UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

AMERICAN ORTHODONTICS CORPORATION,
Petitioner

v.

DENTSPLY INTERNATIONAL INC.,
Patent Owner

Case No. To Be Assigned

PETITION FOR *INTER PARTES* REVIEW OF CLAIMS 1-10 OF U.S. PATENT NO. 6,276,930

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Mandatory Notices, Standing, and Fees

Real Party in Interest: American Orthodontics Corporation ("American Orthodontics" or "Petitioner") is the real party in interest.

Related Matters: The '930 patent is involved in a pending lawsuit, *Dentsply International, Inc. v. American Orthodontics Corp.,* No. 15-CV-1706, in the Middle District of Pennsylvania.

Lead Counsel: Pursuant to 37 C.F.R. §§ 42.8(b)(3) and 42.10(a) (2015), Petitioner designates the following: Lead Counsel is Jennifer Gregor (Reg. No. 56,958) of Godfrey & Kahn, S.C.; Back-up Counsel is Shane Delsman (Reg. No. 60,192) of Godfrey & Kahn, S.C.

Service Information: Service information is as follows: Attn: Jennifer Gregor, Godfrey & Kahn, S.C., One East Main Street, Suite 500, Madison, Wisconsin 53703; Tel. (608) 257-3911; Fax (608) 257-0609. Petitioner consents to service by electronic mail to: jgregor@gklaw.com, sdelsman@gklaw.com, and docketing@gklaw.com.

A Power of Attorney is being filed concurrently under 37 C.F.R. § 42.10(b) (2015).

Certification of Grounds for Standing: Petitioner certifies under 37 C.F.R. § 42.104(a) (2015) that the '930 patent is available for *inter partes* review ("IPR").

Petitioner is not barred or estopped from requesting IPR of any claim of the '930 patent.

Fees: Under 37 C.F.R. § 42.103(a) (2015), the Office is authorized to charge the fee set forth in 37 C.F.R. § 42.15(a) (2015) to Deposit Account No. 07-1509 as well as any additional fees that might be due in connection with this petition.

I. Overview of challenge and relief requested.

American Orthodontics requests *inter partes* review of Claims 1-10 of U.S. Patent No. 6,276,930 ("the '930 patent"). The '930 patent relates to an orthodontic bracket having a base with identifying markings or "indicia" on the back side of the base. *See* Ex. 1001. In a second set of claims, the back side of the base includes a mesh. *Id.* But in the late 1990s, when the '930 patent was filed, the use of identifying indicia to mark orthodontic appliances and brackets having mesh bases had both been well known for decades.

In the late 1970s, the use of brackets with mesh-backed bases was a significant advance. Previously, orthodontists used metal bands surrounding each tooth and mounted orthodontic brackets to the bands. But using mesh on the back of the bracket allowed brackets to be strongly bonded to teeth, rendering bands unnecessary in most cases. The use of un-banded brackets quickly became routine. In parallel, it was common by the 1970s to mark "indicia" on orthodontic appliances—multiple prior art references describe the use of inks and laser engraving to do so. And by the mid-1990s, it was common to use lasers to mark on a wide variety of materials, including for example, orthodontic and dental appliances, other metal parts, ceramics, silicon wafers, contact lenses, and jewelry.

The alleged invention in the '930 patent is simply a predictable application of well-known marking techniques to mesh-backed orthodontic brackets. Claims 1-10 of the '930 patent are obvious and should be cancelled.

A. Prior art patents and printed publications.

The following prior art forms the grounds for this petition:

1. U.S. Patent No. 5,556,276 ("Roman," Ex. 1002), issued on September 17, 1996.
2. U.S. Patent No. 5,322,436 ("Horng," Ex. 1003), issued on June 21, 1994.
3. U.S. Patent No. 5,480,301 ("Farzin-Nia," Ex. 1004), issued on January 2, 1996.
4. U.S. Patent No. 4,120,090 ("Kesling," Ex. 1005), issued on October 17, 1978.
5. U.S. Patent No. 5,238,402 ("Röhlcke," Ex. 1006), issued on August 24, 1993.
6. U.S. Patent No. 4,068,379 ("Miller," Ex. 1007), issued on January 17, 1978.
7. U.S. Patent No. 5,595,484 ("Orikasa," Ex. 1008), issued on January 21, 1997.
8. European Patent Application EP 0876801 (Ex. 1009), published on November 11, 1998.

Each of these references is prior art under 35 U.S.C. § 102(b) (pre-AIA).

B. Grounds for challenge.

Petitioner requests cancellation of claims 1-10 on the ground that they are unpatentable under 35 U.S.C. § 103. This petition and the supporting exhibits demonstrate that there is a reasonable likelihood that Petitioner will prevail with respect to at least one of the challenged claims and that each of the challenged

claims is unpatentable for the reasons in this petition. *See* 35 U.S.C. § 314(a). This petition is also supported by the expert testimony of W. Eugene Roberts, D.D.S., Ph.D. (Ex. 1010, "Roberts Decl.") and Michael L. Lebby, Ph.D. (Ex. 1011, "Lebby Decl.").

II. Overview of the '930 patent.

A. Summary of the claimed subject matter.

The alleged invention in the '930 patent is a way of marking "indicia" on the back of orthodontic brackets. *See* Ex. 1001, Claims 1 and 6. The markings can be accomplished either with a laser or with ink. *See* Ex. 1001, Col. 2:43-45, 3:48-54. Two embodiments of indicia marked on brackets are shown in Figures 2 and 3 of the patent:

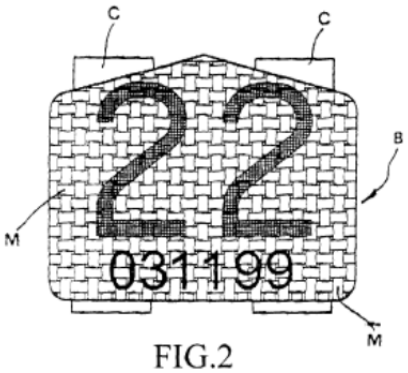


FIG.2

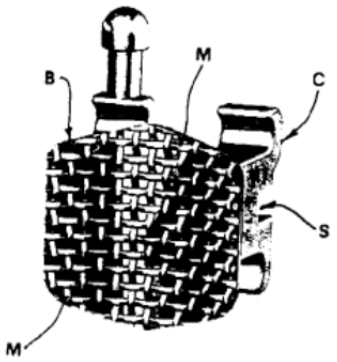


Fig. 3

In Figure 2, the indicia consists of a numerical code "22" and the marking 031199 "representing the manufacturing date or source." *Id.* Col. 3:4-6; 3:44-47. In Figure 3, the indicia is a numerical code "14." *Id.* Col. 3:4-6.

The ’930 patent states that markings produced according to the invention have a “substantially null depth” with respect to the depth of the base of the bracket and “follow[] the outer profile” of the base. *See, e.g.*, Ex. 1001, Abstract, Claims 1 and 6. This is illustrated in Figure 4 of the patent (shown below), which is a “partial cross section of the net-like back side of an orthodontic aid in accordance with the present invention.” Ex. 1001, Col. 2:60-62.

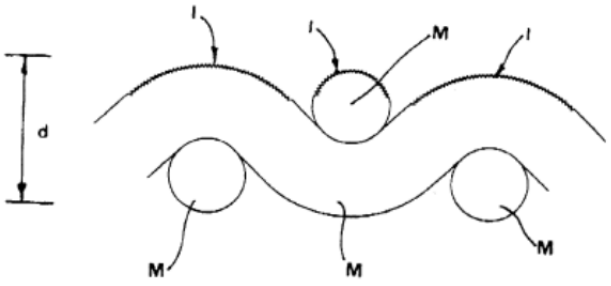


Fig. 4

Reference (“I”) denotes the marked portions of the mesh that comprise the indicia, which are shown on the mesh elements (“M”). *Id.* Col. 4:8-21. Reference (“d”) indicates the depth of the retention base of the bracket. *Id.* Col. 4:26-30. Thus, this figure shows that the depth of the marking or indicia (“I”) with respect to the depth of the retention base is “substantially null.” *Id*.; *see also* Claims 1 and 6.

B. Prosecution of the ’930 patent and its abandoned parent application.

The inventor filed patent application F197U0066 on May 6, 1997, in Italy, entitled “Orthodontic Aid.” *See* Ex. 1012 at 37. Several applications claim priority to it, including applications filed in Austria, China, Germany, Japan, Spain, France,

and the European Patent Office. *See* Ex. 1013 (printout from Espacenet). In the U.S., the inventor filed application serial number 09/039,792 (the "'792 application") on March 16, 1998, also claiming priority to F197U0066. *See* Ex. 1014 ('792 application file history).

The '792 application was never granted. After insurmountable rejections, the inventor abandoned the '792 application. Before the '792 application went abandoned, the inventor filed a continuation-in-part application, serial number 09/443,724 (the "'724 application"), on November 19, 1999, which issued as the '930 patent. *See* Ex. 1012. Curiously, there was only one office action in the '724 application, an *Ex Parte Quayle* action, stating that the claims were all allowable. Ex. 1012 at 48.

III. Legal principles.

The challenged claims are unpatentable because they are obvious under 35 U.S.C. § 103 (pre-AIA). Under the familiar standard, a claim is invalid if it would have been obvious—that is:

> if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which [the] subject matter pertains.

35 U.S.C. § 103(a).

In *KSR International Co. v. Teleflex, Inc.*, 550 U.S. 398, 415 (2007), the U.S. Supreme Court provided an "expansive and flexible" approach to obviousness that is consistent with the "broad inquiry" set forth in *Graham v. John Deere Co*., 383 U.S. 1 (1966). According to the Supreme Court, a person of ordinary skill in the art is "a person of ordinary creativity, not an automaton." *KSR*, 550 U.S. at 421, and "in many cases a person of ordinary skill will be able to fit the teachings of multiple patents together like pieces of a puzzle." *Id.* at 420. The Court held:

> [w]hen there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp. If this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense. In that instance the fact that a combination was obvious to try might show that it was obvious under § 103.

Id. at 421. Thus, *KSR* focused on whether a combination of known elements could be patentable if it yielded predictable results. The Court's guidance was clear: it may not. "The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results." *Id.* at 416. Further, "[i]f a person of ordinary skill can implement a predictable variation, § 103 likely bars its patentability." *Id.* at 417.

The Board must consider, as guided by *KSR*, whether the challenged claims recite an improvement that is "more than the predictable use of prior art elements according to their established functions." *Id.* The Board should conclude that the challenged claims of the '930 patent are merely a predictable combination of known elements that are used according to their established functions, that they are therefore unpatentable, and IPR should be instituted.

IV. Claim construction.

A claim in IPR is given the "broadest reasonable construction in light of the specification…." 37 C.F.R. § 42.100(b) (2015); *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131 (2016). Any claim term which lacks a definition in the specification is therefore also given a broad interpretation. *In re ICON Health & Fitness, Inc.,* 496 F.3d 1374, 1379 (Fed. Cir. 2007). Solely for the purposes of this proceeding, American Orthodontics proposes constructions of certain claim terms below. Any claim terms not discussed here should be given their broadest reasonable interpretation in light of the specification as commonly understood by those of ordinary skill in the art. Should the Patent Owner, in order to avoid the prior art, contend that the claims have a construction different from their broadest reasonable construction, the appropriate course is for the Patent Owner to amend the claims to expressly correspond to its contentions in this proceeding. *See* 77 Fed. Reg. 48,764 (Aug. 14, 2012).

