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. PGR2026-00070

U.S. Patent No. 12,551,319

Title: "Screw-Attached Pick-Up Dental Coping System And Methods"
Issued: February 17, 2026
Application No. 18/827,656
Filed: September 6, 2024

PETITION FOR POST GRANT REVIEW OF U.S. PATENT NO. 12,551,319

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EXHIBITS

Exhibit No.	Description
1001	U.S. Patent No. 12,551,319
1002	Expert Declaration of John B. Brunski, Ph.D.
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	Institution Decision in Case No. IPR2025-00956, instituted on November 21, 2025
1015	Prosecution History of U.S. Patent Application No. 18/328,730
1016	Institution Decision in Case No. PGR2025-00054, instituted on December 10, 2025
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	Order (Doc. 102) dated December 4, 2025 in *Smart Denture Conversions, LLC v. Straumann USA*, LLC, No. 1:24-cv-00507 (D. Del.)
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.)
1022	M. Jaarda, et al., "Geometric comparison of five interchangeable implant prosthetic retaining screws," 74 *Journal of Prosthetic Dentistry*, 373-379 (1995) (Jaarda).
1023	Prosecution History of U.S. Patent Application No. 18/827,656

CLAIM LISTING

1(a)	1. A dental system comprising:
1(b)	a coping having a proximal end with an aperture;
1(c)	an implant abutment having threads, wherein the implant abutment threads extend distally from a most proximal thread position;
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 through rotary engagement to a predetermined definitive fixation torque, wherein the distal post portion is sized and configured to extend through the aperture of the coping; and
1(e)	a temporary fastener having a longitudinal axis with a length measured along the longitudinal axis and a lateral dimension providing different widths along the longitudinal axis measured perpendicular to the longitudinal axis, the temporary fastener comprising a shaft comprising a distal shaft portion sized and configured for rotary engagement with the implant abutment threads,
1(f)	wherein the shaft of the temporary fastener is configured to extend through the aperture of the coping and the distal shaft portion is configured to engage the implant abutment threads through an engagement depth measured axially between a most distal contact position with the implant abutment threads and the most proximal thread position of the implant abutment threads and is configured so that a portion of the temporary fastener holds the coping in alignment with the implant abutment prior to attachment of the definitive screw,
1(g)	wherein the distal shaft portion of the temporary fastener is configured to rotate to couple to the implant abutment through the engagement depth and to a predetermined temporary holding torque whereby the temporary fastener holds the coping into alignment against the implant abutment,
1(h)	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(i)	wherein the distal shaft portion of the temporary fastener is sized and configured to make contact with the implant abutment threads over a first thread contact area to hold the coping against the implant abutment, wherein, after removal of the temporary fastener, the distal post portion of the definitive screw is sized and configured to make contact with the implant abutment threads over a second thread contact area to hold the coping against the implant abutment, and wherein the first thread contact area is less than the second thread contact area.
2	The dental system of claim 1 wherein the threads of the implant abutment comprise female threads, wherein the female threads have a radial extent bounded by a female thread minor diameter and a female thread major diameter, and wherein the female thread minor diameter is located closer to the longitudinal axis than the female thread major diameter.
3	The dental system of claim 2 wherein a maximal width of the distal post portion of the definitive screw having threads is larger than the female thread minor diameter of the implant abutment threads, and wherein a maximal width of the distal shaft portion of the temporary fastener sized and configured to make contact with the implant abutment threads is smaller than the width of the distal post portion of the definitive screw having threads.
4	The dental system of claim 2 wherein the distal shaft portion of the temporary fastener is configured to have a temporary fastener engagement volume extending radially beyond the female thread minor diameter and axially over the engagement depth, wherein the definitive screw is configured to have a definitive screw engagement volume extending radially beyond the female thread minor diameter and axially over the engagement depth, and wherein the definitive screw engagement volume is greater than the temporary fastener engagement volume.

5	The dental system of claim 1 wherein the distal shaft portion of the temporary fastener is configured to have discontinuous contact with the implant abutment threads throughout the engagement depth.
6(a)	The dental system of claim 1 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 in a pick-up process
6(b)	further comprising a dental prothesis bonded and/or adhered to the coping with the temporary fastener coupled to the implant abutment to hold the coping into alignment with the implant abutment, wherein the temporary fastener is configured to release, as a unit, at least a portion of the temporary fastener, the coping and the dental prosthesis bonded and/or adhered to the coping from the implant abutment in response to the axial release force in the proximal direction.
7	The dental system of claim 1 wherein the shaft of the temporary fastener includes a portion that has a smaller width than the distal shaft portion sized and configured for rotary engagement with the implant abutment threads, and wherein the portion with the smaller width is located proximally from the distal shaft portion sized and configured for rotary engagement.
8	The dental system of claim 1 wherein the threads of the distal post portion of the definitive screw are configured to continuously engage the implant abutment threads.
9	The dental system of claim 1 wherein the distal shaft portion of the temporary fastener is configured to deform and disengage the implant abutment threads to release the coping and the temporary fastener as a unit as a result of the axial release force.
10(a)	A method of installing a dental prosthesis according to the dental system of claim 1, comprising:
10(b)	attaching the temporary fastener to the implant abutment threads of the implant abutment while the coping extends about the temporary fastener in axial alignment with the implant abutment;

10(c)	processing the coping using a pick-up process or closed tray impression process while the temporary fastener is attached to the implant abutment;
10(d)	releasing the coping attached to at least part of the temporary fastener as a unit in response to the axial release force applied from the processing;
10(e)	drilling at least one hole through a dental prosthesis aligned with the aperture of the released coping;
10(f)	aligning the dental prosthesis coupled to the released coping with the implant abutment; and
10(g)	attaching the dental prosthesis with the released coping to the implant abutment using the definitive screw inserted through a respective at least one hole of the dental prosthesis.
10(h)	wherein the definitive screw has threads with a maximal width that is greater than a maximal width of the distal shaft portion of the temporary fastener
11	The method of claim 10, wherein the releasing is carried out so that the temporary fastener is entirely removed while attached to the coping providing the unit.
12	The method of claim 10, wherein the method further comprises, before the step of attaching the temporary fastener, providing a tool that is configured to at least partially surround the coping while the temporary fastener extends through the aperture of the coping and aligning the tool with the coping and temporary fastener with the implant abutment.
13	The method of claim 10 wherein the temporary fastener threads are attached to the implant abutment threads at the predetermined temporary holding torque, wherein the definitive screw is attached to the implant abutment threads at the predetermined definitive fixation torque, and wherein the predetermined definitive fixation torque is greater than the predetermined temporary holding torque.

14	The dental system of claim 1 wherein the predetermined definitive fixation torque is greater than the predetermined temporary holding torque.
15(a)	A dental system comprising:
15(b)	an implant abutment having threads and an implant abutment longitudinal axis;
15(c)	a coping having a proximal end with a central aperture merging into a central open channel of greater width than the central aperture;
15(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 into the central open channel;
15(e)	a temporary fastener having a longitudinal axis with a length measured along the longitudinal axis and a width measured perpendicular to the longitudinal axis, the temporary fastener comprising:
15(f)	a head with a proximal end having a drive tool interface configured for rotating the temporary fastener to a predetermined temporary holding torque, and
15(g)	a shaft coupled to or integral with the head and configured to extend through the central aperture of the coping, wherein the shaft has a distal portion having an outer surface comprising threads, wherein a maximal width of the distal portion with the threads is smaller than a maximal width of the distal post portion of the definitive screw with the threads,
15(h)	wherein the temporary fastener is configured so that, in position and engaged with the threads of the implant abutment at the predetermined temporary holding torque, the temporary fastener cooperates with the coping to align the coping into position with the implant abutment,

15(i)	and wherein the temporary fastener is configured so that in response to application of an axial release force above a predefined value in a proximal direction, the coping and at least a portion of the temporary fastener are released as a unit from the implant abutment without rotation.
16	The dental system of claim 15 wherein the distal portion of the shaft of the temporary fastener is configured to deform in response to the application of the axial release force above the predefined value in the proximal direction.
17	The dental system of claim 15 wherein the temporary fastener is configured to move axially in response to the axial release force without rotation.
18	The dental system of claim 15 wherein the threads of the shaft of the temporary fastener are configured to have discontinuous contact with the threads of the implant abutment at the predetermined temporary holding torque.
19	The dental system of claim 15 wherein the shaft of the temporary fastener has a portion located proximally of the distal portion comprising threads having a width smaller than the maximal width of the distal portion comprising the threads.
20	The dental system of claim 15 wherein the definitive screw is configured for rotational engagement with the implant abutment threads to a predetermined definitive fixation torque that exceeds the predetermined temporary holding torque.
21	The dental system of claim 15 wherein the threads of the distal post portion having threads of the definitive screw comprise a helical thread portion characterized by a first thread pitch, wherein the threads of the distal shaft portion of the temporary fastener comprise a helical thread portion characterized by a second thread pitch, and wherein the second thread pitch is essentially the same as the first thread pitch.
22(a)	A dental system comprising:
22(b)	a coping having a proximal end with an aperture and a distal end with a coping seating surface; and

22(c)	an implant abutment having a longitudinal axis comprising:
22(d)	female threading, wherein the female threading resides proximate a proximal end of the implant abutment and extends distally thereof, and
22(e)	an outer wall surrounding the female threading, the outer wall comprising an implant abutment seating surface;
22(f)	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:
22(g)	a proximal portion with a width larger than the coping aperture; and
22(h)	a shaft comprising a distal shaft portion configured for rotary engagement with the implant abutment female threading,
22(i)	wherein the shaft of the temporary fastener is sized to extend through the aperture of the coping, and wherein the distal shaft portion of the temporary fastener is configured to rotatably engage the female threading of the implant abutment at a predetermined temporary holding torque to an engagement depth sufficient to hold the coping seating surface aligned with and against the implant abutment seating surface, and
22(j)	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 as a result of an axial release force in a proximal direction, and
22(k)	wherein the distal shaft portion of the temporary fastener discontinuously engages the female threading of the implant abutment between a most distal engagement position and a proximate end of the female threading of the implant abutment.
23	The dental system of claim 22, 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 as a result of an axial release force in a proximal direction applied in a pick-up process after

	adhesive bonding of the coping to a prosthesis or in a closed tray impression process, further comprising a dental prothesis bonded and/or adhered to the coping with the temporary fastener coupled to the implant abutment to hold the coping into alignment with the implant abutment, wherein the temporary fastener is configured to release, as a unit, the at least a portion of the temporary fastener, the coping and the dental prosthesis bonded and/or adhered to the coping from the implant abutment in response to the axial release force in the proximal direction whereby a closed tray impression process provides the axial release force in the proximal direction.
24	The dental system of claim 22, wherein the axial release force in the proximal direction releases the temporary fastener, intact and in its entirety, and the coping from the implant abutment as a unit.
25	The dental system of claim 22, wherein the temporary fastener comprises a polymeric material.
26(a)	The dental system of claim 22, further comprising a definitive screw with a longitudinal axis and a width measured perpendicular to the longitudinal axis, the definitive screw comprising:
26(b)	a head with a proximal end having a drive tool interface, wherein, after removal of the temporary fastener, the head is configured to be in contact with a proximal surface of the coping proximate the aperture of the coping, and
26(c)	a shaft that has a width configured to extend through the aperture of the coping, the shaft comprising:
26(d)	a distal portion having an outer surface comprising male threading configured to engage the female threading of the implant abutment, wherein the distal portion of the definitive screw is configured to rotatably engage the female threading of the implant abutment to a predefined definitive fixation torque to position the coping seating surface against the implant abutment seating surface.
27	The dental system of claim 26, wherein the male threading of the definitive screw is configured to make continuous contact with the implant abutment female threading.

28	The dental system of claim 26, wherein the male threading of the distal portion of the definitive screw has a greater engagement depth with the female threading of the implant abutment than the engagement depth of the temporary fastener and/or the male threading of the distal portion of the definitive screw has a longitudinal extent that is greater than a longitudinal extent of the distal shaft portion of the temporary fastener.
29	The dental system of claim 26, wherein a maximum width of the distal portion of the definitive screw comprising the male threading is greater than a maximum width of the distal shaft portion of the temporary fastener configured to rotatably engage the implant abutment female threading.

Straumann USA, LLC ("Petitioner") respectfully petitions the Board to institute a post-grant review of claims 1-29 of U.S. Patent No. 12,551,319 ("'319 patent") (Ex. 1001), find the claims unpatentable, and cancel the claims.

I. INTRODUCTION

The '319 patent is a continuation of U.S. Patent No. 12,156,781 ("'781 patent") and U.S. Patent No. 11,937,992 ("'992 patent"), which are currently subject to PTAB review (IPR2025-00956 and PGR2025-00054, both instituted). Although wordier and more numerous, the claims of the '319 patent cover the same basic subject matter and are unpatentable for many of the same reasons presented in the related petitions, including obviousness based on the same prior art, and lack of written description and enablement based on overbroad claims.

The '319 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.

The claims of the '319 patent are directed to a dental system that includes a specific temporary coping-abutment fastener that is threaded into the abutment, but

then pulled out of the abutment, together with the coping, without being unscrewed.

The claims are obvious in view of prior art temporary fasteners that can be pulled out of the abutment, including prior art temporary screws with flexible threads that can be pulled out without being unscrewed (Poovey), and prior art that teaches that an asymmetric "buttress" thread is easier to pull out (Gracco).

The claims are also unpatentable because they do not comply with the written description or the enablement requirement. As with the '992 and '781 patents, Patent Owner apparently drafted the claims of the '319 patent to try to cover Petitioner's device, but as with the claims of the related patents, the claims of the '319 patent are not supported because they are much broader than the only pertinent embodiment described in the specification (Fig. 75), for several reasons.

For example, even though the specification explains that the (1) buttress thread and (2) split post with deflecting legs of the Fig. 75 embodiment enable the temporary fastener to be pulled out without being unscrewed, Patent Owner drafted the claims to encompass (1) a broad range of temporary fastener thread geometries instead of only the buttress thread and (2) temporary fasteners that do not have a split post with deflecting legs.

As explained 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 the '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), which the PTAB instituted on November 21, 2025. Ex. 1014.

Petitioner filed a petition for post-grant review of claims 1-16 of the '781 patent on June 4, 2025 (Case No. PGR2025-00054), which the PTAB instituted on December 10, 2025. Ex. 1016.

Pursuant to a joint stipulation, the district court entered an order on December 4, 2025 that stayed and administratively closed the litigation until after

the Board issues its final decisions in the IPR and PGR proceedings for the '992 and '781 patents. Ex. 1019.

C. Lead and Backup Counsel / Service Information

Petitioner designates the following lead and backup counsel:

Lead Counsel	Sheila Mortazavi Reg. No. 43,343 HAUG PARTNERS LLP 745 Fifth Avenue, 10th Floor New York, NY 10151 (212) 588-0800 smortavazi@haugpartners.com
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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. Petitioner consents to service via email at the above email addresses. Petitioner has paid the petition filing fees and authorizes Account No. DA500320 (Customer No. 20999) to be charged for any additional fees.

III. GROUNDS FOR STANDING

Petitioner certifies that: (1) the '319 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 February 17, 2026; 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 1-29, find the claims unpatentable, and cancel the claims, based on these grounds:

Ground	Claim(s)	Prior Art	Statutory Basis
1	22-28	–	§ 112(b)
2	1-29	–	§ 112(a)
3	1-4, 6-17, 19-21	Obvious based on Bernhard in view of Poovey and Gracco	§ 103

Ground	Claim(s)	Prior Art	Statutory Basis
4	5, 9, 16, 18, 22-29	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), ¶43. For example, Bernhard (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. Ex. 1003, [0065], [0082], Fig. 1; Ex. 1002, ¶47.

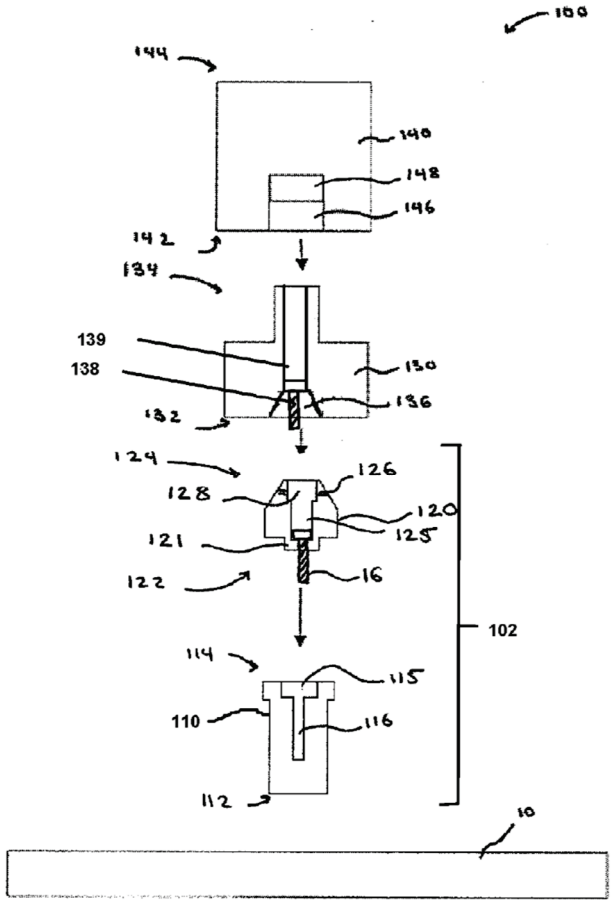


Figure 1

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, ¶¶48-49.

