UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

STRAUMANN USA, LLC,
Petitioner,

v.

SMART DENTURE CONVERSIONS, LLC,
Patent Owner.

Case No. PGR2025-00054

U.S. Patent No. 12,156,781

Title: "Screw-Attached Pick-Up Dental Coping System And Methods"
Issued: December 3, 2024
Application No. 18/424,696
Filed: January 26, 2024

PETITION FOR POST GRANT REVIEW OF U.S. PATENT NO. 12,156,781

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EXHIBITS

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1003	U.S. Patent Application Pub. No. US 2017/0202649 A1 (Bernhard)
1004	U.S. Patent No. 6,283,752 (Kumar)
1005	U.S. Patent Application Pub. No. US 2016/0045290 A1 (Poovey)
1006	A. Gracco et al., "Effects of Thread Shape on the Pullout Strength of Miniscrews," 142 *Amer. J. Orthodontics & Dentofacial Orthopedics*, 186–90 (2012) (Gracco)
1007	Declaration of Lindsay Allen re Gracco
1008	PCT Patent Application No. WO 2013/030839 A1 (Derey)
1009	U.S. Provisional Patent Application No. 62/742,942
1010	U.S. Provisional Patent Application No. 62/774,402
1011	U.S. Provisional Patent Application No. 62/818,082
1012	U.S. Patent Application No. 16/596,361
1013	U.S. Patent No. 11,311,354 (Kofford)
1014	Smart Denture Conversions Webpage – Separable Fastener
1015	Prosecution History of U.S. Patent Application No. 18/328,730
1016	Smart Denture Conversions – Technique Guide
1017	Complaint, D.I. 1 (April 23, 2024), *Smart Denture Conversions, LLC v. Straumann USA, LLC*, No. 1:24-cv-00507-JCB (D. Del.)
1018	U.S. Patent Application No. 17/691,108

1019	NeoConvert Brochure
1020	Prosecution History of U.S. Patent Application No. 18/424,696
1021	Supplemental Complaint, D.I. 34 (Feb. 4, 2025), *Smart Denture Conversions, LLC v. Straumann USA, LLC*, No. 1:24-cv-00507-JCB (D. Del.)

CLAIM LISTING

1(a)	1. A dental system comprising:
1(b)	a coping having a proximal end with an aperture; and
1(c)	an implant abutment having threads;
1(d)	a definitive screw having a proximal head end having a tool interface and a distal post portion having threads configured for securing the coping to the threads of the implant abutment, wherein the distal post portion having threads is sized to extend through the aperture of the coping; and
1(e)	a temporary fastener having an axis with a length measured along the axis and a lateral dimension providing different widths along the axis measured perpendicular to the axis, the temporary fastener comprising:
1(f)	a proximal portion with a width larger than the coping aperture; and
1(g)	a shaft comprising a distal shaft portion sized and configured for rotary engagement with the implant abutment threads,
1(h)	wherein the shaft of the temporary fastener extends through the aperture of the coping and the distal shaft portion engages the implant abutment threads with an engagement depth at a predetermined torque and is configured to cause the proximal portion of the temporary fastener to hold the coping into alignment with the implant abutment prior to attachment of the definitive screw,
1(i)	wherein the temporary fastener is configured to release at least a portion of the temporary fastener and the coping from the implant abutment as a unit when an axial release force is applied in a proximal direction to the temporary fastener,
1(j)	wherein the distal shaft portion is sized and configured so that it does not engage the implant abutment threads continuously between a most distal position of the distal shaft portion and a proximal end of the implant abutment threads,
1(k)	wherein the distal shaft portion of the temporary fastener comprises threading which is sized and configured to make contact with the implant abutment threads over a first threading contact area to hold the coping

	against the implant abutment, wherein the distal post portion of the definitive screw is sized and configured to make contact with the implant abutment threads over a second threading contact area to hold the coping against the implant abutment, and wherein the first threading contact area is less than the second threading contact area.
2	2. The dental system of claim 1, wherein the distal shaft portion of the temporary fastener comprises asymmetric threading.
3	3. The dental system of claim 1, wherein the axial release force in the proximal direction is applied through a pick-up process in which the coping is bonded and/or adhered to a dental element.
4	4. The dental system of claim 1, wherein the threads of the distal post portion of the definitive screw comprise a continuous form.
5	5. The dental system of claim 1, wherein the distal shaft portion of the temporary fastener comprises an outer surface which is sized and configured to deform in response to the axial release force in the proximal direction whereby the at least a portion of the temporary fastener and the coping are released together as the unit.
6(a)	6. A dental system comprising:
6(b)	a coping having a proximal end with an aperture; and
6(c)	an implant abutment having threads;
6(d)	a definitive screw having a proximal head end having a tool interface and a distal post portion having threads for securing the coping to the threads of the implant abutment after processing, wherein the distal post portion having threads is sized to extend through the aperture of the coping; and
6(e)	a temporary fastener having an axis with a length measured along the axis and a lateral dimension providing different widths along the axis measured perpendicular to the axis, the temporary fastener comprising:
6(f)	a proximal portion with a width larger than the coping aperture; and
6(g)	a shaft comprising a distal shaft portion sized and configured for rotary engagement with the implant abutment threads,

6(h)	wherein the shaft of the temporary fastener is sized and configured to extend through the aperture of the coping and the distal shaft portion to engage the implant abutment threads with an engagement depth at a predetermined torque and is configured to cause the proximal portion of the temporary fastener to hold the coping into alignment with the implant abutment,
6(i)	wherein the temporary fastener is configured to release at least a portion of the temporary fastener and the coping from the implant abutment as a unit in response to an axial release force that is applied only in a proximal direction to the temporary fastener whereby the axial release force is applied without rotation of the temporary fastener, and
6(j)	wherein the distal shaft portion is sized and configured so that it does not engage the implant abutment threads continuously between a most distal position of the distal shaft portion and a proximal end of the implant abutment threads.
7	7. The dental system of claim 1, wherein the distal shaft portion of the temporary fastener comprises an open space, and wherein a portion of the axis is located within the open space.
8(a)	8. A dental system comprising:
8(b)	a coping having a proximal end with an aperture; and
8(c)	an implant abutment having threads;
8(d)	a definitive screw having a proximal head end having a tool interface and a distal post portion having threads for securing the coping to the threads of the implant abutment, wherein the distal post portion having threads is sized to extend through the aperture of the coping; and
8(e)	a temporary fastener having an axis with a length measured along the axis and a lateral dimension providing different widths along the axis measured perpendicular to the axis, the temporary fastener comprising:
8(f)	a proximal portion with a width larger than the coping aperture; and

8(g)	a shaft comprising a distal shaft portion sized and configured for rotary engagement with the implant abutment threads prior to attachment of the definitive screw,
8(h)	wherein the shaft of the temporary fastener extends through the aperture of the coping and the distal shaft portion engages the implant abutment threads with an engagement depth at a predetermined torque and is configured to cause the proximal portion of the temporary fastener to hold the coping into alignment with the implant abutment,
8(i)	wherein the temporary fastener is configured to release at least a portion of the temporary fastener and the coping from the implant abutment as a unit when an axial release force is applied in a proximal direction to the temporary fastener,
8(j)	wherein the distal shaft portion is sized and configured so that it does not engage the implant abutment threads continuously between a most distal position of the distal shaft portion and a proximal end of the implant abutment threads,
8(k)	wherein a volume of definitive screw post material of the distal post portion of the definitive screw that is located distally of the proximal end of the implant abutment threads when in position to hold the coping against the implant abutment is greater than a volume of temporary fastener shaft material of the distal shaft portion of the temporary fastener that is located distally of the proximal end of the implant abutment threads when in position to hold the coping against the implant abutment.
9	9. The dental system of claim 1, wherein the temporary fastener is polymeric, and wherein the distal shaft portion of the temporary fastener is hollow.
10(a)	10. A dental system comprising:
10(b)	an implant abutment having threads having an implant abutment threads contour and an implant abutment longitudinal axis;
10(c)	a coping having a proximal end with a central aperture, and

10(d)	a temporary fastener having a longitudinal axis with a length measured along the longitudinal axis and a width dimension measured perpendicular to the longitudinal axis, the temporary fastener comprising:
10(e)	a head with a proximal end having a drive tool interface sized and configured for rotating the temporary fastener to a predetermined torque, wherein the head resides external to the central aperture of the coping, and
10(f)	a shaft coupled to or integral with the head that extends through the central aperture of the coping, the shaft comprising:
10(g)	a distal portion having an outer surface comprising shaft threading having a shaft threading contour, wherein the shaft threading contour does not essentially match the implant abutment threads contour, and
10(h)	a proximal portion with an outer surface devoid of shaft threading,
10(i)	wherein, the temporary fastener is configured so that when the distal portion of the shaft extends through the central aperture of the coping and engages the threads of the implant abutment at a predetermined torque, the shaft threading engages the threads of the implant abutment whereby the shaft threading cooperates with the threads of the implant abutment and is sized and configured to pull the coping into position with the implant abutment,
10(j)	wherein the temporary fastener is configured so that in response to application of an axial release force above a predetermined value in a proximal direction, the coping and the temporary fastener are released as a unit from the implant abutment, and
10(k)	wherein the axial force above the predetermined value in the proximal direction is configured to be applied in a pick-up process after the coping is adhesively bonded to a prosthesis or in a closed tray impression process.
11	11. The dental system of claim 10, wherein the shaft threading does not have a continuous threading contour along its path around the longitudinal axis.

12	12. The dental system of claim 10, wherein the temporary fastener comprises a polymer.
13	13. The dental system of claim 12, wherein the temporary fastener comprises a PEEK material.
14	14. The dental system of claim 10, wherein the distal shaft portion of the shaft of the temporary fastener is configured to deform during the application of the axial force in the proximal direction to thereby release the coping and the temporary fastener as the unit from the implant abutment.
15	15. The dental system of claim 10, further comprising a definitive screw comprising threads configured to engage the implant abutment, wherein a maximal width of the distal portion of the shaft of the temporary fastener is smaller than a maximal width of the threads of the definitive screw.
16	16. The dental system of claim 10, further comprising a definitive screw comprising threads configured to engage the implant abutment, wherein a profile pattern of the threading of the temporary fastener is configured to define a first abutment contact area with the threads of the implant abutment, wherein a profile pattern of the threads of the definitive screw is configured to define a second abutment contact area with the threads of the implant abutment, and wherein the first abutment contact area is less than the second abutment contact area.

Petitioner Straumann USA, LLC ("Petitioner") respectfully petitions the Board to institute a post grant review of claims 1–16 of U.S. Patent No. 12,156,781 ("'781 patent") (Ex. 1001), find the claims unpatentable, and cancel the claims.

I. INTRODUCTION

The '781 patent relates to components used during a procedure to install a dental prosthesis onto implants in a patient's jaw. The prosthesis is often secured to the implants by screws that fasten "copings" bonded to the prosthesis to "abutments" connected to the implants. Before the prosthesis can be installed, each coping must be aligned with its corresponding abutment and implant. The dentist does this by temporarily connecting each coping to its abutment and taking an impression that records the position of each coping. This ensures that the screws later used to permanently fasten the copings to the abutments will be correctly aligned.

This procedure and its components were well known in the prior art, which disclosed a variety of fasteners to temporarily connect copings to abutments while taking an impression. In particular, the prior art disclosed a variety of temporary coping-abutment fasteners that detach from the abutment with the coping when the dentist removes the impression from the jaw, so that the coping is "picked up" with the impression in the correct position and orientation. These prior art temporary fasteners that are pulled out of the abutment include snap-fit and friction-fit

connectors, split-post connectors with deflecting legs, and screws with flexible threads that are screwed in but can be pulled out without being unscrewed.

The claims of the ’781 patent are directed to a dental system that includes a specific design for a temporary coping-abutment fastener that can be pulled out of the abutment, just like the various prior art temporary fasteners. The claimed “temporary fastener” has a different thread pattern than the “definitive screw” (that will later permanently fasten the coping to the abutment) and is threaded into the abutment to temporarily connect the coping and the abutment, but is then pulled out of the abutment with the coping without being unscrewed.

The claims are obvious in view of the prior art temporary fasteners that can be pulled out of the abutment, in particular prior art temporary screws with flexible threads that can be pulled out without being unscrewed, and prior art that teaches that an asymmetric “buttress” thread with a smaller proximal thread angle is easier to pull out.

The claims are also unpatentable because they do not comply with the written description requirement or the enablement requirement. The ’781 patent issued from a continuation application filed on January 26, 2024, after Petitioner’s device was publicly displayed. Patent Owner apparently drafted the claims to try to cover Petitioner’s device, but the claims are not supported because they are much broader than the only embodiment in the specification, for several reasons.

For example, because Petitioner's device does not have a buttress thread like the only disclosed embodiment, Patent Owner drafted the claims to encompass any temporary fastener thread pattern that is different than the definitive screw and abutment threads, even though the specification explains that the buttress thread enables the temporary fastener to be pulled out without being unscrewed.

Moreover, because Petitioner's device does not have a split post structure with deflecting legs like the only disclosed embodiment, Patent Owner drafted the claims to encompass temporary fasteners that do not have a split post with deflecting legs, even though the specification explains that the deflecting legs enable the temporary fastener to be pulled out without being unscrewed.

As explained further below, several of the claims are not supported for other reasons, and several claims are also indefinite.

II. MANDATORY NOTICES

A. Real Parties-In-Interest

The real parties-in-interest are Petitioner Straumann USA, LLC and its affiliates Institut Straumann AG and JJGC Indústria e Comércio de Materiais Dentários S.A.

B. Related Matters

Smart Denture Conversions, LLC ("Patent Owner") sued Petitioner for alleged infringement of U.S. Patent No. 11,937, 992 ("'992 patent") on April 23,

2024. Ex. 1017. Patent Owner filed a supplemental complaint on February 4, 2025, adding allegations of infringement of the '781 patent, which issued from a continuation of the '992 patent. Ex. 1021. The litigation is captioned as *Smart Denture Conversions, LLC v. Straumann USA, LLC*, 1:24-cv-00507-JCB (D. Del.).

Petitioner filed a petition for inter partes review of claims 1–12 of the '992 patent on April 30, 2025 (Case No. IPR2025-00956).

C. Lead and Backup Counsel / Service Information

Petitioner designates the following lead and backup counsel:

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	Washington, DC 20006 (202) 292-1530 cgosselin@haugpartners.com

The backup counsel listed above are provisionally recognized PTAB attorneys, and Petitioner will file a notice of intent to designate these counsel as backup counsel pursuant to 37 C.F.R. § 42.10(c)(2). Filed with this Petition is a Power of Attorney executed by Petitioner appointing the above lead and backup counsel.[1] Petitioner consents to service via email at the above email addresses.

III. GROUNDS FOR STANDING

Petitioner certifies that: (1) the '781 patent is available for post grant review because its earliest claimed effective filing date is October 9, 2018, and the patent issued less than nine months ago, on December 3, 2024; and (2) Petitioner is not barred or estopped from requesting a post grant review on the grounds in this petition.

IV. IDENTIFICATION OF CHALLENGE

Petitioner requests that the Board institute a post grant review of claims 1–16, find the claims unpatentable, and cancel the claims, based on these grounds:

[1] Petitioner has paid the petition filing fees and authorizes Account No. DA500320 (Customer No. 20999) to be charged for any additional fees.

Ground	Claim(s)	Prior Art	Statutory Basis
1	6, 10–16	–	§ 112(b)
2	1–16	–	§ 112(a)
3	10, 12, 15, 16	Obvious based on Bernhard in view of Poovey and Gracco	§ 103
4	1–9, 11, 13, 14	Obvious based on Bernhard in view of Poovey, Gracco and Derey	§ 103

V. BACKGROUND AND PRIOR ART

A. Open-Tray and Closed-Tray Impression Techniques

Implant dentistry includes replacing teeth with prosthetic teeth secured to implants fixed in the jawbone. The prosthetic teeth are often secured to the implants by connecting "copings" bonded in the prosthesis to "abutments" secured to the implants. Brunski Declaration (Ex. 1002), ¶44. For example, Bernhard (Pub. No. US 2017/0202649 A1) (Ex. 1003) depicts prosthesis 140, coping 130, abutment 120, implant 110 and jawbone 10, with screw 138 that connects coping 130 to abutment 120 and screw 16 that connects abutment 120 to implant 110. *Id.*, [0065], [0082], Fig. 1; Ex. 1002, ¶48.

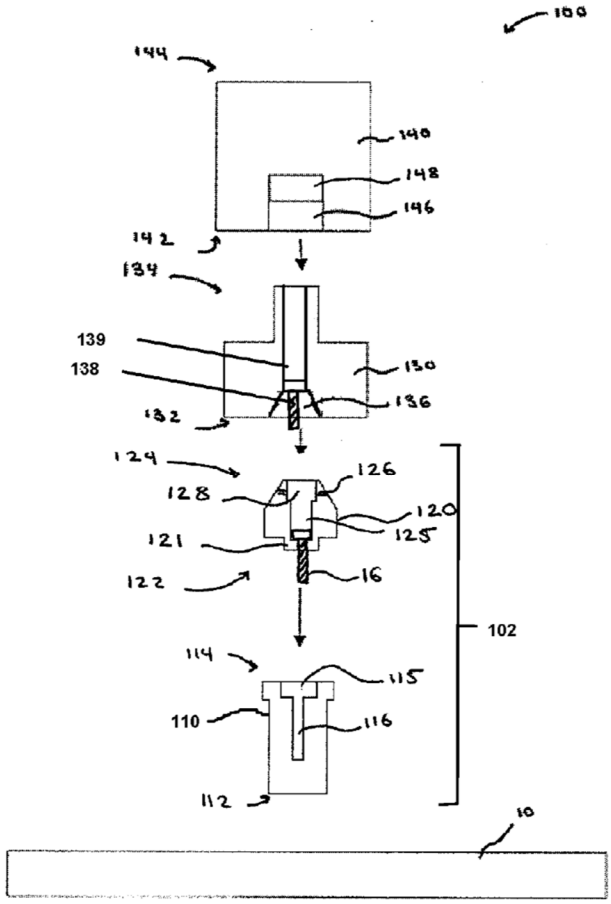


Figure 1

After the implants are fixed in the jaw, but before the copings in the prosthesis are permanently connected to the abutments, the copings must be fitted into the prosthesis and aligned with the abutments. This typically involves taking an impression, using either (1) the patient's denture if it will be converted into the prosthesis or (2) an impression tray if a new prosthesis will be made. In either case, there are two well-known prior art techniques for taking the impression: "open tray" and "closed tray." In both techniques, each coping is temporarily

connected to its abutment so that the coping can be aligned with the abutment to which it will be connected. Ex. 1002, ¶¶50–51.

In an open-tray technique, there is a through-hole in the impression (i.e. the impression tray or the denture) to access each coping. After the dentist connects each coping to its abutment with a screw, the impression is taken. The dentist then inserts a tool in each hole in the impression to unscrew each coping from its abutment. The dentist removes ("picks up") the impression from the jaw, with the bonded copings in place in the correct position and orientation. The open-tray technique is more time intensive for the patient, because the dentist has to unscrew each coping before removing the impression, but it is accurate and produces good quality impressions because the copings are picked up in the correct position. *Id.*, ¶52.

An open-tray technique using an impression tray is shown in Kumar (U.S. Patent No. 6,283,752) (Ex. 1004). Screws 216 inserted through openings 204 in impression tray 202 connect copings 210 to the abutments. *Id.*, 8:30–42, Fig. 2A. After impression material 104 sets, the dentist loosens screws 216 and removes impression tray 202 with copings 210. *Id.*, 8:43–48, Fig. 2B; Ex. 1002, ¶53.

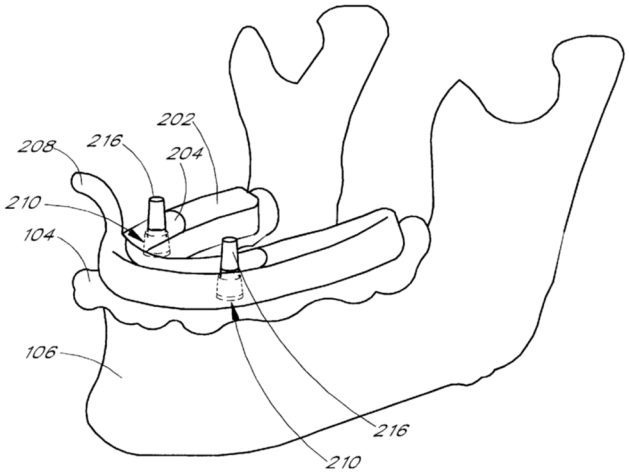


FIG. 2A
(PRIOR ART)

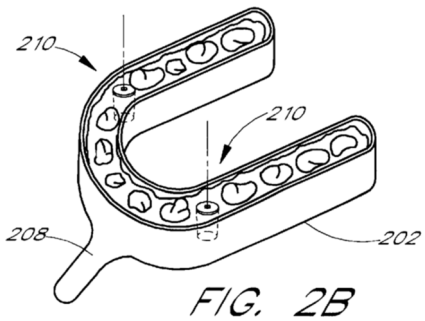


FIG. 2B
(PRIOR ART)

In a closed-tray technique, there are no through-holes in the impression, so the dentist does not unscrew the copings from the abutments before removing the impression. Instead, when the impression is removed, the copings remain connected to the abutments, and the dentist then unscrews the copings and manually inserts them back into the impression. The closed-tray technique does not require pre-drilled through-holes for the temporary connection, but it does require the dentist to recreate the proper position and orientation of each coping in the impression after the fact, which can result in less accurate placement. Ex. 1002, ¶54.

Kumar shows a closed-tray technique using impression tray 102 with copings 110 connected to the abutments. Ex. 1004, 8:6–16, Fig. 1A. After impression material 104 sets, the dentist removes impression tray 102 with indentations 112 created by copings 110. *Id.*, 8:17–23, Fig. 1B. The dentist

removes copings 110 from the abutments and inserts copings 110 into indentations 112 in impression material 104. *Id.*, 8:23–29, Fig. 1B; Ex. 1002, ¶55.

