

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Stanley Black & Decker, Inc.
Petitioner

v.

Howmet Aerospace Inc.
Patent Owner

IPR2025-01581
U.S. Patent No. 11,885,358

PETITION FOR INTER PARTES REVIEW UNDER 37 C.F.R. § 42.100

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Petitioner's Exhibit List

Exhibit	Description
1001	U.S. Patent No. 11,885,358 (“’358 Patent”)
1002	Declaration of Dr. Kim Cameron
1003	U.S.P.A.P. 2018/0111184A1 (“Corbett”)
1004	U.S.P.A.P. 2016/0215808A1 (“Brewer”)
1005	U.S. Patent No. 4,702,655 (“Kendall”)
1006	U.S.P.A.P. 2006/0251490A1 (“Kleinman”)
1007	Prosecution History Of U.S. Application No. 18/404,525 (Continuation Of The ’358 Patent), April 23, 2025, Office Action
1008	U.S. Patent No. 4,203,346 (“D2”)
1009	Prosecution History Of EP 3921552 (EP Counterpart To The ’358 Patent), August 22, 2022, Applicant Letter
1010	U.S.P.A.P. 2014/0271024A1 (“Jones”)
1011	Prosecution History Of The ’358 Patent, October 31, 2023, Response To Office Action
1012	U.S. Patent No. 7,156,596 (“Makino”)
1013	Prosecution History Of U.S. Application No. 18/404,525 (Continuation Of The ’358 Patent), October 2, 2025, Office Action
1014	U.S.P.A.P. 2005/0260056 A1 (“Denham”) (issued 2005)

1015	U.S. Pat. No. 4,907,922 (“Jeal”) (issued 1990)
1016	EP Patent Application Publication No. 0 365 227 A1 (published 1990)
1017	Richard T. Barrett, Fastener Design Manual, NASA Reference Publication 1228, ISBN 9781478352303 (published 1990)
1018	ISO 13469:2014(E), Mechanical joining — Form-fit blind rivets and (lock) bolt joints — Specifications and qualification of testing procedures, International Standard (published 2014)
1019	U.S. Pat. No. 5,315,755 (“Fulbright”) (issued 1994)
1020	European Patent No. 0 527 581 B1 (published 1996)
1021	Declaration of Benjamin L. Kiersz

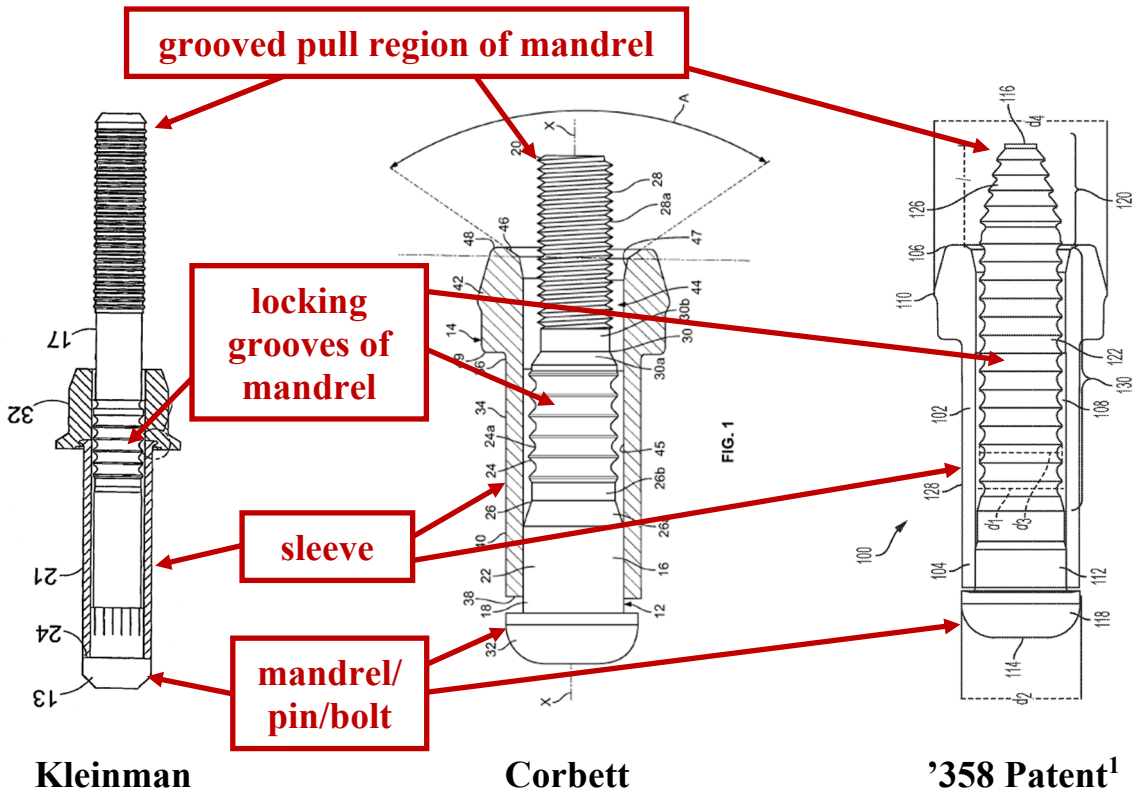
I. INTRODUCTION

Petitioner requests that claims 1-20 of U.S. Patent No. 11,885,358 (Ex. 1001) (“’358 Patent”) be found obvious/unpatentable over U.S.P.A.P. 2018/0111184A1 (Ex. 1003) (“Corbett”) or U.S.P.A.P. 2006/0251490A1 (Ex. 1006) (“Kleinman”) in view of U.S.P.A.P. 2016/0215808A1 (Ex. 1004) (“Brewer”).

Petitioner’s subsidiary, Avdel UK Limited, has been in the fastener field of the ’358 Patent for many years. Brewer and Kleinman are Avdel’s own prior art. This petition seeks to stop Patent Owner (“PO”) from monopolizing what was well known in this art.

II. BACKGROUND

Corbett, Kleinman, and the ’358 Patent disclose similar blind swage fasteners for use when only one side of the workpieces is accessible.



Each fastener includes a deformable sleeve surrounding a mandrel/pin/bolt that includes locking grooves and a pull region with multiple relatively small/shallow threaded or annular pull grooves.

As shown below, installation involves inserting the fastener into a hole in the workpieces 42, 43. An installation tool grips and pulls the grooved pull region, deforming a far/blind end of the sleeve into a blind head 49. The tool's anvil 47 then swages the near/accessible end of the sleeve into the locking grooves on the mandrel's shank to lock the workpieces together.

¹ All color (highlighting; colored annotations) throughout this petition is added.

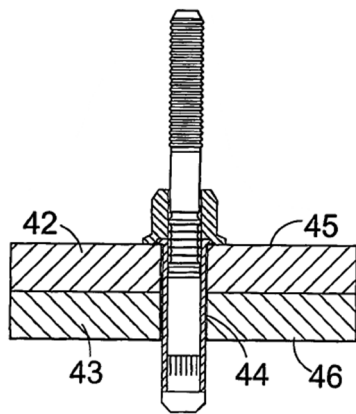


Fig. 3A

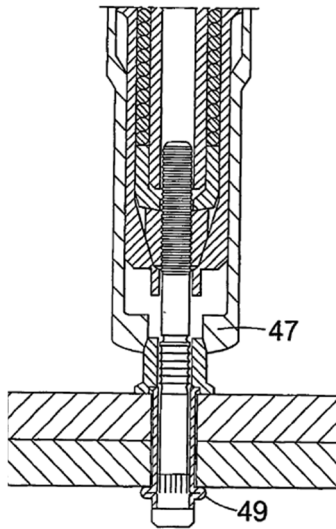


Fig. 5A

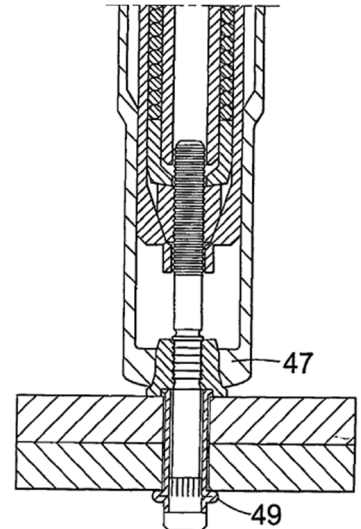
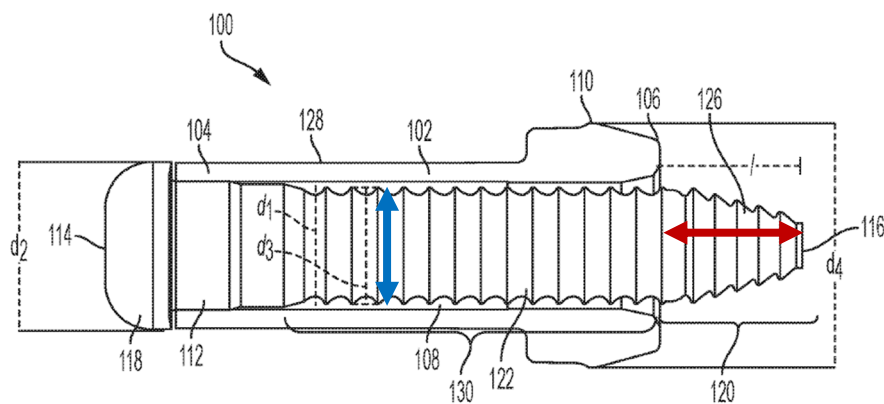


Fig. 5B

Kleinman

III. THE '358 PATENT

As shown below, the '358 Patent purportedly improves such fasteners by shortening an **axial length** of the pull region 120 relative to a **diameter** of a shank 122 of the mandrel 112. '358 Patent, 4:30-39.



'358 Patent, FIG. 1

PO persuaded the USPTO that challenged claims 1 and 16 were inventive because they recite a “pull region compris[ing] an axial length **no greater than 4** times a diameter of the shank region.” Ex. 1011, pp. 2-5.

However, Brewer already taught that the length of a pull region of a swage fastener was preferably “**0.936**” times a diameter of the shank region. Brewer, ¶¶[0076], [0025].

IV. PRIOR ART

Corbett, Kleinman, Brewer, Kendall, and Fulbright are 35 U.S.C. §102(a)(1) [AIA] prior art because their 2018, 2006, 2016, 1987, and 1994 publication dates predated the ’358 Patent’s claimed February 7, 2019 priority date. Exs. 1001, 1003-1006, cover sheets.

A. Corbett (U.S.P.A.P. 2018/0111184A1) (Ex. 1003): Blind Swage Fastener

Primary reference Corbett was not of record during prosecution, despite teaching an extremely similar blind swage fastener. Corbett’s fastener 10 includes a sleeve 14 and a mandrel/bolt 12 with a locking groove portion 24 and a pull region 28 with multiple relatively small pull grooves 28a. Corbett, ¶[0009], FIGS. 1-2.

Kleinman's installation tool utilizes a puller with multi-grooved jaws 49 that engage matching pulling grooves of the pull region 18. Ex. 1006, ¶[0031], FIGS. 3-5.

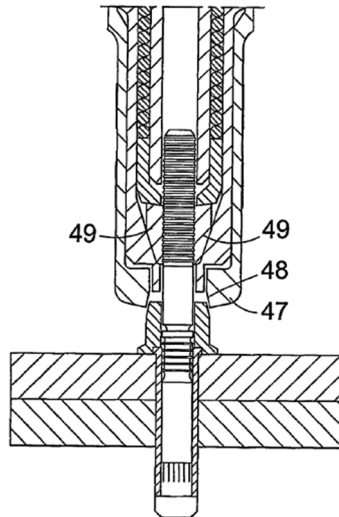


Fig. 4A

Kleinman

C. Brewer (U.S.P.A.P. 2016/0215808A1) (Ex. 1004): Swage Fastener With Improved, Short, Single-Groove, Pull Region

Brewer taught that a “problem” with conventional swage fasteners with multiple relatively small pull grooves, like in Corbett and Kleinman, “is that the crests of the teeth of the installation tool may not engage sufficiently with the shallow grooves provided on [the pull region of] the pin, e.g. the crests of the teeth may be caused to close directly onto the crests of the pull grooves, which can cause increased loads and slippage, thereby causing damage to the tool and/or fastener.” Brewer, ¶[0003]; Brewer, ¶¶[0004]-[0011] (listing additional disadvantages of multi-grooved pull regions).

Brewer taught that such shortcomings of swage fasteners with multi-groove pull regions like in Corbett and Kleinman could be overcome via a pull region 20/80 with a single annular pull groove 20 and end portion 80:

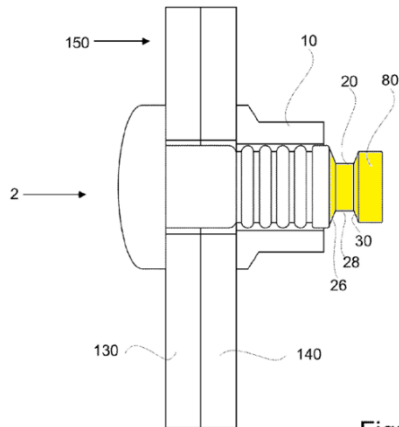


Figure 8

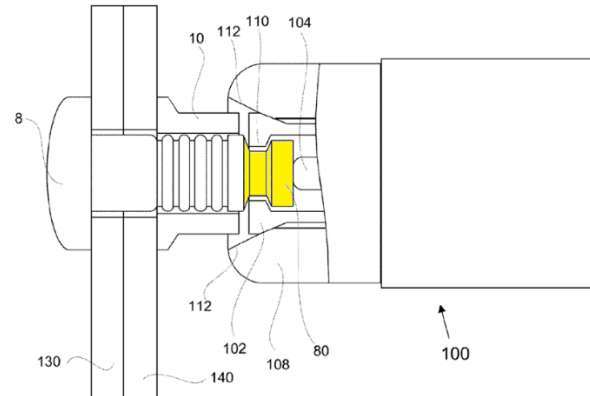


Figure 12

Brewer

Brewer attributes various benefits to Brewer's single groove pull region 20/80:

[0015] As the present invention has only a single relatively large pull groove, rather than a plurality of relatively small pull grooves, this enables easier operator engagement of the tool with the pin, as angular alignment and axial positioning are less critical than with prior art embodiments comprising multiple pull grooves. On engagement of the tool with the lockbolt, the deep pull groove allows the lockbolt to be maintained in an initial position relative to the tool; even if the lockbolt is at an angle relative to the longitudinal axis of the tool, the angular positioning of the lockbolt will be corrected on actuation of the tool. Because alignment and positioning are less critical than with prior art

embodiments, it is quicker and simpler for the operator to enter the pin into the tool nose, thereby leading to improved installation productivity.

