IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent of: Michelson
U.S. Patent No.: 8,444,696 Attorney Docket No.: 13958-0113IP1
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

TABLE OF CONTENTS

EXHIBITS

NUVASIVE1001	Declaration of Dr. John W. Brantigan, M.D.
NUVASIVE1002	U.S. Patent No. 8,444,696 to Michelson ("the '696 patent")
NUVASIVE1003	Select Prosecution History of the '696 patent (Serial No. 13/235,998)
NUVASIVE1004	U.S. Patent No. 5,645,596 to Kim et al. ("Kim")
NUVASIVE1005	PCT Publication WO 89/09035 to Brantigan ("Brantigan '035")
NUVASIVE1006	U.S. Patent No. 5,192,327 to Brantigan ("Brantigan '327")
NUVASIVE1007	PCT Publication WO93/01771 to Senter et al. ("Senter")
NUVASIVE1008	PCT Publication WO90/00037 to Michelson ("Michelson '037")
NUVASIVE1009	U.S. Patent No. 5,306,309 to Wagner et al. ("Wagner")
NUVASIVE1010	Select prosecution history of *inter partes* reexamination proceedings on U.S. Patent No. 8,021,430 (Control No. 95/002,380)
NUVASIVE1011	Plaintiffs' Disclosure of Asserted Claims and Infringement Contentions re U.S. Patent No. 8,444,696, from *Warsaw Orthopedic, Inc. et al. v. NuVasive*, S.D. Cal., Case No. 3:12-cv-02738-CAB (MDD)

NuVasive, Inc. ("Petitioner") petitions for *Inter Partes* Review ("IPR") under 35 U.S.C. §§ 311–319 and 37 C.F.R. § 42 of claims 1-6 of the `696 patent. Below, NuVasive demonstrates there is a reasonable likelihood of prevailing ("RLP") in its challenge of at least one claim identified as unpatentable in this petition.

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 7-12 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* NUVASIVE1010. 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
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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. 13958-0113IP1 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 1-6 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 Patent Claims	Basis for Rejection
Ground 1	**1, 3-4, 6**	Obvious under § 103 by Kim in view of Brantigan '035
Ground 2	**2 and 5**	Obvious under § 103 by Kim in view of Brantigan '035 and Brantigan '327
Ground 3	**1, 3-4, 6**	Obvious under § 103 by Senter in view of Brantigan '035
Ground 4	**2 and 5**	Obvious under § 103 by Senter in view of Brantigan '035 and Brantigan '327

Ground 5	**1-6**	Obvious under § 103 by Michelson '037 in view of Wagner and Brantigan '035

Kim is prior art under at least §102(e), assuming entitlement to the earliest claimed priority, June 7, 1995; all other references above are prior art under §102(b), having been published more than a year before the earliest claimed priority. Kim, Brantigan '327, Senter, and Wagner were of record in the original prosecution; Brantigan '035 and Michelson '037 were not. None of the references were applied in a rejection in the original prosecution; there were no prior art rejections. In addition, although Patent Owner submitted, in an IDS after allowance, invalidity claim charts prepared by Petitioner (NUVASIVE1010), the grounds of those claims charts 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 1 and 4) is interpreted to include sides that are either planar or outwardly bowed. *See* NUVASIVE1001 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*

NUVASIVE1011 at Ex. A, pp. 6-8; NUVASIVE1001 at ¶ 13. Second, the phrase "**upper and lower bearing surfaces having portions … being convex along the <u>entire length of said upper and lower bearing surfaces</u>**" (claims 1 and 4) does **<u>not</u>** 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"). Instead, the claimed convexity, as recited, need only be "along the entire length of **said upper and lower bearing surfaces.**" Indeed, both independent claims 1 and 4 define "a length" for the "upper and lower bearing surfaces" (*see* claim 1, col. 31, lines 36-38), and separately define a different "length" for the overall implant that is "**between said trailing face and … said insertion face**" (see claim 1, col. 13, lines 16-17). 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 shown in FIGS. 13-14).

IV. SUMMARY OF THE `696 PATENT

A. Brief Description

Spinal fusion implants of the type described in the '696 patent were invented in the early 1980's, and provide structural stability while bone grows between the adjacent vertebrae to fuse them together. *See* NUVASIVE1001 at ¶¶ 6-11. The '696 patent claims priori-

ty ultimately to an application filed June 7, 1995, which in turn was characterized as a continuation-in-part of an application chain going back to June 28, 1988, priority to which is not claimed in the '430 patent because then its term would have expired even before issuance. The prior 1988 Michelson patent application (published as Michelson '037) is relevant given that well-known fusion implant structures now claimed in the '696 patent were disclosed in Michelson '037 and other prior art references.

The two independent claims 1 and 4 at issue in this IPR include cobbled-together features not found in any one embodiment of the '696 patent. For example, claims 1 and 4 each define an implant structure with upper and lower bearing surfaces that are "convex" (outwardly bowing), a feature present only in the implant of FIGS. 13-17 (best shown in FIG. 14). Other recited implant features are absent from the FIGS. 13-17 implant, and are only present in embodiments with upper and 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 has the same specification as the '696 patent and 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. The '430 patent issued in Sept. 2011, and on Aug. 17, 2012, the Patent Owner filed a lawsuit against Petitioner NuVasive, alleging infringement of the '430 patent by NuVasive implants that had been on the market since 2004.

In response, NuVasive sought *inter partes* reexamination; on Nov. 29, 2012, the Central Reexamination Unit ("CRU") rejected all claims of the '430 patent 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 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 (i.e., 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 "con-

vex" 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

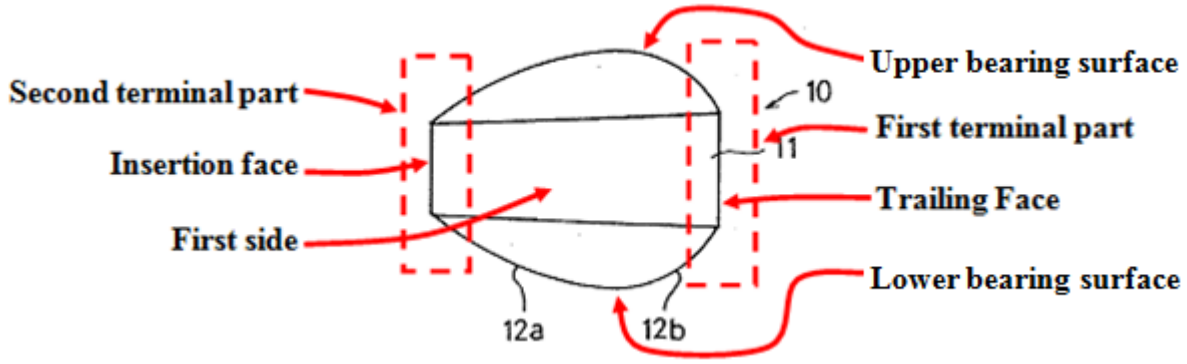
claim charts for the allowed '696 claims that the Petitioner had recently prepared. On Apr. 19, 2013, the examiner made an entry that the IDS had been considered, although made no substantive comment on these materials. On the next business day, the Patent Owner paid the issue fee. After that, on Apr. 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 limitations 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 5) show that independent claims 1 and 4 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 assert 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), Kim discloses a spinal implant 10 that is "provided with a convex surface corresponding to the concave contact surface" of the verte-

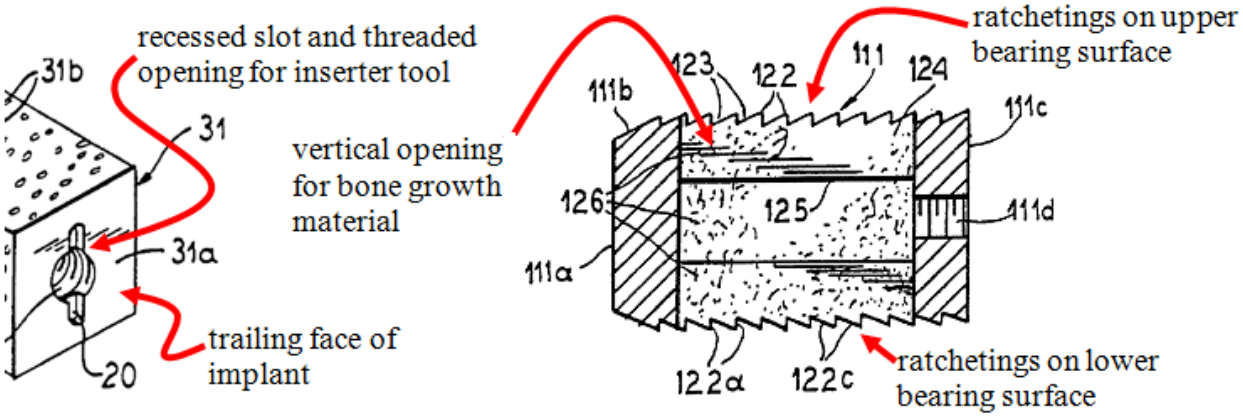
bral endplate. NUVASIVE1004 at 2:28-37; FIG. 4. Kim also teaches that the implant 10 has a structure to cause "spontaneous adhesion" between the bearing surfaces and the associated vertebral bone, thereby "resulting in a firm connection therebetween." *Id.* at 4:22-26. Kim's implant 10 discloses nearly all of the claimed structures, including the structures of the "first terminal part," the "second terminal part," the "insertion face," the "trailing face," the "first side and an opposite second side," and the "upper and lower bearing surfaces":



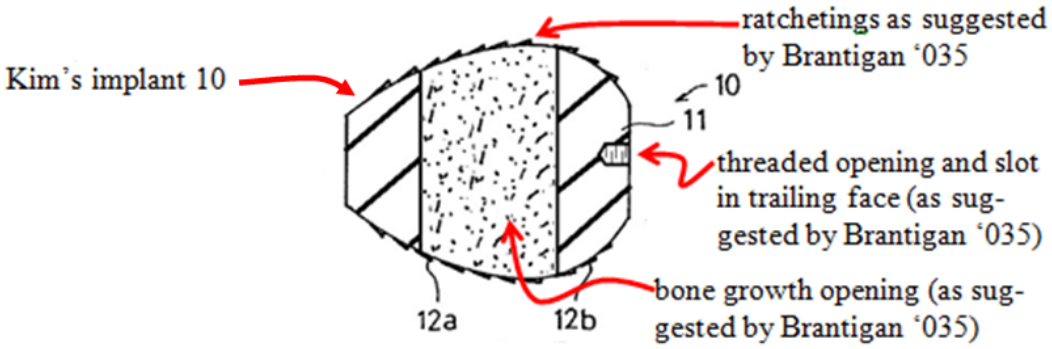
Id. at FIG. 2; *see also* col. 6 and FIG. 1; NUVASIVE1001 at ¶¶ 15, 18 & 21-22.

To the extent Kim does not describe the claimed features of (i) "a recessed portion and a threaded opening" of the trailing face, (ii) "an opening" for the growth of bone, or (iii) "ratchetings on each of said upper and lower bearing surfaces," such structures were widely known in conventional spinal implants *and commonly implemented together in a single spinal implant embodiment*. For example, Brantigan '035 describes a similar spinal fusion implant, and teaches the well-known options of equipping spinal fusion implants with (i) a trailing face having "a recessed portion and a threaded opening" (for purposes of receiving an inserter tool), (ii) an "opening" for the growth of bone through the implant, and (iii) "ratchet-

ings" on the upper and lower bearing surfaces:



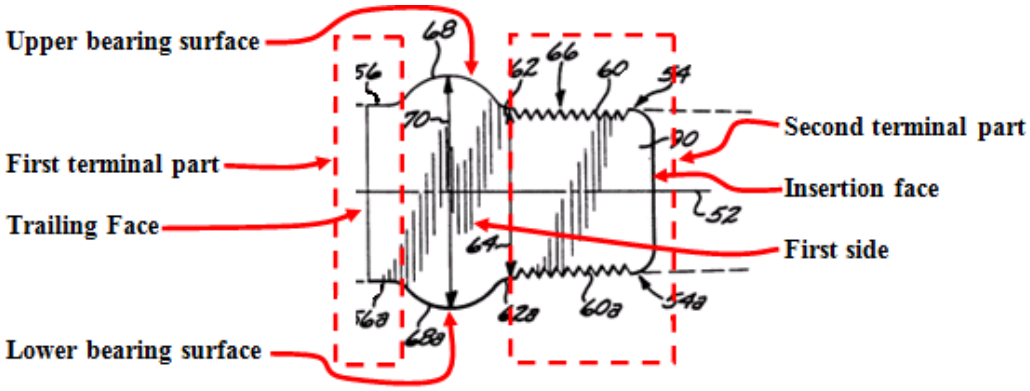
NUVASIVE1005 at FIGS. 18-19 and 5-9; pp. 19-21; NUVASIVE1001 at ¶¶ 16, 19 & 23. A person of ordinary skill in the art would have been prompted to modify Kim's spinal fusion implant to include these conventional options taught by Brantigan '035 so as to achieve the specific advantages (listed below in the claim charts) associated with each of these well-known structures:



NUVASIVE1001 at ¶¶ 17, 20 & 24; NUVASIVE1004 at FIG. 2 (modified above to include traditional options suggested by Brantigan '035). Indeed, the obviousness of combining the well-known features of Brantigan '035 with Kim (an implant having convex upper and lower bearing surfaces) is illustrated by the fact that the combined features are not included in the only "convex" embodiments of the '696 specification, but rather were pulled from different

non-convex embodiments of the '696 specification, as discussed above. In summary, there is a reasonable likelihood that independent claims 1 and 4 of the `696 patent are unpatentable based upon Kim in view of Brantigan '035.

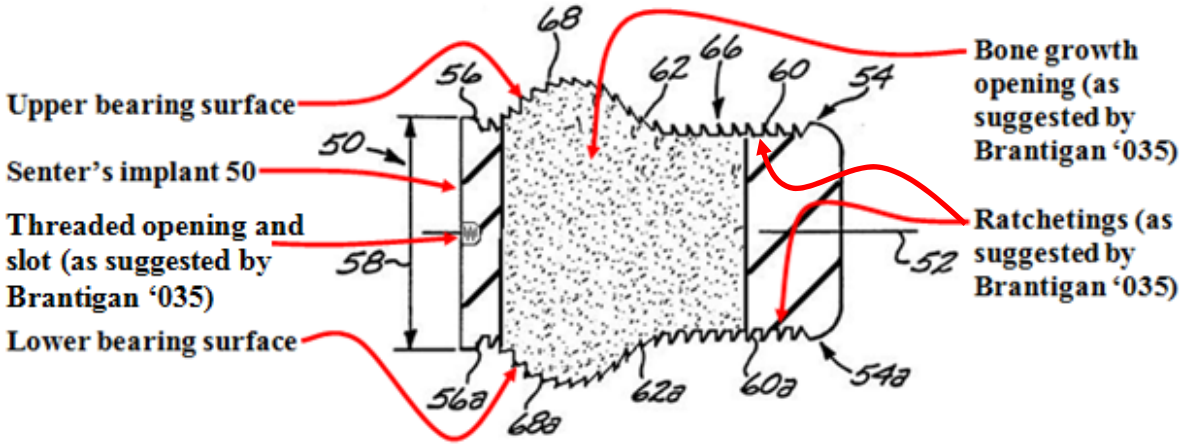
Referring to Ground 3 (also charted below), Senter also discloses nearly all limitations of claims 1 and 4, including the claimed "first terminal part," "second terminal part," "first side and an opposite second side," and "upper and lower bearing surfaces":



NUVASIVE1007 at FIGS. 3-4 & 6F; pp. 4, 10-11 & 16; *see also* NUVASIVE1001 at ¶¶ 29, 32 & 35-36.

