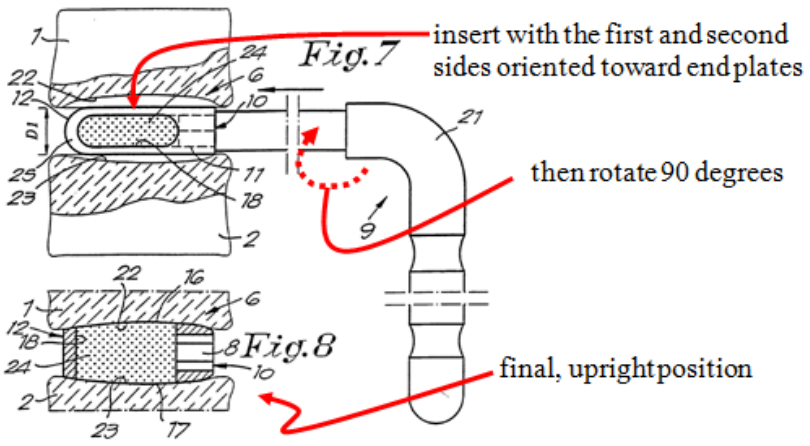
	NUVASIVE1104 at FIG. 1 (modified to include continuous bearing surfaces as suggested by Beckers). Moreover, a person of ordinary skill in the art would have seen a reason to modify Tropiano's implant so that the implant includes such bearing surfaces because to do so would be merely "[u]se of known technique to improve similar devices . . . in the same way." MPEP § 2143(C). Further, for reasons described in connection with claim 7, the resulting combination of Tropiano in view of Michelson '247, Brantigan, and Beckers would include the ratcheting projections on the upper and lower bearing surfaces (as suggested by Brantigan), thereby providing "ratchetings" on the entire upper and lower bearing surfaces of the modified implant: Tropiano in view of Michelson and Brantigan (described above) in further view of Beckers  NUVASIVE1101 at ¶ 30.
12. The implant of claim 10, wherein said convex portions of said upper and lower bearing surfaces are convex along a continuous uninterrupted majority of the lengths of said upper and lower bearing surfaces.	As previously described (see analysis of this same element in claim 9), the resulting combination of Tropiano in view of Michelson '247, Brantigan, and Beckers would provide upper and lower bearing surfaces that are convex along an uninterrupted majority of the lengths to provide more contact surface with the end plates so as to more evenly distribute the load along the upper and lower bearing surface. NUVASIVE1101 at ¶¶ 29-30.

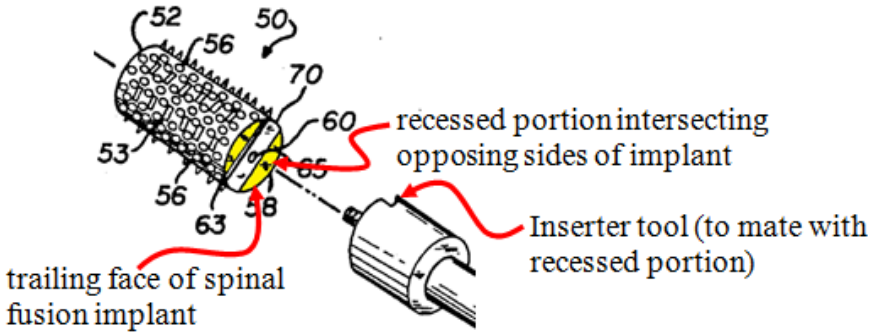
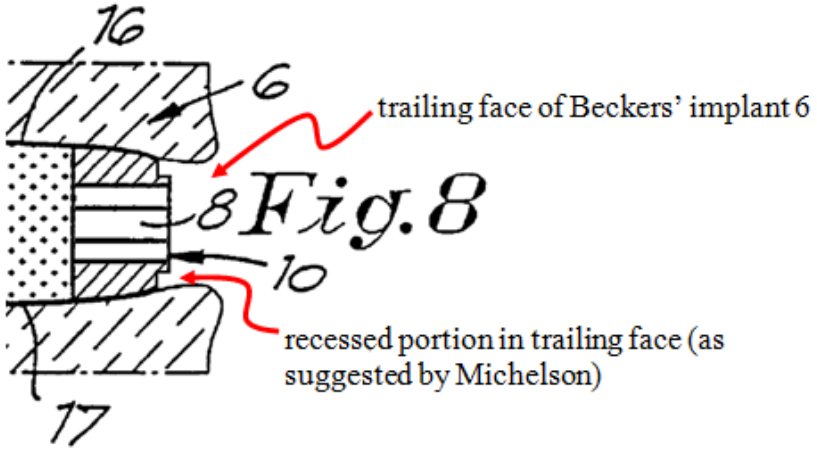
VIII. [GROUND 3 CLAIM CHARTS] – Obviousness of Claims 7-12 under §103 by Beckers in view of Michelson '247 and Brantigan '035

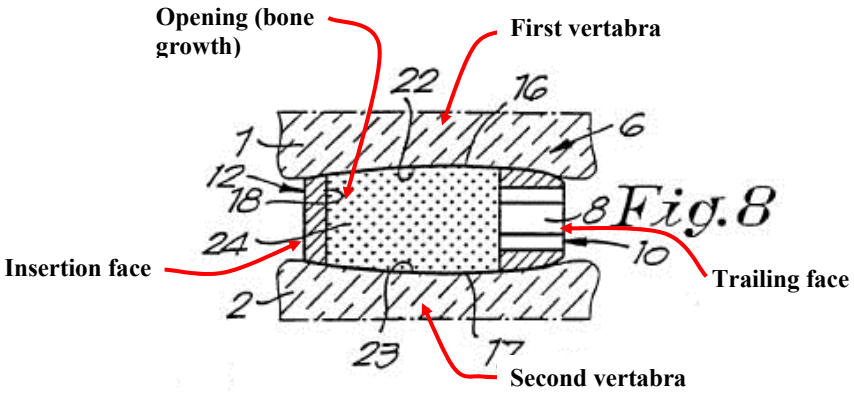
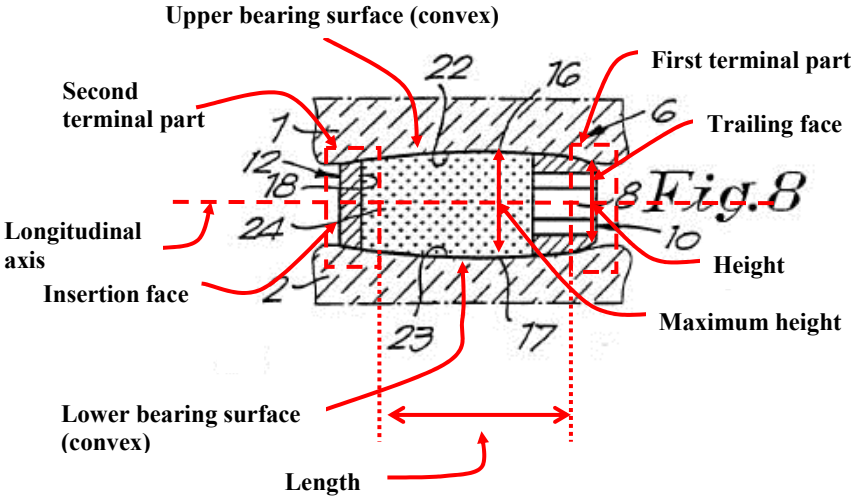
U.S. Pat. 8,444,696	Beckers in view of Michelson '247 and Brantigan '035
7. A lordotic spinal fusion implant for insertion between a first vertebra and a second vertebra adja-	Beckers discloses a lordotic spinal fusion implant for insertion between a first and a second vertebra adjacent the first vertebra, the first vertebra having a generally vertically extending first peripheral wall and a first endplate and the second verte-

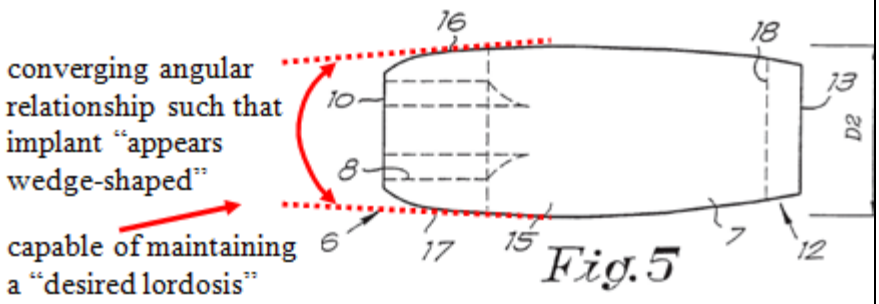
cent the first vertebra, the first vertebra having a generally vertically extending first peripheral wall and a first end plate and the second vertebra having a generally vertically extending second peripheral wall and a second endplate, wherein the implant comprises:	bra having a generally vertically extending second peripheral wall and a second endplate. For example, Beckers discloses an implant for the intervertebral space," which as described in detail below, is configured to maintain the first and second vertebrae in an angular relationship to maintain lordosis between two vertebrae. *See* NUVASIVE1107 at pp. 2 and 7; FIG. 8; *see also generally* NUVASIVE1101 at ¶¶ 31-40.
a first terminal part defining a trailing face, a first bearing surface adapted to bear against a portion of the first end plate, and an opposite second bearing surface adapted to bear against a portion of the second end plate, said trailing face extending between said first bearing surface and second bearing surface;	Beckers discloses a first terminal part defining a trailing face, a first bearing surface adapted to bear against a portion of the first endplate, and an opposite second bearing surface adapted to bear against a portion of the second endplate, the trailing face extending between said first bearing surface and second bearing surface. For example, regarding the claimed "first terminal part" as recited in claim 6, Beckers' FIG. 8 indicates that the implant 6 has the structures of the trailing face and the first and second bearing surfaces. Beckers also discloses that the trailing face extends between the first bearing surface and the second bearing surface:  *Id.* at FIG. 8.
a second terminal part opposite said first terminal part, said second terminal part having an insertion face extending between a third bearing surface and a fourth bearing surface,	Beckers discloses a second terminal part opposite the first terminal part, the second terminal part having an insertion face extending between a third bearing surface and a fourth bearing surface. For example, Beckers' FIG. 8 depicts the implant 6 having these recited structures:

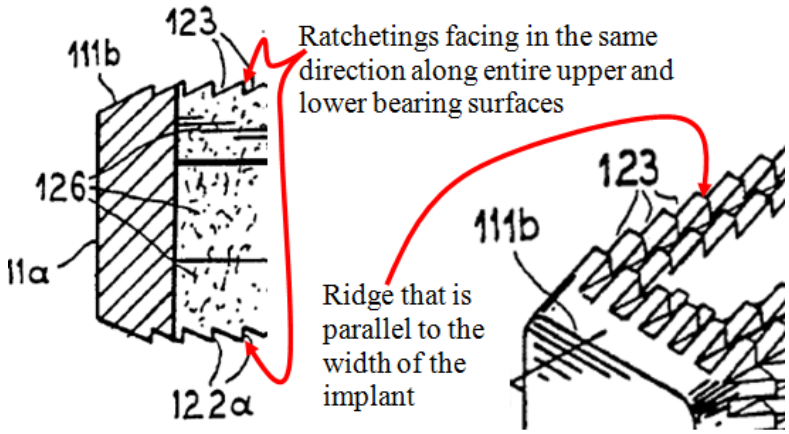
	 Fig. 8 *Id.* at FIG. 8.
said implant having a longitudinal axis extending through said trailing face of said first terminal part and said insertion face of said second terminal part, and having a cross section in a first plane extending through said first bearing surface and said second bearing surface, and along the longitudinal axis, said implant having a length between said trailing face of said first terminal part and said insertion face of said second terminal part and parallel to the longitudinal axis, said implant having a width and a height each perpendicular to the length of said implant;	Beckers discloses these claim elements.  Fig. 8 *Id.* at FIG. 8.  *Id.* at FIG. 4.
a first side and an opposite second side, said first side and said second side extending from said first terminal part to said second terminal part, por-	Beckers discloses a first side and an opposite second side, the first side and the second side extending from the first terminal part to the second terminal part, portions of the first side and the second side being substantially flat. For example, Beckers discloses "[s]ides 14 and 15, … are preferably parallel and flat." *Id.* at p. 9. Beckers' FIG. 4 depicts these structures:

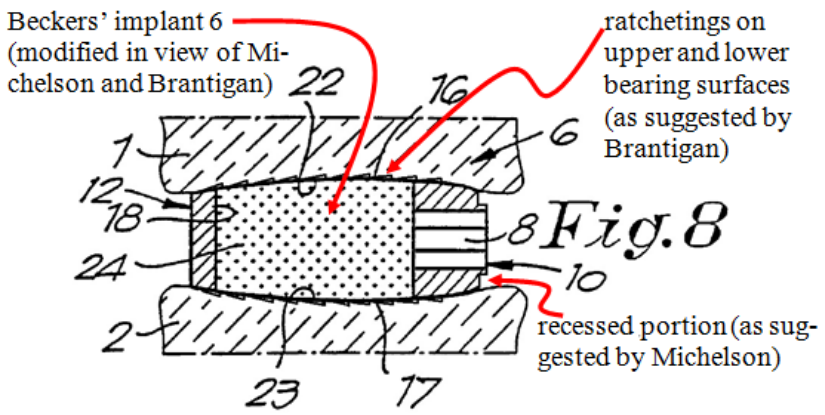
tions of said first side and said second side being substantially flat, said substantially flat portions intersecting a second plane that is perpendicular to the first plane and extends through said insertion face and said trailing face, wherein said substantially flat portions of said first side and said second side are symmetrical about the first plane,	 *Id.* at FIG. 4; *see also* FIG. 6.
said implant being adapted to be inserted between the first vertebra and the second vertebra with said first side and said second side of said implant being oriented toward the first end plate and the second end plate, respectively, and then rotated ninety degrees into an upright position,	Beckers discloses that the implant 6 is capable of being be inserted between the first and second vertebrae with the first and second sides being oriented toward the vertebral end plates, and then being rotated ninety degrees into an upright position. For example, Beckers discloses "[t]o insert implant 6 between vertebral bodies 1 and 2 so as to fit or lock, wrench 21 of tool 9 is turned by 90°, so that after removal of tool 9, a situation as depicted in FIG. 8 will result." *Id.* at pp. 10-11. Beckers FIGS. 7-8 illustrate one example:  *Id.* at FIG. 7-8.
said trailing face having a recessed portion intersecting each of said first and second sides and being configured to receive	To the extent that Beckers does not expressly disclose the trailing face having a recessed portion "intersecting each of said first and second sides" and being configured to receive an insertion instrument, such a configuration was traditionally employed in similar prior art spinal implants, as evidenced by the

an insertion instrument for inserting said implant between the first vertebra and the second vertebra;	Michelson '247 reference. Michelson '247 discusses a spinal implant 50 as shown in FIGS. 4 and 4A-D that includes a cap 52 with a driver engaging element 70 comprising "a raised rectangular portion 63 and a central threaded opening 65, for engaging the driver apparatus, shown in FIG. 4c and FIG. 4d." NUVASIVE1105 at 8:52-61.  *Id.* at FIG. 4. A person of ordinary skill in the art would have been prompted to modify Beckers' implant so that the implant includes a recessed portion along the trailing face of the implant (example shown below) so that the insertion and removal tool "locks onto the implant" and allows for greater mechanical advantage during manipulation and installation of the implant. *Id.* at 9:1-3 & 10:15-17.  NUVASIVE1107 at FIG. 8 (modified to show the recessed portion(s) suggested by Michelson '247); *see also* NUVASIVE1101 at ¶¶ 34-35. Additionally, a skilled artisan would have been prompted to modify Beckers' implant so that the implant includes recessed portions on the trailing face of the implant (in addition to Beckers's opening 8 or a threaded opening as suggested by Michelson '247) so that a surgeon could readily clamp onto the recessed portions and thereby provide mechan-

	ical leverage while rotating the implant (described above). See NUVASIVE1101 at ¶ 35. Finally, a skilled artisan would have been prompted to modify Beckers' implant to include recessed portions in the trailing face because to do so would be merely "[u]se of known technique to improve similar devices . . . in the same way." MPEP § 2143(C).
an opening between said trailing face and said insertion face and between said first and second sides to permit for the growth of bone through said implant from the first vertebra to the second vertebra;	Beckers discloses the claimed opening to permit for the growth of bone through the implant 6. For example, Beckers discloses that the implant 6 includes an "opening 18" that can be "filled with bone graft material 24." *See* NUVASIVE1107 at pp. 10-11. Beckers' FIG. 8 shows one example:  *Id.* at FIG. 8.
upper and lower bearing each surfaces having a length measured parallel to the longitudinal axis of said implant, said upper and lower bearing surfaces having portions proximate each of said first and second sides and being convex along the entire length of said upper and lower bearing surfaces relative to the second plane and in a direction parallel to the longitudinal axis, said trailing face having a height less than and measured parallel to	Beckers discloses the claimed "upper and lower bearing surfaces" that are convex along the entire length and that have all of the recited characteristics as recited in this claim, and that furthermore provide the claimed height of the trailing face being less than and measured parallel to "a maximum height" as recited in this claim: 

a maximum height measured between said upper and lower bearing surfaces proximate one of said first and second sides,	*Id.* at FIG. 8 (above); FIG. 4 (showing that the maximum height is proximate to one of the flat sides).
said upper and lower bearing surfaces being disposed in a converging angular relationship toward each other such that said implant appears wedge-shaped from a side view, the converging angular relationship of said upper and lower bearing surfaces maintaining the first vertebra and the second vertebra adjacent to said upper and lower bearing surfaces in an angular relationship to maintain the desired lordosis between the first vertebra and the second vertebra;	To the extent the unclear phrase "appears wedge-shaped" can be understood, Beckers discloses that the upper and lower bearing surfaces are disposed in a converging angular relationship toward each other such that said implant "appears wedge-shaped" (under a broadest reasonable interpretation standard) from a side view. For example, Beckers discloses that the implant 6 is "lens-shaped" to provide a "wedge-shaped" appearance near the ends because this configuration facilitates insertion into the intervertebral space and furthermore provides a profile that matches the natural dual concave form of the endplates of the adjacent vertebrae. *Id.* at p. 7. Becker's FIG. 5 depicts one example:  Fig. 5 *Id.* at FIG. 5; *see also* FIG. 3. Further, to the extent the unclear phrase "desired lordosis" can be understood, Beckers discloses that the converging angular relationship of the upper and lower bearing surfaces (shown above) is configured to maintain the first and second vertebrae in an angular relationship to maintain the "desired lordosis" (under a broadest reasonable interpretation standard). NUVASIVE1101 at ¶¶ 31 & 37-38.
ratchetings on each of said upper and lower bearing surfaces adapted to engage the first vertebra and the second vertebra, respectively, each of said ratchetings having a ridge oriented in a direction generally parallel to	To the extent that Beckers does not expressly describe the claimed "ratchetings," this engagement feature was traditionally employed in prior art spinal fusion implants. For example, Brantigan '035 describes the well-known design option for spinal fusion implants in which the bearing surfaces of the implant have "a pattern of raised annular nubs." NUVASIVE1106 at FIGS. 18-19; 19:25 to 20:3; 20:30-33, & 21:1-5. Brantigan '035 expressly teaches that these projections 122 can be in the form of ratchetings having a triangular cross-sectional shape orient-