[0016] The single pull groove ... is less likely to become clogged with debris than the shallower multiple grooves of prior art embodiments.

[0017] The lockbolt ... can be manufactured more simply and cheaply than prior art multiple pull groove lockbolts. It is also much less susceptible to manufacturing tolerances, as the groove is much larger/deeper than previous embodiments, and therefore the effect of tolerances is much reduced. Furthermore, no pitch error is possible with the single pull groove.

Brewer, ¶¶[0015]-[0017].

Brewer taught that “[p]referably the ratio of the total **length [L]** of the pin tail over which the pull groove and the end portion extends, to the maximum **diameter [D]** of the locking portion, is within the range 0.7 to 1.2,” preferably 0.936. Brewer, ¶[0025]; Brewer, ¶[0075] (“**L** is the total length of the pin tail 6 over which the pull groove 20 and end portion 80 extend[.]”); Brewer, ¶[0072] (“**D** is the maximum diameter of the locking portion 36”); Brewer, ¶[0076] (“**L**=0.936 **D** (and more generally is within the range 0.7 D to 1.2 D)”).

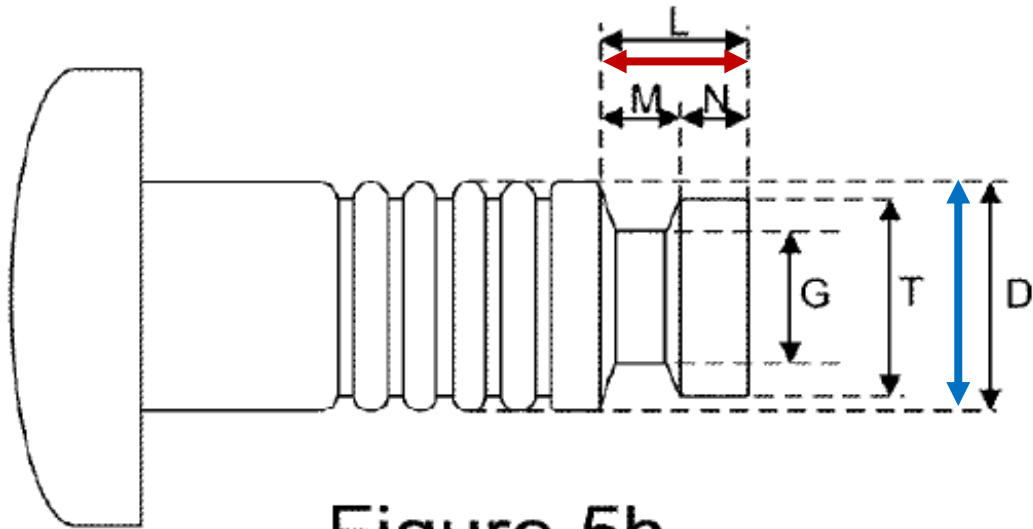
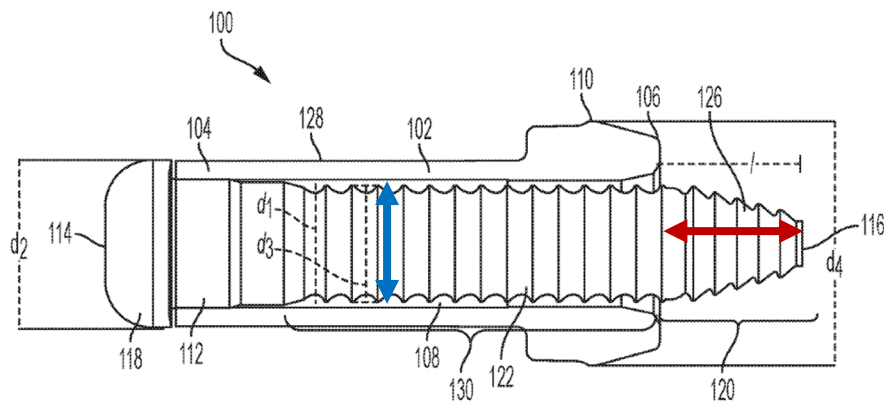


Figure 5b

Brewer

Brewer's 0.936 **L:D** ratio falls squarely within the “no greater than 4” **L:D** ratio recited in challenged claims 1 and 16.



'358 Patent, FIG. 1

D. Kendall (U.S. Patent No. 4,702,655) (Ex. 1005): Blind Fastener With 49-52 HRC Metallic Pin/Mandrel

Kendall taught that for blind fasteners like Corbett's and Kleinman's, an alloy steel pin with a “49-52 Rc” hardness provides “sufficient strength to withstand the frictional forces encountered during setting.” Kendall, 3:25-42.

E. Fulbright (U.S. Patent No. 5,315,755) (Ex. 1019): Swage Fastener With 44+ HRC Pin

Fulbright taught that swage fasteners advantageously used “ferrous,” 33-39 HRC mandrels with pull regions preferably hardened by an additional 15 HRC to 48-54 HRC to enhance “strength” and “minimize the necessary overall length of the pull portion.” Fulbright, 8:17-28, FIGS. 1-7; Ex. 1002, ¶74.

F. Corbett, Kleinman, Brewer, Kendall, And Fulbright Are Analogous Art

POSITAs would obviously look to Brewer, Kendall, and/or Fulbright for ways to improve Corbett or Kleinman because they are analogous art for at least two reasons. These five references and the '358 Patent are in the field of through-hole structural fasteners with deformable locking sleeves/collars (e.g., swage fasteners, blind fasteners). Sections III, IV.A.-D., above; '358 Patent, 1:4-63; Ex. 1002, ¶77. These references are also analogous art because their pins and pull regions are reasonably pertinent to the problem faced by the inventors of the '358 Patent and these references, i.e., providing a pull region that can be effectively gripped and pulled by a fastening tool during installation to deform/swage the sleeve/collar. Sections III-IV, above; Ex. 1002, ¶¶78-79.

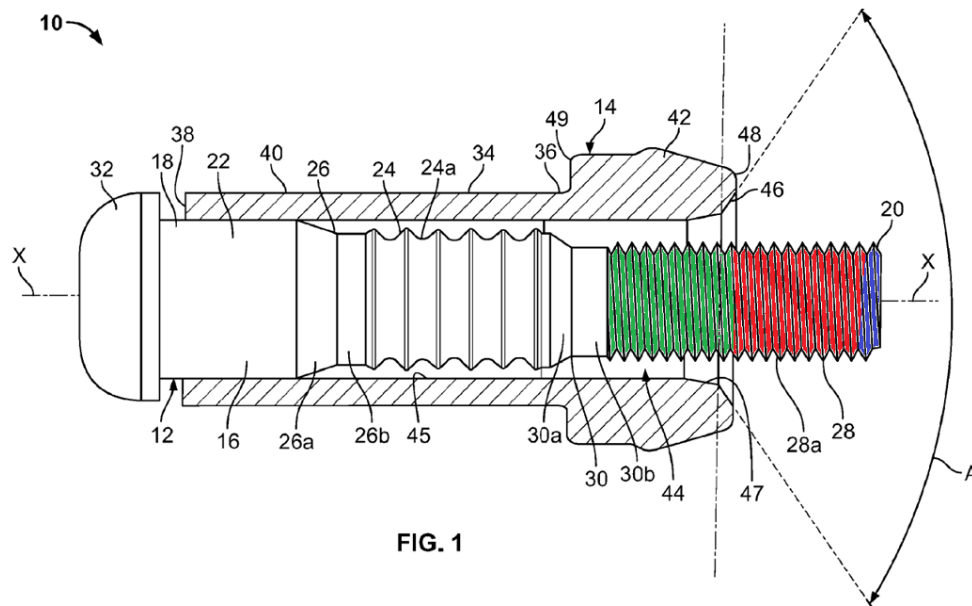
V. PERSON OF ORDINARY SKILL IN THE ART (“POSITA”)

A POSITA would have had a Bachelor of Science degree in Mechanical Engineering or a related field, and at least two (2) years of professional or practical experience with structural/load-bearing mechanical devices, or a comparable

combination of education and experience, such as ten years of practical experience in industry. Ex. 1002, ¶20. All assertions in this petition are made from this POSITA's perspective before February 7, 2019, as supported by Dr. Cameron's declaration (Ex. 1002).

VI. CLAIM CONSTRUCTION: "PULL REGION COMPRISES AN AXIAL LENGTH" (CLAIMS 1-3, 16-17)

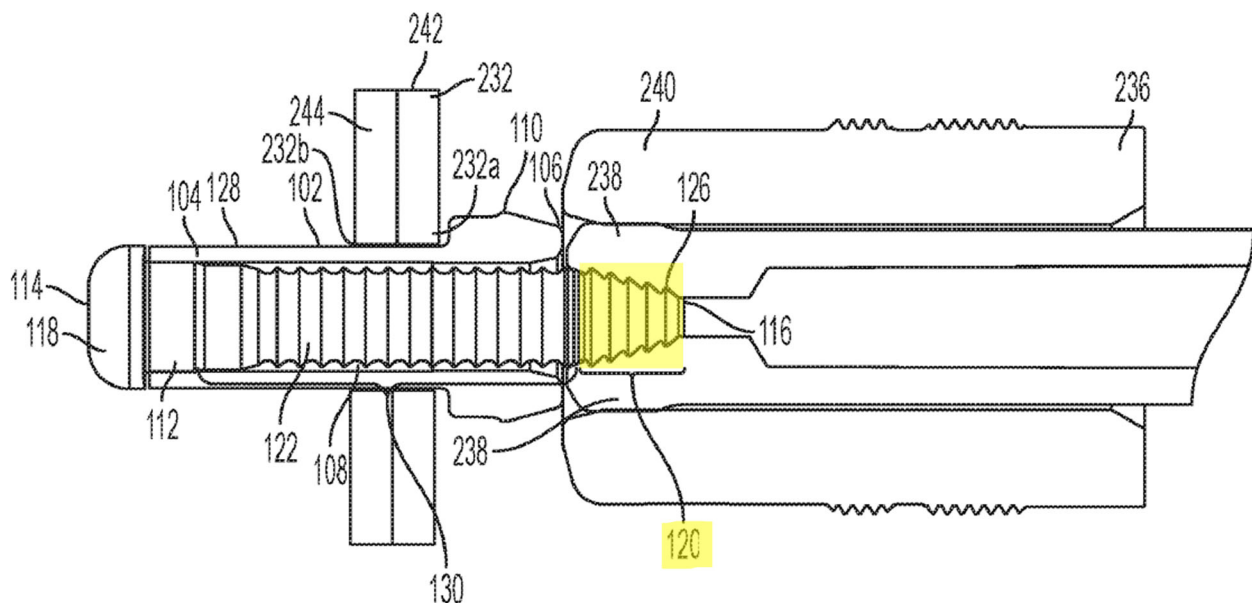
As shown below, this limitation is indefinite as to whether "pull region" means: (A) any region capable of being engaged by the installation tool (**one of multiple grooves**) under the USPTO's intended use construction (Ex. 1013, pp. 3, 5); (B) the mandrel region protruding from the sleeve (~**red+blue**) ("standout"); or (C) the entire region configured to be engaged by an installation tool (**green+red+blue**).



Corbett

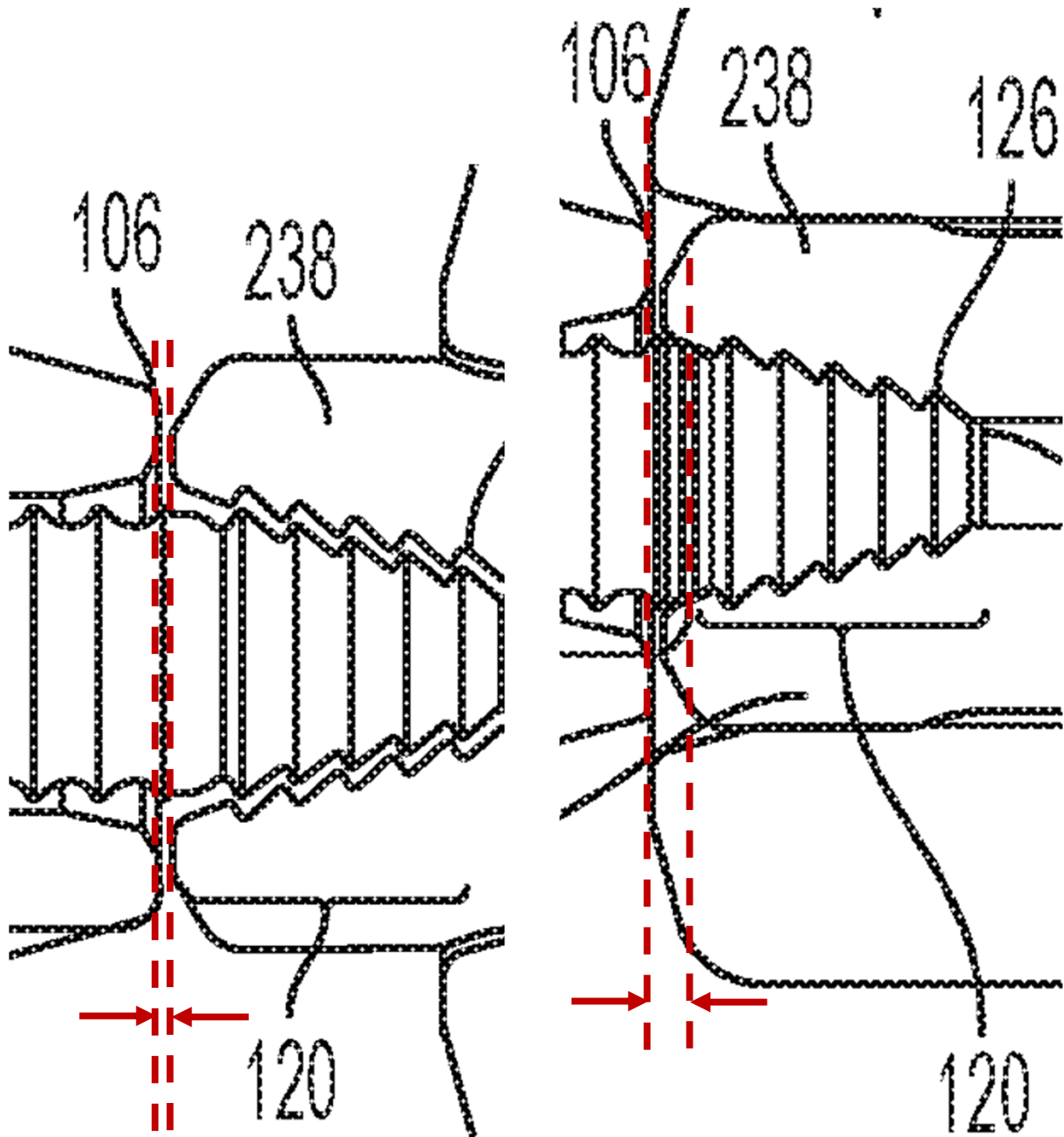
This limitation is also indefinite as to whether the “pull region *comprising* an axial length” encompasses an axial length of a portion of the pull region or of the entire pull region. Ex. 1013, pp. 3, 5. Because Petitioner cannot pursue indefiniteness here, Petitioner conservatively proposes, solely for purposes of this petition, a PO-favorable definition: the “axial length” means the entire axial length of the pull region, and the “pull region” means the entire “region configured to be engaged by an installation tool.” The record supports this construction over a “standout” construction.

