

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. IPR2025-00956

U.S. Patent No. 11,937,992

Title: “Screw-Attached Pick-Up Dental Coping System And Methods”

Issued: March 26, 2024

Application No. 18/328,730

Filed: June 3, 2023

PETITION FOR INTER PARTES REVIEW
OF U.S. PATENT NO. 11,937,992

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EXHIBITS

Exhibit No.	Description
1001	U.S. Patent No. 11,937,992
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 <i>Amer. J. Orthodontics & Dentofacial Orthopedics</i> , 186–90 (2012) (Gracco)
1007	Declaration of Lindsay Allen re Gracco
1008	PCT Patent Application No. WO 2013/030839 A1 (Derey)
1009	U.S. Provisional Patent Application No. 62/742,942
1010	U.S. Provisional Patent Application No. 62/774,402
1011	U.S. Provisional Patent Application No. 62/818,082
1012	U.S. Patent Application No. 16/596,361
1013	U.S. Patent No. 11,311,354 (Kofford)
1014	Smart Denture Conversions Webpage – Separable Fastener
1015	Prosecution History of U.S. Patent Application No. 18/328,730
1016	Smart Denture Conversions – Technique Guide
1017	Complaint, D.I. 1 (April 23, 2024), <i>Smart Denture Conversions, LLC v. Straumann USA, LLC</i> , No. 1:24-cv-00507-JCB (D. Del.)
1018	U.S. Patent Application No. 17/691,108

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1019	NeoConvert Brochure
1020	U.S. Patent No. 7,938,046 (Nino)
1021	German Published Patent Application (Offenlegungsschrift) DE 3808238 A1 (Ruetschi)
1022	Certified English Translation of German Published Patent Application (Offenlegungsschrift) DE 3808238 A1 (Ruetschi)
1023	U.S. Patent No. 1,725,109 (Starkey)
1024	U.S. Patent No. 2,626,029 (Guttermann)

CLAIM LISTING

1(a)	1. A dental system comprising:
1(b)	an implant abutment having threads;
1(c)	a definitive screw having an axis with a length measured along the axis and a width measured perpendicular to the axis, the definitive screw having a proximal head end having a tool interface and a distal post portion having threads configured to engage the threads of the implant abutment;
1(d)	a coping having a proximal end with an aperture, wherein the aperture is larger than the distal post portion of the definitive screw and smaller than the proximal head end of the definitive screw; and
1(e)	a temporary screw having an axis with a length measured along the axis and a width measured perpendicular to the axis, the temporary screw comprising:
1(f)	a proximal head portion with a width larger than the aperture of the coping; and
1(g)	a distal shaft portion with threads in a pattern that is shaped differently from a pattern of the threads of the definitive screw,
1(h)	wherein the temporary screw is rotatable in a distal direction whereby the distal shaft portion of the temporary screw engages the threads of the implant abutment to a predetermined torque which causes the proximal head portion of the temporary screw to hold the coping in alignment with the implant abutment, and
1(i)	wherein an axial force in a proximal direction from pick-up processing releases the coping and the temporary screw from the implant abutment.
2	2. The dental system of claim 1, further comprising a temporary screw torque driver, wherein the temporary screw torque driver comprises: a spring friction cylinder, and a drive cap, and a coil spring, wherein the temporary screw torque driver is configured to limit torque applied to the temporary screw to the predetermined torque.

3	3. The dental system of claim 1, wherein the pattern of the threads of the temporary screw threading is asymmetric.
4	4. The dental system of claim 1, wherein the temporary screw is polymeric, and wherein the distal shaft portion is hollow, and wherein the temporary screw is rotatably insertable into the implant abutment to the predetermined torque.
5	5. The dental system of claim 1, wherein the pattern of the threads of the temporary screw is configured to define an abutment threading contact area and/or volume with the threads of the implant abutment that is less than an abutment threading contact area and/or volume with the threads of the implant abutment defined by the pattern of the threads of the definitive screw.
6	6. The dental system of claim 1, wherein the distal shaft portion of the temporary screw has a first portion with a smaller width than a second portion of the distal shaft portion of the temporary screw comprising the threads, and wherein the first portion with the smaller width is located between the proximal head portion and the threads.
7	7. The dental system claim 1, wherein the threads of the temporary screw deforms during the release of the temporary screw from the implant abutment.
8	8. The dental system of claim 1, wherein the distal shaft portion of the temporary screw has a hollow portion, and wherein at least a portion of the distal shaft portion is configured to deflect inwardly into the hollow portion-in response to the axial force in the proximal direction.
9(a)	9. A dental system for attachment of a coping to a threaded implant abutment comprising:
9(b)	an implant abutment having female threading having an implant abutment thread profile;
9(c)	a definitive screw having a longitudinal axis and a length measured along the axis and a width measured perpendicular to the axis, the definitive screw comprising:

9(d)	a shaft with male threading, wherein the male threading has a male threading profile that matably threadably engages and which matches the female threading of the implant abutment; and a head with a definitive screw drive interface;
9(e)	a coping having a proximal end with an aperture sized to allow the definitive screw shaft to pass through; and
9(f)	a temporary screw having a longitudinal axis and a length measured along the axis and a width measured perpendicular to the axis, the temporary screw comprising:
9(g)	a post comprising male threading, wherein the male threading has a male threading profile that is different from the male threading profile of the shaft of the definitive screw, and wherein the aperture of the coping is sized and configured to allow the post to pass through; and
9(h)	a head with a temporary screw drive interface, wherein the head is integral to or coupled to the post,
9(i)	wherein the temporary screw holds the coping in position against the implant abutment for pick-up processing, wherein the male threading of the post of the temporary screw is configured to enter the implant abutment and rotatably engage the the [sic] female threading of the implant abutment to a predetermined pick-up processing torque, and
9(j)	wherein threads of the male threading of the post release from threads of the female threading of the implant abutment with a predetermined axial pick-up force in a proximal direction in response to and/or during pick-up processing.
10	10. The dental system of claim 9, wherein the male threading profile of the post of the temporary screw comprises at least some threads that have a pitch angle that is different than a pitch angle of the threads of the female threading of the implant abutment and threads of the male threading profile of the shaft of the definitive screw.
11	11. The dental system of claim 9, wherein a proximal flank of the male threading profile of the post of the temporary screw is at a smaller angle relative to the longitudinal axis thereof than a proximal flank of the male

	threading profile of the shaft of the definitive screw relative to the longitudinal axis thereof.
12	12. The dental system of claim 9, wherein the temporary screw comprises a polymeric material.

Petitioner Straumann USA, LLC (“Petitioner”) respectfully petitions the Board to institute an inter partes review of claims 1–12 of U.S. Patent No. 11,937,992 (“’992 patent”) (Ex. 1001), find the claims unpatentable, and cancel the claims.

I. INTRODUCTION

The ’992 patent relates to components used during a procedure to install a dental prosthesis into implants in a patient’s jaw. The prosthesis is often secured to the implants by screws that fasten “copings” bonded in the prosthesis to “abutments” connected to the implants. Before the prosthesis can be installed, each coping must be aligned with its corresponding abutment and implant. The dentist does this by temporarily connecting each coping to its abutment and taking an impression that records the position of each coping. This ensures that the screws later used to permanently fasten the copings to the abutments will be correctly aligned.

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

pulled out of the abutment include snap-fit and friction-fit connectors, split-post connectors with deflecting legs, and screws with flexible threads that can be pulled out without being unscrewed.

The claims of the '992 patent are directed to a dental system that includes a specific design for a temporary coping-abutment fastener that can be pulled out of the abutment, just like the various prior art temporary fasteners. The claimed “temporary screw” has a different thread pattern than the permanent screw (that will later permanently fasten the coping to the abutment) and is threaded into the abutment but pulled out without being unscrewed.

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

The claims are also invalid because their own parent patent is prior art. The '992 patent issued from a continuation application filed on June 3, 2023, shortly after Petitioner’s device was publicly displayed, and more than one year after the parent patent issued. Patent Owner apparently drafted the claims to try to cover Petitioner’s device, but the claims are not supported because they are much broader than the only embodiment in the specification. As a result, the claims are not

entitled to claim priority to any of the priority applications and the parent patent is prior art.

The claims are not supported in two key respects. First, because Petitioner's device does not have a buttress thread, Patent Owner drafted the claims to encompass any temporary screw thread pattern that is different than the permanent screw threads, even though the only disclosed embodiment has a buttress thread. Second, because Petitioner's device does not have a split post with deflecting legs like the only disclosed embodiment, Patent Owner drafted the claims to encompass temporary screws that do not have a split post with deflecting legs, even though the specification explains that the deflecting legs permit the screw to be pulled out without being unscrewed.

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, and served the complaint on June 10, 2024. Patent Owner filed a supplemental complaint on

February 4, 2025, alleging infringement of U.S. Patent No. 12,156,781, which issued from a continuation of the '992 patent. The case is captioned as *Smart Denture Conversions, LLC v. Straumann USA, LLC*, 1:24-cv-00507-JCB (D. Del.).

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, 10 th Floor New York, NY 10151 (212) 588-0800 smortavazi@haugpartners.com
Backup Counsel	Georg Reitboeck (to be admitted pro hac vice) Mark A. Chapman (to be admitted pro hac vice) HAUG PARTNERS LLP 745 Fifth Avenue, 10 th Floor New York, NY 10151 (212) 588-0800 greitboeck@haugpartners.com mchapman@haugpartners.com Christopher Gosselin (to be admitted pro hac vice) HAUG PARTNERS LLP 1717 K Street NW, Suite 9000 Washington, DC 20006 (202) 292-1530 cgosselin@haugpartners.com

Petitioner will file a notice of intent to designate these back up counsel as provisionally recognized PTAB attorneys 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 counsel.¹ Petitioner consents to service via email at the above email addresses.

III. GROUNDS FOR STANDING

Petitioner certifies that (1) the '992 patent became available for inter partes review on December 26, 2024 and remains available for inter partes review and (2) Petitioner is not barred or estopped from requesting an inter partes review on the grounds in this petition.

IV. IDENTIFICATION OF CHALLENGE

Petitioner requests that the Board institute an inter partes review of claims 1–12, find the claims unpatentable, and cancel the claims, based on these grounds:

Ground	Claim(s)	Prior Art	Statutory Basis
1	1–6, 8–9, 11–12	Anticipated by Kofford	§ 102(a)(1)
2	4, 7, 12	Obvious based on Kofford in view of Poovey	§ 103

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

Ground	Claim(s)	Prior Art	Statutory Basis
3	7, 10	Anticipated by Kofford	§ 102(a)(1)
4	1, 3, 5–7, 9–12	Obvious based on Bernhard in view of Poovey and Gracco	§ 103
5	4, 8	Obvious based on Bernhard in view of Poovey, Gracco and Derey	§ 103
6	2	Obvious based on Bernhard in view of Poovey, Gracco and Ruetschi	§ 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 (Pub. No. US 2017/0202649 A1) (Ex. 1003) depicts prosthesis 140, coping 130, abutment 120, implant 110 and jawbone 10, with screw 138 that connects coping 130 to abutment 120 and screw 16 that connects abutment 120 to implant 110. *Id.*, [0065], [0082], Fig. 1.

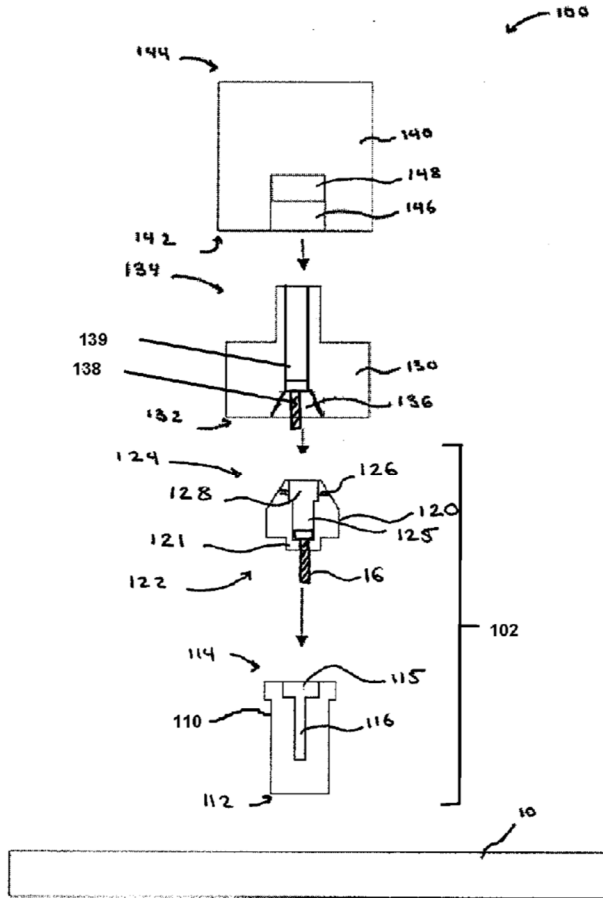


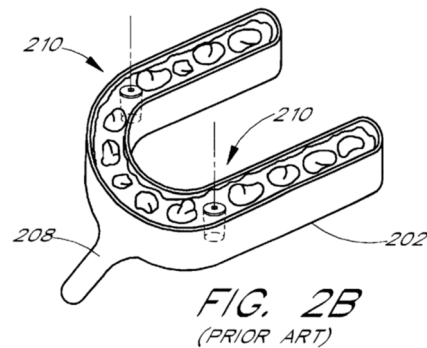
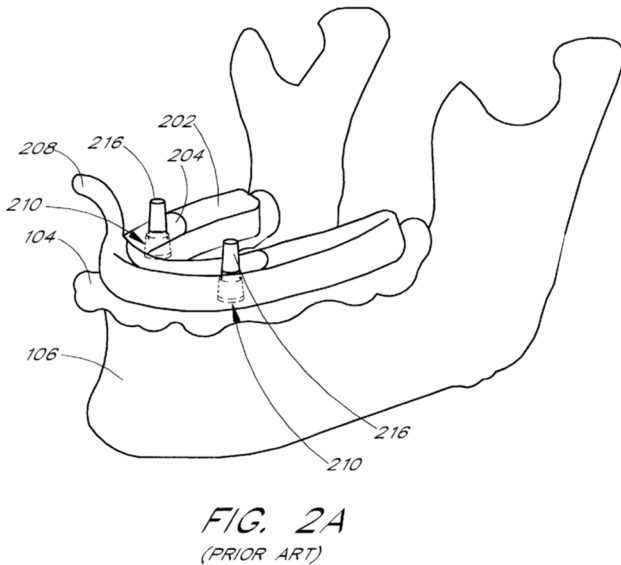
Figure 1

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, ¶¶49–50.

In an open-tray technique, there is a through-hole in the impression (i.e. the impression tray or the denture) to access each coping. After the dentist connects each coping to its abutment with a screw, the impression is taken. The dentist then inserts a tool in each hole in the impression to unscrew each coping from its abutment. The dentist removes (“picks up”) the impression from the jaw, with the bonded copings in place in the correct position and orientation. The open-tray technique is more time intensive for the patient, because the dentist has to unscrew each coping before removing the impression, but it is accurate and produces good quality impressions because the copings are picked up in the correct position. *Id.*, ¶51.

An open-tray technique using an impression tray is shown in Kumar (U.S. Patent No. 6,283,752) (Ex. 1004). Screws 216 inserted through openings 204 in impression tray 202 connect copings 210 to the abutments. *Id.*, 8:30–42, Fig. 2A. After impression material 104 sets, the dentist loosens screws 216 and removes impression tray 202 with copings 210. *Id.*, 8:43–48, Fig. 2B; Ex. 1002, ¶52.



In a closed-tray technique, there are no through-holes in the impression, so the dentist does not unscrew the copings from the abutments before removing the impression. Instead, when the impression is removed, the copings remain connected to the abutments, and the dentist then unscrews the copings and manually inserts them back into the impression. The closed-tray technique does not require pre-drilled through-holes for the temporary connection, but it does require the dentist to recreate the proper position and orientation of each coping in the impression after the fact, which can result in less accurate placement. *Id.*, ¶53.