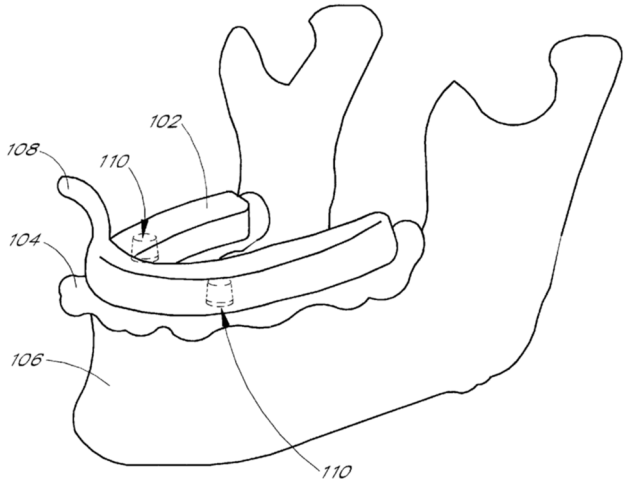


FIG. 1A
(PRIOR ART)

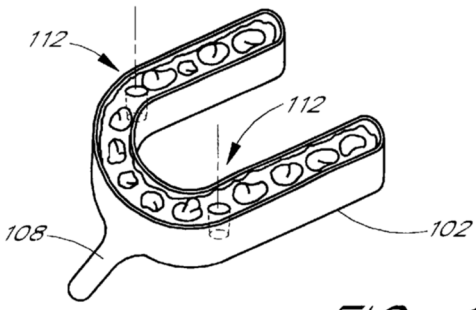


FIG. 1B
(PRIOR ART)

B. Bernhard

Bernhard (Pub. No. US 2017/0202649 A1) (Ex. 1003) is prior art under Section 102(a)(1) as of the earliest claimed effective filing date of October 9, 2018 because it published on July 20, 2017.

Bernhard discloses various designs for fasteners that temporarily connect a coping to an abutment during a pick-up process. Bernhard's temporary fasteners detach the coping from the abutment when the prosthesis is removed from the jaw. As a result, the copings remain in the prosthesis without needing to be unscrewed from the abutments using large through-holes. Thus, Bernhard's temporary

fasteners combine the best aspects of the open-tray and closed-tray techniques. Ex. 1002, ¶¶57, 68.

In Figure 1 of Bernhard shown below, abutment 120 includes provisional connection feature 126, such as a slot, that engages a corresponding feature on coping 130, such as a protrusion. "[T]he provisional connection feature 126 … allow[s] for a 'snap-fit' and or a friction fit connection between the abutment 120 and … the coping 130 thereby advantageously allowing the abutment 120 and … coping 130 … to be easily removed via application of a separation force." Ex. 1003, [0075], Fig. 1; Ex. 1002, ¶58.

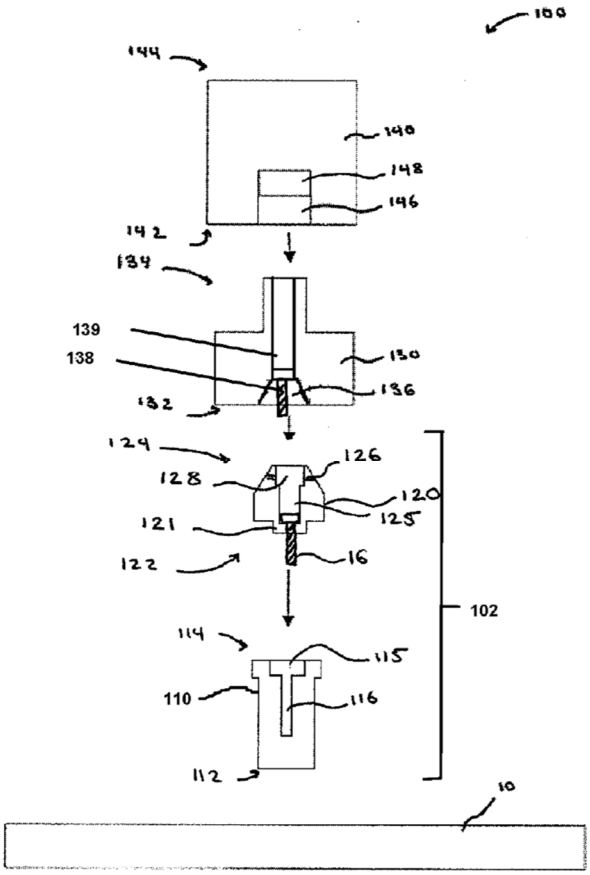


Figure 1

Bernhard discloses a variety of "provisional connection features" that use one or more slots, grooves, recesses, holes, protrusions, ribs, dimples, bosses, pins, dowels, springs, clips, washers, fingers or a "bayonet mounting structure," which temporarily snap-fit or friction-fit together to temporarily connect the coping to the abutment. Ex. 1003, [0066]–[0067], [0075], [0079]–[0081], [0109], [0124], [0126], [0127], [0130], [0135]–[0138], [0140]–[0144], [0146], Figs. 1, 8, 13, 15, 17, 19, 21; Ex. 1002, ¶59. Bernhard also discloses that "the provisional connection feature 126 can be located either entirely or partially along an interior surface of a bore, such as bore 125, of abutment 120." Ex. 1003, [0076], Fig. 1; Ex. 1002, ¶60.

Figures 8–12 of Bernhard depict an embodiment of a prosthesis with a coping connected to an abutment: initially temporarily using a snap-fit connector during the pick-up process, and then permanently using a threaded screw. Ex. 1003, Figs. 8–12; Ex. 1002, ¶¶62–66.

In Figure 8 below, coping 700 in prosthesis 510 is temporarily connected to abutment 650 by resilient spring element 708 that engages annular slot 652 to create a snap-fit connection. Ex. 1003, [0109], [0124], [0126], [0130], Fig. 8.

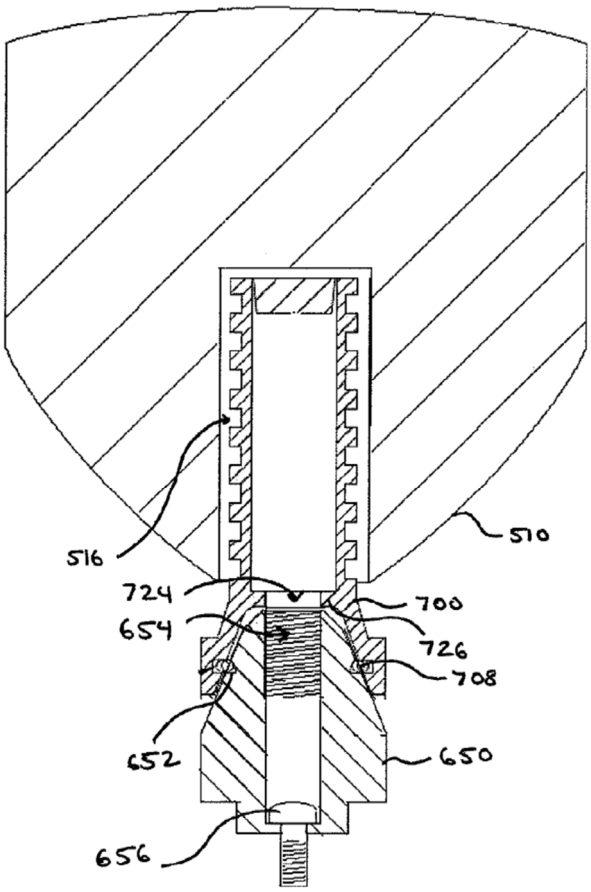


Figure 8

When the dentist removes prosthesis 510 from the jaw, the bonded coping 700 remains in prosthesis 510 because the pulling force causes the snap-fit connection to separate. *Id.*, [0066]. As shown in Figures 10 and 11 below, drill bit 850 is used to drill bore 519 through prosthesis 510 and coping 700 so that a threaded screw can be inserted to permanently connect prosthesis 510 and coping 700 to abutment 650. *Id.*, [0104], [0105], [0131], [0133], Figs. 3, 10–12; Ex. 1002, ¶65.

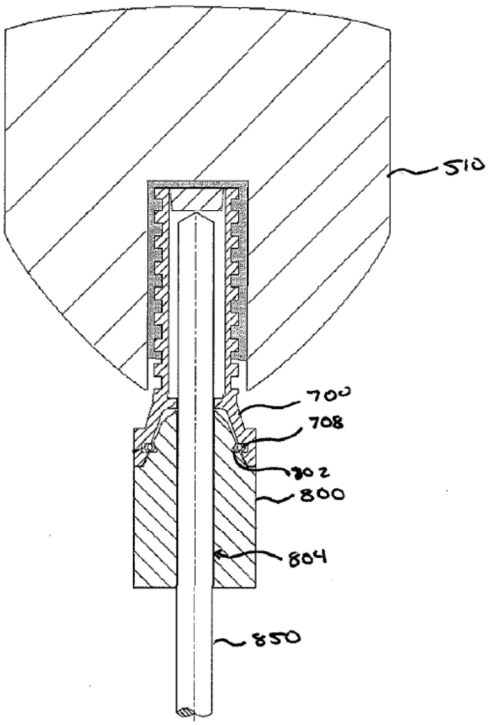


Figure 10

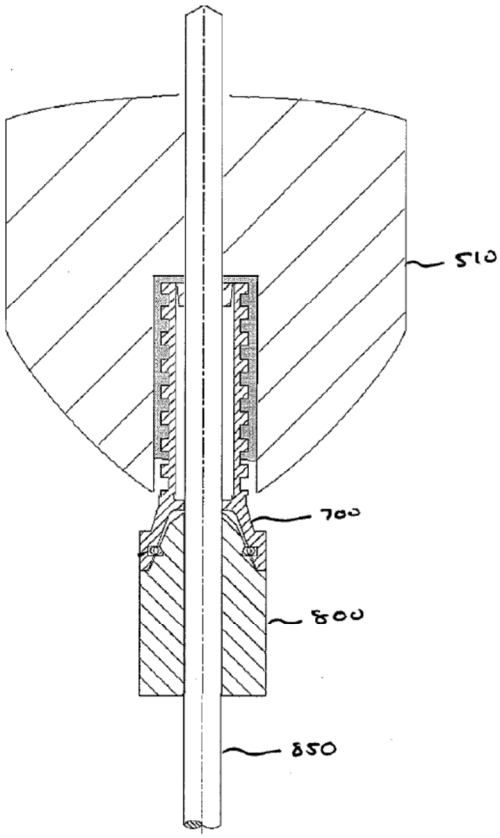


Figure 11

Figure 12 below depicts prosthesis 510 and coping 700 permanently connected to abutment 650 by threaded fastener 750 with threaded shaft 754 inserted through bore 519 and threaded into threaded bore 654 of abutment 650. Ex. 1003, [0105], [0134], Figs. 3, 8, 12; Ex. 1002, ¶66.

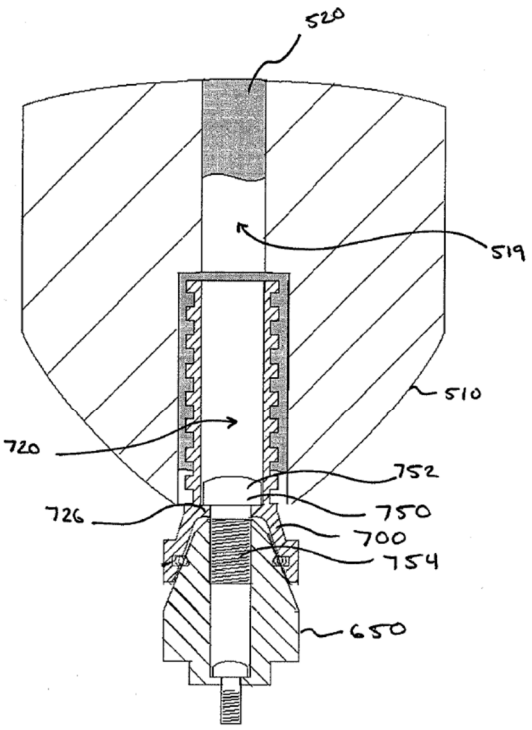


Figure 12

Bernhard also explains that a threaded screw can be used to connect the coping to the abutment in order "to reduce the likelihood of inadvertent detachment." Ex. 1003, [0082], Fig. 1. "[T]he coping 130 and the abutment 120 can be attached using a separate fastener such as prosthetic screw 138" which "can pass through a bore 139 of the coping 130 and positively engage a connection feature of the abutment 120, such as threaded bore 128, … thereby securely attaching the coping 130 to the abutment 120." Ex. 1003, [0082]; Ex. 1002, ¶67.

C. Poovey

Poovey (Pub. No. US 2016/0045290 A1) (Ex. 1005) is prior art under Section 102(a)(1) as of October 9, 2018 because it published on February 18, 2016.

Poovey discloses a threaded screw that temporarily connects a coping to an implant during a denture conversion or impression procedure. *Id.*, [0021]–[0024], [0078]–[0084]. Poovey's "impression coping securing screw" has "flexible" threads made of a "pliable material" that permit the screw to be threaded into the implant to hold the coping in place but then "pulled out without much force" (and without having to be unscrewed) when the impression is removed. *Id.*, [0084]. Poovey adds that "[t]he threading and/or sleeve coating of the impression coping securing screw is preferably a plastic or silicone material with enough flexibility to be pulled out of the implant with low resistance." *Id.* Poovey explains that the flexible screw threads allow for an easier closed-tray technique with the accuracy of an open-trayed technique. *Id.* Figure 13 below depicts impression coping securing screw 1300 with threads 1310 "composed of a heat labile plastic, or silicone," or "made of metal or other suitable hard material, and coated with heat labile plastic, or silicone." *Id.*, [0079], [0084], Fig. 13; Ex. 1002, ¶¶71–72.

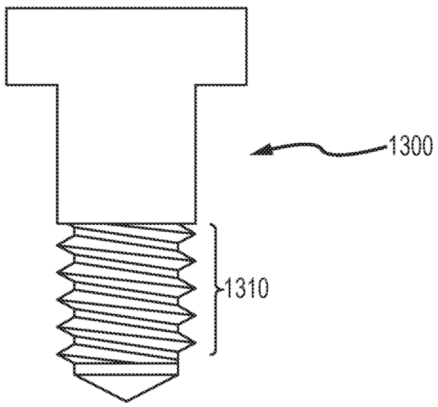


FIG.13

D. Gracco

Gracco (A. Gracco, "Effects of Thread Shape on the Pullout Strength of Miniscrews," 142 *Amer. J. Orthodontics & Dentofacial Orthopedics*, 186–90 (2012)) (Ex. 1006) is prior art under Section 102(a)(1) as of October 9, 2018 because it published and was publicly accessible by July 30, 2012. Allen Declaration (Ex. 1007), ¶¶6–11.

Gracco describes an experiment that measured the force required to pull orthodontic miniscrews with different thread designs out of a synthetic bone support, including an asymmetric buttress thread (B in Figure 1 below), a reverse buttress thread (A in Figure 1), and a symmetric trapezoidal thread (E in Figure 1). Ex. 1006 at 186–87, Fig. 1; Ex. 1002, ¶¶74–80.

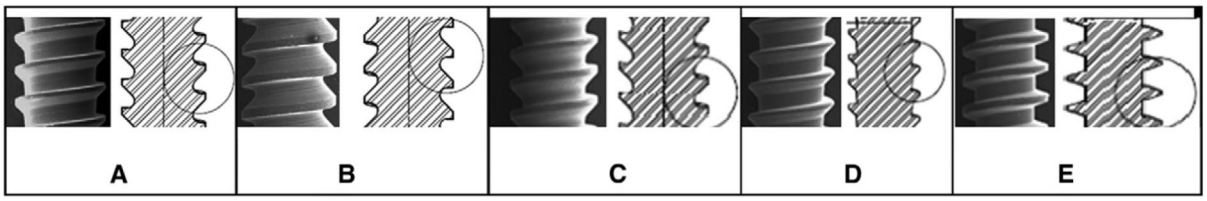


Fig 1. Schematic illustrations of miniscrew thread-designs: **A,** buttress reverse thread shape (control); **B,** buttress thread; **C,** 75° joint profile thread; **D,** rounded thread; **E,** trapezoidal thread.

Gracco states that the buttress thread (B in Figure 1) "with thread peaks inclined toward the miniscrew tip" exhibited a "significant reduction in pullout force" compared to the reverse buttress thread (A in Figure 1), and that "[t]his result could be explained by the geometry of the [buttress] thread that was inclined toward the

tip, thus reducing the resistance to removal in an axial direction." Ex. 1006 at 187, 189, Fig. 1(A, B); Ex. 1002, ¶¶74–77.

E. Derey

Derey (WO 2013/030839 A1) (Ex. 1008) is prior art under Section 102(a)(1) as of October 9, 2018 because it published on March 7, 2013.

Derey discloses another design for a temporary connector used when taking an impression. The device has a split-post structure with deflecting legs that are inserted into and grip the threaded bore of the implant to hold the impression in place, but that release their grip and detach when the impression is removed. Ex. 1002, ¶83.

Figure 5 below depicts flexible holding device 100 with head 11, body 12, and two extended legs 13. Ex. 1008 at 8, Fig. 5. As shown in Figure 6 below, device 100 is inserted legs first through the opening in construction 51 into implant 41. *Id.* at 10, Fig. 6.[2] "The head of device 100 secures the construction 51, and the legs, of device 100, grip the internal thread 42 of implant 41 from within … due to the legs 13 elastic repelling force which repels the legs form [sic – from] one another." *Id.* at 9–10. "[I]f an upper pulling force is applied to the construction 51,

[2] The "construction" can be "any dental device which can be attached to the implant" including "an abutment." *Id.* at 6.

the legs of device 100 will surrender their grip and the construction 51 can be easily detached from the implant 41," so that construction 51 "is removed with the impression." *Id.* at 10; Ex. 1002, ¶¶84–86.

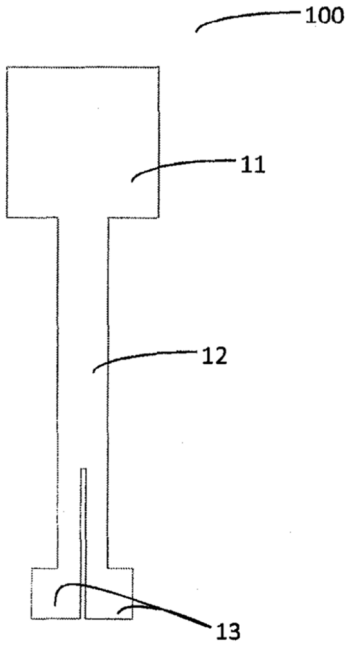


Fig. 5

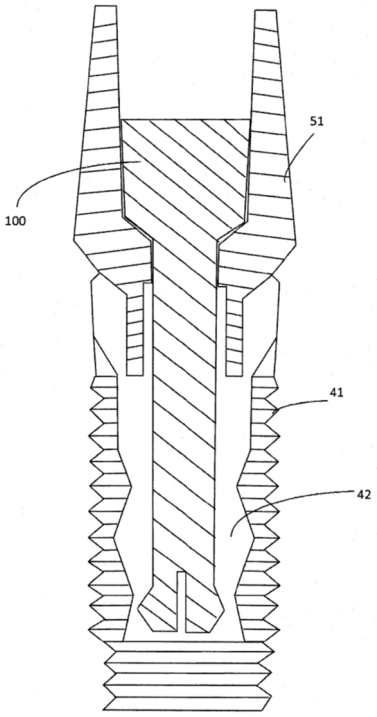


Fig. 6

VI. '781 PATENT

A. Priority Applications of the '781 Patent

After Bernhard, Poovey, Gracco and Derey published, the inventors of the '781 patent, Kofford and Rudisill, filed their original provisional application on October 9, 2018 (Application No. 62/742,942 ("'942 Application")) (Ex. 1009).

They subsequently filed two more provisional applications[3] and four utility applications: Application No. 16/596,361 ("'361 Application") (Ex. 1012); Application No. 17/691,108 ("'108 Application") (Ex. 1018); Application No. 18/328,730 ("'730 Application") (Ex. 1015); Application No. 18/424,696 ("'696 Application") (Ex. 1020).

Kofford and Rudisill's first patent, U.S. Patent No. 11,311,354 (Ex. 1013) ("Kofford"), issued from the first utility application (the '361 Application) on April 26, 2022.

The '361 Application that issued as Kofford acknowledges that prior art "snap-on" systems permit use of a closed-tray impression technique, but criticizes them as complicated, expensive, causing patient discomfort, and reducing stability because they require larger holes. Ex. 1013, 2:20–42. Kofford also criticizes prior art screw connectors, asserting that they require an open-tray technique with larger holes. *Id.*, 2:56–3:15. Kofford also criticizes, without mentioning Poovey, "alignment systems … which use silicone or melting screw threads to allow closed tray transfer" as impractical and causing patient discomfort due to "the lack of disengagement independence required in melting all threads simultaneously." *Id.*,

[3] Application No. 62/774,402 ("'402 Application") (Ex. 1010); Application No. 62/818,082 ("'082 Application") (Ex. 1011).

4:10–19. Kofford also criticizes, without mentioning Bernhard, "hybrid systems that use a snap-on engagement for the pick-up coping during transfer and subsequent screw-attachment" as more complex and less precise than an open-tray technique. *Id.*, 4:19–25; Ex. 1002, ¶94.

The '361 Application that issued as Kofford is directed to threaded fasteners that temporarily connect a coping to an abutment while taking an impression or converting a denture. In some embodiments, the temporary fastener has a cap and a threaded post that are separable, so that when the prosthesis is removed, the bonded coping pulls and detaches the cap from the post, which remains threaded in the abutment. Figure 5 below shows a temporary fastener with cap 11 and post 10, which is threaded into abutment 8 to connect coping 9 to abutment 8 before the prosthesis is removed. Figure 6 below shows that after the prosthesis is removed, coping 9 and cap 11 of the temporary fastener are detached from post 10, which remains threaded in abutment 8. Ex. 1013, 8:33–37, 14:17–39, Figs. 5, 6[4]; Ex. 1002, ¶95.

[4] The claims of the Kofford patent also require the cap to separate from the post. *Id.*, 24:53–25:5.

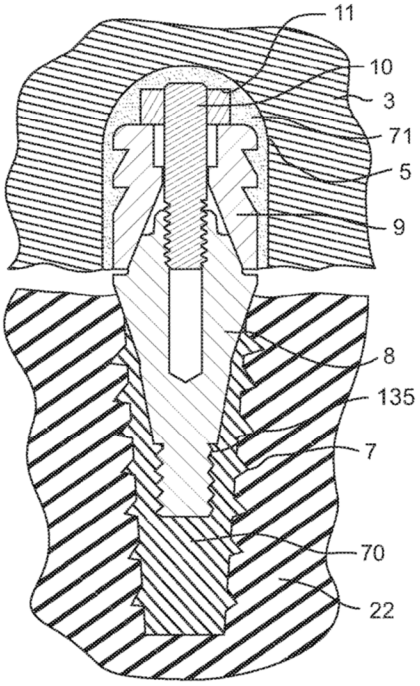


FIG. 5

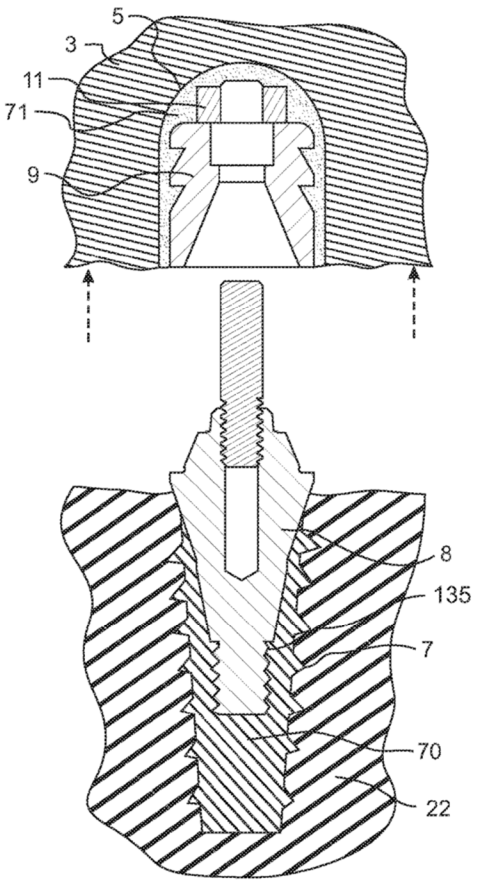


FIG. 6

Kofford also describes a different temporary fastener embodiment, which was first depicted in Figure 43 of the original provisional application ('942 Application), shown below.