First, the specification and claims state that the pull region 120 is “configured to be engaged by an installation tool.” ’358 Patent, 4:27-28, claims 1-3, 16.



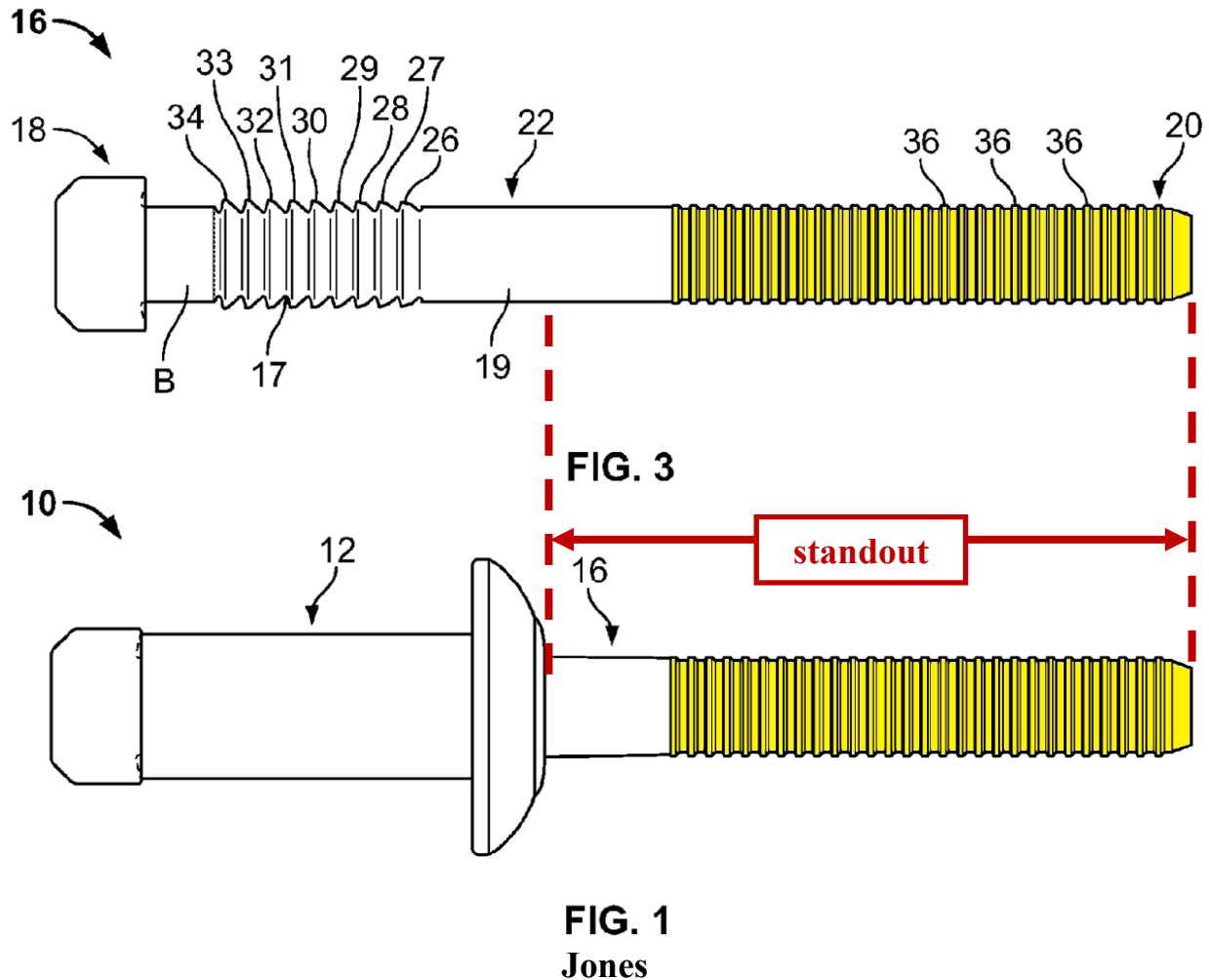
’358 Patent, FIG. 2B (highlighting pull region 120)

Second, FIGS. 2A-2B of '358 Patent do not illustrate the pull region 120 as starting at the sleeve's end 106. There can be an **offset** between them, which confirms that the pull region 120 is not defined by the mandrel's standout.

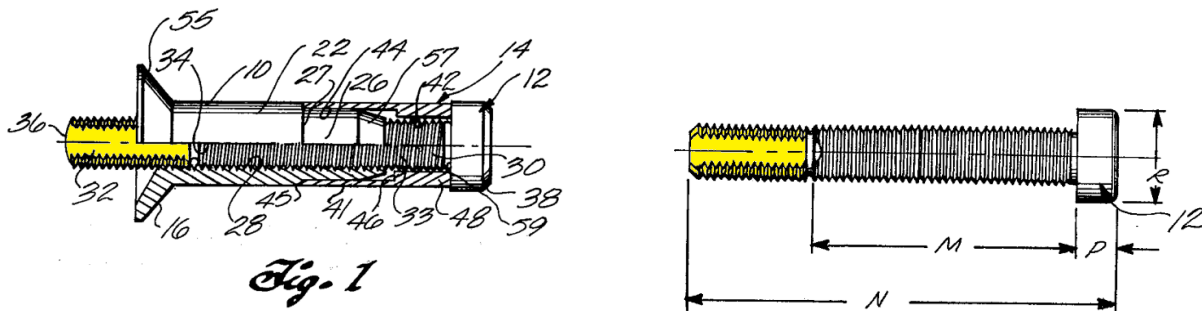


'358 Patent, FIGS. 2A-2B (excerpts)

Third, during prosecution, PO asserted that the pull region in U.S.P.A.P. 2014/0271024A1 (“Jones”) (Ex. 1010) was defined by the “pull grooves 36” (highlighted below), not the mandrel’s **standout**. Ex. 1011, pp. 4-5.



Fourth, while prosecuting PO’s European counterpart, PO asserted that the pull region (highlighted below) in U.S. Patent No. 4,203,346 (D2) (Ex. 1008) extended into the sleeve. Ex. 1009, p. 3 (PO asserting that “a length of the pull region” in D2 is “N-M”).



D2, FIGS. 1-2 (excerpt)

PO thus argued that the pull region is the region configured to be engaged by an installation tool, not the mandrel's standout.

Fifth, Corbett confirms that in this art, the pull region can extend into the sleeve such that only a “a portion of the pull portion 28 extends outwardly from ... the sleeve 14.” Corbett, ¶[0011] (emphasis added). This further refutes a “standout” construction.

“Pull region” should therefore be construed to mean “a region configured to be engaged by an installation tool,” rather than a region protruding from the sleeve (standout). Ex. 1002, ¶¶80-88.

VII. CHALLENGE AND REQUESTED RELIEF

Petitioner raises four 35 U.S.C. §103 invalidity grounds:

- (A) Claims 1-20 were obvious over Corbett in view of Brewer;
- (B) Claims 6-7, 11, 14, and 20 were obvious over Corbett in view of
Brewer, Kendall, and Fulbright;
- (C) Claims 1-20 were obvious over Kleinman in view of Brewer;

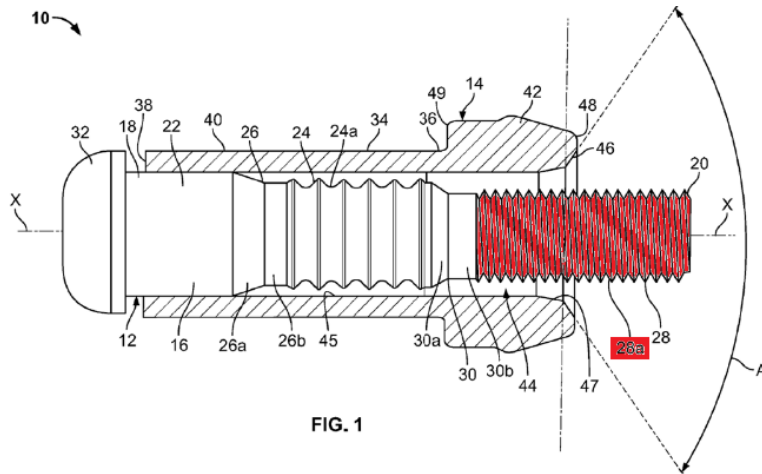
(D) Claims 6-7, 11, and 20 were obvious over Kleinman in view of Brewer, Kendall, and Fulbright.

Petitioner reserves its indefiniteness defenses and interprets the challenged claims as best it can in Grounds A-D despite their indefiniteness.

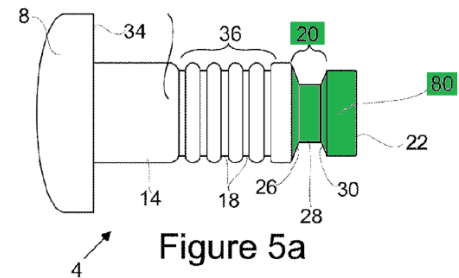
A. Ground A: Claims 1-20 Were Obvious Over Corbett In View Of Brewer

Brewer taught that a “problem” with conventional swage fasteners with multiple, “relatively small pull grooves” like in Corbett (or Kleinman) “is that the crests of the teeth of the installation tool may not engage sufficiently with the shallow grooves provided on the [pull region of the] pin, e.g. the crests of the teeth may be caused to close directly onto the crests of the pull grooves, which can cause increased loads and slippage, thereby causing damage to the tool and/or fastener.” Brewer, ¶[0003], [0015]; Brewer, ¶¶[0004]-[0011] (identifying additional disadvantages of multi-groove pull regions); Sections IV.A., IV.C., above; Ex. 1002, ¶94. POSITAs would understand from Brewer that such shortcomings of swage fasteners like Corbett’s (or Kleinman’s) with multi-groove pull regions can be overcome by replacing the multi-groove pull region with Brewer’s single-groove pull region 20/80 (combination of Brewer’s annular “single pull groove 20” and “end portion 80”). Brewer, ¶¶[0015]-[0017], [0072]-[0076]; Brewer, FIGS. 8, 12; Section IV.C., above; Ex. 1002, ¶94.

As shown below, it was obvious to modify Corbett's fastener 10 in view of Brewer by replacing the **relatively small pull grooves 28a** of Corbett's **pull region 28** with Brewer's **single-groove pull region 20/80**. Ex. 1002, ¶95.

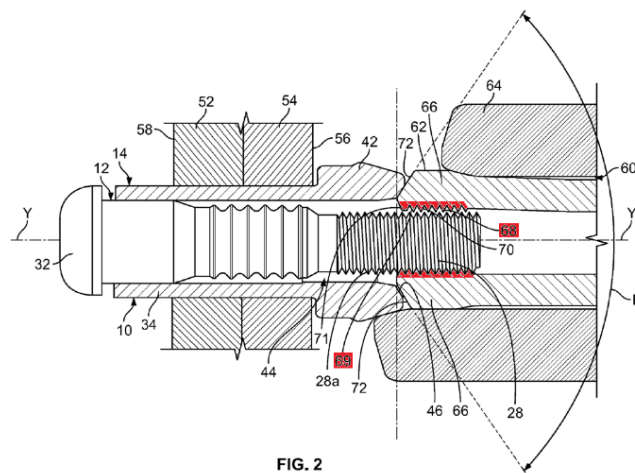


Corbett

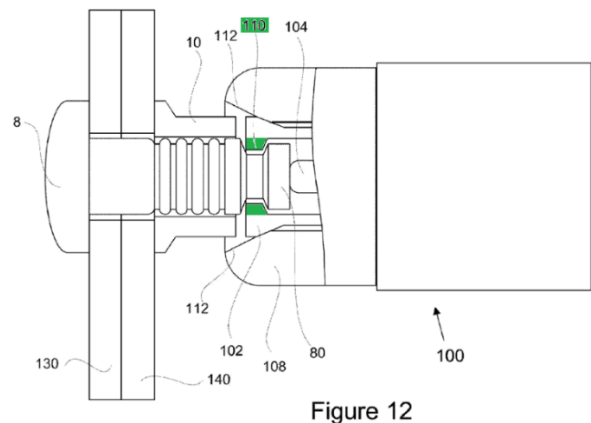


Brewer

As shown below, it was obvious to correspondingly modify Corbett's installation tool 60 by replacing the **teeth 68, 69 and multiple/shallow pull grooves 70** of the collet jaws 66 with the **single lip 110** of Brewer's collet 102 to appropriately mate with the modified fastener's single groove 20. Ex. 1002, ¶96.