Claims 1 and 6 recite the phrase "indicia including a sign," which is not defined in the '930 patent. In the "Background of the Invention," the '930 patent states, *inter alia*, that "each orthodontic aid is usually **marked** with a corresponding **sign** which consists of a numerical abbreviation or of a colour dot . . . ." Ex. 1001, '930 patent Col. 1:28-30 (emphasis added). In the co-pending district court action, the parties have made initial (but not final) exchanges of their positions on claim construction. The patent owner, Dentsply International, Inc., ("Dentsply"), in its proposal served on March 9, 2016, interprets "identifying indicia" to mean "marking." *See* Ex. 1015 (First Am. Proposed Construction of Claim Terms).

The claims themselves and the specification of the '930 patent make clear that this marking must also "identif[y] the respective tooth for which the orthodontic bracket is suitable." Ex. 1001, Claims 1 and 6. The dependent claims of the patent recite different types of "signs" that include numbers, and combinations of items that are broader than simply plus or minus signs. *Compare, e.g.*, Ex. 1001, Claim 2 ("sign comprises character markings consisting of a number with two figures"); to Claim 3 ("sign consists of a number with one figure preceded or followed by the plus sign or by a minus sign"). Thus, based on the language of the claims themselves, and the discussion of the terms "indicia" and "sign" in the specification of the '930 patent, a "sign" is broader than simply a plus

or minus sign; it may include a number or numbers, an alphanumeric combination, a colored dot, notch, or other marking that conveys information about the tooth for which the bracket is suitable. Under the broadest reasonable construction standard, the term "sign" in the phrase, "identifying indicia including a sign," should be construed to mean "marking, figure, or symbol." *See also* Ex. 1010, Roberts Decl. ¶¶ 44-46; Ex. 1011, Lebby Decl. ¶¶ 36-39.

V. State of the relevant art and level of ordinary skill in the art.

A person of ordinary skill in the art would have at least some experience in the design, manufacture, or use of orthodontic brackets, or in the field of laser-based technologies; such a person would have at least a bachelor's degree in an engineering or science field and at least one year of relevant work experience. Lebby Decl. ¶¶ 24-25; Roberts Decl. ¶¶ 31-35.

A review of the state of the art at the time of the alleged invention of the '930 patent provides useful background.

A. The bracket and tooth numbering systems in the '930 patent were both well known.

Before the 1970s, orthodontic brackets were not bonded directly to patients' teeth, as they are today; instead, they were bonded to metal bands that surrounded each tooth. Roberts Decl. ¶ 48. One disadvantage of this technique was that "bands create spaces between the teeth which must be closed at the conclusion of

orthodontic treatment." *Id.* (citing Ex. 1007, Miller Col. 1:21-23). In the mid-1970s, the use of un-banded brackets directly on teeth was "the dream of all orthodontists." *See* Ex. 1016, Elliott Silverman & Morton Cohen, *Current Adhesives for Indirect Bracket Bonding*, 65 Am. J. Orthod. 77, 78 (Jan. 1974).

One of the advances that allowed orthodontists to embrace the use of un-banded brackets was the use of brazed mesh on the back of brackets. *See*, *e.g.*, U.S. Patent No. 4,068,379 (Ex. 1007); *see also* Roberts Decl. ¶ 51. Eliminating bands saved space during treatment, and expanded treatment options and effectiveness. *Id.* By the early 1980s, the use of un-banded brackets was standard practice in the field. *Id.* ¶ 50 (citing Ex. 1018, A.J. Gwinnett, *State of the Art and Science of Bonding in Orthodontic Treatment*, 105 JADA 844 (Nov. 1982)).

Another pertinent area of background is how teeth are identified in dentistry and orthodontics. Four methods are discussed here: Palmer notations, the FDI system, the Universal System, and the Haderup system. Roberts Decl. ¶¶ 53-59 (citing Ex. 1019, R.J. Elderton, *Keeping Up-to-Date with Tooth Notation*, 166 British Dental J. 55 (Jan. 21, 1989)).

The Palmer notation system uses a symbol (┘└ ┐┌) to designate the quadrant in which the tooth is found and a number indicating the position of the tooth from the midline. Roberts Decl. ¶ 54.

The FDI World Dental Federation Notation uses two digit numbers: teeth in the patient's upper right quadrant start with a "1," teeth in the upper left quadrant start with a "2," teeth in the lower left start with a "3," and teeth in the lower right quadrant start with a "4." Roberts Decl. ¶¶ 55-56. Under the FDI system, the upper and lower central incisors are thus identified as, 11, 21, 31, and 41. *Id.*

The Universal Numbering System uses numbers 1 through 32 to identify the patient's teeth; tooth "1" is the rear upper tooth on the patient's right and tooth "32" is the rear lower tooth on the patient's right. Roberts Decl. ¶ 57.

The Haderup system is an eight tooth quadrant system in which plus and minus signs are used to differentiate between upper and lower quadrants, and between right and left quadrants (e.g., +1=upper left central incisor; 1-=lower right central incisor). Primary teeth were numbered as upper right (05+ to 01+), lower left (-01 to -05). Roberts Decl. ¶ 58. These methods all long pre-date the '930 patent. *Id.* at ¶¶ 53-54 (citing Exhibit 1019).

B. Laser engraving was common in many industries, including orthodontics and dentistry.

Since the development of the laser in the 1960s, lasers have been used in many different industries for a wide variety of applications. Lebby Decl. ¶ 27. By the early 1990s, lasers were used to mark, engrave and create indicia on a wide variety of surfaces. *Id.* Scientific and patent publications from the 1970s to the

early 1990s reflect a vast body of knowledge regarding the use of lasers for marking or engraving on both planar and non-planar surfaces. Lebby Decl. ¶¶ 30-33.

The scientific literature demonstrates that by 1990, both CO_2 and YAG lasers (a type of diode-pumped laser using Neodymium-doped Yttrium Aluminium Garnet as the lasing medium) were well known. *Id.* ¶ 30. Both CO_2 and YAG lasers have long been used for marking (also called "scribing") on materials for identification, product information, or theft prevention on materials such as semiconductors, hand guns, jewelry, precious stones, typewriter frames, railroad car wheels, consumer packages, metal and ceramic. *Id.* (collecting articles); *see* Exs. 1020-1022.

Patents issued in the 1980s to mid-1990s also reflect knowledge across many industries concerning the use of lasers to mark both planar and non-planar surfaces. Lebby Decl. ¶ 32-33. Patents during this time describe, for example: lasers to cut identifying indicia on the non-planar surface of a contact lens, the use of diode-pumped lasers to mark identifying information on a credit card type platform, and the use of lasers to print information on a variety of surfaces, including name plates on automobiles, automotive parts, electronics, metal, rubber, cloth and plastic surfaces. *Id.* ¶ 32 (collecting sample patents, *see* Exs. 1024-1026).

In orthodontics and dentistry specifically, laser welding, cutting, and scribing were prominent in the patent art by the mid-1980s. Lebby Decl. ¶ 33 (collecting sample patent art; *see* Exs. 1027-1030). And laser engraved identifying indicia on orthodontic brackets were also disclosed in U.S. Patents before the filing of the ’930 patent. *Id.* (discussing U.S. Patent No. 5,238,402 to Röhlcke (Ex. 1006) and U.S. Patent No. 5,556,276 to Roman (Ex. 1002), issued in 1993 and 1996 respectively).

VI. Claims 1-10 of the ’930 are unpatentable and should be cancelled.

Claims 1-10 of the ’930 patent are obvious and unpatentable for the reasons set forth in detail below.

A. Ground 1: The ’930 patent claims are obvious over Roman in view of Horng and Farzin-Nia.

The combination of Roman in view of Horng and Farzin-Nia renders the challenged claims unpatentable under 35 U.S.C. § 103(a). Roman (Ex. 1002) teaches the use of a diode-pumped laser to mark on a variety of orthodontic appliances and itself has all or almost all of the elements of the independent claims of the ‘930 patent. Horng (Ex. 1003) teaches the laser engraving of identifiers on orthodontic bands. Farzin-Nia (Ex. 1004) relates to an orthodontic bracket having a mesh-backed base. The ’930 patent claims are simply a combination of these known elements for their intended purposes, yielding predictable results.

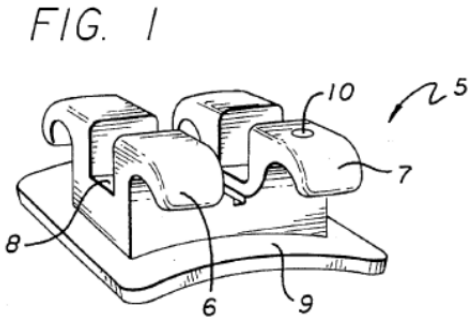
The USPTO never considered this combination. *See* Ex. 1012. Neither Horng nor Farzin-Nia were identified during prosecution of the ’930 patent or its U.S. parent. While Roman was considered during prosecution of the parent to the ’930 patent, it was not cited against the claims of the ’930 patent and was never considered in combination with Horng or Farzin-Nia.

1. Independent Claims 1 and 6 are obvious over Roman in view of Horng and Farzin-Nia.

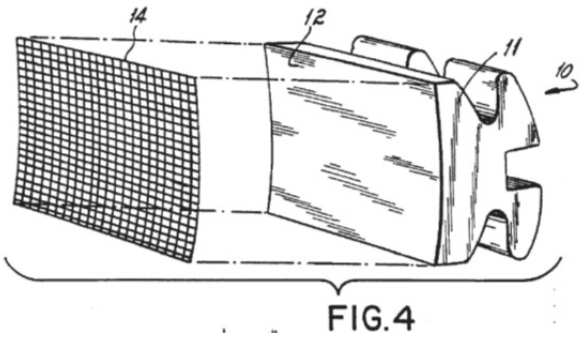
Both Roman and Horng identify the same general problem that is allegedly solved in the ’930 patent, that is to provide easy-to-read identifiers on orthodontic brackets. *See* Ex. 1001, ’930 patent, Col. 1:57, 2:15-16 (seeking to achieve “marks easily recognizable by the orthodontist”); Roberts Decl. ¶¶ 72-75. Roman teaches the use of a diode-pumped laser to make markings on a standard orthodontic bracket where the “marking area is visible with the naked eye.” Ex. 1002, Roman, Col. 2:12-13; Roberts Decl. ¶¶ 116-243; Lebby Decl. ¶ 49. Similarly, Horng teaches the use of a diode-pumped laser to mark orthodontic bands, where the marking is “highly aesthetic,” yet “relatively easy to perceive.” Ex. 1003, Horng Col. 2:15-17; Roberts Decl. ¶ 75, 243; Lebby Decl. ¶ 43. Roman and Horng alone render obvious at least Claims 1-5 of the ’930 patent. Roberts Decl. ¶ 108; Lebby Decl. ¶ 64. As explained above, the teaching of a “net-like structured” back side in Claim 6 is nothing new in the ’930 patent, but to the extent an explicit teaching is

required to render it obvious, it is disclosed in Farzin-Nia, among others. *See* Ex. 1004, Farzin-Nia Fig. 4; Roberts Decl. ¶ 63.

The preamble and element (a)[1] of claims 1 and 6 relate to an orthodontic bracket having a retention base with a back side. Ex. 1001. Roman Figure 1 (reproduced below) shows an orthodontic bracket having these features. Roberts Decl. ¶ 65, 108. The "retention base" in Roman is "[b]ase pad 9 [which] is used as an interface between the orthodontic bracket and the patient's tooth . . . ." Ex. 1002, Roman Col. 2:44-45; Roberts Decl. ¶ 65.