To the extent that Senter does not disclose (i) "a recessed portion and a threaded opening" of the trailing face, (ii) "an opening" for the growth of bone, or (iii) the "ratchetings," these structures were widely known in conventional spinal implants and commonly implemented together in a single spinal implant embodiment. Indeed, as previously described, Brantigan '035 describes a similar spinal fusion implant, and teaches the conventional understanding that spinal implants could be readily equipped with these claimed features. NUVASIVE1005 at FIGS. 18-19 & 5-9; pp. 19-21. As described in the charts below, a per-

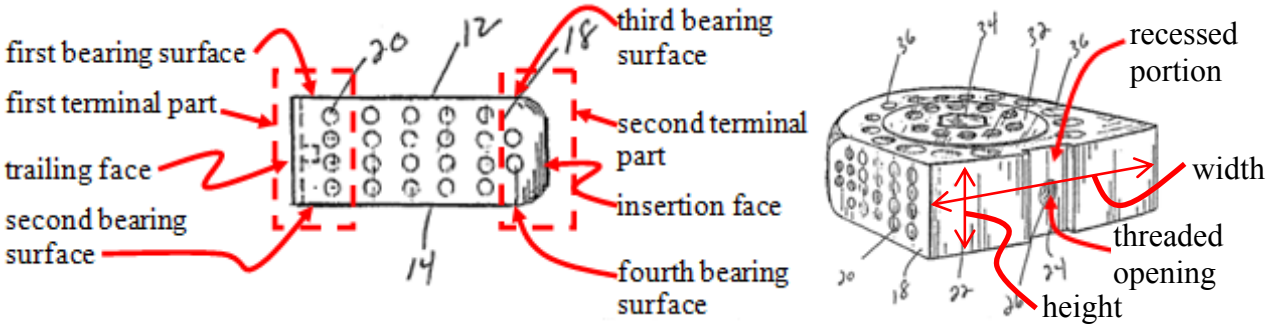
son of ordinary skill in the art would have been prompted to modify Senter's implant to include these conventional options suggested by Brantigan '035 so as to achieve the benefits (detailed below) associated with each of these well-known structures:



NUVASIVE1001 at ¶¶ 31, 34 & 38; NUVASIVE1007 at FIG. 3 (modified above to include traditional options suggested by Brantigan '035). Again, the obviousness of combining the well-known features of Brantigan '035 with Senter (an implant having convex upper and lower bearing surfaces) is illustrated by the fact that the combined features are not included in the only "convex" embodiments of the '696 specification, but rather were pulled from different non-convex embodiments of the '696 specification, as discussed above. In summary, there is a reasonable likelihood that independent claims 1 and 4 of the `696 patent are unpatentable based upon Senter in view of Brantigan '035.

Referring to Ground 5 (also charted below), Michelson '037 discloses nearly all features of independent claims 1 and 4, including the claimed "first terminal part," "second terminal part," "first side and an opposite second side," trailing face having "a recessed portion and a threaded opening," and "width of said implant being greater than the height of said

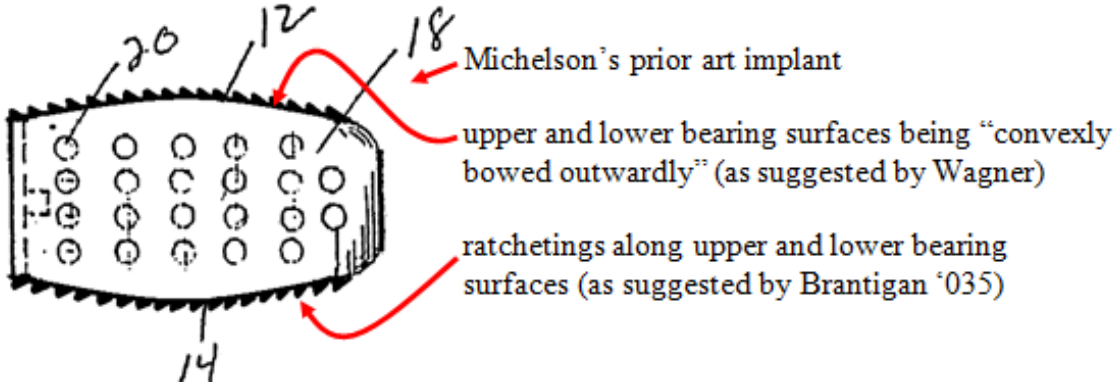
implant":



See NUVASIVE1008 at FIGS. 1 and 1C (shown above); *see also* FIG. 1D; 1:2-4; NUVASIVE1001 at ¶ 43.

To the extent Michelson '037 does not expressly describe the two claimed features of (i) the upper and lower bearing surfaces being "convex", and (ii) the "ratchetings," such structures were widely known in conventional spinal implants and understood to be ordinary design options at the time. NUVASIVE1001 at ¶¶ 44-48. For example, Wagner describes a similar spinal implant, and the design option for implementing an implant in which the top and bottom bearing surfaces of the implant "are convexly bowed outwardly and the convex bowing "may be *from the anterior end to the posterior end* or from side to side, or both." NUVASIVE1009 at 7:24-28 (emphasis added); FIG. 7. Also for example, Brantigan '035 demonstrates that "ratchetings" were well understood at the time as a traditional design option at the time for spinal fusion implants. NUVASIVE1005 at FIGS. 18-19 (FIG. 19 is reproduced above); pp. 19-21. As described in the charts below, a person of ordinary skill in the art would have been prompted to modify Michelson '037's prior art implant to implement these conventional options taught by Wagner and Brantigan '035 so as to achieve the

known advantages (described below) associated with each of these well-known structures:

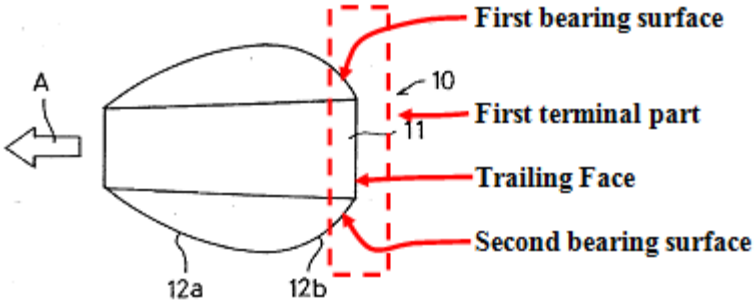
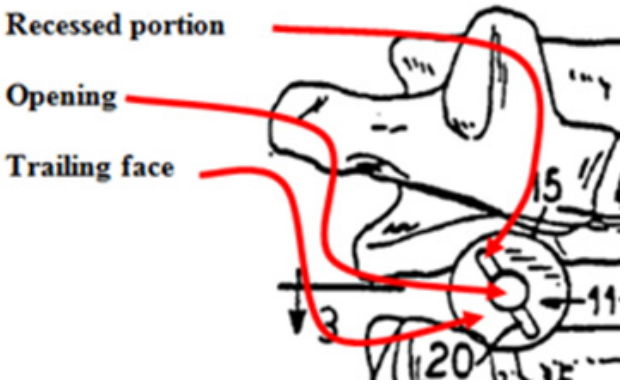


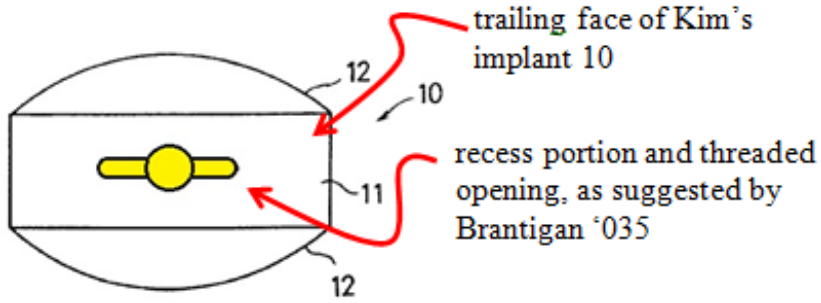
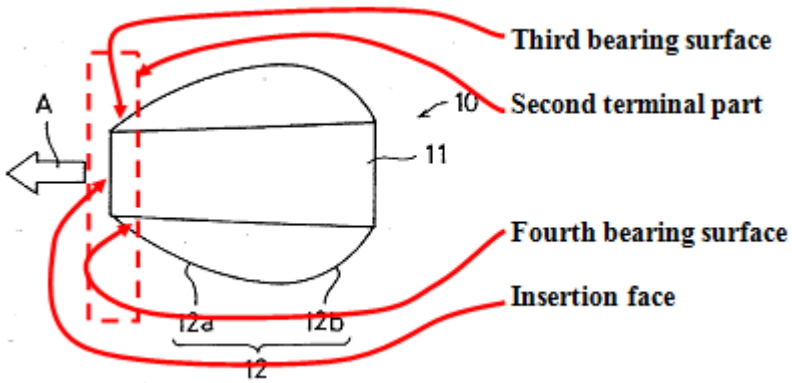
NUVASIVE1008 at FIG. 1C (modified to include Wagner's suggested convex bearing surfaces and Brantigan '035's suggested ratchetings); *see also* NUVASIVE1001 at ¶¶ 45 & 48.

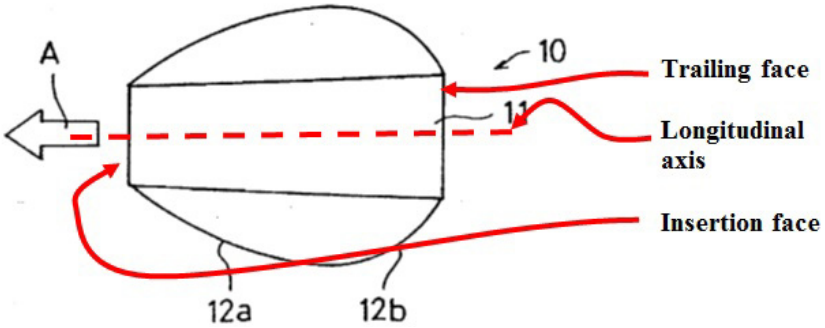
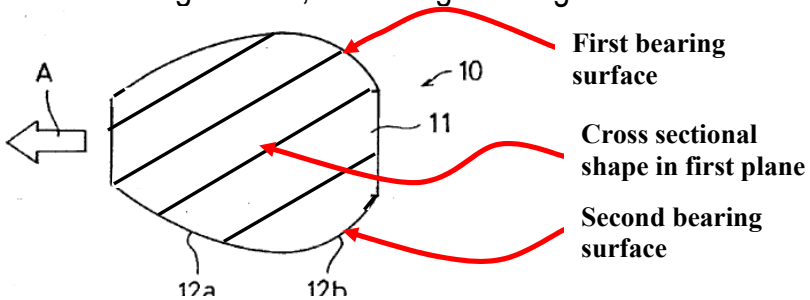
In summary, there is a reasonable likelihood that independent claims 1 and 4 of the `696 patent are unpatentable based upon Michelson '037 in view of Wagner and Brantigan '035.

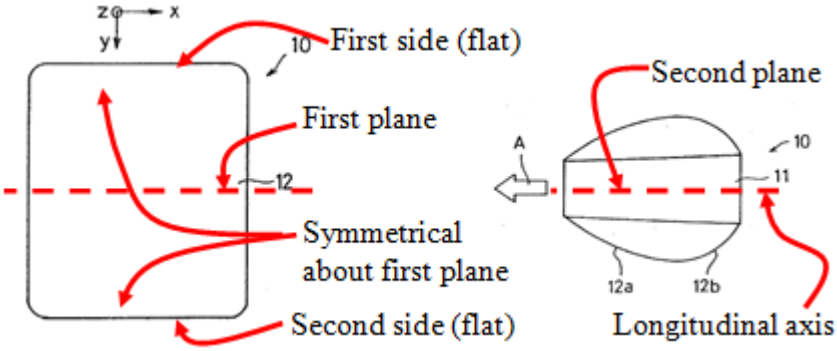
VI. [GROUND 1 CLAIM CHARTS] – Obviousness of Claims 1, 3-4 and 6 under §103 by Kim in view of Brantigan '035

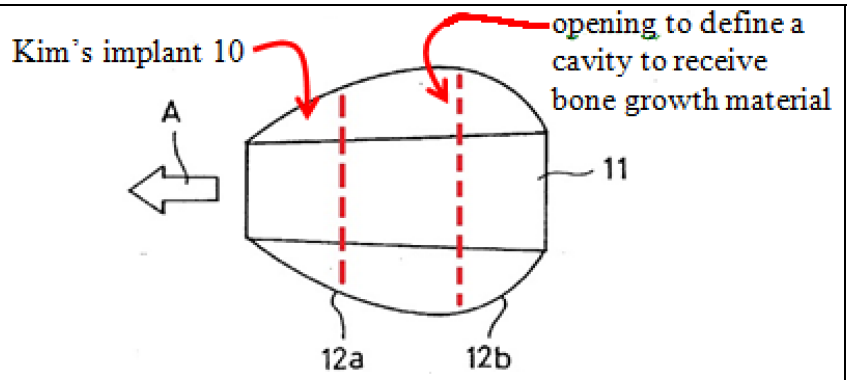
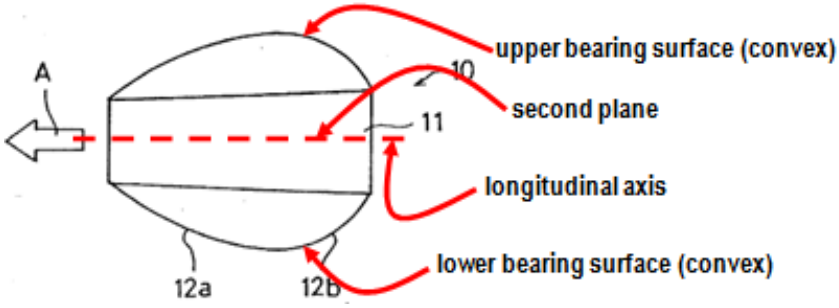
U.S. Pat. 8,444,696	Kim in view of Brantigan '035
1. A spinal fusion implant for insertion between a first vertebra and a second vertebra adjacent the first vertebra, the first vertebra having a generally vertically extending first peripheral wall and a first endplate and the second vertebra having a generally vertically extending second peripheral wall and a second endplate, wherein the implant comprises:	Kim discloses a spinal fusion implant for insertion between a first vertebra and a second vertebra adjacent the first vertebra. For example, Kim discloses "a vertebrae prosthesis" intended for insertion into the space of an "intervertebral disk" and configured with a "convex surface" on the upper and lower portions that correspond to the concave contact surface of the adjacent vertebrae. NUVASIVE1004 at 2:28-37; 5:61; FIG. 4 (showing the implant 10 inserted between the first and second vertebrae 20). Kim also discloses that the implant has a structure to cause "spontaneous adhesion" between the bearing surfaces and the associated vertebral bone, thereby "resulting in a firm connection therebetween." *Id.* at 4:22-26; NUVASIVE1001 at ¶ 14.
a first terminal part defining a trailing face, a first bearing surface adapted to bear against a portion of the first	Kim 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