In an open-tray technique, there is a through-hole in the impression 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 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, because the dentist has to unscrew each coping before removing the impression, but it is accurate because the copings are "picked up" in the correct position. *Id.*, ¶50.

An open-tray technique is described in Kumar (U.S. Patent No. 6,283,752). Ex. 1004, 8:30-48, Figs. 2A-2B; Ex. 1002, ¶51.

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 through-holes for the temporary connection, but the dentist must recreate the proper position and orientation of each coping in the impression after the fact, which can result in less accurate placement. Ex. 1002, ¶52.

A closed-tray technique is described in Kumar. Ex. 1004, 8:6-29, Figs. 1A-1B; Ex. 1002, ¶53.

Before the priority date of the '319 patent, it was already known that the advantages of both the open-tray technique (increased accuracy) and the closed-tray technique (increased structural integrity) could be achieved by modifying the closed-tray technique to use a temporary fastener that aligns the coping with the abutment before pick-up and detaches with the coping from the abutment during pick-up. Examples of this are disclosed in the Bernhard, Poovey, and Derey prior art described below. Ex. 1002, ¶54.

B. Bernhard

Bernhard (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, ¶¶56, 67.

In Figure 1 of Bernhard 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, ¶57.

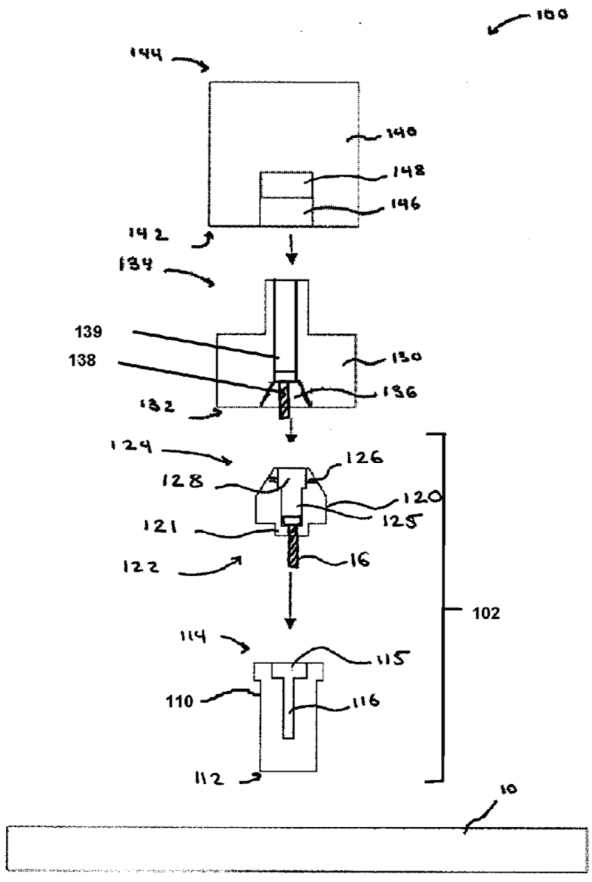


Figure 1

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, ¶58. 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, ¶59.

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, ¶¶61-65.

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.

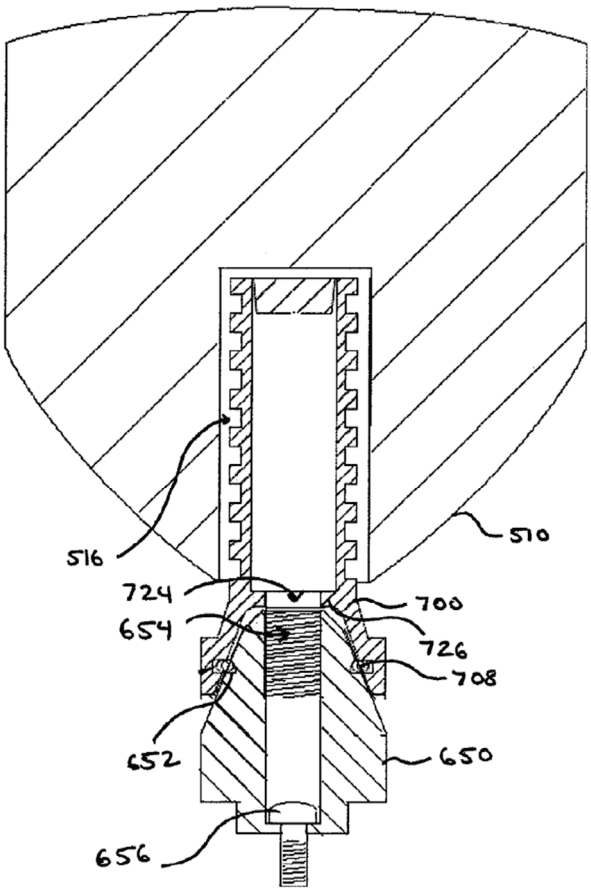


Figure 8

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].

After a bore is drilled through prosthesis and coping (*see* Figures 10-11 below), prosthesis 510 and coping 700 are 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 (*see* Figure 12 below). *Id.*, [0104]-[0105], [0131], [0133]-[0134], Figs. 3, 10-12; Ex. 1002, ¶¶64-66.

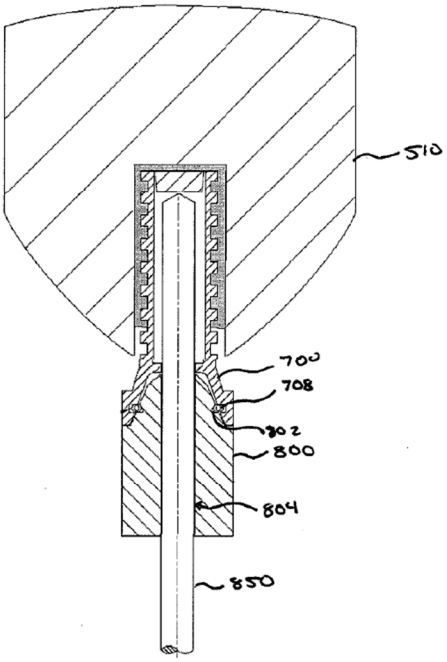


Figure 10

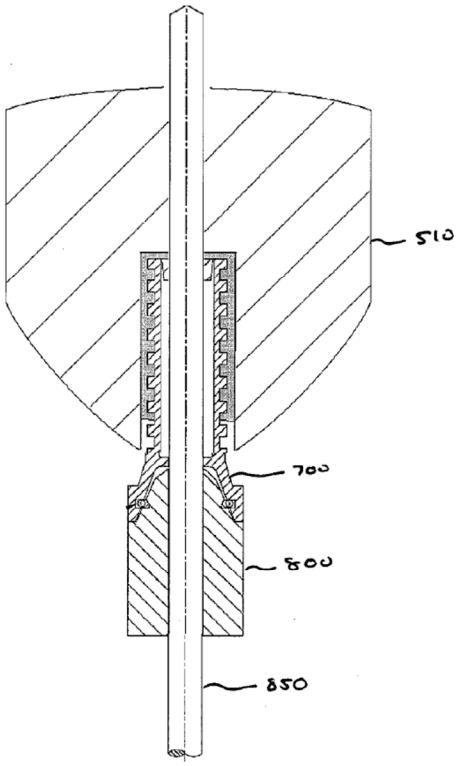


Figure 11

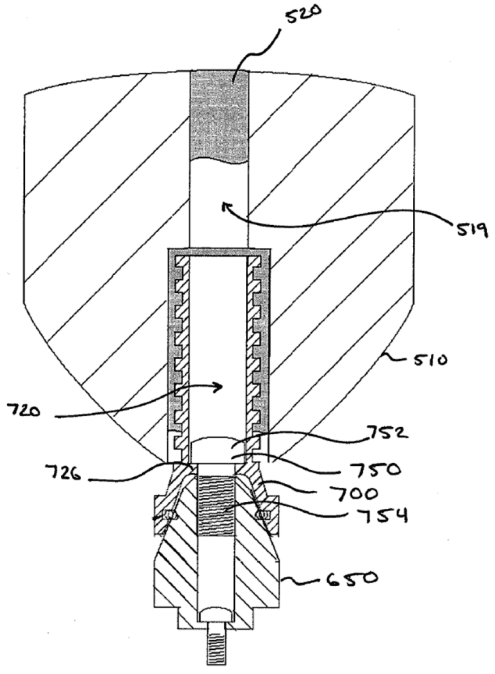


Figure 12

C. Poovey

Poovey (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. Ex. 1005, [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, ¶¶70-71.

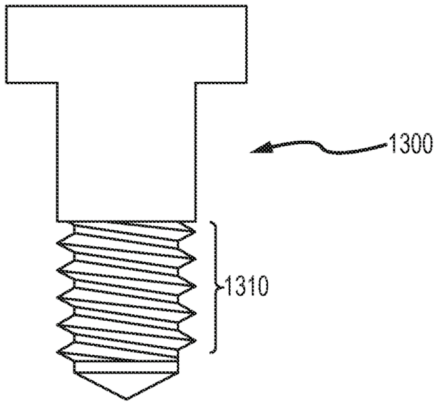


FIG.13

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, ¶¶73-79.

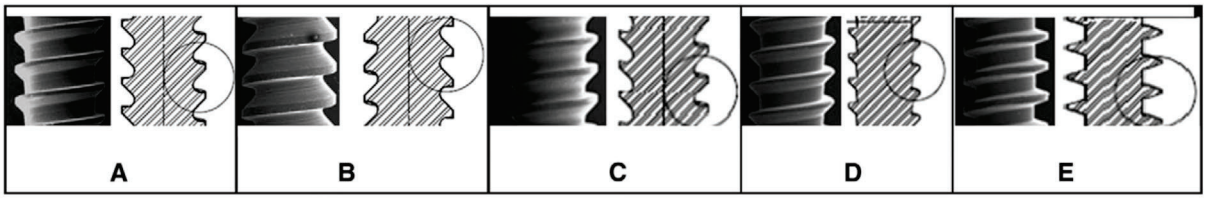


Fig 1. Schematic illustrations of miniscrew thread-designs: **A,** buttress reverse thread shape (control); **B,** buttress thread; **C,** 75° joint profile thread; **D,** rounded thread; **E,** trapezoidal thread.

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. 1A, 1B; Ex. 1002, ¶¶73-76.

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 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 a component in place, but that detach when the impression is removed. Ex. 1002, ¶82.

Figures 5-6 below depict flexible holding device 100 with head 11, body 12, and two extended legs 13; device 100 is inserted legs first through the opening in construction 51 into implant 41. Ex. 1008 at 8-10, Figs. 5-6. The "construction"

can be "any dental device which can be attached to the implant." *Id.* at 6. "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…" *Id.* at 9-10. "[I]f an upper pulling force is applied to the construction 51, 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, ¶¶83-85.

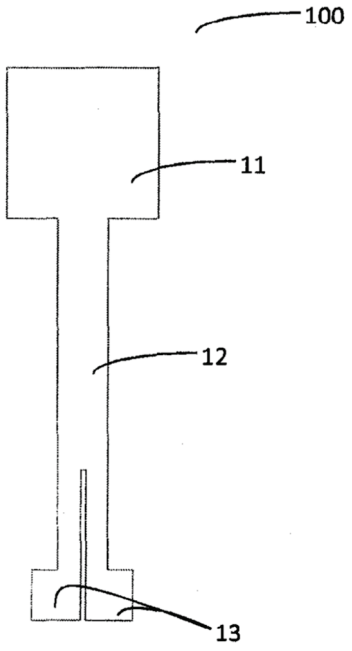


Fig. 5

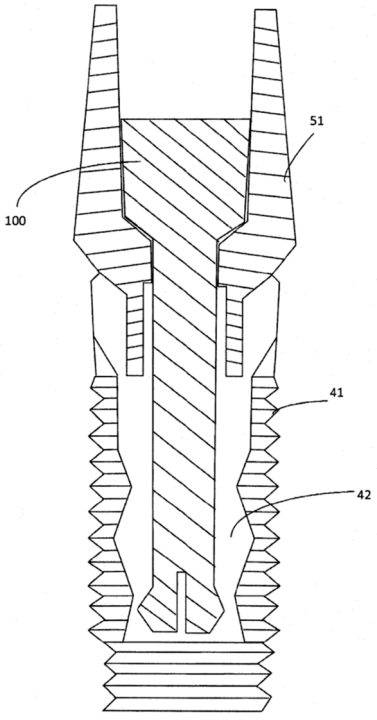


Fig. 6

VI. '319 PATENT

After Bernhard, Poovey, Gracco and Derey published, the inventors of the '319 patent, Kofford and Rudisill, filed their original provisional application on

October 9, 2018 (Ex. 1009). They subsequently filed two more provisional applications (Exs. 1010, 1011) and five utility applications in the same family (Exs. 1012, 1015, 1018, 1020, 1023), two of which resulted in the '992 and '781 patents.

The '319 patent issued from Application No. 18/827,656 ("'656 Application") (Ex. 1023), which is related to the '992 and '781 patents through continuation applications.

A. '319 Patent Specification

The '319 patent is directed to threaded fasteners that temporarily connect a coping to an abutment while taking an impression or converting a denture.

In most of the embodiments described in the specification, 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, as depicted in Figures 5 and 6 below. Ex. 1001, 8:43-47, 14:44-15:2, 24:52-25:4; Figs. 5-6; Ex. 1002, ¶94.

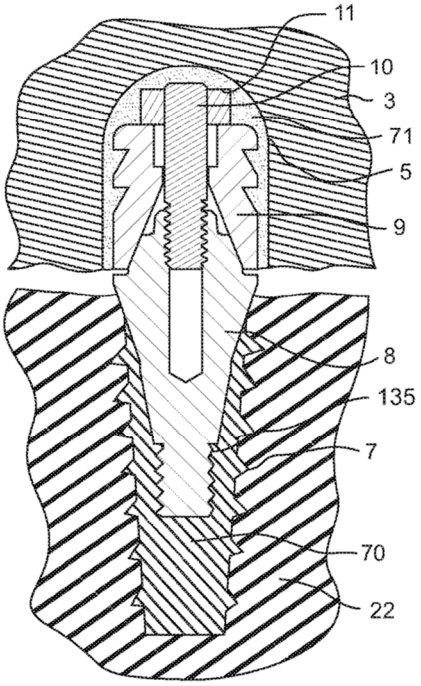


FIG. 5

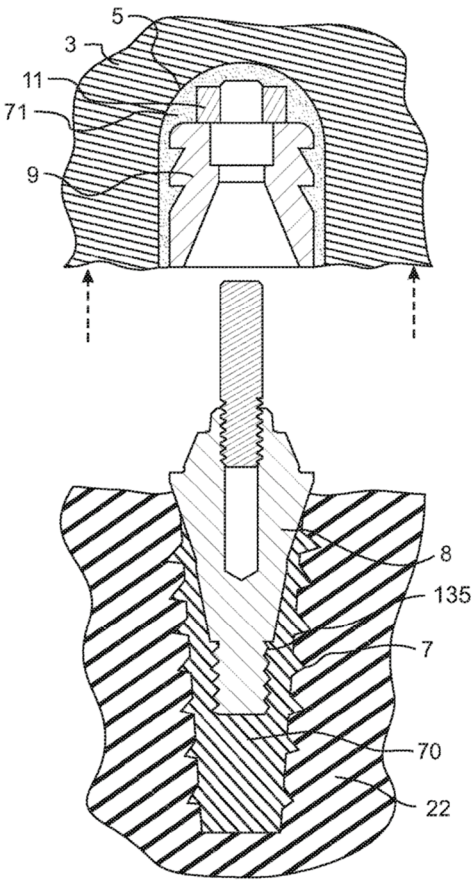


FIG. 6

The ’319 patent also describes a different temporary fastener embodiment, depicted in Figure 75 (below left). In this embodiment, when the prosthesis is removed, head portion 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 (head portion 42 and post 39) out of the abutment. Ex. 1001, 23:13-41, Fig. 75. The ’319 patent explains that post 39 has “a slot 41 and asymmetric threads or serrations 40…” *Id.* The “asymmetric” thread pattern 40 depicted in

Figure 75 (below left) is a buttress thread, like thread B in Figure 1 of Gracco (below right). *Id.*, Fig. 75; Ex. 1006 at Fig. 1B; Ex. 1002, ¶¶95-96.