Roman Fig. 1, Ex. 1002



Farzin-Nia Fig. 4, Ex. 1004

Claim 6 only differs from claim 1 because it has additional language stating that the retention base has a "net-like structured" back side. Ex. 1001.Farzin-Nia, for example in Figure 4 (above), discloses an orthodontic bracket base having a mesh or net-like backing. Ex. 1004, Farzin-Nia Fig. 4; Roberts Decl. ¶ 63, 108.

[1] For ease of reference, throughout this Petition, the elements of the '930 patent claims are referred to with the identifiers shown in the claim charts that follow.

Element (b) of claims 1 and 6 of the '930 patent requires "identifying indicia for identifying the respective tooth" for which the bracket is suitable. Ex. 1001. This is disclosed in both Horng and Roman. Roberts Decl. ¶¶ 72-75, 108.

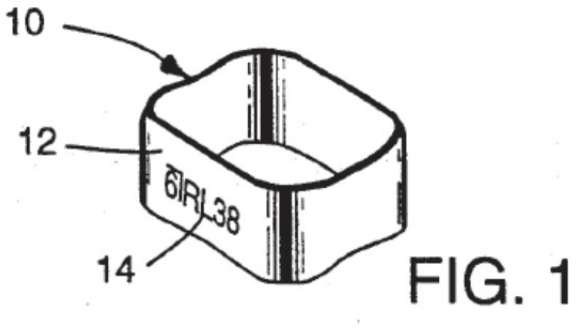


FIG. 1

Horng, Fig.1, Ex. 1003

Horng Figure 1 shows an orthodontic band including "an engraved identification mark 14 . . . ." Ex. 1003, Horng Col. 2:61-63; Roberts Decl. ¶ 75. "The mark 14 includes numerals sufficient to identify the location of the tooth for which the band 10 is intended, as well as a manufacturer's notation that represents a size of the band 10." Ex. 1003, Col. 2:63-66.

Roman also discloses "identifying indicia." Roberts Decl. ¶¶ 72-74 (discussing Roman). The "[m]arking area 10" in Roman is described as including "any specific pattern or design, or may include any combination of alpha and numeric characters for identification of orthodontic bracket 5." Ex. 1002, Roman Col. 2:53-56; Roberts Decl. ¶ 73. Further, Roman teaches that "[o]ther configurations, designs or patterns could include circles, triangles, squares, lines, or virtually any type of pattern for identification purposes. Further, marking area

10 may include alpha and numeric characters which specifically identify each individual orthodontic bracket which corresponds to a specific tooth." Ex. 1002, Col. 2:61-66; Roberts Decl. ¶ 74.

Element (c) of claims 1 and 6 recites "said indicia including a sign provided on the back side of said retention base." Roberts Decl. ¶ 78. This is disclosed by both Roman and Horng. *Id.* at ¶¶ 80, 82, 108. Although the figures of Roman show a marking on a tie wing of an orthodontic bracket, the teachings of Roman are not so limited. Roberts Decl. ¶ 80; Lebby Decl. ¶ 53. The tie wing is given "[a]s an example." *See* Ex. 1002, Roman Col. 2:56. The "Summary of the Invention" section in Roman does not identify any limitation for where the marking can be applied, and describes the marking on an "outer surface" of a bracket. *Id.* Col. 2:1-22. Similarly, Claim 1 of Roman claims marking on any "outer surface" of the bracket. Ex. 1002. A person of ordinary skill in the art would understand these teachings in Roman to mean that the bracket of Roman could be marked on any surface of the bracket that is large enough for the marking desired—which would certainly include the back of the bracket base. Roberts Decl. ¶ 80; Lebby Decl. ¶ 53.

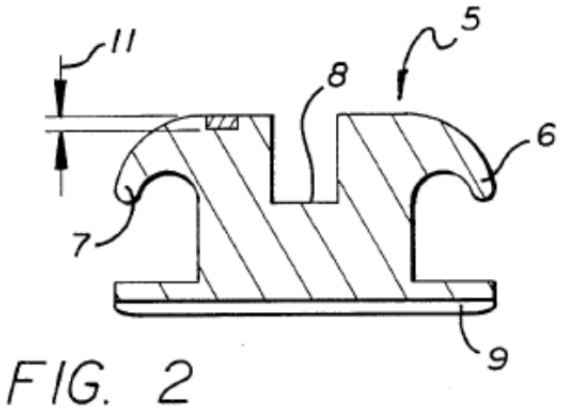
Likewise, Horng also describes putting the indicia in a location not visible when installed in a patient's mouth. Roberts Decl. ¶ 121. Specifically, Horng states that: "[t]he mark 14 is preferably located on a portion of the wall 12 that is

positioned in an interproximal manner on a mesial side of the tooth when the band is placed over the tooth in its correct orientation." Ex. 1003, Horng Col. 2:66-3:2. Those in the orthodontics field understand this to mean that the marking is placed between the teeth. Roberts Decl. ¶ 121. Although Horng relates to orthodontic bands, which are older technology, the teaching in Horng demonstrates the same concept, which translates to marking indicia on the back of an orthodontic bracket. *See* Roberts Decl. ¶ 111.

Element (d) concerning the size of indicia "being at least 3 square millimeters is also disclosed in Horng. Roberts Decl. ¶¶ 84, 108. The size of the markings shown in Figures 1 and 2 of Horng would necessarily cover an area of "at least 3 square millimeters" as in element (d). Roberts Decl. ¶¶ 85-87. Specifically, Horng discusses a character height of "0.15 cm" and line width of "0.01 cm." Ex. 1003, Horng Col. 4:31-33. Based on a conservative or "condensed" height-to-width ratio, each of the five characters in Horng's indicia would be approximately 0.9 mm wide. Roberts Decl. ¶ 87 (explaining: "A letter whose width is approximately 80% of its height is considered normal," while 60% is considered "condensed") (citing Ex. 1031, Rob Carter et al., *Typographic Design: Form and Communication 34* (2nd ed. 1993)). This would make the area of the indicia in Horng more than 6 mm^2, Roberts Decl. ¶ 87 ((0.09 cm x 5) x 0.15 cm = 0.0675 cm^2) or 6.75 mm^2), more than "*at least* 3 square millimeters."

Elements (e) and (f) of claims 1 and 6 are also taught by Roman. Roberts Decl. ¶¶ 95, 97-98, 103, 105, 108; Lebby Decl. ¶¶ 54-59. Roman itself includes a detailed discussion of the laser marking process including attributes of the laser that impact the depth of the "marking area 11." Ex. 1002, Roman Col. 3:23-4:43. Roman explains that the disclosed "annealing process is actually an oxidation of the surface of the material being annealed." *Id.* Col. 3:23-25; 4:41-43. Further, Roman states that because "the annealing process does not actually melt orthodontic bracket 5 in the marking area 10, there is no surface irregularity nor are there any weakened points as a result of melting." *Id.* Col. 4:34-37; Lebby Decl. ¶ 48 (explaining annealing), ¶¶ 54-59. In other words, the depth of the "marking area 11" is only on the surface and therefore, is substantially null. Roberts Decl. ¶¶ 95, 97; Lebby Decl. ¶ 54.

Figure 2 of Roman indeed shows the depth of a marking (11) below:



Roman Fig. 2, Ex. 1002

Lebby Decl. ¶ 55. A publication incorporated by reference in Roman, entitled "Industrial Strength Laser Marking: Turning Photons into Dollars" (*see* Ex. 1002, Roman Col. 3:59-62), also explains that "Marking by annealing has the advantage of not disrupting the surface which is important for some medical applications, specifically implantable devices." Ex. 1023 at 70 (article submitted in Roman's file history); *see also* Lebby Decl. ¶ 62. Annealing also solves a secondary problem mentioned in the '930 patent, namely "untollerable [sic] deformation of the net-like structure." Ex. 1001, '930 patent Col. 2:9-12. Because an annealing process does not disrupt the surface, annealing would not intolerably deform the net-like structure of the base. Lebby Decl. ¶ 62.

Given that the laser marking process described in Roman is simply "an oxidation of the surface of the material being annealed," element (f) of claims 1 and 6 of the '930 patent is also taught by Roman. Because annealing only affects the surface or profile, the resulting markings must necessarily follow the surface profile. Lebby Decl. ¶ 63.

A person of ordinary skill in the art would have been motivated to combine Roman with Horng and Farzin-Nia to put the laser engraved markings of Roman and Horng on the back of any orthodontic bracket—including the brackets taught in Roman and Farzin-Nia. Roberts Decl. ¶¶ 112, 138-139; Lebby Decl. ¶¶ 64-69. The problem solved by the '930 patent was already identified in both Roman and

Horng: providing easy-to-read identifies on orthodontic appliances. Ex. 1002, Roman Col. 2:12-13; Ex. 1003, Horng 2:15-17. It is self-evident that larger markings are easier to read than smaller markings. Roberts Decl. ¶ 114-115. Thus, artisans would be inherently motivated to improve readability of identifiers, without affecting function. *Id.* There are a finite number of places on an orthodontic bracket where legible markings could be placed. It would have been obvious to mark on the largest surface—the back of the base. Roberts Decl. ¶ 118.

Roman itself has all or almost all of the elements of Claims 1 and 6 of the '930 patent. Roman is not limited to marking on tie-wings, but fairly read, discloses marking anywhere on the "outer surface" of a bracket. Lebby Decl. ¶ 53. Roman also suggests that the process disclosed can also be used with different parameters and can be used to mark on other types of brackets (i.e. "stainless steel, ceramics, or plastics") and other types of orthodontic appliances, such as "archwires, buccal tubes, bands, or other orthodontic appliances . . . ." Ex. 1002, Roman Col. 4:22-27, 4:56-62.

Roman also acknowledges that a laser engineer would have several parameters to set, and which could be adjusted. Lebby Decl. ¶ 58. Roman states that: "[t]he velocity of the laser is one factor which determines depth of marking area 11." Ex. 1002, Roman Col. 3:40-41. Roman also identifies other factors including: the thermoconductivity of the bracket, its color, finish, and features of

the laser itself, such as mode, power, pulse width, and beam diameter. *Id.* Col. 3:41-50. Thus, even if Roman is read to not explicitly include a teaching of laser marking on the back of a bracket, it would be a minor adjustment, at most, to simply mark on the back of the bracket, or on the bracket disclosed by Farzin-Nia. Lebby Decl. ¶¶ 65, 69.

Additionally, the suggestion in Roman to mark appliances such as bands makes it highly likely that a person of ordinary skill would look to the teachings of orthodontic band references, such as Horng. Roberts Decl. ¶ 109; Ex. 1003. Horng teaches the placement of the marking on a location of the band that is not visible when in the patient's mouth. *Id.* Given that the standard practice in orthodontics transitioned from using bands to using brackets, it would have been obvious to apply the marking placement taught by Horng to brackets, such as those disclosed in Farzin-Nia. *Id.* Even if an orthodontist himself would not be involved in the specific manufacture of the brackets, a laser engineer with a minimal amount of instructions from an orthodontist or a designer of orthodontic brackets would easily be able to implement these modest design changes. Roberts Decl. ¶ 111; Lebby Decl. ¶ 61.

The chart below summarizes where the above prior art references disclose and make obvious the elements of claims 1 and 6 of the '930 patent.