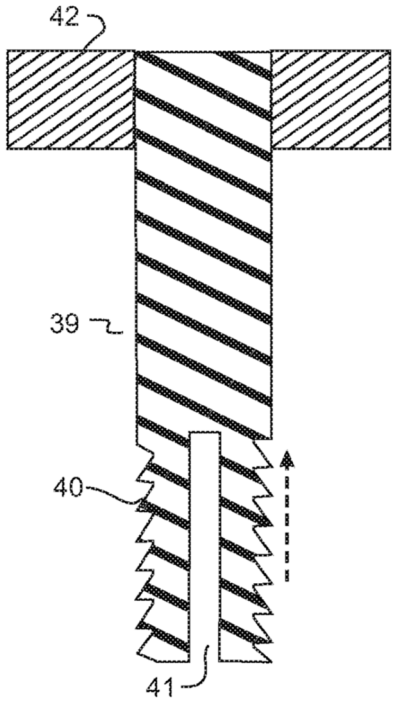


FIG. 43

In this temporary fastener embodiment, when the prosthesis is removed from the jaw, flange 42 does not separate from post 39, and post 39 does not remain threaded in the abutment. Instead, the coping pulls the entire temporary fastener (flange 42 and post 39) out of the abutment. Ex. 1009 at 21, Fig. 43. The '942 Application explains that post 39 has "a slot 41 and asymmetric threads or serrations 40 that allow the screw to be extracted in the axial direction." *Id.* The "asymmetric" thread pattern 40 depicted in Figure 43 (below left) is a buttress thread, like thread B in Figure 1 of Gracco (below right). *Id.*, Fig. 43; Ex. 1006, Fig. 1(B); Ex. 1002, ¶97.

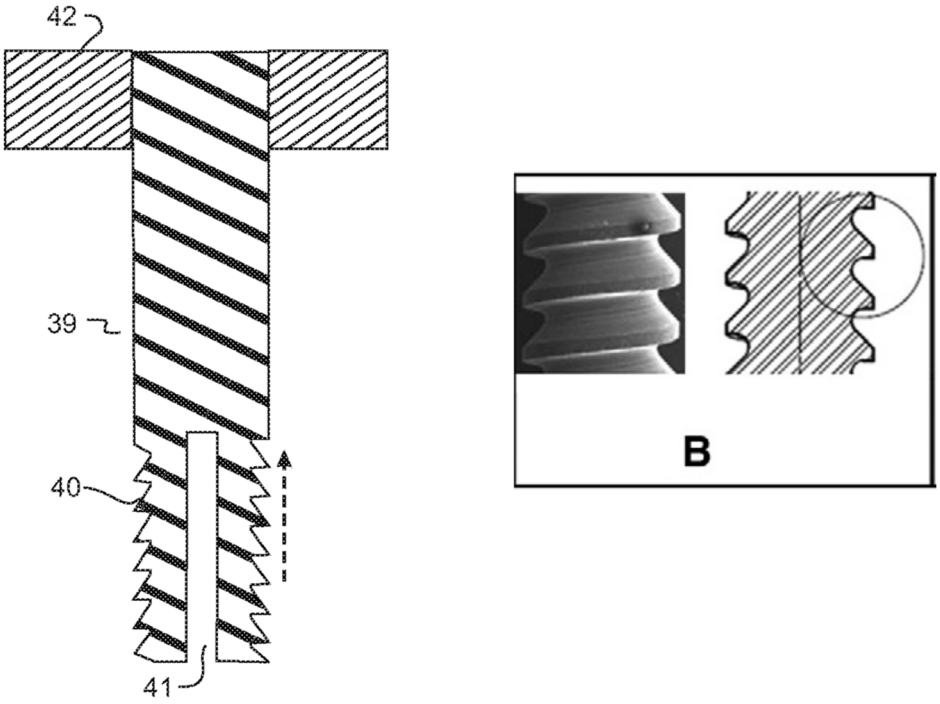


FIG. 43

In the first utility application (the ’361 Application), which issued as Kofford, Figure 43 was renumbered Figure 75 and the specification was expanded to explain that the buttress thread and the deflecting legs of the split post created by the slot enable the temporary fastener to be pulled out of the abutment without being unscrewed:

> [T]he threaded end of the post portion of the temporary fastener has a deflecting feature that allows the post to engage or disengage the abutment threads through axial motion instead of a rotary screw motion. …
>
> FIG. 75 is a cross-sectional view of a temporary screw embodiment incorporating a split post that has deflecting sections with screw

threads shaped to facilitate axial separation without unscrewing the post threads. …

The inventive concepts disclosed are not meant to be restricted to a temporary attachment post with standard screw threads that both engage and disengage the threads in the implant abutment through rotations. For example, alternate separable temporary attachment posts embodiments are possible providing features that allow the post to removably hold the coping to the abutment by other means than a separable cap. For example, as shown in FIG. 75 an alignment fastener 39 may contain a separable threaded or serrated portion 40 that engages the screw threads in the abutment for pick-up, but that will release with axial force after. FIG. 75 shows a temporary attachment post 39 having a slot 41 and asymmetric threads or serrations 40 that allow the temporary attachment post to be inserted through rotation for alignment for coping pick-up but may be subsequently extracted with a separation force in the axial direction. …

[T]he split post bottom structure shown in FIG. 75 which allows axial extraction …

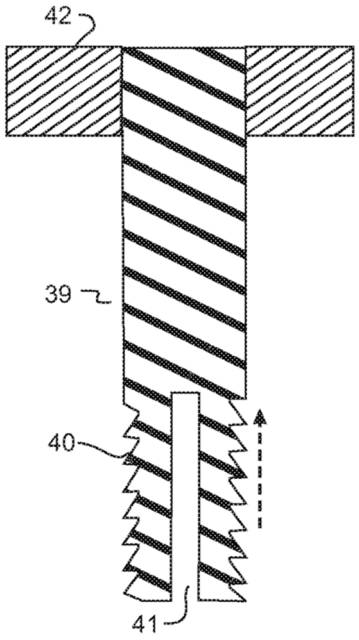


FIG. 75

Ex. 1012 at 67, 78, 97, 100, Fig. 75; Ex. 1013, 5:24–28, 11:21–24, 22:25–41, 23:67–24:1, Fig. 75; Ex. 1002, ¶¶98–99.

The ’696 Application that issued as the ’781 patent is a continuation of the ’730 Application, the ’108 Application and the ’361 Application, and claims priority to the three provisional applications (’942 Application, ’402 Application, and ’082 Application) discussed above (collectively, the “Priority Applications”).

Each Priority Application (except the ’082 Application), as well as the ’696 Application that issued as the ’781 patent, includes either Figure 43 or 75 with the accompanying description that the temporary fastener can be pulled out of the abutment without being unscrewed because of the buttress threads and the deflecting sections created by the slot. Ex. 1009 at 21, Fig. 43; Ex. 1010 at 16, 20,

Fig. 43; Ex. 1012 at 67, 78, 97, 100, Fig. 75; Ex. 1015 at 28, 40, 61, 64, 287, Fig. 75; Ex. 1018 at 50, 61, 80–81, 83, Fig. 75; Ex. 1020 at 60, 72, 94, 97, Fig. 75.

B. Prosecution of the ’781 Patent

As explained above, the ’781 patent issued from the ’696 Application, which is a continuation of the ’730 Application, the ’361 Application and the ’108 Application.

Patent Owner filed the ’696 Application on January 26, 2024, after Petitioner’s NeoConvert product was publicly displayed. Ex. 1020 at 1.

In response to a restriction requirement, Patent Owner elected the species Q of Figure 75. *Id.* at 1007.

Patent Owner apparently drafted the claims to try to cover Petitioner’s NeoConvert product. After the ’781 patent issued on December 3, 2024, Patent Owner supplemented its infringement complaint against Petitioner on February 4, 2025, adding allegations that the NeoConvert product infringes the ’781 patent. Ex. 1021.

C. Specification of the ’781 Patent

The specification of the ’781 patent includes Figure 75, but with new, additional reference numerals 183, 184, 190 and 210 added during prosecution of the parent ’992 patent. Ex. 1015 at 282, 293; Ex. 1001, Fig. 75.

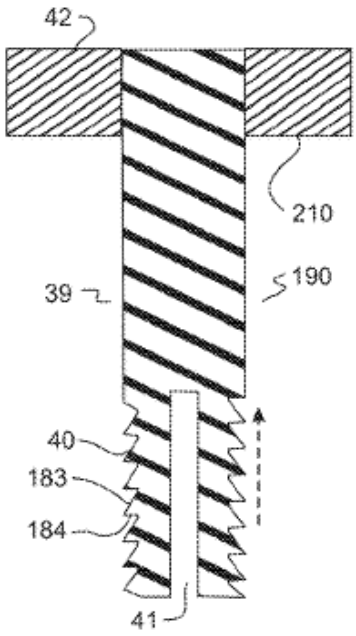


FIG. 75

The specification of the ’781 patent also includes the description of the Figure 75 embodiment from the ’361 Application discussed and quoted above. Ex. 1001, 5:31–35, 11:31–34, 23:10–41, 24:58–59, Fig. 75. However, the paragraph in column 23 of the specification of the ’781 patent includes amendments made by Patent Owner during prosecution of the parent ’992 patent that obscure the role of the deflecting legs created by slot 41 in permitting the temporary fastener to be pulled out without being unscrewed:

> FIG. 75 shows a temporary **fastener 190 with a head 42 portion and an** attachment **post portion** 39. **The attachment post portion 39 is shown as** having a slot 41 and asymmetric threads or serrations 40 **that have proximal flank 183 and a distal flank 184. This asymmetric threading ~~that allow~~ still allows** the temporary attachment post **portion 39** to be inserted through rotation **like other**

> **temporary screw embodiments** for alignment for coping pick-up**.**
> **The post 39** ~~**but**~~ may be subsequently extracted with a separation force in the axial direction.

Ex. 1015 at 287 (additions bold underline; deletions struck through); Ex. 1001, 23:21–30.

D. Claims of the '781 Patent

Even though Patent Owner elected the species Q of Figure 75, claims 1–16 are much broader than Figure 75 and the associated description, in several respects. Ex. 1020 at 1007; Ex. 1002, ¶¶123–125.

For example, the independent claims 1, 6, 8 and 10 are not limited to temporary fasteners with buttress threads, as described and as depicted in Figure 75. Instead, these claims encompass any thread pattern that is different than the definitive screw and implant abutment threads. Claim 1 requires the temporary fastener to have a "threading contact area" with the implant abutment that is "less than" the "threading contact area" of the definitive screw with the abutment. Ex. 1001, 26:14–24. Claim 8 requires the definitive screw to have a "volume" of "post material" that is "greater than" a "volume" of "shaft material" of the temporary fastener. *Id.*, 27:51–60. Claim 10 requires the temporary fastener to have a "shaft threading contour" that "does not essentially match" the "implant abutment threads contour." *Id.*, 28:16–20. Finally, claim 6 does not include any limitation that requires the thread pattern of the temporary fastener to be different or not different

than the definitive screw and implant abutment thread pattern, and therefore the claim encompasses all different thread patterns. *Id.*, 26:50–27:10.

Moreover, independent claims 1, 6, 8 and 10 do not require the temporary fastener to have a slot that creates a split-post structure with deflecting legs that enable the temporary fastener to be pulled out without being unscrewed, as described and as depicted in Figure 75. Instead, these claims merely require that an axial force releases the temporary fastener from the abutment and, for claims 1, 6 and 8 but not claim 10, that the temporary fastener threads do not continuously engage the abutment threads. Claim 1 recites that the temporary fastener "is configured to release at least a portion of the temporary fastener and the coping from the implant abutment as a unit when an axial release force is applied in a proximal direction" and that the "distal shaft portion" of the temporary fastener "does not engage the implant abutment threads continuously." *Id.*, 26:4–13. Claims 6 and 8 have similar limitations. *Id.*, 26:66–27:10, 27:41–50. Claim 10 does not require non-continuous temporary fastener threads like claims 1, 6 and 8, but claim 10 does recite that the temporary fastener "is configured so that in response to application of an axial release force above a predetermined value in a proximal direction, the coping and the temporary fastener are released as a unit from the implant abutment." *Id.*, 28:32–36.

VII. LEVEL OF ORDINARY SKILL

The field of the '781 patent is the design of dental implants and prostheses. Ex. 1002, ¶¶43–49. A person of ordinary skill in the art (POSA), as of the earliest claimed effective filing date of October 9, 2018, would have at least a bachelor's degree in mechanical engineering, biomedical engineering, materials science engineering, or an equivalent degree, plus at least five years of experience working with (researching, developing and/or designing) dental implants and prostheses, including familiarity and experience with fasteners (threaded and otherwise) used to connect prostheses, implants and related components. A POSA could also have less formal education but commensurately more practical experience, or vice versa. *Id.*, ¶¶126–129.

VIII. CLAIM CONSTRUCTION

None of the claim terms of claims 1–16 need to be construed to determine the patentability issues presented in this petition. The petition applies the ordinary meaning of the claim language as it would be understood by a POSA after reading the '781 patent. Ex. 1002, ¶130. Petitioner will propose a construction if Patent Owner argues or the Board determines that one is required for any term.

IX. GROUNDS OF UNPATENTABILITY

A. Ground 1: Claims 6 and 10–16 Are Indefinite

Claims 6 and 10–16 are unpatentable under Section 112(b) because they are indefinite.

1. Claim 6 Recites Only Functional Limitations at the Alleged Point of Novelty

Claim 6 is indefinite because it impermissibly recites only functional limitations at the alleged point of novelty. Ex. 1002, ¶¶132–137.

As explained above, the '781 patent specification explains that the temporary fastener of Figure 75 can be pulled out of the abutment without being unscrewed because of asymmetric buttress threads 40 and the deflecting legs created by slot 41. Ex. 1001, 5:31–35, 11:31–34, 23:17–30, 24:58–59, Fig. 75.

In contrast, claim 6 does not include any structural limitations for the temporary fastener that relate to its ability to be pulled out of the abutment without being unscrewed. Ex. 1002, ¶134. In particular, the claim does not require the temporary fastener threads to be asymmetric (and therefore different than the symmetric definitive screw and implant abutment threads). Nor does the claim require the temporary fastener to have a slot that creates a split-post structure with deflecting legs. *Id*.

Instead, when it comes to the allegedly novel feature of enabling the temporary fastener to be pulled out without being unscrewed, claim 6 includes only a purely functional "wherein" limitation that merely recites that the temporary fastener is "configured to" perform the recited function:

> wherein the temporary fastener is configured to release at least a portion of the temporary fastener and the coping from the implant

> abutment as a unit in response to an axial release force that is applied only in a proximal direction to the temporary fastener whereby the axial release force is applied without rotation of the temporary fastener …

Ex. 1001, 26:66–27:5. Claim 6 says nothing about how this release function is accomplished, including what structural features of the temporary fastener enable it to be pulled out without being unscrewed. Instead, claim 6 uses purely functional language, and thereby purports to encompass any and all threaded temporary fastener means for achieving this function. Ex. 1002, ¶136.

This purely functional claiming at the alleged point of novelty renders claim 6 indefinite. *See General Elec. Co. v. Wabash Appliance Corp.*, 304 U.S. 364, 370–71 (1938). In *General Electric*, the Supreme Court held that a claim directed to an improved tungsten filament for incandescent lamps that overcame problems of "sagging" and "offsetting" was not sufficiently definite because it "use[d] conveniently functional language at the exact point of novelty." *Id.* at 371. In particular, the claim merely recited that the filament was "made up mainly of a number of comparatively large grains of such size and contour as to prevent substantial sagging and offsetting," which the Court explained merely "described the function of the grains to the exclusion of any structural definition." *Id.* at 370. *See also Halliburton Oil Well Cementing Co. v. Walker*, 329 U.S. 1, 8–9 (1946) (finding indefinite claims that did not recite "the physical structure of the

acoustical resonator" but instead merely described device "in terms of what it will do, rather than in terms of its own physical characteristics or its arrangement in the new combination apparatus").[5]

Similarly, in *Ex Parte Jelinek*, No. 2023-003116, 2025 WL 626335 (P.T.A.B. Feb. 25, 2025), the Board rejected as indefinite claims directed to a firearm cartridge chamber because the claims "[did] not identify what specific structural features or properties … would be required to achieve the recited function." *Id.* at *3. In particular, the claims included functional limitations that recited that the inner surface of the cartridge chamber "includes at least one shaped recess configured to carry out marking of the cartridge case" and that the shaped recess "is configured to mark the cartridge case with residues of pressurized gases from a firing of a spent cartridge." *Id.* at *2. However, the claims did not recite any "specific structure" that "would be necessary to meet" the claims, and therefore were indefinite. *Id.* at *3. *See also* M.P.E.P. § 2173.05(g).

[5] In response to the *Halliburton* decision, Congress enacted what is now Section 112(f), which permits functional claiming using limitations that recite a "means for" performing a recited function, but which limits the claim scope to the corresponding structure disclosed in the specification and equivalents. *See Warner-Jenkinson Co. v. Hilton Davis Chem. Co.*, 520 U.S. 17, 27–28 (1997).

Like the claims in *General Electric* and *Jelinek*, claim 6 is indefinite because it recites only functional limitations at the alleged point of novelty. Therefore, claim 6 is unpatentable under Section 112(b). Ex. 1002, ¶¶135–137.

2. The "Does Not Essentially Match" Limitation of Claims 10–16 Is Indefinite

Claims 10–16 are unpatentable under Section 112(b) because the "does not essentially match" limitation is indefinite. Ex. 1002, ¶¶138–151. As explained below, this limitation, when read in light of the specification and the prosecution history, "fail[s] to inform, with reasonable certainty, those skilled in the art about the scope of the invention." *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898, 901 (2014).

Claim 10 recites that the "shaft threading contour" of the "shaft threading" of the "distal portion" of the "temporary fastener" "does not essentially match the implant abutment threads contour." Ex. 1001, 28:16–19. Claims 11–16 depend from claim 10 but add limitations that do not modify the above limitation.

The '781 patent specification states (in a paragraph that defines a long list of common words) that "the term[] 'essentially' mean[s] ± 10 percent." Ex. 1001, 7:61–62. However, the specification does not set forth any standard or guidance that explains how to apply this definition to determine whether or not the thread "contours" of the temporary fastener and the abutment "essentially match." Ex. 1002, ¶143.

In particular, the specification does not explain which feature or features of the two thread contours may vary by up to 10 percent but still "essentially match": The proximal thread angle? The distal thread angle? The thread depth? The thread contact area of the temporary fastener threads with the abutment threads? The thread volume of the temporary fastener threads in the abutment threads? Some other feature? The specification does not say. *Id.*, ¶¶143–144.

The specification also does not explain whether or not the thread contour of asymmetric threads 40 of the temporary fastener of Figure 75 "essentially match[es]" the thread contour of symmetric threads 18 of implant abutment 8 of Figure 9. *Id.*, ¶145.

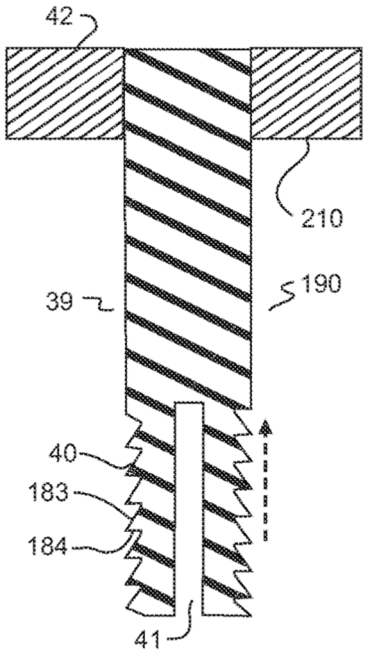


FIG. 75

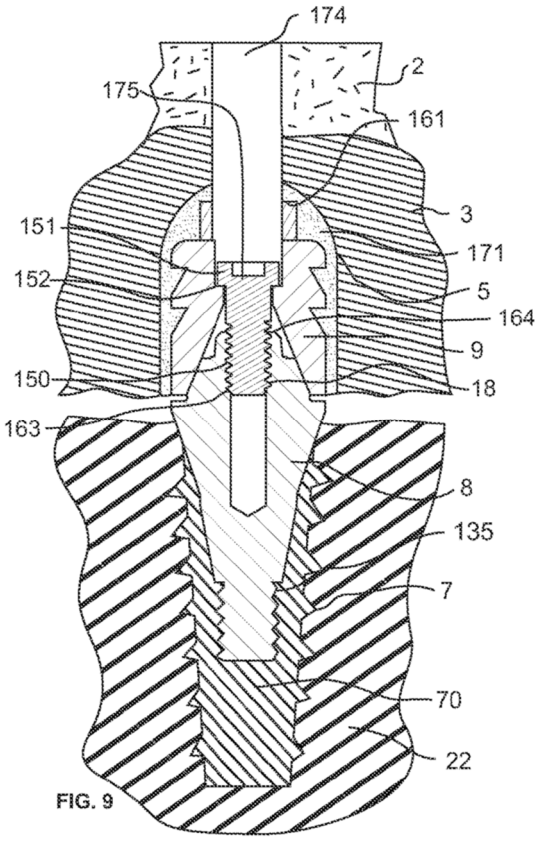


FIG. 9

Although Figures 9 and 75 depict that the thread contour of asymmetric threads 40 does not "match" the contour of symmetric threads 18, it is not clear to a POSA from these figures—or anything else in the specification—whether or not they "essentially match." *Id.*, ¶146. Indeed, during prosecution of the '992 patent, the examiner objected to the drawings and the specification because they did not disclose the limitation "[t]he male threading profile which does not essentially match the male threading profile of the definitive screw shaft" in pending claim 26. Ex. 1015 at 202–203 (emphasis added). The examiner explained that "[t]he specification does not appear to provide such a description, and elected Fig. 75

does not appear to show a male threading profile which does not essentially match the male threading profile of the definitive screw shaft." *Id.* at 208.[6]

During prosecution of the '781 patent, the examiner stated, in rejecting pending claim 18 (which issued as claim 1), that Figure 1 (below left) of the Berrevoets reference depicted a temporary fastener that does disclose the "does not essentially match" limitation, whereas Figure 8 (below right) of the Lannan reference depicted a temporary fastener that does not disclose this limitation. Ex. 1020 at 939–940. In other words, the examiner concluded that helical thread contour 28 interrupted by slots 29 in Figure 1 of Berrevoets "does not essentially match" the abutment thread contour, but that uninterrupted thread contour 98 in Figure 8 of Lannan does "essentially match" the abutment thread contour. *Id.*

[6] In response, Patent Owner amended this claim language by replacing "does not essentially match" with "that is different from." *Id.* at 289, 298.