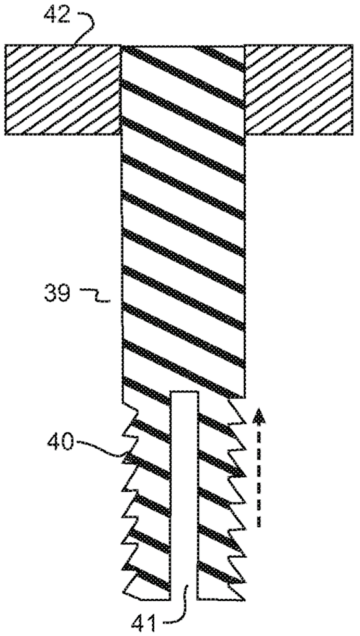
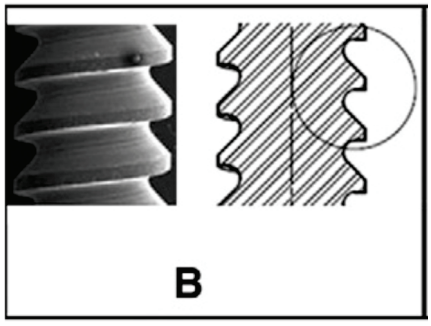


FIG. 75



The ’319 patent explains 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. …
>
> For example, as shown in FIG. 75 an alignment fastener post 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 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 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 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…

Ex. 1001, 5:31-35, 11:31-34, 23:17-30[1], 24:58-59, Fig. 75; Ex. 1002, ¶98.

[1] This paragraph includes amendments Patent Owner made during prosecution of the ’992 patent that try to obscure the role of the deflecting legs created by slot 41 in permitting the temporary fastener to be pulled out without being unscrewed. *Compare* Ex. 1001, 23:17-30 *with* Ex. 1013, 22:36-41.

B. ’319 Patent Prosecution

Patent Owner filed the ’656 Application on September 6, 2024, several months after suing Petitioner for infringement of the ’992 patent. Ex. 1017 at 1.

In response to a restriction requirement, Patent Owner elected the species Q of Figure 75, as it had for the applications that issued as the ’992 and ’781 patents. Ex. 1023 at 326, 275; Ex. 1015 at 181; Ex. 1020 at 927, 1007.

On October 10, 2025, the Examiner allowed the claims. Ex. 1023, 541-51. On November 21, 2025, the Board instituted inter partes review of the ’992 patent, and on December 10, 2025, the Board instituted post-grant review of the ’781 patent. Ex. 1014, 1016. However, Patent Owner did not disclose the Board’s decisions to the Examiner of the ’656 Application. Instead, Patent Owner paid the issue fee on January 10, 2026 and the ’319 patent issued on February 17, 2026. Ex. 1023, 597, 606.

C. ’319 Patent Claims

Even though Patent Owner elected the species Q of Figure 75, claims 1-29 are much broader than Figure 75 and the associated description, in several respects. Ex. 1023 at 326; Ex. 1002, ¶¶131-133.

For example, independent claims 1, 15, and 22 are not limited to temporary fasteners with buttress threads, as described and as depicted in Figure 75. Instead,

as explained below, each of these claims encompasses a wide range of thread geometries that go well beyond what is described in the specification.

Claim 1 requires the temporary fastener threads to make contact with the abutment threads over a "first thread contact area" that is "less than" the "second thread contact area" over which the definitive screw threads make contact with the abutment threads. Claim 15 requires the temporary fastener to have threads with smaller maximal width than the threads of the definitive screw. Finally, claim 22 does not include any limitation that specifies the thread geometry of the temporary fastener and therefore encompasses all thread geometries. Moreover, dependent claims 3, 10, and 29 have similar limitations to claim 15 regarding thread width, and dependent claim 4 requires the temporary fastener to have a smaller thread "engagement volume" than the definitive screw.

For ease of reference, this petition uses the shorthand "thread geometry" or "thread geometry limitations" to refer to the above-discussed limitations regarding the thread contact area, thread width, and/or thread engagement volume of the temporary fastener threads and the definitive screw threads in relation to each other and/or the abutment threads.

Moreover, independent claims 1, 15, and 22 do not require the temporary fastener to have a slot that creates a split-post structure with deflecting legs that enable the fastener to be pulled out without being unscrewed, as described and as

depicted in Figure 75. Instead, as explained below, these claims merely require that an axial force releases the temporary fastener from the abutment, without requiring the described split-post structure.

Claim 1 recites "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." Claim 22 has a similar limitation. Similarly, claim 15 recites "the temporary fastener is configured so that in response to application of an axial release force above a predefined value in a proximal direction, the coping and at least a portion of the temporary fastener are released as a unit from the implant abutment without rotation."

VII. LEVEL OF ORDINARY SKILL

The field of the '319 patent is the design of dental implants and prostheses. Ex. 1002, ¶¶42-47. The specification describes procedures used by dentists to attach dental prostheses to dental implants in a dentistry-specific clinical setting (in a patient's jaw) or dental lab (including dentistry-specific impression protocols). It also explains that the patent is directed to improved temporary-alignment systems to align and connect various dentistry-specific, interrelated components, namely copings in a dental prosthesis with abutments in a dental implant. Ex. 1001, Abstract, 1:35-4:38, 4:42-5:13, 6:3-10, 6:45-49, 14:44-15:2, Figs. 5-9. Moreover,

the key prior art—Bernhard, Poovey, Gracco and Derey—also relates to dental prostheses and implants. Ex. 1002, ¶136.

A person of ordinary skill in the art (POSA), as of the earliest claimed effective filing date of October 9, 2018, would have had 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.*, ¶¶135-138.

VIII. CLAIM CONSTRUCTION

None of the limitations of claims 1-29 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 specification and prosecution history. *Id.*, ¶139. Petitioner will propose a construction if Patent Owner argues or the Board determines that one is required for any limitation.

IX. GROUNDS OF UNPATENTABILITY

A. Ground 1: Claims 22-28 Are Indefinite

Claims 22–28 are indefinite under Section 112(b) because they impermissibly recite only functional limitations at the alleged point of novelty. *Id.*, ¶¶141-149.

As explained above, the 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; Ex. 1002, ¶142.

In contrast, independent claim 22 does not include any structural limitations for the temporary fastener that allow it to be pulled out without being unscrewed. Ex. 1002, ¶143. In particular, the claim does not require the temporary fastener threads to be buttress threads. Nor does the claim require the temporary fastener to have a slot that creates a split-post 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 22 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 as a result of an axial release force in a proximal direction…

Ex. 1001, 29:25-28. Claim 22 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, the claim uses purely functional language. Ex. 1002, ¶145.

Dependent claims 23-28 do not add any structural limitations for the temporary fastener that relate to its ability to be pulled out of the abutment without being unscrewed. Ex. 1002, ¶¶146-149.

This purely functional claiming at the alleged point of novelty renders claims 22-28 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 indefinite because it "use[d] conveniently functional language at the exact point of novelty." *Id.* at 371; *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"); *Halliburton Energy Servs. v. M-I LLC*, 514 F.3d 1244,

1255-56 (Fed. Cir. 2008) (discussing "vice of functional claiming" when using "conveniently functional language at the exact point of novelty" (quoting *General Electric*, 304 U.S. at 371)).

Similarly, in *Ex Parte Jelinek*, 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." No. 2023-003116, 2025 WL 626335, *3 (P.T.A.B. Feb. 25, 2025); *see also* M.P.E.P. § 2173.05(g).

Like the claims in *General Electric* and *Jelinek*, claims 22-28 are indefinite because they recite only functional limitations at the alleged point of novelty. Ex. 1002, ¶¶141-149.

B. Ground 2: Claims 1-29 Are Not Adequately Described or Enabled

Claims 1-29 are unpatentable under Section 112(a) because they do not comply with the written description requirement or the enablement requirement. As explained below, the '319 patent specification does not support the full scope of the claims. Ex. 1002, ¶¶151-201.

1. Independent Claims 1, 15 and 22 Are Not Supported

The '319 patent specification does not contain an adequate written description of or enable independent claims 1, 15 and 22, for two reasons.

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

First, the specification does not support the full scope of the thread geometry limitations[2] in claims 1, 15 and 22. Ex. 1002, ¶¶153-160.

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 threads to have a "threading contact area" with the abutment threads that is "less than" the "second thread contact area" of the definitive screw threads with the abutment threads. Ex. 1001, 26:19-28. Claim 15 requires that the temporary fastener threads have "a maximal width" that is "smaller than a maximal width" of the definitive screw threads. *Id.*, 28:18-24. Claim 22 does not include any limitation that specifies the thread geometry of the temporary fastener and therefore encompasses all thread geometries. *Id.*, 28:65-29:33; Ex. 1002, ¶154.

The specification does not support this broad claim scope encompassing any temporary fastener threads that have a smaller width or thread contact area than the definitive screw threads. The specification describes only one temporary fastener

[2] As explained above, Petitioner uses the shorthand "thread geometry limitations" to refer to limitations regarding the thread contact area, thread width, and/or thread engagement volume.

embodiment with any such thread geometry: the temporary fastener of Figure 75 with an "asymmetric" buttress thread that is different than the matching symmetric threads of the definitive screw and the abutment of Figure 9. *Id.*, 23:10-41, Figs. 9, 75; Ex. 1002, ¶155.

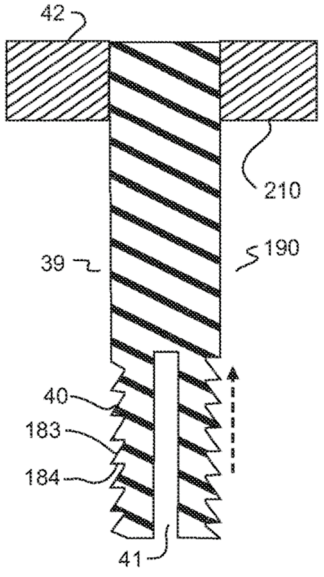


FIG. 75

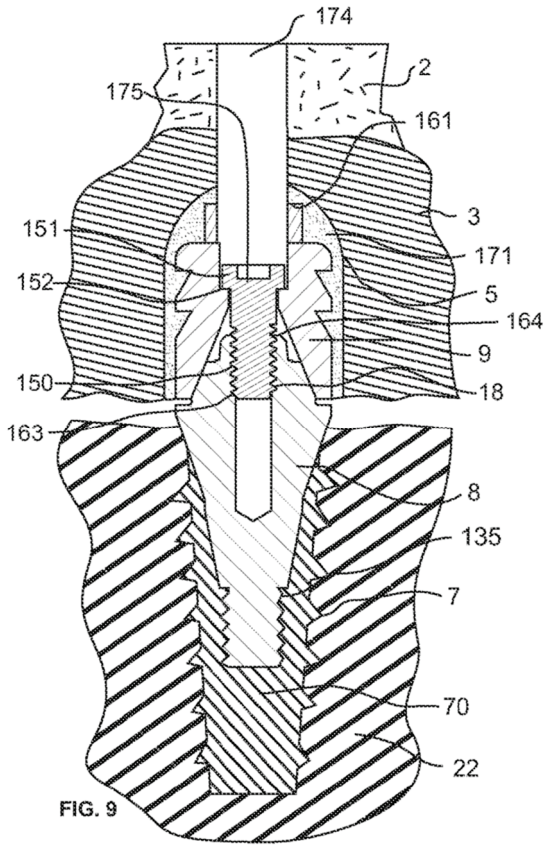
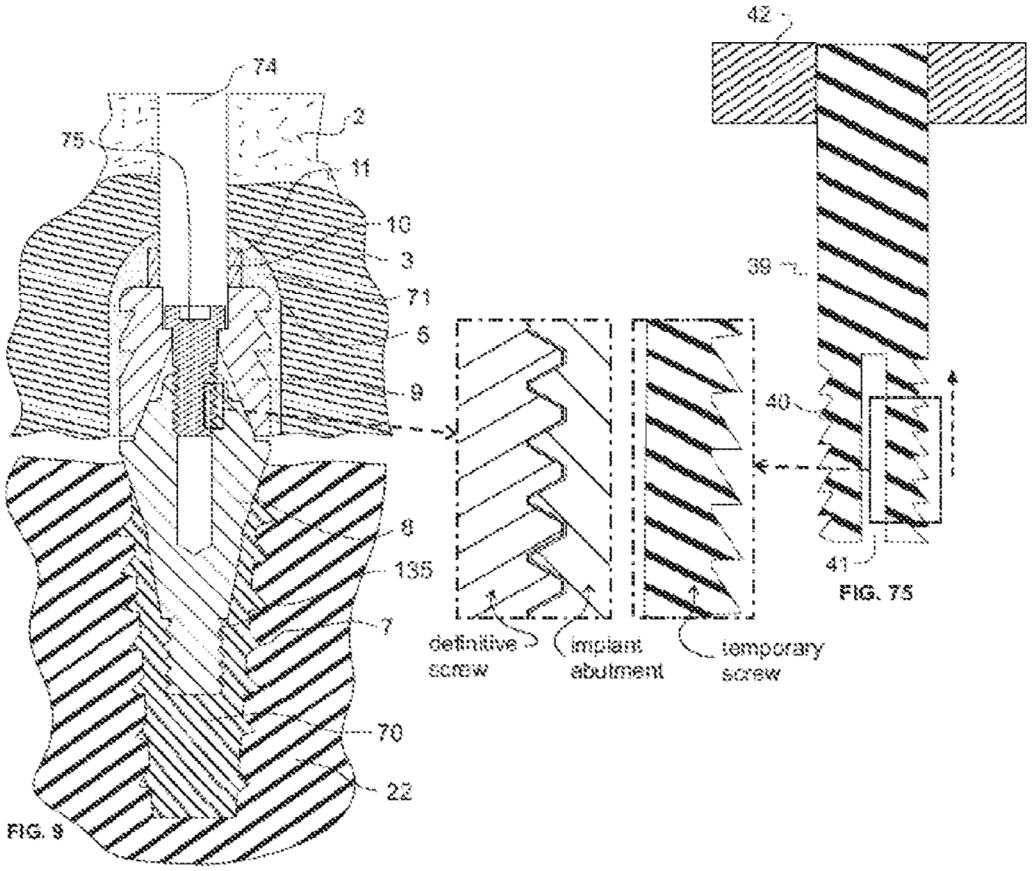


FIG. 9

Indeed, during prosecution of the parent '992 patent, Patent Owner argued 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 abutment of Figure 9, and included this annotated figure:



Ex. 1015 at 295-99. Patent Owner also tied the various claimed thread geometry features—thread contact area, thread width, and thread engagement volume—to the asymmetric buttress threads of Figure 75. Patent Owner told the examiner that because of the smaller proximal angle of the "different" thread "profile" and "shape" of asymmetric threads 40 of temporary fastener 190 in Figure 75, threads 40 do not "fill" female abutment threads 18 but instead leave "open space." Ex. 1015 at 297-99. As a result, Patent Owner explained, "the temporary screw threading of FIG. 75 has less surface area contact with the female implant abutment threading, has less material volume within the engagement depth with

the implant abutment and can have a smaller radial extent or width than the definitive screw." *Id*. at 298.

During prosecution of the '319 patent, Patent Owner reiterated the same arguments, but emphasized that the temporary fastener had a smaller width than the definitive screw. Ex. 1023 at 327-30. Patent Owner argued "[t]his follows directly from simple geometry and is a feature of FIG. 75, for example, having at least an inherent property of the asymmetric/serrated threads" shown in Figure 75. *Id*. at 329; Ex. 1002, ¶157.

The Figure 75 embodiment does not adequately describe or enable the full scope of claims 1, 15 and 22 because the claims encompass a wide range of thread geometries other than the buttress threads of Figure 75. Ex. 1002, ¶¶158-59. 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 threads in Figure 75 (below right). Ex. 1006 at Fig. 1A; Ex. 1001, Fig. 75.