'930 Patent Claim 1 and 6	**Roman, Horng, and Farzin-Nia Exs. 1002, 1003, 1004**
1.[6] An orthodontic bracket, comprising:	Roman Fig. 1, Col. 2:15-18; Farzin-Nia Col. 2:1-10, Figs. 1 and 4.
a) a retention base for a respective tooth, said retention base having a [net-like structured] back side,	Roman Col. 2:42-47 (discussing "base pad 9"); *see also* Fig. 1; Farzin-Nia Col. 4:64-66, 5:23-28 (discussing the bracket base and the use of "mesh or screen").
b) identifying indicia for identifying the respective tooth for which the orthodontic bracket is suitable,	Roman Col. 1:39-42 (identifying the problem to be solved as the need "to more easily identify orthodontic appliances"), 2:53-66 (discussing "marking area 10" and the types of markings that can be made), *see also* Fig. 1; Horng Col. 1:39-42, 1:67-2:9, 2:61-3:2 and Figs. 1 and 2 (teaching ink and laser engraved indicia).
c) said indicia including a sign provided on the back side of said retention base,	Roman Col. 2:53-61 and Claim 1; Horng Figs. 1 and 2, Col. 2:63-3:2 (explaining that the marking "is positioned in an interproximal manner on a mesial side of the tooth when the band 10 is placed over the tooth in its correct orientation"); Roberts Decl. ¶¶ 80, 82; Lebby Decl. ¶ 53.
d) the size of said indicia being at least 3 square millimeters,	Horng Col. 4:31-33 (teaching "character height of 0.15 cm" and "line width of 0.01 cm"); Roberts Decl. ¶¶ 85-87 (regarding resulting marking size).
e) the depth of said indicia being substantially null with respect to the depth of the retention base,	Roman Fig. 2 and related discussion concerning the "depth of the marking area," Col. 3:33-50; Lebby Decl. ¶ 54.
f) said indicia having a profile which follows the outer profile of said retention base.	Roman Col. 3:23-24 (discussing that the marking or annealing process is simply "an oxidation of the surface of the material being annealed"); Horng Fig. 1; Farzin-Nia Figs. 2A and 4; Lebby Decl. ¶ 63.

2. Dependent Claims 2, 3, 7, and 8 are obvious over Roman in view of Horng and Farzin-Nia.

Dependent claims 2, 3, 7, and 8 of the ’930 patent all relate to the specific marking on the orthodontic bracket. *See* Ex. 1001. Claims 2 and 7 require that the “sign comprises character markings consisting of a number with two figures.” Claims 3 and 8 require that the “sign consists of a number with one figure preceded or followed by the plus sign or minus sign.”

Roman and Horng both disclose the use of markings with at least two figures as in claims 2 and 7 of the ’930 patent. Roberts Decl. ¶ 207; *see also* Ex. 1002, Roman; Ex. 1003, Horng. And it would have been obvious to any person having ordinary skill in the art to substitute markings from any of the various tooth numbering systems, *e.g.*, (Palmer, FDI, Universal, or Haderup) for other markings. Roberts Decl. ¶ 207. These numbering systems were known not just to orthodontists but to many individuals working in different roles in dental and orthodontic fields. *Id.* ¶ 33. Claims 2 and 7 simply describe the FDI numbering system. *Id.* ¶214. Claims 3 and 8 simply describe the Haderup system. Roberts Decl. ¶¶ 214-225.

The chart below summarizes where the above prior art references disclose and make obvious the elements of claims 2, 3, 7, and 8 of the ’930 patent.

'930 Patent Claims 2 and 7	**Roman, Horng, and Farzin-Nia, Exs. 1002, 1003, 1004**
2.[7] The orthodontics bracket according to claim 1[6], wherein said sign comprises character markings consisting of a number with two figures.	Roberts Decl. ¶¶ 199, 202, 204, 207-208; Horng Figs. 1 and 2 (showing sign comprising "6┐RL38"); Roman Col. 2:61-66 (explaining the various markings that could be used including "alpha and numeric characters" and "virtually any type of pattern for identification purposes").
'930 Patent Claims 3 and 8	**Roman, Horng, and Farzin-Nia, Exs. 1002, 1003, 1004**
3.[8] The orthodontic bracket according to claim 1[6], wherein said sign consists of a number with one figure preceded or followed by the plus sign or by a minus sign.	Roberts Decl. ¶¶ 215, 217, 220-221, 224-225 (discussing the Haderup numbering system); *see also* Roman Col. 2:61-66 (explaining the various markings that could be used including "alpha and numeric characters" and "virtually any type of pattern for identification purposes").

3. Dependent claims 4, 5, 9, and 10 are obvious over Roman in view of Horng and Farzin-Nia.

Dependent claims 4, 5, 9, and 10 relate to the use of a laser to make the identifying indicia. Ex. 1001. Claims 4 and 9 require the use of a laser apparatus and Claims 5 and 10 require the use of a "diode-pumped laser apparatus." Horng discloses the use of a laser, and in particular, a YAG laser engraving system, which is a diode-pumped laser. Ex. 1003, Horng Col. 3:3-5, 4:28; Lebby Decl. ¶ 43. Similarly, Roman discloses the use of a ND:YAG laser, which is a diode-pumped laser. Ex. 1002, Roman Col. 3:51-52; Lebby Decl. ¶ 49. For the reasons discussed above, it would have been obvious for a person of ordinary skill in the art to

combine these references. Roberts Decl. ¶¶ 231-232, 236-237, 243, 246-247; s*upra* at 12; Lebby Decl. ¶ 49.

The chart below summarizes where the above prior art references disclose and make obvious the elements of claims 4, 5, 9, and 10 of the '930 patent.

'930 Patent Claims 4 and 9	**Roman, Horng, and Farzin-Nia, Exs. 1002, 1003, 1004**
4.[9] The orthodontic bracket according to claim 1[6], wherein said sign is provided on said back side of said retention base with a laser apparatus.	Roman Col. 3:51-52; Horng Col. 3:3-5 ("The mark 14 is preferably made using laser marking apparatus . . . ."); Lebby Decl. ¶¶ 43, 49; Roberts Decl. ¶¶ 231-232, 234-237
'930 Patent Claims 5 and 10	**Roman, Horng, and Farzin-Nia, Exs. 1002, 1003, 1004**
5.[10] The orthodontic bracket according to claim 1[6], wherein said sign is provided on said back side of said retention base with a diode-pumped laser apparatus.	Roman Col. 3:51-52 and following discussion, including identification of Nd:YAG laser; Horng Col. 4:25-29 (describing use of a YAG laser engraving system); Lebby Decl. ¶¶ 43, 49; Roberts Decl. ¶¶ 243, 246-247.

B. Ground 2: The '930 patent claims are obvious over Farzin-Nia in view of Kesling and Röhlcke.

The combination of Farzin-Nia and Kesling with the marking techniques taught in Röhlcke renders the challenged claims unpatentable under 35 U.S.C. § 103(a). As discussed above, Farzin-Nia (Ex. 1004) discloses a bracket with a mesh-backed base. Kesling (Ex. 1005) discloses an orthodontic band having "easy to read" indicia marked—with ink—on a portion of the band that is not visible

when the band is "mounted on a tooth of a patient." Röhlcke (Ex. 1006) teaches a method of marking shallow indicia on orthodontic brackets using a laser.

Neither Farzin-Nia nor Kesling were cited during the prosecution of the '930 patent or its abandoned parent application. *See* Exs. 1012, 1014. Although a continuation application based on Röhlcke was noted in the prosecution of the '930 patent (*see* Ex. 1012 at 43), it was not considered with this combination.

1. Independent Claims 1 and 6 are obvious over Farzin-Nia in view of Kesling and Röhlcke.

Two decades before the filing of the '930 patent, Kesling had identified the problem identified and purportedly solved by the '930 patent, that is, to mark "easy to read" identifiers on a portion of an orthodontic appliance that is not visible when the appliance is mounted on a patient's tooth. *See* Ex. 1005, Kesling Col. 1:9-13; 3:12-15 (filed Mar. 15, 1977). Kesling solved this problem by providing indicia made from ink on the side of the orthodontic band that faces the inside (or tongue side) of the mouth. *Id.* Col. 3:12-20. It would have been obvious to apply this teaching to more modern brackets, such as those in Farzin-Nia. Roberts Decl. ¶ 143.

Like Kesling, the '930 patent also discloses markings made from ink. Ex. 1001, Col. 2:42-45. Only claims 4, 5, 9, and 10 of the '930 patent specify the use of a laser; claims 1-3, and 6-8 do not require a laser and can be accomplished with

ink. Ex. 1001. Laser marking of brackets is nevertheless taught by Röhlcke. Ex. 1006. All of the elements of the challenged claims are present in highly analogous and easy to combine prior art, rendering the challenged claims obvious.

The preamble and element (a) of independent claims 1 and 6 are taught by Farzin-Nia's disclosure of an orthodontic bracket having a retention base for a respective tooth, which has a net-like structured back-side. Roberts Decl. ¶¶ 63, 140. This is drawn in Figures 4 and 3A of Farzin-Nia (shown below) and is described at Ex. 1004, Col. 4:64-67, 5:23-29.

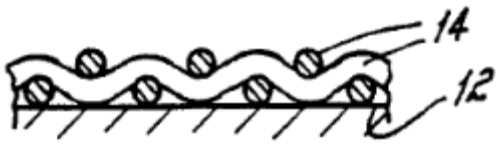


FIG. 3A

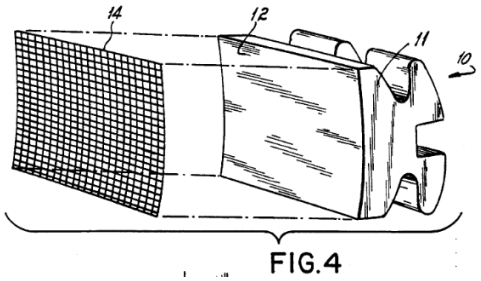
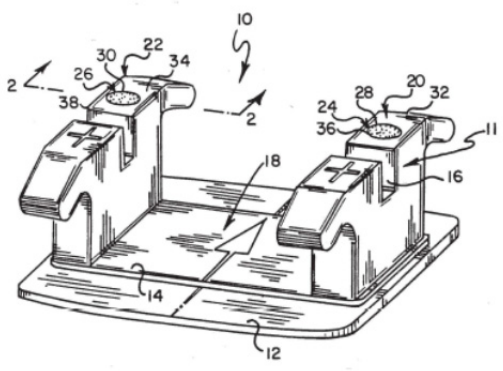


FIG.4

Farzin-Nia Figs. 3A and 4, Ex. 1004

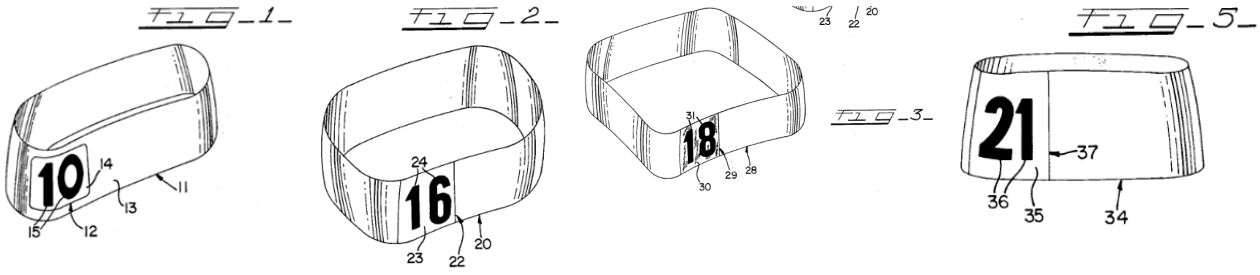
Röhlcke also discloses an orthodontic bracket (11) having a retention base (12) for a respective tooth as seen in Figure 1, reproduced below. *See* Ex. 1006, Röhlcke Col. 4:20-22, Fig. 1; Roberts Decl. ¶¶ 64, 140.