Corbett



Brewer

Corbett, ¶[0012], FIG. 2; Brewer, ¶[0088] (“internal lip 110” engaging “single pull groove 20”), FIGS. 5A, 12.

POSITAs would be motivated to so modify Corbett (or Kleinman) to obtain any of the benefits Brewer attributes to its single groove pull region 20/80 and mating single-lipped 110 installation tool:

- avoiding misengagement, insufficient engagement, or stripping between the installation tool and pull region, as was possible with Corbett’s (or Kleinman’s) multi-groove pull region (Brewer, ¶[0003]; Brewer, ¶[0005] (“The multiple pull grooves and tool teeth of the prior art embodiments are also sensitive to angled entry into the collet, therefore the operator is required to check that the fastener is correctly aligned within the collet before actuating the tool.”); Brewer, ¶[0004] (“It is also possible for the tool teeth not to engage all fastener pulling grooves in an axial direction, which can lead to overstressing and stripping of the loaded pulling grooves on the fastener.”));
- avoiding misalignment between Corbett’s (or Kleinman’s) installation tool and pull region, and the associated higher local stresses and premature failure of the tool’s or pull region’s grooves (Brewer, ¶[0009] (“[A]ny misalignment of the collet teeth and the pulling grooves, or pitch error between the teeth and the pulling grooves due to normal

- manufacturing tolerances, may result in an uneven distribution of pulling load and therefore generate higher localised stresses that lead to premature failure.”));
- avoiding clogging of the multiple shallow grooves on the fastener and installation tool with debris, as was possible with Corbett’s (or Kleinman’s) multi-groove pull region (Brewer, ¶[0016] (“The single pull groove of the present invention is less likely to become clogged with debris than the shallower multiple grooves of prior art embodiments.”); Brewer, ¶[0006] (“A further disadvantage of the [conventional swage] fasteners such comprising a plurality of pull grooves is that the narrow, shallow pull grooves, and also the shallow pulling teeth on the tool, can easily become clogged with debris, particularly in dirty working environments. Fine pitch multiple groove collet teeth are also much more vulnerable to damage by sand and small stones common to the outdoor environments in which these heavy duty lockbolt fasteners are often used (e.g. building of solar power plant structures in desert locations).”));
 - simplifying and reducing the cost of manufacture of Corbett’s (or Kleinman’s) pull region (Brewer, ¶[0017] (“The lockbolt of the present invention can be manufactured more simply and cheaply than prior art multiple pull groove lockbolts. It is also much less susceptible to

- manufacturing tolerances, as the groove is much larger/deeper than previous embodiments, and therefore the effect of tolerances is much reduced. Furthermore, no pitch error is possible with the single pull groove.”); Brewer, ¶[0007] (“Manufacturing of multiple pull grooves lockbolts requires complex and therefore expensive thread rolling tooling, and the multiple pull groove forms generated on the pin are difficult and time consuming to inspect in production, therefore increasing time and cost of production.”));
- avoiding use of complex, expensive, weak, and/or damage-prone shallow collet teeth on Corbett’s (or Kleinman’s) installation tool (Brewer, ¶[0008] (“Multiple collet teeth on an installation tool require small radii around the teeth, which increases stresses and leads to premature cracking. These teeth are also more complex to manufacture and inspect, and so are more costly.”));
 - avoiding “sharp pull groove crests,” which “present[] a risk of injury to the operator or other personnel,” as was the case with multi-groove fasteners like Corbett’s (or Kleinman’s) (Brewer, ¶[0011]);
 - “enabl[ing] easier operator engagement of the tool with the pin, as angular alignment and axial positioning are less critical than with prior

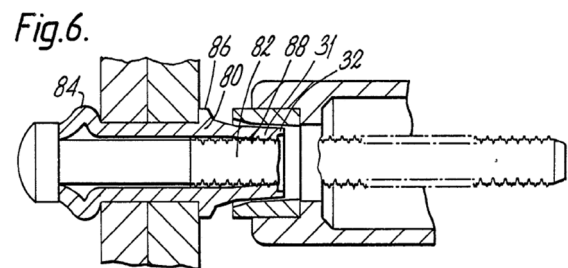
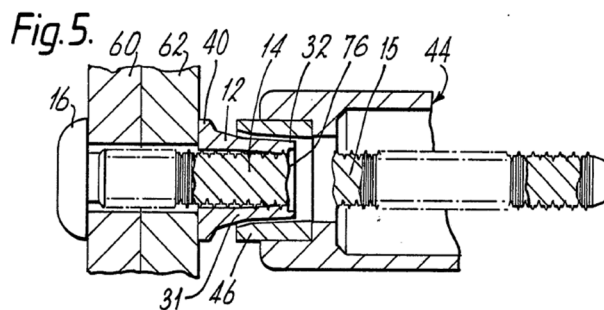
- art embodiments comprising multiple pull grooves” (Brewer, ¶[0015];
see also Brewer, ¶[0100], FIG. 17);
- maintaining and ensuring good “engagement” between the installation tool and pull region, “even if the [fastener] is at an angle relative to the longitudinal axis of the tool” (Brewer, ¶[0015]);
 - making “alignment and positioning” between the fastener and installation tool “less critical than with prior art embodiments” like Corbett’s (or Kleinman’s) (Brewer, ¶[0015]); and/or
 - providing “quicker and simpler” installation of Corbett’s (or Kleinman’s) fastener, “leading to improved installation productivity” (Brewer, ¶[0015]).

See Section IV.C., above; Ex. 1002, ¶¶95-98.

This “mere application of a known technique [(Brewer’s cheaper, faster, stronger, less error-prone, easier-to-install single groove pull region)] to a piece of prior art ready for the improvement,” i.e., Corbett’s (or Kleinman’s) fastener with a disadvantageous multi-groove pull region, was obvious because it involves no “more than the predictable use of prior art elements according to their established functions.” *KSR Int’l. Co. v. Teleflex Inc.*, 550 U.S. 398, 417-18 (2007); Ex. 1002, ¶99.

Such modifications were similarly obvious because they involve the “simple substitution of one known element [(Corbett’s (or Kleinman’s) multi-groove pull region)] for another [(Brewer’s improved single-groove pull region 20/80)]” and therefore involve no “more than the predictable use of prior art elements according to their established functions.” *KSR*, 550 U.S. at 417-18; Ex. 1002, ¶100.

The improved single-groove pull region of Brewer’s non-blind swage fastener was obviously applicable to the pull region of Corbett’s (or Kleinman’s) blind swage fastener because the function of the pull regions in both are the same, enabling the tool to pull the pin/mandrel relative to the sleeve. Corbett, ¶[0015] (recognizing the cross-applicability of teachings about “blind fastener[s]” and “other types of fasteners”); EP0365227A1 (published 1990) (Ex. 1016), 1:44-49 and FIGS. 5-6 (recognizing cross-applicability of teachings relating to non-blind swage fasteners (“lockbolts”) (below left) like Brewer’s and “blind [swage] fasteners” (below right) like Corbett’s (or Kleinman’s)); Ex. 1017 (published 1990), p. 30; Ex. 1002, ¶101.



EP0365227A1 (Ex. 1016)

Corbett recognizes that its pull region 28 with “a plurality of pull grooves 28a” could alternatively comprise “a single pull groove 28a,” further confirming the obvious applicability of Brewer’s single-groove pull region 20/80 to Corbett. Corbett, ¶[0009]; Ex. 1002, ¶101.

Brewer’s installation tool for non-blind swage fasteners was obviously applicable to blind swage fasteners like Corbett’s (or Kleinman’s) because tools for both work in essentially the same way. Ex. 1017 (published 1990), p. 30 (“[I]nstallation [of a non-blind lockbolt] is then completed from the near side with a gun similar to blind rivet guns.”); Ex. 1002, ¶102. Installing a blind swage fastener merely requires a longer pulling stroke to form the blind head before swaging the sleeve. *Id.*

The obviously modified Corbett fastener and installation tool renders claims 1-20 obvious.

1. Claim 1

a. Limitation 1(a): “A blind fastener comprising:”

The obviously modified Corbett fastener 10 is a “blind fastener.” Corbett, ¶¶[0007], [0011]-[0014], FIGS. 1-2; Ex. 1002, ¶108.

As highlighted below, the obviously modified Corbett fastener includes a “sleeve 14” comprising a first sleeve end 38 (left/blind end), a second sleeve end 42/48 (right/collared end), and a cavity 44 extending from the first sleeve end to the second sleeve end, as recited in limitation 1(b). Corbett, ¶¶[0009]-[0010]; Ex. 1002, ¶109.

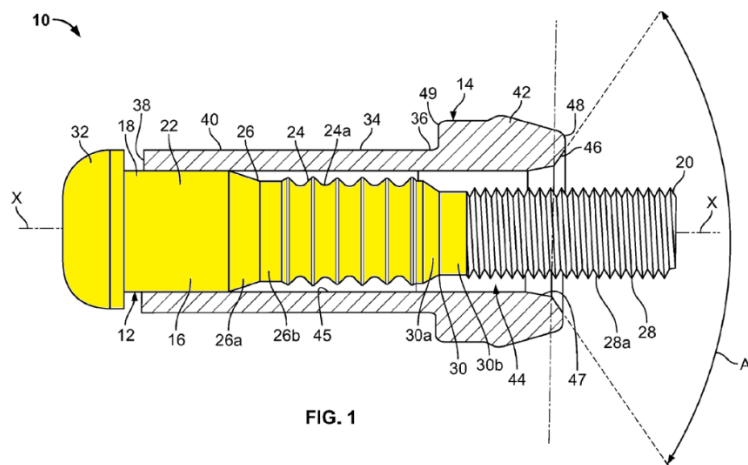


- c. Limitation 1(c): “a mandrel configured to be at least partially received by the cavity of the sleeve, the mandrel comprising a first mandrel end disposed adjacent to the first sleeve end and comprising an enlarged portion having a diameter greater than a diameter of the cavity, a second mandrel end comprising a pull region, and a shank region extending intermediate the first mandrel end and the second mandrel end,”

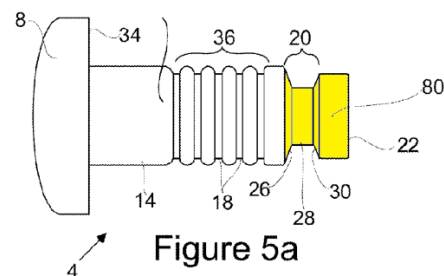
As highlighted below, the obviously modified Corbett fastener includes a **mandrel** (Corbett’s “bolt 12” with Brewer’s pull region 20/80²) configured to be at least partially received by the cavity 44 of the sleeve 14, the mandrel comprising a first mandrel end (Corbett’s “head 32”) disposed adjacent to the first sleeve end 38 and comprising an enlarged portion (Corbett’s “head 32”) having a diameter greater than a diameter of the cavity 44, a second mandrel end (right side of the **mandrel**) comprising Brewer’s pull region 20/80, and a shank region 16/22/24/26/30 extending intermediate the first mandrel end 32 and the second mandrel end 20/80,

² Depending on the construction of “pull region,” Brewer’s pull region might comprise just the groove. To be conservative solely for the purpose of this petition, Petitioner treats the pull region as also including the end portion 80 because that is more favorable to the validity (specifically as to limitation 1(d)) than if “pull region” encompassed only the groove. Ex. 1002, ¶112.

as recited in limitation 1(c). Corbett, ¶[0009], FIGS. 1-2; Brewer ¶[0072], FIGS. 8, 12; Ex. 1002, ¶110.



Corbett



Brewer

d. Limitation 1(d): “wherein the pull region comprises an axial length no greater than 4 times a diameter³ of the shank region and”

This analysis requires identifying and measuring the pull region and shank of the obviously modified Corbett fastener.

³ “[A] diameter” is indefinite as to whether it means maximum diameter (at ref. 112), an intermediate diameter (e.g., d_1), a “major diameter” d_3 of the grooved portion, or a “root diameter” of the grooved portion. ’358 Patent, FIG. 1, 4:31-39. Petitioner endeavors to apply this indefinite limitation despite its indefiniteness.

i. Axial Length L Of Brewer's Pull Region 20/80

The combination of Brewer's pull groove 20 and end portion 80 (highlighted below, left) is the claimed “pull region” because this is the “region configured to be engaged by an installation tool” (Section VI, above). Brewer, FIGS. 5, 8-15; Ex. 1002, ¶112.

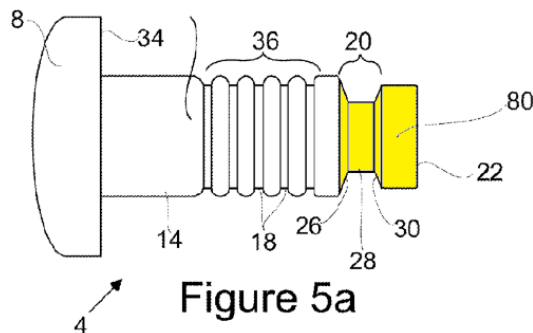
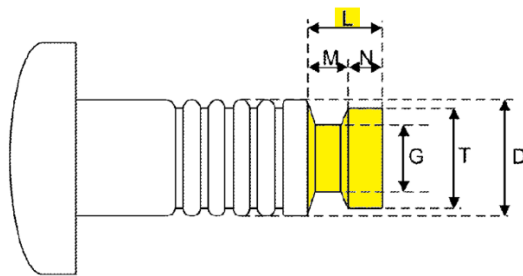
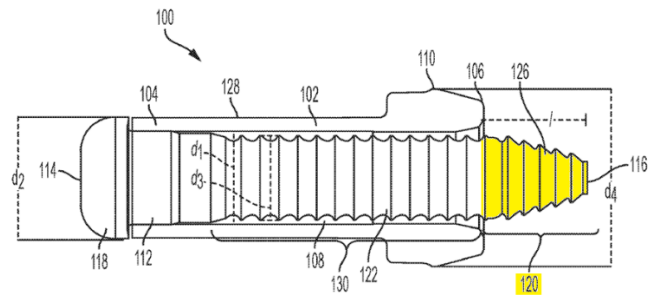


Figure 5a



Brewer, FIGS. 5a-5b



'358 Patent, FIG. 1

Brewer's length L (i.e., “the total length of the pin tail 6 over which the pull groove 20 and end portion 80 extend”) is the claimed “axial length” of Brewer's pull region 20/80. Brewer, ¶[0075]; Section VI, above; Ex. 1002, ¶113.