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

removes copings 110 from the abutments and inserts copings 110 into indentations 112 in impression material 104. *Id.*, 8:23–29, Fig. 1B; Ex. 1002, ¶54.

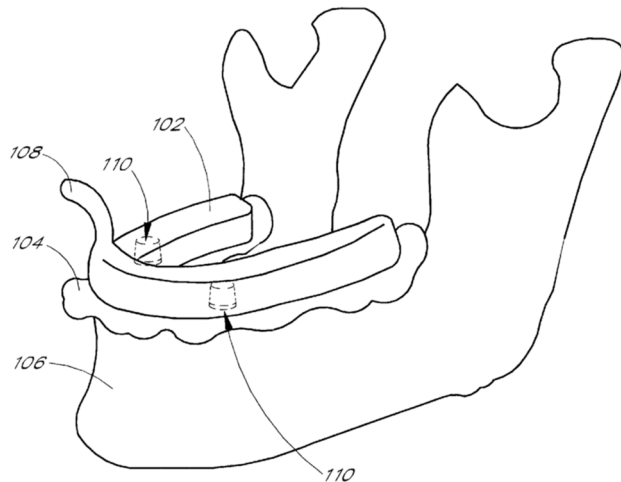


FIG. 1A
(PRIOR ART)

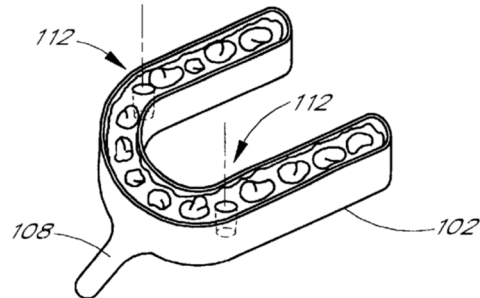


FIG. 1B
(PRIOR ART)

B. Bernhard

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

Bernhard discloses various designs for fasteners that temporarily connect a coping to an abutment during a pick-up process. Bernhard's temporary fasteners detach the coping from the abutment when the prosthesis is removed from the jaw. As a result, the copings remain in the prosthesis without needing to be unscrewed from the abutments using large through-holes. Thus, Bernhard's fasteners combine the best aspects of the open-tray and closed-tray techniques. Ex. 1002, ¶¶56, 67.

In Figure 1, 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.

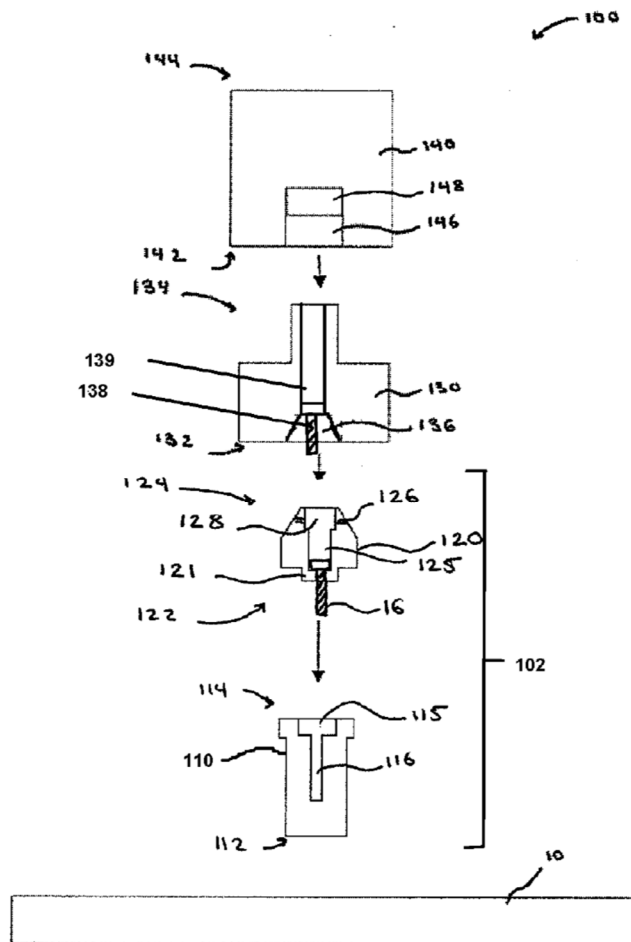


Figure 1

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. *Id.*, [0066]–[0067], [0075], [0079]–[0081], [0109], [0124], [0126], [0127], [0130], [0135]–[0138], [0140]–[0144], [0146], Figs. 1, 8, 13, 15, 17, 19, 21. 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.” *Id.*, [0076], Fig. 1.

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. *Id.*, Figs. 8–12; Ex. 1002, ¶¶61–65.

In Figure 8, 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], [0122], [0126], [0130], Fig. 8.

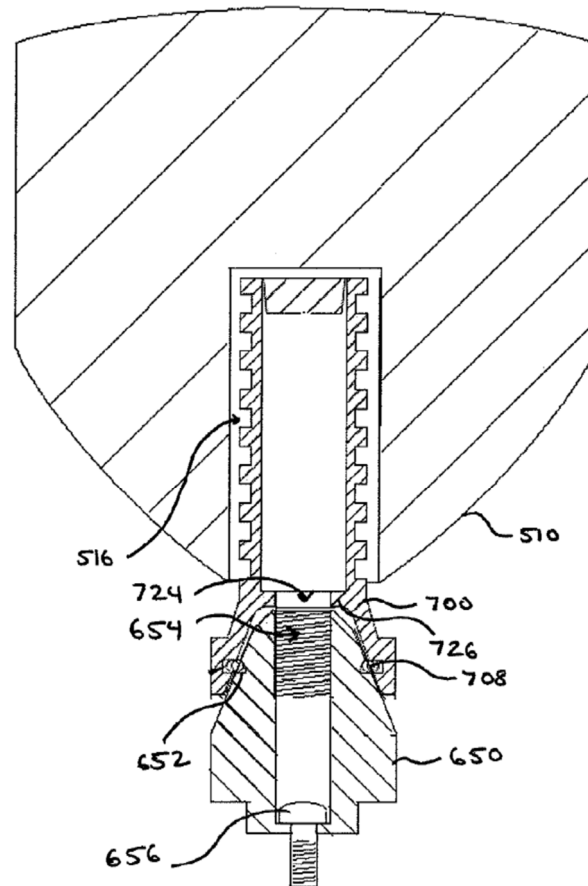


Figure 8

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

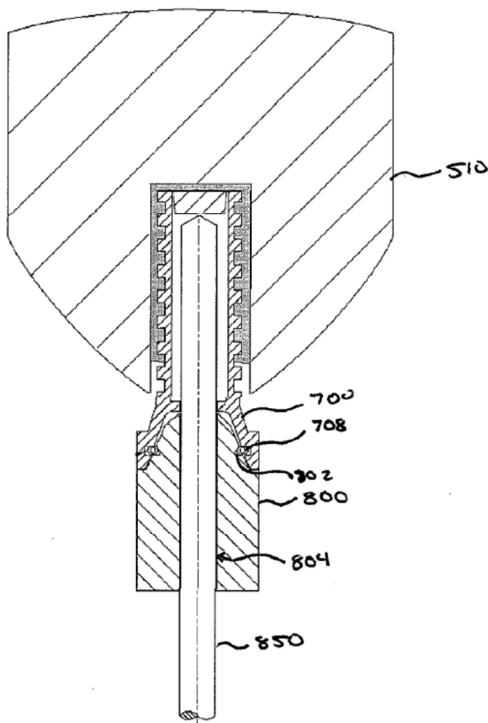


Figure 10

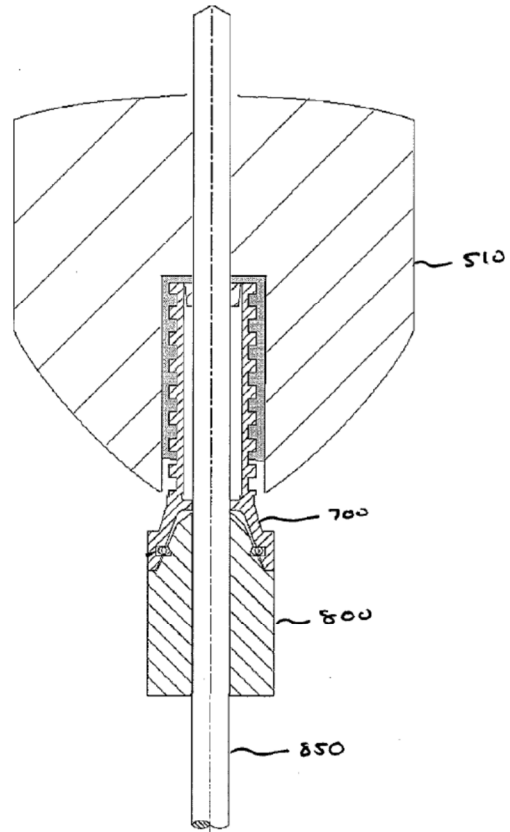


Figure 11

Figure 12 depicts prosthesis 510 and coping 700 permanently connected to abutment 650 by threaded fastener 750 with threaded shaft 754 inserted through bore 519 and threaded into threaded bore 654 of abutment 650. *Id.*, [0105], [0134], Figs. 3, 12.

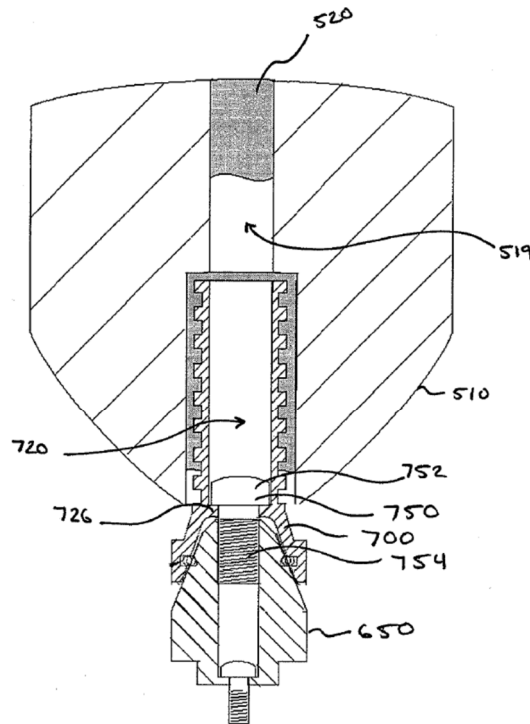


Figure 12

Bernhard also explains that a threaded screw can be used to connect the coping to the abutment in order “to reduce the likelihood of inadvertent detachment.” *Id.*, [0082], Fig. 1. “[T]he coping 130 and the abutment 120 can be attached using a separate fastener such as prosthetic screw 138” which “can pass through a bore 139 of the coping 130 and positively engage a connection feature of the abutment 120, such as threaded bore 128, ... thereby securely attaching the coping 130 to the abutment 120.” Ex. 1003, [0082]; Ex. 1002, ¶66.

C. Poovey

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

Poovey discloses a threaded screw that temporarily connects a coping to an implant during a denture conversion or impression procedure. *Id.*, [0021]–[0024], [0078]–[0084]. Poovey’s “impression coping securing screw” has “flexible” threads made of a “pliable material” that permit the screw to be threaded into the implant to hold the coping in place but then “pulled out without much force” (and without having to be unscrewed) when the impression is removed. *Id.*, [0084]. Poovey adds that “[t]he threading and/or sleeve coating of the impression coping securing screw is preferably a plastic or silicone material with enough flexibility to be pulled out of the implant with low resistance.” *Id.* Poovey explains that the flexible screw threads allow for an easier closed-tray technique with the accuracy of an open-trayed technique. *Id.* Figure 13 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.

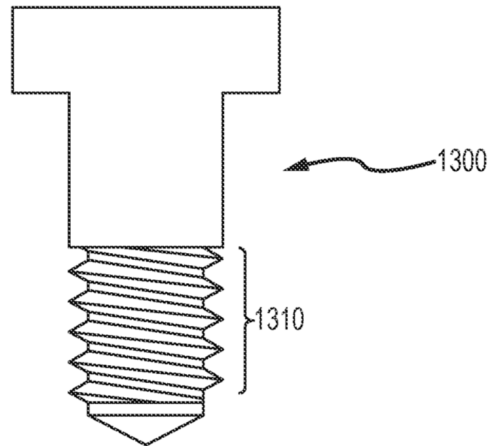


FIG. 13

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), 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.

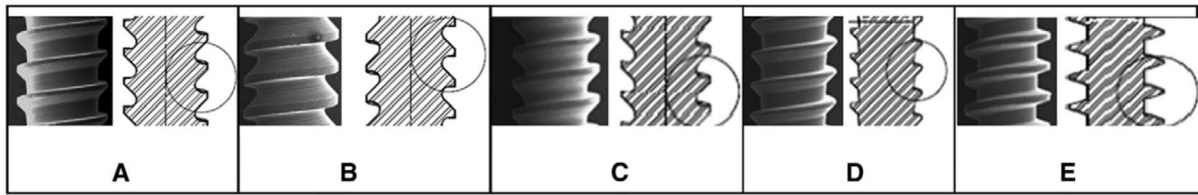


Fig 1. Schematic illustrations of miniscrew thread-designs: **A**, butress reverse thread shape (control); **B**, butress thread; **C**, 75° joint profile thread; **D**, rounded thread; **E**, trapezoidal thread.

Gracco states that the butress thread (B in Figure 1) “with thread peaks inclined toward the miniscrew tip” exhibited a “significant reduction in pullout force” compared to the reverse butress thread (A in Figure 1), and that “[t]his result could be explained by the geometry of the [butress] thread that was inclined toward the tip, thus reducing the resistance to removal in an axial direction.” Ex. 1006 at 187, 189, Fig. 1(A, B); Ex. 1002, ¶¶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 design for a temporary connector used when taking an impression. The device has a split-post structure with deflecting legs that are inserted into and grip the threaded bore of the implant to hold the impression in place, but that release their grip and detach when the impression is removed.

Figure 5 depicts flexible holding device 100 with head 11, body 12, and two extended legs 13. *Id.* at 8, Fig. 5. As shown in Figure 6, device 100 is inserted

legs first through the opening in construction 51 into implant 41. *Id.* at 10, Fig. 6.²

“The head of device 100 secures the construction 51, and the legs, of device 100, grip the internal thread 42 of implant 41 from within ... due to the legs 13 elastic repelling force which repels the legs from [sic – from] one another.” *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.

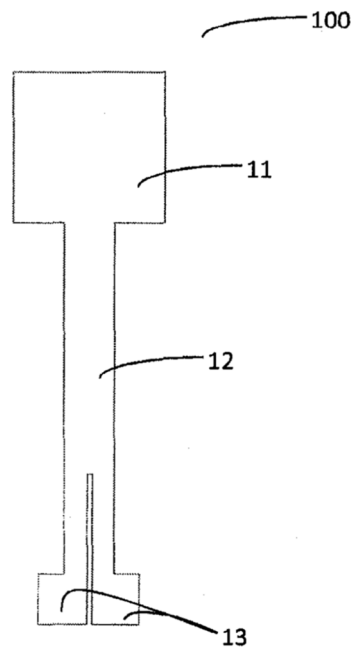


Fig. 5

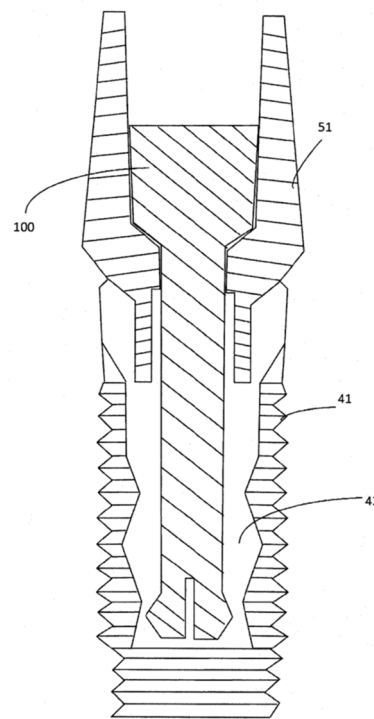


Fig. 6

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

F. Nino

Nino (U.S. Patent No. 7,938,046) (Ex. 1020) is prior art under Section 102(a)(1) as of October 9, 2018 because it published on May 10, 2011.