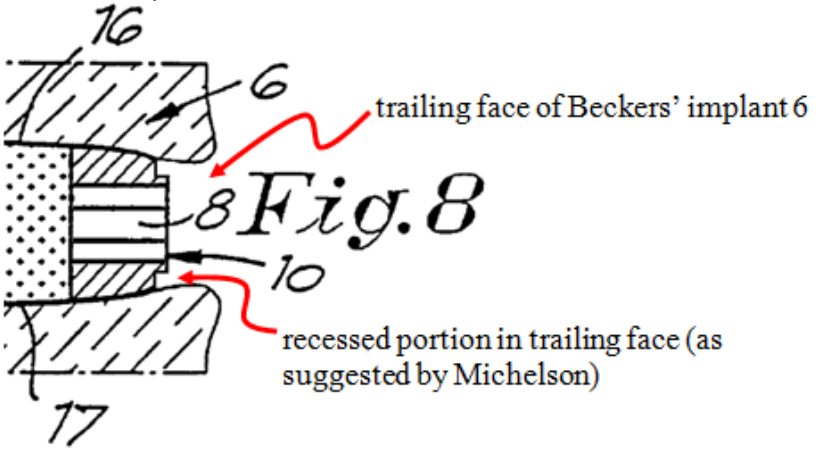
the width of said implant, said ratchetings on each of said upper and lower bearing surfaces facing one direction; and	ed toward the same direction (e.g., oriented toward the trailing face):  *Id.* at FIG. 19 (above left). Further, each ratcheting 122 includes a ridge that is "generally parallel" to the width of the implant. *Id.* at FIG. 18 (above right). Brantigan '035 explains that these traditional ratchetings on the upper and lower bearing surfaces "will accommodate the forward moving" of the implant during insertion and "will prevent retraction" of the implant after full insertion. *Id.* at 20:30 to 21:3. One of ordinary skill in the art would have been prompted to modify Beckers' implant to include the ratcheting projections on the upper and lower bearing surfaces (as suggested by Brantigan) so that the implant can resist retraction and thus "once the plugs are seated in the proper position, they will not shift from this position". *Id.* at 21:1-5. Here, a skilled artisan would have readily understood that the size/orientation angle of the ratchetings of the resulting implant would be selected to permit the implant to allow "an extremely stable locking between the vertebral bodies" (NUVASIVE1107 at p. 2) while also improving Beckers' objective for not "damaging the surface of the bony cover plate of the vertebral body" (*id.* at p. 2):

	 NUVASIVE1101 at ¶¶ 39-40 (depicting Beckers' FIG. 8 modified (shown above) to include traditional options suggested by Michelson '247 and Brantigan). Also, a skilled artisan would have been prompted to modify Beckers' implant to include ratchetings because to do so would be merely "[u]se of known technique to improve similar devices . . . in the same way." MPEP § 2143(C).
said implant being adapted to hold bone fusion promoting materials.	As discussed above, Beckers discloses that the implant is adapted to hold bone fusion promoting materials. For example, Beckers discloses that the implant 6 includes an "opening 18" that can be "filled with bone graft material 24." NUVASIVE1107 at pp. 10-11; FIG. 8 (bone fusion promoting material 24).
8. The implant of claim 7, wherein said implant has a plurality of openings between said trailing face and said insertion face and between said first and second sides to permit for the growth of bone through said implant from the first vertebra to the second vertebra.	Beckers and Michelson '247 both disclose the claimed "plurality of openings" to permit for the growth of bone through the implant from the first vertebra to the second vertebra. In addition to the known option of using a single large opening, Beckers also describes the further prior art option of providing multiple additional openings in the form of "transverse perforations [37] of its walls for bone growth." *See* NUVASIVE1107 at pp. 18-19; FIG. 15 (showing multiple "openings" 36 and 37 located between the trailing face and the insertion face and be-tween the first and second sides). Additionally, Michelson '247 provides an express suggestion to equip such fusion implants with multiple "openings 56" in communication with a central chamber for receiving bone growth material. NUVASIVE1105 at 8:44-46; 10:10-12. Accordingly, a person of ordinary skill in the art would have been prompted to provide the plurality of bone growth openings (as suggested by each of Beckers and Michelson '247) in the resulting combination of Beckers in view of Michelson '247 and Brantigan '035 so as to more readily "admit

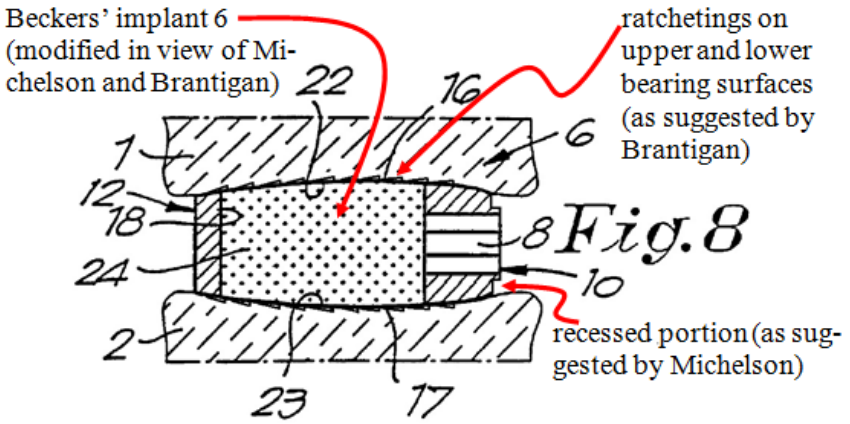
	spongy bone material or osteoconductive or osteoinductive material" through additional openings/regions of the implant structure. NUVASIVE1107 at pp. 18-19.
9. The implant of claim 7, wherein said convex portions of said upper and lower bearing surfaces are convex along a continuous uninterrupted majority of the lengths of said upper and lower bearing surfaces.	Beckers discloses the claimed "convex portions" of the upper and lower bearing surfaces" as recited in this claim. Beckers' implant includes upper and lower bearing surfaces that are convex along a continuous uninterrupted majority of the lengths of said upper and lower bearing surfaces. NUVASIVE1107 at FIG. 8.
10. A spinal fusion implant for insertion between a first vertebra and a second vertebra adjacent the first vertebra, the first vertebra having a generally vertically extending first peripheral wall and a first end plate and the second vertebra having a generally vertically extending second peripheral wall and a second endplate, wherein the implant comprises:	As previously described (see analysis of the preamble in claim 7), Beckers discloses a spinal infusion implant for insertion between a first vertebra and a second vertebra adjacent the first vertebra as recited in this claim. *Id.* at p. 2, FIG. 8; *see also generally* NUVASIVE1101 at ¶¶ 31-40.
a first terminal part defining a trailing face, a first bearing surface adapted to bear against a portion of the first endplate, and an opposite second bearing surface adapted to bear against a portion of the second endplate, said trailing face extending between said first bearing surface and second bearing surface;	As previously described (see analysis of this same element in claim 7), Beckers discloses that the implant comprises a first terminal part defining a trailing face, a first bearing surface adapted to bear against a portion of the first endplate, and an opposite second bearing surface adapted to bear against a portion of the second endplate. *Id.* at FIG. 8 (reproduced above in the analysis of claim 7).

a second terminal part opposite said first terminal part, said second terminal part having an insertion face extending between a third bearing surface and a fourth bearing surface,	As previously described (see analysis of this same element in claim 7), Beckers discloses that the implant comprises a second terminal part opposite the first terminal part, the second terminal part having an insertion face extending between a third bearing surface and a fourth bearing surface. *Id.* at FIG. 8 (reproduced above in the analysis of claim 7).
said implant having a longitudinal axis extending through said trailing face of said first terminal part and said insertion face of said second terminal part, and having a cross section in a first plane extending through said first bearing surface and said second bearing surface, and along the longitudinal axis, said implant having a length between said trailing face of said first terminal part and said insertion face of said second terminal part and parallel to the longitudinal axis, said implant having a width and a height each perpendicular to the length of said implant;	As previously described (see analysis of this same element in claim 7), Beckers discloses that the implant 6 provides these claimed features, including the longitudinal axis, first plane, second plane, length, width, and height. *Id.* at FIGS. 4 & 8 (reproduced above in the analysis of claim 7).
a first side and an opposite second side, said first side and said second side extending from said first terminal part to said second terminal part, portions of said first side and said second side being substantially flat, said substantially flat portions	As previously described (see analysis of this same element in claim 7), Beckers' sides 14 and 15 each include "substantially flat" portions (under the broadest reasonable interpretation standard) that intersect a second plane that is perpendicular to the first plane. *Id.* at FIG. 4 (reproduced above in the analysis of claim 7, and showing examples of "substantially flat" portions that are symmetrical about the first plane); FIG. 6 (reproduced above in the analysis of claim 7 to show the location of the second plane).