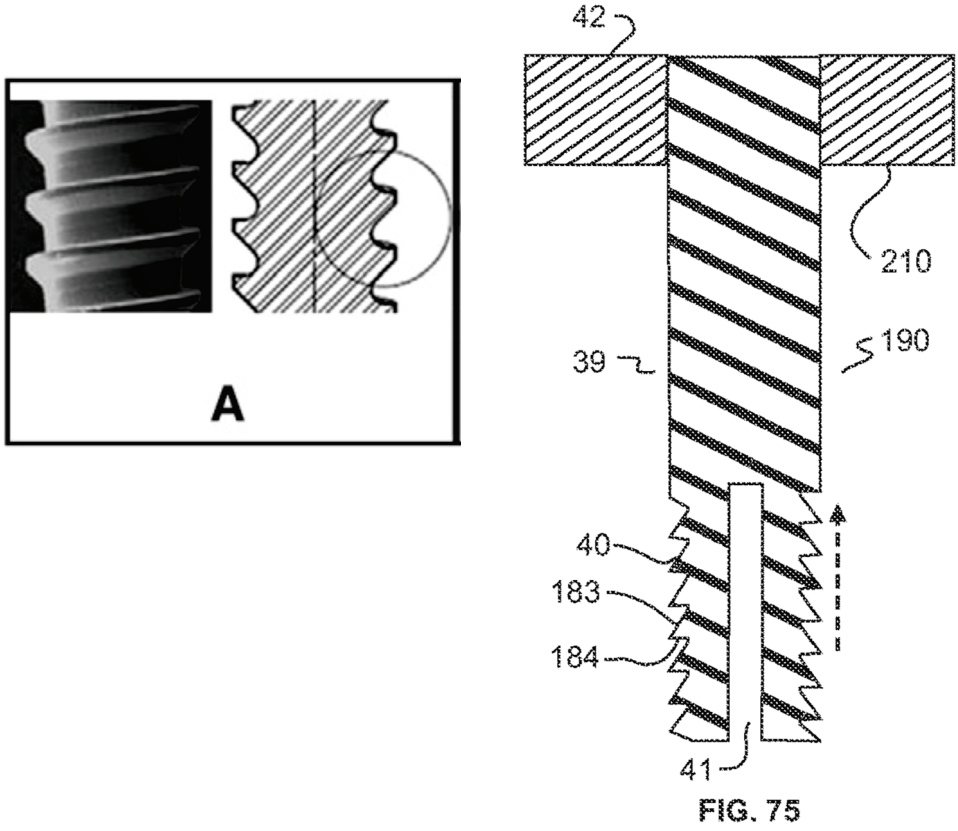


FIG. 75

The 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. Ex. 1002, ¶160.

The claims also encompass myriad other undisclosed embodiments with thread geometries that meet the thread geometry limitations, including for example symmetric threads with truncated or rounded peaks and/or smaller thread angles than the definitive screw and the abutment. The specification does not describe any of these embodiments, much less in an enabling manner. *Id.*

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 a wide range of other thread geometries. *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.") Here, enablement and written description "rise and fall together." *See LizardTech, Inc. v. Earth Resource Mapping, Inc.*, 424 F.3d 1336, 1345-46 (Fed. Cir. 2005) (finding claims not enabled and not described for same reasons).

In sum, claims 1, 15 and 22 are not supported by the specification, and therefore are unpatentable.

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

Second, the specification does not support the full scope of independent claims 1, 15 and 22 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 described embodiment that is within the scope of the claims, namely Figure 75. Ex. 1002, ¶¶161-165.

As explained above, claims 1, 15 and 22 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. Ex. 1001, 25:44-26:28, 27:21-44, 27:65-28:35, 28:65-29:33. The claims do not require the temporary fastener to have deflecting legs that enable the fastener to be pulled out without being unscrewed. Ex. 1002, ¶162.

The specification does not support this broad claim scope because it does not describe any temporary fastener (within the scope of the claims) that does not have a split post with deflecting legs but that can be pulled out without being unscrewed. Ex. 1002, ¶¶163-164. The only such temporary fastener that is described is the embodiment of Figure 75. As the specification explains, this temporary fastener

can be pulled out without being unscrewed because of buttress threads 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 (within the scope of the claims) that did not have a split post with deflecting legs but that could be pulled out without being unscrewed. Ex. 1002, ¶¶163-165.

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, 15 and 22 are not supported by the specification, and therefore are unpatentable.

2. Dependent Claims 2-14, 16-21 and 23-29 Are Not Supported

As explained below, the specification does not contain an adequate written description of or enable dependent claims 2-14, 16-21, and 23-29 for the same reasons as the independent claims. Ex. 1002, ¶¶167-201.

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

Dependent claims 2, 5-9, 11-14, 16-21, and 23-28 are not supported and are unpatentable for the same reasons as the independent claims, because these dependent claims add limitations that do not modify the thread geometry limitations. Ex. 1002, ¶167.

Dependent claims 3, 4, 10, and 29 add limitations related to thread geometry, but these dependent claims are not supported by the description of the buttress threads of Figure 75 in the specification. Ex. 1002, ¶168.

Claim 3 adds "wherein a maximal width of the distal shaft portion of the temporary fastener sized and configured to make contact with the implant abutment threads is smaller than the width of the distal post portion of the definitive screw." Ex. 1001, 26:39-43. Method claim 10, which depends from claim 1, adds "the definitive screw has threads with a maximal width that is greater than a maximal width of the distal shaft portion of the temporary fastener." *Id.*, 27:41-44. Claim 29 adds "a maximum width of the distal portion of the definitive screw comprising the male threading is greater than a maximum width of the distal

shaft portion of the temporary fastener." *Id.*, 30:42-46. Claims 3, 10, and 29 are not described or enabled because they encompass many undisclosed temporary fastener thread geometries, including reverse buttress threads and symmetric threads with truncated or rounded peaks and/or smaller thread angles than the definitive screw and the abutment. Ex. 1002, ¶169.

Claim 4 adds "wherein the definitive screw engagement volume is greater than the temporary fastener engagement volume." Ex. 1001, 26:44-53. This claim scope is also not described or enabled because it encompasses many undisclosed temporary fastener thread geometries, including reverse buttress threads and symmetric threads with truncated or rounded peaks and/or smaller thread angles. Ex. 1002, ¶170.

In sum, dependent claims 2-14, 16-21, and 23-29 are not supported by the specification, and therefore are unpatentable.

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

Dependent claims 2-8, 10-14, 17-21, and 23-29 are not supported and are unpatentable for the same reasons as the independent claims, 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, ¶172.

Dependent claim 9 adds "wherein the distal shaft portion of the temporary fastener is configured to deform and disengage the implant abutment threads to release the coping and the temporary fastener as a unit as a result of the axial release force." Ex. 1001, 27:16-20. Dependent claim 16 adds "wherein the distal portion of the shaft of the temporary fastener is configured to deform in response to the application of the axial release force above the predefined value in the proximal direction." *Id.*, 28:36-39. These limitations do not sufficiently limit the scope, because the mechanism behind the deformation of the temporary fastener is not specified, and these claims do not require the temporary fastener to have a split post with deflecting legs. Therefore, claims 9 and 16 are not described or enabled for the same reason as claims 1 and 15. Ex. 1002, ¶173.

In sum, dependent claims 2-14, 16-21, and 23-29 are not supported by the specification, and therefore are unpatentable.

3. The "Securing the Coping to the Threads of the Implant Abutment" Limitation of Claims 1-21 Is Not Supported

Claims 1-21 are unpatentable under Section 112(a) because the specification does not adequately describe or enable the limitation that requires the "definitive screw" to have "a distal post portion having threads configured for securing the coping to the threads of the implant abutment," as recited in independent claims 1 and 15. Ex. 1001, 25:49-52, 28:4-7 (emphasis added); Ex. 1002, ¶¶175-179.

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; Ex. 1002, ¶¶177-78.

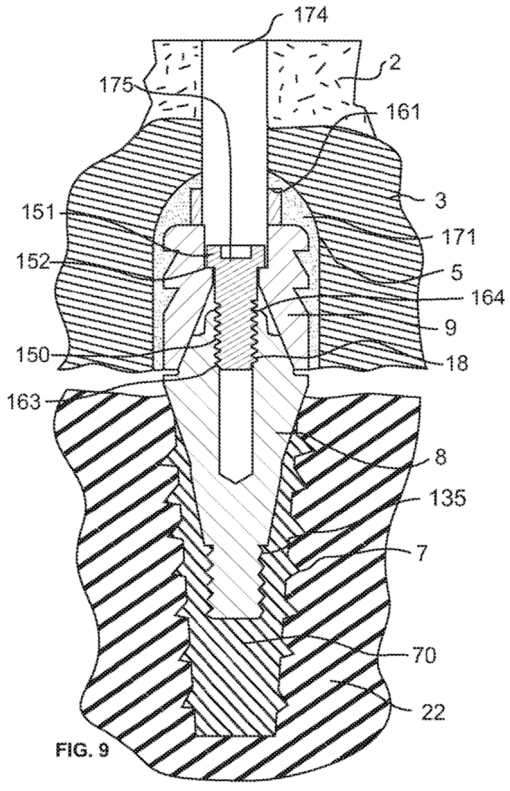


FIG. 9

4. The "Predetermined Definitive Fixation Torque" Exceeding the "Predetermined Temporary Holding Torque" Limitations of Claims 13, 14 and 20 Are Not Supported

Claims 13, 14 and 20 are unpatentable under Section 112(a) because the specification does not adequately describe or enable a "predetermined definitive fixation torque" for the definitive screw that "exceeds" or "is greater" than a "predetermined temporary holding torque" for the temporary fastener, as recited in these claims. Ex. 1001, 27:55-64, 28:52-56; Ex. 1002, ¶¶180-83.

The specification does not describe a "predetermined definitive fixation torque" of the definitive screw exceeding a "predetermined temporary holding torque" of the temporary fastener. Ex. 1002, ¶¶182.

Indeed, Patent Owner tacitly conceded this during prosecution. Because there is no disclosure of fixation torque values for a definitive screw in the specification, Patent Owner had to go outside the specification to cite dental journal articles for exemplary definitive screw torque values, in order to argue that these extrinsic values are greater than the temporary fastener torque values in the specification. *Id.*; Ex. 1023 at 300-351, 356.

5. The "Greater Engagement Depth" and "Longitudinal Extent" Limitations of Claim 28 Are Not Supported

Claim 28 is unpatentable under Section 112(a) because the specification does not adequately describe or enable the limitation that "the male threading of the distal portion of the definitive screw has a greater engagement depth with the

female threading of the implant abutment than the engagement depth of the temporary fastener and/or the male threading of the distal portion of the definitive screw has a longitudinal extent that is greater than a longitudinal extent of the distal shaft portion of the temporary fastener." Ex. 1001, 30:34-41 (emphases added); Ex. 1002, ¶¶184-87.

During prosecution, Patent Owner admitted these limitations are "not specifically disclosed for the elected species of FIG. 75," but argued the limitations are "enabled" because the threads of the temporary fastener of Figure 34 have fewer thread crests than threads 150 of the definitive screw inserted into abutment threads 18 in Figure 9. Ex. 1023 at 332; Ex. 1002, ¶186.

The Figure 34 embodiment does not support these limitations because "[a] patent owner cannot show written description support by picking and choosing claim elements from different embodiments that are never linked together in the specification." *See Flash-Control, LLC v. Intel Corp.*, 2021 U.S. App. LEXIS 20790, *7, *12 (Fed. Cir. July 14, 2021) (non-precedential). The claimed subject matter must be described "as an 'integrated whole rather than as a collection of independent limitations,'" and therefore cannot be supported by "an 'amalgam of disclosures' plucked selectively from the [specification]." *See Novozymes A/S v. DuPont Nutrition Biosciences APS*, 723 F.3d 1336, 1349 (Fed. Cir. 2013).

6. The "Smaller Width" Limitations of Claims 7 and 19 Are Not Supported

Claims 7 and 19 are unpatentable under Section 112(a) because the specification does not adequately describe or enable the limitations that the temporary fastener shaft includes "a portion that has a smaller width than," and "is located proximally from," "the distal shaft portion sized and configured for rotary engagement with the implant abutment threads," as recited in claim 7, or "a portion located proximally of," and "having a width smaller than the maximal width of," "the distal portion comprising threads," as recited in claim 19. Ex. 1001, 27:5-8, 28:48-50 (emphases added). Ex. 1002, ¶¶188-193.

These limitations are not supported because the unthreaded portion of post 39 of the Figure 75 embodiment is depicted as having the same width as the maximum thread diameter of threads 40. *Id.*, ¶190.

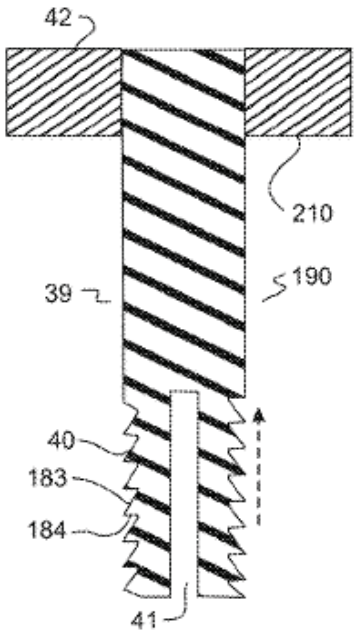


FIG. 75

Indeed, during prosecution, Patent Owner admitted this feature of claim 7 "is not disclosed specifically for the elected species Q of FIG. 75." Instead, Patent Owner relied on the separable cap-post embodiment of Figure 67. Ex. 1023 at 331; Ex. 1002, ¶191.

The Figure 67 embodiment does not support these limitations because the claimed subject matter cannot be supported by "an 'amalgam of disclosures' plucked selectively from the [specification]." *Novozymes*, 723 F.3d at 1349; *Flash-Control*, 2021 U.S. App. LEXIS 20790 at *12.

7. The "Wherein the Temporary Fastener Is Configured To Release" Limitation of Claims 22-28 Is Not Supported

Claims 22-28 are unpatentable under Section 112(a) because the specification does not adequately describe or enable the "wherein the temporary

fastener is configured to release" limitation in independent claim 22. Ex. 1002, ¶¶194-197.

As explained above in section IX.A, claim 22 does not include any structural limitations for the temporary fastener that allow it to be pulled out of the abutment without being unscrewed. Instead, for this feature, claim 22 includes only the purely functional "wherein" limitation quoted above in section IX.A, which merely recites that the temporary fastener is "configured to" perform the recited "release" function. Ex. 1001, 28:66-29:5. Dependent claims 23-28 do not add any structural limitations related to the ability of the temporary fastener to be pulled out without being unscrewed. Ex. 1002, ¶195.

By using purely functional language, claims 22-28 purport 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 specification. Ex. 1002, ¶196. As explained above, the specification discloses only one threaded temporary fastener embodiment that can be pulled out of the abutment without being unscrewed: 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 description 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) (claims to "large printer" that recited "a sheet feeding area operable to feed" not enabled because "operable to feed" limitation was "a purely functional recitation with no limitation of structure" and claims "do not contain any additional recitation of structure"); *Ex Parte Wang*, No. 2012-001318, 2014 WL 1005328, at *2 (P.T.A.B. Jan. 9, 2014) (claims directed to mold used to manufacture fog-resistant goggles not described or enabled, for lack of structural limitations).

8. The Steps of "Providing" and "Aligning" a "Tool" In Claim 12 Are Not Supported

Claim 12 is unpatentable under Section 112(a) because the specification does not adequately describe or enable the recited steps of "providing a tool that is configured to at least partially surround the coping while the temporary fastener extends through the aperture of the coping" and "aligning the tool with the coping and temporary fastener with the implant abutment." Ex. 1001, 27:48-54; Ex. 1002, ¶¶198-201.

The specification does not describe using a "tool" that "partially surrounds" the coping to align the temporary fastener of Figure 75 with the abutment. Instead, it describes and depicts the Figure 75 temporary fastener 190 as having "a head 42 portion" that interfaces with a driver tool. Ex. 1001, 23:20-22; Ex. 1002, ¶199.

During prosecution, Patent Owner relied on alignment tool 84 of Figure 90 in support of claim 12, arguing this tool "is not precluded from use with the elected species of FIG. 75." Ex. 1023 at 332; Ex. 1002, ¶200.

However, the specification makes clear that tool 84 of Figure 90 (shown below) is used to align the temporary fasteners of Figures 82-89 because, unlike the Figure 75 fastener, these fasteners do not have a head or cap with a tool drive interface to screw the fastener into the abutment. Tool 84 of Figure 90 is used for "[i]nstallation of these [i.e. the Figures 82-89] embodiments" because the tool "engage[s] the flats or other features of the coping 75, and/or features on top of the threaded post 71." Ex. 1001, 24:47-51; *cf. id.*, 23:61-24:46; Ex. 1002, ¶200.

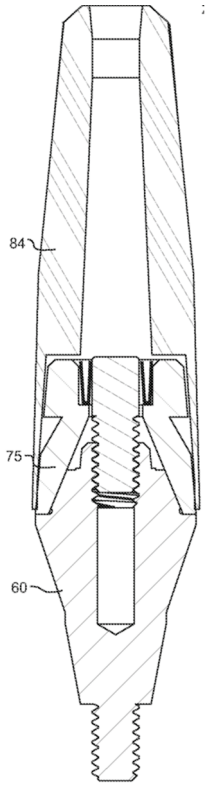


FIG. 90

The Figure 90 tool does not support claim 12 because the specification does not describe tool 84 as used with the Figure 75 fastener that has a head with a drive tool interface. Ex. 1002, ¶201. Patent Owner's reliance on Figure 90 during prosecution was unsupported, because the claimed subject matter cannot be supported by "an 'amalgam of disclosures' plucked selectively from the [specification]." *Novozymes*, 723 F.3d at 1349; *Flash-Control*, 2021 U.S. App. LEXIS 20790 at *12.