Nino discloses “a torque-limiting driver that disengages at a predefined torque limit,” for use in medical and dental applications, including “the installation of dental ... implants.” Ex. 1020, 1:12–13, 5:20–22, Fig. 1; Ex. 1002, ¶87.

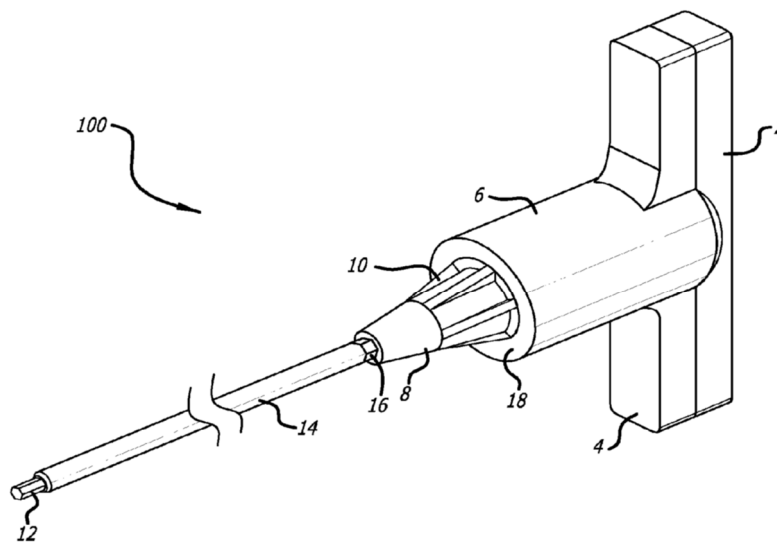


FIG. 1

G. Ruetschi

Ruetschi (DE 3808238 A1) (Ex. 1021; Ex. 1022 (certified translation)) is prior art under Section 102(a)(1) as of October 9, 2018 because it published on October 27, 1988.

Ruetschi discloses screwing tool 1 with driver 4, and helical spring 5 wound around shaft 3. Tool 1 is used in surgery to tighten and loosen screws up to a

maximum torque. Ex. 1022, 2:7–13, 2:18–41, 3:2–17, 3:38–55, Figs. 1, 2; Ex. 1002, ¶¶89–90.

FIG. 1

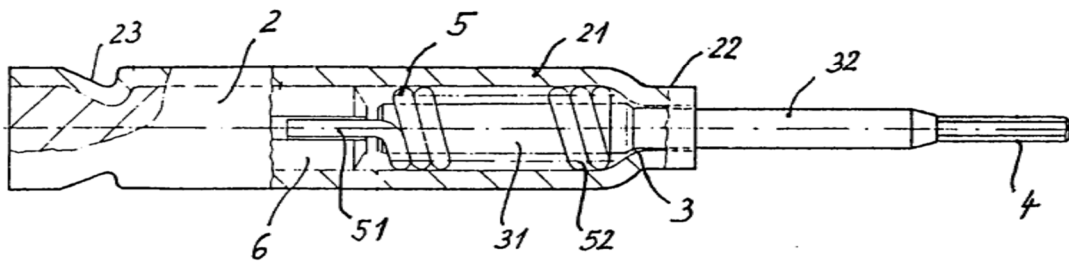
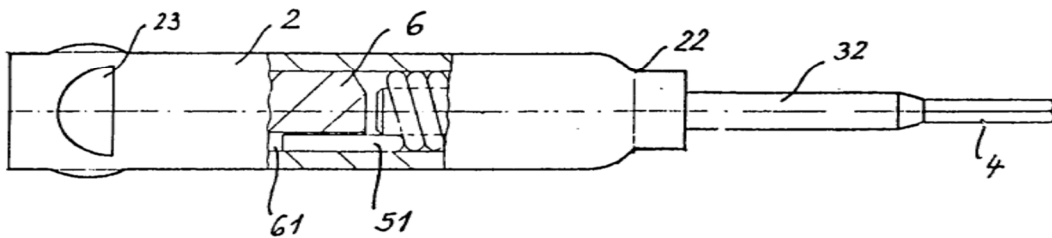


FIG. 2



H. Kofford

After Bernhard, Poovey, Gracco, Derey, Nino and Ruetschi published, the inventors of the '992 patent, Kofford and Rudisill, filed their original provisional application on October 9, 2018 (Application No. 62/742,942 (“’942 Application”)) (Ex. 1009).

They subsequently filed two more provisional applications³ and three utility applications: Application No. 16/596,361 (“’361 Application”) (Ex. 1012); Application No. 17/691,108 (“’108 Application”) (Ex. 1018); and Application No. 18/328,730 (“’730 Application”) (Ex. 1015).

“Kofford” (U.S. Patent No. 11,311,354) (Ex. 1013) issued from the first utility application (the ’361 Application) on April 26, 2022.

Kofford is prior art under Section 102(a)(1) because, as explained below, the effective filing date of claims 1–12 is not the earliest claimed date of October 9, 2018 but instead June 3, 2023, the filing date of the ’730 Application that issued as the ’992 patent.

Kofford acknowledges that prior art “snap-on” systems permit use of a closed-tray impression technique, but criticizes them as complicated, expensive, causing patient discomfort, and reducing stability because they require larger holes. Ex. 1013, 2:20–42. Kofford criticizes prior art screw connectors, asserting that they require an open-tray technique with larger holes. *Id.*, 2:56–3:15. Kofford criticizes, without mentioning Poovey, “alignment systems ... which use silicone or melting screw threads to allow closed tray transfer” as impractical and causing

³ Application No. 62/774,402 (“’402 Application”) (Ex. 1010); Application No. 62/818,082 (“’082 Application”) (Ex. 1011).

patient discomfort due to “the lack of disengagement independence required in melting all threads simultaneously.” *Id.*, 4:10–19. Kofford criticizes, without mentioning Bernhard, “hybrid systems that use a snap-on engagement for the pick-up coping during transfer and subsequent screw-attachment” as more complex and less precise than an open-tray technique. *Id.*, 4:19–25.

Kofford is directed to threaded screws that temporarily connect a coping to an abutment while taking an impression or converting a denture. In some embodiments, the temporary screw has a cap and a threaded post that are separable, so that when the prosthesis is removed, the bonded coping pulls and detaches the cap from the post, which remains threaded in the abutment. Figure 5 shows post 10 of the temporary screw threaded into abutment 8 to connect coping 9 to abutment 8 before the prosthesis is removed, and Figure 6 shows that after removal, coping 9 and cap 11 of the temporary screw are detached from post 10, which remains threaded in abutment 8. *Id.*, 8:33–37, 14:17–39, Figs. 5, 6⁴; Ex. 1002, ¶101.

⁴ Kofford’s claims also require the cap to separate from the post. *Id.*, 24:53–25:5.

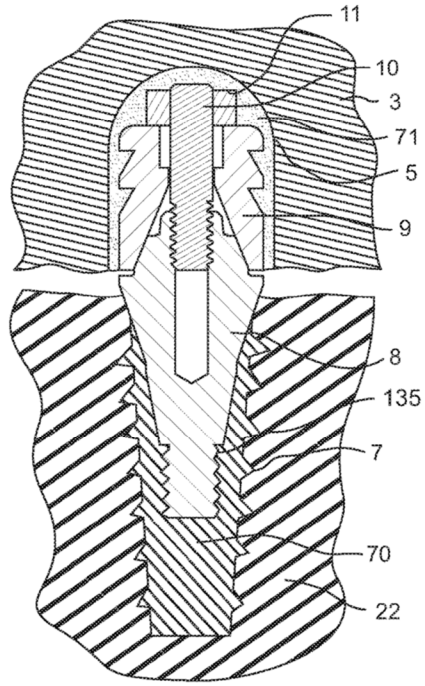


FIG. 5

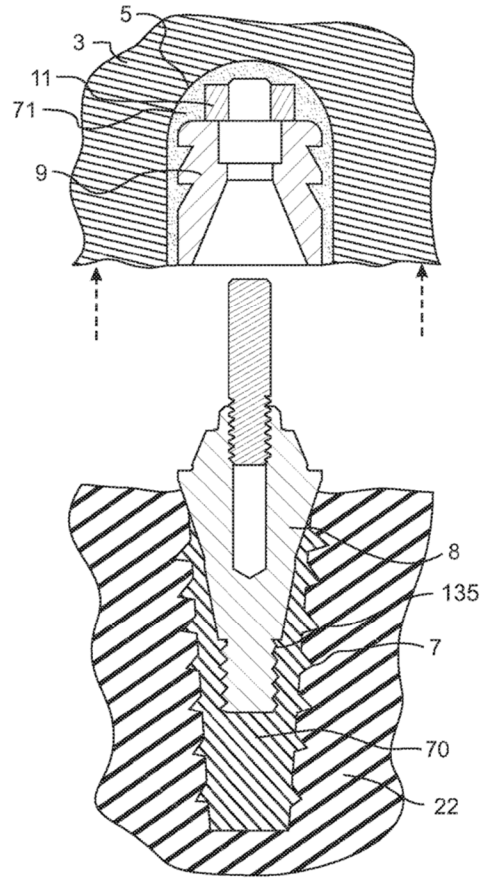


FIG. 6

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

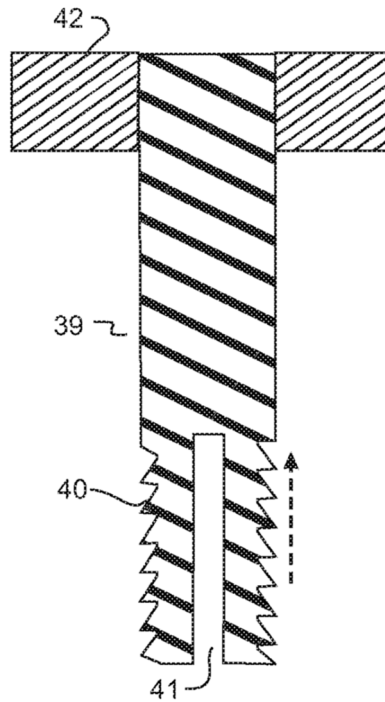
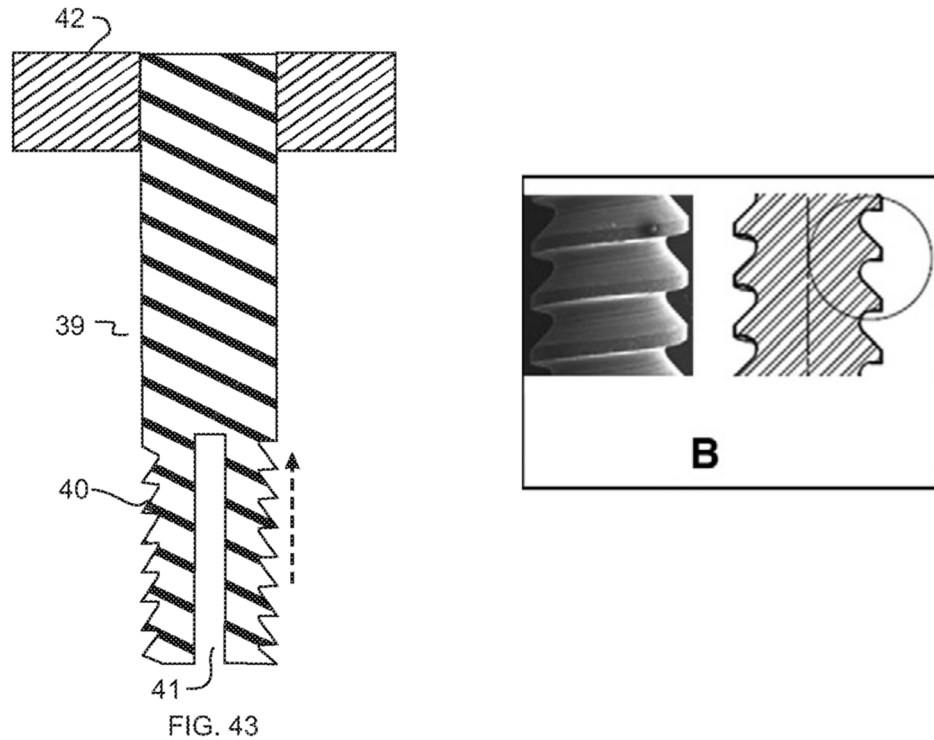


FIG. 43

In this embodiment, when the prosthesis is removed, cap 42 does not separate from post 39, and post 39 does not remain threaded in the abutment. Instead, the coping pulls the entire temporary screw (cap 42 and post 39) out of the abutment. Ex. 1009 at 21, Fig. 43. The '942 Application explains that post 39 has “a slot 41 and asymmetric threads or serrations 40 that allow the screw to be extracted in the axial direction.” *Id.* at 5. The “asymmetric” thread pattern 40 depicted in Figure 43 (below left) is a buttress thread, like thread B in Figure 1 of Gracco (below right). *Id.*, Fig. 43; Ex. 1006, Fig. 1(B); Ex. 1002, ¶103.



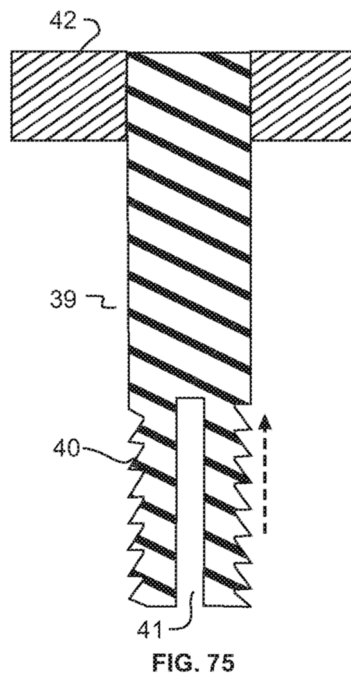
In the first utility application ('361 Application), Figure 43 was renumbered Figure 75 and the specification was expanded to explain that the buttress thread and deflecting legs of the split post created by slot 41 enable the temporary screw to be pulled out of the abutment without being unscrewed:

[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. ...

FIG. 75 shows a temporary attachment post 39 having a slot 41 and asymmetric threads or serrations 40 that allow the temporary attachment post to be inserted through rotation for alignment for coping pick-up but may be subsequently extracted with a separation force in the axial direction. ...

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



Ex. 1012 at 67, 78, 97, 100, Fig. 75.

VI. '992 PATENT

A. Prosecution

The '992 patent issued from the '730 Application, a continuation of the '361 Application and the '108 Application.

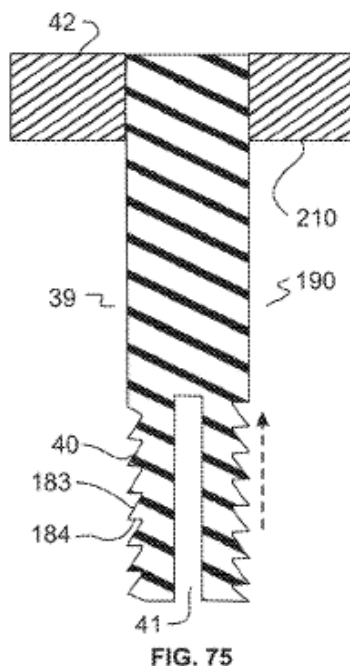
Patent Owner filed the '730 Application on June 3, 2023, after Petitioner's NeoConvert product was publicly displayed at a conference. Ex. 1015 at 2.

In response to a restriction requirement, Patent Owner elected the species Q of Figure 75. *Id.* at 173–181.

Patent Owner apparently drafted the claims to try to cover Petitioner's NeoConvert product. Within a few weeks after the '992 patent issued on March 26, 2024, Patent Owner sued Petitioner, alleging that its NeoConvert product infringes. Ex. 1017.