intersecting a second plane that is perpendicular to the first plane and extends through said insertion face and said trailing face, wherein said substantially flat portions of said first side and said second side are symmetrical about the first plane,	
said implant being adapted to be inserted between the first vertebra and the second vertebra with said first side and said second side of said implant being oriented toward the first end plate and the second endplate, respectively, and then rotated ninety degrees into an upright position,	As previously described (see analysis of this same element in claim 7), according to the broadest reasonable interpretation of "adapted to," Beckers discloses an implant 6 that is capable of being inserted with the first side and the second side of the implant being oriented toward the first and second end plates, and then rotated ninety degrees into an upright position. *Id.* at FIGS. 7 & 8 (reproduced above in the analysis of claim 7).
said trailing face having a recessed portion intersecting each of said first and second sides and being configured to receive an insertion instrument for inserting said implant between the first vertebra and the second vertebra;	As previously described (see analysis of this same element in claim 7), to the extent that Beckers implant structure does not include a trailing face having a recessed portion intersecting each of the first and second sides and configured to receive an insertion instrument, such a design choice was well known in similar prior art spinal fusion implants. For example, Michelson '247 discusses a spinal implant 50 as shown in FIGS. 4 and 4A-D that includes a cap 52 with a driver engaging element 70 comprising "a raised rectangular portion 63 and a central threaded opening 65, for engaging the driver apparatus, shown in FIG. 4c and FIG. 4d." NUVASIVE1105 at 8:52-61; FIG. 4 (showing two recessed portions in the trailing face so as to mate with the insertion instrument). A person of ordinary skill in the art would have been prompted to modify Beckers' implant so that the implant includes recessed portions along the trailing face of the implant (example illustrated below) so that the insertion and removal tool "locks onto the implant" and allows for greater mechanical advantage during manipulation and installa-

	tion of the implant. *Id.* at 9:1-3 & 10:15-17.  Fig. 8 Additionally, a skilled artisan would have been prompted to modify Beckers' implant so that the implant includes recessed portions along the trailing face of the implant so that a surgeon could readily engage/disengage a threaded tool into the central threaded opening 39 while maintaining the orientation of the implant (with the portion of the inserter tool that mates with the recessed portions). See NUVASIVE1101 at ¶¶ 34-35. Finally, a skilled artisan would have been prompted to modify Beckers' implant to include recessed portions in the trailing face because to do so would be merely "[u]se of known technique to improve similar devices . . . in the same way." MPEP § 2143(C).
an opening between said trailing face and said insertion face and between said first and second sides to permit for the growth of bone through said implant from the first vertebra to the second vertebra;	As previously described (see analysis of this same element in claim 7), Beckers' implant 6 includes an opening between the trailing face and the insertion face and between the first and second sides to permit for the growth of bone through the implant. NUVASIVE1107 at FIG. 8 (showing opening 24); pp. 10-11.
upper and lower bearing surfaces each having a length measured parallel to the longitudinal axis of said implant, said upper and lower bearing surfaces having portions proximate each of said first	As previously described (see analysis of the "upper and lower bearing surfaces" recitation in claim 7), Beckers' implant 6 includes portions of the upper and lower bearings surfaces that are proximate each of the first and second sides and convex along the entire length of the upper and lower bearing surfaces. Becker at FIG. 8 (reproduced above in the analysis of claim 7, and showing the convexity of the upper and lower bearing surfaces such that the maximum height is greater than the height

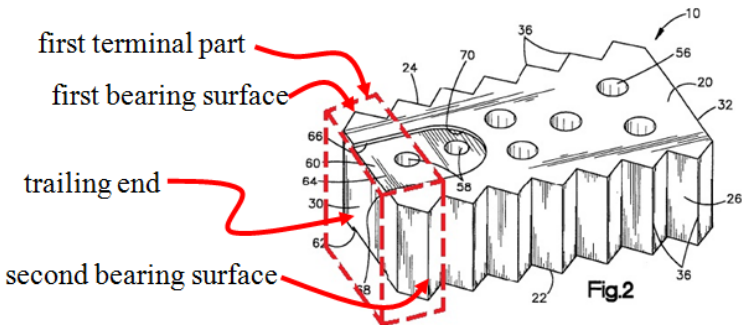
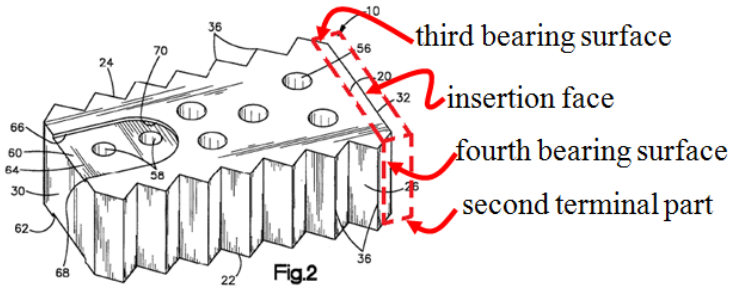
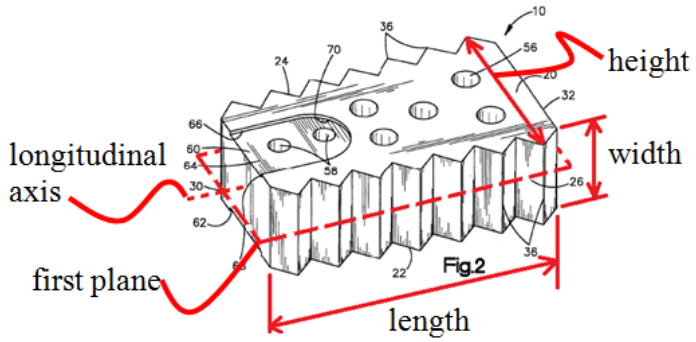
and second sides and being convex along the entire length of said upper and lower bearing surfaces relative to the second plane and in a direction parallel to the longitudinal axis, said trailing face having a height less than and measured parallel to a maximum height measured between said upper and lower bearing surfaces proximate one of said first and second sides;	of the trailing face). Refer also to the analysis of dependent claim 9 above in which the convex portions of the bearing surfaces are convex along "a continuous uninterrupted majority of the lengths" of the bearing surfaces.
ratchetings on each of said upper and lower bearing surfaces adapted to engage the first vertebra and the second vertebra, respectively, each of said ratchetings having a ridge oriented in a direction generally parallel to the width of said implant, said ratchetings on each of said upper and lower bearing surfaces facing one direction; and	As previously described (see analysis of this same element in claim 7), to the extent that Beckers does not expressly describe the claimed ratchetings, this feature was traditionally employed in prior art spinal fusion implants. For example, Brantigan '035 describes the well-known design option for spinal fusion implants in which the bearing surfaces of the implant have "a pattern of raised annular nubs." NUVASIVE1106 at FIGS. 18-19; 19:25 to 20:3; 20:30-33, & 21:1-5. Brantigan '035 expressly teaches that these projections 122 can be in the form of ratchetings having a triangular cross-sectional shape oriented toward the same direction (e.g., oriented toward the trailing face). *Id.* at FIGS. 18-19 (shown above in the analysis of claim 7). Brantigan '035 explains that these traditional ratchetings on the upper and lower bearing surfaces "will accommodate the forward moving" of the implant during insertion and "will prevent retraction" of the implant after full insertion. *Id.* at 20:30 to 21:3. One having ordinary skill in the art would have been prompted to modify Beckers' implant to include the ratcheting projections on the upper and lower bearing surfaces (as suggested by Brantigan) so that the implant can resist retraction and thus "once the plugs are seated in the proper position, they will not shift from this position". *Id.* at 21:1-5. Here, a skilled artisan would have readily understood that the size/orientation angle of the ratchetings of the resulting implant would be selected to permit the implant to allow "an extremely stable lock-

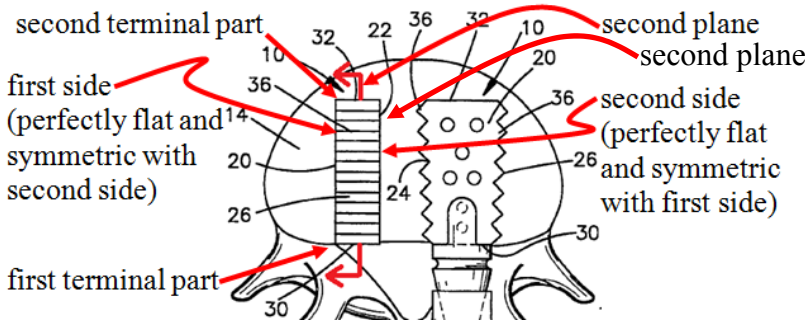
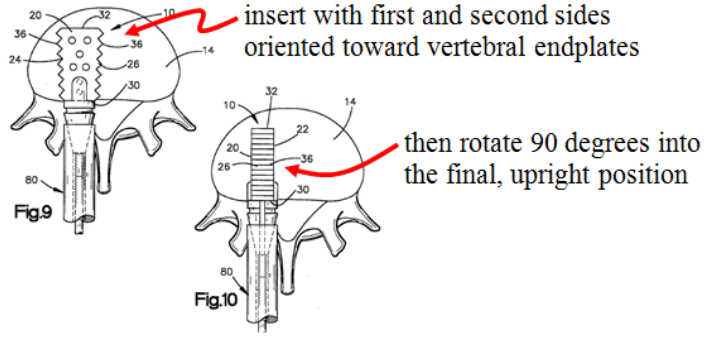
	ing between the vertebral 40 bodies" (NUVASIVE1107 at p. 2) while also improving Beckers' objective for not "damaging the surface of the bony cover plate of the vertebral body" (Becker at p. 2):  NUVASIVE1101 at ¶¶ 39-40 (depicting Beckers' FIG. 8 modified (shown above) to include traditional options suggested by Michelson '247 and Brantigan). Also, a skilled artisan would have been prompted to modify Beckers' implant to include ratchetings because to do so would be merely "[u]se of known technique to improve similar devices . . . in the same way." MPEP § 2143(C).
said implant being adapted to hold bone fusion promoting materials.	As discussed above, Beckers discloses that the implant 6 includes an "opening 18" that can be "filled with bone graft material 24." *See* NUVASIVE1107 at pp. 10-11; FIG. 8 (bone fusion promoting material 24).
11. The implant of claim 29, wherein said implant has a plurality of openings between said trailing face and said insertion face and between said first and second sides to permit for the growth of bone through said implant from the first vertebra to the second vertebra.	As previously described (see analysis of this same element in claim 8), both of Beckers and Michelson '247 disclose the claimed "plurality of openings." *See* Becker at pp. 18-19; FIG. 15 (showing multiple "openings" 36 and 37 located between the trailing face and the insertion face and between the first and second sides). NUVASIVE1105 at 8:44-46 ("openings 56" in communication with a central chamber for receiving bone growth material); 10:10-12. Accordingly, a person of ordinary skill in the art would have been prompted to provide the plurality of bone growth openings (as suggested by each of Beckers and Michelson '247) in the resulting combination of Beckers in view of Michelson '247 and Brantigan '035 so as to more readily "admit spongy bone material or osteoconductive or osteoinductive material" through additional openings/regions of the implant structure. NUVASIVE1107 at pp. 18-19.