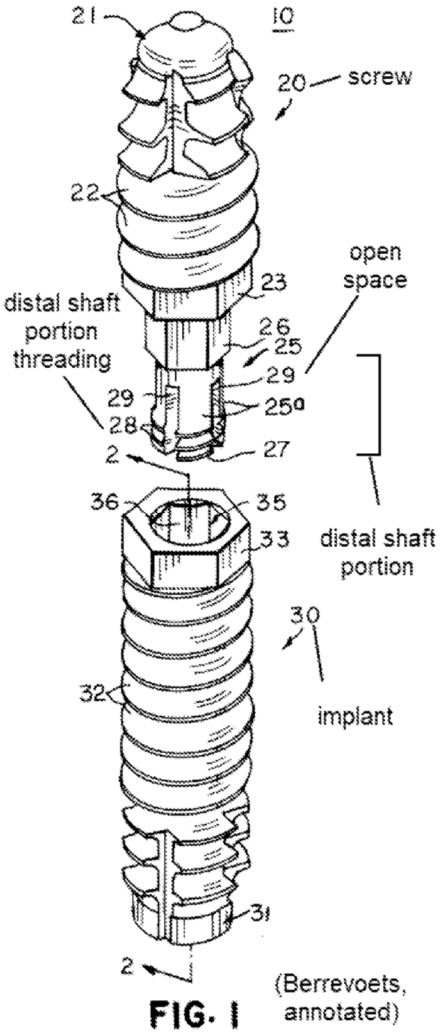


FIG. 1 (Berrevoets, annotated)

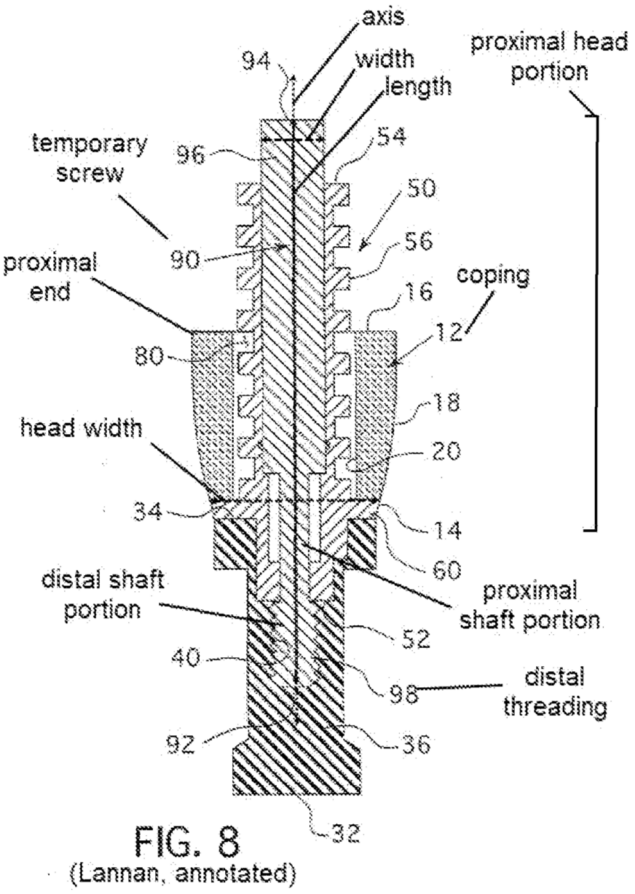


FIG. 8 (Lannan, annotated)

Id. at 934 (Fig. 1 (annotated by examiner)); *id.* at 932 (Fig. 8 (annotated by examiner)). However, the examiner's statements about these references do not provide any further guidance that explains how to determine whether or not the thread contours of the temporary fastener and the implant abutment "essentially match." Ex. 1002, ¶150.

In sum, the "does not essentially match" limitation is indefinite because the claim language, when read in light of the specification and the prosecution history,

does not inform a POSA with reasonable certainty about the scope of the limitation, i.e. whether the two thread contours do or do not "essentially match." *Nautilus*, 572 U.S. at 901. Therefore, claims 10–16 are indefinite and unpatentable under Section 112(b). Ex. 1002, ¶151.

B. Ground 2: Claims 1–16 Are Not Adequately Described or Enabled

Claims 1–16 are unpatentable under Section 112(a) because they do not comply with the written description requirement or the enablement requirement. As explained below, the '781 patent specification does not support the full scope of the claims. Ex. 1002, ¶¶152–209.

1. Independent Claims 1, 6, 8 and 10 Are Not Supported By the '781 Patent Specification

The '781 patent specification does not contain an adequate written description of or enable independent claims 1, 6, 8 and 10, for two reasons.

a. The Full Scope of the Different Thread Pattern Limitations Is Not Supported

First, the '781 patent specification does not support the full scope of the limitations in claims 1, 6, 8 and 10 that encompass any temporary fastener thread pattern that is different than the definitive screw and implant abutment thread pattern. Ex. 1002, ¶¶155–161.

As explained above, the independent claims are not limited to temporary fasteners with buttress threads, as described and as depicted in Figure 75, but

instead are much broader. Claim 1 merely requires the temporary fastener to have a "threading contact area" with the implant abutment that is "less than" the "threading contact area" of the definitive screw with the abutment. Ex. 1001, 26:14–24. Claim 8 requires the definitive screw to have a "volume" of "post material" that is "greater than" a "volume" of "shaft material" of the temporary fastener. *Id.*, 27:51–60. Claim 10 requires the "temporary fastener" to have a "shaft threading contour" that "does not essentially match" the "implant abutment threads contour." *Id.*, 28:16–20. Finally, claim 6 does not include any limitation that requires the thread pattern of the temporary fastener to be the same or different than the definitive screw and implant abutment thread pattern, and therefore encompasses all different thread patterns. *Id.*, 26:50–27:9.

The '781 patent specification does not support this broad claim scope because it describes only one temporary fastener embodiment with a different thread pattern: the temporary fastener of Figure 75 with an "asymmetric" buttress thread that is different than the symmetric thread of the definitive screw and the implant abutment of Figure 9. Ex. 1001, 23:10–41, Figs. 9, 75; Ex. 1002, ¶157.

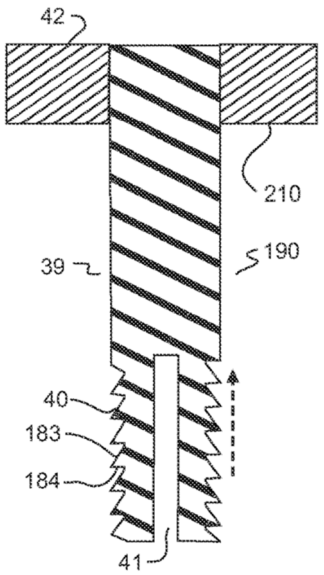


FIG. 75

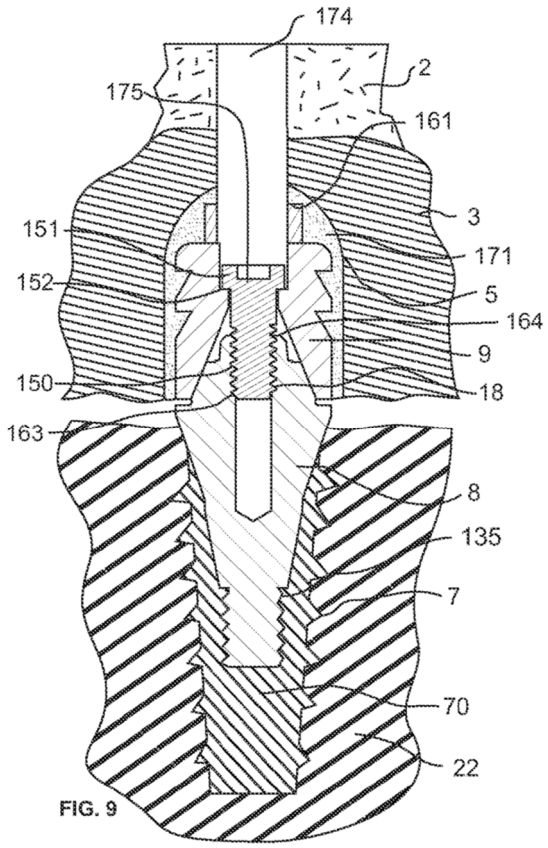
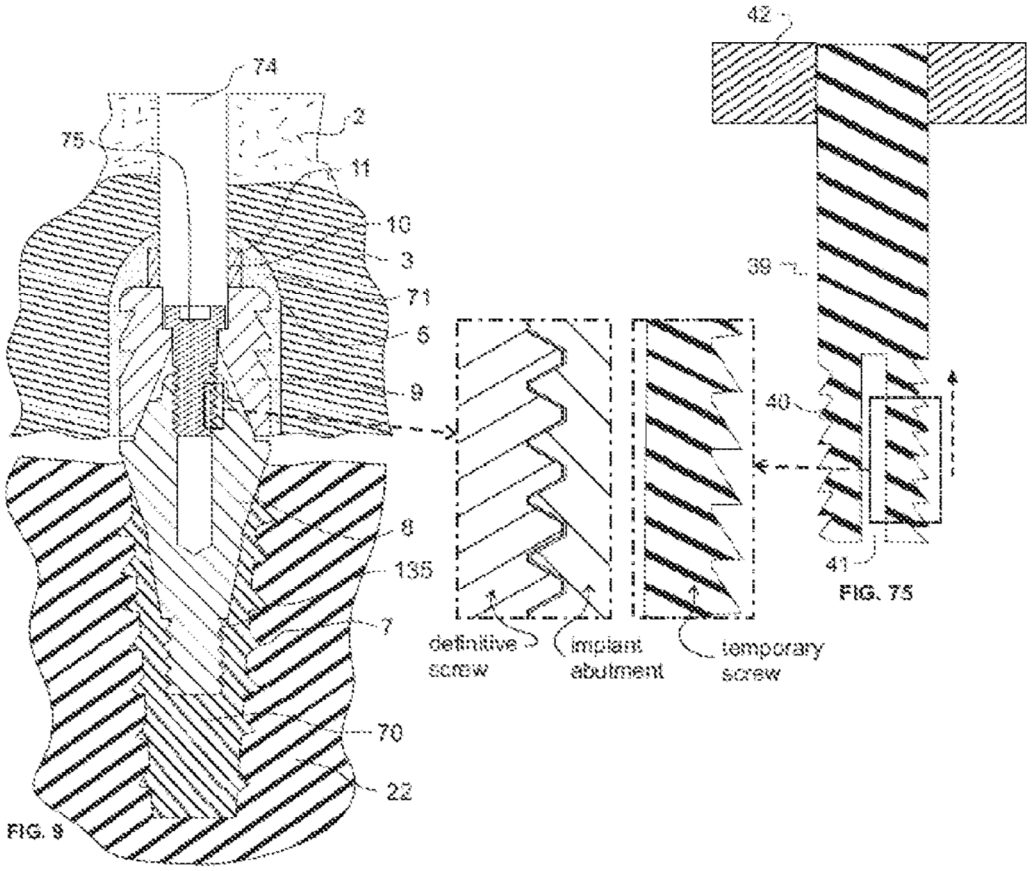


FIG. 9

Patent Owner confirmed during prosecution of the ’992 patent that the “thread profile” and “threading shape” of asymmetric threads 40 of the temporary fastener of Figure 75 are “not the same” and “different” than the symmetric threads of the definitive screw and the implant abutment of Figure 9, and included this annotated figure:



Ex. 1015 at 295–299.

The buttress thread of the Figure 75 embodiment does not adequately describe or enable the full scope of claims 1, 6, 8 and 10, which encompasses all thread pattern differences. Ex. 1002, ¶¶159–160. For example, these claims encompass hypothetical, undisclosed temporary fasteners with reverse buttress threads, like thread A in Figure 1 of Gracco (below left) but the opposite of the buttress thread in Figure 75 (below right). Ex. 1006, Fig. 1(A); Ex. 1001, Fig. 75.

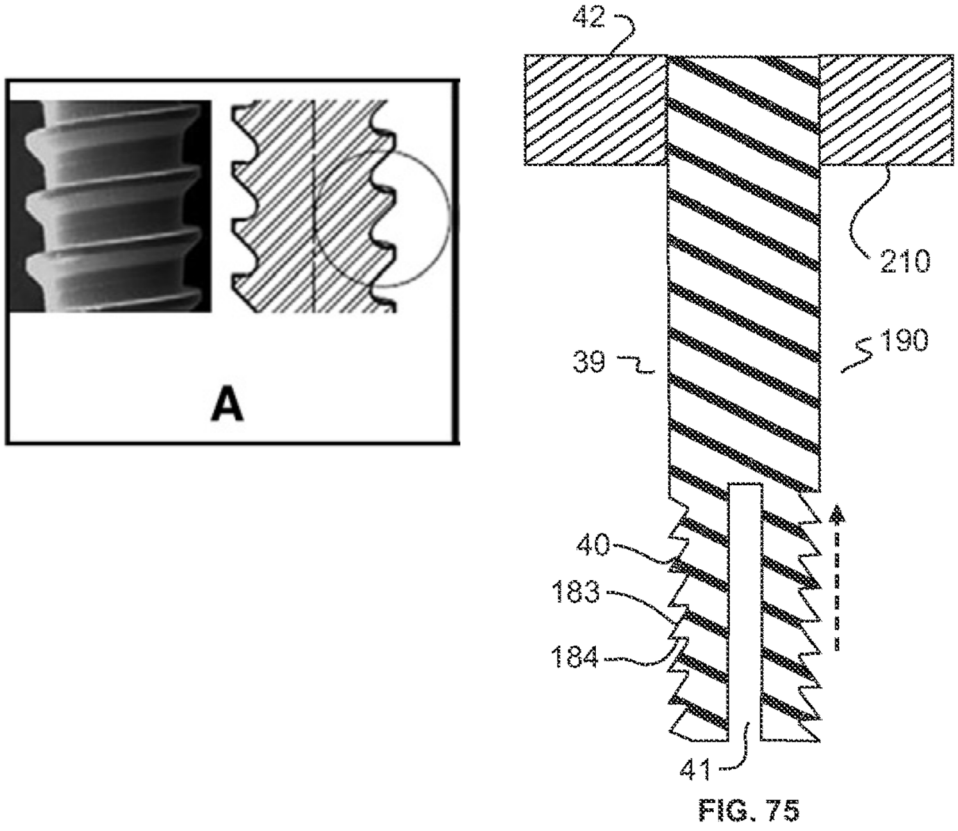


FIG. 75

The ’781 patent specification does not describe any embodiment with a reverse buttress thread, much less how such a temporary fastener would be pulled out without being unscrewed. The claims also encompass myriad other undisclosed embodiments with different thread patterns, including for example threads with truncated or rounded peaks and/or smaller thread angles than the definitive screw and the implant abutment. The ’781 patent specification does not describe any of these embodiments, much less in an enabling manner. Ex. 1002, ¶161.

This case is analogous to *Tronzo v. Biomet, Inc.*, 156 F.3d 1154 (Fed. Cir. 1998). In *Tronzo*, the patent related to artificial hip sockets with cup implants. *Id.* at 1156. The specification described only one shape of cup: a conical cup. *Id.* at 1159. The claims did not specify the cup shape, and therefore did not require the cup to be conical. *Id.* The Federal Circuit held that the description of "*only* conical shaped cups and nothing broader" did not support claims that covered any cup shape. *Id.* Similarly, the description of the buttress thread of Figure 75 does not support the claim scope that encompasses all thread pattern differences. *See also Synthes USA, LLC v. Spinal Kinetics, Inc.*, 734 F.3d 1332, 1344–45 (Fed. Cir. 2013) (claims to implant with plates having "openings" not supported because specification described only plates with "grooves" or "channels"); *Ex Parte Deacon*, 2005 Pat. App. LEXIS 2281, *21–26 (B.P.A.I. June 2, 2005) (claims to cleat with "protrusions," "members" or "elements" not supported because specification described only "ribs" and "ridges").

For the same reason, the description of the buttress thread of Figure 75 also does not enable the full claim scope. *See Amgen Inc. v. Sanofi*, 598 U.S. 594, 610 (2023) ("[The] specification must enable the full scope of the invention as defined by its claims.").

In sum, claims 1, 6, 8 and 10 are not supported by the '781 patent specification, and therefore the claims are unpatentable under Section 112(a).

b. The Full Scope of the Release Limitations Is Not Supported

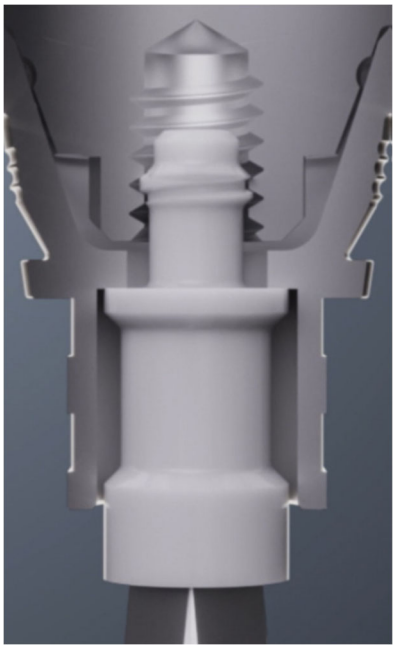
Second, the ’781 patent specification does not support the full scope of independent claims 1, 6, 8 and 10 because these claims do not require the temporary fastener to have a split-post structure with deflecting legs that enable the fastener to be pulled out without being unscrewed, as in the only disclosed embodiment. Ex. 1002, ¶¶162–167.

As explained above, claims 1, 6, 8 and 10 encompass embodiments in which a threaded temporary fastener is released by an axial force, regardless of whether the fastener has a split-post structure with deflecting legs. The claims merely require that an axial force releases the temporary fastener from the abutment and (for claims 1, 6 and 8) that the temporary fastener threads do not continuously engage the abutment threads. Ex. 1001, 26:4–13, 26:66–27:10, 27:41–50, 28:32–36. But the claims do not require the temporary fastener to have deflecting legs that enable the temporary fastener to be pulled out without being unscrewed.

The ’781 patent specification does not support this broad claim scope because it does not describe any temporary fastener that does not have a split post with deflecting legs but that can be pulled out without being unscrewed. Ex. 1002, ¶¶162–165. The only temporary fastener that can be pulled out without being unscrewed that is described in the ’781 patent specification is the embodiment of Figure 75. As the specification explains, this temporary fastener can be pulled out

without being unscrewed because of buttress thread 40 and the deflecting legs of the split post created by slot 41. Ex. 1001, 5:31–35, 11:31–34, 23:17–30, 24:58–59, Fig. 75. Nothing in the specification indicates that the inventors were in possession of a temporary fastener that did not have a split post and deflecting legs but that could be pulled out without being unscrewed. Ex. 1002, ¶¶164, 167.

The breadth of the claim scope sought by Patent Owner is illustrated by its infringement allegations against Petitioner's NeoConvert "Pin Capture" device. Ex. 1021, ¶50. As shown below, the accused device does not have a slot that creates a split post with deflecting legs that enables it to be pulled out of the threaded abutment without being unscrewed. Instead, the device can be pulled out because its threads detach.



Before removal



After removal

Ex. 1019 at 4, 5; Ex. 1002, ¶166. This is a different release mechanism than the deflecting legs of the split-post structure of Figure 75, and it is not described in the '781 patent specification, much less in an enabling manner. *Id.*

This case is analogous to *ICU Med., Inc. v. Alaris Medical Sys., Inc.*, 558 F.3d 1368 (Fed. Cir. 2009). In *ICU*, the specification described only medical valves with spikes. *Id.* at 1378. The claims did not require the valves to have a spike but instead encompassed valves with or without a spike. *Id.* The Federal Circuit held that the description of "only medical valves with spikes" did not support claims that "cover[ed] those valves that operate with a spike and those that operate without a spike." *Id.* Similarly, the description of the split-post temporary fastener of Figure 75 does not support the full claim scope that encompasses temporary fasteners without a split post and deflecting legs. *See also D Three Enters., LLC v. SunModo Corp.*, 890 F.3d 1042, 1051–52 (Fed. Cir. 2018) (claims to assembly with washers above or below flashing not supported because specification described only embodiments with washers above flashing); *Anascape, Ltd. v. Nintendo of Am., Inc.*, 601 F.3d 1333, 1340 (Fed. Cir. 2010) (claims to controller with multiple input members not supported because specification described only controllers with single member); *Ex Parte Gunaratnam*, 2017 Pat. App. LEXIS 10614, *5–8 (P.T.A.B. Oct. 30, 2017) (claims to mask and headgear with strap not supported because specification described

only embodiments without strap); *Ex Parte Vargas*, 2007 Pat. App. LEXIS 3682, *10–15 (B.P.A.I. Sept. 13, 2007) (claims to anastomosis device requiring only single flange not supported because specification described only embodiments with two flanges).

This case is also analogous to *Liebel-Flarsheim Co. v. Medrad, Inc.*, 481 F.3d 1371 (Fed. Cir. 2007). In *Liebel-Flarsheim*, the specification described only fluid injectors with a pressure jacket. *Id.* at 1379. The claims did not require a pressure jacket but instead encompassed injectors with or without a jacket. *Id.* The Federal Circuit held that the claims were not enabled because "there is no guidance or suggestion [in the specification] of how to make or use a disposable syringe for high pressure use without a pressure jacket." *Id.* Similarly, the description of the split-post temporary fastener of Figure 75 does not enable the full claim scope that encompasses temporary fasteners that do not have a split post with deflecting legs.

In sum, claims 1, 6, 8 and 10 are not supported by the '781 patent specification, and therefore are unpatentable under Section 112(a).

2. Dependent Claims 2–5, 7, 9 and 11–16 Are Not Supported By the '781 Patent Specification

The '781 patent specification does not contain an adequate written description of or enable dependent claims 2–5, 7, 9 and 11–16, for the same reasons as the independent claims. Ex. 1002, ¶¶168–177.

a. The Full Scope of the Different Thread Pattern Limitations Is Not Supported

Dependent claims 3–5, 7, 9 and 11–14 are not supported and are unpatentable for the same reasons as independent claim 1 (for claims 3–5, 7 and 9) and independent claim 10 (for claims 11–14), because these dependent claims add limitations that do not modify the limitations in the independent claims that encompass any different thread pattern. Ex. 1002, ¶169.