B. Specification

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



The specification also includes the description of the Figure 75 embodiment quoted above, except with amendments by Patent Owner during prosecution that obscure the role of the deflecting legs created by slot 41 in permitting the screw to be pulled out:

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 193 and a distal flank 184. This asymmetric threading that allow still allows** the temporary attachment post **portion 39** to be inserted through rotation **like other temporary screw embodiments** for alignment for coping pick-up. **The post 39 but** may be subsequently extracted with a separation force in the axial direction.

Ex. 1015 at 287; Ex. 1001, 5:29–33, 11:26–29, 23:2–34, 24:51–52.

C. Claims

Patent Owner told the examiner that claims 1–12 were directed to the elected species Q of Figure 75, but they are much broader than Figure 75 and the associated description, in two respects. Ex. 1015 at 181–82; Ex. 1002, ¶¶124–126.

First, the independent claims are not limited to temporary screws with buttress threads, as described and as depicted in Figure 75. Instead, the claims encompass any thread pattern or profile that is different than the definitive screw threads. Claim 1 requires the “temporary screw” to have “threads in a pattern that

is shaped differently from a pattern of the threads of the definitive screw.” Ex. 1001, 25:48–55. Claim 9 requires the “temporary screw” to have “male threading” with a “male threading profile that is different from the male threading profile of the shaft of the definitive screw.” *Id.*, 26:48–54.

Second, the independent claims do not require the temporary screw to have a slot that creates a split-post structure with deflecting legs that enable the screw to be pulled out without being unscrewed, as described and as depicted in Figure 75. Instead, the claims merely require that an axial force releases the temporary screw from the abutment. Claim 1 recites “an axial force in a proximal direction from pick-up processing releases the coping and the temporary screw from the implant abutment.” *Id.*, 25:62–64. Claim 9 recites “threads of the male threading of the post release from threads of the female threading of the implant abutment with a predetermined axial pick-up force in a proximal direction in response to and/or during pick-up processing.” *Id.*, 26:65–27:2.

D. Priority Applications

The ’730 Application that issued as the ’992 patent is a continuation of the ’108 Application and the ’361 Application, and claims priority to the three provisional applications (’942 Application, ’402 Application, and ’082 Application) discussed above (collectively, the “Priority Applications”).

Each Priority Application (except the '082 Application) includes Figure 43 or 75 with the description that the temporary screw can be pulled out the abutment without being unscrewed because of the buttress threads and the deflecting sections created by the slot. Ex. 1009 at 21, Fig. 43; Ex. 1010 at 16, Fig. 43; Ex. 1012 at 67, 78, 97, 100, Fig. 75; Ex. 1018 at 50, 61, 80–81, 83, Fig. 75.

VII. LEVEL OF ORDINARY SKILL

The field of the '992 patent is the design of dental implants and prostheses. Ex. 1002, ¶¶42–48. A person of ordinary skill in the art (POSA), as of both the earliest claimed effective filing date of October 9, 2018 and the actual effective filing date of June 3, 2023, would have at least a bachelor's degree in mechanical engineering, biomedical engineering, materials science engineering, or an equivalent degree, plus at least five years of experience working with (researching, developing and/or designing) dental implants and prostheses, including familiarity and experience with fasteners (threaded and otherwise) used to connect prostheses, implants and related components. A POSA could also have less formal education but commensurately more practical experience, or vice versa. *Id.*, ¶¶128–130.

VIII. CLAIM CONSTRUCTION

None of the claim terms of claims 1–12 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 '992 patent. *Id.*, ¶131. Petitioner will propose a construction if Patent Owner argues or the Board determines that one is required for any term.

IX. GROUNDS OF UNPATENTABILITY

A. Kofford Is Prior Art Because the Claims Are Not Supported By Any of the Priority Applications

Grounds 1–3 present Kofford as prior art because the effective filing date is June 3, 2023, the filing date of the '730 Application. The claims are not entitled to claim priority to any of the Priority Applications under Sections 119 or 120 because, as explained below, none of them support the claims under Section 112(a).⁵

1. Independent Claims 1 and 9 Are Not Supported By Any of the Priority Applications

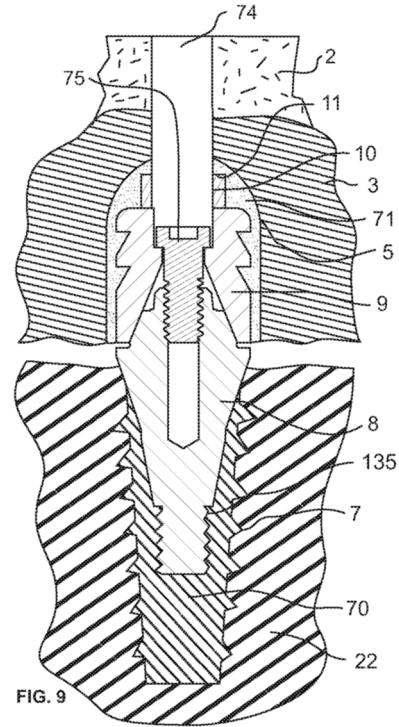
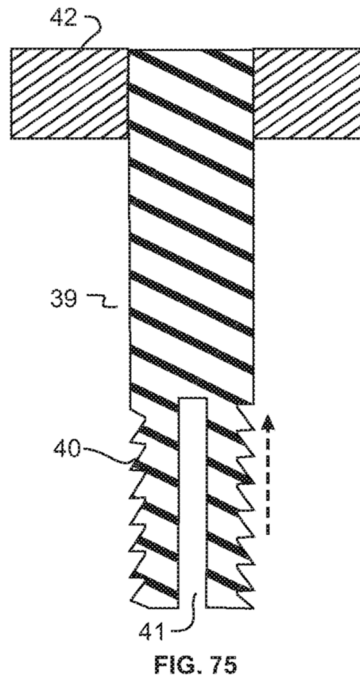
None of the Priority Applications contain an adequate written description of or enable independent claims 1 and 9, for two reasons.

⁵ Patent Owner has the burden of production to demonstrate that the claims are supported and therefore have an earlier effective filing date. *See Technology Licensing Corp. v. Videotek, Inc.*, 545 F.3d 1316, 1327–28 (Fed. Cir. 2008).

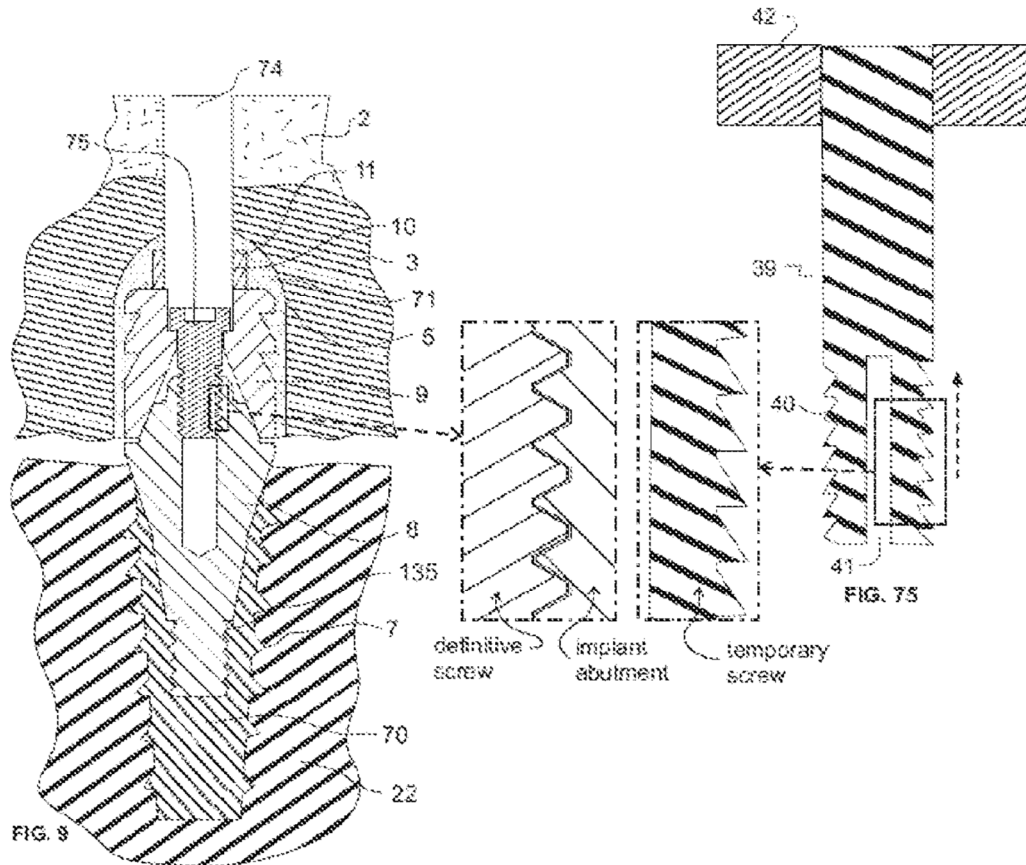
**a. The Full Scope of the Different Thread
Pattern/Profile Limitations Is Not Supported**

First, none of the Priority Applications support the full scope of the “threads in a pattern that is shaped differently” limitation of claim 1 and the “threading profile that is different” limitation of claim 9. Ex. 1002, ¶¶136–142.

As explained above, claims 1 and 9 encompass any difference in the “shape” of the “pattern” (claim 1) or “profile” (claim 9) of the threads of the temporary screw and the definitive screw. Ex. 1001, 25:48–55, 26:48–54. The Priority Applications do not support this claim scope because they describe only one temporary screw embodiment with a different thread pattern or profile: the temporary screw of Figure 75 with an “asymmetric” buttress thread that is different than the symmetric thread of the definitive screw of Figure 9. Ex. 1002, ¶138.

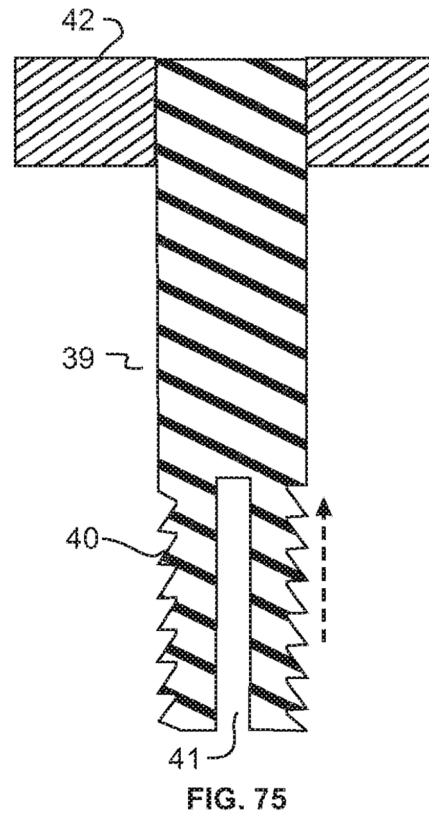
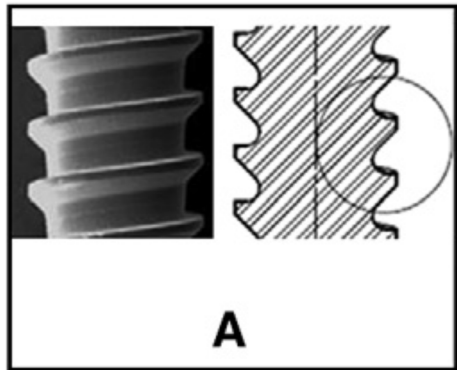


Patent Owner confirmed during prosecution that the “thread profile” and “threading shape” of threads 40 of the temporary screw of Figure 75 are “not the same” and “different” than the threads of definitive screw 75 of Figure 9, and included this annotated figure:



Ex. 1015 at 295–299.

This buttress thread of the Figure 75 embodiment does not adequately describe or enable the full scope of the “threads in a pattern that is shaped differently” and “threading profile that is different” limitations, which encompass all thread pattern or profile differences. Ex. 1002, ¶¶140–141. For example, these limitations encompass a hypothetical, undisclosed temporary screw with a reverse buttress thread, like thread A in Figure 1 of Gracco (below left) but the opposite of the buttress thread in Figure 75 (below right). Ex. 1006, Fig. 1(A); Ex. 1001, Fig. 75.



None of the Priority Applications describe any embodiment with a reverse buttress thread, much less how it would be pulled out without being unscrewed. The claims also encompass myriad other undisclosed embodiments with different thread patterns, including for example threads with truncated or rounded peaks and/or smaller thread angles. The Priority Applications do not describe any of these embodiments, much less in an enabling manner. Therefore, claims 1 and 9 are not supported. Ex. 1002, ¶142.

This case is analogous to *Tronzo v. Biomet, Inc.*, 156 F.3d 1154 (Fed. Cir. 1998). In *Tronzo*, the patent related to artificial hip sockets with cup implants. *Id.* at 1156. The specification described only one shape of cup: a conical cup. *Id.* at

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

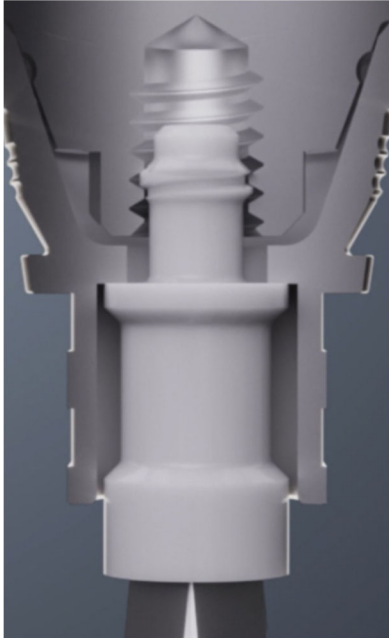
The description of the buttress thread of Figure 75 also does not enable the full claim scope. *See Amgen Inc. v. Sanofi*, 598 U.S. 594, 610 (2023) (“[The] specification must enable the full scope of the invention as defined by its claims.”).

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

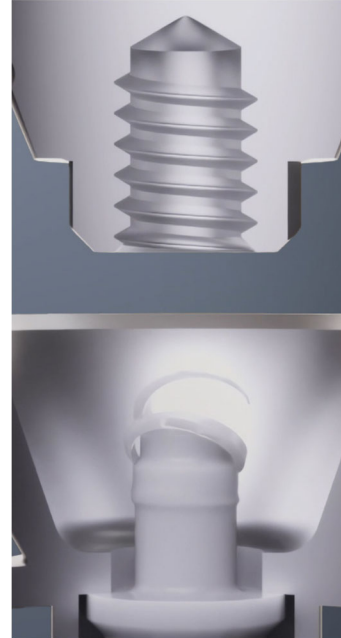
Second, none of the Priority Applications support the full scope of claims 1 and 9 because the claims do not require the temporary screw to have deflecting legs that enable the screw to be pulled out without being unscrewed, as in the only disclosed embodiment. Ex. 1002, ¶¶143–148.

As explained above, claims 1 and 9 encompass all embodiments in which a differently-threaded temporary screw is released by an axial force, regardless of whether the screw has a split post with deflecting legs. Ex. 1001, 25:62–64, 26:65–27:2. The Priority Applications do not support this claim scope because they do not describe any differently-threaded temporary screw that does not have a split post with deflecting legs but can be pulled out without being unscrewed. Ex. 1002, ¶¶143, 146. The only differently-threaded temporary screw described in the Priority Applications is the embodiment of Figure 75. As the '361 Application explains (in the passages quoted above in section V.H), this temporary screw can be pulled out without being unscrewed because of buttress thread 40 and the deflecting legs of the split post created by slot 41. Ex. 1012 at 67, 78, 97, 100, Fig. 75. Nothing in the Priority Applications indicates that the inventors were in possession of a differently-threaded temporary screw without a split post that could be pulled out without being unscrewed. Ex. 1002, ¶148.