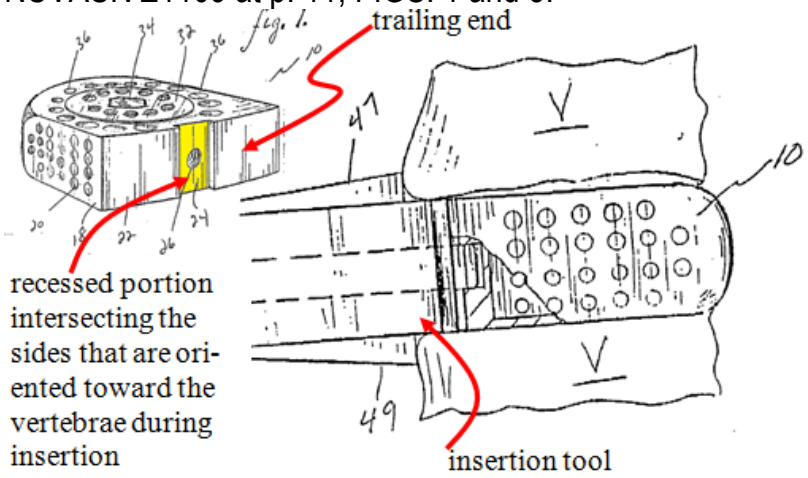
12. The implant of claim 10, wherein said convex portions of said upper and lower bearing surfaces are convex along a continuous uninterrupted majority of the lengths of said upper and lower bearing surfaces.	As previously described (see analysis of this same element in claim 9), Beckers discloses that the implant 6 includes upper and lower bearing surfaces that are convex along a continuous uninterrupted majority of the lengths of said upper and lower bearing surfaces. *See* NUVASIVE1107 at FIG. 8.

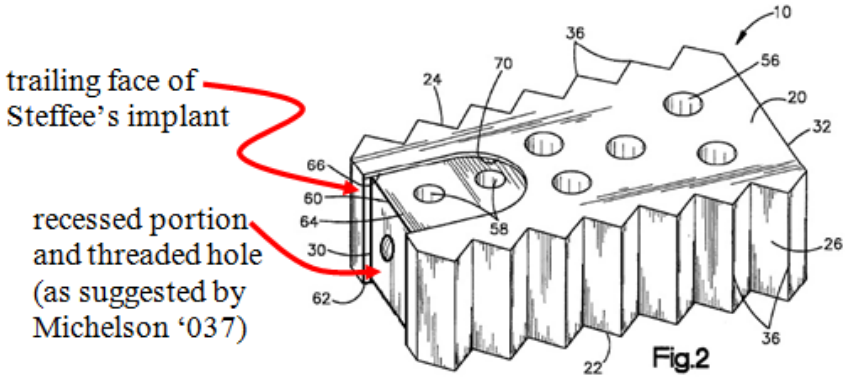
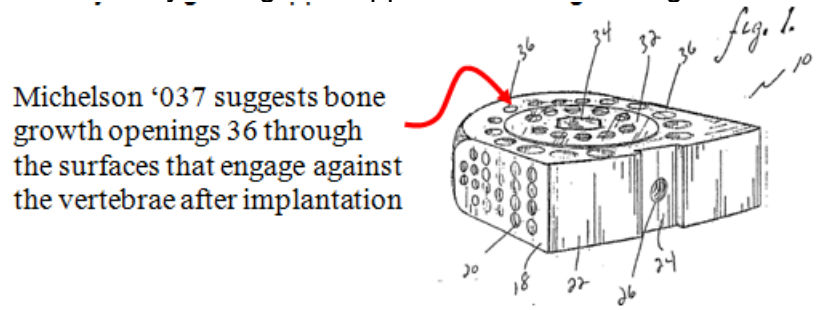
IX. [GROUND 4 CLAIM CHARTS] – Obviousness of Claims 7-12 under §103 by Steffee in view of Michelson '037 and Kim

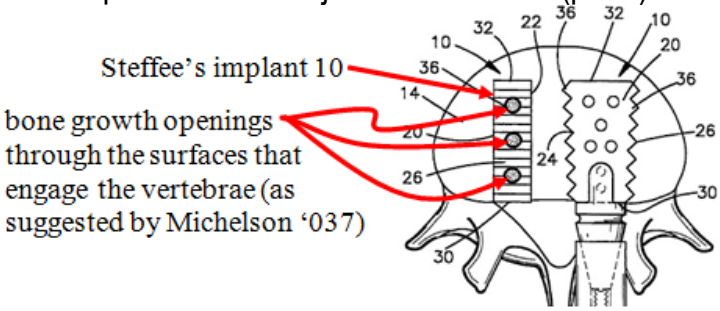
U.S. Pat. 8,444,696	Steffee in view of Michelson '037 and Kim
7. A lordotic spinal fusion implant for insertion between a first vertebra and a second vertebra adjacent the first vertebra, the first vertebra having a generally vertically extending first peripheral wall and a first end plate and the second vertebra having a generally vertically extending second peripheral wall and a second endplate, wherein the implant comprises:	Steffee discloses a lordotic spinal fusion implant for insertion between a first and a second vertebra adjacent the first vertebra, the first vertebra having a generally vertically extending first peripheral wall and a first endplate and the second vertebra having a generally vertically extending second peripheral wall and a second endplate. *See* NUVASIVE1108 at FIG. 1; col. 2:40-43 ("for use in portions of the spine with a lordotic curve"). *See also generally* NUVASIVE1101 at ¶¶ 41-52.
a first terminal part defining a trailing face, a first bearing surface adapted to bear against a portion of the first end plate, and an opposite second bearing surface adapted to bear against a portion of the second end plate, said trailing face extending between said first bearing surface and second bear-	Steffee discloses a first terminal part defining a trailing face, a first bearing surface adapted to bear against a portion of the first endplate, and an opposite second bearing surface adapted to bear against a portion of the second endplate, the trailing face extending between said first bearing surface and second bearing surface. For example, regarding the claimed "first terminal part" as recited in claim 6, Steffee's FIGS. 1-2 indicate that the implant 10 has the structures of the trailing face and the first and second bearing surfaces. Steffee also discloses that the trailing face extends between the first bearing surface and the second bearing surface:

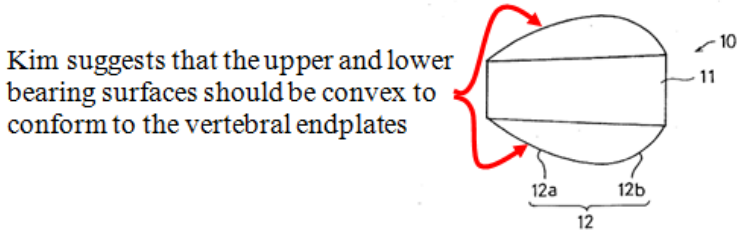
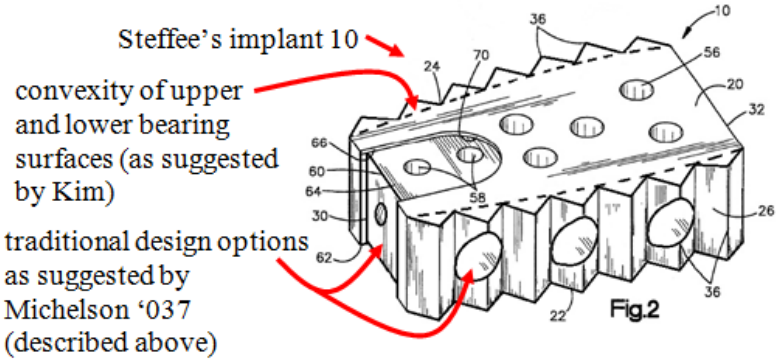
ing surface;	 *Id.* at FIG. 2.
a second terminal part opposite said first terminal part, said second terminal part having an insertion face extending between a third bearing surface and a fourth bearing surface,	Steffee discloses a second terminal part opposite the first terminal part, the second terminal part having an insertion face extending between a third bearing surface and a fourth bearing surface. For example, Steffee's FIGS. 1-2 depict the implant 10 having these recited structures:  *Id.* at FIG. 2.
said implant having a longitudinal axis extending through said trailing face of said first terminal part and said insertion face of said second terminal part, and having a cross section in a first plane extending through said first bearing surface and said second bearing surface, and along the longitudinal axis, said implant having a length between said trailing face of said first terminal part and said insertion face of said second terminal part and	Steffee discloses the "longitudinal axis," the "first plane," the "length," the "width," and the "height" as recited in this claim element:  *Id.* at FIG. 2.