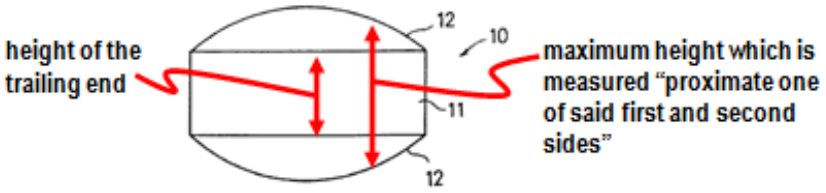
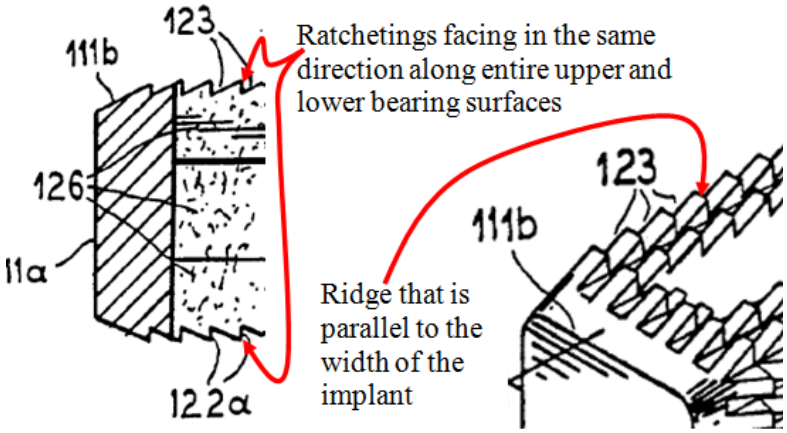
end plate, and an opposite second bearing surface adapted to bear against a portion of the second end plate, said trailing face extending between said first bearing surface and second bearing surface,	the second endplate.  *See id.* at FIGS. 2 (above) and 4; *see also* col. 6:5-23; NUVASIVE1001 at ¶ 15.
said trailing face having a recessed portion and a threaded opening configured to receive an insertion instrument for inserting said implant between the first vertebra and the second vertebra;	To the extent that Kim's implant structure does not include a trailing face having a recessed portion and a threaded opening configured to receive an insertion instrument for inserting the implant between the first vertebra and the second vertebra, such a design choice was well known in similar prior art spinal fusion implants. For example, Brantigan '035 discloses a similar spinal fusion implant equipped with "tool receiving recesses facilitating insertion of the [implant] into place on the prepared sites of adjacent vertebrae." *See* NUVASIVE1005 at 5:8-13. Thus, Brantigan '035 teaches the well-known option for spinal implants in which the trailing face includes "an internally threaded circular hole 19" and a "radial slot 20 diametrically intersecting the tapped hole 19." *Id.* at 12:4-9. One example is reproduced below:  *Id.* at FIG. 2; *see also* FIGS. 5-10; NUVASIVE1001 at ¶ 16. A person of ordinary skill in the art would have been prompted to modify Kim's implant to include a recessed portion and threaded opening in the trailing face (as suggested by Brantigan '035) so as to provide a convenient and simplified process for "insertion . . . and removal of [an insertion instru-

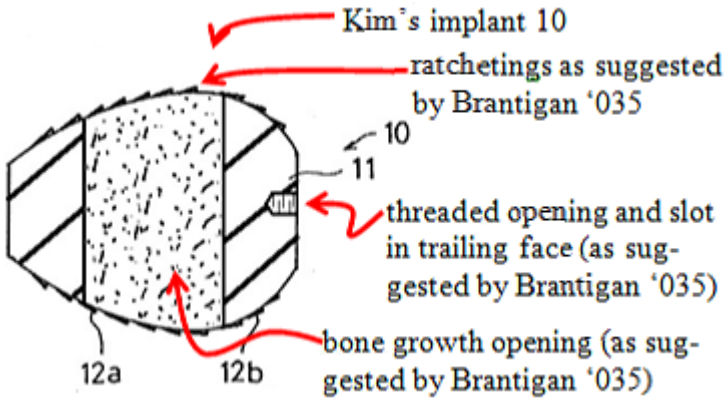
	ment] without disturbing the mounting." NUVASIVE1005 at 12:1-4; 5:16-18. Here, a skilled artisan would have understood the threaded hole and recess for the inserter tool would be readily applied to the structure of Kim's implant, thereby providing the known insertion advantages:  NUVASIVE1001 at ¶ 17. Moreover, a person of ordinary skill in the art would have seen a reason to modify Kim's implant to include a recessed portion and threaded opening configured to receive an insertion instrument because to do so would be merely "[u]se of known technique to improve similar devices . . . in the same way." MPEP § 2143(C).
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,	Kim 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.  *See* NUVASIVE1004 at FIG. 2 (shown above) and 4; *see also* col. 6:5-23; NUVASIVE1001 at ¶ 15.
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	Kim teaches that the implant 10 has a longitudinal axis extending through the trailing face of the first terminal part and the insertion face of the second terminal part.

	 *See* NUVASIVE1004 at FIG. 2 and col. 6:46-50; NUVA-SIVE1001 at ¶ 15.
having a cross section in a first plane extending through said first bearing surface and said second bearing surface, and along the longitudinal axis,	Kim also teaches that the implant has a cross section in a first plane extending through the first bearing surface and the second bearing surface, and along the longitudinal axis.  *See* NUVASIVE1004 at FIGS. 1-2; *see also* col. 6:44-51.
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, the width of said implant being greater than the height of said implant;	Kim also teaches that the implant has a length between the trailing face of the first terminal part and the insertion face of the second terminal part and parallel to the longitudinal axis, and the implant has a width and a height each perpendicular to the length of the implant, the width of the implant being greater than the height of the implant. *Id.* at FIG. 1 (the length along the direction of insertion); FIG. 3 (illustrating the width is greater than the height).
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	Kim's implant 10 includes a first side and an opposite second side, the first side and the second side extending along the first terminal part, the elongated body, and the second terminal part, and portions of the first side and the second side are substantially flat. The substantially flat portions intersect a second plane that is perpendicular to the first plane

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,	and extends through the insertion face and the trailing face.  *Id.* at FIGS. 1-2; col. 6:44-51 (describing that the implant's sidewalls can be flat so as to take the form of a "parallel-sided plate" with convex upper and lower bearing surfaces). *See also* NUVASIVE1001 at ¶ 18.
wherein said substantially flat portions of said first side and said second side are symmetrical about the first plane;	Kim discloses that the substantially flat portion of the first side and the substantially flat portion of the second side are symmetrical about the first plane. *See id.* at FIG. 1 (reproduced above) and col. 6:44-51; *see also* NUVASIVE1001 at ¶ 18.
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;	To the extent that Kim does not expressly describe the claimed opening, this feature was traditionally employed in prior art spinal fusion implants. For example, Brantigan '035 describes the conventional option of equipping a spinal fusion implant with "slots for carrying bone graft material." *See* NUVASIVE1005 at FIGS. 18-19 & 1:3-20; *see also* NUVASIVE1001 at ¶ 19. Brantigan '035 teaches that this design option provided "a vertical slot" through the spinal implant to provide an internal bone growth cavity for receiving "bone growth material". *Id.* at 2:11-29. One having ordinary skill in the art would have been prompted to modify Kim's implant to include at least one opening (as suggested by Brantigan '035) so as to provide the implant with an internal cavity that is "filled with strips of bone implant" that will subsequently "grow into the bone tissue of the adjoining vertebrae." *See id.* at 20:21-29. Here, a skilled artisan would have understood that the shape/size of the opening in the resulting implant structure would be selected to maintain the objective of Kim in which the implant is "stably held in the inserted position" (*see* NUVASIVE1004 at col. 2:20) while also enhancing the bone fusion process:

	 NUVASIVE1001 at ¶ 20; NUVASIVE1004 at FIG. 2 (modified above to include a bone growth opening, as suggested by Brantigan '035). Also, a skilled artisan would have been prompted to modify Kim's implant to include such openings because to do so would be merely "[u]se of known technique to improve similar devices . . . in the same way." MPEP § 2143(C). "[W]hen a patent simply arranges old elements with each performing the same function it had been known to perform and yields no more than one would expect from such an arrangement, the combination is obvious." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007).
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 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	Kim discloses upper and lower bearing surfaces each having a length measured parallel to the longitudinal axis of said implant, the upper and lower bearing surfaces having portions proximate each of the 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:  *See* NUVASIVE1004 at FIG. 2 and col. 6:1-9; *see also* NUVASIVE1001 at ¶¶ 21-22. Also, Kim discloses that the trailing face has 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:

and second sides;	 *See* NUVASIVE1004 at FIG. 3. Moreover, the claimed "maximum height" that is "measured proximate one of said first and second sides" is even more clearly achieved by the resulting combination of Kim in view of Brantigan '035 (described above, having the central opening therethrough as suggested by Brantigan '035). NUVASIVE1001 at ¶ 22.
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 Kim 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* NUVASIVE1005 at FIGS. 18-19; 19:25 to 20:3; 20:30-33; and 21:1-5. Brantigan '035 expressly teaches that these nubs 122 can be in the form of ratchetings oriented toward the same direction (e.g., oriented toward the trailing face):  *Id.* at FIGS. 18-19 (above). Further, each of these nubs 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; *see also* NUVASIVE1001 at ¶ 23. One having ordinary skill in the art would have been

	prompted to modify Kim's implant to include the ratcheting projections on the upper and lower bearing surfaces (as suggested by Brantigan '035) 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". See *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 be "easily inserted" (NUVASIVE1004 at col. 2:20) while also improving Kim's objective for a "firm connection" (NUVASIVE1004 at 4:22-26) between the bearing surfaces and the vertebral bone:  NUVASIVE1001 at ¶ 24; NUVASIVE1004 at FIG. 2 (modified above to include traditional options suggested by Brantigan '035). Also, a skilled artisan would have been prompted to modify Kim'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 shown above, to the resulting combination of Kim in view of Brantigan '035 would include at least one vertical slot – the claimed "opening" (as suggested by Brantigan '035) that is "filled with strips of bone implant 126" which "will then grow into the bone tissue of the adjoining vertebrae." NUVASIVE1005 at FIG.18; 20:21-29; *see also* NUVASIVE1001 at ¶¶ 19-20.
3. The implant of claim 1, wherein said convex portions of said upper and lower bearing surfaces are convex along a continuous uninter-	Kim discloses the convex portions of the upper and lower bearing surfaces are convex along a continuous uninterrupted majority of the lengths of the upper and lower bearing surfaces. *See* NUVASIVE1004 at FIG. 2; *see also* col. 6:1-9. The resulting combination of Kim in view of Brantigan

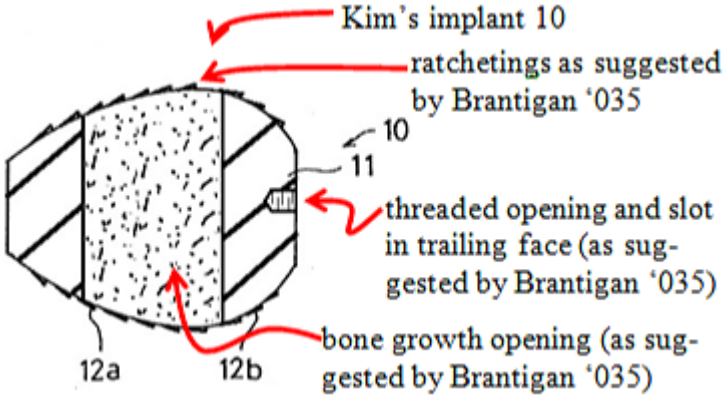
rupted majority of the lengths of said upper and lower bearing surfaces.	'035 would likewise provide this feature, as depicted in one example above in connection with claim 1.
4. A spinal fusion implant for insertion between a first vertebra and a second vertebra adjacent the first vertebra, the first 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 end plate, wherein the implant comprises:	Note: this preamble is identical to the preamble of claim 1. As previously described (see analysis of this same preamble in claim 1), Kim 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 FIG. 4; 2:28-37; 5:61; 4:22-26 (describing adhesion between the bearing surfaces and the associated vertebral bone, thereby "resulting in a firm connection therebetween"). *See also* NUVASIVE1001 at ¶ 14.
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,	Note: this claim limitation is identical to claim 1. As previously described (see analysis of this same element in claim 1), Kim 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. NUVASIVE1004 at FIGS. 2 and 4 and col. 6:5-23; *see also* NUVASIVE1001 at ¶ 15.
said trailing face having a recessed portion and a threaded opening configured to receive an insertion instrument for inserting said implant between the first vertebra and the second vertebra;	Note: this claim limitation is identical to claim 1. As previously described (see analysis of this same element in claim 1), to the extent that Kim's implant structure does not include a trailing face having a recessed portion and a threaded opening configured to receive an insertion instrument, such a design choice was well known in similar prior art spinal fusion implants. For example, Brantigan '035 discloses a similar spinal fusion implant equipped with "tool receiving recesses facilitating insertion of the [implant] into place on the prepared sites of adjacent vertebrae." *See* NUVASIVE1005 at 5:8-13. Thus, Brantigan '035 teaches the well-known option for spinal implants in which the trailing

	face includes "an internally threaded circular hole 19" and a "radial slot 20 diametrically intersecting the tapped hole 19." *Id.* at FIGS. 2-3 and 5-10; 12:4-9; *see also* NUVASIVE1001 at ¶ 16. Thus, as previously described in the analysis of this same element in claim 1, a person of ordinary skill in the art would have been prompted to modify Kim's implant to include a recessed portion and threaded opening in the trailing face (as suggested by Brantigan '035) so as to provide a convenient and simplified process for "insertion . . . and removal of [an insertion instrument] without disturbing the mounting." NUVASIVE1005 at 12:1-4; 5:16-18. Again, a skilled artisan would have understood the threaded hole and recess for the inserter tool would be readily applied to the structure of Kim's implant, thereby providing the known insertion advantages. NUVASIVE1001 at ¶ 17. Additionally, a person of ordinary skill in the art would have seen a reason to modify Kim's implant to include a recessed portion and threaded opening configured to receive an insertion instrument because to do so would be merely "[u]se of known technique to improve similar devices . . . in the same way." MPEP § 2143(C).
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,	Note: this claim limitation is identical to claim 1. As previously described (see analysis of the "second terminal part" element in claim 1), Kim 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. NUVASIVE1004 at FIG. 2 & 4, and col. 6:5-23; *see also* NUVASIVE1001 at ¶ 15.
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	Note: this claim limitation is identical to claim 1. As previously described (see analysis of the "second terminal part" element in claim 1), Kim teaches that the implant 10 has a longitudinal axis extending through the trailing face of the first terminal part and the insertion face of the second terminal part. NUVASIVE1004 at FIG. 2; col. 6:46-50; *see also* NUVASIVE1001 at ¶ 15.
having a cross section in a first plane extending through said first bearing surface and	Note: this claim limitation is identical to claim 1. As previously described (see analysis of the "second terminal part" element in claim 1), Kim also teaches that the

said second bearing surface, and along the longitudinal axis,	implant has a cross section in a first plane extending through the first bearing surface and the second bearing surface, and along the longitudinal axis. NUVASIVE1004 at FIG. 2 (reproduced above, modified to show cross-section); col. 6:44-51; *see also* NUVASIVE1001 at ¶ 15.
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;	Note: this claim limitation is identical to claim 1, except that it omits the last clause included in this limitation in claim 1. As previously described (see analysis of the "second terminal part" element in claim 1), Kim also teaches that the implant has a length between the trailing face of the first terminal part and the insertion face of the second terminal part and parallel to the longitudinal axis, and the implant has a width and a height each perpendicular to the length of the implant. NUVASIVE1004 at FIGS. 1 and 3 (illustrating the length along the direction of insertion, and illustrating the width and height).
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,	Note: this claim limitation is identical to claim 1. As previously described (see analysis of this same element in claim 1), Kim's implant 10 includes a first side and an opposite second side, the first side and the second side extending along the first terminal part, the elongated body, and the second terminal part, and portions of the first side and the second side are substantially flat. *Id.* at FIGS. 1-2; *see also* col. 6:44-51 (describing that the implant's sidewalls can be flat so as to take the form of a "parallel-sided plate" with convex upper and lower bearing surfaces); *see also* NUVASIVE1001 at ¶ 18
wherein said substantially flat portions of said first side and said second side are symmetrical about the first plane;	Note: this claim limitation is identical to claim 1. As previously described (see analysis of this same element in claim 1), Kim discloses that the substantially flat portion of the first side and the substantially flat portion of the second side are symmetrical about the first plane. NUVASIVE1004 at FIG. 1 and col. 6:44-51; *see also* NUVASIVE1001 at ¶ 18.
an opening between said trailing face and said insertion face and between said	Note: this claim limitation is identical to claim 1. As previously described (see analysis of this same element in claim 1), to the extent that Kim does not expressly