The breadth of the claim scope sought by Patent Owner is illustrated by its infringement allegations against Petitioner's NeoConvert "Pin Capture" device. Ex. 1017, ¶39. As shown below, the accused device does not have a slot that creates a split post with deflecting legs that permit it to be pulled out. Instead, the screw can be pulled out because its threads detach.



Before removal



After removal

Ex. 1019 at 4, 5; Ex. 1002, ¶147. This is a different release mechanism than the deflecting legs of the split-post structure of Figure 75, and it is not described in any of the Priority Applications. *Id.*

This case is analogous to *ICU Med., Inc. v. Alaris Medical Sys., Inc.*, 558 F.3d 1368 (Fed. Cir. 2009). In *ICU*, the specification described only medical valves with spikes. *Id.* at 1378. The claims did not require the valves to have a spike but instead encompassed valves with or without a spike. *Id.* The Federal Circuit held that the description of “only medical valves with spikes” did not support claims that “cover[ed] those valves that operate with a spike and those that operate without a spike.” *Id.* Similarly, the description of the split-post temporary screw of Figure 75 does not support the full claim scope that encompasses screws

without a split post with 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 screw of Figure 75 does not enable the full

claim scope that encompasses differently-threaded temporary screws that do not have a split post with deflecting legs.

2. Dependent Claims 2–8 and 10–12 Are Not Supported By Any of the Priority Applications

None of the Priority Applications contain an adequate written description of or enable dependent claims 2–8 and 10–12.

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

Claims 2, 4, 6, 7, 8 and 12 are not supported for the same reasons as claims 1 and 9 because these claims add limitations that do not relate to the “threads in a pattern that is shaped differently” or “threading profile that is different” limitations. Ex. 1002, ¶150.

Claims 3, 5 and 10 add limitations related to the threads, but they are not supported by the description of the buttress thread of Figure 75, as explained below.

Claim 3 adds “the pattern of the threads of the temporary screw is asymmetric.” Ex. 1001, 26:7–8. This claim scope is not described or enabled because it encompasses many undisclosed asymmetric threads, including a reverse buttress thread. Ex. 1002, ¶152.

Claim 5 adds “the pattern of the threads of the temporary screw is configured to define an abutment threading contact area and/or volume with the

threads of the implant abutment that is less than an abutment threading contact area and/or volume with the threads of the implant abutment defined by the pattern of the threads of the definitive screw.” Ex. 1001, 26:13–19. This claim scope is not described or enabled because it encompasses many undisclosed thread patterns, including a reverse buttress thread and a symmetric thread with truncated or rounded peaks and/or a smaller thread angle. Ex. 1002, ¶153.

Claim 10 adds “the male threading profile of the post of the temporary screw comprises at least some threads that have a pitch angle that is different than a pitch angle of the threads of the female threading of the implant abutment and threads of the male threading profile of the shaft of the definitive screw.” Ex. 1001, 27:3–8. This claim scope is not described or enabled because the threads of the temporary screw of Figure 75 have the same maximum thread diameter and thread pitch, and therefore the same pitch angle, as the threads of the definitive screw and the abutment of Figure 9. Ex. 1012, Figs. 9, 75; Ex. 1002, ¶¶154–158. Even if the temporary screw threads of Figure 75 did have a different pitch angle, that would not support the full claim scope, which encompasses many other undisclosed threads with different pitch angles. *Id.*, ¶159.

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

Claims 2–3, 5–7 and 10–12 are not supported for the same reasons as claims 1 and 9 because these claims add limitations that do not require the temporary

screw to have deflecting legs that permit the screw to be pulled out. Ex. 1002, ¶160.

Claim 4 adds “wherein the temporary screw is polymeric, and wherein the distal shaft portion is hollow, and wherein the temporary screw is rotatably insertable into the implant abutment to the predetermined torque.” Ex. 1001, 26:9–12. These limitations do not require the temporary screw to have a split post with deflecting legs because they encompass an undisclosed embodiment that includes a hollow bore but not a slot that creates deflecting legs. Therefore, claim 4 is not described or enabled for the same reasons as claim 1. Ex. 1002, ¶161.

c. The “Threads Deform” Limitation of Claim 7 Is Not Supported

Claim 7 is not supported for an additional reason. Claim 7 adds “the threads of the temporary screw deforms during the release of the temporary screw from the implant abutment.” Ex. 1001, 26:26–28. None of the Priority Applications describe or enable claim 7 because they do not describe any differently-threaded temporary screw with threads that “deform” during release. Instead, as discussed above, they explain that the screw can be pulled out because of the deflecting legs and the buttress threads. Moreover, the ’361 Application criticizes “other alignment systems ... which use silicone ... screw threads.” Ex. 1012 at 65. Therefore, none of the Priority Applications adequately describes or enables claim 7. Ex. 1002, ¶162.

B. Ground 1: Claims 1–6, 8–9 and 11–12 Are Anticipated By Kofford

Claims 1–6, 8–9 and 11–12 are unpatentable under Section 102(a)(1) because they are anticipated by Kofford, which discloses every limitation of these claims.⁶ Ex. 1002, ¶¶163–239.

1. Claim 1

a. Limitation 1(a)

Kofford discloses a dental system comprising implant abutment 8, definitive screw 75, coping 9, and temporary screw with cap 42 and threaded post 39. Ex. 1013, 11:21–24, 12:38–44, 14:65–15:1, 22:32–36, Figs. 1, 2, 4, 5, 9, 75; Ex. 1002, ¶166.

b. Limitation 1(b)

Implant abutment 8 has a bore with threads 18. Ex. 1013, 12:38–45, Figs. 1, 4, 5, 9; Ex 1002, ¶167.

c. Limitation 1(c)

Definitive screw 75 has a longitudinal axis with a length measured along the axis and a width measured perpendicular to the axis, and a proximal head end that has a tool interface and a distal post portion that has threads configured to engage

⁶ Although Kofford’s specification does not support the full claim scope under Section 112(a), it discloses an embodiment within that scope under Section 102(a)(1). *See Vas-Cath Inc. v. Mahurkar*, 935 F.2d 1555, 1562 (Fed. Cir. 1991).

threads 18 of implant abutment 8. Ex. 1013, 14:65–15:1, Fig. 9; Ex 1002, ¶¶168–170.

d. Limitation 1(d)

Coping 9 has a proximal end with aperture 16. Ex. 1013, 12:43–46, Fig. 1. Aperture 16 is larger than the distal post portion of definitive screw 75 and smaller than the proximal head end of definitive screw 75. *Id.*, 5:46–49, 14:65–15:7, Fig. 9; Ex 1002, ¶¶171–173.

e. Limitation 1(e)

The temporary screw of Figure 75 has a longitudinal axis with a length measured along the axis and a width measured perpendicular to the axis. Ex. 1013, Fig. 75; Ex. 1002, ¶¶174–175.

f. Limitation 1(f)

The temporary screw of Figure 75 has a proximal head portion (flange 42) with a width larger than aperture 16 of coping 9. Ex. 1013, 13:9–15, 14:25–26, Figs. 4, 5, 75; Ex. 1002, ¶¶176–178.

g. Limitation 1(g)

The temporary screw of Figure 75 has distal shaft portion 39 with threads 40 in an asymmetric buttress thread pattern shaped differently from the symmetric pattern of threads of definitive screw 75 of Figure 9. Ex. 1013, 22:32–41, Figs. 9, 75; Ex. 1015 at 296–97; Ex. 1002, ¶¶179–181.

h. Limitation 1(h)

The temporary screw of Figure 75 is rotatable in a distal direction, and distal shaft portion 39 engages threads 18 of implant abutment 8 to a predetermined torque. Ex. 1013, 13:9–15, 13:40–52, 22:32–45, Figs. 4, 5, 75. This engagement with threads 18 of abutment 8 causes proximal head portion 42 of the temporary screw to hold coping 9 in alignment with implant abutment 8. *Id.*, 13:9–15, 14:25–26, 22:28–45, Figs. 4, 5, 75; Ex. 1002, ¶¶182–183.

i. Limitation 1(i)

An axial force in a proximal direction from pick-up processing releases coping 9 and the temporary screw of Figure 75 with threads 40 from implant abutment 8. Ex. 1013, 5:24–28, 11:21–24, 14:30–36, 22:28–41, 23:67–24:1, Figs. 6, 75; Ex. 1002, ¶184.

2. Claim 2

Temporary screw torque driver 113 comprises spring friction cylinder 141, drive cap 137, and coil spring 136. Ex. 1013, 17:42–53, 20:8–24, Figs. 59, 60. Driver 113 is configured to limit torque applied to the temporary screw to the predetermined torque. *Id.*, 5:17–23, 20:19–24, 22:44–45; Ex. 1002, ¶¶185–191.

3. Claim 3

The pattern of threads 40 of the temporary screw of Figure 75 is an asymmetric buttress thread. Ex. 1013, 22:36–37, Fig. 75; Ex. 1015 at 297–298; Ex. 1002, ¶¶192–194.

4. Claim 4

Distal shaft portion 39 of the temporary screw of Figure 75 includes a hollow portion created by slot 41. Ex. 1013, 22:36–41, Fig. 75. The temporary screw is rotatably insertable into implant abutment 8 to the predetermined torque. *Id.*, 22:32–45, Fig. 75. The temporary screw may be made from a polymer. *Id.*, 20:64–66; Ex. 1002, ¶¶195–198.

5. Claim 5

The pattern of threads of definitive screw 75 is symmetric and the threads engage with symmetric threads 18 of implant abutment 8. Ex. 1013, 14:36–39, 14:65–15:1, Fig. 9; Ex. 1002, ¶¶199–204. The Patent Owner told the examiner that “FIG. 9 ... shows that the implant abutment threading 18 matches and is filled with the definitive screw post threading 150.” Ex. 1015 at 296.

The pattern of threads 40 of the temporary screw of Figure 75 is asymmetric because the proximal thread angle is smaller than the larger distal thread angle. Ex. 1013, 22:32–41, Fig. 75; Ex. 1002, ¶203. As Patent Owner told the examiner, the asymmetric threads of the temporary screw of Figure 75 make contact with less area and occupy less volume of thread 18 of abutment 8 than the threads of definitive screw 75 of Figure 9 because of “the open space created on the proximal side of the male thread” of the temporary screw “due to the angle lying closer to the axis.” Ex. 1015 at 298.

6. Claim 6

The temporary screw of Figure 74 has a distal shaft portion with a first portion 37 with a smaller width than a second portion 36 comprising the threads, located between the proximal head portion and the threads. Ex. 1013, 22:9–24, Fig. 74. Patent Owner told the examiner that Figure 74 disclosed the limitation added by claim 6. Ex. 1015 at 301; Ex. 1002, ¶¶205–207.

7. Claim 8

Distal shaft portion 39 of the temporary screw of Figure 75 includes a hollow portion created by slot 41. Ex. 1013, 22:36–41, Fig. 75. This split-post structure has deflecting portions that deflect inwardly into the hollow portion in response to the axial force in the proximal direction. *Id.*, 5:24–28, 11:21–24, 23:67–24:1, Fig. 75; Ex. 1002, ¶¶208–211.

8. Claim 9

a. Limitation 9(a)

Kofford discloses a dental system for attachment of coping 9 to threaded implant abutment 8, comprising implant abutment 8, definitive screw 75, coping 9, and a temporary screw with cap 42 and threaded post 39. Ex. 1013, 11:21–24, 12:38–44, 14:65–15:1, 22:32–36, Figs. 1, 2, 4, 5, 9, 75; Ex. 1002, ¶213.

b. Limitation 9(b)

Implant abutment 8 has a bore with female threading 18 with an implant abutment thread profile. Ex. 1013, 12:38–45, Figs. 1, 4, 5, 9; Ex. 1002, ¶214.

c. Limitation 9(c)

Definitive screw 75 has a longitudinal axis and a length measured along the axis and a width measured perpendicular to the axis. Ex. 1013, Fig. 9; Ex. 1002, ¶¶215–216.

d. Limitation 9(d)

Definitive screw 75 has a head with a definitive screw drive interface and a shaft with male threads with a male threading profile that matably threadably engages and matches female threading 18 of implant abutment 8. Ex. 1013, 14:65–15:1, Fig. 9; Ex 1015 at 297; Ex. 1002, ¶217.

e. Limitation 9(e)

Coping 9 has a proximal end with aperture 16 sized to allow the shaft of definitive screw 75 to pass through. Ex. 1013, 5:46–49, 12:45–46, 14:65–15:7, Figs. 1, 9; Ex. 1002, ¶¶218–220.

f. Limitation 9(f)

The temporary screw of Figure 75 has a longitudinal axis with a length measured along the axis and a width measured perpendicular to the axis. Ex. 1013, Fig. 75; Ex. 1002, ¶¶221–222.

g. Limitation 9(g)

The temporary screw of Figure 75 has a post 39 with male threading 40 that has an asymmetric buttress male threading profile different from the symmetric male threading profile of threads of the shaft of definitive screw 75. Ex. 1013,

22:32–41, Figs. 9, 75; Ex. 1015 at 296–97. Aperture 16 of coping 9 is sized and configured to allow post 39 of the temporary screw to pass through. Ex. 1013, 13:11–15, 14:25–26, 22:32–41, Figs. 4, 5, 9, 75; Ex. 1002, ¶¶223–227.

h. Limitation 9(h)

The temporary screw of Figure 75 has head 42 with a temporary screw drive interface, and head 42 is integral to or coupled to post 39 of the temporary screw. Ex. 1013, Figs. 4, 5, 75; Ex. 1002, ¶228.

i. Limitation 9(i)

Male threading 40 of post 39 of the temporary screw of Figure 75 is configured to enter implant abutment 8 and rotatably engage female threading 18 of abutment 8 to a predetermined pick-up processing torque. Ex. 1013, 13:9–15, 13:40–52, 22:32–45, Figs. 4, 5, 75. The temporary screw holds coping 9 in position against abutment 8 for pick-up processing. *Id.*, 13:9–15, 14:25–26, 22:28–45, Figs. 4, 5, 75; Ex. 1002, ¶¶229–230.

j. Limitation 9(j)

Threads of male threading 40 of post 39 of the temporary screw of Figure 75 release from threads of female threading 18 of implant abutment 8 with a predetermined axial pick-up force in a proximal direction in response to and/or during pick-up processing. Ex. 1013, 5:24–28, 11:21–24, 14:30–36, 22:28–41, 23:67–24:1, Figs. 6, 75; Ex. 1002, ¶231.

9. Claim 11

The proximal flank of the male threading profile of the asymmetric threads 40 of the post 39 of the temporary screw of Figure 75 is at a smaller angle relative to the longitudinal axis than the proximal flank of the male threading profile of the symmetric threads of the shaft of definitive screw 75. Ex. 1013, 14:36–39, 14:65–15:1, 22:32–41, Figs. 9, 75; Ex. 1002, ¶¶232–237. Patent Owner told the examiner that the proximal flank of threads 40 of the temporary screw in Figure 75 is at a “smaller angle relative to the longitudinal axis” than the proximal flank of threads of definitive screw 75 in Figure 9. Ex. 1015 at 296–97.

10. Claim 12

The temporary screw may be made from a polymer. Ex. 1013, 20:64–66; Ex. 1002, ¶¶238–239.

C. Ground 2: Claims 4, 7 and 12 Would Have Been Obvious Based on Kofford In View of Poovey

Claims 4, 7 and 12 are unpatentable under Section 103 because they would have been obvious to a POSA before the effective filing date of June 3, 2023, based on Kofford in view of Poovey. Ex. 1002, ¶¶240–252.

1. Motivation to Modify Kofford In View of Poovey

Claims 4 and 12 require the temporary screw to be made from a polymer. Ex. 1001, 26:9–12, 27:15–16. Claim 7 requires the temporary screw threads to deform during the release of the screw from the abutment. *Id.*, 26:26–28.

Poovey teaches making or coating the temporary screw threads with a flexible material, such as silicone (a polymer), so that the screw can be pulled out without being unscrewed. Ex. 1005, [0084]; Ex. 1002, ¶¶70–71, 243.