parallel to the longitudinal axis, said implant having a width and a height each perpendicular to the length of said implant;	
a first side and an opposite second side, said first side and said second side extending from said first terminal part to said second terminal part, portions of said first side and said second side being substantially flat, said substantially flat portions intersecting a second plane that is perpendicular to the first plane and extends through said insertion face and said trailing face, wherein said substantially flat portions of said first side and said second side are symmetrical about the first plane,	Steffee discloses a first side and an opposite second side, the first side and the second side extending from the first terminal part to the second terminal part, portions of the first side and the second side being substantially flat. For example, Steffee discloses flat and "parallel side surfaces 20 and 22." *Id.* at 2:32-33. Steffee's FIGS. 2 and 10-12 depict these structures:  *Id.* at FIG. 11.
said implant being adapted to be inserted between the first vertebra and the second vertebra with said first side and said second side of said implant being oriented toward the first end plate and the second end plate, respectively, and then rotated ninety degrees into an upright position,	Steffee discloses that the implant 10 is capable of being be inserted between the first and second vertebrae with the first and second sides being oriented toward the vertebral end plates, and then being rotated ninety degrees into an upright position. *Id.* at 1:35-42; 4:28-39 ("rotated 90°"). Steffee's FIGS. 9-10 illustrate one example:  *Id.* at FIGS. 9-10.

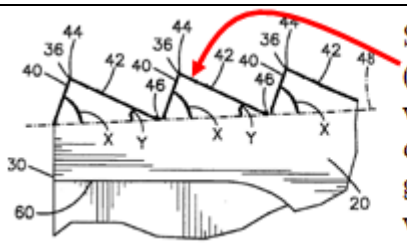
said trailing face having a recessed portion intersecting each of said first and second sides and being configured to receive an insertion instrument for inserting said implant between the first vertebra and the second vertebra;	To the extent that Steffee does not expressly disclose the trailing face having a recessed portion "intersecting each of said first and second sides" and being configured to receive an insertion instrument, such a configuration was traditionally employed in similar prior art spinal implants, as evidenced by the Michelson '037 reference. Michelson '037 discusses a spinal implant 10 as shown in FIGS. 1-5a that includes a trailing face having a "depressed portion 24 with a central threaded opening for receiving the engaging end 28 of a driving member 30." NUVASIVE1109 at p. 11; FIGS. 1 and 5.  *Id.* at FIGS. 1 and 5a. According the suggestion in Michelson '037, the recessed portion 24 intersects the particular sides that are oriented toward the vertebrae during the insertion step so that the "restriction members 47 and 49" of the inserter tool (oriented near the ends of the recessed portion 24) act as stops that abut the vertebrae and prevent over insertion of the implant 10. *Id.* at p. 13. A person of ordinary skill in the art would have been prompted to modify Steffee's implant 10 to provide a recessed portion and threaded opening along the trailing face of the implant (as suggested by Michelson '037) so that the insertion tool provides dual engagement mechanisms (both threaded engagement and slot/extension engagement) and thereby "prevents movement of the implant 10 in relation to the driving member 30." *Id.* at p. 12. In such circumstances, a surgeon could readily engage/disengage a threaded tool into the central threaded opening 39 while maintaining the established orientation of the implant (with the portion of the inserter tool that mates with the recessed portions). See NUVASIVE1101 at ¶¶ 45-46. Here, a skilled artisan would recognize that Mi-

	chelson '037 suggests the recessed portion intersects the particular sides that face toward the vertebrae during the insertion step (as previously described), so the resulting combination of Steffee in view of Michelson '037 would likewise provide such an orientation for the recessed portion (which is likewise suggested by the orientation of Steffee's inserter tool):  NUVASIVE1108 at FIG. 2 (modified to show the recessed portion and threaded tooling hole suggested by Michelson '037); *see also* NUVA1101 at ¶ 46. Finally, a skilled artisan would have been prompted to modify Steffee's implant to include a recessed portion and threaded tooling hole in the trailing face because to do so would be merely "[u]se of known technique to improve similar devices . . . in the same way." MPEP § 2143(C).
an opening between said trailing face and said insertion face and between said first and second sides to permit for the growth of bone through said implant from the first vertebra to the second vertebra;	Both Steffee and Michelson '037 disclose the claimed opening to permit for the growth of bone through the implant. For example, Steffee discloses that the implant 10 includes "openings 56 and 58" to provide for blood flow and bone growth therethrough." NUVASIVE1108 at 2:64-67; FIGS. 1-2. Additionally, Michelson '037 discloses the traditional design option for fusion implants in which bone growth openings 36 are provided vertically through the upper and lower bearing surfaces:  *See* NUVASIVE1109 at FIGS. 1 and 1e; p. 12; Thus, even if the recitation of intended use ("to permit for the growth of bone

	through said implant from the first vertebra to the second vertebra") is interpreted narrowly so as to require openings that are vertically oriented between the vertebrae, the aforementioned combination of Steffee and Michelson '037 would provide such openings because the "serve[ ] to promote bone ingrowth between the implant and the adjacent vertebrae" (p. 13):  NUVASIVE1108 at FIG. 11 (modified to show the bone growth openings suggested by NUVASIVE1109 at p. 13); *see also* NUVASIVE1101 at ¶¶ 47-48. Additionally, a skilled artisan would have been prompted to modify Steffee's implant to include such bone growth openings through the surfaces that engage the vertebrae because to do so would be merely "[u]se of known technique to improve similar devices . . . in the same way." MPEP § 2143(C).
upper and lower bearing each surfaces having a length measured parallel to the longitudinal axis of said implant, said upper and lower bearing surfaces having portions proximate each of said first and second sides and being convex along the entire length of said upper and lower bearing surfaces relative to the second plane and in a direction parallel to the longitudinal axis, said trailing face having a height less than and measured parallel to a maximum height meas-	Steffee discloses upper and lower bearing surfaces each having a length measured parallel to the longitudinal axis of said implant, the trailing face having a height less than and measured parallel to a maximum height measured between the upper and lower bearing surfaces proximate one of the first and second sides. *See* NUVASIVE1108 at FIGS. 1-2; col. 2:44-47. To the extent that Steffee does not disclose that the upper and lower bearing surfaces of Steffee's implant 10 are "convex along the entire length of said upper and lower bearing surfaces" as recited in this claim, such convex bearing surfaces were commonly employed in similar prior art spinal implants, as evidenced by the Kim reference. For example, Kim discloses the widely known configuration in which the upper and lower bearings surfaces are "convex" so as to correspond with the "concave contact surface" of the adjacent vertebrae. NUVASIVE1110 at 2:28-37; 5:61; FIG. 4 (showing the implant 10 inserted between the first and second vertebrae 20).

ured between said upper and lower bearing surfaces proximate one of said first and second sides,	 *Id.* at FIG. 2. A person of ordinary skill in the art would have been prompted to modify Steffee's implant 10 to provide a convex curvature along the entire length of the upper and lower bearing surfaces (as suggested by Kim) so that bearing surfaces correspond to the concave vertebral endplates and "the compression stress can be effectively dispersed or distributed." *Id.* at 3:26 to 4:10. Here, a skilled artisan would recognize that Kim suggests the upper and lower bearing surfaces should provide some degree of convexity along the length of the implant to correspond to the "macroscopically concave surfaces" of the vertebral endplates, so the resulting combination of Steffee in view of Michelson '037 and Kim would likewise provide such convexity for the upper and lower bearing surfaces:  NUVASIVE1108 at FIG. 2 (modified in view of Michelson '037 (described above) and furthermore to show the convexity of the upper and lower bearing surfaces as suggested by Kim); *see also* NUVASIVE1101 at ¶¶ 49-50. Finally, a skilled artisan would have been prompted to modify Steffee's implant to include the convexity of the upper and lower bearing surfaces because to do so would be merely "[u]se of known technique to improve similar devices . . . in the same way." MPEP § 2143(C). Moreover, in the resulting combination (depicted above), the claimed "maximum height" that is "measured . . . proximate one of said first and second sides" is clearly achieved just as it was in Steffee's implant 10. *Id.* at FIG. 2.
said upper and lower	To the extent the unclear phrase "appears wedge-shaped" can