Dependent claims 2, 15 and 16 add limitations related to the different thread pattern, but these dependent claims are not supported by the description of the buttress thread of Figure 75 in the ’781 patent specification, as explained below.

Claim 2 adds “wherein the distal shaft portion of the temporary fastener comprises asymmetric threading.” Ex. 1001, 26:25–27. This claim scope is not described or enabled because it encompasses many undisclosed asymmetric temporary fastener threads, including reverse buttress threads. Ex. 1002, ¶171.

Claim 15 adds “further comprising a definitive screw comprising threads configured to engage the implant abutment, wherein a maximal width of the distal portion of the shaft of the temporary fastener is smaller than a maximal width of the threads of the definitive screw.” Ex. 1001, 28:55–59. This claim scope is not described or enabled because it encompasses many undisclosed temporary fastener thread patterns, including reverse buttress threads and symmetric threads with truncated or rounded peaks and/or smaller thread angles. Ex. 1002, ¶172.

Claim 16 adds limitations that require a "profile pattern" of the threads of the temporary fastener to have an "abutment contact area" with the implant abutment threads that is "less than" the "abutment contact area" of a "profile pattern" of the threads of the definitive screw with the abutment threads. Ex. 1001, 28:60–29:2. These limitations added by claim 16 are similar to the "threading contact area" limitation of claim 1, discussed above. This claim scope is not described or enabled because it encompasses many undisclosed temporary fastener thread patterns, including reverse buttress threads and symmetric threads with truncated or rounded peaks and/or smaller thread angles. Ex. 1002, ¶173.

In sum, claims 2–5, 7, 9 and 11–16 are not supported by the '781 patent specification, and therefore are unpatentable under Section 112(a).

b. The Full Scope of the Release Limitations Is Not Supported

Dependent claims 2–5, 11–13 and 15–16 are not supported and are unpatentable for the same reasons as independent claim 1 (for claims 2–5) and independent claim 10 (for claims 11–13 and 15–16), because these dependent claims add limitations that do not require the temporary fastener to have a split-post structure with deflecting legs that permit the fastener to be pulled out without being unscrewed. Ex. 1002, ¶175.

Dependent claim 7 adds "wherein the distal shaft portion of the temporary fastener comprises an open space, and wherein a portion of the axis is located

within the open space." Ex. 1001, 27:11–14. Dependent claim 9 adds "wherein the temporary fastener is polymeric, and wherein the distal shaft portion of the temporary fastener is hollow." *Id.*, 27:61–63. These limitations do not require the temporary fastener to have a split post with deflecting legs because they encompass undisclosed embodiments that include a hollow bore but not a slot that creates deflecting legs. Therefore, the full scope of claims 7 and 9 is not described or enabled for the same reason as independent claim 1. Ex. 1002, ¶176.

In sum, claims 2–5, 7, 9, 11–13 and 15–16 are not supported by the '781 patent specification, and therefore are unpatentable under Section 112(a).

3. The "Securing the Coping to the Threads of the Implant Abutment" Limitation of Claims 1–9 Is Not Supported

Claims 1–9 are unpatentable under Section 112(a) because the '781 patent specification does not adequately describe or enable the "securing the coping to the threads of the implant abutment" limitation in independent claims 1, 6 and 8. Ex. 1002, ¶¶178–182.

Claim 1 recites that the "definitive screw" has "a distal post portion having threads configured for securing the coping to the threads of the implant abutment." Ex. 1001, 25:48–51. Claims 6 and 8 recite that the "definitive screw" has "a distal post portion having threads for securing the coping to the threads of the implant abutment." *Id.*, 26:44–47, 27:18–21. Dependent claims 2–5, 7 and 9 depend from claim 1 but add limitations that do not modify the above limitation.

The ’781 patent specification does not describe or enable these limitations in claims 1–9. Ex. 1002, ¶¶180–182. Although the disclosed definitive screw threads secure the coping to the abutment, the definitive screw threads do not secure the coping to the threads of the abutment as recited. As shown in Figure 9 below, male threads 150 of definitive screw 175 are threaded into female threads 18 of abutment 8 to secure coping 9 to abutment 8. Ex. 1001, 15:29–40, Fig. 9. However, threads 150 of definitive screw 175 do not secure coping 9 to threads 18 of abutment 8 as recited; as seen in Figure 9, coping 9 does not make any contact with threads 18 of abutment 8. *Id.*, Fig. 9.

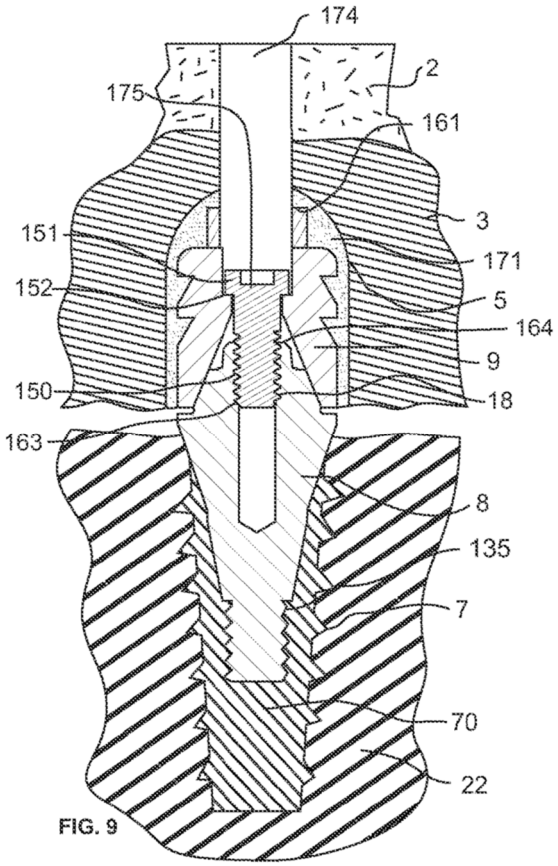


FIG. 9

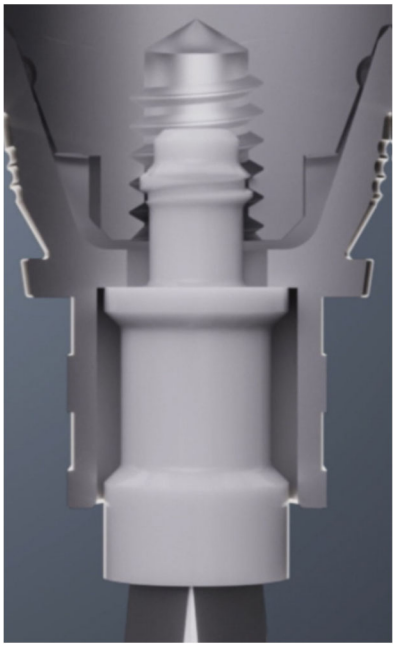
Therefore, claims 1–9 are not supported by the '781 patent specification, and are unpatentable under Section 112(a).

4. The "Does Not Engage the Implant Abutment Threads Continuously" Limitation of Claims 1–9 Is Not Supported

Claims 1–9 are unpatentable under Section 112(a) because the '781 patent specification does not adequately describe or enable the "does not engage the implant abutment threads continuously" limitation in independent claims 1, 6 and 8. Ex. 1002, ¶¶183–189.

Claims 1, 6 and 8 recite "the distal shaft portion [of the temporary fastener] is sized and configured so that it does not engage the implant abutment threads continuously between a most distal position of the distal shaft portion and a proximal end of the implant abutment threads." Ex. 1001, 26:9–13, 27:6–10, 27:46–50. Dependent claims 2–5, 7 and 9 depend from claim 1 but do not add limitations that modify the above limitation.

In the co-pending litigation, Patent Owner alleges that Petitioner's NeoConvert "Pin Capture" device satisfies this limitation, even though its threads are continuous, on the ground that the device's threads are threaded into only a portion of the abutment threads, such that abutment threads above and below the device threads are not engaged by the device threads:



Ex. 1019 at 4; Ex. 1021, ¶51. Therefore, the claim scope sought by Patent Owner for this limitation encompasses temporary fasteners with continuous threads that are threaded into only a portion of the abutment threads, leaving abutment threads above and/or below the temporary fastener empty.

This claim scope is not described or enabled by the '781 patent specification. Ex. 1002, ¶187. The only temporary fastener with threads that do not engage the abutment threads continuously that is described is the embodiment of Figure 75. Threads 40 of this temporary fastener do not engage abutment threads 18 continuously because threads 40 are interrupted on either side of post 39 by the open space created by slot 41.

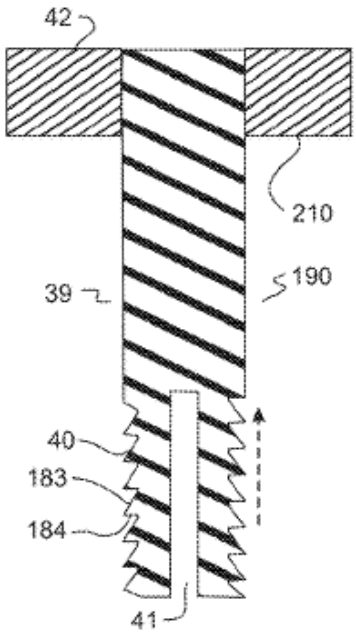


FIG. 75

Ex. 1001, 23:17–34, Fig. 75.

The ’781 patent specification does not describe any temporary fastener with continuous threads that are threaded into only a portion of the abutment threads, leaving abutment threads above and/or below the temporary fastener empty. Therefore, the claim scope sought by Patent Owner is not supported, and claims 1–9 are unpatentable under Section 112(a). Ex. 1002, ¶¶188–189.

5. The “Outer Surface … Deform” Limitation of Claim 5 Is Not Supported

Claim 5 is unpatentable under Section 112(a) because the ’781 patent specification does not adequately describe or enable the “outer surface … deform” limitation. Ex. 1002, ¶¶190–193.

Claim 5 adds "wherein the distal shaft portion of the temporary fastener comprises an outer surface which is sized and configured to deform in response to the axial release force in the proximal direction whereby the at least a portion of the temporary fastener and the coping are released together as the unit." Ex. 1001, 26:35–40.

The '781 patent specification does not describe or enable claim 5 because it does not describe any temporary fastener that has an "outer surface" that "deform[s]" when the coping and the temporary fastener are pulled out of the abutment without being unscrewed. Ex. 1002, ¶192. In particular, the specification does not describe the outer surface of the temporary fastener of Figure 75 as deforming upon release. Instead, as discussed above, the specification explains that the temporary fastener can be pulled out without being unscrewed because of the deflecting legs and the asymmetric threads. Ex. 1001, 5:31–35, 11:31–34, 23:17–30, 24:58–59, Fig. 75. Moreover, the specification criticizes temporary fasteners that have silicone threads, which a POSA would understand would be deformable, as taught by Poovey. Ex. 1001, 4:16–25; Ex. 1005, [0079], [0084]; Ex. 1002, ¶192.

Therefore, claim 5 is not supported and is unpatentable under Section 112(a).

6. The "Wherein the Temporary Fastener Is Configured To Release" Limitation of Claim 6 Is Not Supported

Claim 6 is unpatentable under Section 112(a) because the '781 patent specification does not adequately describe or enable the "wherein the temporary fastener is configured to release" limitation. Ex. 1002, ¶¶194–197.

As explained above in section IX.A.1, claim 6 does not include any structural limitations for the temporary fastener that relate to its ability to be pulled out of the abutment without being unscrewed. Instead, for this feature, claim 6 includes only the purely functional "wherein" limitation quoted above in section IX.A.1, which merely recites that the temporary fastener is "configured to" perform the recited "release" function. Ex. 1001, 26:66–27:5.

By using purely functional language, claim 6 purports to encompass any and all threaded temporary fastener means for achieving the recited function. This broad claim scope is not described or enabled by the '781 patent specification. Ex. 1002, ¶196. As explained above, the specification discloses only one temporary fastener embodiment that can be pulled out of the abutment without being unscrewed: the embodiment of Figure 75. And the specification explains that this temporary fastener can be pulled out of the abutment because of asymmetric buttress threads 40 and the deflecting legs created by slot 41. Ex. 1001, 5:31–35, 11:31–34, 23:17–30, 24:58–59, Fig. 75. The disclosure of this embodiment does not support the full claim scope, which purports to cover any threaded temporary

fastener that is "configured to" perform the recited function. *See, e.g.*, *Ex Parte Miyazaki*, No. 2007-3300, 2008 WL 5105055, at *10–14 (B.P.A.I. Nov. 19, 2008) (precedential); *Ex Parte Wang*, No. 2012-001318, 2014 WL 1005328, at *2 (P.T.A.B. Jan. 9, 2014).

In *Miyazaki*, the Board held that claims directed to a "large printer" that recited "a sheet feeding area operable to feed" were not enabled. 2008 WL5105055, at *10–14. The Board explained that the "operable to feed" limitation "is a purely functional recitation with no limitation of structure" and that the claims "do not contain any additional recitation of structure." *Id.* at *10, *14. Therefore, the claims were unpatentable "for lack of an enabling disclosure commensurate with the scope of the claims." *Id.* at *14.

In *Wang*, the Board held that claims directed to a mold used to manufacture fog-resistant goggles were not described or enabled. 2014 WL 1005328, at *2. The Board explained that the claims did not include any structural limitations about the mold and therefore encompassed "any mold … that will result in the recited structure of the goggles." *Id.* As the Board further explained, "[w]here an applicant attempts to claim 'an exclusive right to use a manner and process which he has not described and indeed had not invented, and therefore could not describe' we must conclude that the claim is overly broad because applicant has failed to

describe and enable the full scope of the claimed invention." *Id.* (quoting *O'Reilly v. Morse*, 56 U.S. 62, 113–114 (1853)); *see also* M.P.E.P. § 2173.05(g).

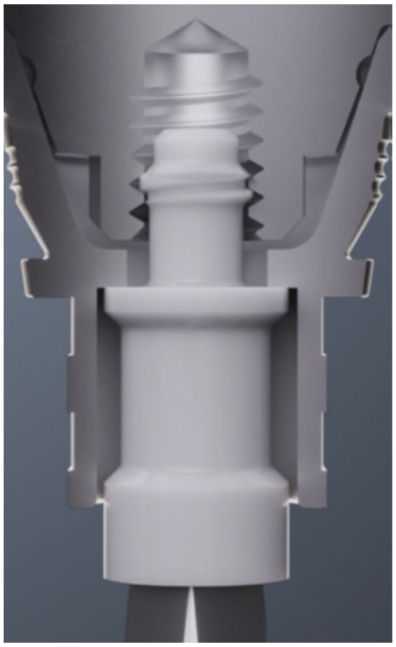
Like the claims in *Miyazaki* and *Wang*, claim 6 is unpatentable because the disclosure of the Figure 75 embodiment does not adequately describe or enable the broad functional limitation that encompasses all threaded temporary fasteners that are "configured to" perform the recited function.

7. The "Distal Shaft … Configured to Deform" Limitation of Claim 14 Is Not Supported

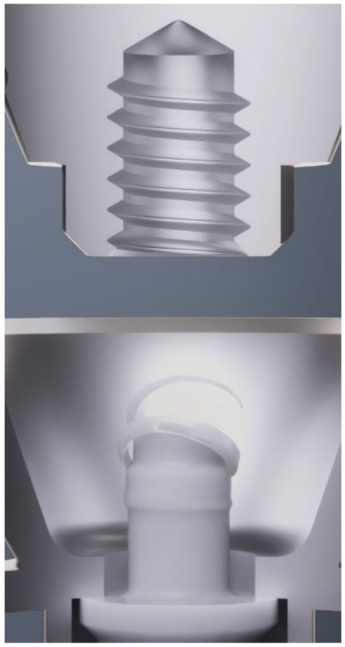
Claim 14 is unpatentable under Section 112(a) because the '781 patent specification does not adequately describe or enable the "distal shaft … configured to deform" limitation. Ex. 1002, ¶¶198–203.

Claim 14 adds "wherein the distal shaft portion of the shaft of the temporary fastener is configured to deform during the application of the axial force in the proximal direction to thereby release the coping and the temporary fastener as the unit from the implant abutment." Ex. 1001, 28:49–54.

In the co-pending litigation, Patent Owner alleges that Petitioner's NeoConvert "Pin Capture" device satisfies this limitation. In particular, Patent Owner alleges that the accused device deforms because its threads detach when the device is pulled out of the abutment, as shown in the image below right:



Before removal



After removal

Ex. 1019 at 4, 5. Therefore, the claim scope sought by Patent Owner for this limitation encompasses temporary fasteners with threads that detach when the fastener is pulled out of the abutment. Ex. 1002, ¶201.

This claim scope is not described or enabled by the '781 patent specification. The specification does not describe any temporary fastener that can be pulled out of the abutment without being unscrewed because its threads detach. Ex. 1002, ¶202. The only disclosed temporary fastener that can be pulled out of the abutment without being unscrewed is the embodiment of Figure 75, which can be pulled out not because its threads detach, but instead because of the asymmetric threads and the deflecting legs. Ex. 1001, 5:31–35, 11:31–34, 23:17–30, 24:58–59, Fig. 75.

Therefore, the claim scope sought by Patent Owner is not supported, and claim 14 is unpatentable under Section 112(a).

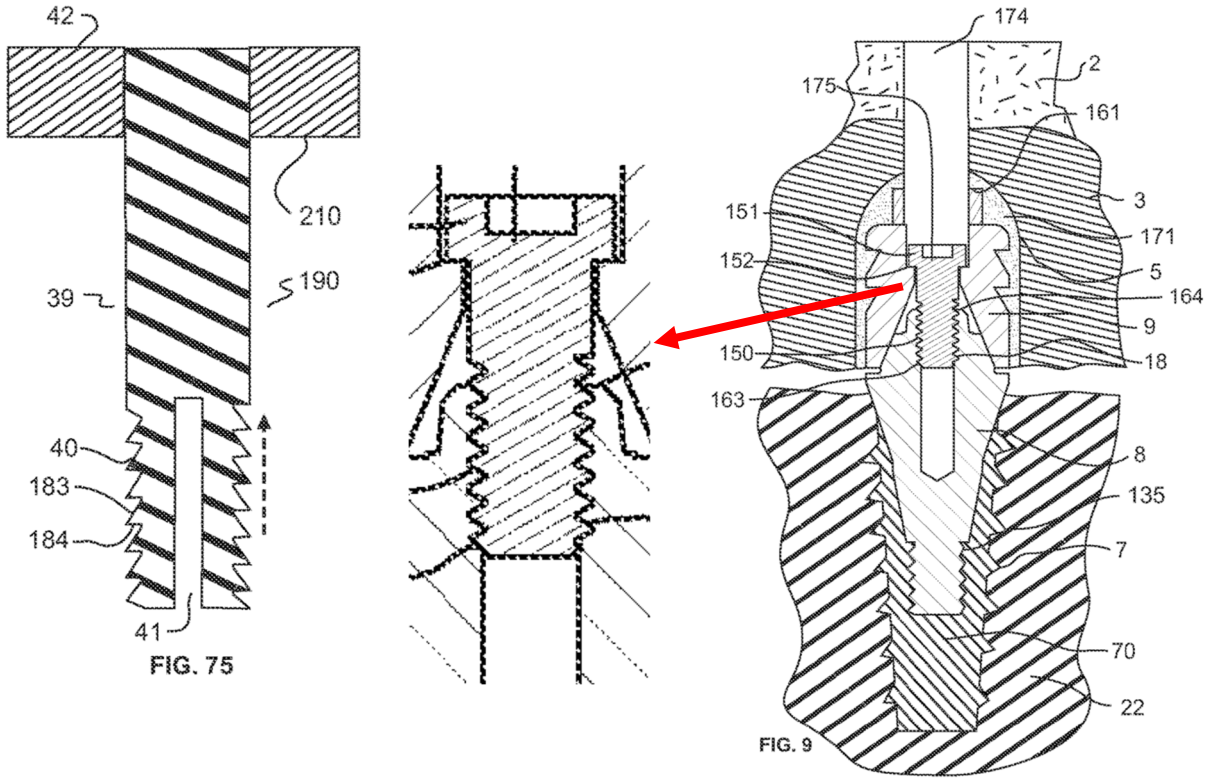
8. The "Smaller … Maximal Width" Limitation of Claim 15 Is Not Supported

Claim 15 is unpatentable under Section 112(a) because the '781 patent specification does not adequately describe or enable the "smaller … maximal width" limitation. Ex. 1002, ¶¶204–209.

Claim 15 adds "further comprising a definitive screw comprising threads configured to engage the implant abutment, wherein a maximal width of the distal portion of the shaft of the temporary fastener is smaller than a maximal width of the threads of the definitive screw." Ex. 1001, 28:54–59.

The '781 patent specification does not describe or enable claim 15 because it does not describe any temporary fastener that can be pulled out without being unscrewed in which the distal portion of the shaft has a maximal width that is smaller than the maximal width of the definitive screw threads. Ex. 1002, ¶206.

In particular, nothing in Figures 9 or 75, or the accompanying description, indicates that the maximum width of the distal portion of the shaft (post 39) of the temporary fastener in Figure 75 is smaller than the maximum width of the threads of definitive screw 175 in Figure 9. If anything, as shown below in Figure 75 and Figure 9, the thread peaks of the temporary fastener and the definitive screw appear to have the same diameter as the proximal unthreaded portion of the shaft.



Ex. 1001, 15:29–40, 23:17–30, Figs. 9, 75 (annotated); Ex. 1002, ¶¶207–208.

Therefore, claim 15 is not supported by the '781 patent specification, and is unpatentable under Section 112(a).

C. Ground 3: Claims 10, 12, 15 and 16 Would Have Been Obvious Based on Bernhard In View of Poovey and Gracco

Claims 10, 12, 15 and 16 are unpatentable under Section 103 because they would have been obvious to a POSA before the earliest claimed effective filing date of October 9, 2018, based on Bernhard in view of Poovey and Gracco. Ex. 1002, ¶¶210–271.

1. Motivation to Modify Bernhard In View of Poovey and Gracco

As explained in section V.B above, Bernhard discloses dental systems with various designs for copings, abutments, permanent screws, and temporary coping-abutment fasteners that employ snap-fit or friction-fit connections.

Figure 12 in Bernhard depicts a dental system including coping 700, abutment 650, and threaded fastener 750 with threaded shaft 754 threaded into threaded bore 654 of abutment 650 to permanently connect abutment 650 to coping 700. Ex. 1003, [0105], [0130], [0134], Figs. 3, 12. Figure 8 depicts coping 700 temporarily connected to abutment 650 by resilient spring 708 that engages annular slot 652. *Id.*, [0122], [0126], [0130], Fig. 8.