Based on Poovey, it would have been obvious to a POSA to modify the temporary screw of Figure 75 of Kofford to make the screw out of a flexible polymer, so that the polymer threads deform during the release of the screw from abutment 8. A POSA would have been motivated to do this because it would make it easier to pull out the screw, as taught by Poovey. Ex. 1005, [0084]. A POSA would have had a reasonable expectation of success because this is a predictable technology and this would have been well within the level of ordinary skill. In particular, a POSA would have known how to make the screw out of a polymer so that threads 40 deform, as taught by Poovey. *Id.*; Ex. 1002, ¶¶243–245.

As explained below, the temporary screw of Kofford, made out of a polymer as taught by Poovey, would have all the limitations of claims 4, 7 and 12.

2. Claim 4

Kofford discloses that distal shaft portion 39 of the temporary screw of Figure 75 includes a hollow portion created by slot 41. Ex. 1013, 22:36–41, Fig. 75. The temporary screw is rotatably insertable into implant abutment 8 to the predetermined torque. *Id.*, 22:32–45, Fig. 75. Poovey teaches making the temporary screw out of a polymer. Ex. 1005, [0084]; Ex. 1002, ¶¶246–247.

3. Claim 7

Kofford discloses that the temporary screw of Figure 75 is released from abutment 8 by an axial force. Ex. 1013, 5:24–28, 11:21–24, 14:30–36, 22:28–41, 23:67–24:1, Fig. 75. Poovey discloses a temporary screw with “flexible” threads made from or coated with “a plastic or silicone material with enough flexibility to be pulled out of the implant with low resistance.” Ex. 1005, [0084]; Ex. 1002, ¶¶248–250.

4. Claim 12

Kofford discloses a temporary screw. Ex. 1013, 22:32–45, Fig. 75. Poovey teaches making the temporary screw out of a polymer. Ex. 1005, [0079], [0084]; Ex. 1002, ¶¶251–252.

D. Ground 3: Claims 7 and 10 Are Anticipated by Kofford

1. Claim 7

As explained above in section IX.A.2.c, none of the Priority Applications support claim 7 because none describe a differently-threaded temporary screw with threads that “deform” during release. However, if Patent Owner argues that claim 7 is supported by any of the Priority Applications, the same disclosure in Kofford would anticipate claim 7. Ex. 1002, ¶¶253–255.

2. Claim 10

As explained above in section IX.A.2.a, none of the Priority Applications support claim 10 because threads 40 of the temporary screw of Figure 75 have the

same pitch angle as the threads of definitive screw 75 and abutment 8 of Figure 9. However, if Patent Owner argues that claim 10 is supported by any of the Priority Applications, the same disclosure in Kofford would anticipate claim 10. Indeed, Patent Owner argued during prosecution that “FIG. 75 clearly shows a temporary thread pitch angle that is different from a pitch angle of threads of the implant abutment and definitive screw in FIG. 9.” Ex. 1015 at 299; Ex. 1002, ¶¶256–257.

E. Ground 4: Claims 1, 3, 5–7 and 9–12 Would Have Been Obvious Based on Bernhard In View of Poovey and Gracco

Claims 1, 3, 5–7 and 9–12 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, ¶¶258–350.

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 depicts a dental system including coping 700, abutment 650, and threaded fastener 750 with threaded shaft 754 threaded into threaded bore 654 of abutment 650 to permanently connect abutment 650 to coping 700. Ex. 1003, [0105], [0130], [0134], Figs. 3, 12. Figure 8 depicts coping 700 temporarily

connected to abutment 650 by resilient spring 708 that engages annular slot 652.

Id., [0122], [0126], [0130], Fig. 8.

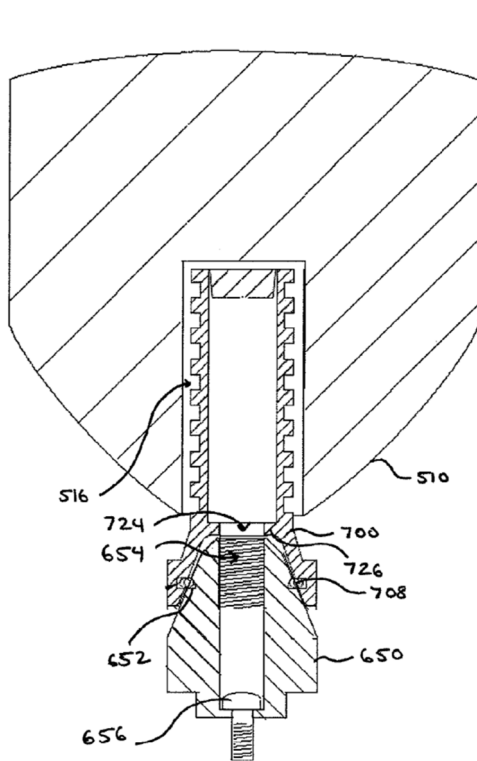


Figure 8

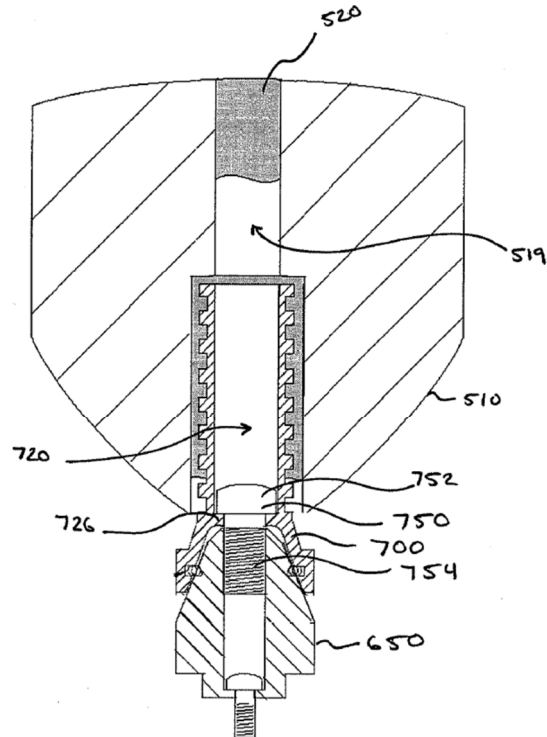


Figure 12

As explained below, it would have been obvious in view of Bernhard, Poovey and Gracco to modify the system of Figure 8 to temporarily connect coping 700 to abutment 650 with a temporary screw with flexible threads in a buttress thread pattern, which would be threaded into bore 654 but pulled out of abutment 650 without being unscrewed when the prosthesis is removed. Ex. 1002, ¶262.

A POSA would have been motivated by Bernhard and Poovey to use a threaded temporary screw 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.*,

¶263. 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, ¶264.

A POSA also would have been motivated to use a threaded temporary screw because bore 654 of abutment 650 already includes threads into which the temporary screw 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 screw also would be simpler and more straightforward. Ex. 1002, ¶¶265–266.

A POSA also would have been motivated by Bernhard and Poovey to design the threaded temporary screw 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

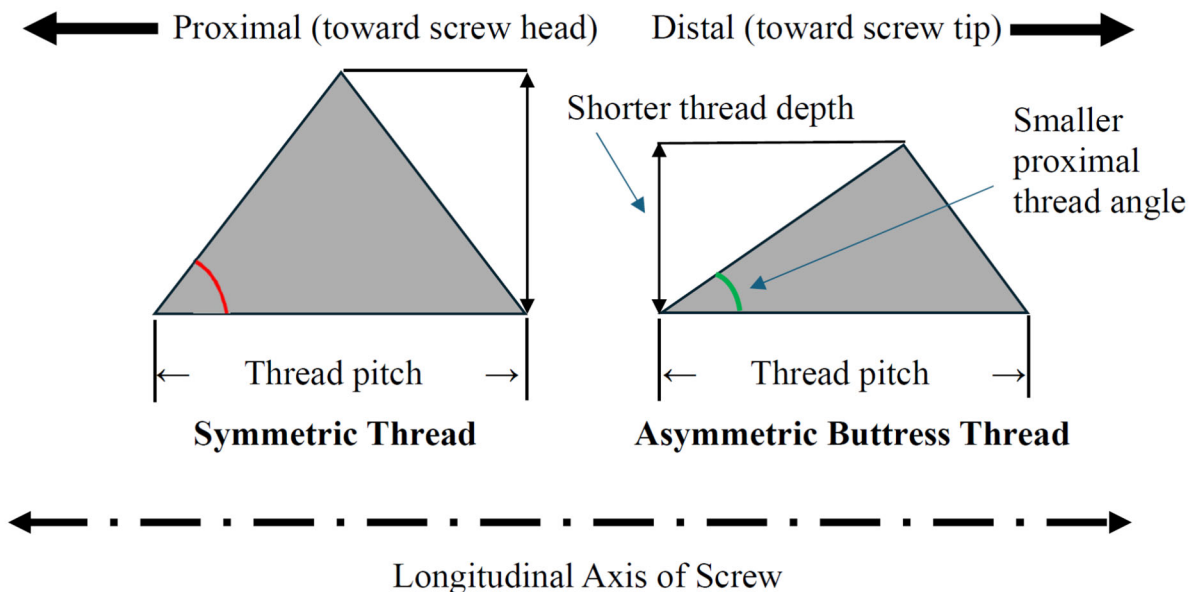
screw with flexible threads can be pulled out without being unscrewed. Ex. 1005, [0084]; Ex. 1002, ¶267.

Having decided to use a temporary screw with flexible threads, a POSA would have understood that the design of the temporary screw thread pattern would affect the amount of force required to pull the screw 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 screw in bore 654, to reduce the maximum thread depth of the thread pattern sufficiently to permit the screw to be pulled out. *Id.*, ¶268.

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

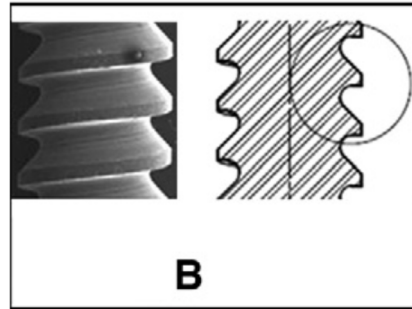
ensure that the flexible threads would compress sufficiently in the radial direction to permit the screw to be pulled out. *Id.*, ¶269.

One well known and obvious example of such a screw 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 angle than a corresponding symmetric thread with the same thread pitch, as shown below. *Id.*, ¶270.



A POSA would understand that, as a result of this shorter thread depth and smaller proximal 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.*, ¶271. Gracco depicts an example of an asymmetric buttress thread with a smaller proximal angle, and reports that it could be pulled out with less force than a reverse buttress thread. *Id.*; Ex. 1006 at 189, Fig. 1(B).



Based on the foregoing, a POSA would have been motivated to design the temporary screw to have an asymmetric buttress thread with a shorter thread depth and a smaller proximal angle (instead of a symmetric thread with a steeper angle as depicted in Figure 13 of Poovey), to make the screw easier to pull out while maintaining its secure, reliable and stable threaded connection. Ex. 1005, Fig. 13; Ex. 1002, ¶272.

In sum, based on Bernhard, Poovey and Gracco, a POSA would have been motivated to design a temporary screw with flexible buttress threads that would be threaded into bore 654 of abutment 650 but pulled out when the prosthesis is removed without needing to be unscrewed. *Id.*, ¶273.

A POSA would have had a reasonable expectation of success designing such a temporary screw 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 screw on the design of threaded fastener 750 in Figure 12 of Bernhard, so that the temporary screw would fit within aperture 724 of coping 700 and be threaded into bore 654 of abutment 750, like fastener 750. Ex. 1003, Fig. 12; Ex. 1002, ¶¶274–275.

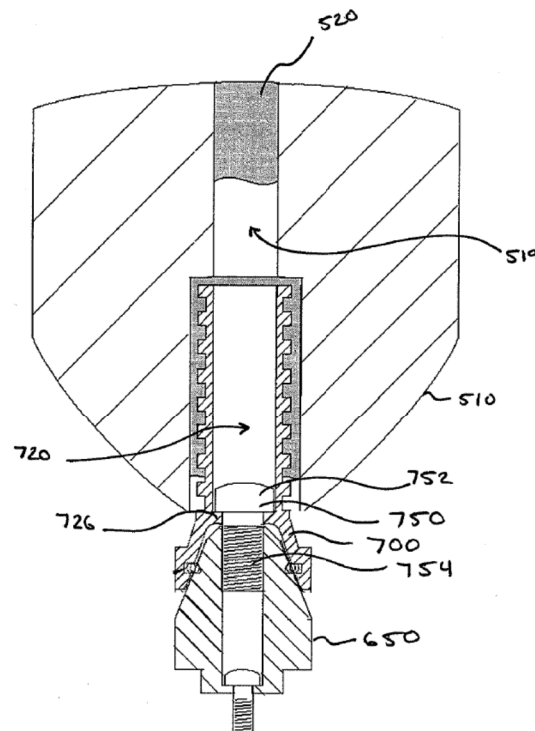


Figure 12

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

the head would make contact with rim 726 like head 752, in order to temporarily connect coping 700 to abutment 650. *Id.*, ¶276.

However, as explained above, based on the teachings of Poovey and Gracco, a POSA would have modified the threads of shaft 754 of fastener 750 in two respects, so that the temporary screw would provide a stable, reliable and secure connection but still be able to be pulled out without being unscrewed. First, a POSA would have chosen an asymmetric buttress thread, based on Gracco, as discussed above. Second, a POSA would have made or coated the threads with silicone or another flexible plastic to make the threads flexible, based on Poovey, as discussed above. *Id.*, ¶¶277–283.

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

The modification would have been merely a combination of prior art elements (Bernhard’s system with Poovey’s temporary screw with flexible threads modified by Gracco’s buttress thread) according to known methods to yield predictable results. Ex. 1002, ¶279.

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

The modification would have been merely the use of a known technique (detaching a coping and a temporary fastener from an abutment) using a temporary screw with flexible buttress threads based on Poovey and Gracco, to improve a similar device in the same way. Similarly, the modification would have been merely applying a known technique to a known device ready for improvement to yield predictable results. *Id.*, ¶280.

The modification would have been obvious to try because it is one choice from among a finite number of identified, predictable solutions, with a reasonable expectation of success. *Id.*, ¶281.

Finally, as explained above, the teachings, suggestions, and motivations in the prior art (Bernhard, Poovey and Gracco) would have led a POSA to make this modification. *Id.*, ¶282.

As explained below, this temporary screw with flexible buttress threads used in Bernhard's system would have all the features of claims 1, 3, 5–7 and 9–12. *Id.*, ¶283.

2. Claim 1

a. Limitation 1(a)

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

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

Coping 700 is temporarily connected to abutment 650 by resilient spring 708 that engages annular slot 652. *Id.*, [0122], [0126], [0130], Fig. 8.

As explained above, it would have been obvious to use a temporary screw 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, ¶¶287–289.

b. Limitation 1(b)

Bore 654 of abutment 650 has female threads. Ex. 1003, [0130], Fig. 8; Ex. 1002, ¶290.

c. Limitation 1(c)

Threaded fastener 750 has a longitudinal axis with a length measured along the axis and a width measured perpendicular to the axis. Ex. 1003, Fig. 12.

Fastener 750 has a proximal head end 752 with a tool interface and a distal post portion 754 with threads configured to engage the threads in bore 654 of abutment 650. *Id.*, [0134], Figs. 8, 12; Ex. 1002, ¶¶291–294.

d. Limitation 1(d)

Coping 700 includes aperture 724 that interfaces with abutment 650. Ex. 1003, [0129], Figs. 7A, 8; Ex. 1002, ¶295.