Röhlcke Fig. 1, Ex. 1006.

Both Kesling and Röhlcke teach identifying indicia. Roberts Decl. ¶¶ 69, 71, 140; Lebby Decl. ¶¶ 73, 81. Röhlcke teaches that "it is necessary to apply markings in order to clearly identify [the brackets'] orientation and allocation to individual types of teeth." Ex. 1006, Röhlcke Col. 1:13-16. The indicia in Röhlcke include dots (24) and (26) as well as "+" signs. *Id.* Fig. 1, Col. 4:29-36.

Kesling teaches the use of ink to create indicia "such as numerals and/or letters" for identification. Ex. 1005, Kesling Col. 1:28; 2:5-7, Figs. 1-3 and 5. Kesling provides: "[i]nasmuch as the bands come in so many different sizes and shapes, it is necessary to provide identifying means on the bands to facilitate use by the orthodontist." *Id.* Col. 1:21-24. Several examples from the figures in Kesling are shown below:



Kesling Figs. 1-3 and 5, Ex. 1005

Kesling also teaches elements (c) and (d) of claims 1 and 6 of the '930 patent, which require indicia on the back side of the device and that the indicia are at least 3 square millimeters. Roberts Decl. ¶¶ 81, 88-90, 140. Kesling teaches that "[p]referably the identification is applied at an area which will not show when the

band is cemented to a tooth in the mouth." Ex. 1005, Kesling Col. 3:12-15; Col. 3:18-20 ("The identification 12 is located on the lingual side of the band. . .."); Roberts Decl. ¶ 81 ("lingual" means towards the tongue). Kesling also explains that the marking should not interfere functionally. Ex. 1005, Kesling Col. 3:15-18 (explaining that it should not "interfere with the attachment of any appliances to the band"). Kesling also describes an embodiment where "[t]he identification is located on the lingual side of the band and at one end of the lingual side so as to avoid interference with the welding of any attachments onto the lingual side." *Id.* Col. 3:51-54.

The markings shown in Figures 1-3 and 5 of Kesling would necessarily cover an area of "at least 3 square millimeters" as in element (d) of the '930 patent. Kesling explains that the marking area "may be sized to receive indicia thereon and may be in the form of a rectangle or the like." *Id.* Col. 2:3-5. Based on typical band sizes and an estimation of the size of the markings shown in the figures in Kesling, the indicia in Kesling are probably greater than 5 mm^2, and certainly "*at least* 3 square millimeters." Roberts Decl. ¶¶ 88-90 (based on band sizes described in an American Orthodontics catalog from 1980); *see also* Ex. 1032 (American Orthodontics Catalog VII (1980)).

Element (e) is disclosed in both Kesling and Röhlcke. Roberts Decl. ¶¶ 94, 98, 100-101, 140. The '930 patent permits marking of the indicia in one of two

ways, namely inks and lasers. Ex. 1001, '930 patent Col. 2:42-44; 3:49-51. Kesling teaches the use of inks and Röhlcke teaches the use of lasers such that the depth of the indicia is substantially null.

Kesling teaches the use of ink in two contexts. Roberts Decl. ¶ 100. First, Kesling notes the use of ink in prior art, explaining that: "[h]eretofore, such identification has been applied by printing or stamping of indicia such as numerals and/or letters onto the exterior surface of the bands." Ex. 1005, Kesling Col. 1:26-29. Second, the invention in Kesling also uses ink or paint: "[i]dentification 12 in FIG. 1 includes a first coating or layer 14 of . . . suitable ink or paint; and a second layer or coating 15 . . . and in the form of indicia, and in this illustration the numeral '10.'" Ex. 1005, Kesling Col. 3:24-28. A person of ordinary skill in the art would understand the thickness of the indicia in Kesling to be substantially null—it would be similar to the thickness of ink on a newspaper or ink printing on tin cans or other consumer products, likely undetectable or barely detectable by a person touching the object. Lebby Decl. ¶ 83. Given the use of the bands described in Kesling, the ink would need to be very thin so that it does not interfere with the functionality of the bands. Roberts Decl. ¶ 101.

Röhlcke teaches that the markings (24, 26) are a thickness "chosen in the range of approximately 0.1 μm to 0.5 μm." Ex. 1006, Col. 5:25-28. This is substantially null. Roberts Decl. ¶ 94.

Röhlcke also explains the common sense observation that a greater or lesser thickness can be achieved based upon how the laser is used:

> [T]he energy supplied in point-type configuration to the respective surface region upon which the laser beam impinges. Accordingly, greater laser beam energy or longer dwell time of the laser beam on the respective point results in a greater thickness d of the layer with a remelt structure and the latter, therefore, extends further into the interior of the respective bracket wing 16 and 18, respectively.

Ex. 1006, Röhlcke Col. 4:52-60. Dwell time refers to the time the laser is marking an object. Lebby Decl. ¶ 75. A longer dwell time affects the object more; a shorter dwell time affects the object less, resulting in a shallower marking. Lebby Decl. ¶¶ 75, 85. It would be obvious to one of skill in the art to use a shorter dwell time on the mesh backed bracket of Farzin-Nia to try to preserve the benefits of the mechanical and/or chemical treatments intended to enhance bond strength of the bracket. Lebby Decl. ¶ 85. A relatively short dwell time could be used to achieve a shallow or substantially null marking that thus follows the profile of the retention base. *Id.*

Element (f) is also disclosed in both Kesling and Röhlcke. Roberts Decl. ¶¶ 104-106. Röhlcke teaches that "[t]he bracket 11 is normally profiled, the type of

profile apparent from FIG. 1 being typical." Ex. 1006, Röhlcke Col. 4:20-25. The markings (24, 26) and "+" signs follow the profile of the bracket 11 as seen in Figure 1 reproduced above. Lebby Decl. ¶ 77. The paint or ink described in Kesling also follows the profile of the band disclosed. Roberts Decl. ¶ 106. Indeed, Figure 1 of Kesling reproduced above shows identification (12) wrapping around the bend of a band. *Id.*

A person of ordinary skill in the art would have been motivated to combine Farzin-Nia with Kesling and Röhlcke to put the indicia of Kesling on the back of the bracket taught in Farzin-Nia using laser engraving as taught by Röhlcke, or ink as taught by Kesling. Roberts Decl. ¶¶ 145, 167-168. Kesling identifies and solves, the same problem solved by the '930 patent—to provide easy-to-read identification on orthodontic appliances to facilitate use by the orthodontist. Ex. 1005, Kesling Col. 1:9-13; 1:21-32.

Kesling teaches the placement of indicia on the back (tongue side) of an orthodontic appliance. Given that orthodontists transitioned away from the use of bands (such as in Kesling) to the use of brackets, it would be obvious to try to put the indicia of Kesling onto brackets, including onto the back of brackets. Roberts Decl. ¶ 143.

By the 1990s, laser engraving was common in so many industries there would have been no doubt as to the effect of using a shorter or longer dwell time as

suggested by Röhlcke. Lebby Decl. ¶ 85. And given the benefits of enhanced mechanical or chemical treatment on mesh-backed brackets as taught by Farzin-Nia, it would have been obvious to try a shorter dwell time and shallower scribe on the bracket. Roberts Decl. ¶ 157-158; Lebby Decl. ¶ 85. Adjusting the parameters or operational settings of a laser to achieve marks with desired characteristics would be easy to do by a laser operator, and would yield predictable results. Lebby Decl. ¶ 85.

Similarly, using ink, it would have been obvious to apply the ink markings of Kesling on the back of orthodontic brackets, instead of bands. Roberts Decl. ¶ 143, 172. Applying Kesling's teachings to more modern bracket technology would yield highly predictable results as well. *Id.* Even if an orthodontist himself would not be involved in the manufacture of brackets, a laser operator or manufacturing technician would be readily able to implement these modest design changes. Roberts Decl. ¶ 144. Claims 1 and 6 of the '930 patent would have been obvious to a person of ordinary skill in the art.

The chart below summarizes where the above prior art references disclose and make obvious the elements of claims 1 and 6 of the '930 patent.

'930 Patent Claim 1 and 6	**Farzin-Nia, Kesling, and Röhlcke, Exs. 1004, 1005, 1006**
1.[6] An orthodontic bracket, comprising:	Farzin-Nia Col. 2:1-10, Figs. 1 and 4; Röhlcke Fig. 1.

'930 Patent Claim 1 and 6	**Farzin-Nia, Kesling, and Röhlcke, Exs. 1004, 1005, 1006**
a) a retention base for a respective tooth, said retention base having a [net-like structured] back side,	Farzin-Nia Col. 4:64-66, 5:23-28 (discussing the bracket base and the use of "mesh or screen" as retention means); Röhlcke Fig. 1, Col. 4:17-20 ("retention base 12").
b) identifying indicia for identifying the respective tooth for which the orthodontic bracket is suitable,	Kesling Col. 1:9-13, 1:21-29, 4:12-40 ("identification 12"), and Figs. 1-3 and 5; Röhlcke Fig. 1 ("+" and dot markings), and Col. 1:13-16 ("it is necessary to apply markings in order to clearly identify [the tooth's] orientation and allocation to individual types of teeth"); 4:28-53 (discussing the markings).
c) said indicia including a sign provided on the back side of said retention base,	Kesling Figs. 1-3 and 5 (showing signs comprising "10," "16," "18," and "21"), Col. 3:13-19 ("[p]referably the identification is applied at an area which will not show when the band is cemented to a tooth in the mouth. . . . on the lingual side of the band"), Col. 3:51-54 ("[t]he identification is located on the lingual side of the band"); Roberts Decl. ¶¶ 81, 83, 140.
d) the size of said indicia being at least 3 square millimeters,	Kesling Col. 2:3-5 (marking area "may be sized to receive indicia thereon and may be in the form of a rectangle or the like"); Roberts Decl. ¶¶ 88-90, 140.
e) the depth of said indicia being substantially null with respect to the depth of the retention base,	Kesling Col. 2:5-6 (discussing the use of "suitable ink or paint" to make the marking); Röhlcke Col. 4:53-62, 5:25-32 (discussing a marking depth of 0.1 µm to 0.5µm); Lebby Decl. ¶ 75.
f) said indicia having a profile which follows the outer profile of said retention base.	Kesling Figs. 1-3 and 5 (showing identification 12 following the lingual profile of the band 11); Farzin-Nia Fig. 1; Röhlcke Col. 4:20-26 (showing the markings 24, 26 and + follow the profile of the bracket 11); Lebby Decl. ¶ 77.

2. Dependent Claims 2, 3, 7 and 8 are obvious over Farzin-Nia in view of Kesling and Röhlcke.

Dependent claims 2, 3, 7 and 8 of the ’930 patent all relate to the specific marking on the orthodontic bracket. Claims 2 and 7 require that the “sign comprises character markings consisting of a number with two figures.” Claims 3 and 8 require that the “sign consists of a number with one figure preceded or followed by the plus sign or by a minus sign.”