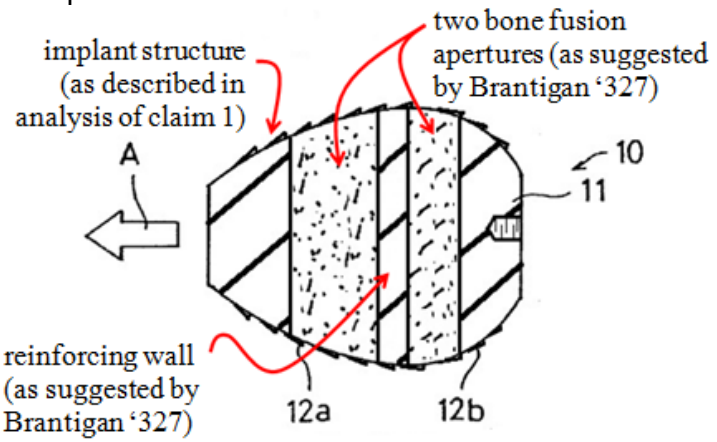
first and second sides to permit for the growth of bone trough said implant from the first vertebra to the second vertebra;	describe the claimed opening, this feature was traditionally employed in prior art spinal fusion implants. For example, Brantigan '035 describes the conventional option of equipping a spinal fusion implant with "slots for carrying bone graft material." *See* NUVASIVE1005 at FIGS. 18-19; 1:3-20; *see also* NUVASIVE1001 at ¶ 19. Brantigan '035 teaches that this design option provided "a vertical slot" through the spinal implant to provide an internal bone growth cavity for receiving "bone growth material". *Id.* at 2:11-29. Thus, as previously described in the analysis of this same element in claim 1, one having ordinary skill in the art would have been prompted to modify Kim's implant to include at least one opening (as suggested by Brantigan '035) so as to provide the implant with an internal cavity that is "filled with strips of bone implant" that will subsequently "grow into the bone tissue of the adjoining vertebrae." *See* NUVASIVE1005 at 20:21-29. Again, a skilled artisan would have understood that the shape/size of the opening in the resulting implant structure would be selected to maintain the objective of Kim in which the implant is "stably held in the inserted position" (*see* NUVASIVE1004 at col. 2:20) while also enhancing the bone fusion process. NUVASIVE1001 at ¶ 20. Furthermore, a skilled artisan would have been prompted to modify Kim's implant to include such openings because to do so would be merely "[u]se of known technique to improve similar devices . . . in the same way." MPEP § 2143(C); *KSR*, 550 U.S. at 417 ("[W]hen a patent simply arranges old elements with each performing the same function it had been known to perform and yields no more than one would expect from such an arrangement, the combination is obvious.").
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 and second sides and being convex along the en-	Note: this claim limitation is identical to claim 1, except bolded limitation is different from claim 1. As previously described in the analysis of claim 1 above, Kim discloses upper and lower bearing surfaces each having a length measured parallel to the longitudinal axis of said implant, the upper and lower bearing surfaces having portions proximate each of the first and second sides and being convex along the entire length of the upper and lower bearing surfaces relative to the second plane and in a direction

tire length of said upper and lower bearing surfaces relative to the second plane and in a direction parallel to the longitudinal axis**, the width of said implant being greater than the height measured between said upper and lower bearing surfaces proximate one of said first and second sides of said implant**;	parallel to the longitudinal axis. NUVASIVE1004 at FIG. 2; *see also* col. 6:1-9. Also, as previously shown in the analysis of claim 1 above Kim illustrates that the width of the implant is greater than the height measured between the upper and lower bearing surfaces proximate one of the first and second sides of the implant. *Id.* at FIGS. 1 and 3; *see also* NUVASIVE1001 at ¶ 22.
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	Note: this claim limitation is identical to claim 1. As previously described (see analysis of this same element in claim 1), to the extent that Kim 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* NUVASIVE1005 at FIGS. 18-19; 19:25 to 20:3; 20:30-33, & 21:1-5. Brantigan '035 expressly teaches that these nubs 122 can be in the form of ratchetings oriented toward the same direction (e.g., oriented toward the trailing face), and each of these nubs 122 includes a ridge that is "generally parallel" to the width of the implant. *Id.* at FIGS. 18-19. 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. Thus, as previously described in the analysis of this same element in claim 1, one having ordinary skill in the art would have been prompted to modify Kim's implant to include the ratcheting projections on the upper and lower bearing surfaces (as suggested by Brantigan '035) 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". *See Id.* at 21:1-5. Again, 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 be "easily inserted" (NUVASIVE1004 at col. 2:20) while also improving Kim's objective for a "firm connection" (NUVASIVE1004 at 4:22-26) between the bearing surfaces and the vertebral bone:  NUVASIVE1001 at ¶ 24; NUVASIVE1004 at FIG. 2 (modified above to include traditional options suggested by Brantigan '035). Also, a skilled artisan would have been prompted to modify Kim'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.	Note: this claim limitation is identical to claim 1. As shown above, the resulting combination of Kim in view of Brantigan '035 would include at least one vertical slot – the claimed "opening" (as suggested by Brantigan '035) that is "filled with strips of bone implant 126" which "will then grow into the bone tissue of the adjoining vertebrae." NUVASIVE1005 at FIG.18; 20:21-29; *see also* NUVASIVE1001 at ¶¶ 19-20.
6. The implant of claim 4, 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 3), Kim discloses that the convex portions of the upper and lower bearing surfaces are convex along a continuous uninterrupted majority of the lengths of the upper and lower bearing surfaces. *See* NUVASIVE1004 at FIG. 2; *see also* col. 6:1-9. The resulting combination of Kim in view of Brantigan '035 would likewise provide this feature, as depicted in one example above.

VII. [GROUND 2 CLAIM CHARTS] – Obviousness of Claims 2 and 5 under §103 by Kim in view of Brantigan '035 and Brantigan '327

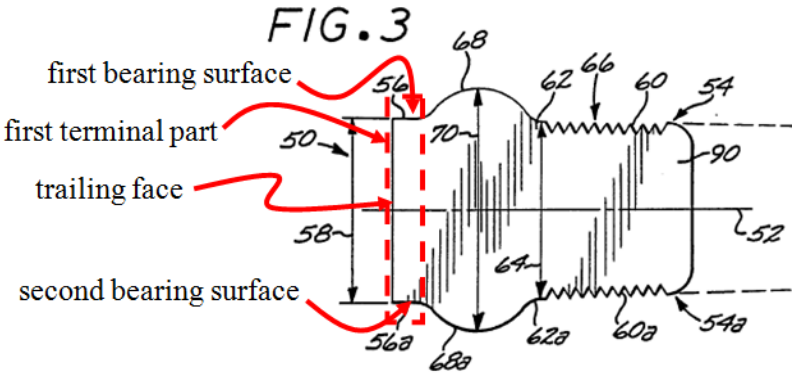
U.S. Pat. 8,444,696	Kim in view of Brantigan '035 and Brantigan '327

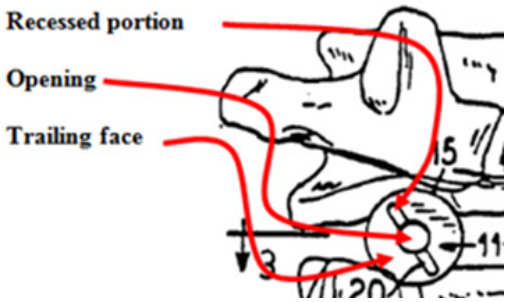
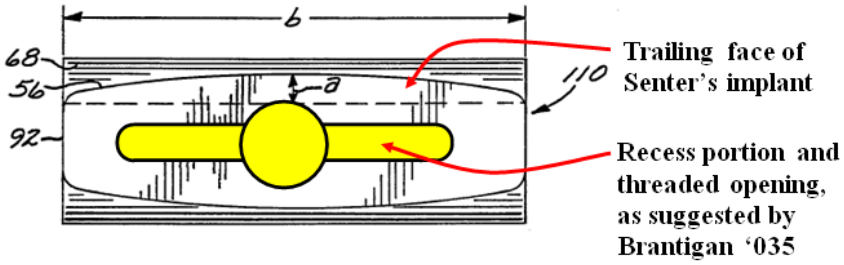
2. The implant of claim 1, wherein said implant has a plurality of openings between said trailing face and said insertion face and between said first and second sides to permit for the growth of bone through said implant from the first vertebra to the second vertebra.	As discussed above in the analysis of claim 1, the resulting combination of Kim in view of Brantigan '035 would provide a spinal implant having at least one vertical opening (as suggested by Brantigan '035) to permit for the growth of bone through the implant, and equipping the implant with two vertical opening rather than one is not a patentable improvement here. To the extent that the resulting combination of Kim in view of Brantigan '035 does not include a "plurality of openings" as recited in this claim, it was a widely known design option in similar spinal fusion implants to include two bone fusion openings rather than one. For example, Brantigan '327 describes equipping a spinal fusion implant with "ample chambers for ingrowth of blood capillaries and bone graft material to expedite bone ingrowth during a post-operative period" and furthermore discloses a typical option of "forming a pair of side-by-side apertures through the [implant] adapted to receive bone graft material." *See* NUVASIVE1006 at FIG. 6; 5:36-43; 7:15-28. A skilled artisan would have been prompted to modify the resulting implant of Kim in view of Brantigan '035 to further include a plurality of openings (as suggested by Brantigan '327) so as to provide the implant with additional internal cavities that are "adapted to receive bone graft material" and to provide a central support wall that serves as a "reinforcing" mechanical support for the implant. *See Id.* at FIG. 6; 5:36-43. Here, a skilled artisan would have understood that the number, shape, and/or size of the openings in the resulting implant structure would be selected to maintain the objective of Kim in which the implant is "stably held in the inserted position" (*see* NUVASIVE1004 at col. 2:20) while also enhancing the bone fusion process:  NUVASIVE1001 at ¶¶ 26-27; NUVASIVE1004 at FIG. 2 (modified above to include traditional options as suggested by Brantigan '035

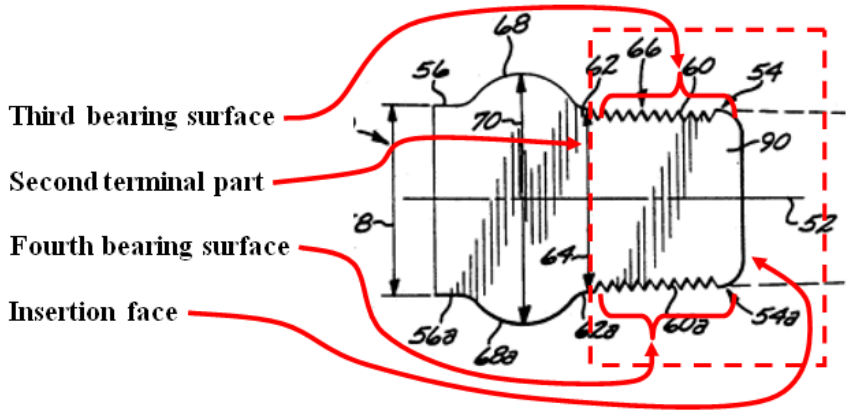
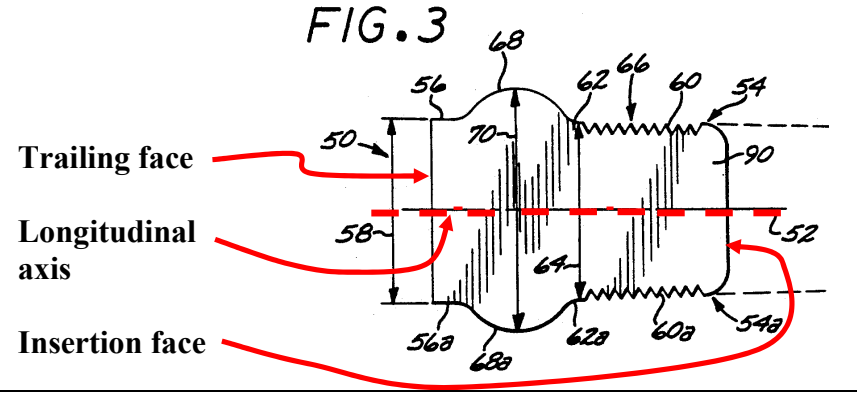
	and Brantigan '327). Also, a skilled artisan would have been prompted to modify Kim's implant to include a plurality of such openings because to do so would be merely "[u]se of known technique to improve similar devices . . . in the same way." MPEP § 2143(C); *see also KSR*, 550 U.S. at 417.
5. The implant of claim 4, 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 2), the resulting combination of Kim in view of Brantigan '035 and Brantigan '327 would provide the claimed spinal implant having a plurality of openings (as suggested by Brantigan '327) so as to provide the implant with additional internal cavities that are "adapted to receive bone graft material" and to provide a central support wall that serves as a "reinforcing" mechanical support for the implant. NUVASIVE1006 at FIG. 6; 5:36-43; NUVASIVE1001 at ¶¶ 26-27.

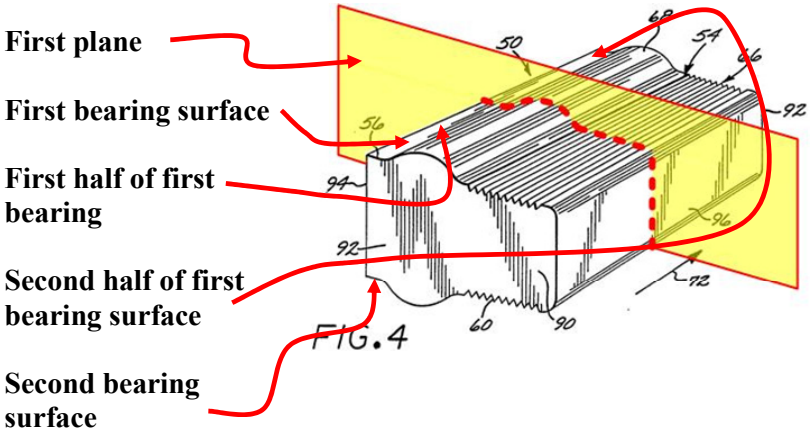
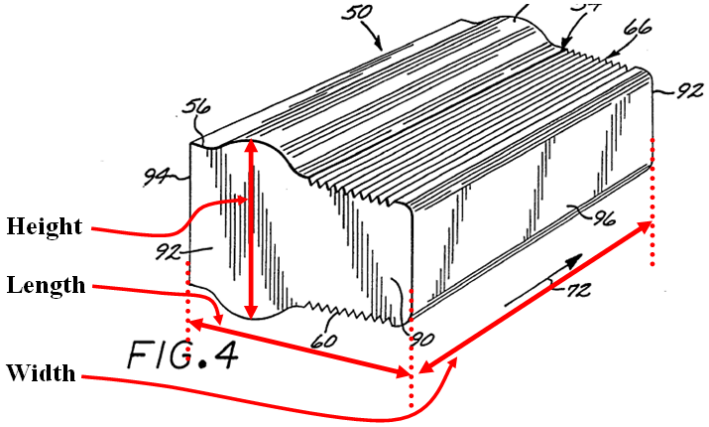
VIII. [GROUND 3 CLAIM CHARTS] – Obviousness of Claims 1, 3-4 and 6 under §103 by Senter in view of Brantigan '035