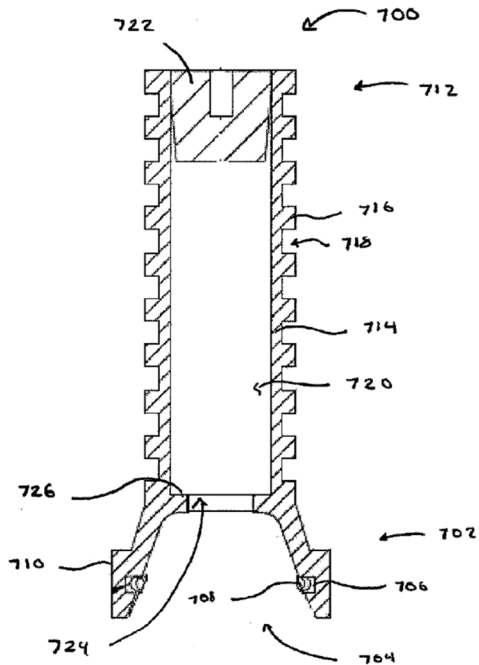


Figure 7A

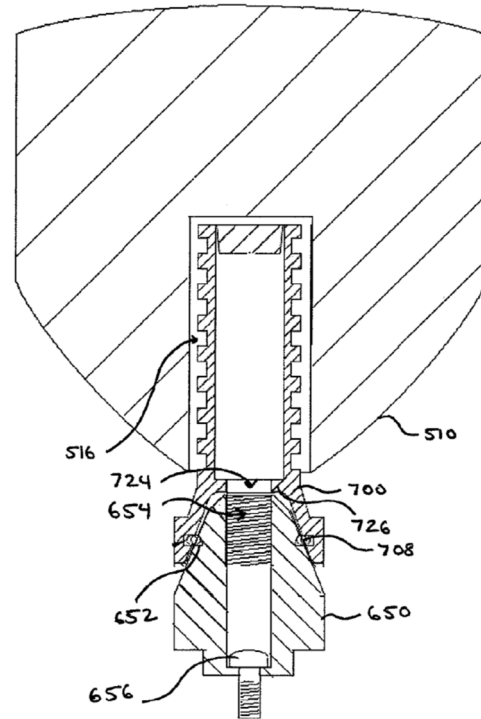


Figure 8

Aperture 724 in coping 700 is larger than the distal post portion of shaft 754 of fastener 750 and smaller than proximal head end 752 of fastener 750. Ex. 1003, [0134], Fig. 12; Ex. 1002, ¶¶296–297.

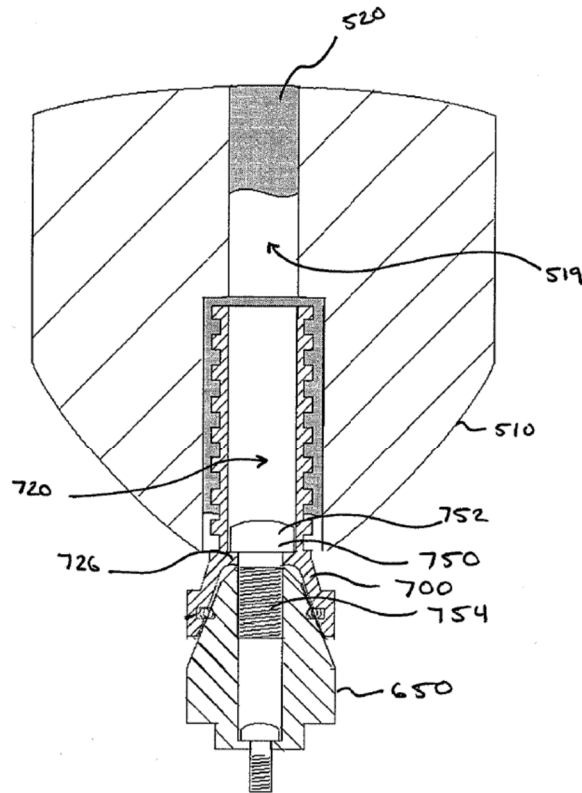


Figure 12

A POSA would understand that member 714 could be eliminated or made shorter so that aperture 724 is at the proximal end of coping 700, because member 714 is optional. Ex. 1003, [0128] (“[C]oping 700 can include an elongate member 714 ...”), [0013], [0149], [0158], [0176], Fig. 7A. Furthermore, a POSA would understand that member 714 would not be needed because of the additional stability created by the temporary screw. 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, ¶298.

e. Limitation 1(e)

As explained above, it would have been obvious to use a temporary screw based on the design of fastener 750 but with flexible buttress threads that engage the threads in bore 654 of abutment 650 to temporarily connect abutment 650 to coping 700. Just like fastener 750, this temporary screw would have a longitudinal axis with a length measured along the axis and a width measured perpendicular to the axis. Ex. 1003, [0134], Figs. 8, 12; Ex. 1002, ¶¶299–300.

f. Limitation 1(f)

As explained above, the temporary screw with flexible buttress threads would be based on the design of fastener 750 and include a head like head 752 that is wider than aperture 724 of coping 700 so that it makes contact with rim 726 to hold coping 700 against abutment 650. Ex. 1003, [0134], Figs. 8, 12; Ex. 1002, ¶301.

g. Limitation 1(g)

As explained above, the temporary screw with flexible buttress threads would be based on the design of fastener 750 and include a threaded post like shaft 754 but with asymmetric buttress threads in a pattern shaped differently from a pattern of the matching, symmetric threads of shaft 754 of fastener 750 and bore 654 of abutment 650. Ex. 1003, [0134], Figs. 8, 12; Ex. 1002, ¶302.

h. Limitation 1(h)

As explained above, the temporary screw with flexible buttress threads would be based on the design of fastener 750 and include a head like head 752 and a threaded post like shaft 754 but with buttress threads that engage the threads in bore 654 of abutment 650 until the head contacts rim 726, in order to connect coping 700 and abutment 650. Thus, this temporary screw would be rotatable in a distal direction whereby the distal shaft portion of the screw engages the threads in bore 654 of abutment 650 to a predetermined torque which causes the proximal head portion of the screw to hold coping 700 in alignment with abutment 650. Ex. 1003, [0134], Figs. 8, 12. A POSA would understand that the temporary screw should be threaded into bore 654 with a torque driver up to a predetermined torque, in order to cause the proximal head portion of the screw to hold coping 700 in alignment with abutment 650. *Id.*; Ex. 1002, ¶¶303–304.

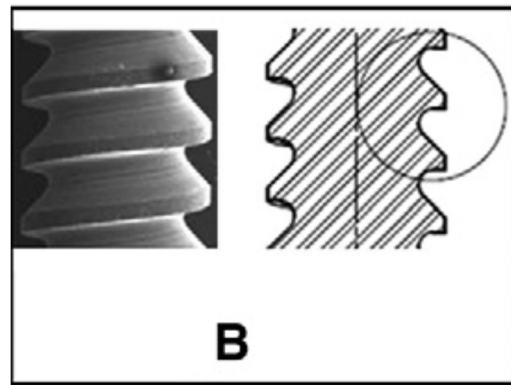
i. Limitation 1(i)

As explained above, the temporary screw would be designed so that the flexible buttress threads enable the screw to be pulled out of bore 654 of abutment 650. Thus, an axial force in a proximal direction from pick-up processing would release coping 700 and the temporary screw from abutment 650. Ex. 1003, [0066]; Ex. 1005, [0084]; Ex. 1002, ¶¶305–306.

3. Claim 3

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

By definition this buttress thread pattern would be asymmetric, like thread B in Figure 1 of Gracco. Ex. 1006, Fig. 1 (B); Ex. 1002, ¶¶307–308.



4. Claim 5

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

By definition this asymmetric buttress thread would have a smaller proximal thread angle and a larger distal thread angle, and therefore would occupy less volume and 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, ¶310.

5. Claim 6

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

As shown in Figure 12, 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, ¶¶312–313.

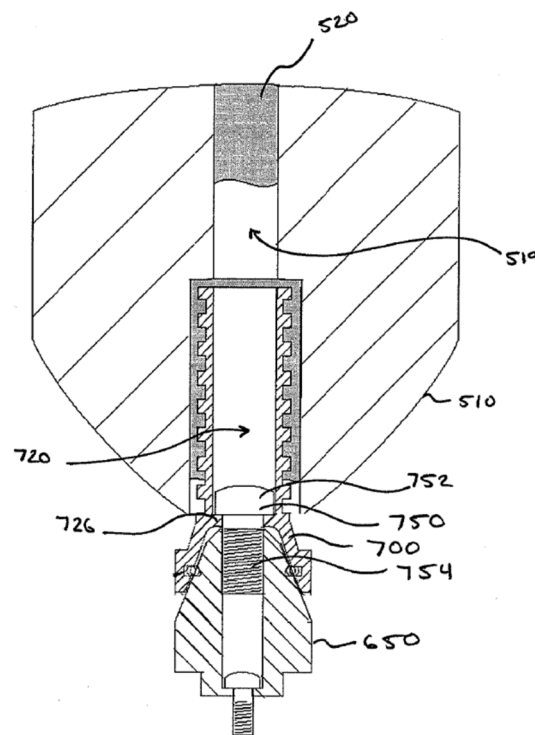


Figure 12

A POSA would design the temporary screw to have the same unthreaded portion between the head and the threaded portion of the shaft as fastener 750, so

that the screw could be inserted through aperture 724 and threaded into bore 654, like fastener 750. Ex. 1002, ¶314.

It would have been obvious to design the temporary screw so that the unthreaded portion has a smaller diameter than the threaded portion. Ex. 1002, ¶¶314–317. For example, the shaft of screw 1260 in Figure 26 has an unthreaded portion with a smaller diameter between the head and the threaded portion. Ex. 1003, Fig. 26.

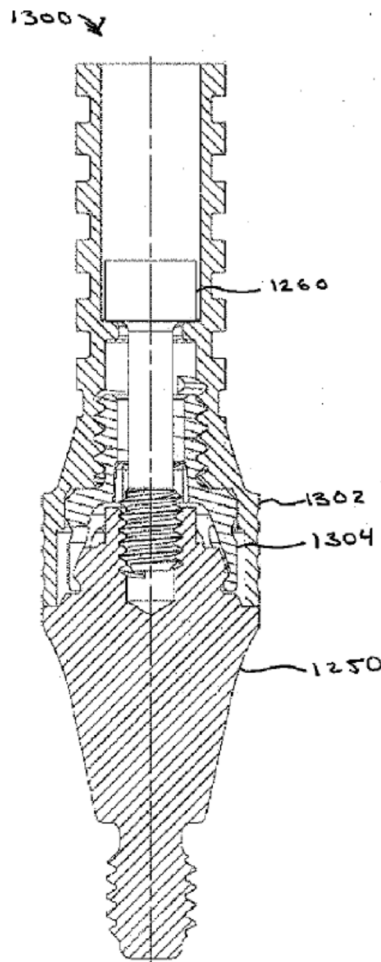


Figure 26

Therefore, it would have been obvious for the distal shaft portion of the temporary screw to have a first portion between the proximal head portion and the threads with a smaller width than a second portion of the distal shaft portion of the temporary screw with threads. Ex. 1002, ¶317.

6. Claim 7

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

As taught by Poovey, the flexible threads of the temporary screw would be made from or coated with a flexible or pliable material, such as silicone, so that the threads deform when the screw is pulled out of abutment 650. Ex. 1005, [0079], [0084]; Ex. 1002, ¶319.

7. Claim 9

a. Limitation 9(a)

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

Coping 700 is temporarily connected to abutment 650 by resilient spring 708 that engages annular slot 652. *Id.*, [0122], [0126], [0130], Fig. 8.

As explained above, it would have been obvious to use a temporary screw, 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, ¶¶323–325.

b. Limitation 9(b)

Bore 654 of abutment 650 has female threading having an implant abutment thread profile. Ex. 1003, [0130], Fig. 8; Ex. 1002, ¶326.

c. Limitation 9(c)

Threaded fastener 750 has a longitudinal axis and a length measured along the axis and a width measured perpendicular to the axis. Ex. 1003, Fig. 12; Ex. 1002, ¶¶327–328.

d. Limitation 9(d)

Threaded fastener 750 has head 752 with a definitive screw drive interface, and shaft 754 with male threading that has a male threading profile that matably threadably engages and which matches the female threading of bore 654 of abutment 650. Ex. 1003, [0134], Figs. 8, 12; Ex. 1002, ¶¶329–330.

e. Limitation 9(e)

Coping 700 includes an aperture at the proximal end which leads to aperture 724 that interfaces with abutment 650. Ex. 1003, [0129], Figs. 7A, 8.

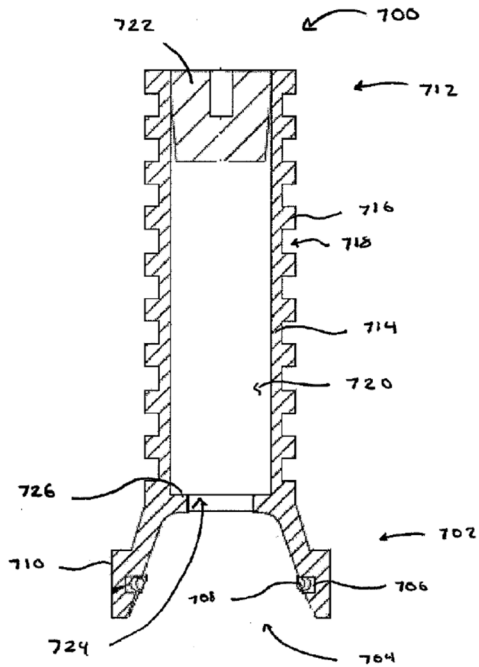


Figure 7A

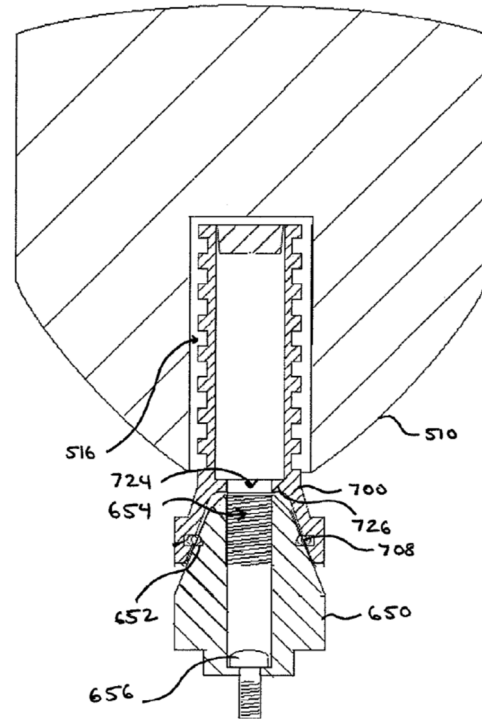


Figure 8

The aperture at the proximal end of coping 700 and aperture 724 are both sized to allow shaft 754 of fastener 750 to pass through. *Id.*, [0134], Fig. 12; Ex. 1002, ¶¶331–333.

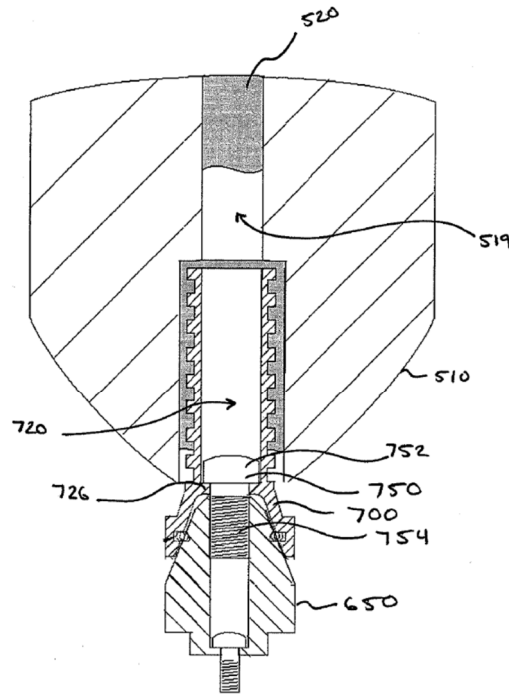


Figure 12

f. Limitation 9(f)

As explained above, it would have been obvious use a temporary screw in Bernhard's system, based on the design of 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. Like fastener 750, this temporary screw would have a longitudinal axis and a length measured along the axis and a width measured perpendicular to the axis. Ex. 1003, [0134], Figs. 8, 12; Ex. 1002, ¶¶334–335.

g. Limitation 9(g)

As explained above, the temporary screw would be based on the design of fastener 750 and include a threaded post with male buttress threading with a male

threading profile that is different from the symmetric, male threading profile of shaft 754 of fastener 750. Ex. 1003, [0134], Figs. 8, 12. The temporary screw shaft based on the design of shaft 754 would be smaller than the aperture at the proximal end of coping 700 and aperture 724, like shaft 754. Therefore, the aperture at the proximal end of coping 700 and aperture 724 are both sized and configured to allow the temporary screw post to pass through. *Id.*, [0134], Fig. 12; Ex. 1002, ¶¶336–338.