C. Ground 3: Claims 1-4, 6-17 and 19-21 Would Have Been Obvious Based on Bernhard In View of Poovey and Gracco

Claims 1-4, 6-17, and 19-21 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, ¶¶202-328.

In particular, as explained below, it would have been obvious based on Bernhard and Poovey to use a temporary fastener with flexible threads in Bernhard's system. As in Poovey, the flexible threads would temporarily connect the coping and abutment but enable the fastener to be pulled out without being unscrewed. The only difference between Poovey's flexible screw and the claimed temporary fastener is that Poovey's symmetric threads do not have a different thread geometry than the symmetric definitive screw threads. As explained below, however, a POSA would have been motivated to use an asymmetric buttress thread

in order to make the temporary fastener easier to pull out (as disclosed in Gracco) while still stable and secure.

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.*, [0124], [0126], [0130], Fig. 8.

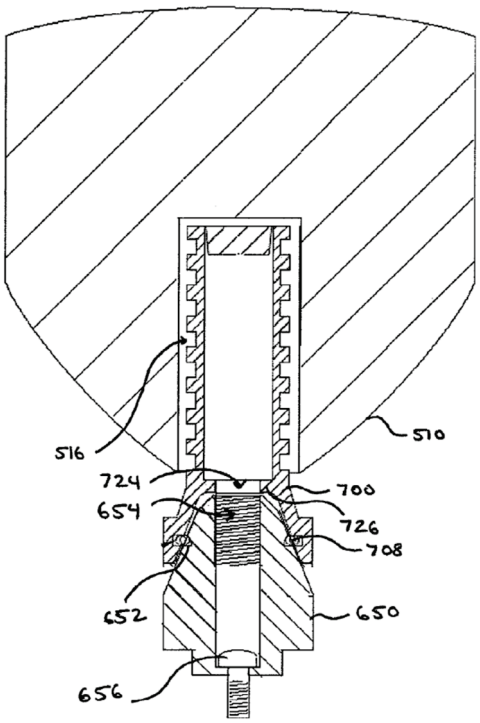


Figure 8

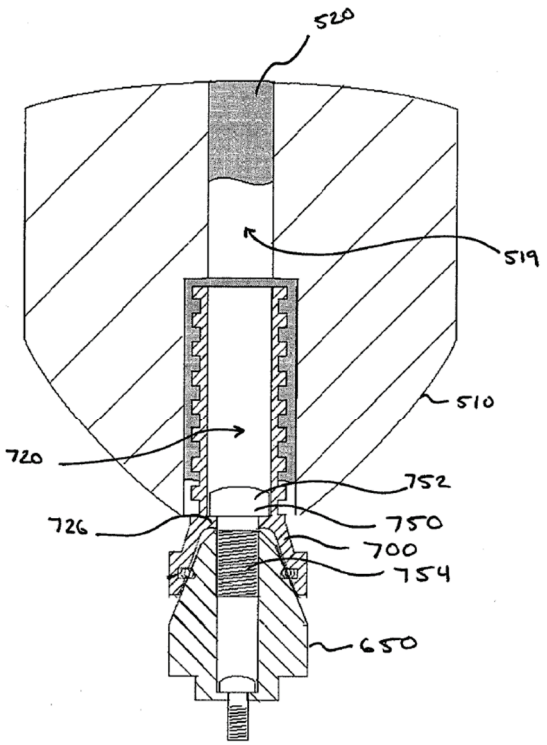


Figure 12

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 buttress threads, which would be threaded into bore 654 but pulled out of abutment 650 without being unscrewed when the prosthesis is removed. Ex. 1002, ¶206.

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.*,

¶207. 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, ¶208.

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, ¶¶209-10.

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, ¶211. Therefore, based on Bernhard and Poovey, a POSA would

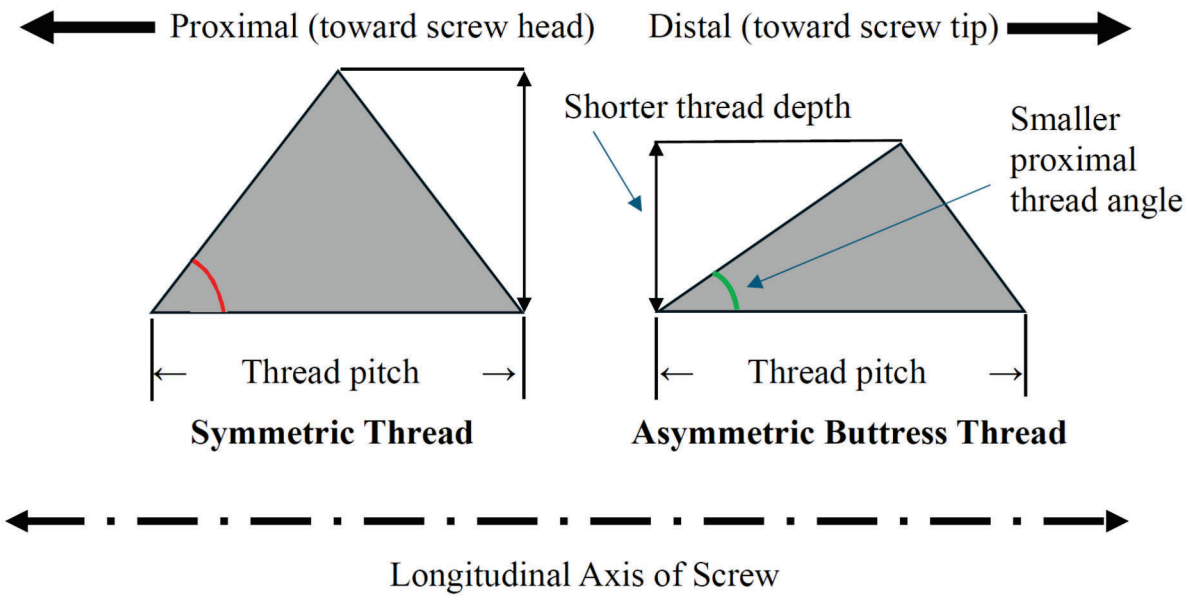
have decided to use a temporary fastener with flexible threads in Bernhard's system.

Having decided to use a temporary fastener with flexible threads, a POSA would have understood that the design of the temporary fastener thread geometry 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 threads sufficiently to permit the fastener to be easily pulled out without being unscrewed. Ex. 1002, ¶212. Reducing the required pull-out force as much as possible (as long as stability is maintained) is important in order not to injure the patient (who, in some cases, has a freshly-placed dental implant in his/her jaw) and to make the procedure comfortable for the patient—a consideration expressed in both Bernhard and Poovey. *Id.*; Ex. 1003, [0067]; Ex. 1005, [0084].

Given these two objectives, a POSA would have been motivated to consider and choose from among various thread designs different than the symmetric thread

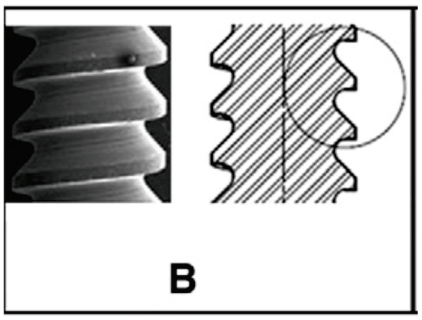
of threaded fastener 750, which—unlike the temporary fastener—is designed to ensure a very secure and permanent connection with the threads of bore 654. In particular, a POSA designing the temporary fastener would consider threads with a shorter thread depth and a smaller proximal thread angle, to ensure that the flexible threads would compress sufficiently in the radial direction to permit the temporary fastener to be easily pulled out without being unscrewed. Ex. 1002, ¶213.

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.*, ¶214.



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.*, ¶215. 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. 1B.



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, ¶216.

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. Ex. 1002, ¶¶216-217. A POSA would have been motivated to do so based on: (1) the prior art (Bernhard and Poovey providing motivation, and Poovey and Gracco providing solutions, to reduce the required removal force); (2) the nature of the problem to be solved (how to design the flexible fastener to be easier to pull out); (3) a POSA's knowledge (a buttress thread's shorter depth and smaller angle make it easier to pull out); and (4) the fact that this is merely a combination of prior art elements according to known methods to yield predictable results. *See PGS Geophysical AS v. Iancu*, 891 F.3d 1354, 1365 (Fed. Cir. 2018) (motivation "can come from the knowledge of those skilled in the art, from the prior art reference itself, or from the nature of the problem to be solved"); *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007); *id.* at 418 (obviousness "can take account of the inferences and creative steps that a [POSA] would employ"); M.P.E.P. § 2143.

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, [0134], Fig. 12; Ex. 1002, ¶¶218-19.

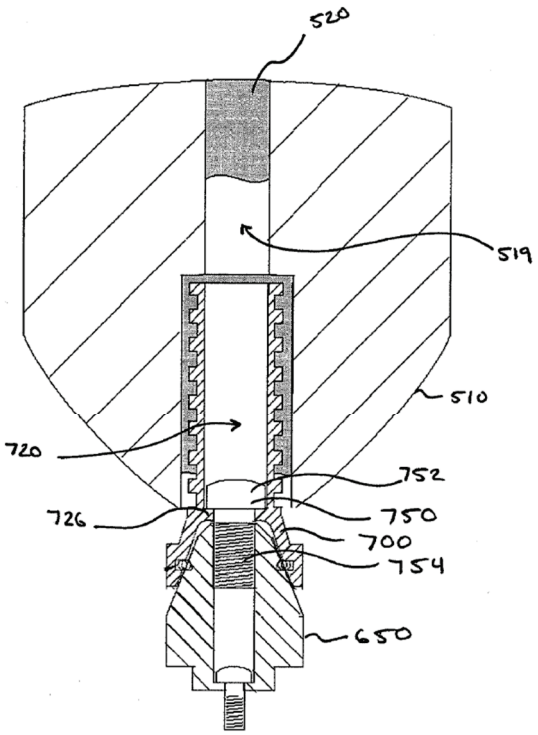


Figure 12

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. Ex. 1002, ¶220.

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 easily 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.*, ¶221.

The temporary fastener would be designed to engage the abutment 650 at a predetermined rotational torque sufficient to temporarily hold coping 700 in alignment with abutment 650. This predetermined torque value would be high enough to maintain stability, but low enough not to damage the components, and to allow the temporary fastener to be easily pulled out of abutment 650. Ex. *Id.*, ¶222.

As explained below, this temporary fastener with flexible buttress threads used in Bernhard's system would have all the features of claims 1-4, 6-17 and 19-21. *Id.*, ¶223.

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, 8, 12.

Coping 700 is temporarily connected to abutment 650 by spring 708 that engages 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, ¶¶226-29.

b. Limitation 1(b)

As shown in Figures 7A and 8 of Bernhard, coping 700 includes an aperture at its proximal end. Ex. 1003, [0129], Figs. 7A, 8; Ex. 1002, ¶230.

c. Limitation 1(c)

As shown in Figure 8 of Bernhard, bore 654 of abutment 650 has female threads that extend distally from a most proximal thread position in bore 654. Ex. 1003, [0130], Fig. 8; Ex. 1002, ¶231.

d. Limitation 1(d)

As shown in Figure 12, Bernhard discloses a definitive screw, namely threaded fastener 750 (described as a "threaded screw") with threads configured to engage the threads of bore 654 of abutment 650. Ex. 1003, [0105], [0130], [0134], Figs. 3, 12. Threaded fastener 750 includes a proximal head end (head 752), which

inherently has a tool interface (to drive the "threaded screw"), 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.[3] 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. Ex. 1003, [0134], Figs. 8, 12; Ex. 1002, ¶232. A POSA would understand that, like any threaded screw, threaded fastener 750 should be screwed in to bore 654 to a predetermined torque, determined to be sufficient to permanently hold the coping in place, but not damage the components. Ex, 1002, ¶¶233-239.

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 flexible buttress threads.

[3] As explained above in section IX.B.3 in Ground 2, this limitation is not described or enabled by the specification. However, for purposes of Grounds 3 and 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 abutment, even if the definitive screw threads do not secure the coping to the threads of the abutment.

Like threaded fastener 750, the temporary fastener would have a longitudinal axis with a length measured along the longitudinal axis. Moreover, the temporary fastener would have a lateral dimension providing different widths along the axis measured perpendicular to the longitudinal axis, because the head of the temporary fastener would have a maximum diameter that is greater than the width of the shaft, just like head 752 of fastener 750 is wider than shaft 754. Ex. 1003, [0134], Figs. 8, 12; Ex. 1002, ¶241.

Like shaft 754, the temporary fastener shaft would be threaded into bore 654 of abutment 650 to hold coping 700 against abutment 650. Ex. 1003, [0134], Figs. 8, 12. 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. Ex. 1002, ¶242.

f. Limitation 1(f)

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. The temporary fastener shaft would extend through the aperture at the proximal end of coping 700 and aperture 724 to engage with the threads of bore 654 of abutment 650 with an engagement depth measured axially between a most distal contact position with the

implant abutment threads and the most proximal thread position of the implant abutment threads, so that the temporary fastener holds the coping in alignment with the implant abutment prior to attachment of the definitive screw 750. Ex. 1003, [0134], Figs. 8, 12; Ex. 1002, ¶243.

g. Limitation 1(g)

As explained above, like head 752 of fastener 750, the head of the temporary fastener would have a proximal end with a drive tool interface, and like shaft 754, the distal shaft portion of the temporary fastener would be sized and configured for rotating the temporary fastener into abutment 650 through the engagement depth and to a predetermined temporary holding torque so that the temporary fastener is rotated to couple to abutment 650 and holds coping 700 into alignment against abutment 650. Ex. 1003, [0134], Figs. 8, 12; Ex. 1002, ¶244. A POSA would understand that the temporary fastener should be installed with a torque driver up to a predetermined torque sufficient to hold the coping in alignment against the abutment, while allowing the temporary fastener to release after application of an axial force. Ex. 1003, [0134], Figs. 8, 12; Ex. 1002, ¶245.

h. Limitation 1(h)

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 abutment 650. Thus, the temporary fastener would be configured to release

together with coping 700 from 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, ¶246.

i. Limitation 1(i)

Bernhard discloses a definitive screw (threaded fastener 750) with symmetric threads configured to engage the matching symmetric threads of bore 654 of abutment 650 over a certain contact area. Ex. 1003, [0105], [0130], [0134], Figs. 3, 12; Ex. 1002, ¶247.

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 than the symmetric threads of fastener 750 and abutment 650. As a result, the temporary fastener threads would inherently contact a smaller area of the symmetric threads of bore 654 of abutment 650 than the matching, symmetric threads of shaft 754 of fastener 750. Ex. 1003, [0134], Fig. 12; Ex. 1002, ¶248.

Indeed, Patent Owner confirmed this for the buttress thread of the temporary fastener of Figure 75 during prosecution of the '319 patent. Patent Owner told the examiner that the proximal side of the asymmetric threads 40 of the temporary fastener of Figure 75 lies "at a smaller angle relative to the longitudinal axis than the angle of the proximal side of the threads of the definitive screw" and that "as

the male proximal side profile angle becomes closer to the axis, the male thread fills less of the female thread." Ex. 1023 at 328-29. Similarly, during prosecution of the parent '992 patent, Patent Owner explained that the asymmetric threads of Figure 75 make contact with less area of, and occupy less volume of, threads 18 of abutment 8 than the symmetric threads of definitive screw 175 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, ¶249.

Therefore, the threaded distal shaft portion of the temporary fastener would be sized and configured to make contact with the threads of abutment 650 over a first thread contact area, the threads of the definitive screw (threaded fastener 750) would be configured to make contact with the threads of abutment 650 over a second thread contact area, and the first thread contact area would inherently be less than the second thread contact area. Ex. 1003, [0134], Fig. 12; Ex. 1002, ¶250. As explained above for claim elements 1(d) and 1(g), both the temporary fastener and the definitive screw hold the coping against the abutment.

3. Claim 2

Like all female threads, the female threads in bore 654 of abutment 650 have a radial extent bounded by a female thread minor diameter and a female thread

major diameter, and the minor diameter is located closer to the longitudinal axis than the major diameter. Ex. 1003, [0130], Fig. 8; Ex. 1002, ¶252.

4. Claim 3

Bernhard discloses a definitive screw (threaded fastener 750) with threads configured to securely engage the threads in bore 654 of abutment 650. Ex. 1003, [0105], [0130], [0134], Figs. 3, 12. The definitive screw securely engages the female threading of abutment 650 because the maximal width of the threads on the distal portion of shaft 754 of definitive screw 750 is wider (larger) than the minor diameter of the female threading in bore 654 of abutment 650. Ex. 1002, ¶254.