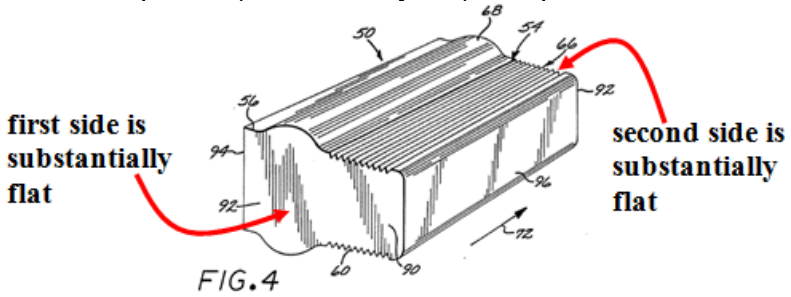
U.S. Pat. 8,444,696	Senter in view of Brantigan '035 and Brantigan '327
1. A spinal fusion implant for insertion between a first vertebra and a second vertebra adjacent the first vertebra, the first vertebra having a generally vertically extending first peripheral wall and a first endplate and the second vertebra having a generally vertically extending second peripheral wall and a second endplate, wherein the implant comprises:	Senter discloses a spinal fusion implant for insertion between a first vertebra and a second 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. For example, Senter discloses "a surgical implant, and its method of use, that is implanted between two vertebrae during a procedure in which the two vertebrae are fused together." NUVASIVE1007 at 4:14-17. FIG. 6F of Senter depicts "placement of the implant 50 or 74 between the vertebrae 22a and 22b." *Id.* at 16:22-24; *see also* NUVASIVE1001 at ¶ 28.
a first terminal part defining a trailing face, a first bearing surface adapted	Senter 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

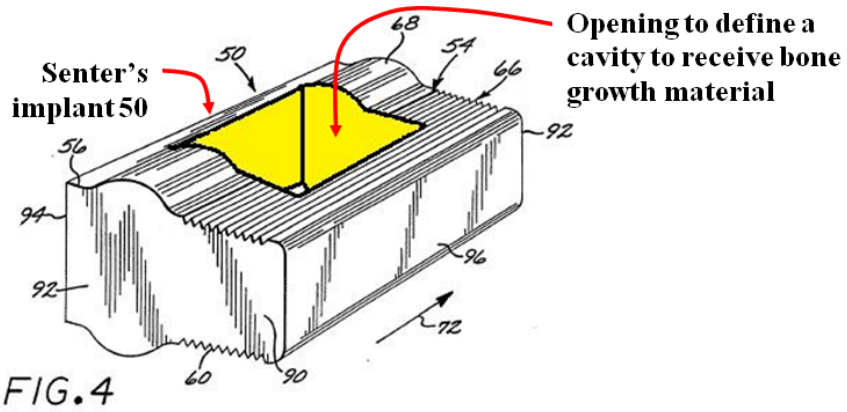
to bear against a portion of the first end plate, and an opposite second bearing surface adapted to bear against a portion of the second end plate, said trailing face extending between said first bearing surface and second bearing surface,	bearing surface adapted to bear against a portion of the second endplate. *See* NUVASIVE1001 at ¶ 29. For example, Senter's implant 50 has a first terminal part with an anterior face 94 (trailing face), a transverse face 54 with an anterior platform 56 (first bearing surface adapted to bear against a portion of the first endplate), and an opposing transverse face 54a with an opposing anterior platform 56a (an opposite second bearing surface adapted to bear against a portion of the second endplate). NUVASIVE1007 at FIGS. 3, 4, 6F; 10: 4-22; 16:27-35.  Senter describes that, when the implant 50 is installed between adjacent vertebrae 22a and 22b, that "[t]he anterior platform 56 is aligned with the anterior edge 42 of the vertebra 22, which is made of hard cortical bone." NUVASIVE1007 at 16:27-35; FIG. 6F (depicting the anterior platforms of the implant 50 bearing against the endplates of the vertebrae 22a and 22b).
said trailing face having a recessed portion and a threaded opening configured to receive an insertion instrument for inserting said implant between the first vertebra and the second vertebra;	To the extent that Senter's implant structure does not include a trailing face having a recessed portion and a threaded opening configured to receive an insertion instrument for inserting the implant between the first vertebra and the second vertebra, such a design choice was well known in similar prior art spinal fusion implants. For example, Brantigan '035 discloses a similar spinal fusion implant equipped with "tool receiving recesses facilitating insertion of the [implant] into place on the prepared sites of adjacent vertebrae." NUVASIVE1005 at 5:8-13. Thus, Brantigan '035 teaches the well-known option for spinal implants in which the trailing face includes "an internally threaded circular hole 19" and a "radial slot 20 diametrically intersecting the tapped hole 19." *Id.* at 12:4-9.

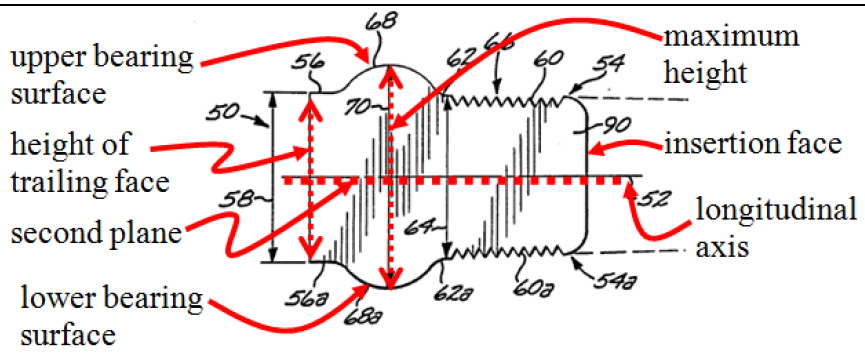
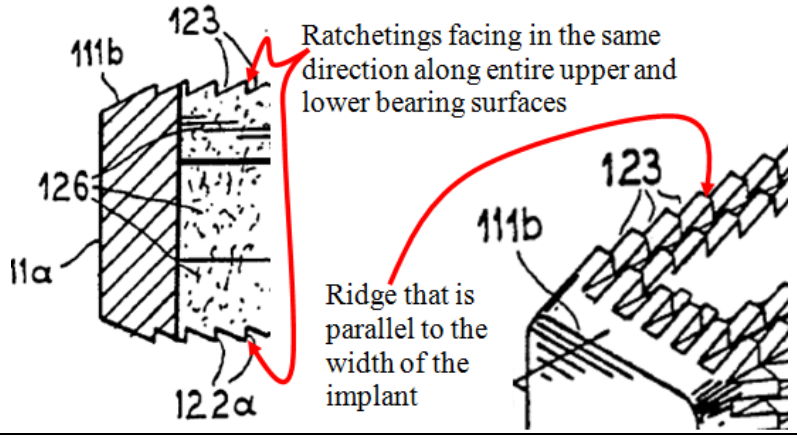
	 *Id.* at FIG. 2; *see also* FIGS. 5-10; *see also* NUVASIVE1001 at ¶ 30. A person of ordinary skill in the art would have been prompted to modify Senter's implant to include a recessed portion and threaded opening in the trailing face (as suggested by Brantigan '035) so as to provide a convenient and simplified process for "insertion . . . and removal of [an insertion instrument] without disturbing the mounting." NUVASIVE1005 at 12:1-4; 5:16-18. Here, a skilled artisan would have understood the threaded hole and recess for the inserter tool would be readily applied to the structure of Senter's implant, thereby providing the known insertion advantages:  NUVASIVE1001 at ¶ 17; NUVASIVE1007 at FIG. 9 (modified to show the recessed portion and threaded hole suggested by Brantigan '035). Moreover, a person of ordinary skill in the art would have seen a reason to modify Senter's implant to include a recessed portion and threaded opening configured to receive an insertion instrument because to do so would be merely "[u]se of known technique to improve similar devices . . . in the same way." MPEP § 2143(C).
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,	Senter 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, Senter discloses a second terminal part (opposite the first terminal part) that includes a posterior face 96 (insertion face) that extends from the posterior ledge 60 (third bearing surface) to the opposing posterior ledge 60a

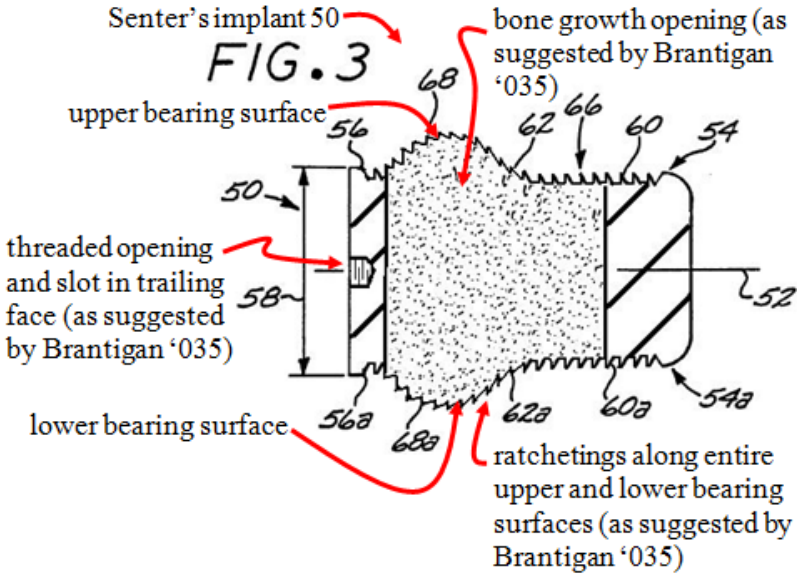
	(fourth bearing surface). NUVASIVE1007 at FIGS. 3, 4, 6F; 10:23 – 11:20; *see also* NUVASIVE1001 at ¶ 29. 
said implant having a longitudinal axis extending through said trailing face of said first terminal part and said insertion face of said second terminal part, and	Senter teaches that the implant 10 has a longitudinal axis extending through the trailing face of the first terminal part and the insertion face of the second terminal part. For example, Senter depicts a central plane 52 (longitudinal axis) of the implant 50 that extends through the posterior face 94 (trailing face) of the anterior platform 56 (first terminal part) and the anterior face 96 (insertion face) of the posterior ledge 60 (second terminal part). NUVASIVE1007 at FIGS. 3 (shown below), 4, 6F; 10:4 – 11:32. 
having a cross section in a first plane extending through said first bearing surface and said second bearing surface, and along the longitudinal axis,	Senter also teaches that the implant has a cross section in a first plane extending through the first bearing surface and the 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, the width of said implant being greater than the height of said implant;	Senter also teaches that the implant has a length between the trailing face of the first terminal part and the insertion face of the second terminal part and parallel to the longitudinal axis, and the implant has a width and a height each perpendicular to the length of the implant, the width of the implant being greater than the height of the implant.  NUVASIVE1007 at FIG. 4 (illustrating both the length along the direction of insertion and the width that is greater than the height).
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	Senter's implant 50 includes a first side and an opposite second side, the first side and the second side extending along the first terminal part, the elongated body, and the second terminal part, and portions of the first side and the second side are substantially flat. The substantially flat portions intersect a second plane that is perpendicular to the first plane and extends through the insertion face and the trailing face. For example, Senter discloses opposed sides 92 (first side and opposite second side) that extend from the anterior platform 56 (first

substantially flat portions intersecting a second plane that is perpendicular to the first plane and extends through said insertion face and said trailing face,	terminal part) to the posterior ledge 62 (second terminal part). *Id.* at FIGS. 3, 4, 6F; 10:2-22. The opposed sides 92 are depicted in FIG. 4 as being substantially flat and are described as being "opposed parallel bases 92" (col 10:4) indicating that the sides 92 are planar (substantially flat) and parallel.  FIG. 4 *Id.* at FIG. 4; *see also* FIG. 3 (depicting a transverse central plane 52 (second plane) that extends through the body 90 of the implant (including the trailing face 94 and the leading face 96) and intersects the flat sides 92 (substantially flat portions) of the implant 50); *see also* NUVASIVE1001 at ¶ 32.
wherein said substantially flat portions of said first side and said second side are symmetrical about the first plane;	Senter discloses that the substantially flat portion of the first side and the substantially flat portion of the second side are symmetrical about the first plane. For example, Senter describes the sides 92 (first and second sides) as "opposed parallel bases 92," indicating that the sides 92 are symmetrical about the first plane bisecting the implant 50 along a longitudinal axis. NUVASIVE1007 at p. 10, line 4; FIG. 4 (depicting the symmetrical sides).
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;	To the extent that Senter does not expressly describe the claimed opening, this feature was traditionally employed in prior art spinal fusion implants. For example, Brantigan '035 describes the conventional option of equipping a spinal fusion implant with "slots for carrying bone graft material." NUVASIVE1005 at FIGS. 18-19; 1:3-20; *see also* NUVASIVE1001 at ¶ 33. Brantigan '035 teaches that this design option provided "a vertical slot" through the spinal implant to provide an internal bone growth cavity for receiving "bone growth material". *Id.* at 2:11-29. One having ordinary skill in the art would have been prompted to modify Senter's implant to include at least one opening (as suggested by Brantigan '035) so as to provide the implant with an internal cavity that is "filled with strips of bone implant" that will subsequently "grow into the bone tissue of the

	adjoining vertebrae." *Id.* at 20:21-29. Here, a skilled artisan would have understood that the shape/size of the opening in the resulting implant structure would be selected to maintain the objective of Senter "to inhibit dislocation (movement) of the implant 50 relative to the vertebrae after implantation" (NUVASIVE 1007 at 11:18-20) while also enhancing the bone fusion process:  FIG. 4 NUVASIVE1001 at ¶ 34; NUVASIVE1007 at FIG. 4 (modified above to include a bone growth slot, as suggested by Brantigan '035). Also, a skilled artisan would have been prompted to modify Senter's implant to include such openings because to do so would be merely "[u]se of known technique to improve similar devices . . . in the same way." MPEP § 2143(C). "[W]hen a patent simply arranges old elements with each performing the same function it had been known to perform and yields no more than one would expect from such an arrangement, the combination is obvious." *KSR*, 550 U.S. at 417.
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 and second sides and being convex along the entire length of said upper and lower bearing surfaces relative to the second	Senter discloses all of these recited features for the claimed upper and lower bearing surfaces and the claimed height of the trailing face. First, Senter illustrates that the upper and lower bearing surfaces (e.g., between the first terminal part and the second terminal part described above) are convexly curved along their entire length:

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;	 NUVASIVE1007 at FIG. 3; *see also* NUVASIVE1001 at ¶¶ 35-36. Also, in addition to the convex ridge 68, Senter teaches that all the other bearing surfaces (first, second, third, and fourth bearing surfaces as described in this claim) can be likewise convexly "bowed outwardly slightly" for purposes of matching "the shape of the contacted vertebrae more precisely." NUVASIVE1007 at p. 6. Regarding the maximum height limitation, Senter discloses "[t]he distance 70 is greater than either the distance 58 or 64." *Id.* at 11:26-29.
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 Senter does not expressly describe the claimed ratchetings on each of said upper and lower bearing surfaces, this feature was traditionally employed in prior art spinal fusion implants. *See* NUVASIVE1001 at ¶ 37. 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* NUVASIVE1005 at FIGS. 18-19; 19:25 to 20:3; 20:30-33, & 21:1-5. Brantigan '035 expressly teaches these nubs 122 can be in the form of ratchetings that extend along the upper and lower bearing surfaces and that have a triangular cross-sectional shape oriented toward the same direction (e.g., oriented toward the trailing face): 

	Id. at FIGS. 18-19 (above). Further, each of these nubs 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; *see also* NUVASIVE1001 at ¶ 37. One having ordinary skill in the art would have been prompted to modify Senter's implant to provide the ratcheting projections on the upper and lower bearing surfaces (as suggested by Brantigan '035) so that the implant "will accommodate the forward moving" and "will prevent retraction" once the implant is seated in the proper position. *Id.* at 20:30 to 21:5. Here, a skilled artisan would have readily understood that the size/orientation angle of the ratchetings of the resulting implant would be selected to improve Senter's objective to "inhibit dislocation (movement) of the implant … after implantation" (NUVASIVE1007 at 11:8-19) between the bearing surfaces and the vertebral bone:  NUVASIVE1001 at ¶ 38; NUVASIVE1007 at FIG. 3 (modified above to include traditional options suggested by Brantigan '035). Also, a skilled artisan would have been prompted to modify Senter'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).