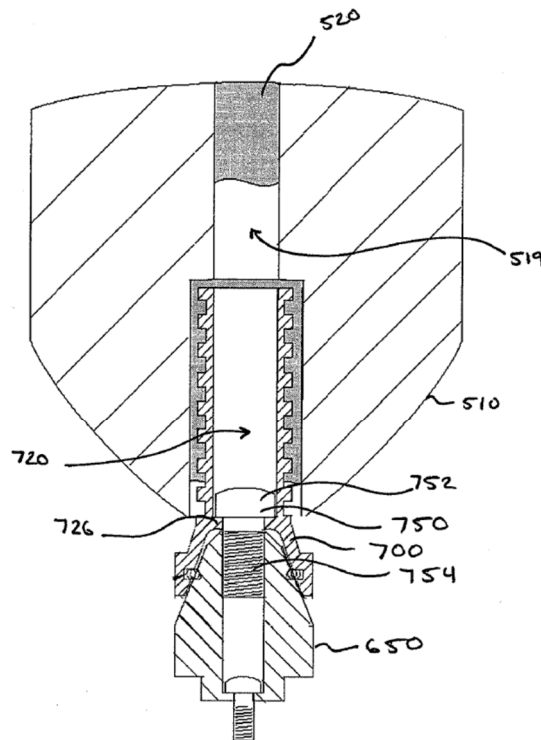


Figure 12

h. Limitation 9(h)

As explained above, the temporary screw with flexible buttress threads would be based on the design of fastener 750 and include a head like head 752 that

is integral to or coupled to the post and has a drive interface so it can be threaded into bore 654 of abutment 650. Ex. 1003, [0134], Figs. 8, 12; Ex. 1002, ¶339.

i. Limitation 9(i)

As explained above, the temporary screw with flexible buttress threads would be based on the design of fastener 750 and include a head like head 752 that is wider than aperture 724 of coping 700, so that it makes contact with rim 726 to hold coping 700 in position against abutment 650 for pick-up processing. Ex. 1003, [0134], Figs. 8, 12. The temporary screw would also include a threaded post like shaft 754 but with male buttress threading configured to enter bore 654 of abutment 650 and rotatably engage the female threading in bore 654. *Id.* A POSA would understand that the temporary screw should be threaded into bore 654 with a torque driver up to a predetermined torque, in order to cause the proximal head of the screw to hold coping 700 in position against abutment 650 for pick-up processing. *Id.*; Ex. 1002, ¶¶340–342.

j. Limitation 9(j)

As explained above, the temporary screw would be designed so that the flexible buttress threads enable the screw to be pulled out of bore 654 of abutment 650. Thus, the buttress threads of the male threading of the post of the temporary screw would release from threads of the female threading in bore 654 of abutment

650 with a predetermined axial pick-up force in a proximal direction in response to and/or during pick-up processing. Ex. 1002, ¶¶343–344.

8. Claim 10

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

The buttress threads would have the same thread pitch but a shorter thread depth (and therefore a smaller thread diameter) than the threads of bore 654 of abutment 650 and the threads of shaft 754 of threaded fastener 750. Ex. 1003, [0134], Fig. 12; Ex. 1006, Fig. 1(B). Because of the smaller thread diameter, the temporary screw threads would have a different pitch angle than the definitive screw and abutment threads. Ex. 1002, ¶346.

9. Claim 11

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

The proximal flank of the male threading profile of this asymmetric buttress thread profile would be at a smaller angle relative to the longitudinal axis than a proximal flank of the symmetric, male threading profile of shaft 754 of fastener 750. Ex. 1003, [0134], Fig. 12; Ex. 1006, Fig. 1(B); Ex. 1002, ¶348.

10. Claim 12

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

As taught by Poovey, the flexible threads would be made from or coated with a flexible material, such as silicone, a polymer. Ex. 1005, [0084]; Ex. 1002, ¶350.

F. Ground 5: Claims 4 and 8 Would Have Been Obvious Based on Bernhard In View of Poovey, Gracco and Derey

Claims 4 and 8 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, ¶¶351–365.

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

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

Claims 4 and 8, which require a portion of the distal shaft of the temporary screw to be hollow, would have been obvious in further view of Derey. Ex. 1002, ¶354.

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, ¶355.

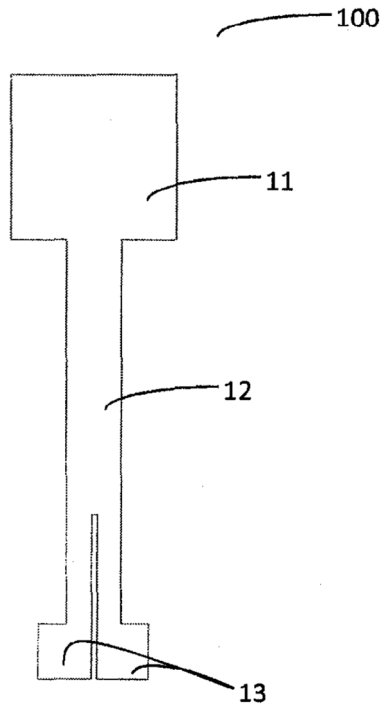


Fig. 5

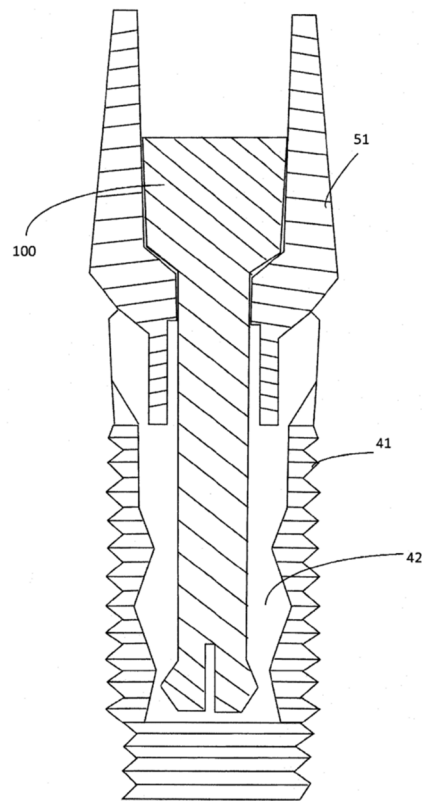


Fig. 6

Based on Derey, a POSA would have been motivated to design the temporary screw to have a slot to create a split-post structure with deflecting legs, in order to make it easier to pull the screw out of the abutment while still ensuring that the temporary connection is stable and secure. *Id.*, ¶356.

A POSA would have had a reasonable expectation of success designing such a split-post temporary screw 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 screw to be pulled out without being unscrewed. *Id.*, ¶357.

As explained below, this split-post temporary screw with flexible buttress threads would have all the features of claims 4 and 8. *Id.*, ¶358.

2. Claim 4

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

The distal shaft portion of this temporary screw would include a hollow portion inside the slot. As explained above for limitation 1(h), the buttress threads would be rotatably insertable into threaded bore 654 of abutment 650 to the predetermined torque. Poovey discloses making the threads 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. A POSA would understand that making the screw out of a polymer would permit the deflecting legs to deflect inwardly into the hollow portion. Ex. 1002, ¶¶361–362.

3. Claim 8

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

Given the slot, the distal shaft portion would include a hollow portion and two legs configured to deflect inwardly into the hollow portion in response to an axial force in the proximal direction when the temporary screw is threaded into bore 654 of abutment 650. *Id.*, ¶365.

G. Ground 6: Claim 2 Would Have Been Obvious Based on Bernhard In View of Poovey, Gracco and Ruetschi

Claim 2 is unpatentable under Section 103 because it would have been obvious before the earliest claimed effective filing date of October 9, 2018, based on Bernhard in view of Poovey, Gracco and Ruetschi. Ex. 1002, ¶¶366–385.

Ruetschi discloses a torque driver (screwing tool 1) used in surgery to tighten and loosen screws up to a maximum torque limit. Ex. 1022, 2:7–13, 2:51–53, 3:2–7. As shown in Figures 1 and 2, helical spring 5 is wound around portion 31 of shaft 3. *Id.*, 3:14–26, Figs. 1, 2. Because of the friction between spring 5 and shaft 3, rotating handle 2 causes spring 5 to rotate and transmit torque to shaft 3 and driver 4 until the maximum selected torque, when spring 5 unwinds sufficiently and no longer grips shaft 3, at which point spring 5 stops transmitting torque to shaft 3 and driver 4. *Id.*, 2:7–13, 218–41, 3:38–55.

FIG. 1

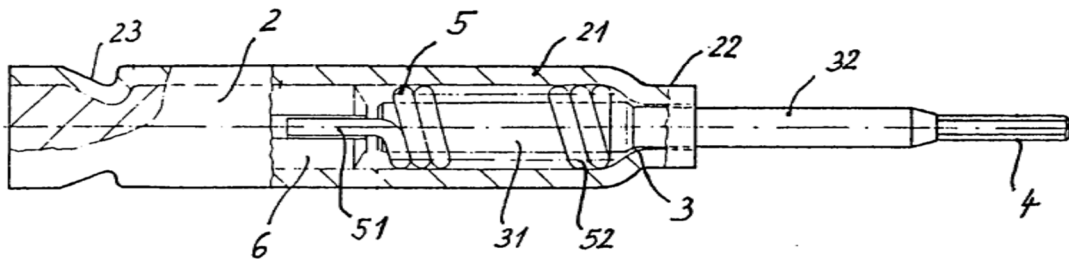
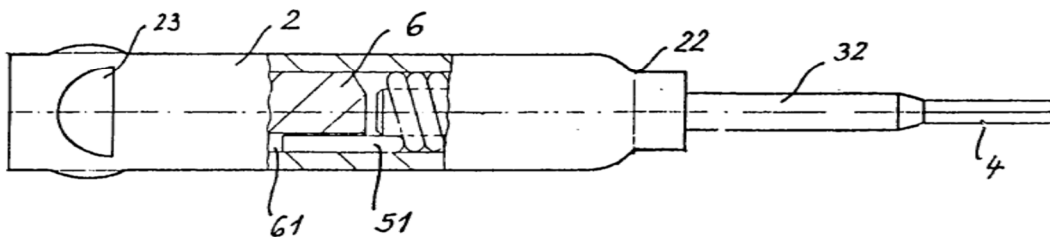


FIG. 2



A POSA would have considered Ruetschi to be reasonably pertinent because Ruetschi's tool 1 is used for tightening and loosening screws in a surgical context, and a POSA would have known that this tool may be suitable in a dental implant context. Ex. 1002, ¶377. Indeed, Nino discloses that torque drivers are used in medical and dental applications, including dental implants. Ex. 1020, 1:11–18, 5:20–22. Moreover, a POSA in the dental implant field would look to literature in the orthopedic field. Ex. 1002, ¶377.

A POSA would have been motivated to use a torque driver based on the design of Ruetschi's tool 1 to thread the temporary screw into the bore 654 of

abutment 650 in Bernhard's system up to the predetermined torque. A POSA would understand the importance of not over-torquing the temporary screw, in order to avoid damaging the screw, coping 700, abutment 650 and the implant. A POSA would also understand the importance of ensuring that the screw is threaded into bore 654 with a sufficient torque to ensure that it securely connects coping 700 and abutment 650, especially given the flexible threads and smaller thread depth. Thus, a POSA would have considered Ruetschi's tool, which is designed to tighten and loosen screws up to a maximum torque in a surgical context, to be a suitable torque driver design for the temporary screw in Bernhard's system. Ex. 1022, 2:1–6, 2:51–53, 3:2–7; Ex. 1002, ¶¶378–379.

A POSA would have had a reasonable expectation of success because they would know what torque limit would be appropriate for the temporary screw in Bernhard's system, and they would be able to adapt Ruetschi's design to this torque limit. Ruetschi teaches that his tool can be customized for different torque limits by varying parameters including the spring constant and the spring and shaft dimensions. Ex. 1022, 4:16–28. A POSA would know how to design the torque driver so that the torque limit was suitable for the temporary screw in Bernhard's system. Ex. 1002, ¶380.

Ruetschi's screwing tool 1 has all the limitations added by claim 2. *Id.*, ¶¶381–385.

Ruetschi has a drive cap: hollow cylindrical handle 2, which transmits torque to spring 5 via bolt 6. Ex. 1022, 3:2–26, Figs. 1, 2; Ex. 1002, ¶382.

Ruetschi has a coil spring: helical spring 5, wound around portion 31 of shaft 3. Ex. 1022, 3:14–17, Figs. 1, 2; Ex. 1002, ¶383.

Ruetschi has a spring friction cylinder: cylindrical portion 31 of shaft 3, around which spring 5 is wound so that the friction between spring 5 and shaft 3 transmits torque from handle 2 via spring 5 to shaft 3 and driver 4, up to the maximum torque. Ex. 1022, 2:7–13, 2:18–41, 3:14–17, 3:38–55, Figs. 1, 2; Ex. 1002, ¶384.

Ruetschi's tool limits the torque applied to a screw to a predetermined torque. Handle 2 transmits torque to spring 5, shaft 3 and driver 4 until the maximum torque is reached, at which point spring 5 no longer grips shaft 3 and stops transmitting torque to shaft 3 and driver 4. Ex. 1022, 2:7–13, 2:18–41, 3:38–55; Ex. 1002, ¶385.

X. OBJECTIVE EVIDENCE OF NON-OBVIOUSNESS

Petitioner is not aware of any objective evidence of non-obviousness that could rebut the strong case of obviousness in Grounds 2, 4, 5 and 6.

The Board should reject any argument by Patent Owner that any commercial success of or praise for its “Separable Fastener” device is evidence of non-obviousness, because it would have no nexus with claims 1–12. Patent Owner's

device (shown below): (1) does not have a different thread pattern as required by every claim, but instead has the same symmetric threads as the permanent screw; and (2) is not released by an axial force as required by every claim, but instead has a separable cap that detaches from the post, which remains threaded in the abutment. Ex. 1002, ¶¶386–392.

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Ex. 1016 at 4; Ex. 1014 at 1–2.

XI. CONCLUSION

Petitioner respectfully requests that the Board institute an inter partes review of claims 1–12, find the claims unpatentable, and cancel the claims.

Respectfully submitted,

/s/ Sheila Mortazavi

Sheila Mortazavi

Reg. No. 43,343

Counsel for Petitioner Straumann USA,
LLC

CERTIFICATE OF COMPLIANCE

This petition complies with the word limit of 14,000 words because it has 13,999 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.

/s/ Sheila Mortazavi

Sheila Mortazavi

Reg. No. 43,343

Counsel for Petitioner Straumann USA,
LLC

CERTIFICATE OF SERVICE

The undersigned certifies that on April 30, 2025, true and correct copies of this petition, all of its exhibits, and Petitioner's power of attorney were served on the following counsel (at the Patent Center Correspondence Address for U.S. Patent No. 11,937,992) by Federal Express:

Daniel J. Whittle
1229 Modoc Drive
Bellingham, WA 98229

/s/ Sheila Mortazavi

Sheila Mortazavi
Reg. No. 43,343

Counsel for Petitioner Straumann USA,
LLC