bearing surfaces being disposed in a converging angular relationship toward each other such that said implant appears wedge-shaped from a side view, the converging angular relationship of said upper and lower bearing surfaces maintaining the first vertebra and the second vertebra adjacent to said upper and lower bearing surfaces in an angular relationship to maintain the desired lordosis between the first vertebra and the second vertebra;	be understood, Steffee disclose that the upper and lower bearing surfaces are disposed in a converging angular relationship toward each other such that said implant "appears wedge-shaped" (under a broadest reasonable interpretation standard) from a side view. For example, Steffee discloses that the height of the anterior-most end should be greater~ than the height of the posterior-most end "to give the spinal implant a wedge shape for use in portions of the spine with a lordotic curve." *See Id.* at 2:40-43; FIG. 1. Thus, to the extent the unclear phrase "desired lordosis" can be understood, the resulting combination of Steffee in view of Michelson '037 and Kim (one example depicted above) provides that the converging angular relationship of the upper and lower bearing surfaces is configured to maintain the first and second vertebrae in an angular relationship to maintain the "desired lordosis" (under a broadest reasonable interpretation standard). NUVASIVE1101 at ¶¶ 51 & also 41-42. Also, Kim is consistent with Steffee's teaching because the height of Kim's anterior-most end should be greater than the height of the posterior-most end (FIG. 2, showing a wedge-shaped side view) so that the implant supports the vertebrae in "a morphologically natural form." NUVASIVE1110 at 3:29-30.
ratchetings on each of said upper and lower bearing surfaces adapted to engage the first vertebra and the second vertebra, respectively, each of said ratchetings having a ridge oriented in a direction generally parallel to the width of said implant, said ratchetings on each of said upper and lower bearing surfaces facing one direction; and	Steffee discloses that the upper and lower bearing surfaces of the implant 10 are equipped with engagement structures that form the claimed "ratchetings" recited in this claim. For example, Steffee teaches that the upper and lower bearing surfaces are equipped with teeth 36, and that the orientation (e.g., ratcheting orientation) is achieved by selecting the surface angles "x" and "y." NUVASIVE1108 at FIG. 3; col. 2, lines 54-56. While Steffee describes an embodiment in which both angles "x" and "y" are 45 degrees, Steffee expressly discloses that the available range for angle "x" is limited only to an "acute angle" (e.g., less than 90 degrees) and that the selectable range for angle "y" is limited only to an "acute angle." *Id.* at col. 2, lines 54-59. Accordingly, Steffee expressly discloses or suggests to a skilled artisan that the angles "x" and "y" can be selected to provide traditional ratcheting teeth:

	 *Id.* at FIG. 3 (modified to show "x" and "y" within the expressly suggested ranges); NUVASIVE1101 at ¶ 52. Thus, Steffee expressly discloses this claim element, or alternatively, suggests to a skilled artisan that angle "x" can be different from angle "y" so as to achieve the traditional ratchetings. Indeed, by the early 1990s, the mere substitution of non-oriented teeth for ratcheting teeth along the bearing surfaces of a spinal fusion implant was nothing more than an obvious design choice available to any ordinary artisan at that time. NUVASIVE1101 at ¶ 52 (citing to Steffee and Brantigan '035 as documentary evidence of this conventional design choice).
said implant being adapted to hold bone fusion promoting materials.	As discussed above, Steffee and Michelson '037 disclose that the implant is adapted to hold bone fusion promoting materials. NUVASIVE1108 at 2:64-67; NUVASIVE1109 at pp. 11 and 13.
8. The implant of claim 7, wherein said implant has a plurality of openings between said trailing face and said insertion face and between said first and second sides to permit for the growth of bone through said implant from the first vertebra to the second vertebra.	As previously described in the analysis of claim 7, both Steffee and Michelson '037 disclose the claimed "plurality of openings" to permit for the growth of bone through the implant from the first vertebra to the second vertebra. *See* NUVASIVE1108 at 2:64-67 (openings 56 and 58); FIGS. 1-2; *see also* NUVASIVE1105 at FIGS. 1 and 1e; p. 12 (openings 36); p. 8 ("openings").
9. The implant of claim 7, wherein said convex portions of said upper and lower bearing surfaces are convex along a continuous uninterrupted majority of the lengths of said upper and lower bearing surfaces.	As previously described in the analysis of claim 7, the resulting combination would provide Steffee's implant 10 modified to provide a convex curvature along a continuous uninterrupted majority of the lengths of the upper and lower bearing surfaces (as suggested by Kim) so that bearing surfaces correspond to the concave vertebral endplates and "the compression stress can be effectively dispersed or distributed." NUVASIVE1110 at 3:26 to 4:10; *see also* NUVASIVE1108 at FIG. 2 (modified as shown above in view of Michelson '037 (described above) and

	furthermore to show the convexity of the upper and lower bearing surfaces as suggested by Kim).
10. A spinal fusion implant for insertion between a first vertebra and a second vertebra adjacent the first vertebra, the first vertebra having a generally vertically extending first peripheral wall and a first end plate and the second vertebra having a generally vertically extending second peripheral wall and a second endplate, wherein the implant comprises:	As previously described (see analysis of the preamble in claim 7), Steffee discloses a spinal fusion implant for insertion between a first and a second vertebra adjacent the first vertebra, the first vertebra having a generally vertically extending first peripheral wall and a first endplate and the second vertebra having a generally vertically extending second peripheral wall and a second endplate. *See* NUVASIVE1108 at FIG. 1; col. 2:40-43 ("for use in portions of the spine with a lordotic curve"). *See also generally* NUVASIVE1101 at ¶¶ 41-52.
a first terminal part defining a trailing face, a first bearing surface adapted to bear against a portion of the first endplate, and an opposite second bearing surface adapted to bear against a portion of the second endplate, said trailing face extending between said first bearing surface and second bearing surface;	As previously described (see analysis of this same element in claim 7), Steffee discloses that the implant comprises a first terminal part defining a trailing face, a first bearing surface adapted to bear against a portion of the first endplate, and an opposite second bearing surface adapted to bear against a portion of the second endplate. *Id.* at FIGS. 1-2.
a second terminal part opposite said first terminal part, said second terminal part having an insertion face extending between a third bearing surface and a fourth bearing surface,	As previously described (see analysis of this same element in claim 7), Steffee discloses that the implant comprises a second terminal part opposite the first terminal part, the second terminal part having an insertion face extending between a third bearing surface and a fourth bearing surface. *Id.* at FIG. 1; FIG. 2 (reproduced above in the analysis of claim 7).
said implant having a longitudinal axis extending through said trailing face	As previously described (see analysis of this same element in claim 7), Steffee discloses that the implant 6 provides these claimed features, including the longitudinal axis, first plane, se-

of said first terminal part and said insertion face of said second terminal part, and having a cross section in a first plane extending through said first bearing surface and said second bearing surface, and along the longitudinal axis, said implant having a length between said trailing face of said first terminal part and said insertion face of said second terminal part and parallel to the longitudinal axis, said implant having a width and a height each perpendicular to the length of said implant;	cond plane, length, width, and height. *Id.* at FIG. 1; FIG. 2 (reproduced above in the analysis of claim 7).
a first side and an opposite second side, said first side and said second side extending from said first terminal part to said second terminal part, portions of said first side and said second side being substantially flat, said substantially flat portions intersecting a second plane that is perpendicular to the first plane and extends through said insertion face and said trailing face, wherein said substantially flat portions of said first side and said second side are symmetrical about the first plane,	As previously described (see analysis of this same element in claim 7), the sides of Steffee's implant 10 each include "substantially flat" portions (under the broadest reasonable interpretation standard) that intersect a second plane and that are symmetrical about the first plane. *Id.* at 2:32-33; FIGS. 2 and 10-12 (FIG. 11 being reproduced above in the analysis of claim 7).

said implant being adapted to be inserted between the first vertebra and the second vertebra with said first side and said second side of said implant being oriented toward the first end plate and the second endplate, respectively, and then rotated ninety degrees into an upright position,	As previously described (see analysis of this same element in claim 7), according to the broadest reasonable interpretation of "adapted to," Steffee discloses that the implant is capable of being inserted with the first side and the second side of the implant being oriented toward the first and second end plates, and then rotated ninety degrees into an upright position. *Id.* at 1:35-42; 4:28-39 ("rotated 90^{o}"); FIGS. 9-10 (reproduced above in the analysis of claim 7)
said trailing face having a recessed portion intersecting each of said first and second sides and being configured to receive an insertion instrument for inserting said implant between the first vertebra and the second vertebra;	As previously described (see analysis of this same element in claim 7), to the extent that Steffee's implant structure does not include a trailing face having a recessed portion intersecting each of the first and second sides and configured to receive an insertion instrument, such a configuration was traditionally employed in similar prior art spinal implants, as evidenced by the Michelson '037 reference. Michelson '037 discusses a spinal implant 10 as shown in FIGS. 1-5a that includes a trailing face having a "depressed portion 24 with a central threaded opening for receiving the engaging end 28 of a driving member 30." NUVASIVE1109 at p. 11; FIGS. 1, 5, and 5a. According to Michelson, the recessed portion 24 intersects the particular sides that are oriented toward the vertebrae during the insertion step so that the "restriction members 47 and 49" of the inserter tool (oriented near the ends of the recessed portion 24) acts as stops that abut the vertebrae and prevent over insertion of the implant 10. *Id.* at p. 13. A person of ordinary skill in the art would have been prompted to modify Steffee's implant 10 to provide a recessed portion and threaded opening along the trailing face of the implant (as suggested by Michelson '037) so that the insertion tool provides dual engagement mechanisms (both threaded engagement and slot/extension engagement) and thereby "prevents movement of the implant 10 in relation to the driving member 30." *Id.* at p. 12. In such circumstances, a surgeon could readily engage/disengage a threaded tool into the central threaded opening 39 while maintaining the established orientation of the implant (with the portion of the inserter tool that mates with the recessed portions). See NUVA-