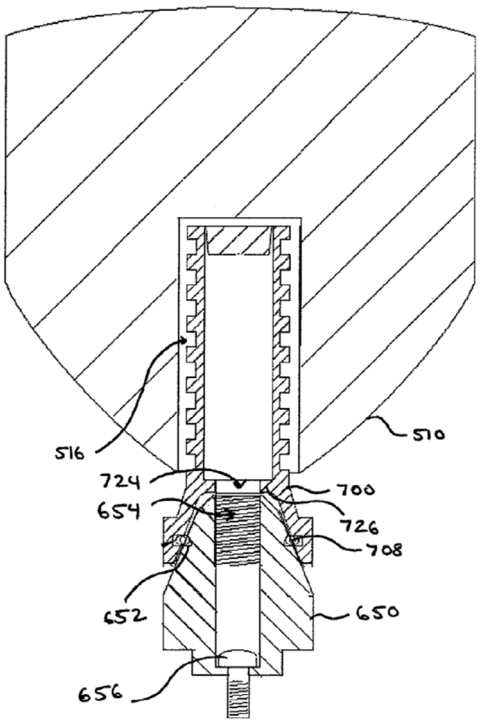


Figure 8

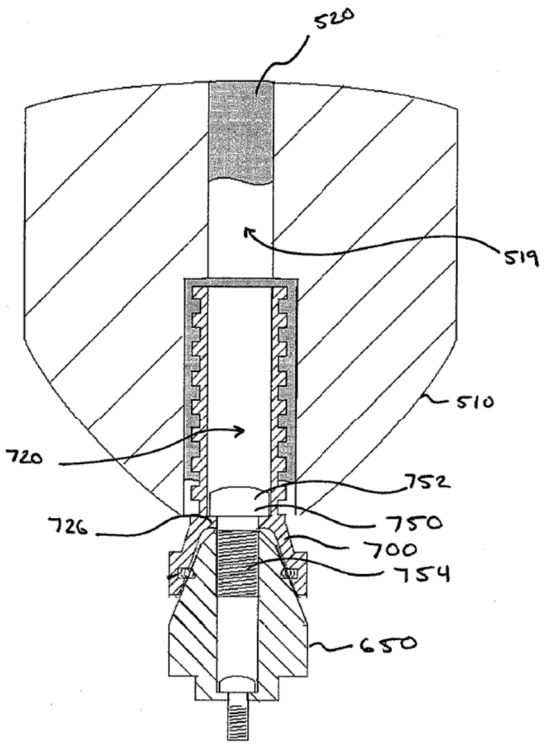


Figure 12

As explained below, it would have been obvious in view of Bernhard, Poovey and Gracco to modify the system of Figures 8–12 of Bernhard to temporarily connect coping 700 to abutment 650 with a temporary fastener with flexible threads in a buttress thread pattern, which would be threaded into bore 654 but pulled out of abutment 650 without being unscrewed when the prosthesis is removed. Ex. 1002, ¶214.

A POSA would have been motivated by Bernhard and Poovey to use a threaded temporary fastener because the engagement of the screw threads with the abutment threads would make the temporary connection between coping 700 and abutment 650 more secure, reliable and stable than a snap-fit mechanism. *Id.*,

¶215. Bernhard teaches that a threaded screw can be used to bolster the connection between the coping and the abutment "to reduce the likelihood of inadvertent detachment," i.e. to make the connection more secure, reliable and stable. Ex. 1003, [0082]. Poovey teaches that his threaded impression coping securing screw that is threaded into the bore increases stability. Ex. 1005, [0084]; Ex. 1002, ¶216.

A POSA also would have been motivated to use a threaded temporary fastener because bore 654 of abutment 650 already includes threads into which the temporary fastener could be threaded without having to modify bore 654. Bernhard teaches that the temporary connection can be achieved using the existing threading "located either entirely or partially along an interior surface of a bore, such as bore 125, of the abutment 120." Ex. 1003, [0076]. As a result, in addition to being more stable and secure, a threaded temporary fastener also would be simpler and more straightforward. Ex. 1002, ¶¶217–218.

A POSA also would have been motivated by Bernhard and Poovey to design the threaded temporary fastener so that it could be pulled out of abutment 650 without needing to be unscrewed, just like the temporary snap-fit connection of Bernhard and the temporary screw of Poovey. Poovey teaches that his temporary screw with flexible threads can be pulled out without being unscrewed. Ex. 1005, [0084]; Ex. 1002, ¶219. Therefore, based on Bernhard and Poovey, a POSA would

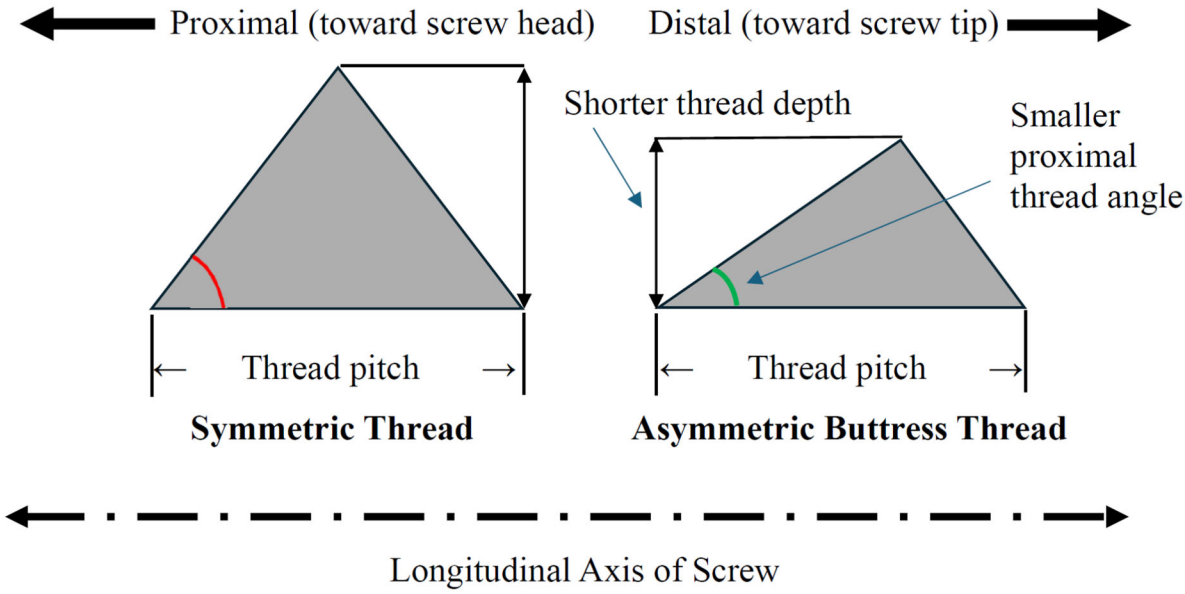
have decided to use a temporary fastener with flexible threads in Bernhard's system.

Having decided to use a temporary fastener with flexible threads, a POSA would have understood that the design of the temporary fastener thread pattern would affect the amount of force required to pull the fastener out of abutment 650. In particular, they would have understood that the flexible threads would need to accomplish two objectives. First, the flexible threads would need to extend sufficiently into and engage with the threads of bore 654 of abutment 650 to ensure that they could be threaded into bore 654 and provide a secure, reliable and stable temporary connection. Second, the flexible threads would need to compress sufficiently in the radial direction, in response to a sufficient pull-out force applied to the temporary fastener in bore 654, to reduce the maximum thread depth of the thread pattern sufficiently to permit the fastener to be pulled out without being unscrewed. *Id.*, ¶220.

Given these two objectives, a POSA would have been motivated to consider and choose from among various thread pattern designs different than the symmetric thread of threaded fastener 750, which—unlike the temporary fastener—is designed to ensure a very secure and permanent connection with the threads of bore 654. In particular, a POSA designing the temporary fastener would consider thread patterns with a shorter thread depth and a smaller proximal thread

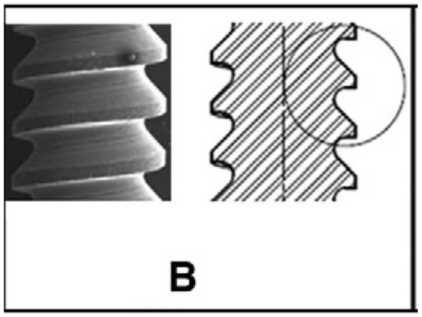
angle, to ensure that the flexible threads would compress sufficiently in the radial direction to permit the temporary fastener to be pulled out without being unscrewed. *Id.*, ¶221.

One well known and obvious example of such a threaded fastener design that a POSA would consider and then choose is an asymmetric buttress thread. A POSA would understand that the asymmetric geometry of a buttress thread permits a shorter thread depth and a smaller proximal thread angle than a corresponding symmetric thread with the same thread pitch, as shown below. *Id.*, ¶222.



A POSA would understand that, as a result of this shorter thread depth and smaller proximal thread angle, less pull-out force would be required to sufficiently compress the flexible threads in the radial direction to enable the thread to be pulled out, as compared to a symmetric thread. *Id.*

Gracco confirms this understanding. *Id.*, ¶223. Gracco depicts an example of an asymmetric buttress thread with a smaller proximal thread angle, and reports that it could be pulled out with less force than a reverse buttress thread. *Id.*; Ex. 1006 at 189, Fig. 1(B).



Based on the foregoing, a POSA would have been motivated to design the temporary fastener to have an asymmetric buttress thread with a shorter thread depth and a smaller proximal thread angle (instead of a symmetric thread with a steeper angle as depicted in Figure 13 of Poovey), to make the fastener easier to pull out while maintaining its secure, reliable and stable threaded connection. Ex. 1005, Fig. 13; Ex. 1002, ¶224.

In sum, based on Bernhard, Poovey and Gracco, a POSA would have been motivated to design a temporary fastener with flexible buttress threads that would be threaded into bore 654 of abutment 650 but pulled out when the prosthesis is removed without needing to be unscrewed. *Id.*, ¶225.

A POSA would have had a reasonable expectation of success designing such a temporary fastener because this is a predictable technology and this would have

been well within the level of ordinary skill. A POSA would have adopted the straightforward approach of basing the design of the temporary fastener on the design of threaded fastener 750 in Figure 12 of Bernhard, so that the temporary fastener shaft would fit within aperture 724 of coping 700 and be threaded into bore 654 of abutment 750, like shaft 754 of threaded fastener 750. Ex. 1003, Fig. 12; Ex. 1002, ¶¶226–227.

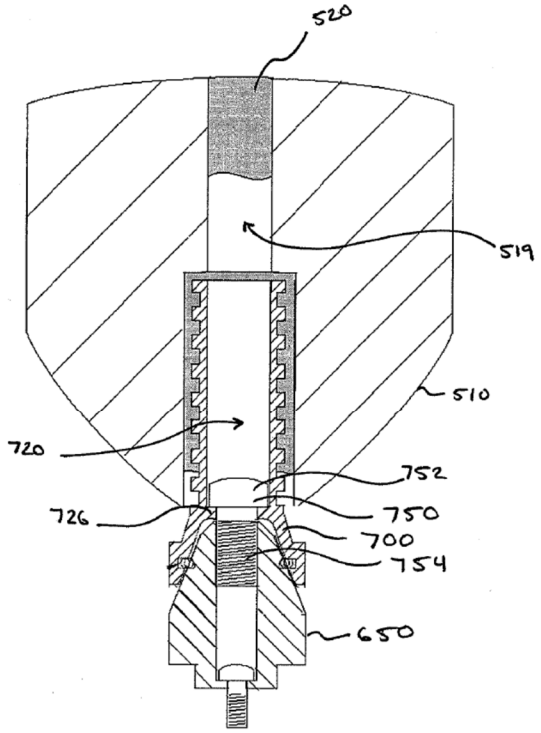


Figure 12

Specifically, a POSA would have designed the temporary fastener to have a shaft like shaft 754 of threaded fastener 750 and a head like head 752 of fastener 750. By doing so, the temporary fastener shaft would be able to be inserted through aperture 724 of coping 700 and threaded into bore 654 of abutment 650

like shaft 754, and the head would make contact with rim 726 like head 752, in order to temporarily connect coping 700 to abutment 650. *Id.*, ¶228.

However, as explained above, based on the teachings of Poovey and Gracco, a POSA would have modified the threads of shaft 754 of threaded fastener 750 in two respects, so that the temporary fastener would provide a stable, reliable and secure connection but still be able to be pulled out without being unscrewed. First, a POSA would have chosen an asymmetric buttress thread, based on Gracco, as discussed above. Second, a POSA would have made or coated the threads with silicone or another flexible plastic to make the threads flexible, based on Poovey, as discussed above. *Id.*, ¶¶229–234.

A POSA would have had several reasons for making this modification, each of which supports a conclusion of obviousness. *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 415–21 (2007); M.P.E.P. § 2143.

The modification would have been merely a combination of prior art elements (Bernhard's system with Poovey's temporary fastener with flexible threads modified by Gracco's buttress thread) according to known methods to yield predictable results. Ex. 1002, ¶231.

The modification would have been merely a simple substitution of known elements (a temporary fastener with flexible buttress threads based on Poovey and Gracco) for another to obtain predictable results. *Id.*

The modification would have been merely the use of a known technique (detaching a coping and a temporary fastener from an abutment) using a temporary fastener with flexible buttress threads based on Poovey and Gracco, to improve a similar device in the same way. Similarly, the modification would have been merely applying a known technique to a known device ready for improvement to yield predictable results. *Id.*, ¶232.

The modification would have been obvious to try because it is one choice from among a finite number of identified, predictable solutions, with a reasonable expectation of success. *Id.*, ¶233.

Finally, as explained above, the teachings, suggestions, and motivations in the prior art (Bernhard, Poovey and Gracco) would have led a POSA to make this modification. *Id.*, ¶234.

As explained below, this temporary fastener with flexible buttress threads used in Bernhard's system would have all the features of claims 10, 12, 15 and 16. *Id.*, ¶235.

2. Claim 10

a. Limitation 10(a)

Bernhard discloses a dental system comprising implant abutment 650, coping 700, and a definitive screw (threaded fastener 750) with threaded shaft 754

that engages the threads in bore 654 of abutment 650 to permanently connect abutment 650 to coping 700. Ex. 1003, [0105], [0130], [0134], Figs. 3, 12.

Coping 700 is temporarily connected to abutment 650 by resilient spring 708 that engages annular slot 652. *Id.*, [0124], [0126], [0130], Fig. 8.

As explained above, it would have been obvious to use a temporary fastener in Bernhard's system, based on the design of threaded fastener 750, but with flexible buttress threads that engage the threads in bore 654 of abutment 650 to temporarily connect coping 700 to abutment 650. Ex. 1002, ¶¶239–241.

b. Limitation 10(b)

As shown in Figure 8 of Bernhard, implant abutment 650 has an implant abutment longitudinal axis (vertical in Figure 8), and bore 654 of abutment 650 has female threads that have an implant abutment threads contour. Ex. 1003, [0130], Fig. 8; Ex. 1002, ¶242.

c. Limitation 10(c)

As shown in Figures 7A and 8 of Bernhard, coping 700 includes an aperture at its proximal end and central aperture 724 that leads to bore 654 of abutment 650. Ex. 1003, [0129], Figs. 7A, 8; Ex. 1002, ¶243.

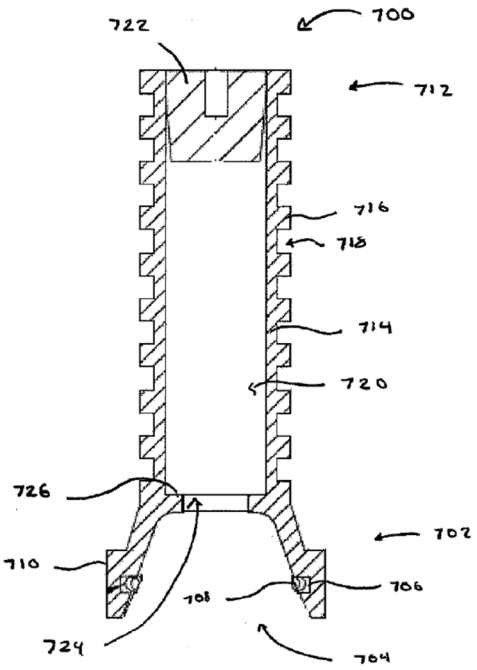


Figure 7A

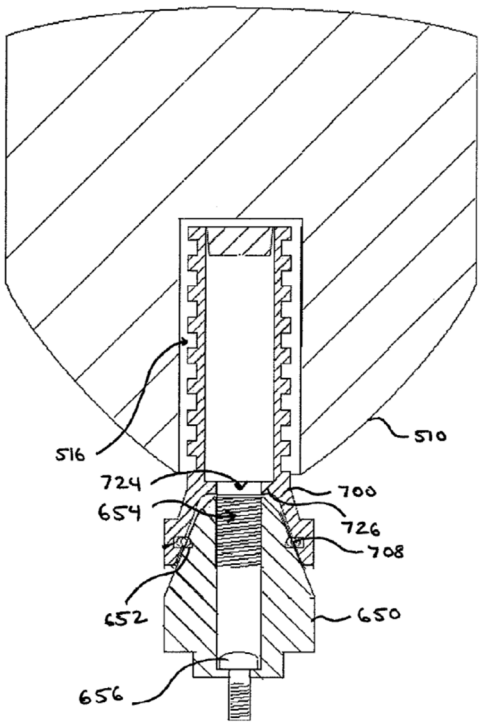


Figure 8

The aperture at the proximal end of coping 700 and central aperture 724 in coping 700 are larger than shaft 754 of threaded fastener 750. Central aperture 724 is smaller than proximal head end 752 of fastener 750. Ex. 1003, [0134], Fig. 12; Ex. 1002, ¶¶244–245.

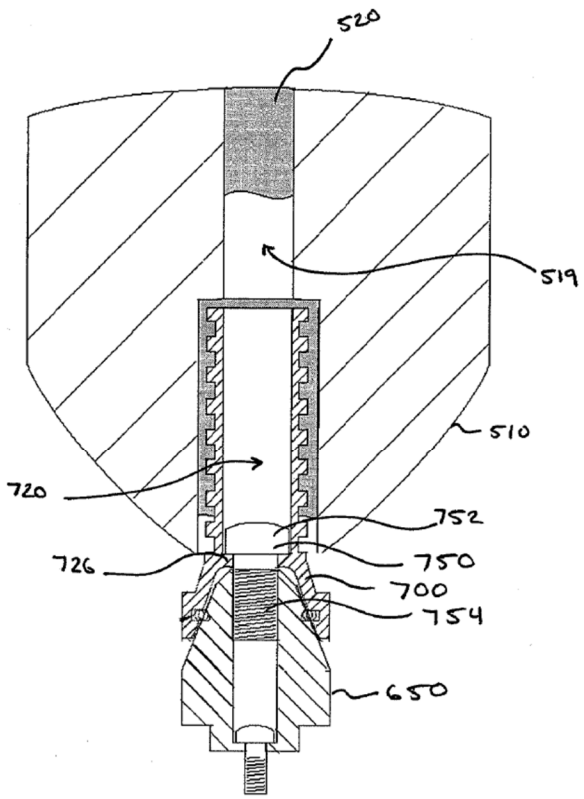


Figure 12

Bernhard discloses that, and a POSA would understand that, elongate member 714 could be eliminated or made shorter so that central aperture 724 is at the proximal end of coping 700, because Bernhard describes member 714 as optional. Ex. 1003, [0128] ("[C]oping 700 can include an elongate member 714 … ."), [0013], [0149], [0158], [0176], Fig. 7A. Furthermore, a POSA would understand that member 714 would not be needed because of the additional stability created by the temporary fastener. Moreover, it would have been obvious to make member 714 shorter because Poovey teaches that with his temporary

screw, "[t]he impression coping is shorter in height." Ex. 1005, [0084]; Ex. 1002, ¶246.

d. Limitation 10(d)

As explained above, it would have been obvious to use a temporary fastener in Bernhard's system, based on the design of threaded fastener 750 but with flexible buttress threads that engage the threads in bore 654 of abutment 650 to temporarily connect abutment 650 to coping 700. Like threaded fastener 750, this temporary fastener would have a longitudinal axis with a length measured along the longitudinal axis and a width dimension measured perpendicular to the longitudinal axis. Ex. 1003, [0134], Figs. 8, 12; Ex. 1002, ¶¶247–248.

e. Limitation 10(e)

As explained above, the temporary fastener with flexible buttress threads would be based on the design of threaded fastener 750 and include a head like head 752 that is wider than aperture 724 of coping 700 so that the head makes contact with rim 726 to hold coping 700 against abutment 650. Ex. 1003, [0134], Figs. 8, 12; Ex. 1002, ¶¶249–250. Like head 752, the head of the temporary fastener would have a proximal end with a drive tool interface sized and configured for rotating the temporary fastener to a predetermined torque. Ex. 1003, [0134], Figs. 8, 12; Ex. 1002, ¶251. A POSA would understand that the temporary fastener should be threaded into bore 654 with a torque driver up to a predetermined torque,

in order to cause the head of the temporary fastener to hold coping 700 in alignment with abutment 650. Ex. 1003, [0134], Figs. 8, 12; Ex. 1002, ¶251. Like head 752, the head of the temporary fastener would make contact with rim 726 and reside external to central aperture 724 of coping 700. Ex. 1003, [0134], Figs. 8, 12; Ex. 1002, ¶251. As explained above for limitation 10(c), Bernhard discloses that elongate member 714 is optional, in which case central aperture 724 would be at the proximal end of coping 700. Ex. 1002, ¶¶246, 251.

f. Limitation 10(f)

As explained above, the temporary fastener with flexible buttress threads would include a head like head 752 and a threaded shaft like shaft 754 but with asymmetric buttress threads. Ex. 1003, [0134], Figs. 8, 12; Ex. 1002, ¶252. Like shaft 754, the threaded shaft of the temporary fastener would be coupled to the head and extend through central aperture 724 of coping 700. Ex. 1003, [0134], Figs. 8, 12; Ex. 1002, ¶252.

g. Limitation 10(g)

As explained above, the temporary fastener with flexible buttress threads would include a threaded shaft like shaft 754 but with asymmetric buttress threads. Therefore, the distal portion of the shaft of the temporary fastener would have an outer surface with asymmetric shaft threading that has an asymmetric shaft threading contour. This asymmetric shaft threading contour would be different

than the symmetric threads contour of the symmetric threads of bore 654 of abutment 650. Ex. 1003, [0134], Figs. 8, 12; Ex. 1002, ¶253. Therefore, the shaft threading contour of the outer surface of the distal portion of the shaft of the temporary fastener would "not essentially match" the implant abutment threads contour.[7]

h. Limitation 10(h)

As explained above, the temporary fastener with flexible buttress threads would include a head like head 752 and a threaded shaft like shaft 754 but with asymmetric buttress threads. Like shaft 754, the shaft of the temporary fastener would have a proximal portion below rim 726 with an outer surface devoid of shaft threading, between the head and the threaded portion that is threaded into bore 654 of abutment 650. Ex. 1003, [0134], Fig. 12; Ex. 1002, ¶254.

i. Limitation 10(i)

As explained above, the temporary fastener with flexible buttress threads would include a head like head 752 and a threaded shaft like shaft 754 but with

[7] As explained above in section IX.A.2 in Ground 1, the "does not essentially match" limitation is indefinite. However, for purposes of this Ground 3, Petitioner has assumed that this limitation is definite, i.e. that it is disclosed if the temporary fastener threading contour and the implant abutment threads contour are different.

buttress threads that engage the threads in bore 654 of abutment 650 until the head contacts rim 726, in order to connect coping 700 and abutment 650. Thus, this temporary fastener would be configured so that the distal shaft portion of the shaft extends through central aperture 724 of coping 700 and engages the threads in bore 654 of implant abutment 650 at a predetermined torque, such that the shaft threading engages and cooperates with the threads of implant abutment 650, and is sized and configured to pull coping 700 into position with abutment 650. Ex. 1003, [0134], Figs. 8, 12. A POSA would understand that the temporary fastener should be threaded into bore 654 with a torque driver up to a predetermined torque, in order to cause the proximal head portion of the fastener to pull coping 700 into position with abutment 650. *Id.*; Ex. 1002, ¶¶255–256.

j. Limitation 10(j)

As explained above, the temporary fastener would be designed so that the flexible buttress threads enable the temporary fastener to be pulled out of bore 654 of implant abutment 650. Thus, the temporary fastener would be configured so that in response to application of an axial release force above a predetermined value in a proximal direction, coping 700 and the temporary fastener are released as a unit from implant abutment 650. Ex. 1003, [0066], [0067]; Ex. 1005, [0084]; Ex. 1002, ¶¶257–258.

k. Limitation 10(k)

As shown in Figure 9 of Bernhard below, coping 700 is bonded to prosthesis 510 with bonding agent 518 when coping 700 is temporarily connected to implant abutment 650. Ex. 1003, [0131], Fig. 9.