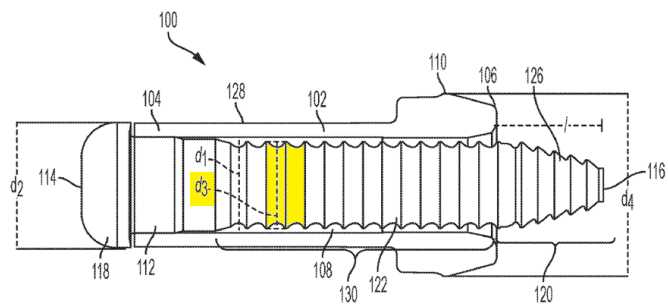
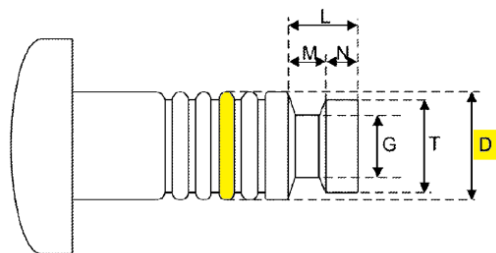
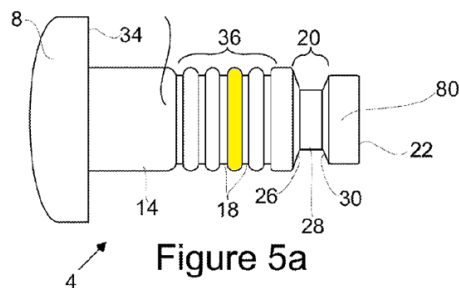
Even if “pull region” meant standout, the axial length of the pull region in the obviously modified Corbett fastener would still obviously be Brewer's dimension L to limit the pull region's installed standout, reduce potential obstruction with other objects or the risk of catching a person's skin or clothing on the exposed pull region

20/80, and/or minimize mandrel material cost or weight, while still providing easy tool access to the pull region. Ex. 1002, ¶114. POSITAs would have understood that one of the intended benefits of Brewer’s short pull region 20/80 is to advantageously reduce the installed standout. *Id.*; Fulbright, 8:23-24.

As a result, under either construction of “pull region,” it was obvious to have the axial length of the pull region be Brewer’s length L. Ex. 1002, ¶116-117.

ii. “A Diameter [D] Of The Shank Region” in Brewer

Brewer’s “maximum diameter [D] of the locking portion 36” of Brewer’s shank and the maximum diameter D of Corbett’s locking portion 24 both correspond to how the ’358 Patent illustrates d_3 as being the maximum diameter of the locking portion of the shank. Brewer, ¶[0072], FIGS. 5a-5b; Corbett, ¶[0010], FIG. 1; Ex. 1002, ¶118-119; ’358 Patent, 4:31-32 (“a diameter, d_3 , of the shank region 122”).



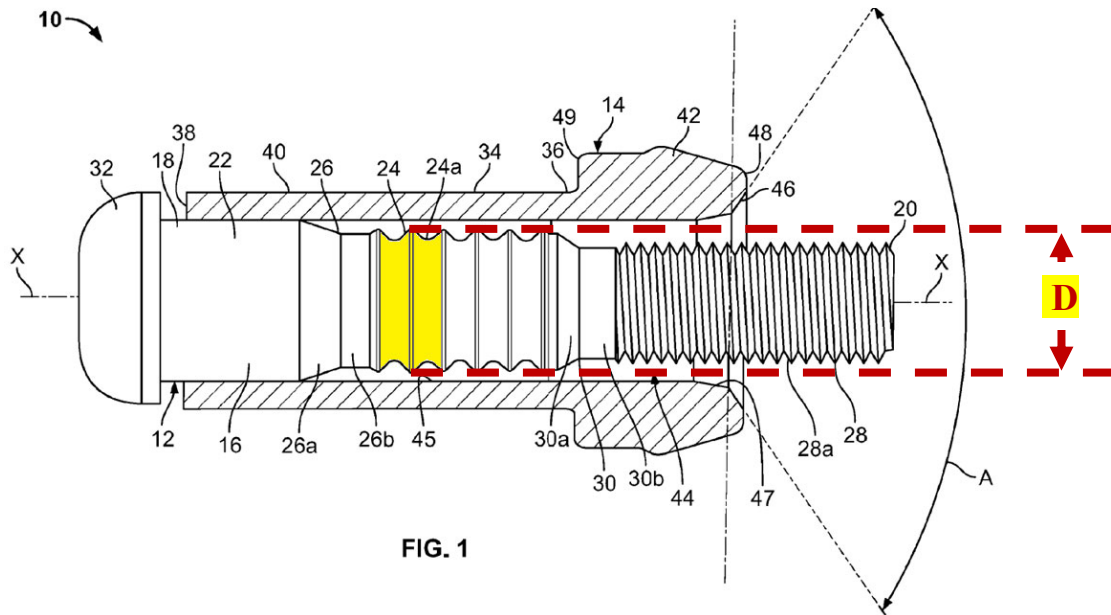


FIG. 1

Corbett (annotated)

Brewer's and Corbett's diameter D is therefore "a diameter of the shank region," as recited in claim 1, as best understood despite this limitation's indefiniteness. Ex. 1002, ¶120.

If "diameter" meant maximum shank diameter, the relevant diameter in the obviously modified Corbett fastener would increase because the smooth portion 22 of Corbett's shank 16/22/24/26/30 has a larger diameter than the locking groove portion 24 of Corbett's shank (or the locking groove portion 36 of Brewer's shank). Corbett, ¶[0009], FIG. 1; Ex. 1002, ¶121. The resulting increased diameter dimension results in the obviously modified Corbett fastener even more clearly satisfying the dimensional relationship in this limitation (i.e., an axial length of the pull region gets even smaller relative to a diameter of the shank). *Id.*

**iii. The Obviously Modified Corbett Fastener Would Obviously
Use Brewer's Preferred L:D Ratio, Satisfying Limitation 1(d)**

Brewer taught that “[p]referably the ratio of the total length [L] of the pin tail over which the pull groove [20] and the end portion [80] extends, to the maximum diameter [D] of the locking portion [36 of the shank], is within the range 0.7 to 1.2.” Brewer, ¶[0025]; Brewer, ¶[0076] (“L=0.936 D (and more generally is within the range 0.7 D to 1.2 D)”).

In the obviously modified Corbett fastener, it was obvious to maintain Brewer's “prefer[red]” L:D relationship between the pull region 20/80 axial length L and Corbett's shank diameter D/d₃ (i.e., “L=0.936 D”; L = “0.7 D to 1.2 D”) (Brewer, ¶¶[0025], [0072], [0075]-[0076]), and/or other ratios within the ranges recited in claims 1-3 and 16-17, for multiple reasons:

1. It is “prefer[red].” Brewer, ¶[0025].
2. It facilitates a suitably strong installation-tool-to-pull-region axial gripping force over a pull region 20/80 length L that can be advantageously short relative to the fastener's nominal size (diameter D). Brewer, ¶[00080]. In contrast, Corbett's tool must engage numerous shallow grooves 28a (e.g., threads) over a long axial length of Corbett's pull region 28 to obtain sufficient grip the pull region. Corbett, FIG. 2.

3. It advantageously limits the installed pull region standout, which reduces the risk of having the protruding pull region unintentionally catch on an object or person.
4. It advantageously reduces the mandrel's material cost and weight by reducing the length L of the pull region relative to the shank diameter D .
5. It resulted from the obvious relative optimization of known result-effective parameters. Pull region axial length was known to affect installed standout and/or the installation tool's ability to generate sufficient installation-tool-to-pull-region grip. Because shank diameter was a conventional way of sizing fasteners, the claimed $L:D$ ratio provided an obvious result-effective way to articulate the length L in non-absolute terms, as taught by Brewer.

Ex. 1002, ¶¶122-130. As a result, the obviously modified Corbett fastener's pull region 20/80 comprises an axial length L (e.g., $L=0.936 D$; $L = 0.7 D$ to $1.2 D$) no greater than 4 times a diameter D/d_3 of the shank region, as recited in limitation 1(d).

Id.

e. Limitation 1(e): “[the pull region] is configured to be engaged by an installation tool”

The obviously modified Corbett fastener's pull region 20/80 is configured to be engaged by an installation tool (Corbett's “installation tool 60,” as modified to pull Brewer's pull region 20/80), as recited in limitation 1(e). *See* Section VII.A, above; Corbett, ¶¶[0012]-[0014]; Brewer, ¶¶[0086]-[0091]; Ex. 1002, ¶131.

Ground A renders obvious/unpatentable claim 1. Ex. 1002, ¶¶94-132.

2. **Claims 2-3: “2. The blind fastener of claim 1, wherein the pull region comprises an axial length no greater than 3.8 times the diameter of the shank region.”; “3. The blind fastener of claim 1, wherein the pull region comprises an axial length no greater than 2 times the diameter of the shank region.”**

As explained above regarding limitation 1(d), the obviously modified Corbett fastener’s pull region 20/80 comprises an axial length (e.g., 0.936 D, 0.7-1.2 D) no greater than 3.8 (claim 2) or 2 (claim 3) times the diameter D of the shank region, as recited in claims 2-3. Ex. 1002, ¶¶133-134.

3. **“4. The blind fastener of claim 1, wherein the pull region comprises a taper extending from the shank region.”**

The obviously modified Corbett fastener’s pull region 20/80 comprises a **taper 26** (highlighted below) (or 30) extending from Corbett’s shank region 16/22/24/26/30 (Corbett, ¶[0009]), as recited in claim 4. *See* Brewer, ¶[0081] (“The single pull groove 20 includes a first **tapered section 26** [and] a second tapered section 30[.]”); Ex. 1002, ¶135.

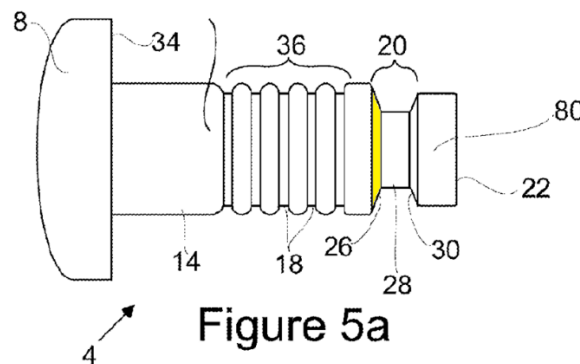
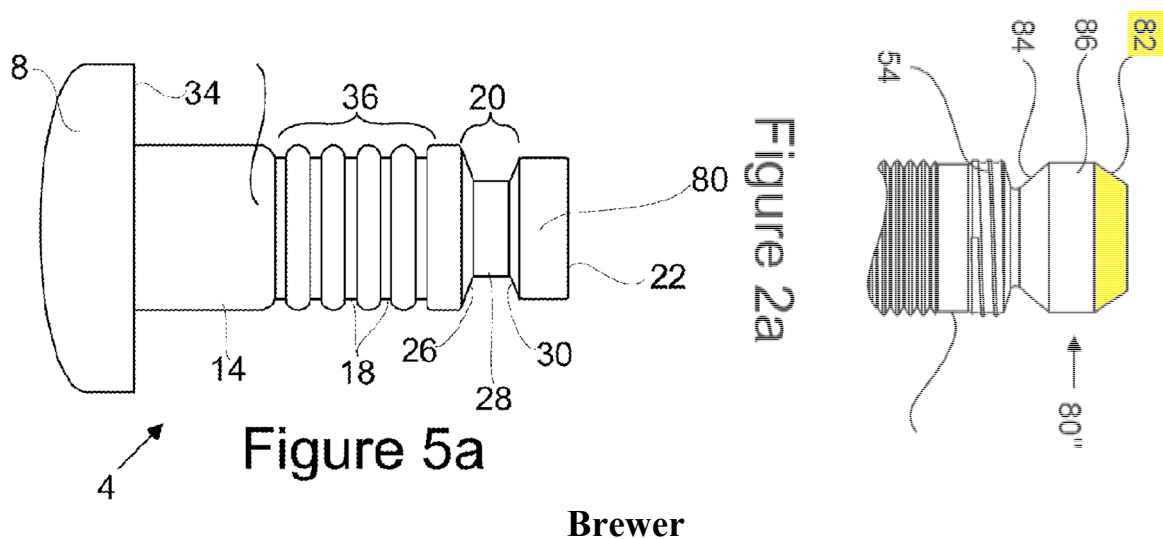


Figure 5a

Brewer

Alternatively, Brewer taught that the “constant cross-section” end portion 80 (below, left), “may have a different profile, such as alternative end portion 80” shown in FIG. 2a [below, right], including two tapered portions 82 and 84[.]” Brewer, ¶[0097].



It was obvious to use Brewer’s end portion 80" instead of Brewer’s end portion 80 in the obviously modified Corbett fastener because: Brewer taught that such shapes were interchangeable; the taper 82 advantageously avoids a sharp edge/angle, which could disadvantageously catch on objects or people; the taper 82 reduces fastener material, which reduces weight and cost; and/or the taper 82 helps to guide the pull region into the installation tool. Brewer, ¶[0097]; Ex. 1002, ¶136-137. In this alternative obvious modification to Corbett, the pull region 20/80" comprises a taper 82 (or 84), as recited in claim 4. *Id.*

4. “5. The blind fastener of claim 1, wherein the mandrel does not comprise a breakneck groove.”