	SIVE1101 at ¶¶ 45-46. Here, a skilled artisan would recognize that Michelson '037 suggests the recessed portion intersects the particular sides that face toward the vertebrae during the insertion step (as previously described), so the resulting combination of Steffee in view of Michelson '037 would likewise provide such an orientation for the recessed portion (which is likewise suggested by the orientation of Steffee's inserter tool). NUVASIVE1108 at FIG. 2 (modified above in the analysis of claim 7 to show the recessed portion and threaded tooling hole suggested by Michelson '037); *see also* NUVASIVE1101 at ¶ 46. Additionally, a skilled artisan would have been prompted to modify Steffee's implant to include a recessed portion and threaded tooling hole in the trailing face because to do so would be merely "[u]se of known technique to improve similar devices . . . in the same way." MPEP § 2143(C).
an opening between said trailing face and said insertion face and between said first and second sides to permit for the growth of bone through said implant from the first vertebra to the second vertebra;	As previously described (see analysis of this same element in claim 7), both Steffee and Michelson '037 disclose the claimed opening to permit for the growth of bone through the implant. For example, Steffee discloses that the implant 10 includes "openings 56 and 58" to provide for blood flow and bone growth therethrough. NUVASIVE1108 at 2:64-67; FIGS. 1-2. Additionally, Michelson '037 discloses the traditional design option for spinal fusion implants in which bone growth openings 36 are provided vertically through the upper and lower bearing surfaces. *See* NUVASIVE1105 at pp. 8 and 12; FIGS. 1 and 1e. In light of Michelson's prior art teaching, the aforementioned combination of Steffee and Michelson '037 would provide such a traditional configuration because the "serve[ ] to promote bone ingrowth between the implant and the adjacent vertebrae." NUVASIVE1109 at p. 13; *see also* NUVASIVE1108 at FIG. 11 (modified above in the analysis of claim 7 to show the bone growth openings suggested by Michelson '037 at p. 13); *see also* NUVASIVE1101 at ¶¶ 47-48. Additionally, a skilled artisan would have been prompted to modify Steffee's implant to include such bone growth openings through the surfaces that engage the vertebrae because to do so would be merely "[u]se of known technique to improve similar devices . . . in the same way." MPEP § 2143(C).
upper and lower bearing surfaces each having a	As previously described (see analysis of the "upper and lower bearing surfaces" recitation in claim 7), Steffee discloses upper

length measured parallel to the longitudinal axis of said implant, said upper and lower bearing surfaces having portions proximate each of said first and second sides and being convex along the entire length of said upper and lower bearing surfaces relative to the second plane and in a direction parallel to the longitudinal axis, said trailing face having a height less than and measured parallel to a maximum height measured between said upper and lower bearing surfaces proximate one of said first and second sides;	and lower bearing surfaces each having a length measured parallel to the longitudinal axis of said implant, the trailing face having a height less than and measured parallel to a maximum height measured between the upper and lower bearing surfaces proximate one of the first and second sides. *See* NUVASIVE1108 at FIGS. 1-2; col. 2:44-47. To the extent that Steffee does not disclose that the upper and lower bearing surfaces of Steffee's implant 10 are "convex along the entire length of said upper and lower bearing surfaces" as recited in this claim, such convex bearing surfaces were commonly employed in similar prior art spinal implants, as evidenced by the Kim reference. For example, Kim discloses the widely known configuration in which the upper and lower bearings surfaces are "convex" so as to correspond with the "concave contact surface" of the adjacent vertebrae. NUVASIVE1110 at 2:28-37; 5:61; FIGS. 2 and 4. A person of ordinary skill in the art would have been prompted to modify Steffee's implant 10 to provide a convex curvature along the entire length of the upper and lower bearing surfaces (as suggested by Kim) so that bearing surfaces correspond to the concave vertebral endplates and "the compression stress can be effectively dispersed or distributed." *Id.* at 3:26 to 4:10. Here, a skilled artisan would recognize that Kim suggests the upper and lower bearing surfaces should provide some degree of convexity along the length of the implant to correspond to the "macroscopically concave surfaces" of the vertebral endplates, so the resulting combination of Steffee in view of Michelson '037 and Kim would likewise provide such convexity for the upper and lower bearing surfaces. NUVASIVE1108 at FIG. 2 (modified above in the analysis of claim 7 in view of Michelson '037 (described above) and furthermore to show the convexity of the upper and lower bearing surfaces as suggested by Kim); *see also* NUVASIVE1101 at ¶¶ 49-50. Also, a skilled artisan would have been prompted to modify Steffee's implant to include the convexity of the upper and lower bearing surfaces because to do so would be merely "[u]se of known technique to improve similar devices . . . in the same way." MPEP § 2143(C). Moreover, in the resulting combination (one example depicted above), the claimed "maximum height" that is "measured . . . proximate one of said first and second sides" is clearly

	achieved just as it was in Steffee's disclosed implant 10.
ratchetings on each of said upper and lower bearing surfaces adapted to engage the first vertebra and the second vertebra, respectively, each of said ratchetings having a ridge oriented in a direction generally parallel to the width of said implant, said ratchetings on each of said upper and lower bearing surfaces facing one direction; and	As previously described (see analysis of this same element in claim 7), Steffee discloses that the upper and lower bearing surfaces of the implant 10 are equipped with engagement structures that form the claimed "ratchetings" recited in this claim. For example, Steffee teaches that the upper and lower bearing surfaces are equipped with teeth 36, and that the orientation (e.g., ratcheting orientation) is achieved by selecting the surface angles "x" and "y." NUVASIVE1108 at FIG. 3; col. 2, lines 54-56. While Steffee describes an embodiment in which both angles "x" and "y" are 45 degrees, Steffee expressly discloses that the available range for angle "x" is limited only to an "acute angle" (e.g., less than 90 degrees) and that the selectable range for angle "y" is limited only to an "acute angle." *Id.* at col. 2, lines 54-59. Accordingly, Steffee expressly discloses or suggests to a skilled artisan that the angles "x" and "y" can be selected to provide traditional ratcheting teeth. *Id.* at FIG. 3 (modified above in the analysis of claim 7 to show "x" and "y" within the expressly suggested ranges); NUVASIVE1101 at ¶ 52. Thus, Steffee expressly discloses this claim element, or alternatively, suggests to a skilled artisan that angle "x" can be different from angle "y" so as to achieve the traditional ratchetings. Indeed, by the early 1990s, the mere substitution of non-oriented teeth for ratcheting teeth along the bearing surfaces of a spinal fusion implant was nothing more than an obvious design choice available to any ordinary artisan at that time. NUVASIVE1101 at ¶ 52.
said implant being adapted to hold bone fusion promoting materials.	As discussed above, Steffee and Michelson '037 disclose that the implant is adapted to hold bone fusion promoting materials. NUVASIVE1108 at 2:64-67; NUVASIVE1109 at pp. 11 and 13.
11. The implant of claim 10, wherein said implant has a plurality of openings between said trailing face and said insertion face and between said first and second sides to permit for the growth of bone through said implant from the first vertebra to the	As previously described in the analysis of claim 10, both Steffee and Michelson '037 disclose the claimed "plurality of openings" to permit for the growth of bone through the implant from the first vertebra to the second vertebra. *See* NUVASIVE1108 at 2:64-67 (openings 56 and 58); FIGS. 1-2; *see also* NUVASIVE1105 at FIGS. 1 and 1e; p. 12 (openings 36); p. 8 ("openings");

second vertebra.	
12. The implant of claim 10, wherein said convex portions of said upper and lower bearing surfaces are convex along a continuous uninterrupted majority of the lengths of said upper and lower bearing surfaces.	As previously described in the analysis of claim 10, the resulting combination would provide Steffee's implant 10 modified to provide a convex curvature along a continuous uninterrupted majority of the lengths of the upper and lower bearing surfaces (as suggested by Kim) so that bearing surfaces correspond to the concave vertebral endplates and "the compression stress can be effectively dispersed or distributed." NUVASIVE1110 at 3:26 to 4:10; *see also* NUVASIVE1108 at FIG. 2 (modified as shown above in view of Michelson '037 (described above) and furthermore to show the convexity of the upper and lower bearing surfaces as suggested by Kim).

X. CONCLUSION

Claims 7-12 are invalid over the prior art pursuant to Grounds 1-4 set forth above.

Accordingly, Petitioner requests *inter partes* review of claims 7-12 of the `696 patent.

Respectfully submitted,

Dated: June 27, 2013 /Stephen R. Schaefer, Reg. No. 37,927/
Stephen R. Schaefer, Reg. No. 37,927

Dated: June 27, 2013 /Michael T. Hawkins, Reg. No. 57,867/
Michael T. Hawkins, Reg. No. 57,867

Both above signers of:
Fish & Richardson P.C.
3200 RBC Plaza
60 South Sixth Street
Minneapolis, MN 55402

(Trial No. _____) *Attorneys for Petitioner*

CERTIFICATE OF SERVICE

Pursuant to 37 CFR §§ 42.8(b)(4) and 42,105(b), the undersigned certifies that on June 27, 2013, a complete and entire copy of this Petition for Inter Partes Review and all supporting exhibits were provided via Express Mail, costs prepaid, to the Patent Owner by serving the correspondence address of record as follows:

Martin & Ferraro, LLP
1557 Lake O'Pines Street NE
Hartville, OH 44632

By: /Stephen R. Schaefer, Reg. No. 37,927/
Stephen R. Schaefer
Fish & Richardson P.C.
60 South Sixth Street, Suite 3200
Minneapolis, MN 55402
(612) 335-5070