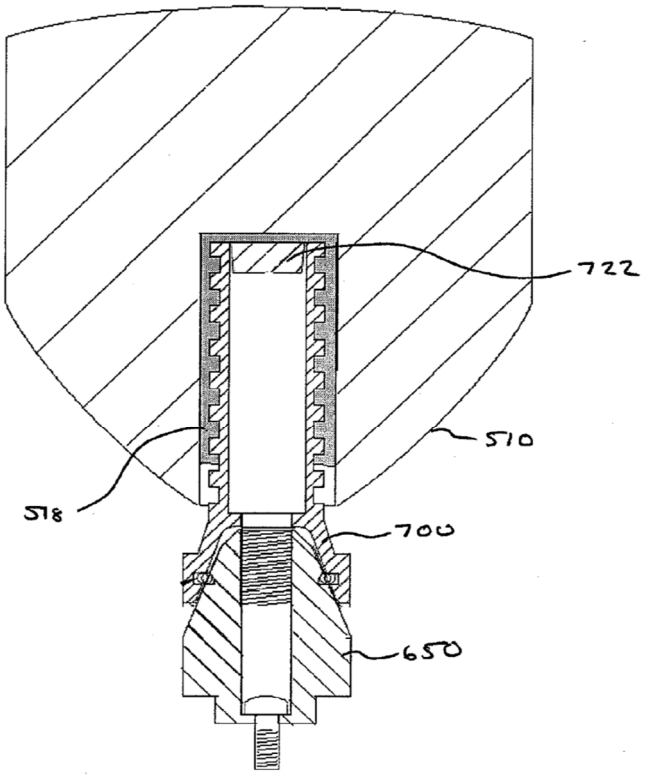


Figure 9

As explained above, it would have been obvious to use a temporary fastener with flexible buttress threads to temporarily connect coping 700 to implant abutment 650. The temporary fastener would be designed so that the flexible buttress threads enable the temporary fastener and coping 700 to be pulled out of bore 654 of abutment 650 when the dentist removes prosthesis 510 from the

patient's jaw during a pick-up process, including a closed-tray impression process. Ex. 1002, ¶260.

Therefore, the axial force above the predetermined value in the proximal direction would be configured to be applied in a pick-up process after coping 700 is adhesively bonded to prosthesis 510 or in a closed tray impression process. Ex. 1002, ¶261.

3. Claim 12

As explained above, it would have been obvious to use a temporary fastener with flexible buttress threads in Bernhard's system.

As taught by Poovey, the flexible threads of the temporary fastener would be made from or coated with a flexible material, such as silicone, a polymer. Ex. 1005, [0084]; Ex. 1002, ¶263.

4. Claim 15

Bernhard discloses a definitive screw (threaded fastener 750) with threads configured to engage the threads of bore 654 of implant abutment 650. Ex. 1003, [0105], [0130], [0134], Figs. 3, 12.

As explained above, it would have been obvious to use a temporary fastener in Bernhard's system, based on the design of threaded fastener 750 but with flexible buttress threads that have a smaller proximal thread angle and a smaller

thread depth than the symmetric threads of threaded fastener 750. Ex. 1002, ¶¶221–222, 266.

Given the smaller thread depth, a maximal width of the distal portion of the shaft of the temporary fastener would be smaller than a maximal width of the threads of the definitive screw. Ex. 1002, ¶267.

5. Claim 16

Bernhard discloses a definitive screw (threaded fastener 750) with threads configured to engage the threads of bore 654 of implant abutment 650. Ex. 1003, [0105], [0130], [0134], Figs. 3, 12.

As explained above, it would have been obvious to use a temporary fastener with flexible buttress threads in Bernhard's system. The asymmetric buttress threads would have a smaller proximal thread angle. As a result, the temporary fastener threads would contact a smaller area of the symmetric threads of bore 654 of abutment 650 than the matching, symmetric threads of shaft 754 of threaded fastener 750. Ex. 1003, [0134], Fig. 12; Ex. 1002, ¶270.

Indeed, Patent Owner confirmed this for the buttress thread of the temporary fastener of Figure 75 during prosecution of the '992 patent. Patent Owner told the examiner that the asymmetric threads of the temporary fastener of Figure 75 make contact with less area of, and occupy less volume of, threads 18 of abutment 8 than the threads of definitive screw 75 of Figure 9 because of "the open space created

on the proximal side of the male thread" of the temporary fastener "due to the angle lying closer to the axis." Ex. 1015 at 298; Ex. 1002, ¶270.

Therefore, the profile pattern of the threading of the temporary fastener would be configured to define a first abutment contact area with the threads of implant abutment 650, a profile pattern of the threads of the definitive screw (threaded fastener 750) would be configured to define a second abutment contact area with the threads of abutment 650, and the first abutment contact area would be less than the second abutment contact area. Ex. 1003, [0134], Fig. 12; Ex. 1002, ¶271.

D. Ground 4: Claims 1–9, 11, 13 and 14 Would Have Been Obvious Based on Bernhard In View of Poovey, Gracco and Derey

Claims 1–9, 11, 13 and 14 are unpatentable under Section 103 because they would have been obvious to a POSA before the earliest claimed effective filing date of October 9, 2018, based on Bernhard in view of Poovey, Gracco and Derey. Ex. 1002, ¶¶272–374.

1. Motivation to Modify Bernhard In View of Poovey, Gracco and Derey

As explained in section IX.C.1 above, it would have been obvious to modify Bernhard's system in view of Poovey and Gracco to use a temporary fastener based on the design of threaded fastener 750 but with flexible buttress threads.

Claims 1–9, 11, 13 and 14 would have been obvious in further view of Derey. Ex. 1002, ¶275.

Claims 1, 6 and 8 require the distal shaft portion of the temporary fastener to not engage the implant abutment threads continuously. Ex. 1001, 26:9–13, 27:6–10, 27:46–50. Dependent claims 2–5, 7 and 9 depend from claim 1 but do not modify the above limitation. Claim 11 requires the temporary fastener to not have a continuous threading contour. *Id.*, 28:42–44. Claims 7 and 9 require the distal shaft portion of the temporary fastener to have an open space (claim 7) or to be hollow (claim 9). *Id.*, 27:11–14, 27:61–63. Claim 13 requires the temporary fastener to include a PEEK material. *Id.*, 28:47–48. Claim 14 requires the distal shaft portion of the temporary fastener to deform when the fastener and the coping are pulled out of the abutment. *Id.*, 28:49–54.

Derey teaches that a temporary fastener made of a polymer with two deflecting legs that grip the internal threads in the bore is a stable and secure connector that can be pulled out when the impression is removed. Ex. 1008 at 4, 9–10, Figs. 5, 6; Ex. 1002, ¶281.

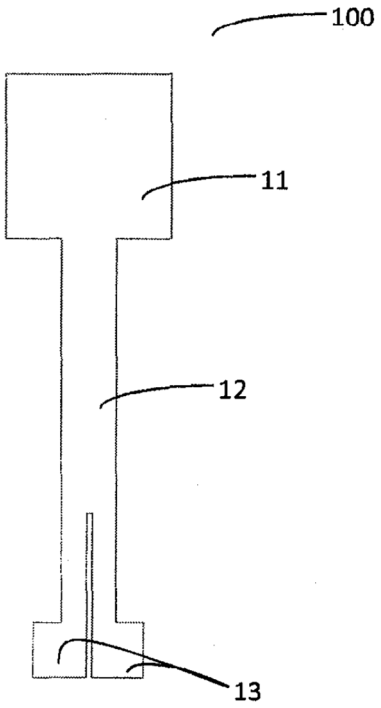


Fig. 5

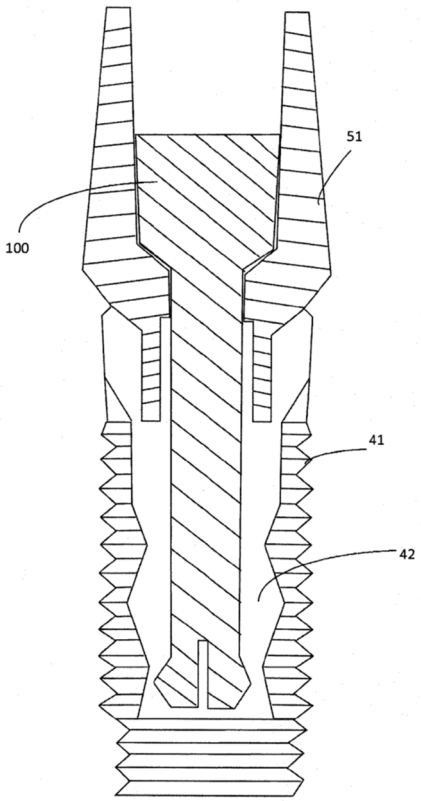


Fig. 6

Based on Derey, a POSA would have been motivated to design the temporary fastener to have a slot to create a split-post structure with deflecting legs, in order to make it easier to pull the fastener out of the abutment while still ensuring that the temporary connection is stable and secure. *Id.*, ¶282. As taught by Derey, the slot that creates the split-post structure would allow the portion of the temporary fastener that is threaded into threaded bore 654 of abutment 650 to deflect inwardly, which would facilitate removing the temporary fastener from abutment 650 when the prosthesis is removed from the jaw. Ex. 1008 at 4, 9–10, Figs. 5, 6; Ex. 1002, ¶282.

A POSA would have had a reasonable expectation of success designing such a split-post temporary fastener with deflecting legs because this is a predictable technology and this would have been well within the level of ordinary skill. In particular, a POSA would have understood how to design the length and width of the slot and deflecting legs to achieve the objectives of maintaining a secure and stable temporary connection while enabling the temporary fastener to be pulled out without being unscrewed. *Id.*, ¶283.

As explained below, this split-post temporary fastener with flexible buttress threads would have all the features of claims 1–9, 11, 13 and 14. *Id.*, ¶284.

2. Claim 1

a. Limitation 1(a)

Bernhard discloses a dental system comprising implant abutment 650, coping 700, and a definitive screw (threaded fastener 750) with threaded shaft 754 that engages the threads in bore 654 of abutment 650 to permanently connect abutment 650 to coping 700. Ex. 1003, [0105], [0130], [0134], Figs. 3, 12.

Coping 700 is temporarily connected to abutment 650 by resilient spring 708 that engages annular slot 652. *Id.*, [0124], [0126], [0130], Fig. 8; Ex. 1002, ¶289.

As explained above, it would have been obvious to use a temporary fastener in Bernhard's system, based on the design of threaded fastener 750, but with a split-post structure and flexible buttress threads that engage the threads in bore 654

of abutment 650 to temporarily connect coping 700 to abutment 650. Ex. 1002, ¶¶287–290.

b. Limitation 1(b)

Figures 7A and 8 in Bernhard disclose that coping 700 includes an aperture at the proximal end which leads to aperture 724 that leads to bore 654 of implant abutment 650. Ex. 1003, [0129], Figs. 7A, 8; Ex. 1002, ¶291.

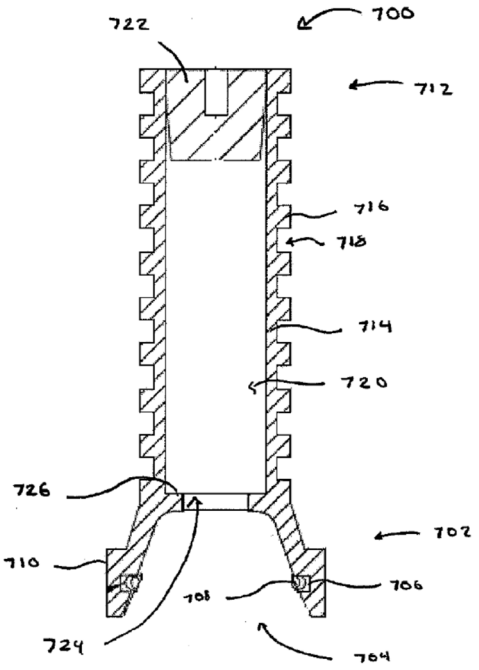


Figure 7A

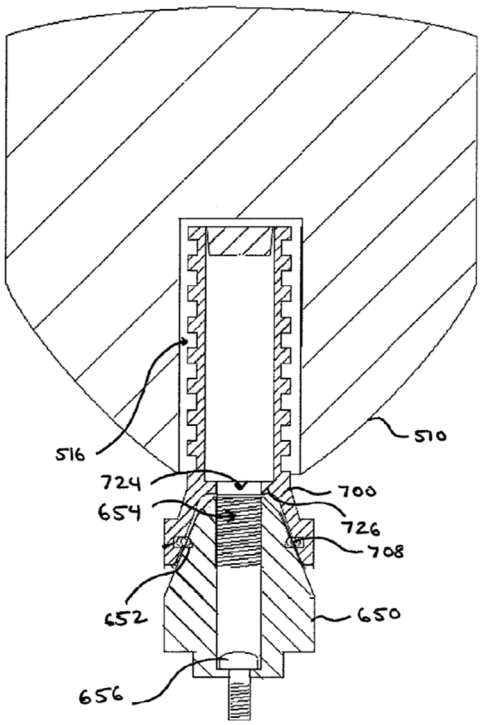


Figure 8

The aperture at the proximal end of coping 700 and aperture 724 in coping 700 are both larger than shaft 754 of threaded fastener 750. Ex. 1003, [0134], Fig. 12; Ex. 1002, ¶¶292–293.

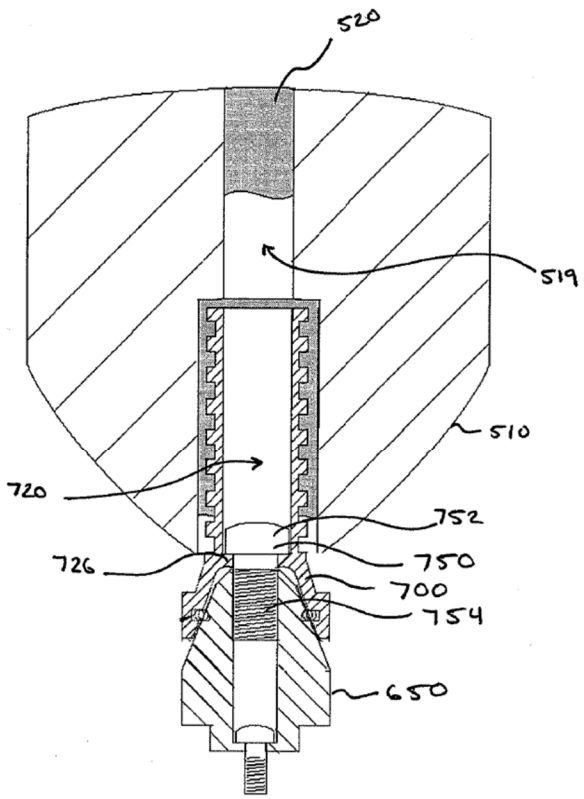


Figure 12

Bernhard discloses that, and a POSA would understand that, elongate member 714 could be eliminated or made shorter so that aperture 724 is at the proximal end of coping 700, because Bernhard describes member 714 as optional. Ex. 1003, [0128] ("[C]oping 700 can include an elongate member 714 … ."), [0013], [0149], [0158], [0176], Fig. 7A. Furthermore, a POSA would understand that member 714 would not be needed because of the additional stability created by the temporary fastener. Moreover, it would have been obvious to make member 714 shorter because Poovey teaches that with his temporary screw, "[t]he impression coping is shorter in height." Ex. 1005, [0084]; Ex. 1002, ¶294.

c. Limitation 1(c)

As shown in Figure 8 of Bernhard, bore 654 of implant abutment 650 has female threads. Ex. 1003, [0130], Fig. 8; Ex. 1002, ¶295.

d. Limitation 1(d)

As shown in Figure 12, Bernhard discloses a definitive screw (threaded fastener 750) with threads configured to engage the threads of bore 654 of implant abutment 650. Ex. 1003, [0105], [0130], [0134], Figs. 3, 12. Threaded fastener 750 includes a proximal head end (head 752) with a tool interface, and shaft 754 with a distal post portion with threads configured to secure coping 700 to the threads in bore 654 of abutment 650. *Id.*, [0134], Figs. 8, 12; Ex. 1002, ¶¶296–298.[8] The distal post portion of shaft 754 is sized to extend through the aperture at the proximal end of coping 700 and aperture 724 of coping 700. *Id.*, [0134], Figs. 8, 12; Ex. 1002, ¶¶297–298.

[8] As explained above in section IX.B.3 in Ground 2, this limitation is not described or enabled by the '781 patent specification. However, for purposes of this Ground 4, Petitioner has assumed that this limitation is supported, i.e. that it is disclosed if the definitive screw threads secure the coping to the implant abutment, even if the definitive screw threads do not secure the coping to the threads of the abutment.

e. Limitation 1(e)

As explained above, it would have been obvious to use a temporary fastener in Bernhard's system, based on the design of threaded fastener 750 but with a split-post structure and flexible buttress threads.

Like threaded fastener 750, the temporary fastener would have a longitudinal axis with a length measured along the longitudinal axis. Ex. 1003, [0134], Figs. 8, 12; Ex. 1002, ¶¶299–301. Moreover, because of the asymmetric buttress thread, the temporary fastener would have a lateral dimension providing different widths along the axis measured perpendicular to the longitudinal axis, i.e. at the thread peaks and troughs. Furthermore, the head of the temporary fastener would have a maximum diameter that is greater than the width of the threads. Ex. 1003, [0134], Figs. 8, 12; Ex. 1002, ¶¶299–301.

f. Limitation 1(f)

As explained above, the temporary fastener with a split-post structure and flexible buttress threads would include a proximal portion (a head) like head 752 of threaded fastener 750. Like head 752, the temporary fastener head would be wider than aperture 724 of coping 700, so that the head makes contact with rim 726 to hold coping 700 against implant abutment 650. Ex. 1003, [0134], Figs. 8, 12; Ex. 1002, ¶302. As explained above for limitation 1(b), Bernhard discloses that

elongate member 714 is optional, in which case aperture 724 would be at the proximal end of coping 700. Ex. 1002, ¶¶294, 302.

g. Limitation 1(g)

As explained above, the temporary fastener would include a threaded shaft like shaft 754 but with asymmetric buttress threads. Like shaft 754, the temporary fastener shaft would be threaded into bore 654 of implant abutment 650 to hold coping 700 against abutment 650. Ex. 1003, [0134], Figs. 8, 12; Ex. 1002, ¶¶303–304. Therefore, like shaft 754, the temporary fastener shaft would include a distal shaft portion sized and configured for rotary engagement with the threads of bore 654 of abutment 650.

h. Limitation 1(h)

As explained above, the temporary fastener would have a head like head 752 and a shaft like shaft 754 but with a split-post structure and asymmetric buttress threads. Ex. 1003, [0134], Figs. 8, 12; Ex. 1002, ¶¶305–307.

Like shaft 754, the temporary fastener shaft would extend through the aperture at the proximal end of the coping 700 and aperture 724 of coping 700, and the distal shaft portion would engage the threads in bore 654 of the implant abutment 650 with an engagement depth at a predetermined torque. A POSA would understand that the temporary fastener should be threaded into bore 654 with a torque driver up to a predetermined torque, in order to cause the head to

hold coping 700 in alignment with abutment 650, like head 752. Ex. 1003, [0134], Figs. 8, 12.

Therefore, the temporary fastener shaft would extend through the aperture at the proximal end of coping 700 and aperture 724 of coping 700, and the distal shaft portion would engage with the threads of bore 654 of abutment 650 with an engagement depth at a predetermined torque, and would be configured to cause the proximal portion of the temporary fastener to hold coping 700 into alignment with implant abutment 650 prior to attachment of the definitive screw. Ex. 1002, ¶307.

i. Limitation 1(i)

As explained above, the temporary fastener would be designed so that the split-post structure and the flexible buttress threads enable the temporary fastener to be pulled out of bore 654 of abutment 650. Thus, the temporary fastener would be configured to release the temporary fastener and coping 700 from implant abutment 650 as a unit when an axial release force is applied in a proximal direction to the temporary fastener. Ex. 1003, [0066]; Ex. 1005, [0084]; Ex. 1002, ¶¶308–309.

j. Limitation 1(j)

As explained above, the temporary fastener would include a threaded shaft like shaft 754 but with a split-post structure and asymmetric buttress threads. Ex. 1003, [0134], Figs. 8, 12. The gap on either side of the threaded shaft created by

the slot of the split-post structure would interrupt the helical thread pattern so that the thread pattern is not continuous. Therefore, the distal shaft portion would be sized and configured so that it does not engage the threads of bore 654 of implant abutment 650 continuously between a most distal position of the distal shaft portion and a proximal end of the threads of bore 654 of abutment 650. Ex. 1002, ¶¶310–311.

k. Limitation 1(k)

As explained above, it would have been obvious to use a temporary fastener with a split-post structure and flexible buttress threads in Bernhard's system. The asymmetric buttress threads would have a smaller proximal thread angle. As a result, the temporary fastener threads would contact a smaller area of the symmetric threads of bore 654 of implant abutment 650 than the matching, symmetric threads of shaft 754 of threaded fastener 750. Ex. 1003, [0134], Fig. 12; Ex. 1002, ¶312.