Corbett’s illustrated mandrel 12 (Corbett, FIG. 1) and Brewer’s mandrel 4 (Brewer, FIGS. 5-15) have no breakneck groove. Corbett, ¶[0014] (“[T]he pull portion 28 remains as part of the shank 16 after installation[.]”); Brewer, ¶[0092] (“[T]he end of the pin tail 6 [mandrel] does not break off during installation[.]”); Brewer, FIGS. 12-15. Since neither Corbett’s nor Brewer’s mandrel includes a breakneck groove, the obviously modified Corbett fastener’s mandrel would likewise lack a breakneck groove, as recited in claim 5.

Moreover, even if Corbett’s fastener had a breakneck groove, it was obvious to omit a breakneck groove from the obviously modified Corbett fastener for the same reasons as explained below (Section VII.C.4) that it was obvious to omit a breakneck groove from the obviously modified Kleinman fastener. Ex. 1002, ¶139-140; Corbett, ¶[0014].

Furthermore, during prosecution of the ’358 Patent’s continuation, the USPTO found this limitation was an “intended use” limitation that could be satisfied by the capability of using a fastener in a manner that does not break the groove. Ex. 1007, pp. 4-5. Under that construction, the obviously modified Corbett fastener’s mandrel does not comprise a breakneck groove, as recited in claim 5, because the fastener is capable of being installed in a manner that does not break the end portion 20/80 off. Ex. 1002, ¶¶141-142.

5. Claims 6-7: “6. The blind fastener of claim 1, wherein the mandrel comprises a Rockwell hardness of at least HRC 25.”; “7. The blind fastener of claim 1, wherein the mandrel comprises a Rockwell hardness of at least HRC 43.”

POSITAs were motivated to make the mandrel from a strong, hard material of at least HRC 25 or 43 to resist damaging pin deformation when forming the blind head or swaging the sleeve/collar into the locking grooves. Ex. 1002, ¶143. Choosing “at least HRC 25” (claim 6) or “at least HRC 43” (claim 7) was also a mere matter of design choice and obvious optimization of a known result-effective parameter to avoid failure/crushing of the mandrel, particularly because pins comprising hardnesses of at least HRC 43 were well known. Ex. 1002, ¶¶143-144. As a result, it was obvious to have the mandrel comprise a Rockwell hardness of at least HRC 25 (claim 6) or HRC 43 (claim 7), as recited in claims 6-7. *Id.*

6. “8. The blind fastener of claim 1, wherein the shank region comprises at least one of, a threaded region, an annular shoulder, and a groove.”

The obviously modified Corbett fastener’s shank region comprises an annular **shoulder 26a or 30a** and/or a **groove 24a**, any of which satisfies claim 8. Corbett, ¶[0009], FIG. 1; Ex. 1002, ¶¶145-146.

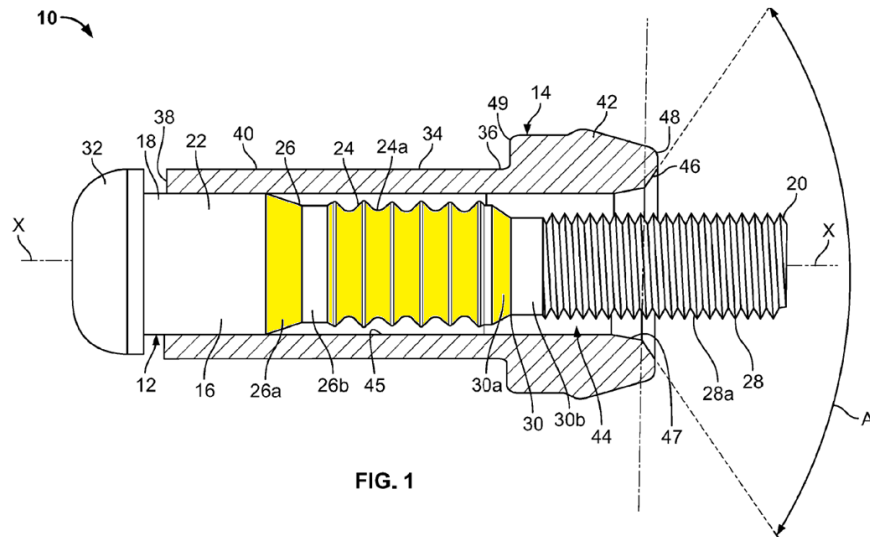


FIG. 1

Corbett

7. **“9. The blind fastener of claim 1, wherein the pull region comprises at least one of a threaded region, an annular shoulder, and a groove.”**

The obviously modified Corbett fastener’s pull region 20/80 comprises two annular shoulders 26, 30 and a groove 20, any of which satisfies claim 9. Brewer, ¶[0072] (“pull groove 20”); Brewer, ¶[0081] (“first tapered section 26;” “second tapered section 30”); Ex. 1002, ¶¶147-148.

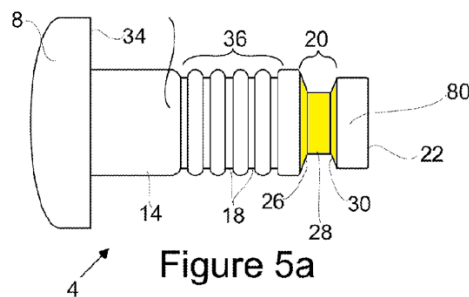


Figure 5a

Brewer

8. “10. The blind fastener of claim 1, wherein the sleeve is generally cylindrical and the mandrel is generally cylindrical.”

The term “generally” (both instances) in claim 10 is indefinite, so Petitioner interprets this limitation as best Petitioner can. The obviously modified Corbett fastener’s sleeve 14 and **mandrel** (highlighted below) (Corbett’s bolt 12 with Brewer’s pull region 20/80) are comparably cylindrical to the sleeve 102 and mandrel 112 illustrated in the ’358 Patent’s FIG. 1. Ex. 1002, ¶¶149-150. If this limitation is definite, the obviously modified Corbett fastener’s sleeve 14 and the mandrel are as “generally” cylindrical as the ’358 Patent’s sleeve 102 and mandrel 112, so the obviously modified Corbett fastener’s sleeve 13 is generally cylindrical and its **mandrel** is generally cylindrical, as recited in claim 10. *Id.*

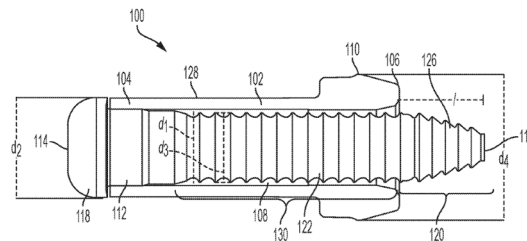
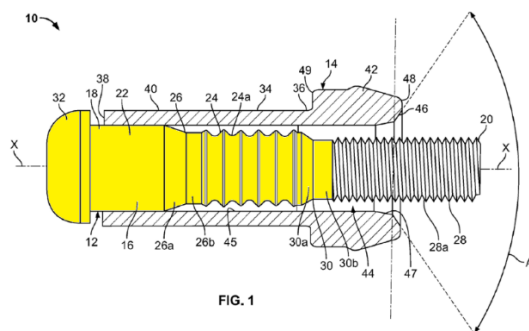
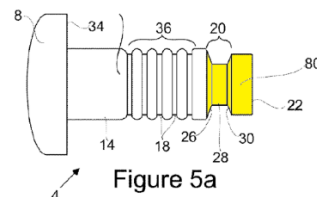


FIG. 1
’358 Patent



Corbett



Brewer

9. “11. The blind fastener of claim 1, wherein the blind fastener comprises at least one of a metal, metal alloy, and a composite material.”

Brewer taught that the mandrel/pin of swage fasteners like Brewer’s and Corbett’s were made of “metal,” e.g., to facilitate “the flow of metal during the roll-forming” and “provid[e] superior strength [to] pin tail 6.” Brewer, ¶[0098]. Brewer also taught that the pin can comprise “stainless steel or aluminum” to avoid “corrosion.” Brewer, ¶[0040]. It was therefore obvious in view of Brewer to make the mandrel in the obviously modified Corbett fastener from metal (e.g., stainless steel, aluminum) to provide easier roll-forming, superior strength, and/or corrosion resistance. Ex. 1002, ¶¶151-153.

As a result, the obviously modified Corbett fastener comprises at least one of a metal, metal alloy, and a composite material, as recited in claim 11. *Id.*

10. “12. The blind fastener of claim 1, wherein the blind fastener is adapted to be installed in a bore in a structure, the bore having a diameter greater than the diameter of the enlarged portion.”

The obviously modified Corbett blind fastener is adapted to be installed in a bore (“holes”) in a structure 52, 54, the bore having a diameter greater than the diameter of the enlarged portion 32, as recited in claim 12, so the fastener can be “inserted through holes of the work pieces 52, 54.” Corbett, ¶[0011], FIG. 2; Ex. 1002, ¶¶154-155. Moreover, this is an intended use limitation that is satisfied because the obviously modified Corbett fastener is capable of such use. *Id.*

11. “13. The blind fastener of claim 12, wherein the sleeve further comprises a collar, the sleeve is configured to deform on a first side of the structure, and the collar is configured to swage onto the shank region on an oppositely disposed second side of the structure.”

The obviously modified Corbett fastener’s sleeve 14 comprises a collar (“head 42” (Corbett, ¶[0010], FIG. 2)), and the sleeve 14 is configured to deform on a first/blind side of the structure 52, 54 to form a blind head, and the collar 42 is configured to swage onto the shank region on an oppositely disposed/non-blind second side of the structure 52, 54, as recited in claim 13, because that is how blind swage fasteners function. Corbett, ¶¶[0013]-[0014] (“The anvil 64 then engages and swages the sleeve 14. ... [T]he sleeve 14 can form various expanded blind side shapes as the bolt 12 is pulled into or against the outer sleeve’s 14 blind side. In an embodiment, a portion of the elongated body 34 of the outer sleeve 14 is compressed and swaged into the grooved portion 24 of the bolt 12.”); Corbett, FIG. 2; Ex. 1002, ¶¶156-157.

12. “14. The blind fastener of claim 12, wherein the structure comprises at least one of a metal, a metal alloy, and a composite material.”

It was well known to use fasteners like Corbett’s and/or Brewer’s to fasten structures like “solar power plant structures” (Brewer, ¶[0006]) that obviously comprised at least one of a metal, a metal alloy, and a composite material. Ex. 1002, ¶¶158-160. Corbett’s structure 52, 54 obviously comprised metal, a metal alloy, and/or a composite material because these are the types of materials typically

secured using such fasteners. *Id.*; Kendall, 3:44-45 (“aluminum” “workpieces 38, 40”). As a result, with the obviously modified Corbett fastener, it was obvious for the structure 52, 54 (e.g., “solar power plant structures”) to comprise at least one of a metal, a metal alloy, and a composite material, as recited in claim 14.

Moreover, the “structure” is not affirmatively claimed, so claim 14 is an intended use claim that is satisfied because the obviously modified Corbett fastener is capable of being used on a structure 52, 54 comprising metal, a metal alloy, or a composite material. Ex. 1002, ¶159.

13. “15. The blind fastener of claim 12, wherein the structure is configured as at least one of an aerospace component, an automotive component, a transportation component, and a building and construction component.”

It was known to use fasteners like Corbett’s and/or Brewer’s to fasten building or construction components like “solar power plant structures” (Brewer, ¶[0006]) or “workpieces 52, 54” (Corbett, ¶[0011]). It was obvious to use the obviously modified Corbett fastener on such structures because the modified Corbett fastener would be well suited for such applications. Ex. 1002, ¶161. It was therefore obvious to configure the structure 52, 54 as at least one of an aerospace component, an automotive component, a transportation component, and a building and construction component (e.g., a solar power plant structure, construction of two workpieces), as recited in claim 15. *Id.*

Moreover, the “structure” is not affirmatively claimed, so claim 15 is an intended use claim that is satisfied because the obviously modified Corbett fastener is capable of being used on a structure 52, 54 that is configured as at least one of an aerospace component, an automotive component, a transportation component, and a building and construction component. Ex. 1002, ¶162.

14.Claim 16

a. Limitation 16(a): “A method for fastening, the method comprising:”

It was obvious to use the obviously modified Corbett fastener for fastening because that is its purpose. Ex. 1002, ¶164. Such use provides a method for fastening structures 52, 54, as recited in limitation 16(a). *Id.*; Corbett, FIG. 2; Corbett, ¶[0011] (“[T]he fastener 10 is adapted to secure a plurality of work pieces 52, 54[.]”).

b. Limitation 16(b): “inserting a first mandrel end of a blind fastener into a bore in a structure,”

Use of the obviously modified Corbett fastener obviously involves inserting a first mandrel end (Corbett’s “head 32”) of a blind fastener (the obviously modified Corbett fastener) into a bore (“holes of the work pieces 52, 54”) in a structure 52, 54, as recited in limitation 16(b) and explained above regarding claim 12, because that is how such blind swage fasteners were used. Ex. 1002, ¶165; Corbett, FIG. 2, ¶[0011].

- c. **Limitation 16(c): “the blind fastener comprising a sleeve comprising a first sleeve end, a second sleeve end, and a cavity extending from the first sleeve end to the second sleeve end, and a mandrel configured to be at least partially received by the cavity of the sleeve, the mandrel comprising a first mandrel end disposed adjacent to the first sleeve end and comprising an enlarged portion having a diameter greater than a diameter of the cavity, a second mandrel end comprising a pull region, and a shank region extending intermediate the first mandrel end and the second mandrel end, wherein the pull region comprises an axial length no greater than 4 times a diameter of the shank region and is configured to be engaged by an installation tool”**

See above regarding the same substantive text in limitations 1(b)-1(e). Ex.

1002, ¶166. Use of the obviously modified Corbett fastener satisfies limitation 16(c).

- d. **Limitation 16(d): “engaging a collet of the installation tool with the pull region of the blind fastener;”**

Use of the obviously modified Corbett fastener obviously involves engaging a “collet” (Corbett’s “puller 62 is a split collet” (Corbett, ¶[0012]) with jaws 66) of Corbett’s installation tool 60 with Brewer’s pull region 20/80 of the blind fastener, as recited in limitation 16(d), in manner described in Corbett ¶¶[0012]-[0014] and shown in Corbett FIG. 2. Ex. 1002, ¶167.