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. Given the smaller thread depth, the maximal width of the distal portion of the shaft of the temporary fastener (the threaded portion), which would be sized and configured to make contact with the threads in bore 654 of abutment 650, would inherently be a smaller width than the width of the distal portion of shaft 754 of definitive screw 750 with threads. Ex. 1002, ¶255. Indeed, Patent Owner told the examiner during prosecution of the '319 patent that an asymmetric thread with a smaller proximal

thread angle inherently has a smaller thread width than a symmetric thread with a larger proximal thread angle. *See* Ex. 1023 at 328-330.

5. Claim 4

Bernhard discloses a definitive screw (threaded fastener 750) with symmetric threads configured to engage the matching, symmetric threads of bore 654 of abutment 650. Ex. 1003, [0105], [0130], [0134], Figs. 3, 12. Given these matching, symmetric threads, definitive screw 750 has a definitive screw engagement volume extending radially beyond the female thread minor diameter and axially over the engagement depth. Ex. 1002, ¶257.

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. Given these asymmetric threads with a smaller thread depth, the temporary fastener would be configured to have a temporary fastener engagement volume extending radially beyond the female thread minor diameter and axially over the engagement depth. Ex. 1002, ¶258.

Because the definitive screw 750 has maximal engagement with the female threading of abutment 650, as shown in Figure 12 of Bernhard, it would have a large engagement volume per unit length. In contrast, the threads of the temporary

fastener, having a smaller thread depth, would inherently fill less of the female threads in bore 654 of abutment 650 than the threads of shaft 754 of definitive screw 750, and have a smaller engagement volume. Indeed, during prosecution of the '319 patent, Patent Owner told the examiner that "the definitive screw represents a maximum threading material size and shape that can engage the female threading," while a temporary fastener with a smaller proximal angle has "negligible filling of the female threads." Ex. 1023 at 328-29; Ex. 1002, ¶259.

A POSA would further understand that the threaded portion of the temporary fastener would be no longer than the threaded portion of the definitive screw (*see* Section IX.D.12 for claim 28, below). Thus, the definitive screw engagement volume would be greater than the temporary fastener engagement volume. Ex. 1002, ¶260.

6. Claim 6

a. Limitation 6(a)

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 abutment 650. Thus, the temporary fastener would be configured so that when an axial release force is applied in a proximal direction to the temporary fastener in a pick-up process, coping 700 and the temporary fastener are released as a unit

from abutment 650. Ex. 1003, [0066]-[0067]; Ex. 1005, [0084]; Ex. 1002, ¶262. Bernhard describes a pick-up process, as discussed for limitation 6(b) below.

b. Limitation 6(b)

As shown in Figure 9 of Bernhard, coping 700 is bonded to prosthesis 510 with bonding agent 518 when coping 700 is temporarily connected to abutment 650. Ex. 1003, [0116]-[0117], [0131], Figs. 4, 9; Ex. 1002, ¶263.

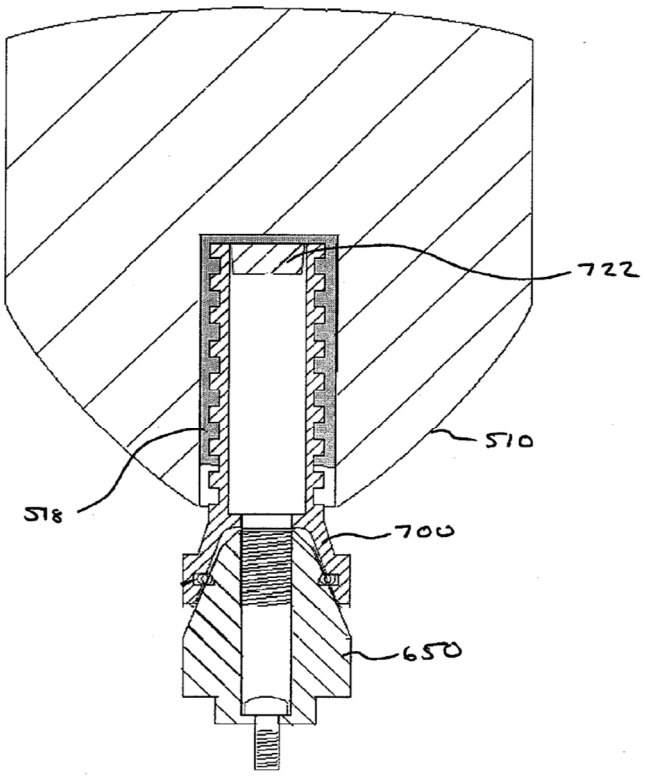


Figure 9

Moreover, in the flowchart of Figure 4 shown below, at step 416, Bernhard discloses bonding the prosthesis to the coping so that, after the bonding agent has cured, the clinician can, as described in step 418, remove the prosthesis, the

coping, and the provisional connection feature together as a unit, which is a pick-up process. Ex. 1003, [0116], Fig. 4; Ex. 1002, ¶264.

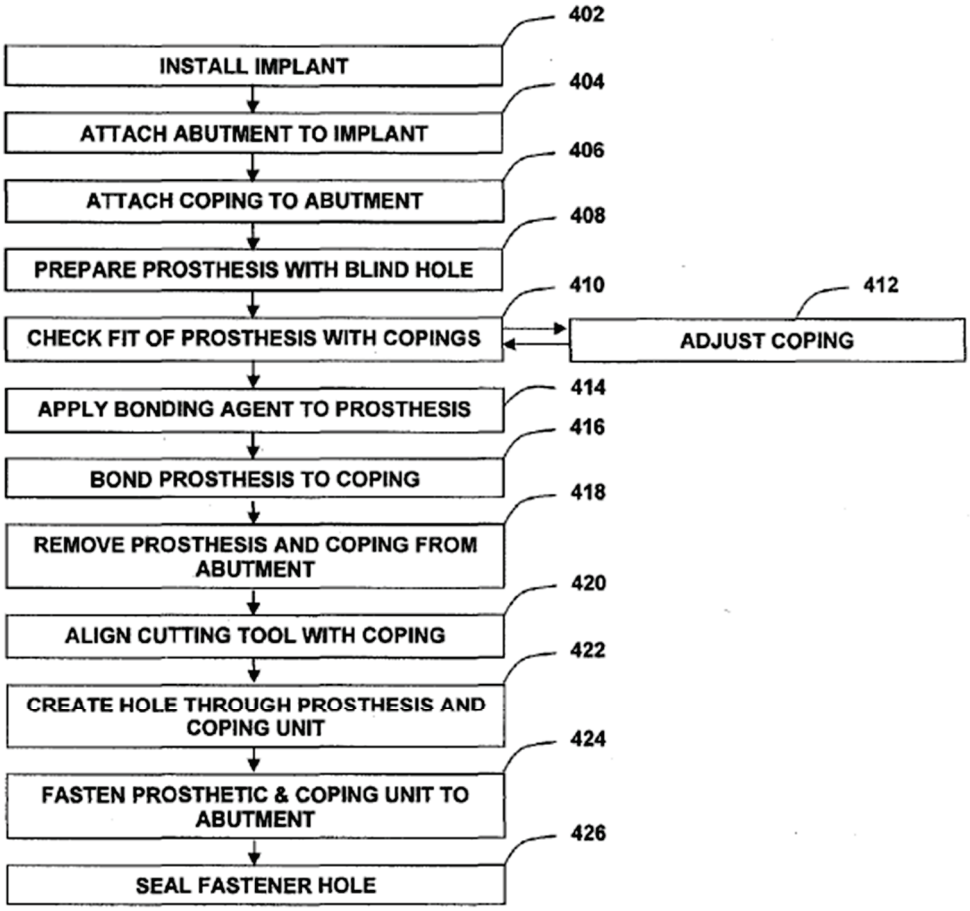


Figure 4

As explained above, it would have been obvious to use a temporary fastener with flexible buttress threads to temporarily hold coping 700 bonded to prosthesis 510 in alignment with abutment 650. The temporary fastener would be designed so that the flexible buttress threads enable the temporary fastener, coping 700, and prosthesis 510 bonded to coping 700, to release from abutment 650 as a unit in

response to the axial release force in the proximal direction when the dentist removes prosthesis 510 bonded to coping 700 from the patient's jaw during a pick-up process. Ex. 1002, ¶265.

7. Claim 7

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. As shown in Figure 12 of Bernhard, shaft 754 of fastener 750 includes an unthreaded portion between head 752 and the threaded portion. Ex. 1003, Fig. 12. A POSA would understand this unthreaded portion is due to the gap between the top of lip 726 and the threads in bore 654. Ex. 1002, ¶267.

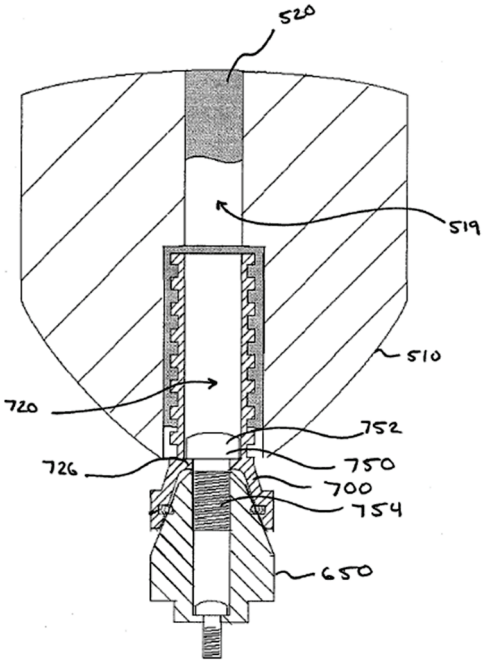


Figure 12

A POSA would design the temporary fastener, configured for rotary engagement with the threads of abutment 650, to have the same unthreaded portion between the head and the threaded portion of the shaft as fastener 750, so that the temporary fastener could be inserted through aperture 724 and threaded into bore 654, like fastener 750. Ex. 1002, ¶268. It would have been obvious to design the temporary fastener so that the unthreaded portion ("neck") has a smaller diameter than the threaded portion. An unthreaded shaft portion, proximally from the threaded portion and with a diameter corresponding approximately to the minor diameter of the threading (or less) is a common design variation in screws. Ex. 1022, Figs. 3-4, Table II; Ex. 1002, ¶¶269. For example, the shaft of screw 1260 in Figure 26 of Bernhard has an unthreaded portion with a smaller diameter between the head and the threaded portion. Ex. 1003, Fig. 26; Ex. 1002, ¶270.

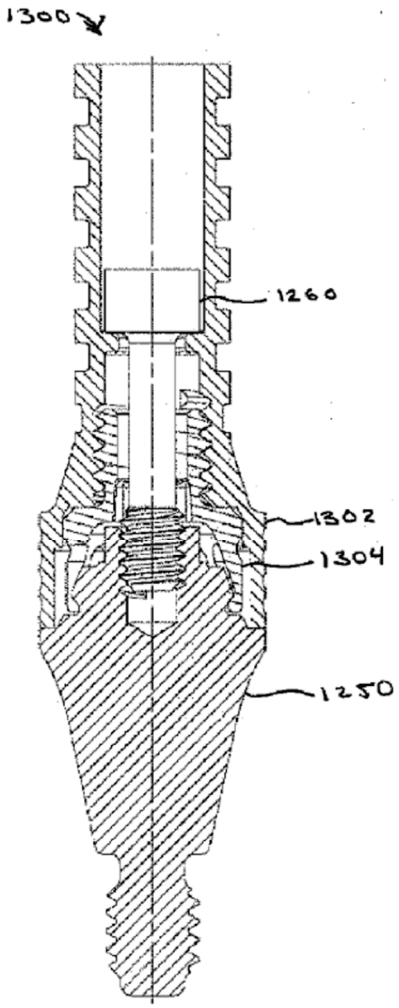


Figure 26

Therefore, it would have been obvious for the distal shaft portion of the temporary fastener to have a portion with a smaller width located proximally from the distal shaft portion. Ex. 1002, ¶¶266-271.

8. Claim 8

Bernhard discloses a dental system comprising abutment 650 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. As depicted in Figure 12 of Bernhard, the threads of definitive screw 750 are continuous, and thus definitive screw 750 continuously engages the threads of abutment 650. Ex. 1002, ¶273.

9. Claim 9

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, and thereby the shaft, deform when the temporary fastener and coping 700 disengage from the threads of implant abutment 650. Ex. 1005, [0079], [0084]. Therefore, the distal shaft portion of the temporary fastener would deform and disengage the threads of abutment 650 to release coping 700 and the temporary fastener as a unit as a result of the axial release force. Ex. 1002, ¶274.

10. Claim 10

a. Limitation 10(a)

As explained above, it would have been obvious to use a temporary fastener with flexible buttress threads in Bernhard's system, and doing so would meet all of the limitations of claim 1. As explained below, the use of this temporary fastener in Bernhard's system to install Bernhard's dental prosthesis 510 would also meet all the additional limitations of the method recited in dependent claim 10, including the preamble of claim 10. *See* Section IX.C.2; Ex. 1002, ¶276.

b. Limitation 10(b)

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 buttress threads that would engage the threads in bore 654 of abutment 650 in order to attach coping 700 to abutment 650. As shown in Figure 8 of Bernhard, coping 700 has a central aperture 724, through which the threaded shaft of the temporary fastener would extend, so that the temporary fastener would attach to the threads of abutment 650 and the temporary fastener and coping 700 would be held in axial alignment with abutment 650, with the coping extending about the temporary fastener. Ex. 1003, [0130]-[0131], Figs. 8, 12; Ex. 1002, ¶277.

c. Limitation 10(c)

As explained above, it would have been obvious to use a temporary fastener with flexible buttress threads to temporarily connect coping 700 to 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, ¶278. Bernhard discloses a pickup process. *See id.;* Section IX.C.6.a; Ex. 1003, Fig. 4, steps 414-418.

d. Limitation 10(d)

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 abutment 650. Thus, the temporary fastener would be configured so that in response to application of the axial release force applied from the pick-up processing, coping 700 attached to the temporary fastener are released as a unit from abutment 650. Ex. 1003, [0066]-[0067]; Ex. 1005, [0084]; Ex. 1002, ¶279.

e. Limitation 10(e)

As explained in Section V.B above, and shown in Figures 10-12 of Bernhard, after the dentist removes prosthesis 510 from the jaw, drill bit 850 is used to drill bore 519 through prosthesis 510, and bore 519 is aligned with the aperture at the proximal end of coping 700 and aperture 752 of coping 700. Ex. 1003, [0104]-[0105], [0131], [0133], Figs. 3, 10-12; Ex. 1002, ¶280.

f. Limitation 10(f)

As explained below with respect to limitation 10(g), after bore 519 is drilled, prosthesis 510 together with coping 700 are aligned with and connected to abutment 650 using definitive screw 750. Ex. 1003, [0104]-[0105], [0131]-[0134], Figs. 3, 10-12; Ex. 1002, ¶281.

g. Limitation 10(g)

As shown in Figure 12, Bernhard discloses attaching prosthesis 510 with the released coping 700 to abutment 650 using the definitive screw (threaded fastener

750). Ex. 1003, [0105], [0130], [0134], Figs. 3-4, 12. Threaded fastener 750 includes shaft 754 which is inserted through the hole (bore 519) in prosthesis 510. *Id.*; Ex. 1002, ¶282.

h. Limitation 10(h)

As discussed above for claim 3, the maximal width of the symmetric threads of the definitive screw (fastener 750) would be greater than the maximal width of the asymmetric threads of the distal shaft portion of the temporary fastener. *See* Section IX.C.4; Ex. 1002, ¶283.

11. Claim 11

As explained above, it would have been obvious to use a temporary fastener with flexible buttress threads in Bernhard's system. As discussed above, the flexible buttress threads would enable the temporary fastener to be completely removed from abutment 650 while the temporary fastener remains attached to coping 700, when the dentist removes prosthesis 510 from the patient's jaw during a pick-up process, as shown in Figs. 10-11 of Bernhard. Ex. 1003, [0104]-[0105], [0131]-[0134], Figs. 3-4, 10-12; Ex. 1002, ¶285.

12. Claim 12

Based on Bernhard, it would have been obvious to provide and use an alignment tool as recited in claim 12.

Bernhard describes an alignment tool used to align a cutting tool (e.g., a drill bit) with a dental component—such as a coping, abutment, or coping/abutment combination—and a prosthesis. Ex. 1003, [0163], [00167], Fig. 32B; *see also id.*, [0011], [0090]. Alignment tool 2800 is a hollow cylinder with varying diameters: A section with a wider diameter ("cavity" 2820) surrounds and fits around the dental component; a section with a narrower diameter surrounds and fits around drill bit 2850. *Id.*; Ex. 1002, ¶288.