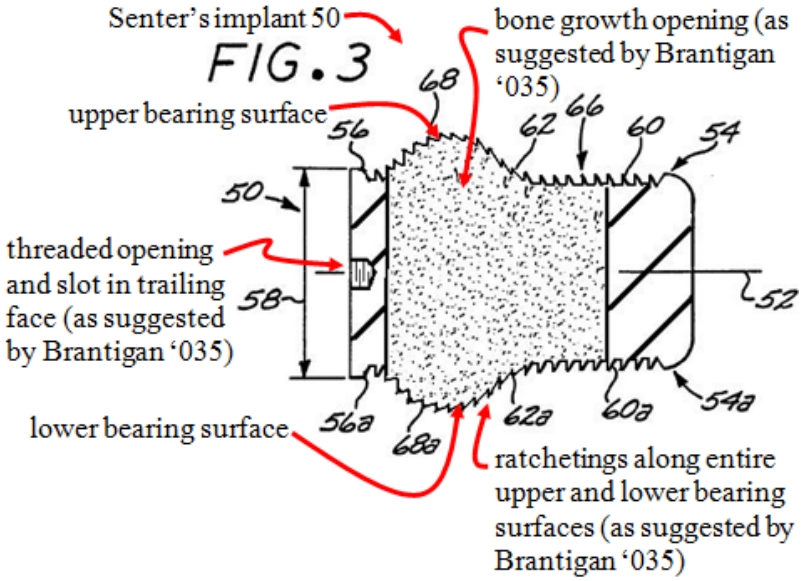
said implant being adapted to hold bone fusion promoting materials.	As shown above, to the resulting combination of Senter in view of Brantigan '035 would include at least one vertical slot – the claimed "opening" (as suggested by Brantigan '035) that is "filled with strips of bone implant 126" which "will then grow into the bone tissue of the adjoining vertebrae." NUVASIVE1005 at FIG.18; 20:21-29; *see also* NUVASIVE1001 at ¶ 34.
3. The implant of claim 1, 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.	Senter discloses the convex portions of the upper and lower bearing surfaces are convex along a continuous uninterrupted majority of the lengths of the upper and lower bearing surfaces. NUVASIVE1007 at FIG. 3 (reproduced above in connection with claim 1). The resulting combination of Senter in view of Brantigan '035 would likewise provide this feature, as depicted in one example above in connection with claim 1.
4. 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 end plate, wherein the implant comprises:	Note: the preamble is identical to the preamble of claim 1. As previously described (see analysis of this same preamble in claim 1), Senter discloses a spinal fusion implant for insertion between a first vertebra and a second 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. *Id.* at 4:14-17; 16:22-24; FIG. 6F; *see also* NUVASIVE1001 at ¶ 28.
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	Note: this claim limitation is identical to claim 1. As previously described (see analysis of this same element in claim 1), Senter 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. NUVASIVE1007 at FIGS. 3, 4, 6F; 10: 4-22; 16:27-35; *see also* NUVASIVE1001 at ¶ 29.

surface and second bearing surface,	
said trailing face having a recessed portion and a threaded opening configured to receive an insertion instrument for inserting said implant between the first vertebra and the second vertebra;	Note: this claim limitation is identical to claim 1. As previously described (see analysis of this same element in claim 1), to the extent that Senter's implant structure does not include a trailing face having a recessed portion and a threaded opening configured to receive an insertion instrument, such a design choice was well known in similar prior art spinal fusion implants. For example, Brantigan '035 discloses a similar spinal fusion implant equipped with "tool receiving recesses facilitating insertion of the [implant] into place on the prepared sites of adjacent vertebrae." NUVASIVE1005 at 5:8-13. Thus, Brantigan '035 teaches the well-known option for spinal implants in which the trailing face includes "an internally threaded circular hole 19" and a "radial slot 20 diametrically intersecting the tapped hole 19." *Id.* at FIGS. 2-3 and 5-10; 12:4-9. Thus, as previously described in the analysis of this same element in claim 1, a person of ordinary skill in the art would have been prompted to modify the Senter's implant to include a recessed portion and threaded opening in the trailing face (as suggested by Brantigan '035) so as to provide a convenient and simplified process for "insertion . . . and removal of [an insertion instrument] without disturbing the mounting." *Id.* at 12:1-4; 5:16-18. Again, a skilled artisan would have understood the threaded hole and recess for the inserter tool would be readily applied to the structure of Senter's implant, thereby providing the known insertion advantages. NUVASIVE1001 at ¶ 31. Moreover, a person of ordinary skill in the art would have seen a reason to modify Senter's implant to include a recessed portion and threaded opening configured to receive an insertion instrument because to do so would be merely "[u]se of known technique to improve similar devices . . . in the same way." MPEP § 2143(C).
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,	Note: this claim limitation is identical to claim 1. As previously described (see analysis of the "second terminal part" element in claim 1), Senter 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. NUVASIVE1007 at FIGS. 3, 4, 6F; 10:23 to 11:20; *see also* NUVASIVE1001 at ¶ 29.

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	Note: this claim limitation is identical to claim 1, except it does not include the last clause included in the limitation in claim 1. As previously described (see analysis of the "second terminal part" element in claim 1), Senter teaches that the implant 10 has a longitudinal axis extending through the trailing face of the first terminal part and the insertion face of the second terminal part. NUVASIVE1007 at FIGS. 3, 4, 6F; 10:4 to 11:32.
having a cross section in a first plane extending through said first bearing surface and said second bearing surface, and along the longitudinal axis,	Note: this claim limitation is identical to claim 1. As previously described in the analysis of claim 1, Senter also teaches that the implant has a cross section in a first plane extending through the first bearing surface and the second bearing surface, and along the longitudinal axis. *Id.* at FIG. 4 (reproduced with annotation above in connection with claim 1).
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;	Note: this claim limitation is identical to claim 1. As previously described (see analysis of the "second terminal part" element in claim 1), Senter also teaches that the implant has a length between the trailing face of the first terminal part and the insertion face of the second terminal part and parallel to the longitudinal axis, and the implant has a width and a height each perpendicular to the length of the implant, the width of the implant being greater than the height of the implant. *Id.* at FIG. 4 (illustrating the length along the direction of insertion between the trailing face and the insertion face).
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 in-	Note: this claim limitation is identical to claim 1. As previously described (see analysis of this same element in claim 1), Senter's implant 50 includes a first side and an opposite second side, the first side and the second side extending along the first terminal part, the elongated body, and the second terminal part, and portions of the first side and the second side are substantially flat. *Id.* at FIGS. 3, 4, 6F; 10:2-22 (describing the opposed sides 92 as planar (substantially flat) and parallel surfaces). FIG. 3 of Senter further depicts a transverse central plane 52 (second plane) that extends through the body 90 of the implant (including the trailing face 94 and the leading face 96) and intersects the flat sides 92 (substantially flat portions) of the implant 50. *Id.* at FIG. 3; *see also* NUVASIVE1001 at ¶ 32.

sertion face and said trailing face,	
wherein said substantially flat portions of said first side and said second side are symmetrical about the first plane;	Note: this claim limitation is identical to claim 1. As previously described (see analysis of this same element in claim 1), Senter discloses that the substantially flat portion of the first side and the substantially flat portion of the second side are symmetrical about the first plane. NUVASIVE1007 at FIG. 4 (shown above); p. 10:4.
an opening between said trailing face and said insertion face and between said first and second sides to permit for the growth of bone trough said implant from the first vertebra to the second vertebra;	Note: this claim limitation is identical to claim 1. As previously described (see analysis of this same element in claim 1), to the extent that Senter does not expressly describe the claimed opening to permit for the growth of bone, this feature was traditionally employed in prior art spinal fusion implants. For example, Brantigan '035 describes the conventional option of equipping a spinal fusion implant with "slots for carrying bone graft material." NUVASIVE1005 at FIGS. 18-19 (reproduced above); 1:3-20; *see also* NUVASIVE1001 at ¶ 33. Brantigan '035 teaches that this design option provided "a vertical slot" through the spinal implant to provide an internal bone growth cavity for receiving "bone growth material". *Id.* at 2:11-29. Thus, as previously described in the analysis of this same element in claim 1, one having ordinary skill in the art would have been prompted to modify Senter's implant to include at least one opening (as suggested by Brantigan '035) so as to provide the implant with an internal cavity that is "filled with strips of bone implant" that will subsequently "grow into the bone tissue of the adjoining vertebrae." *Id.* at 20:21-29. Again, a skilled artisan would have understood that the shape/size of the opening in the resulting implant structure would be selected to maintain the objective of Senter "to inhibit dislocation (movement) of the implant 50 relative to the vertebrae after implantation" (NUVASIVE1007 at 11:18-20) while also enhancing the bone fusion process. NUVASIVE1001 at ¶ 34. Also, a skilled artisan would have been prompted to modify Senter's implant to include such openings because to do so would be merely "[u]se of known technique to improve similar devices . . . in the same way." MPEP § 2143(C); *see also KSR*, 550 U.S. at 417 ("[W]hen a patent simply arranges old elements with each performing the same function it had been known to perform and

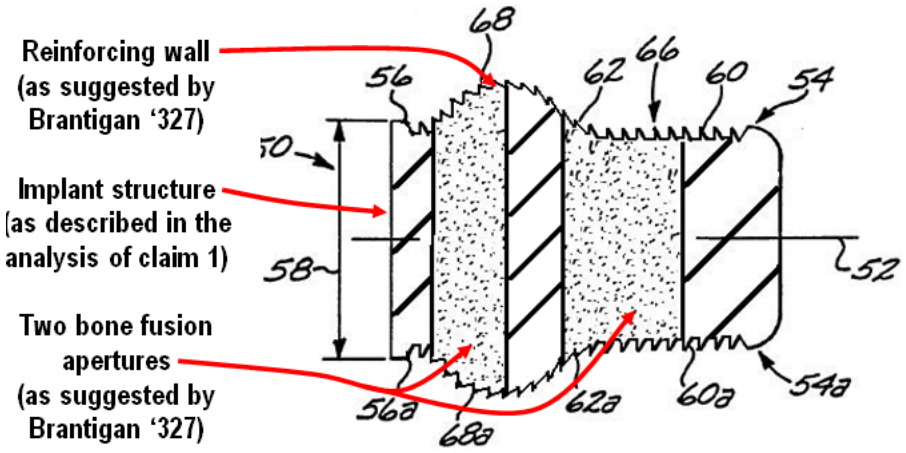
	yields no more than one would expect from such an arrangement, the combination is obvious.").
upper and lower bearing surfaces each having a length measured parallel to the longitudinal axis of said implant, said upper and lower bearing surfaces having portions proximate each of said first and second 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, **the width of said implant being greater than the height measured between said upper and lower bearing surfaces proximate one of said first and second sides of said implant**;	Note: this claim limitation is identical to claim 1, except that the bolded portion is different from claim 1. As previously described in the analysis of claim 1 above, Senter discloses upper and lower bearing surfaces each having a length measured parallel to the longitudinal axis of said implant, the upper and lower bearing surfaces having portions proximate each of the 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, the width of the implant being greater than the height measured between the upper and lower bearing surfaces proximate one of the first and second sides of the implant. NUVASIVE1007 at FIG. 3; p. 6 ("bowed outwardly slightly" for purposes of matching "the shape of the contacted vertebrae more precisely"); 11:26-29; *see also* FIG. 4 (illustrating both the length along the direction of insertion and the width that is greater than the height); *see also* NUVASIVE1001 at ¶¶ 35-36.
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	Note: this claim limitation is identical to claim 1. As previously described (see analysis of this same element in claim 1), to the extent that Senter does not expressly describe the claimed ratchetings on each of said upper and lower bearing surfaces, 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* NUVASIVE1005 at FIGS. 18-19 (reproduced above); 19:25 to 20:3; 20:30-33, & 21:1-5. Brantigan '035 expressly teaches these nubs 122 can be in the form of ratchetings that extend along the upper and lower bearing surfaces and that have a triangular cross-sectional shape oriented toward the same direction (e.g., oriented toward the trailing face), and each of these nubs 122 includes a ridge that is

	"generally parallel" to the width of the implant. *Id.* at FIGS. 18-19. 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; *see also* NUVASIVE1001 at ¶ 37. Thus, as previously described in the analysis of this same element in claim 1, one having ordinary skill in the art would have been prompted to modify Senter's implant to provide the ratcheting projections on the upper and lower bearing surfaces (as suggested by Brantigan '035) so that the implant "will accommodate the forward moving" and "will prevent retraction" once the implant is seated in the proper position. *Id.* at 20:30 to 21:5. Here, a skilled artisan would have readily understood that the size/orientation angle of the ratchetings of the resulting implant would be selected to improve Senter's objective to "inhibit dislocation (movement) of the implant … after implantation" (NUVASIVE1007 at 11:8-19) between the bearing surfaces and the vertebral bone:  NUVASIVE1001 at ¶ 24; NUVASIVE1007 at FIG. 3 (modified above to include traditional options suggested by Brantigan '035). Also, a skilled artisan would have been prompted to modify Senter'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.	Note: this claim limitation is identical to claim 1. As shown above, to the resulting combination of Senter in view of Brantigan '035 would include at least one vertical slot – the claimed "opening" (as suggested by Brantigan '035) that is "filled with strips of bone implant 126" which "will then grow into the bone tissue of the adjoining vertebrae." NUVASIVE1005 at FIG.18; 20:21-29; *see also* NUVASIVE1001 at ¶¶ 19-20.
6. The implant of claim 4, 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 3), Senter discloses the convex portions of the upper and lower bearing surfaces are convex along a continuous uninterrupted majority of the lengths of the upper and lower bearing surfaces. NUVASIVE1007 at FIG. 3. The resulting combination of Senter in view of Brantigan '035 would likewise provide this feature, as depicted in one example above in connection with claim 4.