If Corbett’s jaws 66 were not already a collet (they were), it was also obvious to integrate Corbett’s jaws 66 into a multi-jawed split collet because Corbett and Brewer taught that a multi-jawed “split collet” was well suited for use in the installation tool of a swage fastener like Corbett’s and Brewer’s. Brewer, ¶¶[0086]-

[0091] (“split collet 102”) and FIGS. 12-15; Corbett, ¶[0012] (“split collet”); Ex. 1002, ¶168. It was also obvious to incorporate Corbett’s jaws 66 into a collet to ensure that the jaws 66 remain axially aligned with each other, circumferentially spaced from each other, and/or spring-biased radially outwardly to facilitate easier insertion of the pull region 20/80 between the jaws 66. *Id.* It was therefore obvious to engage a collet of the installation tool 60 with the pull region 20/80 of the obviously modified Corbett blind fastener, as recited in limitation 16(d). *Id.*

e. Limitation 16(e): “after the inserting, forcibly contacting the second sleeve end of the blind fastener with an anvil of the installation tool and moving the pull region distal from the second sleeve end utilizing the collet of the installation tool; and”

Use of the obviously modified Corbett fastener obviously involves, after the inserting, forcibly contacting the second sleeve end 42/48 of the blind fastener with an “anvil 64” (Corbet, ¶[0012]) of the installation tool 60 and moving the pull region 20/80 distal from the second sleeve end 42/46 utilizing the collet 62 of the installation tool, as recited in limitation 16(e), because that is how Corbett’s blind swage fastener is used. *See* Corbett, ¶¶[0013]-[0014], FIG. 2; Section VII.A.11. (claim 13), above; Ex. 1002, ¶169. The pull region 20/80 moves distal from the second sleeve end 42/48 to cause the first end of the sleeve 14 to deform on the blind side to form the blind head, as POSITAs would understand to be disclosed in Corbett. *See* Corbett, ¶[0014] (“Referring to FIG. 2, the puller 62 continues to provide an axial force on the bolt 12. In embodiments, the sleeve 14 can form

various expanded blind side shapes as the bolt 12 is pulled into or against the outer sleeve's 14 blind side."); Ex. 1002, ¶169. Additionally, when the proximal end of the pull region 20/80 is aligned with the second sleeve end 42/48 of the uninstalled fastener (as was obvious as explained above regarding limitation 1(d) such that the standout equals L), this distal movement during installation results in the entire pull region 20/80 protruding distally from the sleeve end 42/48. *Id.*

f. Limitation 16(f): “deforming the sleeve on a first side of the structure, and swaging the second sleeve end onto the shank region on an oppositely disposed second side of the structure, thereby securing at least a portion of the blind fastener in the structure.”

Use of the obviously modified Corbett fastener obviously involves deforming the sleeve 14 on a first/blind side of the structure 52, 54 (left side of Corbett FIG. 2), and swaging the second sleeve end (collar 42) onto the shank region 24 on an oppositely disposed second/non-blind side of the structure 52, 54 (right side of Corbett FIG. 2), thereby securing at least a portion of the blind fastener in the structure 52, 54, as recited in limitation 16(f), because that is how Corbett's blind swage fastener is used. Corbett, ¶[0014] (“[T]he sleeve 14 can form various expanded blind side shapes as the bolt 12 is pulled into or against the outer sleeve's 14 blind side.... [The] sleeve 14 is compressed and swaged into the grooved portion 24 of the bolt 12.”); Section VII.A.11. (claim 13), above; Ex. 1002, ¶¶170-171.

Ground A renders obvious every limitation in claim 16. Ex. 1002, ¶¶164-171.

15. “17. The method of claim 16, wherein the pull region comprises an axial length no greater than 3.8 times the diameter of the shank region.”

See above regarding the identical text in claim 2, so use of the obviously modified Corbett fastener 10 satisfies claim 17. Ex. 1002, ¶¶172-173.

16. “18. The method of claim 16, wherein the pull region comprises a taper or reverse taper extending from the shank region.”

As explained above regarding claim 4, the obviously modified Corbett fastener’s pull region 20/80 comprises a taper 26, 82 or reverse taper 30, 84 extending from the shank region, as recited in claim 18. Ex. 1002, ¶¶174-175.

17. “19. The method of claim 16, wherein the mandrel does not comprise a breakneck groove.”

See above regarding the identical limitation in claim 5. Use of the obviously modified Corbett fastener 10 satisfies claim 19. Ex. 1002, ¶¶176-177.

18. “20. The method of claim 16, wherein the blind fastener comprises at least one of a metal, a metal alloy, and a composite material.”

See above regarding the identical limitation in claim 11. Use of the obviously modified Corbett fastener satisfies claim 20. Ex. 1002, ¶¶178-179.

Claims 1-20 were therefore obvious/unpatentable over Corbett in view of Brewer (Ground A). Ex. 1002, ¶¶94-180.

B. Ground B: Claims 6-7, 11, 14, and 20 Were Obvious Over Corbett In View Of Brewer, Kendall, and Fulbright

If not already obvious over Corbett in view of Brewer (Ground A, above), it was obvious to further modify Corbett (or Kleinman), as applied to claims 1 and 16, in view of Kendall and/or Fulbright to satisfy the following claims:

6. The blind fastener of claim 1, wherein the mandrel comprises a Rockwell hardness of **at least HRC 25**.

7. The blind fastener of claim 1, wherein the mandrel comprises a Rockwell hardness of **at least HRC 43**.

11. The blind fastener of claim 1, wherein the blind fastener comprises at least one of a **metal**, metal alloy, and a composite material.

14. The blind fastener of claim 12, wherein the structure comprises at least one of a **metal**, a metal alloy, and a composite material.

20. The method of claim 16, wherein the blind fastener comprises at least one of a **metal**, a metal alloy, and a composite material.

Kendall taught, in connection with blind fasteners like Corbett's (and Kleinman's), that "a high hardness pin 12 made of alloy steel AISI 8740 and having a Rockwell hardness of around 49-52 Rc [a.k.a. HRC]" provides "sufficient strength

to withstand the frictional forces encountered during setting without significant yielding or wire drawing.” Kendall (Ex. 1005), 3:25-42; Ex. 1002, ¶182. Fulbright taught that hardening a swage fastener’s “ferrous” pin’s pull region to 44+ Rc advantageously enhanced “strength” and “minimize[d]” the necessary overall length of the pull portion.” Fulbright, 8:17-28, FIGS. 1-7; Ex. 1002, ¶¶182, 143. It was obvious to form the mandrel of the obviously modified Corbett (or Kleinman) fastener from iron or alloy steel that comprises at least HRC 25 (claim 6) or HRC 43 (claim 7), as taught by Kendall or Fulbright, to provide sufficient strength to withstand the pulling (e.g., to form the blind head), swaging, and/or frictional forces encountered during installation of Corbett’s blind swage fastener. Ex. 1002, ¶182; Ex. 1007, p. 6 (USPTO finding during prosecution of the ’358 Patent’s continuation that it was obvious to modify a blind swage fastener’s pin/mandrel to comprise metal with a hardness “greater than Rockwell 45 Hrc” because Kendall taught that it was “well suited for blind fastener[s]”).

Moreover, selecting a fastener material comprising metal (claims 11, 20) and/or having “at least HRC 25” (claim 6) or “at least HRC 43” (claim 7) was a mere matter of obvious design choice and optimization of a known result-effective parameter (hardness) to avoid failure/crushing of the mandrel during installation and use. Ex. 1002, ¶¶183, 143. As a result, it was obvious to modify the obviously modified Corbett (or Kleinman) fastener to comprise metal (claims 11, 20) and/or

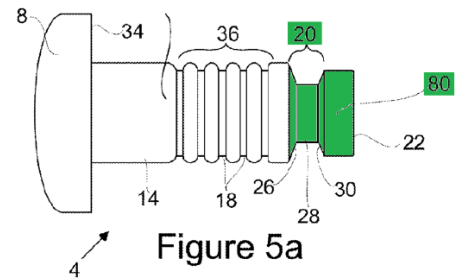
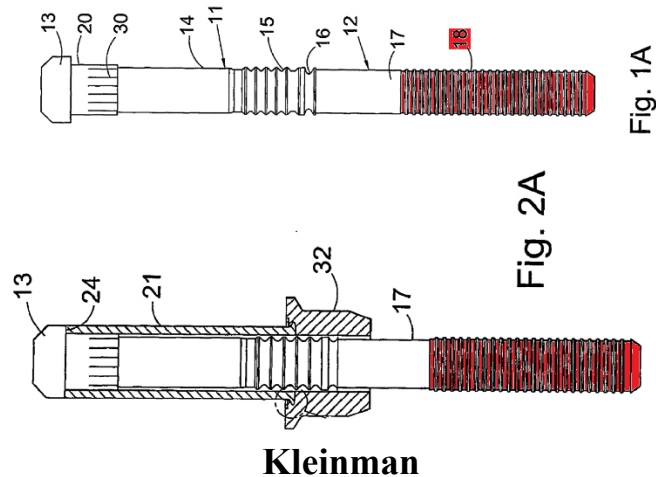
use a mandrel hardness of at least HRC 25 (claim 6) or 43 (claim 7), thereby satisfying claims 6-7, 11, and 20. *Id.*

It was obvious to use the obviously modified Corbett fastener on a structure 52, 54 comprising metal, as recited in claim 14, because Kendall taught that such fasteners were well suited for fastening structures comprising metal (e.g., “aluminum”). Kendall, 3:44-45; Section VII.A.12, above; Ex. 1002, ¶184.

Claims 6-7, 11, 14, and 20 were therefore obvious/unpatentable over Corbett in view of Brewer, Kendall, and Fulbright (Ground B). Ex. 1002, ¶¶181-185.

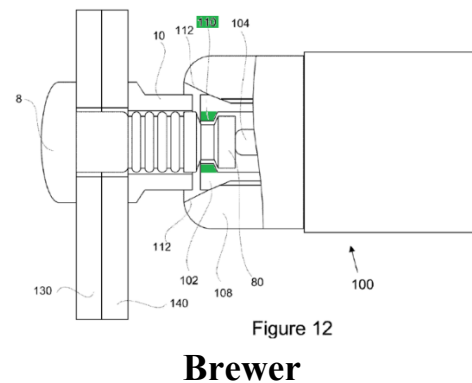
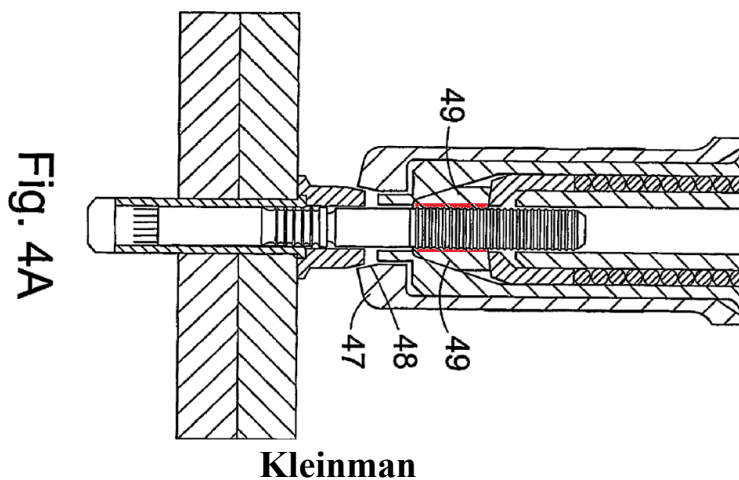
C. Ground C: Claims 1-20 Were Obvious Over Kleinman In View Of Brewer

Like Corbett, Kleinman’s blind swage fastener has a pull region 18 with multiple “relatively small pull grooves” (Brewer, ¶[0015]), which Brewer disparages. *See* Kleinman, FIG. 1A, ¶[0020]. It was obvious to modify Kleinman’s blind swage fastener and installation tool in view of Brewer in the same manner and for the same reasons as discussed above in Section VII.A that it was obvious to so modify Corbett. Ex. 1002, ¶186. Thus, as shown below, it was obvious to modify Kleinman’s fastener in view of Brewer by replacing the **multiple relatively small pull grooves** of Kleinman’s “**pulling groove portion 18**” with (Kleinman, ¶[0018]) with Brewer’s **single-groove pull region 20/80**.



Id. It was obvious to axially size Kleinman's shank region 14/15/17/20 so that the pull region 20/80 appropriately protrudes from Kleinman's sleeve 21/32 (e.g., by Brewer's distance L (L=standout)) to facilitate engagement by the installation tool, as explained below in Section VII.C.1.d.i. *Id.*

As shown below, it was also obvious to correspondingly modify Kleinman's installation tool by replacing the **multiple relatively small pull grooves** of Kleinman's jaws 49 with the **single lip 110** of Brewer's collet 102 to appropriately mate with the fastener's single groove 20.



Ex. 1002, ¶187; *see also* Kleinman, ¶[0031]; Brewer, ¶[0088] (“an internal lip 110 of the collet 102 engages with the single pull groove 20”); Brewer, FIGS. 5A, 12.

Alternatively, it was obvious to use an installation tool like Brewer’s with a single-lipped collet to install the modified Kleinman fastener with a single groove pull region 20/80 because Brewer’s tool 100 is well suited for such use. Brewer, ¶¶[0082]-[0091]; Section VII.C.14.d, below; Ex. 1002, ¶187.

POSITAs would be motivated to make these modifications in view of Brewer for the same reasons as with Corbett, as explained above in Section VII.A, e.g., to avoid the disadvantages of Kleinman’s multi-groove pull region 18 and/or obtain the advantages of Brewer’s single groove pull region 20/80 and mating installation tool (e.g.: avoiding misengagement, insufficient engagement, or stripping of the multiple pull grooves; avoiding clogging of a multi-grooved pull region or installation tool; simplifying and reducing the cost of manufacture of the pull region; avoiding complex, expensive, weak, and/or damage-prone shallow pull grooves on the pull region 18 or jaws 49; avoiding sharp pull crests; enabling easier installation; and/or improving the tool’s engagement with the pull region; and/or providing quicker and simpler installation). *See* Brewer, ¶¶[0003]-[0011], [0015]-[0017], [0072], FIGS. 8, 12; Sections IV.B, IV.C., VII.A, above; Ex. 1002, ¶188.