Kesling discloses the use of markings consisting of a number with two figures as in Claims 2 and 7 of the ’930 patent. Roberts Decl. ¶ 209. Röhlcke also discloses a plus sign. *Id.* ¶ 226; Ex. 1006, Fig. 1. And it would have been obvious to any person having ordinary skill in the art to substitute markings from any of the various tooth numbering systems, *e.g.,* (Palmer, FDI, Universal, or Haderup) for other markings. Roberts Decl. ¶ 209. These numbering systems were known not just to orthodontists but to many individuals working in different roles in dental and orthodontic fields. *Id.* ¶ 33. Claims 2 and 7 simply describe the FDI numbering system. Roberts Decl. ¶¶ 198, 209-210. Claims 3 and 8 simply describe the Haderup system. Roberts Decl. ¶¶ 214, 226-227.

The chart below summarizes where the above prior art references disclose and make obvious the elements of claims 2, 3, 7, and 8 of the ’930 patent.

'930 Patent Claims 2 and 7	**Farzin-Nia, Kesling and Röhlcke, Exs. 1004, 1005, 1006**
2.[7] The orthodontic bracket according to claim 1[6], wherein said sign comprises character markings consisting of a number with two figures.	Roberts Decl. ¶¶ 198-201, 205, 209-210; Kesling Figs. 1-3 and 5 (showing signs comprising "10," "16," "18," and "21").
'930 Patent Claims 3 and 8	**Farzin-Nia, Kesling and Röhlcke, Exs. 1004, 1005, 1006**
3.[8] The orthodontic bracket according to claim 1[6], wherein said sign consists of a number with one figure preceded or followed by the plus sign or by a minus sign.	Roberts Decl. ¶¶ 215-216, 221-222, 226-227 (discussing the Haderup numbering system and explaining that it would be obvious to use a plus or minus sign); *see also* Röhlcke Fig. 1 (showing marking consisting of a dot and "+" sign).

3. Dependent claims 4, 5, 9, and 10 are obvious over Farzin-Nia in view of Kesling and Röhlcke.

Dependent claims 4, 5, 9, and 10 all relate to the use of a laser to make the markings discussed above. Claims 4 and 9 require the use of a laser apparatus and Claims 5 and 10 require the use of a "diode-pumped laser apparatus." Röhlcke teaches the use of a laser to mark orthodontic brackets. Ex. 1006, Röhlcke Col. 3:12-18. Although Röhlcke does not explicitly disclose a "diode-pumped laser," a person of ordinary skill in the art would readily select a diode-pumped laser for this purpose. Lebby Decl. ¶ 85. For the reasons discussed above, it would have been obvious for a person of ordinary skill in the art to combine these references. *See supra*; Roberts Decl. ¶¶ 233-234, 238-239, 243-244, 248-249.

The chart below summarizes where the above prior art references disclose and/or make obvious the elements of claims 4, 5, 9 and 10 of the '930 patent.

'930 Patent Claims 4 and 9	**Farzin-Nia, Kesling and Röhlcke, Exs. 1004, 1005, 1006**
4.[9] The orthodontic bracket according to claim 1[6], wherein said sign is provided on said back side of said retention base with a laser apparatus.	Röhlcke Col. 3:12-18 (discussing use of "laser beam" to make markings on brackets); Lebby Decl. ¶ 74.
'930 Patent Claims 5 and 10	**Farzin-Nia, Kesling and Röhlcke**
5.[10] The orthodontic bracket according to claim 1[6], wherein said sign is provided on said back side of said retention base with a diode-pumped laser apparatus.	Lebby Decl. ¶ 85.

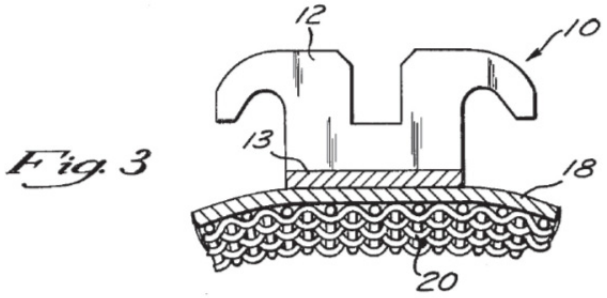
C. Ground 3: The '930 patent claims are obvious over Miller in view of Kesling and/or Orikasa, and further in view of Roman.

This ground is based on Miller (Ex. 1007) as a primary reference. Claims 1, 2, 6, and 7 of the '930 patent are unpatentable under 35 U.S.C. § 103(a) over Miller in view of Kesling (Ex. 1005) and/or Orikasa (Ex. 1008). Claims 3-5 and 8-10 are obvious over any of those combinations plus Roman (Ex. 1002).

1. Independent Claims 1 and 6 are obvious over Miller in view of Kesling and/or Orikasa.

The elements of claims 1 and 6 of the '930 patent are disclosed in or are obvious over Miller in view of Kesling and/or Orikasa. Miller teaches a mesh or

net-backed bracket, as identified in the preamble and element (a) of claims 1 and 6 of the ’930 patent.

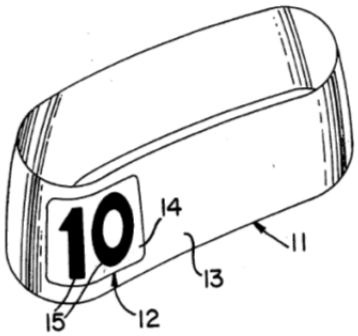


Miller Fig. 3, Ex. 1007

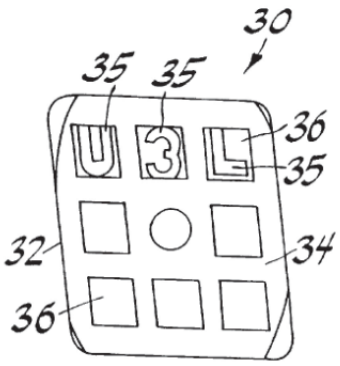
Although Miller was identified in the ’930 patent application, the prosecution history does not indicate that the examiner appreciated the importance of the advance provided by the use of a mesh-backed bracket during original prosecution of the application, or how prevalent that style of bracket had become at the time of the alleged invention in the ’930 patent. Exs. 1012, 1014; *see* Roberts Decl. ¶ 52.

Element (b), concerning an identifying indicia for identifying the appropriate tooth, is disclosed in each of Kesling and Orikasa. Indeed, Kesling identifies the same problem solved by the ’930 patent, which is to provide easy-to-read identification on orthodontic appliances to facilitate use by the orthodontist. Ex. 1005, Kesling Col. 1:9-13, 1:21-32. Kesling, issued in 1978—nearly 20 years before the alleged invention in the ’930 patent, teaches the use of ink to create “indicia such as numerals and/or letters” for identification. *Id.* Col. 1:27-28, 2:5-7, Figs. 1-3 and 5 (showing different numerals). Orikasa teaches “identification

characters 35" in recessed portions of the lingual surface (i.e. the back) of the bracket. Ex. 1008, Orikasa Fig. 13 (showing indicia "U3L" as an example); *see also* Col. 6:46-48. Orikasa teaches that an "advantage of locating the identification characters 35 on the lingual surface 34 is that after cement or other bonding material is applied to the lingual surface 34 to bond the bracket 30 to the tooth, the reference characters should not be noticeable." *Id.* Col. 6:48-56.



Kesling Fig. 1, Ex. 1005



Orikasa Fig. 13, Ex. 1008

Element (c), concerning indicia on the back of the retention base, is taught by Kesling and Orikasa. Roberts Decl. ¶¶ 79, 81, 83, 169. Kesling teaches indicia marked on the back of an orthodontic band: "[p]referably the identification is applied at an area which will not show when the band is cemented to a tooth in the mouth. . . . on the lingual side of the band…." Ex. 1005, Kesling Col. 3:13-19; *see also* Col. 3:51-54. In the context of brackets, Orikasa clearly shows identification characters "U3L" on the back of the bracket. Ex. 1008, Orikasa, Fig. 13 and Col. 6:41-56.

Element (d) requires the size of the indicia to be at least 3 square millimeters. Based on typical band sizes and an estimation of the size of markings shown in Kesling, the indicia in Kesling are probably greater than 50 mm^2, well beyond "*at least* 3 square millimeters." Roberts Decl. ¶¶ 88-90. It is common sense that larger markings are easier to read, and given the teachings in the prior art concerning "easy-to-read" markings, this element would be obvious to one of ordinary skill in the art.

The typical size of orthodontic brackets in the early 1990s was no smaller than 3.1 mm x 3.5 mm. Roberts Decl. ¶ 91. A typical diameter of an orthodontic band in the 1980s was around 0.4 inches wide. Roberts Decl. ¶ 89. Further, Orikasa identifies that the size of the base surface of the brackets disclosed is "about $10mm^2$." Ex. 1008, Orikasa Col. 6:16-18. It can thus be estimated from those sizes and from dimensions identified in prior art references that "easy-to-read" indicia, as taught in the prior art, would meet the "at least 3 square millimeters" element in the challenged claims. Roberts Decl. ¶¶ 88-92. This would be about a third of the area of the base of the Orikasa reference, which appears to be drawn in the figures, even though they are not necessarily to scale. Given typical dimensions for prior art brackets and bands, any "easy-to-read" indicia would easily satisfy this element, or at least make this element obvious to one of ordinary skill in the art. *See also In re Applied Materials, Inc.*, 692 F.3d 1289, 1295 (Fed. Cir. 2012).

Elements (e) and (f) require that the depth of the indicia is "substantially null," and that the indicia follow the profile of the retention base. Ex. 1001. This is disclosed explicitly by Kesling, and would have been obvious to one of ordinary skill in the art. Roberts Decl. ¶¶ 100-101, 106, 169. Kesling teaches the use of "suitable ink or paint" to make the indicia. Ex. 1005, Kesling Col. 2:5-6. The '930 patent similarly teaches that its "indicia" may be made using ink. Ex. 1001, Col. 2:42-44. As explained above (*supra* at 31), the thickness of the indicia in Kesling is quite thin. Lebby Decl. ¶ 83. Even without the explicit disclosure of ink in Kesling, the depth element would have been obvious to a person of ordinary skill in the art. Roberts Decl. ¶ 101; Lebby Decl. ¶¶ 84, 86.

In the 1970s—nearly 20 years before the priority date of the '930 patent—a person of ordinary skill in the art would have combined the teachings of Miller and Kesling to solve the problem identified in Kesling of "easy-to-read" identifiers. Roberts Decl. ¶¶ 172-179. Simply applying the markings of Kesling to the then-new bracket in Miller would have resulted in claims 1 and 6 of the '930 patent. *Id.*

A person of ordinary skill in the art would have recognized a reason to combine these references (to achieve easy-to-read markings) and would have known how to do so, achieving predictable results. Roberts Decl. ¶ 195. Given the benefits of the mesh textured bracket base taught in Miller, a person of ordinary skill in the art would have been motivated to try to retain the bonding

characteristics and benefits obtained from that texture. Roberts Decl. ¶¶ 186-190. Given that the bracket base provides a relatively large surface, and is hidden from view when the bracket is installed, it would also be obvious to place the marking there. *Id.* To the extent not common sense, it is suggested by Orikasa as well. Thus the use of a shallow marking or one having a "substantially null" depth on the back of a bracket such as Miller would have been obvious to try and would have been predictably accomplished. *Id.*; Lebby Decl. ¶¶ 84, 86. Further, any marking or indicia made by such a technique would necessarily "follow the profile" of the topography of the base of the bracket. Roberts Decl. ¶¶ 105-106.