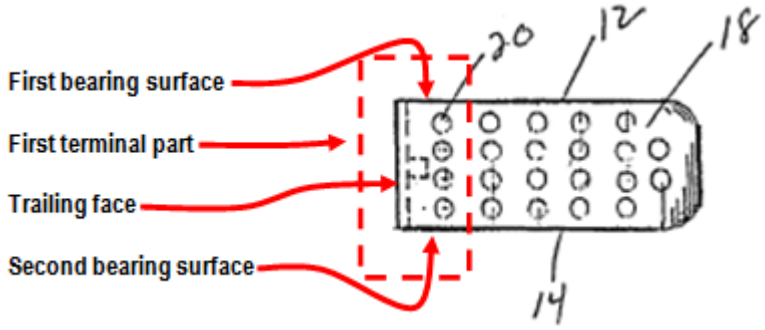
IX. [GROUND 4 CLAIM CHARTS] – Obviousness of Claims 2 and 5 under §103 by Senter in view of Brantigan '035 and Brantigan '327

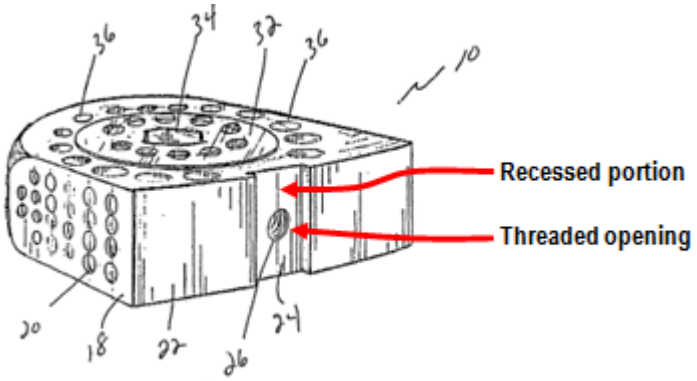
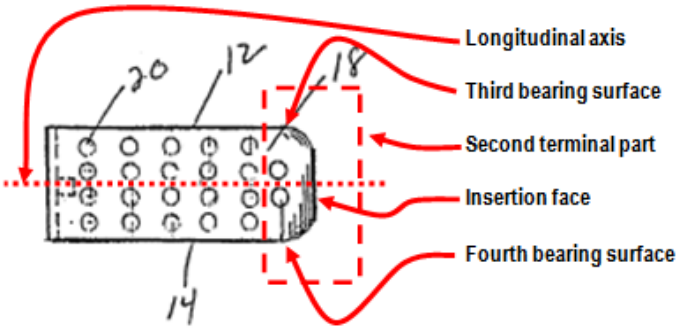
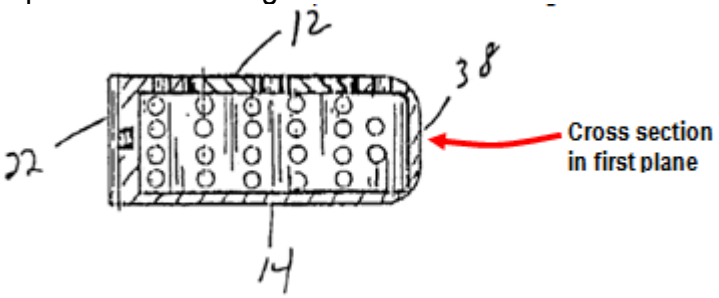
U.S. Pat. 8,444,696	**Senter in view of Brantigan '035 and Brantigan '327**
2. The implant of claim 1, wherein said implant has a plurality of openings between said trailing face and said insertion face and between said first and second sides to permit for the growth of bone through said implant from the first vertebra to the second vertebra.	As discussed above, the resulting combination of Senter in view of Brantigan '035 would provide a spinal implant having at least one vertical opening (as suggested by Brantigan '035) to permit for the growth of bone through the implant, and equipping the implant with two openings rather than one is not a patentable improvement here. To the extent that the resulting combination of Senter in view of Brantigan '035 does not include a "plurality of openings" as recited in this claim, it was a widely known design option in similar spinal fusion implants to include two bone fusion openings rather than one. For example, Brantigan '327 describes equipping a spinal fusion implant with "ample chambers for ingrowth of blood capillaries and bone graft material to expedite bone ingrowth during a post-operative period" and furthermore discloses a typical option of "forming a pair of side-by-side apertures through the [implant] adapted to receive bone graft material." NUVASIVE1006 at FIG. 6; 5:36-43; 7:15-28. A skilled artisan would have been prompted to modify the resulting implant of Senter in view of Brantigan '035 to further include a plurality of openings (as suggested by Brantigan '327) so as to pro-

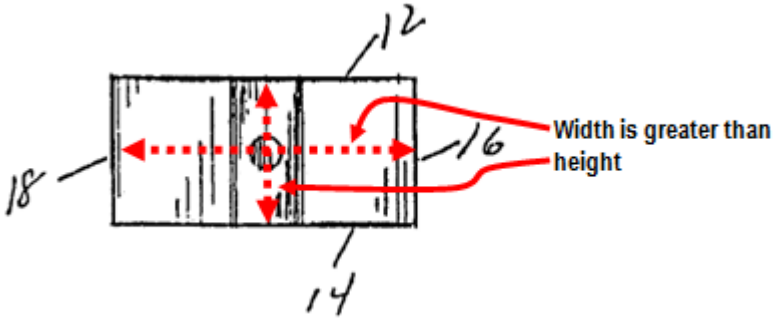
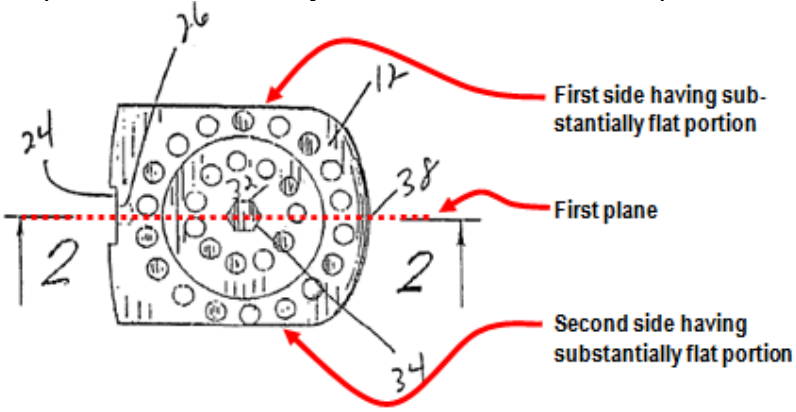
	vide the implant with additional internal cavities that are "adapted to receive bone graft material" and to provide a central support wall that serves as a "reinforcing" mechanical support for the implant. *Id.* at FIG. 6; 5:36-43. Here, a skilled artisan would have understood that the number, shape, and/or size of the openings in the resulting implant structure would be selected to maintain the objective of Senter to "inhibit dislocation (movement) of the implant" between the bearing surfaces and the vertebral bone (NUVASIVE1007 at 11:8-19) while also enhancing the bone fusion process:  NUVASIVE1001 at ¶¶ 40-41; NUVASIVE1007 at FIG. 3 (modified to include traditional options as suggested by Brantigan '035 and Brantigan '327). Also, a skilled artisan would have been prompted to modify Senter's implant to include a plurality of such openings because to do so would be merely "[u]se of known technique to improve similar devices . . . in the same way." MPEP § 2143(C); *see also KSR*, 550 U.S. at 417.
5. The implant of claim 4, 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 se-	As previously described (see analysis of this same element in claim 2), the resulting combination of Senter in view of Brantigan '035 and Brantigan '327 would provide the claimed spinal implant having a plurality of openings (as suggested by Brantigan '327) so as to provide the implant with additional internal cavities that are "adapted to receive bone graft material" and to provide a central support wall that serves as a "reinforcing" mechanical support for the implant. NUVASIVE1006 at FIG. 6; 5:36-43; NUVASIVE1001 at ¶¶ 40-41.

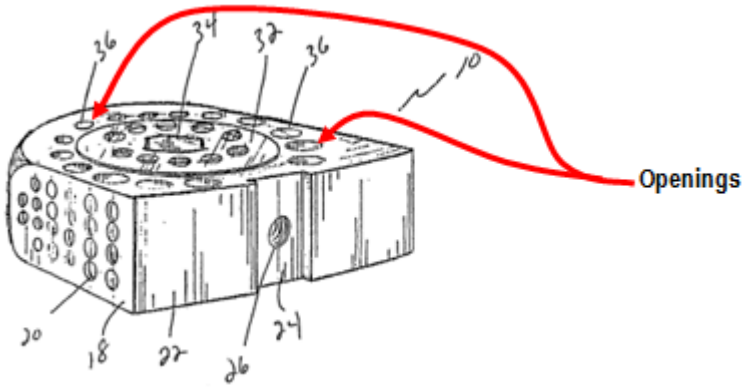
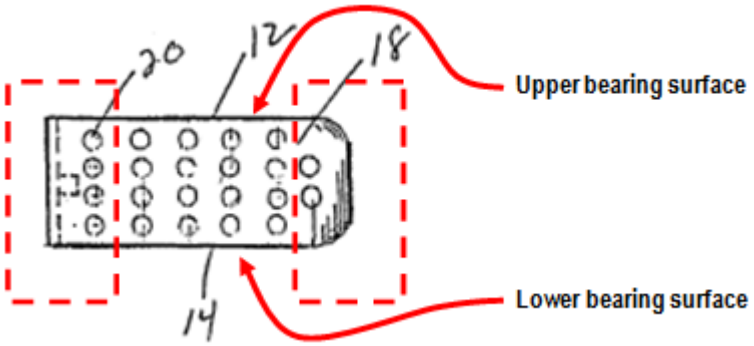
cond vertebra.	

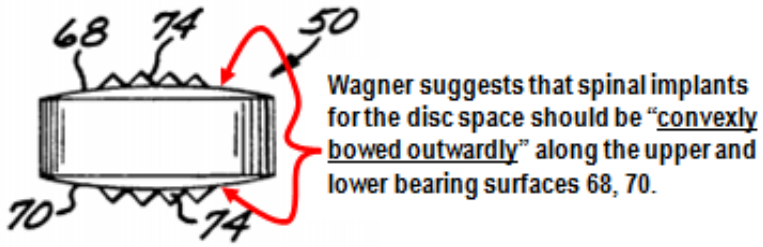
X. [GROUND 5 CLAIM CHARTS] – Obviousness of Claims 1-6 under §103 by Michelson '037 in view of Wagner and Brantigan '035

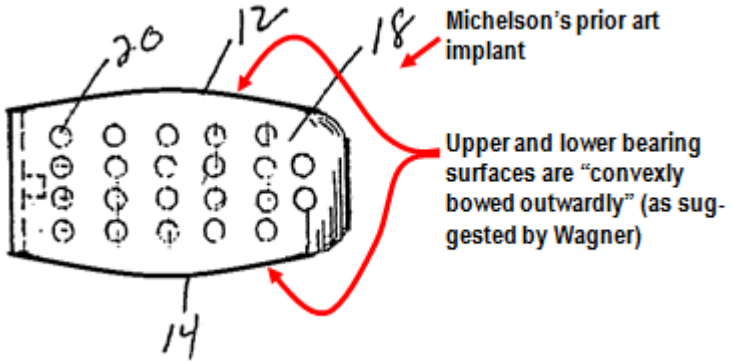
U.S. Pat. 8,444,696	Michelson '037 in view of Wagner and Brantigan '035
1. A spinal fusion implant for insertion between a first vertebra and a second vertebra adjacent the first vertebra, the first vertebra having a generally vertically extending first peripheral wall and a first endplate and the second vertebra having a generally vertically extending second peripheral wall and a second endplate, wherein the implant comprises:	Michelson '037 discloses a spinal infusion implant for insertion between a first vertebra and a second vertebra adjacent the first vertebra. For example, Michelson '037 discloses "an artificial fusion implant to be placed into the intervertebral space left after the removal of a damaged spinal disc." NUVASIVE1008 at 1:2-4; FIG. 1; *see also* NUVASIVE1001 at ¶ 43.
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,	Michelson '037 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:  *See* NUVASIVE1008 at FIG. 1C (shown above); *see also* NUVASIVE1001 at ¶ 43.
said trailing face having a recessed portion and a threaded opening configured to receive an insertion instrument for inserting said implant between the first vertebra and the second vertebra;	Michelson '037 discloses said trailing face having a recessed portion and a threaded opening configured to receive an insertion instrument for inserting said implant between the first vertebra and the second vertebra. For example, Michelson '037 discloses that "[t]he front wall 22 . . . has a depressed portion 24 with a central opening 26 for receiving the engaging end 28 of a driving member

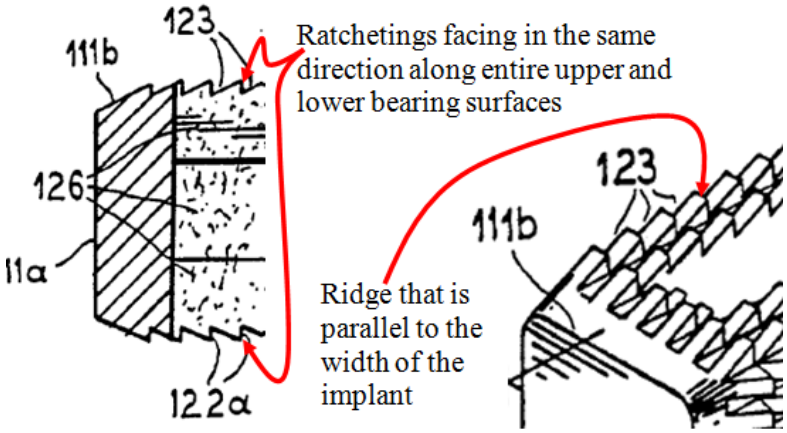
	30." NUVASIVE1008 at 11:38-40.  *Id.* at FIG. 1 (shown above); FIG. 4; *see also* NUVASIVE1001 at ¶ 43.
a second terminal part opposite said first terminal part, said second terminal part having an insertion face extending between a third bearing surface and a fourth bearing surface, said implant having a longitudinal axis extending through said trailing face of said first terminal part and said insertion face of said second terminal part, and	Michelson '037 discloses all features of the claimed "second terminal part" and "longitudinal axis":  NUVASIVE1008 at FIG. 1C; *see also* NUVASIVE1001 at ¶ 43.
having a cross section in a first plane extending through said first bearing surface and said second bearing surface, and along the longitudinal axis,	Michelson '037 discloses that the implant has a cross section in a first plane extending through the first bearing surface and the second bearing surface, and along the longitudinal axis. NUVASIVE1008 at FIG. 1D (showing the first plane along line 2-2). Michelson '037 discloses that Figure 2 (shown below) "is a side sectional view of the implant viewed along lines 2-2 of FIG. 1d":  *Id.* at 10:24-25 and FIG. 2; *see also* NUVASIVE1001 at ¶ 43.

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, the width of said implant being greater than the height of said implant;	Michelson '037 discloses the implant having a length between the trailing face of the first terminal part and the insertion face of the second terminal part and parallel to the longitudinal axis, the implant having a width and a height each perpendicular to the length of the implant, the width of said implant being greater than the height of the implant:  NUVASIVE1008 at FIG. 1B; *see also* NUVASIVE1001 at ¶ 43.
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.	Michelson '037 discloses all features of the claimed "first side and an opposite second side" that have "substantially flat portions" and are "symmetrical about the first plane":  NUVASIVE1008 at FIG. 1D; *see also* NUVASIVE1001 at ¶ 43.
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	Michelson '037 discloses 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. For example, Michelson '037 discusses "openings 36 of 1mm to 3mm" extending through the bearing surfaces and