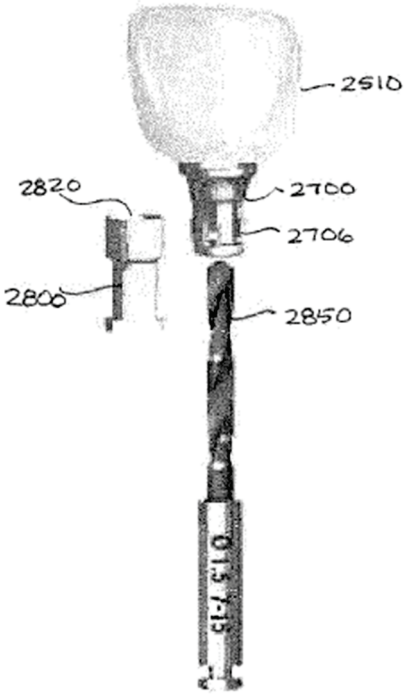


Figure 32B

When using a temporary fastener with flexible buttress threads in Bernhard's system, as described above, a POSA would have recognized that the alignment tool

described in Bernhard could also be used for temporarily connecting the coping to the abutment using the temporary fastener. Ex. 1002, ¶289.

In particular, it would have been obvious, based on this alignment tool, to design a hollow cylinder with varying diameters to align the coping and the temporary fastener with the abutment before screwing the fastener in. The wider part (like "cavity 2820") would fit around the coping and the abutment (which Bernhard depicts as having the same diameter, *see* Fig. 8), thereby aligning the tool with the coping and the abutment. The narrower part would surround and fit around the temporary fastener head, thereby aligning the fastener with the coping and the abutment. Ex. 1002, ¶290.

A POSA would have been motivated to design and provide such an alignment tool for use with the temporary fastener with flexible buttress threads in Bernhard's system, given the small size of the fastener (its head would roughly be around 2-3 mm in diameter), the associated difficulty of bringing it into the correct position before screwing it in, and the related risk of dropping it in the patient's mouth. Ex. 1002, ¶291.

Using such an alignment tool would have been merely the use of a tool and technique known from Bernhard (a hollow cylinder with sections of varying widths to align a drill with a coping or abutment) to improve a similar clinical procedure (aligning a fastener with a coping and abutment) in the same way (using a hollow

cylinder with sections of varying widths that fit around the various components that are aligned). Ex. 1002, ¶292.

A POSA would have had a reasonable expectation of success designing such an alignment tool because he/she would have had to merely adjust the dimensions (length, width) of the various sections of the hollow cylinder described in Bernhard to fit the coping/abutment and temporary fastener. Ex. 1002, ¶293.

13. Claim 13

As explained above, the temporary fastener with buttress threads would attach to the threads in bore 654 of abutment 650 at a predetermined temporary holding torque. A POSA would understand that the temporary fastener would be designed to engage abutment 650 at a predetermined rotational torque (*see* Section IX.C.1 above) and should be screwed into bore 654 to a predetermined temporary holding torque, sufficient to temporarily hold coping 700 in alignment with abutment 650, while still allowing the temporary fastener to be easily pulled out of abutment 650. Ex. 1002, ¶295.

As further explained above, Bernhard discloses that the definitive screw (fastener 750) is screwed into bore 654 of abutment 650 to permanently connect prosthesis 510 and coping 700 to abutment 650. Ex. 1003, [0134], Fig. 12. A POSA would understand that the definitive screw 750 should be screwed into bore 654 with a torque driver up to the predetermined fixation torque, and that this

fixation torque for the metal definitive screw would be greater than the temporary holding torque for the temporary fastener with flexible threads. This is because the rotational fixation torque for a screw is related to its clamping force. Ex. 1002, ¶¶296-97. As the fixation torque increases, the holding or clamping force increases. *Id*. A POSA would understand that because the definitive screw 750 is meant to permanently connect prosthesis 510 and coping 700 to abutment 650, it would have a high rotational fixation torque, whereas the temporary fastener, which is designed to temporarily connect these components, would require less clamping force, and thus have a lower rotational fixation torque. *Id*., ¶¶297-300.

14. Claim 14

As explained for claim 13 above, a POSA would understand that the fixation torque for the definitive screw would be greater than the predetermined temporary holding torque for the temporary fastener. *See* Section IX.C.13; Ex. 1002, ¶302.

15. Claim 15

a. Limitation 15(a)

As explained above, Bernhard discloses a dental system, and 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, ¶¶305-307.

b. Limitation 15(b)

As shown in Figure 8 of Bernhard, implant abutment 650 has female threads in bore 654 and an implant abutment longitudinal axis. Ex. 1003, [0130], Fig. 8; Ex. 1002, ¶308.

c. Limitation 15(c)

As shown in Figure 7A of Bernhard, coping 700 has a proximal end with an aperture and a central aperture (aperture 724) which merges into a central open channel (cavity 704) with a greater width than central aperture 724. Ex. 1003, [0126], [0129], Figs. 7A, 8; Ex. 1002, ¶309.

Bernhard discloses that, and a POSA would understand that, elongate member 714 of coping 700 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. 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]. Thus, central aperture 724 would be at the proximal end of coping 700. Ex. 1002, ¶310.

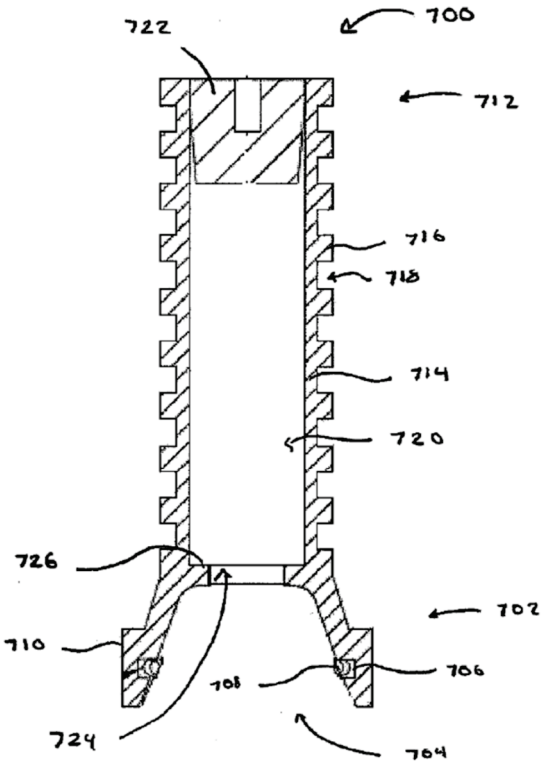


Figure 7A

d. Limitation 15(d)

As shown in Figure 12, Bernhard discloses a definitive screw, namely threaded fastener 750 (described as a "threaded screw"), with threads configured to engage the threads of bore 654 of abutment 650. Ex. 1003, [0105], [0130], [0134], Figs. 3, 12. Threaded fastener 750 includes a proximal head end (head 752) which inherently has a tool interface (to drive the "threaded screw"), and shaft 754 with a distal post portion with threads configured to secure coping 700 to the threads in

bore 654 of abutment 650.[4] *Id.*, [0134], Figs. 8, 12; Ex. 1002, ¶311. 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 into the central open channel (cavity 704). Ex. 1003, [0134], Figs. 8, 12; Ex. 1002, ¶311.

e. Limitation 15(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 flexible buttress threads.

Like threaded fastener 750, the temporary fastener would have a longitudinal axis with a length measured along the longitudinal axis, and a width measured perpendicular to the longitudinal axis. Ex. 1003, [0134], Figs. 8, 12; Ex. 1002, ¶¶312-313.

f. Limitation 15(f)

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. 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 temporary torque for holding coping 700 in alignment with abutment 650. Ex. 1003, [0134], Figs. 8, 12; Ex. 1002, ¶314. A POSA would

[4] See footnote 3 above.

understand that a drive tool interface in dental screws is intended for use with a dental torque driver, which is a standard dental device that applies rotational torque until a preset limit is reached. A POSA would further understand that the temporary fastener would be designed to engage abutment 650 at a predetermined rotational torque (*see* Section IX.C.1 above), and would know to set the torque driver to a corresponding torque value for the temporary fastener. Ex. 1002, ¶314.

g. Limitation 15(g)

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. The temporary fastener shaft would extend through the central aperture at the proximal end of coping 700 and central aperture 752. Ex. 1003, [0134], Figs. 8, 12. Given the smaller thread depth, a maximal width of the distal portion of the shaft of the temporary fastener with threads would inherently be smaller than a maximal width of the distal post portion of the definitive screw 750 with threads. Ex. 1002, ¶315.

h. Limitation 15(h)

As explained above, the temporary fastener with flexible buttress threads would be configured so that the shaft threading would engage the threads of abutment 650, so that when in position, the temporary fastener would cooperate

with coping 700 to align 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 temporary torque for holding coping 700 in alignment with abutment 650. *Id.*; Ex. 1002, ¶316.

i. Limitation 15(i)

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 abutment 650. Thus, the temporary fastener would be configured so that in response to application of an axial release force in a proximal direction during pick-up processing, coping 700 and the temporary fastener are released as a unit from abutment 650 without rotation. Ex. 1003, [0066]-[0067]; Ex. 1005, [0084]. Bernhard teaches, and a POSA would understand, that the axial release force would need to be above a predefined threshold value, sufficient to overcome the frictional forces holding the temporary fastener in place in threaded bore 654. Ex. 1003, [0067], [0104]; Ex. 1002, ¶317.

16. Claim 16

As explained above for claim limitation 15(i), the temporary fastener would be configured to release from abutment 650 in response to application of an axial

force above a predefined threshold value in the proximal direction. *See* Section IX.C.15.i; Ex. 1002, ¶¶319-320.

As explained above for claim 9, the flexible threads on the shaft of the temporary fastener, and thereby the distal shaft portion, would deform in response to application of the axial release force. *See* Section IX.C.9; Ex. 1002, ¶319.

17. Claim 17

As explained above, the temporary fastener would be designed so that the flexible buttress threads enable the temporary fastener to be pulled axially out of bore 654 of abutment 650 without being unscrewed, i.e. without rotating the temporary fastener, in response to the axial release force. Ex. 1005, [0079], [0084]; Ex. 1002, ¶322.

18. Claim 19

As explained above for claim 7, it would have been obvious to design the temporary fastener so that the proximal unthreaded portion of the shaft has a smaller diameter than the distal threaded portion of the shaft. *See* Section IX.C.7; Ex. 1002, ¶324.

19. Claim 20

As explained above for claim 13, a POSA would understand that definitive screw 750 should be screwed into bore 654 up to a predetermined definitive

fixation torque, and that this torque would be higher than the temporary holding torque used with the temporary fastener. *See* Section IX.C.13; Ex. 1002, ¶326.

20. Claim 21

As shown in Figure 12, Bernhard discloses a definitive screw (threaded fastener 750) with a shaft 754 that has symmetrical helical threads that match and are screwed into the threads of bore 654 of abutment 650. The definitive screw threads are on the distal post portion of shaft 754, and the threads have a first thread pitch that is the same as the thread pitch of the threads of abutment 650. Ex. 1003, [0105], [0130], [0134], Figs. 3, 12. As explained above in Section IX.C.1, the temporary fastener would have flexible buttress threads on the distal shaft portion of its shaft. The temporary fastener threads would also be helical and would be designed to have the same thread pitch (and therefore "essentially the same" pitch) as the abutment threads and the definitive screw threads, so that the temporary fastener could be screwed into the same abutment threads as the definitive screw. Ex. 1002, ¶328.

D. Ground 4: Claims 5, 9, 16, 18 and 22-29 Would Have Been Obvious Based on Bernhard In View of Poovey, Gracco and Derey

Claims 5, 9, 16, 18 and 22-29 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, ¶¶329-394.

In particular, as explained above, it would have been obvious based on Bernhard and Poovey to use a temporary fastener with flexible threads in Bernhard's system. The only differences between Poovey's flexible screw and the claimed temporary fastener are that Poovey's symmetric threads do not have a different thread geometry and Poovey's screw does not have a split-post structure with deflecting legs. As explained above, a POSA would have been motivated to use an asymmetric buttress thread in order to make the temporary fastener easier to pull out (as disclosed in Gracco) while still stable and secure. As explained below, a POSA also would have been motivated to incorporate deflecting legs into the fastener based on Derey, for the same reason.

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 5, 9, 16, 18 and 22-29 would have been obvious in further view of Derey. Ex. 1002, ¶332.

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, ¶336.

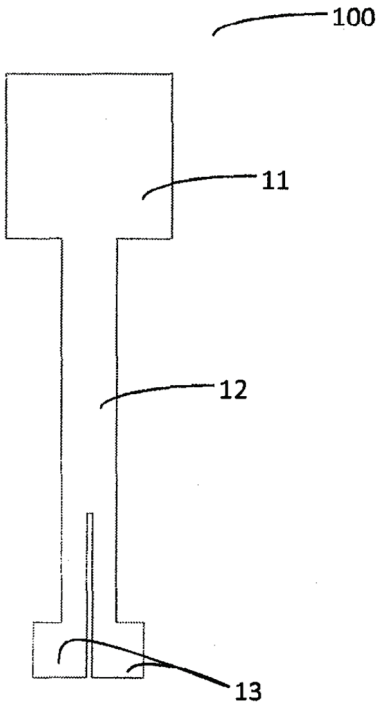


Fig. 5

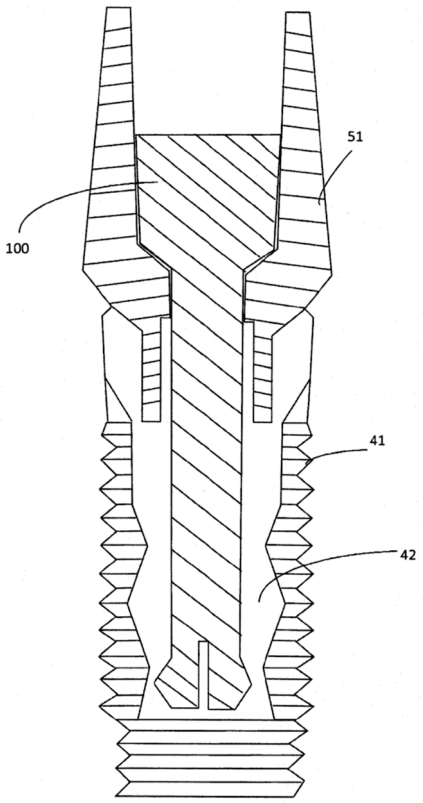


Fig. 6

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. As discussed above, reducing the required pull-out force as much as possible (as long as stability is maintained) is important in order not to injure the patient (who, in some cases, has a freshly-placed dental implant in his/her jaw) and to make the procedure comfortable for the patient—a consideration expressed in both Bernhard and Poovey. Ex. 1002, ¶337; Ex. 1003, [0067]; Ex. 1005, [0084].

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 deform and 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, ¶338.

In sum, a POSA would have been motivated to use a temporary fastener with flexible buttress threads and deflecting legs based on: (1) the prior art (Bernhard and Poovey providing motivation, and Poovey, Gracco and Derey providing solutions, to reduce the required removal force); (2) the nature of the problem to be solved (how to design the flexible screw to be easier to pull out); (3) a POSA's knowledge; and (4) the fact that this is merely a combination of prior art elements according to known methods to yield predictable results. *See PGS*, 891 F.3d at 1365; *KSR*, 550 U.S. at 416, 418; M.P.E.P. § 2143; Ex. 1002, ¶339.

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 easily pulled out without being unscrewed. Ex. 1002, ¶340.

As explained below, this split-post temporary fastener with flexible buttress threads and deflecting legs would have all the features of claims 5, 9, 16, 18 and 22-29. *Id.*, ¶341.

2. Claim 5

As explained above, the temporary fastener with deflecting legs would have a gap on either side of the threaded shaft created by the slot of the split-post structure. This gap would interrupt the helical threads and therefore make the contact between the temporary fastener threads and the threads of bore 654 of abutment 650 discontinuous. Therefore, the distal shaft portion of the temporary fastener would be configured to have discontinuous contact with the threads of bore 654 of abutment 650 throughout the engagement depth. Ex. 1002, ¶343.

3. Claim 9

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 further enable the temporary fastener and coping 700 to be pulled out of bore 654 of abutment 650 without having to unscrew the temporary fastener. Ex. 1002, ¶346.

Therefore, the distal shaft portion of the shaft of the temporary fastener would be configured to deform and disengage the threads in bore 654 of abutment 650 to release coping 700 and the temporary fastener as a unit from abutment 650 as a result of the axial release force. Ex. 1002, ¶347.

4. Claim 16

As explained above for limitation 15(i), the temporary fastener would be configured to release from abutment 650 in response to application of an axial force above a predefined threshold value in the proximal direction. *See* Section IX.C.15.i; Ex. 1002, ¶349.