The chart below summarizes where the above prior art references disclose and/or make obvious the elements of claims 1 and 6 of the '930 patent.

'930 Patent Claim 1 and 6	**Miller in view of Kesling and/or Orikasa, Exs. 1005, 1007, 1008**
1.[6]An orthodontic bracket, comprising:	*See* Miller Summary and Figs. 2, 3; Orikasa Summary and Figs. 5 and 13.
a) a retention base for a respective tooth, said retention base having a [net-like structured] back side,	*See* Miller Col. 2:17-20 ("an orthodontic appliance is attached to a tooth by means of a base").
b) identifying indicia for identifying the respective tooth for which the orthodontic bracket is suitable,	Kesling Col. 1:23-29 (discussing providing "identifying means" on orthodontic bands including "indicia such as numerals and/or letters"); Orikasa Fig. 13 and Col. 6:41-56 (showing identification characters "U3L").

'930 Patent Claim 1 and 6	**Miller in view of Kesling and/or Orikasa, Exs. 1005, 1007, 1008**
c) said indicia including a sign provided on the back side of said retention base,	Kesling Figs. 1-3 and 5 (showing signs comprising "10," "16," "18," and "21"), Col. 3:13-19 ("[p]referably the identification is applied at an area which will not show when the band is cemented to a tooth in the mouth. . . . on the lingual side of the band"), Col. 3:51-54 ("The identification is located on the lingual side of the band"); Orikasa Fig. 13 and Col. 6:41-56 (showing identification characters "U3L" on the back side of the bracket).
d) the size of said indicia being at least 3 square millimeters,	Roberts Decl. ¶¶ 88-92; Orikasa Col. 6:16-18 (size of the base surface, "about 10 mm^2").
e) the depth of said indicia being substantially null with respect to the depth of the retention base,	Kesling Col. 2:5-6 (discussing the use of "suitable ink or paint" to make the marking, which would be very thin); Lebby Decl. ¶ 83.
f) said indicia having a profile which follows the outer profile of said retention base.	Kesling Figs. 1-3 and 5 (showing that the indicia follows the profile of the band), Col. 2:3 (indicia having a "suitable geometric shape").

2. Dependent Claims 2, 3, 7, and 8 are obvious over Miller in view of Kesling and/or Orikasa.

This group of claims relates to the specific marking on the bracket. Dependent claims 2 and 7 require that the marking on the bracket consists of "a number with two figures." This is disclosed by Kesling, in Figures 1-3 and 5, which teach multiple markings that consist of "a number with two figures," namely, "10," "16,", "18," and "21." Ex. 1005. Markings on the back of orthodontic brackets are also taught by Orikasa. Ex. 1008, Orikasa Fig. 13 and Col. 6:41-56. And the FDI tooth numbering system—involving a series of two figure

numbers—has been well-known since the priority date of the '930 patent. Roberts Decl. ¶¶ 198-199, 203, 205, 211-212. It would be obvious to a person of ordinary skill in the art to combine these references for the reasons discussed above.

Dependent claims 3 and 8 require a marking that includes a "number with one figure preceded or followed by the plus sign or by a minus sign." These claims describe the Haderup numbering system discussed above in Section VI.A.1, which involves the use of a single number with a plus or minus sign to identify individual teeth. Roberts Decl. ¶ 214. Simply substituting one numbering system for a different numbering system would be obvious. Roberts Decl. ¶ 221.

The chart below summarizes where the above prior art references disclose and/or make obvious the elements of claims 2, 3, 7, and 8 of the '930 patent.

'930 Patent Claims 2 and 7	**Miller in view of Kesling and/or Orikasa, Exs. 1005, 1007, 1008**
2.[7] The orthodontic bracket according to claim 1[6], wherein said sign comprises character markings consisting of a number with two figures.	Kesling Figs. 1-3 and 5 (showing signs comprising "10," "16," "18," and "21"); Roberts Decl. ¶¶ 198-201, 203, 205, 211-212.
'930 Patent Claims 3 and 8	**Miller in view of Kesling and/or Orikasa**
3.[8] The orthodontic bracket according to claim 1[6], wherein said sign consists of a number with one figure preceded or followed by the plus sign or by a minus sign.	Roberts Decl. ¶¶ 214-215, 218-219, 221-222, 228-229 (discussing the Haderup and other tooth numbering systems).

3. Dependent claims 4, 5, 9, and 10 are obvious over Miller in view of either of Kesling and/or Orikasa and further in view of Roman.

These claims relate to the use of lasers to apply the marking to the bracket. Claims 4 and 9 require that the marking is made with "a laser apparatus." Claims 5 and 10 require that the marking is made with "a diode-pumped laser apparatus." Roman discloses the use of lasers to mark orthodontic brackets, and in particular, discloses the use of lasers including Nd:ELF, Nd:YAG, and CO_2 lasers. Ex. 1002, Roman Col. 3:34-37, 3:50-54. ND:YAG lasers were a well-known type of diode-pumped lasers at the time of the '930 patent. Lebby Decl. ¶¶ 29-30. Given the prevalence of the use of lasers, including diode-pumped lasers, for numerous different applications, including the use of lasers in orthodontics and dentistry, it would have been obvious to a person trying to create "easy-to-read" markings to use a laser or a diode-pumped laser to do so. Lebby Decl. ¶¶ 64-69. Thus, it would have been obvious for a person of ordinary skill in the art to combine Roman with Miller and/or any of the orthodontic marking references discussed in this ground. Roberts Decl. ¶¶ 232, 234, 240-241, 243-244, 250-251.

The chart below summarizes where the above prior art references disclose and/or make obvious the elements of claims 4, 5, 9, and 10 of the '930 patent.

'930 Patent Claims 4 and 9	**Miller in view of Kesling and/or Orikasa, and further in view of Roman, Ex. 1002**
4.[9] The orthodontic bracket according to claim 1[6], wherein said sign is provided on said back side of said retention base with a laser apparatus.	Lebby Decl. ¶ 49; Roman Col. 3:34-37 ("it is an aspect of the invention to use some form of laser to anneal the surface of orthodontic bracket 5 to thereby create marking area 10").
'930 Patent Claims 5 and 10	**Miller in view of Kesling and/or Orikasa, and further in view of Roman**
5.[10] The orthodontic bracket according to claim 1[6], wherein said sign is provided on said back side of said retention base with a diode-pumped laser apparatus.	Lebby Decl. ¶ 49; Roman Col. 3:34-37 ("it is an aspect of the invention to use some form of laser to anneal the surface of orthodontic bracket 5 to thereby create marking area 10"); *see also* Roman Col. 3:50-54 (lasers could include "lasers identified as Nd:ELF, Nd:YAG and CO_2").

D. Ground 4: The '930 patent claims are obvious over the inventor's own European Publication EP 0876801.

A fatal error was committed in prosecuting the family of patents to which the '930 patent belongs, resulting in some of the inventor's own published foreign applications becoming invalidating prior art to the '930 patent. One of these is European Patent Office published application, EP 0876801 (Ex. 1009), filed on February 19, 1998 and published on November 11, 1998, which claims priority to Italian application F197U0066. Publications in Austria, China, Germany, France,

and Italy[2] are also invalidating, but for simplicity, we focus on the European Publication, which was published in English.

1. The European Publication is prior art to the '930 patent.

European Publication EP0876801 is prior art to the '930 patent under 35 U.S.C. § 102(b) because it was published more than one year before the priority date of the '930 patent claims. Ex. 1009 (EP0876801); *see* also Lebby Decl. ¶¶ 87-106. The '930 patent is a continuation-in-part in which significant new matter was added both to the specification and the claims. Lebby Decl. ¶ 88. The written description of the parent application does not support these new claims. *Id.* ¶ 105. Therefore, the '930 patent claims are not entitled to the priority date of its parent; their priority date is the filing date: November 19, 1999. The European Publication was published more than one year prior, on November 11, 1998.

a) The new matter in the continuation-in-part that became the '930 patent.

A highlighted copy of the '930 patent showing the new matter added in the continuation-in-part filed on November 19, 1999 (the '724 application) is attached.

[2] Austrian Publication AT2406 (Oct. 27, 1998), Chinese Publication CN1198318 (Nov. 11, 1998), German Publication DE29802269 (Apr. 16, 1998), French Publication FR2762988 (Nov. 13, 1998), and Italian Publication ITFI970066 (Nov. 6, 1998). *See* Ex. 1013 (showing patent family).

See Ex. 1033; *also compare* Ex. 1012 (’724 application and ’930 patent file history) to Ex. 1014 (file history for application serial no. 09/039,792, the U.S. parent of the ’930 patent); *see also* Lebby Decl. ¶ 92.

Each of the independent claims (1 and 6) of the ’930 patent includes a new element, namely “indicia having a profile which follows the outer profile of said retention base.” Ex. 1033. This element is illustrated in Figures 3 and 4 of the ’930 patent, which were also new matter, along with significant discussion of these figures. *See, e.g.,* Ex. 1033, ’930 patent Col. 3:55-56, 3:58-60 and 4:5-34. Dentsply itself has admitted that this element concerning the “profile” is illustrated by Figure 4. *See* Ex. 1015.

Independent claims 1 and 6 of the ’930 patent also expand on a brief reference to the term “substantially null” in the parent. Lebby Decl. ¶ 94. The single sentence in the parent ’792 application refers vaguely to a “substantially null” thickness, but does not explain what it means or provide any frame of reference. The sentence states: “Furthermore, the anchorage of the retention base to the tooth is not adversely affected, contrarly [sic] to the case of brackets having molded identification marks, since the thickness of the identification marks according to the invention is *substantially null*.” Ex. 1014 at 18-19 (’792 file history) (emphasis added).

The ’930 continuation-in-part enhanced this sparse disclosure and provided a frame of reference. *See* Ex. 1033. New Figure 4 in the ’930 patent depicts relative dimensions of the indicia (reference letter “I”) with respect to the depth (reference letter “d”) of the base of the bracket (reference letter “B”). *Id.* Claims 1 and 6 also include language stating that the indicia are substantially null “with respect to the depth of the retention base,” which was disclosed nowhere in any parent application. *Id.* The ’930 patent also contains other new matter as shown in Exhibit 1033. *See also* Lebby Decl. ¶ 96.

The new matter in the ’930 patent was apparently enough for the USPTO to allow the claims—albeit incorrectly—when the claims of the parent were not allowable. Lebby Decl. ¶ 95. Indeed, the new matter was recited in the examiner’s “reasons for allowance.” *See* Ex. 1012 at 50 (’930 file history) (“The prior art does not show nor fairly suggest an orthodontic bracket comprising a retention base having a back side having indicia thereon where the indicia is at least 3 square millimeters in size, the depth of the indicia is *substantially null with respect to the depth of the base and the indicia has a profile that follows the outer profile of the base.”*) (emphasis added). The new matter added was significant both in terms of quantity and content. *See* Exhibit 1033.

b) The '930 patent claims are not supported by the parent application, and are not entitled to its priority date.

A claim in a later-filed application is entitled to the filing date of an earlier application only if the earlier application satisfies the written description requirement of 35 U.S.C. § 112. *See Lockwood v. Am. Airlines, Inc.*, 107 F.3d 1565, 1571 (Fed. Cir. 1997). The prior application must "convey with reasonable clarity to those skilled in the art that, as of the filing date sought, [the inventor] was in possession *of the invention*." *PowerOasis, Inc. v. T-Mobile USA, Inc.*, 522 F.3d 1299, 1306 (Fed. Cir. 2008) (quoting *Vas-Cath Inc. v. Mahurkar*, 935 F.2d 1555, 1563-64 (Fed. Cir. 1991)). This requires that the parent application "actually or inherently disclose" the elements of the later-filed claims. *PowerOasis*, 522 F.3d at 1306.