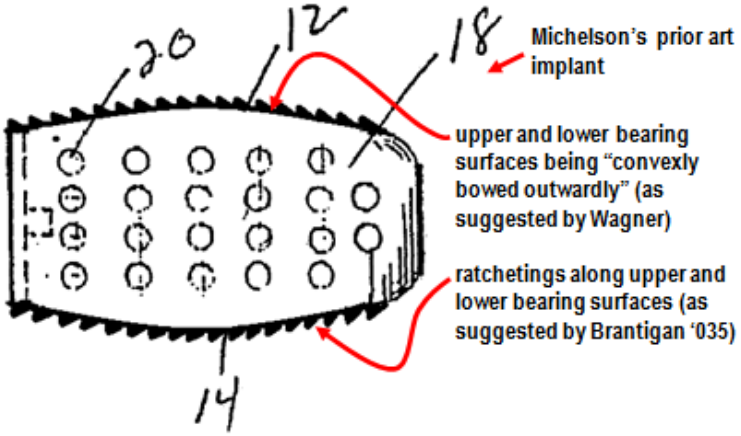
to the second vertebra;	into the central hollow portion of the implant that is filled with "autogenus bone material" to thereby "promote bone ingrowth between the implant and the adjacent vertebrae." *Id.* at 12:6-9 and 13:12-18; 8:16-21.  NUVASIVE1008 at FIG. 1; *see also* NUVASIVE1001 at ¶ 43.
upper 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 and second sides and	Michelson '037 discloses upper and lower bearing surfaces each having a length measured parallel to the longitudinal axis of said implant, the upper and lower bearing surfaces having portions proximate each of the first and second sides, the upper and lower bearing surfaces having portions proximate each of said first and second sides.  NUVASIVE1008 at FIG. 1C; *see also* NUVASIVE1001 at ¶ 43.
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	To the extent that Michelson '037 does not expressly disclose that the upper and lower bearing surfaces are "convex along the entire length" as recited in this claim element, such a structural feature was a widely known design option at the time for prior art spinal fusion implants. *See* NUVASIVE1001 at ¶ 44. For example, the Wagner reference discloses "a readily manufactured and implanted spinal disk implant. The disk implant is configured to

measured between said upper and lower bearing surfaces proximate one of said first and second sides;	engage the cortical bone region of the vertebrae after implantation, so that the majority of the loading transmitted through the implant is carried by the cortical bone." NUVASIVE1009 at 2:47-52. Wagner explains the traditional design option in which the upper and lower bearing surfaces 68, 70 "are convexly bowed outwardly" and the convex bowing "may be *from the anterior end to the posterior end* or from side to side, or both":  *Id.* at 7:24-28 (emphasis added) and FIG. 7 (shown above); *see also* NUVASIVE1001 at ¶ 45. One having ordinary skill in the art would have been prompted to modify the upper and lower bearing surfaces of Michelson's implant to be "convexly bowed outwardly" along the direction "from the anterior end to the posterior end" (as suggested by Wagner) so as to more closely conform to the contours of the vertebral endplates, thereby causing "the majority of the loading transmitted through the implant is carried by the cortical bone." NUVASIVE1009 at 2:47-52; *see also* NUVASIVE1001 at ¶ 45. Here, the skilled artisan would have readily understood that the degree of convex bowing of the resulting implant would be selected to conform to the vertebral endplates while also achieving Michelson '037's objective of achieving interspace fusion and stabilization "without significant violation or removal of the adjacent vertebral bone stock," such as in one example depicted below:

	 NUVASIVE1008 at FIG. 1C (modified to show the upper and lower bearing surfaces being convexly bowed outwardly along the direction from the anterior end to the posterior end (as suggested by Wagner)). Also, a skilled artisan would have been prompted to modify the upper and lower bearing surfaces of Michelson's implant to be "convexly bowed outwardly" along the anterior-posterior direction because to do so would be merely "[u]se of known technique to improve similar devices . . . in the same way." MPEP § 2143(C). Thus, in the resulting combination (one example is shown above with the modified FIG. 1C of Michelson '037), the trailing face has 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* NUVASIVE1001 at ¶ 46.
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 Michelson '037 does not expressly disclose the claimed "ratchetings," this feature was traditionally employed in prior art spinal fusion implants. *See* NUVASIVE1001 at ¶ 47. 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* NUVASIVE1005 at FIGS. 18-19; 19:25 to 20:3; 20:30-33, & 21:1-5. Brantigan '035 expressly teaches that these nubs 122 can be in the form of ratchetings oriented toward the same direction (e.g., oriented toward the trailing face):



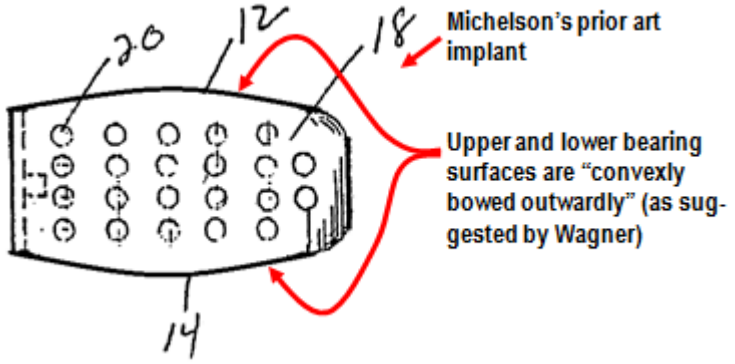
Id. at FIG. 19 (above left). Further, each of these nubs 122 includes a ridge that is "generally parallel" to the width of the implant. *Id.* at FIG. 18 (above right). Brantigan '035 explains that these ratchetings on the upper and lower bearing surfaces "will accommodate the forward moving" of the implant during insertion and "will prevent retraction" of the implant after full insertion. *Id.* at 20:30 to 21:3; *see also* NUVASIVE1001 at ¶ 47. One having ordinary skill in the art would have been prompted to modify Michelson '037's implant (already modified to include bowing) to include the ratcheting projections on the upper and lower bearing surfaces (as suggested by Brantigan '035) 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". NUVASIVE1005 at 21:1-5; NUVASIVE1001 at ¶ 47. Here, a skilled artisan would have readily understood that the size/orientation angle of the ratchetings of the resulting implant would be selected so as to supplement or improve upon Michelson '037's objective to "resist dislodgement" (p. 8:25-29) of the implant from the disc space:

	 NUVASIVE1008 at FIG. 1C (modified to include Wagner's suggested convex bearing surfaces and Brantigan '035's suggested ratchetings); NUVASIVE1001 at ¶ 48. Also, a skilled artisan would have been prompted to modify Michelson '037'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.	Michelson '037 discloses that the implant is adapted to hold bone fusion promoting materials. For example, Michelson '037 discloses that the implant "permits the insertion of autogenous bone material into the hollow portion of the implant 10." NUVASIVE1008 at 12:4-6; 8:16-21; 13:12-18.
2. The implant of claim 1, 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.	Michelson '037 discloses that the implant has a "plurality of openings" 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 from the first vertebra to the second vertebra. *Id.* at 8:16-21; 12:6-9; FIG. 1.
3. The implant of claim 1, wherein said convex portions of said upper and lower bearing surfaces are convex along a continuous uninterrupted majority of the lengths of said up-	As previously described in the analysis of claim 1 above, the resulting combination of Michelson '037, Wagner, and Brantigan '035 discloses that the convex portions of the upper and lower bearing surfaces are convex along a continuous uninterrupted majority of the lengths of the upper and lower bearing surfaces. *Id.* at FIG. 1C (modi-

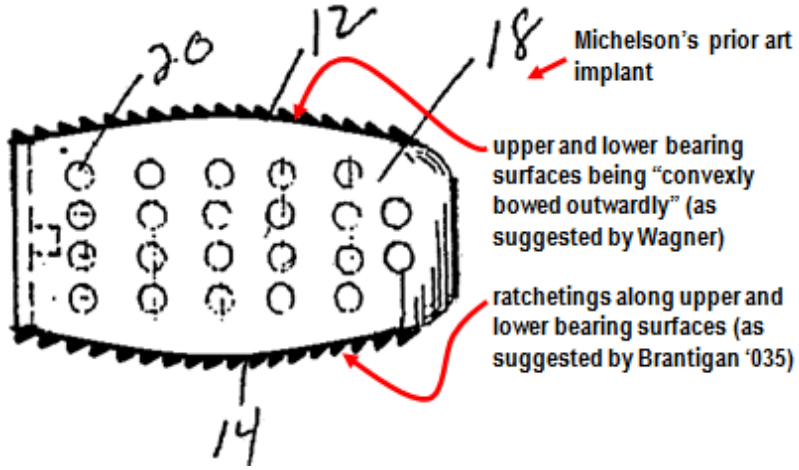
per and lower bearing surfaces.	fied as shown above to include Wagner's suggested convex bearing surfaces and Brantigan '035's suggested ratchetings); NUVASIVE1001 at ¶¶ 45 & 48.
4. A spinal fusion implant for insertion between a first vertebra and a second vertebra adjacent the first vertebra, the first 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 end plate, wherein the implant comprises:	Note: the preamble of this claim is identical to the preamble of claim 1. As previously described (see analysis of this same preamble in claim 1), Michelson '037 discloses a spinal infusion implant for insertion between a first vertebra and a second vertebra adjacent the first vertebra. For example, Michelson '037 discloses "an artificial fusion implant to be placed into the intervertebral space left after the removal of a damaged spinal disc." NUVASIVE1008 at 1:2-4.
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,	Note: this claim limitation is identical to claim 1. As previously described (see analysis of this same element in claim 1), Michelson '037 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. See *Id.* at FIG. 1C.
said trailing face having a recessed portion and a threaded opening configured to receive an insertion instrument for inserting said implant between the first vertebra and the second vertebra;	Note: this claim limitation is identical to claim 1. As previously described (see analysis of this same element in claim 1), Michelson '037 discloses said trailing face having a recessed portion and a threaded opening configured to receive an insertion instrument for inserting said implant between the first vertebra and the second vertebra. For example, Michelson '037 discloses that "[t]he front wall 22 . . . has a depressed portion 24 with a central opening 26 for receiving the engaging end 28 of a driving member 30." *Id.* at 11:38-40 and FIGS. 1 and 4.
a second terminal part opposite said first terminal part, said second terminal part having an insertion face extending be-	Note: this claim limitation is identical to claim 1. As previously described (see analysis of the "second terminal part" element in claim 1), Michelson '037 discloses a second terminal part opposite said first terminal part,

tween a third bearing surface and a fourth bearing surface, 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	said second terminal part having an insertion face extending between a third bearing surface and a fourth bearing surface, 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. *Id.* at FIG. 1C.
having a cross section in a first plane extending through said first bearing surface and said second bearing surface, and along the longitudinal axis,	Note: this claim limitation is identical to claim 1. As previously described (see analysis of the "second terminal part" element in claim 1), Michelson '037 discloses that the implant has a cross section in a first plane extending through said first bearing surface and said second bearing surface, and along the longitudinal axis. Michelson '037 discloses that Figure 2 (shown below) "is a side sectional view of the implant viewed along lines 2-2 of FIG. 1d." *Id.* at 10:24-25 and FIGS. 1D and 2.
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;	Note: this claim limitation is identical to claim 1, except it does not include the last clause in the limitation of claim 1. As previously described (see analysis of the "said implant having a length" element in claim 1), Michelson '037 discloses 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 FIG. 1B.
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	Note: this claim limitation is identical to claim 1. As previously described (see analysis of this element in claim 1), Michelson '037 discloses 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. *Id.* at FIGS. 1C and 1D.

said first side and said second side are symmetrical about the first plane;	
an opening between said trailing face and said insertion face and between said first and second sides to permit for the growth of bone trough said implant from the first vertebra to the second vertebra;	Note: this claim limitation is identical to claim 1. As previously described (see analysis of this same element in claim 1), Michelson '037 discloses 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. For example, Michelson '037 discusses "openings 36 of 1mm to 3mm passing through the upper surface and into the central hollow portion of the implant." *Id.* at 12:6-9; 8:16-21; FIGS 1 and 1D.
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 and second sides and	Note: this claim limitation is identical to claim 1. As previously described in the analysis of claim 1 above, Michelson '037 discloses 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 and second sides, said upper and lower bearing surfaces having portions proximate each of said first and second sides. *Id.* at FIG. 1C.
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,	Note: this claim limitation is identical to claim 1. To the extent that Michelson '037 does not expressly disclose that the upper and lower bearing surfaces are "convex along the entire length" as recited in this claim element, such a structural feature was a widely known design option at the time for prior art spinal fusion implants. *See* NUVASIVE1001 at ¶ 44. For example, the Wagner reference discloses "a readily manufactured and implanted spinal disk implant. The disk implant is configured to engage the cortical bone region of the vertebrae after implantation, so that the majority of the loading transmitted through the implant is carried by the cortical bone." NUVASIVE1009 at 2:47-52. Wagner explains the traditional design option in which the upper and lower bearing surfaces 68, 70 "are convexly bowed outwardly" and the convex bowing "may be *from the anterior end to the posterior end* or from side to side, or both." *Id.* at 7:24-28 (emphasis added) and FIG. 7; *see also* NUVA-

	SIVE1001 at ¶ 45. One having ordinary skill in the art would have been prompted to modify the upper and lower bearing surfaces of Michelson '037's implant to be "convexly bowed outwardly" along the direction "from the anterior end to the posterior end" (as suggested by Wagner) so as to more closely conform to the contours of the vertebral endplates, thereby causing "the majority of the loading transmitted through the implant is carried by the cortical bone." NUVASIVE1009 at 2:47-52.; *see also* NUVASIVE1001 at ¶ 45. Here, the skilled artisan would have readily understood that the degree of convex bowing of the resulting implant would be selected to conform to the vertebral endplates while also achieving Michelson's objective of achieving interspace fusion and stabilization "without significant violation or removal of the adjacent vertebral bone stock," such as in one example depicted below:  NUVASIVE1008 at FIG. 1C (modified to show the upper and lower bearing surfaces being convexly bowed outwardly along the direction from the anterior end to the posterior end (as suggested by Wagner)). Also, a skilled artisan would have been prompted to modify the upper and lower bearing surfaces of Michelson's implant to be "convexly bowed outwardly" along the anterior-posterior direction because to do so would be merely "[u]se of known technique to improve similar devices . . . in the same way." MPEP § 2143(C).
the width of said implant being greater than the height measured between said upper and lower bearing surfaces proxi-	Note: this claim limitation differs from the limitation included in claim 1. As previously described (see analysis of the "said implant having a length" element in claim 1), Michelson '037

mate one of said first and second sides of said implant;	discloses that the width of the implant is greater than the height measured between the upper and lower bearing surfaces proximate one of the first and second sides of said implant. NUVASIVE1008 at FIG. 1B; *see also* NUVASIVE1001 at ¶ 43. Thus, the resulting combination of Michelson '037 and Wagner (one example is shown above) would likewise provide this configuration.
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	Note: this claim limitation is identical to claim 1. As previously described (see analysis of this same element in claim 1), to the extent Michelson '037 does not expressly disclose 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* NUVASIVE1005 at FIGS. 18-19; 19:25 to 20:3; 20:30-33, & 21:1-5. Brantigan '035 expressly teaches that these nubs 122 can be in the form of ratchetings oriented toward the same direction (e.g., oriented toward the trailing face). *Id.* at FIG. 19 (reproduced above). Further, each of these nubs 122 includes a ridge that is "generally parallel" to the width of the implant. *Id.* at FIG. 18 (reproduced above). 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 Michelson '037's implant (already modified to include bowing) to include the ratcheting projections on the upper and lower bearing surfaces (as suggested by Brantigan '035) 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; NUVASIVE1001 at ¶¶ 47-48. Here, a skilled artisan would have readily understood that the size/orientation angle of the ratchetings of the resulting implant would be selected so as to supplement or improve upon Michelson '037's objective to "resist dislodgement" (p. 8:25-29) of the implant from the disc space:

	 NUVASIVE1008 at FIG. 1C (modified to include Wagner's suggested convex bearing surfaces and Brantigan '035's suggested ratchetings); NUVASIVE1001 at ¶ 48. Also, a skilled artisan would have been prompted to modify Michelson '037'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.	Note: this claim limitation is identical to claim 1. Michelson '037 discloses that the implant is adapted to hold bone fusion promoting materials. For example, Michelson '037 discloses that the implant "permits the insertion of autogenous bone material into the hollow portion of the implant 10." NUVASIVE1008 at 12:4-6; 8:16-21; 13:12-18.
5. The implant of claim 4, 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 described above in the analysis of claim 2, Michelson '037 discloses that 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. *Id.* at 8:16-21; 12:6-9.
6. The implant of claim 4, wherein said convex portions of said upper and lower bearing surfaces are convex along a continuous uninterrupted ma-	As described above in the analysis of claim 4, the resulting combination of Michelson '037, Wagner, and Brantigan '035 discloses 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

jority of the lengths of said upper and lower bearing surfaces.	bearing surfaces. *Id.* at FIG. 1C (modified as shown above to include Wagner's suggested convex bearing surfaces and Brantigan '035's suggested ratchetings); NUVASIVE1001 at ¶ 48.

XI. CONCLUSION

Claims 1-6 of the '696 patent are invalid over the prior art pursuant to Grounds 1-6 set forth above. Accordingly, Petitioner requests *inter partes* review of claims 1-6.

Respectfully submitted,

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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:

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