As explained above for claim 9, the distal shaft portion of the shaft of the temporary fastener with flexible buttress threads would be configured to deform in response to the application of the axial release force above the predefined value in the proximal direction. *See* Section IX.D.3; Ex. 1002, ¶350.

5. Claim 18

As explained above, the temporary fastener with a split-post structure would have a gap on either side of the threaded shaft created by the slot of the split-post structure. This gap would interrupt the helical threads and therefore make the contact between the temporary fastener threads in bore 654 and the threads of abutment 650 discontinuous when the temporary fastener is threaded into bore 654 at the predetermined temporary holding torque. Therefore, the threads of the shaft

of the temporary fastener would be configured to have discontinuous contact with the threads of bore 654 of abutment 650 at the predetermined temporary holding torque. *See* IX.C.14.h; Ex. 1002, ¶¶352-53.

6. Claim 22

a. Limitation 22(a)

As explained above, Bernhard discloses a dental system, and 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, ¶¶356-358.

b. Limitation 22(b)

As shown in Figure 7A of Bernhard, coping 700 includes an aperture at the proximal end and aperture 724. Coping 700 also has a distal end with a coping seating surface that surrounds cavity 704. Cavity 704 defined by the coping seating surface is "shaped to closely fit the shape of" abutment 650. Ex. 1003, [0126], [0129], Figs. 7A, 8; Ex. 1002, ¶359.

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. 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, ¶360. Thus, aperture 724 would be at the proximal end of coping 700.

c. Limitation 22(c)

As shown in Figure 8 of Bernhard, implant abutment 650 has a longitudinal axis. Ex. 1003, [0130], Fig. 8; Ex. 1002, ¶361.

d. Limitation 22(d)

As shown in Figure 8 of Bernhard, bore 654 of abutment 650 has female threading that begins at the proximal end of abutment 650 and extends distally. Ex. 1003, [0130], Fig. 8; Ex. 1002, ¶362.

e. Limitation 22(e)

As shown in Figure 8 of Bernhard, implant abutment 650 has an outer walled surface that surrounds threaded bore 654. Ex. 1003, [0130], Fig. 8. This outer walled surface of abutment 650 is an implant abutment seating surface that "closely fit[s]" the shape of cavity 704 in coping 700. Ex. 1003, [0124], [0126], Figs. 7A, 8; Ex. 1002, ¶363.

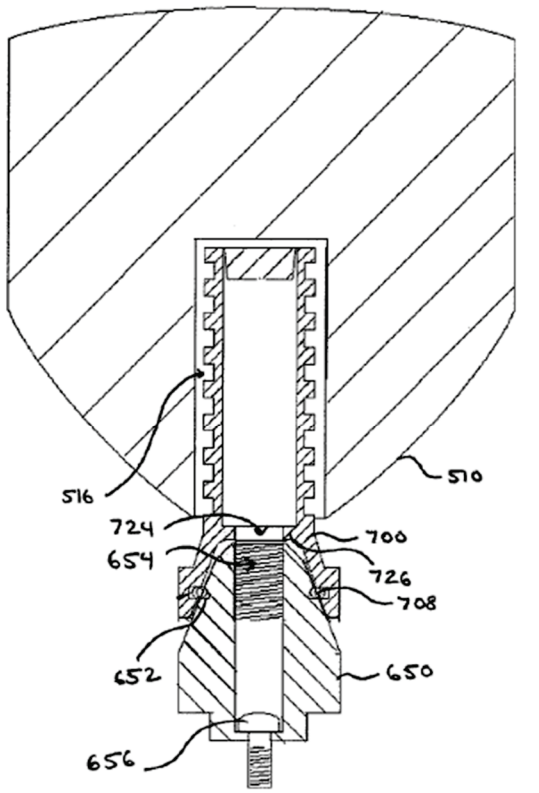


Figure 8

f. Limitation 22(f)

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 an axis with a length measured along the axis. Moreover, the temporary fastener would have a lateral dimension providing different widths along the axis measured perpendicular to the axis, because the head of the temporary fastener would have a maximum diameter that is greater than the width of the shaft, just like head 752 of fastener 750 is wider than shaft 754. Ex. 1003, [0134], Figs. 8, 12; Ex. 1002, ¶365.

g. Limitation 22(g)

As explained above, the temporary fastener with a split-post structure and 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, ¶366.

h. Limitation 22(h)

As explained above, the temporary fastener would be based on the design of threaded fastener 750, but with flexible buttress threads and a split-post structure. Like shaft 754 of threaded fastener 750, the threads of the temporary fastener shaft

would be threaded into the threads of bore 654 of abutment 650 to hold coping 700 against abutment 650. Ex. 1003, [0134], Figs. 8, 12. Therefore, like shaft 754, the temporary fastener shaft would include a distal shaft portion sized and configured for rotary engagement with the female threads of bore 654 of abutment 650. Ex. 1002, ¶367.

i. Limitation 22(i)

As explained above, the temporary fastener with a split-post and flexible buttress threads would be based on the design of threaded fastener 750 and include a shaft that, like shaft 754, would be sized to extend through aperture 724 of coping 700. Moreover, the temporary fastener would have a threaded shaft that, like shaft 754, would have a distal shaft portion configured to rotatably engage the female threads of bore 654 of abutment 650 to an engagement depth sufficient to hold coping 700 in alignment with and against abutment 650. A POSA would have understood that the temporary fastener should be threaded into bore 654 up to a predetermined temporary holding torque to hold the coping seating surface of coping 700 in alignment with and against the corresponding abutment seating surface on abutment 650. A POSA would have understood that the temporary fastener would be designed to engage abutment 650 at a predetermined rotational torque (*see* Section IX.C.1 above) sufficient to temporarily hold coping 700 in

alignment, while still allowing the temporary fastener to be easily pulled out of abutment 650. Ex. 1003, [0134], Fig. 12; Ex. 1002, ¶368.

j. Limitation 22(j)

As explained above, the temporary fastener would be designed so that the split-post structure and flexible buttress threads enable the temporary fastener to be pulled out of bore 654 of abutment 650. Thus, the temporary fastener would be configured so that, as a result of the axial release force in a proximal direction during pick-up processing, coping 700 and the temporary fastener are released as a unit from abutment 650, without having to unscrew the temporary fastener. Ex. 1003, [0066]-[0067]; Ex. 1005, [0084]; Ex. 1002, ¶369.

k. Limitation 22(k)

As explained above, the temporary fastener would include a threaded shaft like shaft 754 of fastener 750 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 discontinuous. Therefore, the distal shaft portion of the temporary fastener would be sized and configured to discontinuously engage the threads of bore 654 of abutment 650 between a most distal engagement position of the distal shaft portion and a proximal end of the female threads of bore 654 of abutment 650. Ex. 1002, ¶370.

7. Claim 23

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 abutment 650 to hold coping 700 in alignment with abutment 650. Ex. 1003, [0116]-[0117], [0131], Figs. 4, 9; Ex. 1002, ¶372.

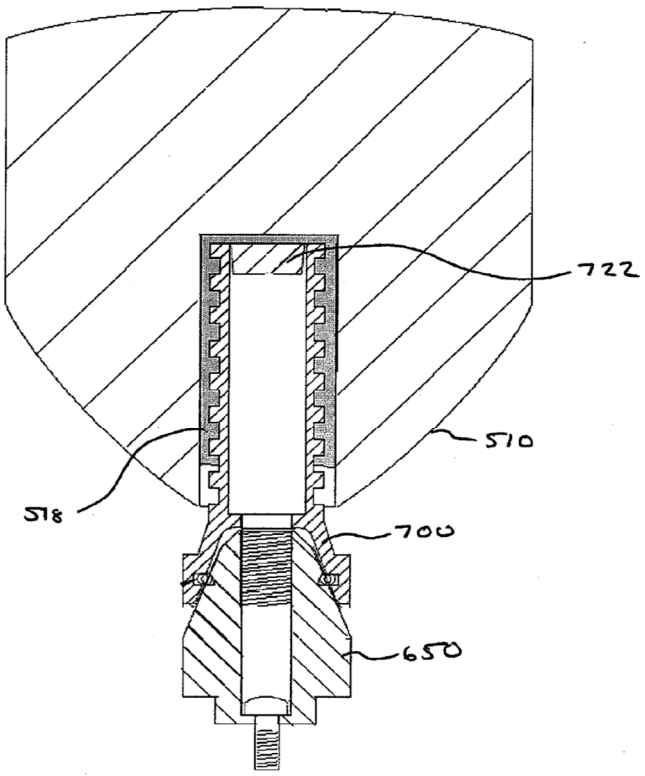


Figure 9

Moreover, in the flowchart of Figure 4 shown below, at step 416, Bernhard discloses bonding the prosthesis to the coping so that, after the bonding agent has cured, the clinician can remove the prosthesis, the coping, and the provisional connection feature together as a unit "in an aligned configuration" as described in

step 418. Ex. 1003, [0104], [0116], [0177], Fig. 4. Bernhard discloses a pick-up process in steps 414-418 of Figure 4, reproduced below. *Id*. Bernhard's pick-up process is a closed-tray impression process, because there is no through hole in the prosthesis until step 422, after the prosthesis is removed from the abutment. Ex. 1003, [0104], [0117], Figs. 3-4; Ex. 1002, ¶373.

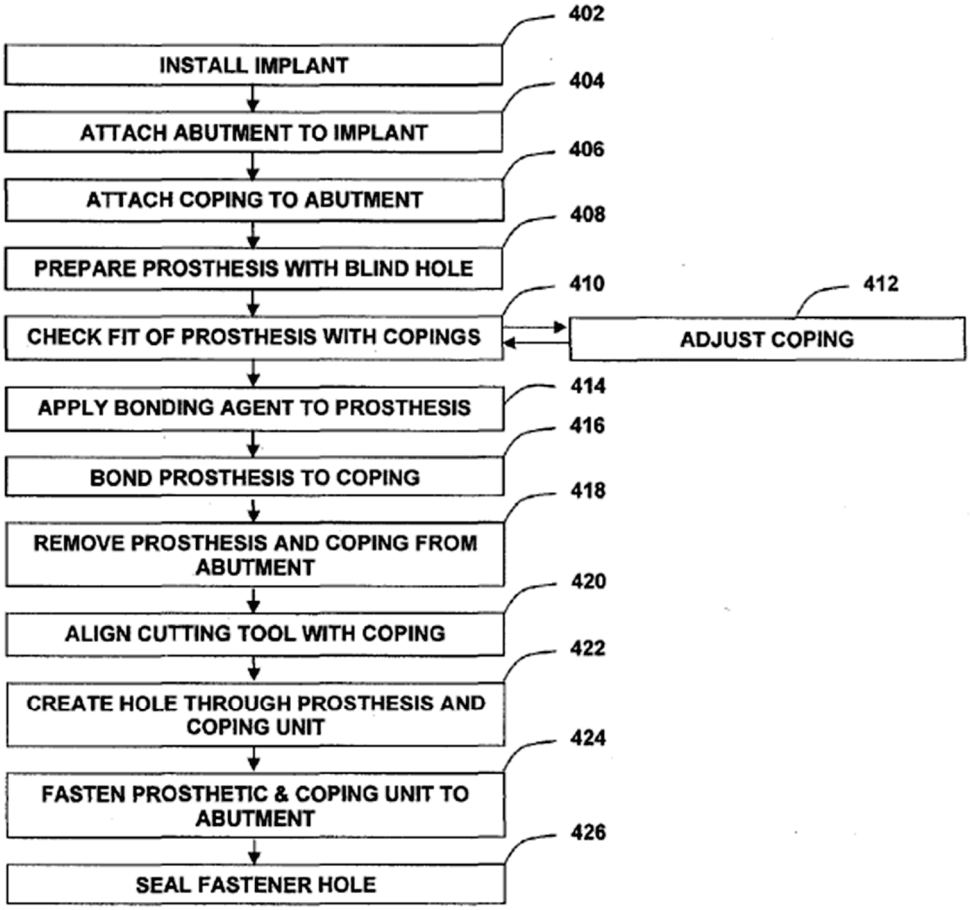


Figure 4

Further, 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 bonded to prosthesis 510 to abutment 650. The temporary fastener would be configured so that the split-post structure and the flexible buttress threads enable the temporary fastener, coping 700, and prosthesis 510 bonded to coping 700, to release as a unit from bore 654 of abutment 650 in response to an axial release force in the proximal direction during pick-up. Ex. 1002, ¶374.

Therefore, the axial force in the proximal direction would be applied in a closed-tray pick-up process after coping 700 is adhesively bonded to prosthesis 510. *Id.*, ¶375.

8. Claim 24

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 intact, and in its entirety. Thus, the temporary fastener would be configured to be released, intact, and in its entirety, together with coping 700 from abutment 650 as a unit when an axial release force is applied in a proximal direction. Ex. 1003, [0066]; Ex. 1005, [0084]; Ex. 1002, ¶377.

9. Claim 25

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.

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, ¶378.

10. Claim 26

a. Limitation 26(a)

The definitive screw (threaded fastener 750) in Bernhard's system has a longitudinal axis and a width measured perpendicular to the longitudinal axis. Ex. 1003, [0134], Figs. 8, 12; Ex. 1002, ¶381.

b. Limitation 26(b)

Bernhard discloses a definitive screw (threaded fastener 750) having a proximal head end (head 752) which inherently has a drive tool interface. Ex. 1003, [0134], Figs. 8, 12. As shown in Figure 12, shaft 754 of definitive screw 750 is screwed into bore 654 until head 752 contacts a proximal surface (rim 726) of coping 700. *Id*. As explained above in Section IX.C.15.c, Bernhard discloses that, and a POSA would understand that, elongate member 714 in Figure 7A could be eliminated or made shorter so that aperture 724 and rim 726 are at the proximal end of coping 700. Ex. 1002, ¶382.

c. Limitation 26(c)

Bernhard discloses a definitive screw (threaded fastener 750) in which the distal post portion of shaft 754 has a width that is sized and configured to extend through aperture 724 of coping 700. Ex. 1003, [0134], Figs. 8, 12; Ex. 1002, ¶383.

d. Limitation 26(d)

Bernhard discloses a definitive screw (threaded fastener 750) with a distal portion having an outer surface with male threading that is configured to rotatably engage the female threading in bore 654 of abutment 650 and position the coping seating surface (see cavity 704) against the abutment. Ex. 1003, [0105], [0126], [0130], [0134], Figs. 3, 7A, 12; Ex. 1002, ¶384.

A POSA would understand that threaded fastener 750 should be screwed into threaded bore 654 of abutment 650 to a predefined definitive fixation torque that is sufficient to position and secure the coping seating surface of coping 700 against the implant abutment seating surface of abutment 650, without damaging the components. Ex. 1002, ¶385.

11. Claim 27

Bernhard discloses a dental system comprising abutment 650 and a definitive screw (threaded fastener 750) with threaded shaft 754 that engages the female threads in bore 654 of abutment 650. Ex. 1003, [0105], [0130], [0134], Figs. 3, 12. The threads of definitive screw 750 are continuous. *Id.* Therefore, the threads of definitive screw 750 are configured to make continuous contact with the threads in bore 654 of abutment 650. *Id*; Ex. 1002, ¶387.

12. Claim 28

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, and this temporary fastener would be designed to provide a stable and secure temporary connection but also be easily pulled out without being unscrewed. Ex. 1002, ¶389.

It would have been obvious to design the temporary fastener to be shorter and to have a shorter engagement depth and longitudinal extent than the definitive screw (threaded fastener 750) in Bernhard's system. Definitive screw 750 is designed to permanently connect prosthesis 510 and coping 700 to abutment 650, whereas the temporary fastener is designed to be pulled out of abutment 650. A POSA would understand that reducing the engagement volume of the temporary fastener would make it easier to pull out, and that a simple way of reducing the engagement volume of the temporary fastener would be to make the threaded portion shorter than the threaded portion of the definitive screw. Ex. 1002, ¶390.

13. Claim 29

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 have a smaller proximal thread

angle and a smaller thread depth than the symmetric threads of threaded fastener 750. Ex. 1002, ¶392.

Given the smaller thread depth of the temporary fastener threads, the maximum width of the threads on the distal portion of the definitive screw with threads would be greater than the maximum width of the distal shaft portion of the temporary fastener. *See* Section IX.C.4; Ex. 1002, ¶393.

X. OBJECTIVE EVIDENCE OF NON-OBVIOUSNESS

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

XI. CONCLUSION

Petitioner respectfully requests that the Board institute a post-grant review of claims 1-29, find the claims unpatentable, and cancel the claims.

Dated: August 11, 2026

Respectfully submitted,

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CERTIFICATE OF COMPLIANCE

This petition complies with the word limit of 18,700 words because it has 18,689 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 August 11, 2026, 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. 12,551,319) by Federal Express:

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