Indeed, Patent Owner confirmed this for the buttress thread of the temporary fastener of Figure 75 during prosecution of the '992 patent. Patent Owner told the examiner that the asymmetric threads of the temporary fastener of Figure 75 make contact with less area of, and occupy less volume of, threads 18 of abutment 8 than the threads of definitive screw 75 of Figure 9 because of "the open space created

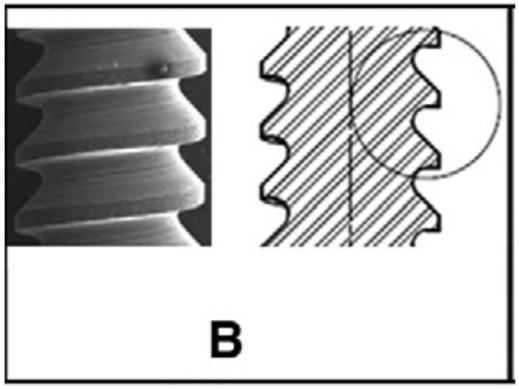
on the proximal side of the male thread" of the temporary fastener "due to the angle lying closer to the axis." Ex. 1015 at 298; Ex. 1002, ¶312.

Therefore, the distal shaft portion of the temporary fastener would have threading that is sized and configured to make contact with the threads of bore 654 of implant abutment 650 over a first threading contact area to hold coping 700 against implant abutment 650, the distal post portion of the definitive screw (threaded fastener 750) is sized and configured to make contact with the threads of bore 654 of implant abutment 650 over a second threading contact area to hold coping 700 against implant abutment 650, and the first threading contact area is less than the second abutment contact area. Ex. 1003, [0134], Fig. 12; Ex. 1002, ¶313.

3. Claim 2

As explained above, it would have been obvious to use a split-post temporary fastener with flexible buttress threads in Bernhard's system.

As further explained above, the buttress thread pattern on the distal shaft portion of the temporary fastener would be asymmetric, like thread B in Figure 1 of Gracco. Ex. 1006, Fig. 1 (B); Ex. 1002, ¶315.



4. Claim 3

As shown in Figure 9 of Bernhard below, coping 700 is bonded to prosthesis 510 with bonding agent 518 when coping 700 is temporarily connected to implant abutment 650. Ex. 1003, [0131], Fig. 9.

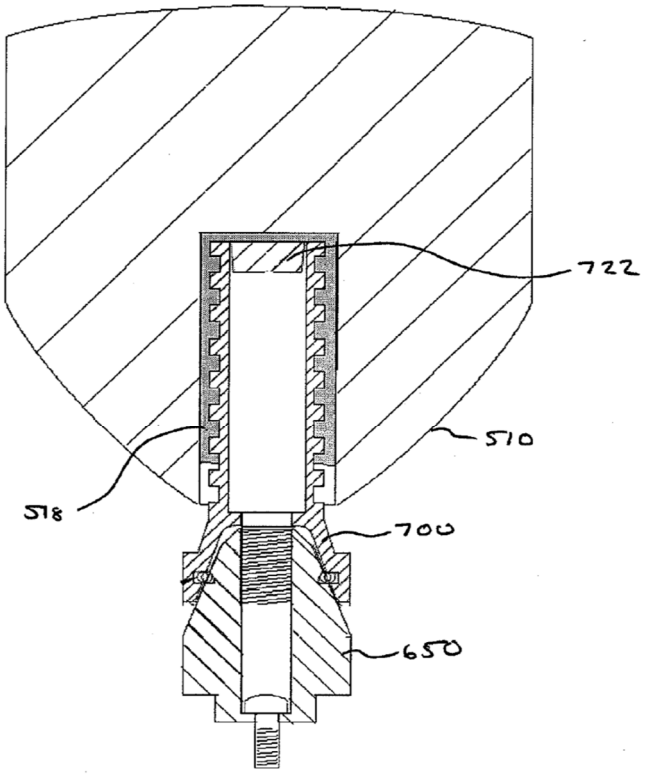


Figure 9

As explained above, it would have been obvious to use a split-post temporary fastener with flexible buttress threads in Bernhard's system to temporarily connect coping 700 to implant abutment 650. Moreover, the temporary fastener would be designed so that the split-post structure and the flexible buttress threads enable the temporary fastener and coping 700 to be pulled out of bore 654 of abutment 650 when the dentist removes prosthesis 510 from the patient's jaw during a pick-up process. Ex. 1002, ¶¶316–319.

Therefore, the axial release force in the proximal direction would be applied through a pick-up process in which coping 700 is bonded and/or adhered to a dental element, i.e. prosthesis 510.

5. Claim 4

As shown in Figure 12 of Bernhard below, the threads of shaft 754 on the distal post portion of the definitive screw (threaded fastener 750) are continuous, and therefore include a continuous form. Ex. 1003, Fig. 12; Ex. 1002, ¶321.

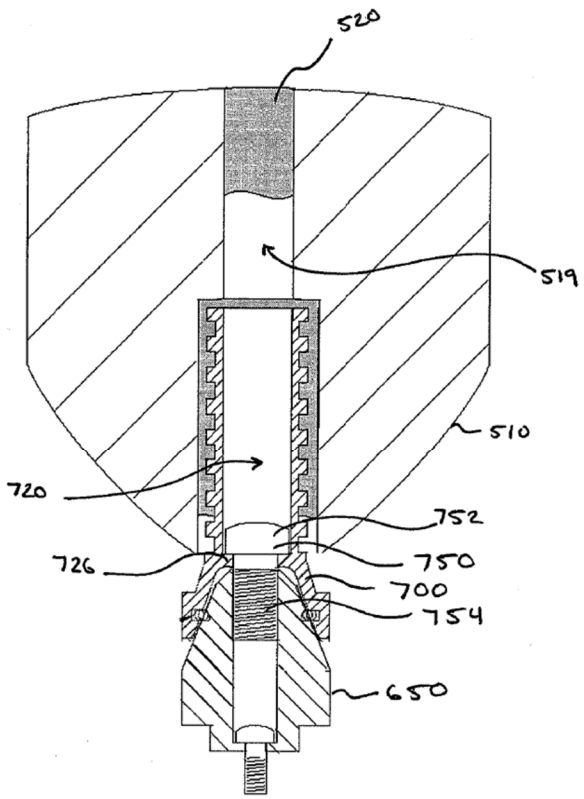


Figure 12

6. Claim 5

As explained above, it would have been obvious to use a split-post temporary fastener with flexible buttress threads in Bernhard's system.

As taught by Poovey, the flexible threads of the temporary fastener would be made from or coated with a flexible or pliable material, such as silicone, so that the threads deform when the temporary fastener and coping 700 are pulled out of implant abutment 650. Ex. 1005, [0079], [0084]; Ex. 1002, ¶¶324–325.

Therefore, the distal shaft portion of the temporary fastener would include an outer surface which is sized and configured to deform in response to the axial

release force in the proximal direction, and at least a portion of the temporary fastener and coping 700 would be released together as the unit.

7. Claim 6

a. Limitations 6(a)–6(c), 6(e)–6(g) and 6(j)

Limitations 6(a), 6(b), 6(c), 6(e), 6(f), 6(g) and 6(j) are the same as limitations 1(a), 1(b), 1(c), 1(e), 1(f), 1(g) and 1(j). Therefore, the analysis in sections IX.D.2.a–c, e–g and j above for limitations 1(a)–1(c), 1(e)–1(g) and 1(j) applies to limitations 6(a)–6(c), 6(e)–6(g) and 6(j). Ex. 1002, ¶¶328–330, 332–334, 337.

b. Limitation 6(d)

Limitation 6(d) is the same as limitation 1(d) except for (i) the removal of "configured" before "for securing" and (ii) the addition of "after processing" after "abutment." Therefore, the analysis in section IX.D.2.d above for limitation 1(d) applies to limitation 6(d) with the following addition: The definitive screw (threaded fastener 750) secures coping 700 to implant abutment 650 after pick-up processing. Ex. 1003, [0134], Fig. 12; Ex. 1002, ¶331.

c. Limitation 6(h)

Limitation 6(h) is the same as limitation 1(h) except for (i) the replacement of "extends" with "is sized and configured to extend," (ii) the replacement of "engages" with "to engage" after "portion," and (iii) the removal of "prior to attachment of the definitive screw" after "abutment." Therefore, the analysis in

section IX.D.2.h above for limitation 1(h) applies to limitation 6(h). Ex. 1002, ¶335.

d. Limitation 6(i)

Limitation 6(i) is the same as limitation 1(i) except for (i) the replacement of "when" with "in response to" after "unit," (ii) the addition of "that" before "is applied," (iii) the addition of "only" after "is applied," and (iv) the addition of "whereby the axial release force is applied without rotation of the temporary fastener." Therefore, the analysis in section IX.D.2.i above for limitation 1(i) applies to limitation 6(i) with the following addition: As explained above, the temporary fastener would be designed so that the split-post structure and the flexible buttress threads enable the temporary fastener to be pulled out of bore 654 of implant abutment 650 without being unscrewed, i.e. without rotating the temporary fastener. Ex. 1005, [0079], [0084]; Ex. 1002, ¶336.

8. Claim 7

As explained above, it would have been obvious to use a split-post temporary fastener with flexible buttress threads in Bernhard's system.

The distal shaft portion of this temporary fastener would include an open space inside the slot between the two deflecting legs, and the open space would encompass a portion of the longitudinal axis of the fastener. Ex. 1002, ¶340.

9. Claim 8

a. Limitations 8(a)–8(c), 8(e), 8(f), 8(i) and 8(j)

Limitations 8(a), 8(b), 8(c), 8(e), 8(f), 8(i) and 8(j) are the same as limitations 1(a), 1(b), 1(c), 1(e), 1(f), 1(i) and 1(j). Therefore, the analysis in sections IX.D.2.a–c, e, f, i, and j above for limitations 1(a)–1(c), 1(e), 1(f), 1(i) and 1(j) applies to limitations 8(a)–8(c), 8(e), 8(f), 8(i) and 8(j). Ex. 1002, ¶¶341–345, 347–348, 350–352.

b. Limitation 8(d)

Limitation 8(d) is the same as limitation 1(d) except for the removal of "configured" before "for securing." Ex. 1002, ¶346. Therefore, the analysis in section IX.D.2.d above for limitation 1(d) applies to limitation 8(d). *Id*.

c. Limitation 8(g)

Limitation 8(g) is the same as limitation 1(g) except for the addition of "prior to attachment of the definitive screw" after "threads." Ex. 1002, ¶349. Therefore, the analysis in section IX.D.2.g above for limitation 1(g) applies to limitation 8(g) with the following addition: As explained above, the threaded shaft of the temporary fastener would be configured for rotary engagement with the threads of bore 654 of implant abutment 650 to temporarily connect coping 700 to abutment 650, prior to the attachment of the definitive screw (threaded fastener 750) to abutment 650. Ex. 1003, [134], Fig. 12; Ex. 1002, ¶349.

d. Limitation 8(h)

Limitation 8(h) is the same as limitation 1(h) except for the removal of "prior to attachment of the definitive screw" after "abutment." Ex. 1002, ¶350. Therefore, the analysis in section IX.D.2.h above for limitation 1(h) applies to limitation 8(h). *Id*.

e. Limitation 8(k)

As explained above, it would have been obvious to use a temporary fastener with a split-post structure and flexible buttress threads in Bernhard's system. As further explained above, the asymmetric buttress threads would have a smaller proximal thread angle. As a result, the temporary fastener threads would occupy a smaller volume of the symmetric threads of bore 654 of implant abutment 650 than the matching, symmetric threads of shaft 754 of threaded fastener 750. Ex. 1003, [0134], Fig. 12; Ex. 1002, ¶¶353–354.

Indeed, Patent Owner confirmed this for the buttress thread of the temporary fastener of Figure 75 during prosecution of the '992 patent. Patent Owner told the examiner that the asymmetric threads of the temporary fastener of Figure 75 make contact with less area of, and occupy less volume of, threads 18 of abutment 8 than the threads of definitive screw 75 of Figure 9 because of "the open space created on the proximal side of the male thread" of the temporary fastener "due to the angle lying closer to the axis." Ex. 1015 at 298; Ex. 1002, ¶354.

Therefore, a volume of the definitive screw post material of the distal post portion of the definitive screw (threaded fastener 750) that is located distally of the proximal end of the threads of bore 654 of implant abutment 650 when in position to hold coping 700 against implant abutment 650 would be greater than a volume of the temporary fastener shaft material of the distal shaft portion of the temporary fastener that is located distally of the proximal end of the threads of bore 654 of implant abutment 650 when in position to hold coping 700 against implant abutment 650. Ex. 1003, [0134], Fig. 12; Ex. 1002, ¶355.

10. Claim 9

As explained above, it would have been obvious to use a temporary fastener with flexible buttress threads and a split-post structure in Bernhard's system.

The distal shaft portion of this temporary fastener would be hollow inside the slot. Poovey discloses making the threads of the temporary fastener out of a flexible material, such as silicone (a polymer), and Derey discloses making his device out of a polymer. Ex. 1005, [0079], [0084]; Ex. 1008 at 4, 9; Ex. 1002, ¶¶358–359.

11. Claim 11

As explained above, it would have been obvious to use a temporary fastener with flexible buttress threads and a split-post structure in Bernhard's system.

The gap on either side of the threaded shaft of the temporary fastener created by the slot of the split-post structure would interrupt the helical thread pattern so that the shaft threading of the temporary fastener would not have a continuous threading contour along its path around the longitudinal axis. Ex. 1002, ¶362.

12. Claim 13

As explained above, it would have been obvious to use a temporary fastener with flexible buttress threads and a split-post structure with deflecting legs in Bernhard's system.

It also would have been obvious to a POSA to make the split-post temporary fastener with deflecting legs out of a PEEK material. Ex. 1002, ¶365.

PEEK (polyetheretherketone) is a well-known thermoplastic polymer used in the dental implant and prosthesis field. Ex. 1002, ¶366. PEEK has similar characteristics to Toarplast POM (polyoxymethylene), a thermoplastic that Derey teaches to make his temporary connector with deflecting legs. Ex. 1008 at 9; Ex. 1002, ¶367. Bernhard also teaches making a temporary connector with deflecting legs out of PEEK. Ex. 1003, [0155]–[0158], Figs. 27A, 27B. Bernhard's snap-fit connector, shown in Figures 27A and 27B below, has a provisional connection feature 1406 in the form of elongate resilient fingers 1408 with an engagement protrusion 1410 that snap fits into a groove and can press against an interior surface, such as a recess or a bore. *Id.*, [0155]–[0157], Figs. 27A, 27B. Bernhard

teaches that the resilient fingers can be made out of PEEK. *Id.*, [0158]; Ex. 1002, ¶368.

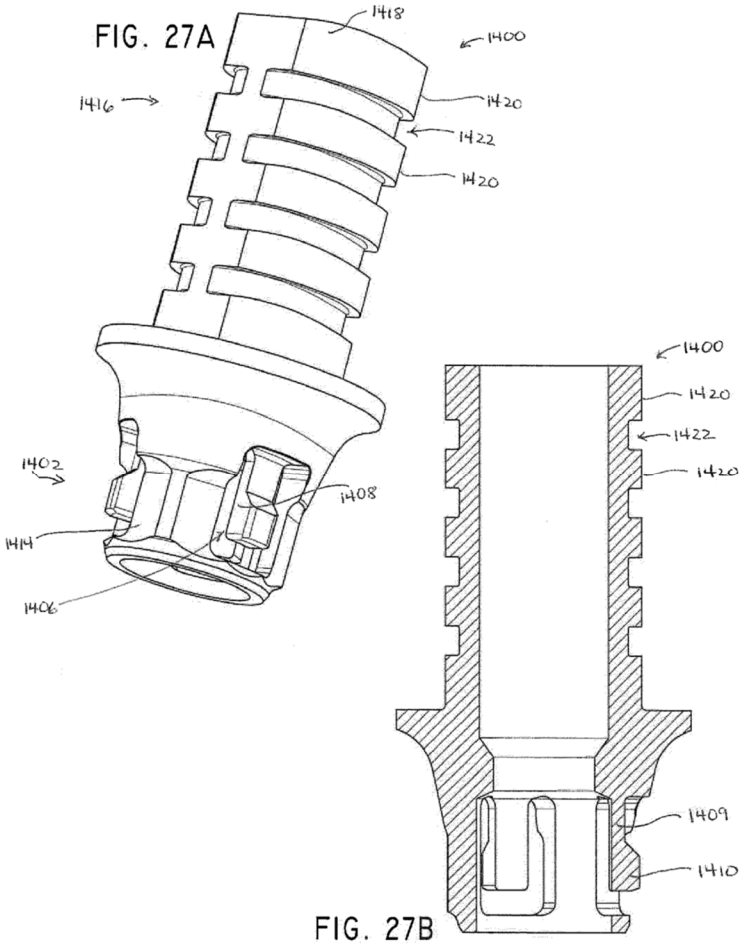


FIG. 27B

A POSA would have been motivated, based on Derey and Bernhard, to make the split-post temporary fastener with deflecting legs out of PEEK, because PEEK has a high strength but would still enable the deflecting legs to deflect so that the temporary fastener could be pulled out of implant abutment 650 without being unscrewed. A POSA would have had a reasonable expectation of success because PEEK is a well-known material used in the dental implant and prosthesis field and

designing the temporary fastener out of PEEK would have been within the level of ordinary skill. Ex. 1002, ¶¶369–370.

13. Claim 14

As explained above, it would have been obvious to use a temporary fastener with flexible buttress threads and a split-post structure with deflecting legs in Bernhard's system.

The two deflecting legs would deflect inwardly into the hollow portion created by the slot in response to an axial force in the proximal direction and thereby enable the temporary fastener and coping 700 to be pulled out of bore 654 of implant abutment 650 without having to unscrew the temporary fastener. Ex. 1002, ¶373.

Therefore, the distal shaft portion of the shaft of the temporary fastener would be configured to deform during the application of the axial force in the proximal direction to thereby release coping 700 and the temporary fastener as the unit from implant abutment 650. Ex. 1002, ¶374.

X. OBJECTIVE EVIDENCE OF NON-OBVIOUSNESS

Petitioner is not aware of any objective evidence of non-obviousness that could rebut the strong case of obviousness in Grounds 3 and 4.

The Board should reject any argument by Patent Owner that any commercial success of or praise for its "Separable Fastener" device is evidence of non-obviousness, because this evidence would have no nexus with claims 1–16.

In particular, Patent Owner's "Separable Fastener" device (shown below) does not satisfy several limitations of the claims.

First, the threaded post of the Separable Fastener has symmetric threads that appear to match the symmetric implant abutment threads and therefore the definitive screw threads. Therefore, the distal shaft portion of the threaded post does not have a different thread pattern than the definitive screw threads as required by claims 1–5 and 7–9 or the implant abutment threads as required by claims 10–16. Ex. 1002, ¶380.

Second, the threaded post of the Separable Fastener has a continuous thread. Therefore, the distal shaft portion of the threaded post continuously engages the abutment threads, instead of not continuously engaging the abutment threads as required by claims 1–9. Similarly, the distal shaft portion of the threaded post has a continuous threading contour along its path around the longitudinal axis, instead of not having a continuous threading contour as required by claim 11. Ex. 1002, ¶381.

Third, the threaded post of the Separable Fastener remains threaded in the abutment when the coping and the separable cap are pulled off the threaded post

and out of the abutment. Therefore, the outer surface of the distal shaft portion of the threaded post does not deform when the coping is pulled out of the abutment as required by claim 5. Similarly, the distal shaft portion of the threaded post does not deform when the coping is pulled out of the abutment as required by claim 14. Ex. 1002, ¶382.

Fourth, the threaded post of the Separable Fastener is solid. Therefore, the distal shaft portion does not have an open space as required by claim 7 and it is not hollow as required by claim 9. Ex. 1002, ¶383.

Finally, the distal shaft portion of the threaded post of the Separable Fastener appears to have the same maximum diameter as the implant abutment threads and therefore the definitive screw threads. Therefore, the distal shaft portion does not have a smaller maximal width than the definitive screw threads as required by claim 15. Ex. 1002, ¶384.





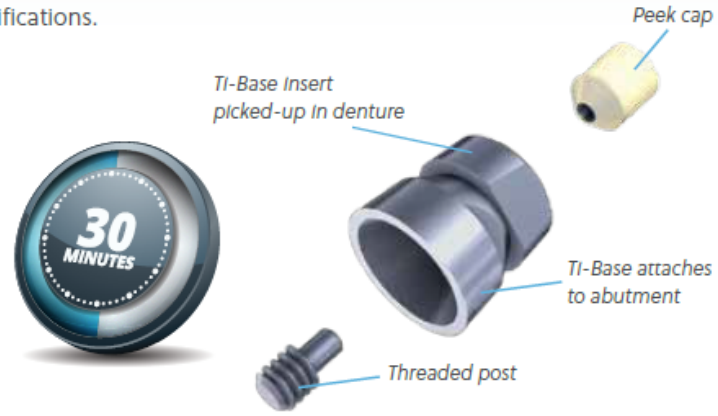
Smart Denture Conversions

Immediate full-arch provisionalization

Convert a stronger provisional in less time

Smart Denture Conversions eliminates the need for large holes in the denture by allowing a closed-tray pickup. This is possible by fastening the Ti-Base to a Multi-Unit Abutment with a unique prosthetic screw, the Separable Fastener.

The Separable Fastener divides into two pieces for the pickup and the denture can be easily removed from the mouth prior to major modifications.



Faster
Process dentures in 30 minutes vs. the traditional two hours, significantly reducing the overall treatment time.

The Separable Fastener is the revolutionary patented technology behind Smart Denture Conversions. It significantly simplifies the procedure for converting a removeable denture to a screw-retained fixed prosthesis by allowing for a closed-tray pickup.

The Separable Fastener secures the TiBase to the multi-unit abutment the same way as a prosthetic screw, except the PEEK Cap (Screw Head) and the Threaded Post are designed to separate, allowing the denture to be removed from the mouth. The PEEK Cap will disengage and remain in the TiBase for the pickup while the threaded post remains in the multi-unit abutment.

Ex. 1016 at 4; Ex. 1014 at 1–2.

XI. CONCLUSION

Petitioner respectfully requests that the Board institute a post grant review of claims 1–16, find the claims unpatentable, and cancel the claims.

Respectfully submitted,

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Counsel for Petitioner Straumann USA, LLC

CERTIFICATE OF COMPLIANCE

This petition complies with the word limit of 18,700 words because it has 18,355 words, excluding the parts exempted by 37 C.F.R. § 42.24(a). This petition also complies with the format requirements of 37 C.F.R. § 42.6(a) and has been prepared with Microsoft Word in 14 point Times New Roman font.

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CERTIFICATE OF SERVICE

The undersigned certifies that on June 4, 2025, true and correct copies of this petition, all of its exhibits, and Petitioner's power of attorney were served on the following counsel (at the Patent Center Correspondence Address for U.S. Patent No. 12,156,781) by Federal Express:

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