For disclosure to be inherent, "the missing descriptive matter must *necessarily* be present in the parent application's specification such that one skilled in the art would recognize such a disclosure." *Tronzo v. Biomet, Inc.*, 156 F.3d 1154, 1159 (Fed. Cir. 1998) (emphasis added); *Agilent Techs., Inc. v. Affymetrix, Inc.*, 567 F.3d 1366, 1383 (Fed. Cir. 2009) ("The very essence of inherency is that one of ordinary skill in the art would recognize that a reference *unavoidably* teaches the property in question.") (emphasis added). Inherency "'may not be established by probabilities or possibilities.'" *In re Oelrich*, 666 F.2d 578, 581

(C.C.P.A. 1981) (explaining that the disclosure is insufficient if the feature or characteristic at issue is not the "natural result" of the disclosed matter). A description that merely renders the invention obvious does not satisfy the written description requirement. *Lockwood,*107 F.3d at 1572.

The '792 patent application did not actually or inherently disclose the new elements in claims 1 and 6 in the '930 patent. The new claim element, "indicia having a profile which follows the outer profile of said retention base," and the new "substantially null" limitation were simply not disclosed in the '792 application. Lebby Decl. ¶ 101.

The parent application did not identify that the indicia "have a profile" which follows the profile of the bracket base. *Id.* Indeed, the term "profile" was never used in the parent application. *Id.* Although the term "substantially null" was used once in the parent application, the sentence in which it is used (see Exhibit 1014 at 18-19 ('792 file history)) only distinguishes the markings from "molded identification marks" but does not identify any point of reference for the thickness of the markings. *Id.* No person of ordinary skill—indeed, no person at all—would understand the disclosure of the '792 application to indicate that the inventor was "in possession" of these aspects of the claimed invention. *Id.*

The parent application contains no inherent disclosure of the new matter either. Lebby Decl. ¶¶ 102-103. The disclosure of the '792 application does not

"necessarily" or "unavoidably" disclose elements of the claims of the '930 patent reciting "indicia having a profile which follows the outer profile of said retention base," or that substantially null is a measurement "with respect to the depth of the retention base." *Id.* Lasers can be set according to a variety of parameters, some of which would result in a significant disruption or groove in the surface material, and some of which would not. *Id.* ¶ 103. Nor does the use of ink for markings necessarily result in a substantially null thickness. *Id.* ¶ 104. The parent application provides no detail about the ink or process that could be used to apply it to the surface. *Id.* Applying ink in many cases could result in markings that have an uneven or non-uniform thickness, which is not substantially null, especially on a net-like surface. *Id.* The '792 application does not necessarily or inherently disclose the new elements in the '930 patent claims; the European Publication is prior art.

2. The new matter in the '930 patent claims is obvious in view of the European Publication.

European Publication EP 0876801 discloses nearly every element of claims 1-10 of the '930 patent. The only limitations missing from the disclosure of the European Publication are the elements "indicia having a profile which follows the outer profile of said retention base," and the limitation that "substantially null" is a measurement "with respect to the depth of the retention base." Lebby Decl. ¶ 107.

Claims 1-10 of the ’930 patent are obvious in view of the inventor’s own European Publication. *Id.* ¶¶ 107-116; *see In re Van Langenhoven*, 458 F.2d 132 (C.C.P.A. 1972) (affirming rejection of claims in a continuation-in-part in view of inventor’s own French patent); *Santarus, Inc. v. Par Pharm., Inc.*, 694 F.3d 1344, 1352-54 (Fed. Cir. 2012) (affirming decision that continuation-in-part claims were not entitled to parent’s priority date and that they were obvious in view of the parent).

With respect to claims 1 and 6 of the ’930 patent, EP 0876801 discloses an orthodontic bracket with a retention base (including a retention base with a net-like structured back side), identifying indicia for identifying the tooth for which the orthodontic bracket is suitable, and where the size of the indicia is at least three square millimeters. Ex. 1009 at 2-3, Figs. 1 and 2; *see also* claim chart below; Lebby Decl. ¶¶ 107-108. The European Publication has the same vague reference to “substantially null” as the ’792 application, but it similarly does not teach what that means or describe any frame of reference for determining the depth of the indicia. Lebby Decl. ¶ 108. Based on the disclosure in the European Publication, a person of ordinary skill would understand there to be at least three possible reference points for determining how to measure whether the marking was “substantially null.” *Id.* ¶ 109. For example, the marking could be substantially null with respect to the size of the bracket overall, with respect to the size of the bracket base, or with respect to the depth of the “net-like structure” on the back of the base.

Id. Which reference point the inventor had in mind was not disclosed, but would be a simple design choice to a person of ordinary skill. *Id.*

Laser technology was sufficiently advanced—even by the late 1980s—for a typical laser engineer to know that several design choices were available for the characteristics of the indicia. Lebby Decl. ¶ 110. Laser engineers of ordinary skill at the relevant time would have been trained on how to vary the parameters of a laser to achieve markings having differing thicknesses, depth, color, or other characteristics as desired. *Id.* The benefits of markings made by laser annealing were known in the prior art, *e.g.* as in Roman (Ex. 1002), which discloses a marking that does not change the surface structure and is thus "substantially null." *Id.* Similarly, varying the thickness of a layer of ink would be common sense to any person of ordinary skill, and obvious as well. *Id.* The new element in claims 1 and 6, while not supported by the parent application, would have been obvious to a person of ordinary skill in the art. Lebby Decl. ¶ 111; *see also Lockwood*, 107 F.3d at 1572 (invalidating continuation-in-part, explaining that "it is 'not a question of whether one skilled in the art might be able to construct the patentee's device from the teachings of the [prior] disclosure…Rather, it is a question whether the application necessarily discloses that particular device.'").

The dependent claims in the '930 patent share the same priority date, and are obvious too. Lebby Decl. ¶ 112. The limitations of dependent claims 2 and 7 of the

'930 patent, which relate to markings consisting of a number with two figures, were disclosed in Figure 2 of the European Publication. *Id.* ¶ 113. Dependent claims 3 and 8 relate to a marking that is a number with one figure preceded or followed by a plus or minus sign. This was also disclosed in EP 0876801 at page 3, lines 16-18. *Id.* ¶ 114; *see also* Ex. 1009. Claims 4 and 9 relate to marking the indicia with a laser apparatus; this was disclosed in EP 0876801 at page 3, lines 21-22. Lebby Decl. ¶ 115. Claims 5 and 10 relate to the use of a diode-pumped laser. The European Publications admits that many technicians will be familiar with laser marking. *See* Ex. 1009 at 3, lines 21-22. Given that diode-pumped lasers were commercially available in the 1980s and were commonly used in manufacturing well before the mid-1990s, it would have been obvious to choose a diode-pumped laser for this marking. Lebby Decl. ¶ 116.

As illustrated in the claim chart below, EP 0876801 renders claims 1-10 of the '930 patent invalid under 35 U.S.C. § 103.

'930 Patent Claims 1 and 6	**EP 0876801, Ex. 1009**
1.[6] An orthodontic bracket, comprising:	p. 2, line 3 ("The present invention relates to an orthodontic aid or bracket."); *see also* Fig. 2.
a) a retention base for a respective tooth, said retention base having a [net-like structured] back side,	p. 2, line 55-p. 3, line 1 (discussing "retention base (B)" and the "back side of the retention base (B)" in Fig. 2); *see also* p. 3, line 22 ("[t]he orthodontic aid in fig. 2 features a net-like retention base").

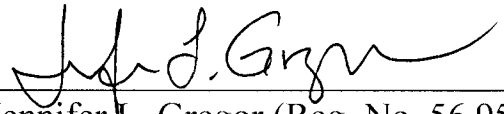
b) identifying indicia for identifying the respective tooth for which the orthodontic bracket is suitable,	p. 2, line 57-58 (discussing an "indicia consisting of a numerical code ('22' in fig. 2) positioned on the back side of the retention base"); *see also* p. 3, lines 1-10 (discussing the FDI identification system).
c) said indicia including a sign provided on the back side of said retention base,	p. 3, lines 15-17 (discussing the "identification code may consist of a number with one figure identifying the tooth, proceded [sic] or followed by a '+' or a '-' sign, which indicates if the number belongs to the right or to the left side [of the mouth]").
d) the size of said indicia being at least 3 square millimeters,	Claim 1 of EP 0876801; *see also* p. 3, lines 17-18 (discussing a "wider marking area, which can even be 9 square millimeter" [sic]).
e) the depth of said indicia being substantially null with respect to the depth of the retention base,	p. 2, lines 44-45 ("the thickness of the identification marks according to the invention is substantially null"); Lebby Decl. ¶¶ 109-111.
f) said indicia having a profile which follows the outer profile of said retention base.	Lebby Decl. ¶ 111.
'930 Patent Claims 2 and 7	**EP 0876801**
2.[7] The orthodontic bracket according to claim 1[6], wherein said sign comprises character markings consisting of a number with two figures.	Fig. 2 (and the code "22" on the back of the retention base (B)).
'930 Patent Claims 3 and 8	**EP 0876801**
3.[8] The orthodontic bracket according to claim 1[6], wherein said sign consists of a number with one figure preceded or followed by the plus sign or by a minus sign.	p. 3, lines 16-18 ("the 3+ symbol identifies the upper right eye-tooth and the -4 symbol identifies the first lower left premolar").

'930 Patent Claims 4 and 9	**EP 0876801**
4.[9] The orthodontic bracket according to claim 1[6], wherein said sign is provided on said back side of said retention base with a laser apparatus.	p. 3, lines 21-22 ("[t]he marking of the retention base (B) can be produced by means of a laser apparatus").
'930 Patent Claims 5 and 10	**EP 0876801**
5.[10] The orthodontic bracket according to claim 1[6], wherein said sign is provided on said back side of said retention base with a diode-pumped laser apparatus.	Lebby Decl. ¶ 116.

VII. Conclusion.

Petitioner respectfully requests that the Board institute IPR and cancel claims 1-10 of the '930 patent under 35 U.S.C. § 103.

August 19, 2016
Date



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Certification Under 37 C.F.R. § 42.24(d)

Under the provisions of 37 C.F.R. § 42.24(d), the undersigned hereby certifies that the word count for the foregoing Petition for *Inter Partes* Review totals 13,940 words, as calculated by Microsoft Word, which is less than the 14,000 allowed under 37 C.F.R. § 42.24(a)(i).

August 19, 2016
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Certificate of Service

In accordance with 37 C.F.R. §§ 42.6(e) and 42.105, the undersigned certifies that on August 19, 2016, a complete and entire copy of the **PETITION FOR *INTER PARTES* REVIEW OF CLAIMS 1-10 OF U.S. PATENT NO. 6,276,930** ("petition") and related documents were served on the patent owner at the correspondence address of record for the subject patent:

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Scarborough, NY 10510-9227

via Priority Mail Express or by means at least as fast and reliable as Priority Mail Express. Additionally, the same were also served upon litigation counsel for the subject patent's owner, DENTSPLY International Inc.:

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because that is likely to effect service.

In accordance with § 42.51(b)(1), the undersigned certify that Petitioner is not aware of, and therefore does not provide any "relevant information that is inconsistent with a position advanced by petitioner[]."

August 19, 2016
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