During installation of Kleinman's original fastener, the pull region 18 can be broken off at breakneck 16. Kleinman, ¶[0020], [0034], FIG. 6. As explained below regarding claim 5, it was obvious to eliminate Kleinman's breakneck groove 16 from Kleinman's shank 14/15/17/20 and use the obviously modified Kleinman fastener as a non-breakneck fastener. Alternatively, it was obvious to retain Kleinman's breakneck groove 16 to provide breakneck functionality. Ex. 1002, ¶189. Alternatively, it was obvious to eliminate Kleinman's breakneck 16 in favor of Brewer's breakneck groove 20' and end portion 80', which can be used as a breakneck if desired with a comparable functional result as when Kleinman's breakneck 16 is broken during installation. *See* Brewer, FIG. 16, ¶[0092]; Ex. 1002, ¶189. The differences between these obvious variants is immaterial to the below invalidity analysis for claims 1-4 and 6-20. Claim 5 is separately addressed below.

It was obvious to incorporate Brewer's single pull groove region 20/80 (or 20'/80') into Kleinman's fastener regardless of whether Kleinman's breakneck functionality or breakneck 16 are retained because Brewer states that its pull region teaching applies to both breakneck and non-breakneck swage fasteners. Brewer, ¶[0092]; Ex. 1002, ¶190.

The obviously modified Kleinman fastener and obviously modified Kleinman (or Brewer) installation tool satisfies every limitation in claims 1-20.

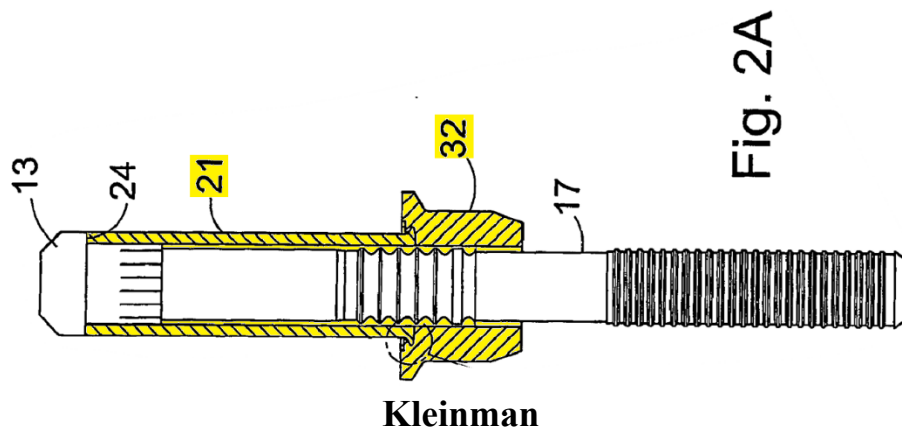
1. Claim 1

a. Limitation 1(a): “A blind fastener comprising:”

The obviously modified Kleinman fastener is a “blind fastener.” Kleinman, title, ¶[0007], FIGS. 2A, 3-5, ¶¶[0031]-[0032]; Ex. 1002, ¶192.

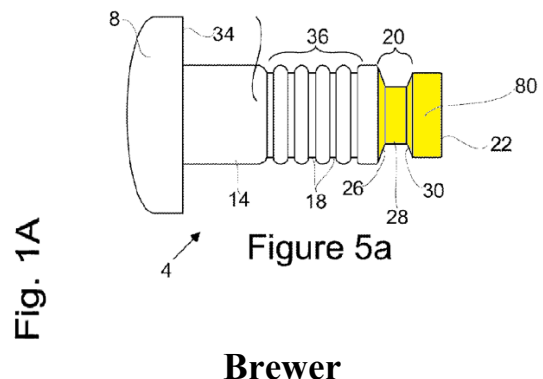
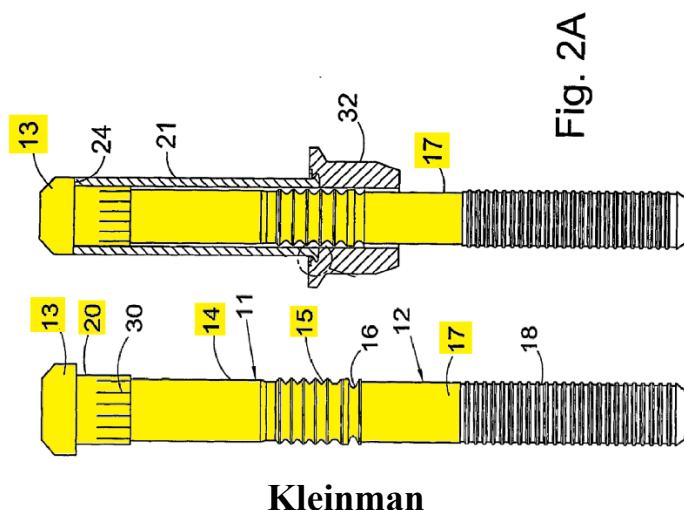
b. Limitation 1(b): “a sleeve comprising a first sleeve end, a second sleeve end, a cavity extending from the first sleeve end to the second sleeve end; and”

As highlighted below, the obviously modified Kleinman fastener includes a sleeve 21/32 comprising a first sleeve end (left/blind end), a second sleeve end (right, collar 32 end), and a cavity extending from the first sleeve end to the second sleeve end, as recited in limitation 1(b). Kleinman, ¶¶[0020]-[0023], FIG. 2A; Ex. 1002, ¶193.



- c. Limitation 1(c): “a mandrel configured to be at least partially received by the cavity of the sleeve, the mandrel comprising a first mandrel end disposed adjacent to the first sleeve end and comprising an enlarged portion having a diameter greater than a diameter of the cavity, a second mandrel end comprising a pull region, and a shank region extending intermediate the first mandrel end and the second mandrel end,”

As highlighted below, the obviously modified Kleinman fastener includes a **mandrel** (Kleinman’s pin 11 with Brewer’s pull region 20/80) configured to be at least partially received by the cavity of the sleeve 21/32, the mandrel comprising a first mandrel end (Kleinman’s “head 13”) disposed adjacent to the first sleeve 21/32 end and comprising an enlarged portion (Kleinman’s “enlarged head 13”) having a diameter greater than a diameter of the cavity, a second mandrel end (right side of the **mandrel**) comprising Brewer’s pull region 20/80, and Kleinman’s shank region 14/15/17/20 extending intermediate Kleinman’s first mandrel end 13 and Brewer’s second mandrel end 20/80, as recited in limitation 1(c). Kleinman, ¶[0020], FIGS. 1A, 2A; Brewer ¶[0072], FIGS. 8, 12; Ex. 1002, ¶194.



d. Limitation 1(d): “wherein the pull region comprises an axial length no greater than 4 times a diameter of the shank region and”

Assessment of this limitation requires identifying and measuring the pull region and shank of the obviously modified Kleinman fastener.

i. Axial Length L Of Brewer’s Pull Region 20/80

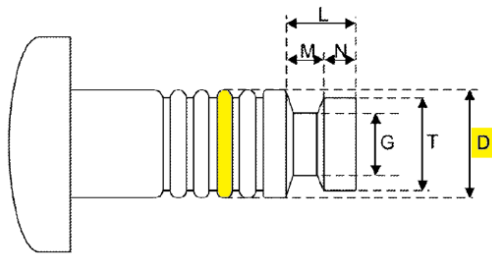
Brewer’s pull region 20/80 is the claimed “pull region” and Brewer’s length L is the claimed “axial length” of Brewer’s pull region 20/80, as explained above in Section VII.A.1.d.i.

It was also obvious to have the pull region 20/80 in the obviously modified Kleinman fastener stand out from the sleeve 21/32 by Brewer’s dimension L for the same reasons as explained above in Section VII.A.1.d.i regarding Corbett, e.g., to provide easy tool access to the pull region 20/80, limit an extent to which the pull region 20/80 stands out in the installed state, reduce potential obstruction with other objects or the risk of catching a person’s skin or clothing on the exposed pull region 20/80, and/or to minimize mandrel material cost or weight, and/or advantageously reduce the pull region’s installed standout. Ex. 1002, ¶197.

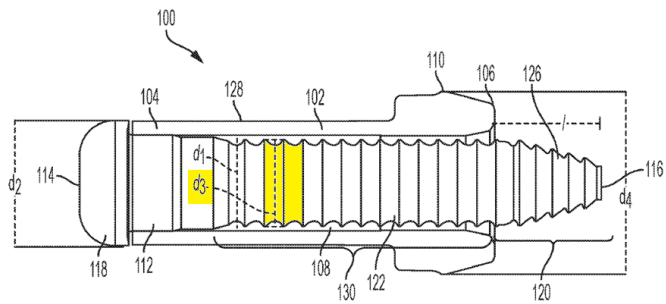
Under either construction of “pull region,” it was obvious to have the axial length of the pull region be Brewer’s length L. Ex. 1002, ¶¶196-198.

ii. “A Diameter [D] Of The Shank Region” in Brewer

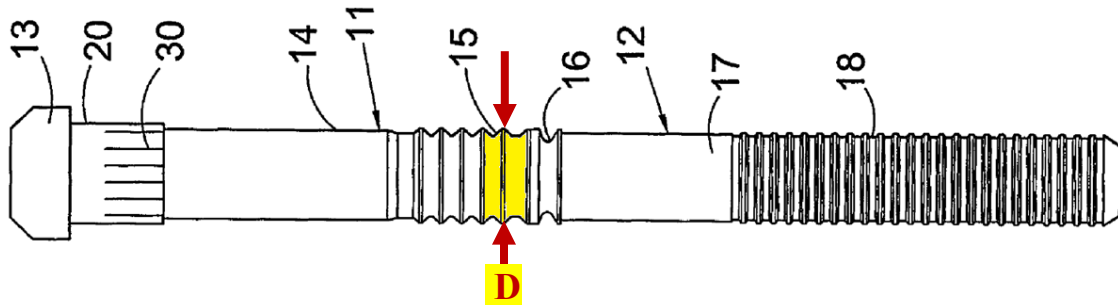
As shown below and/or explained above in Section VII.A.1.d.ii, Brewer’s diameter D and the maximum diameter D of Kleinman’s locking portion 15 both correspond to the ’358 Patent’s diameter d_3 , so Brewer’s and Kleinman’s diameters D are the claimed “diameter of the shank region.” Ex. 1002, ¶200; limitation 1(d).



Brewer, FIG. 5b



'358 Patent, FIG. 1



Kleinman (annotated)

Fig. 1A

If “diameter” meant maximum diameter of the shank, then the relevant diameter in the obviously modified Kleinman fastener is even larger than D because the “slightly oversize portion 20” of Kleinman’s shank has a larger diameter than the maximum diameter D of Kleinman’s locking groove portion 15 (or Brewer’s locking groove portion 36). Kleinman, ¶[0020], FIG. 1A; Ex. 1002, ¶201. The resulting increased diameter dimension results in the obviously modified Kleinman

fastener even more clearly satisfying the dimensional relationship in this limitation (i.e., an axial length of the pull region gets even smaller relative to a diameter of Kleinman's shank portion 20). *Id.*

iii. The Obviously Modified Kleinman Fastener Would Obviously Use Brewer's Preferred L:D Ratio And Satisfy Limitation 1(d)

Brewer taught that “[p]referably the ratio of the total length [L] of the pin tail over which the pull groove [20] and the end portion [80] extends, to the maximum diameter [D] of the locking portion [36 of the shank], is within the range 0.7 to 1.2.” Brewer, ¶¶[0025]; Brewer, ¶¶[0076] (“L=0.936 D (and more generally is within the range 0.7 D to 1.2 D)”).

In the obviously modified Kleinman fastener, it was obvious to maintain Brewer's preferred dimensional relationship between the pull region 20/80 axial length L and shank diameter D/d₃ (i.e., L=0.936 D; L = 0.7 D to 1.2 D), and/or other ratios within the ranges recited in claims 1-3 and 16-17, for the same reasons as explained above in Section VII.A.1.d.iii regarding Corbett: it is “prefer[red];” it facilitates an advantageously shorter pull region length L; it reduces deleterious installed standout, material cost, and/or fastener expense; and/or it was the obvious optimization of known result-effective parameters. *See* Brewer, ¶¶[0025], [0072], [0075]; Ex. 1002, ¶¶202-203. Thus, it was obvious to have selected a pull region axial length L (e.g., L=0.936 D; L = 0.7 D to 1.2 D) for the obviously modified

Kleinman fastener that was no greater than 4 times a diameter D/d_3 of the shank region, as recited in limitation 1(d). Ex. 1002, ¶204.

e. Limitation 1(e): “[the pull region] is configured to be engaged by an installation tool”

The pull region 20/80 of the obviously modified Kleinman fastener is configured to be engaged by an installation tool (Kleinman’s “installation tool” (Kleinman, ¶[0020])) as obviously modified to pull Brewer’s pull region 20/80, or an installation tool like Brewer’s), as recited in limitation 1(e). *See* Sections IV.B, II, VII.C, above; Kleinman, FIGS. 3-5, ¶¶[0030]-[0033]; Brewer, ¶¶[0086]-[0091]; Ex. 1002, ¶205.

Kleinman, as obviously modified in view of Brewer, renders claim 1 obvious/unpatentable. Ex. 1002, ¶¶192-206.

2. Claims 2-3: “2. The blind fastener of claim 1, wherein the pull region comprises an axial length no greater than 3.8 times the diameter of the shank region.”; “3. The blind fastener of claim 1, wherein the pull region comprises an axial length no greater than 2 times the diameter of the shank region.”

As explained above regarding limitation 1(d), the obviously modified Kleinman fastener’s pull region 20/80 comprises an axial length (e.g., 0.936 D, 0.7-1.2 D) no greater than 3.8 (claim 2) or 2 (claim 3) times the diameter D of the shank region, as recited in claims 2-3. Ex. 1002, ¶¶207-208.

3. **“4. The blind fastener of claim 1, wherein the pull region comprises a taper extending from the shank region.”**

In the obviously modified Kleinman fastener, the pull region 20/80 comprises a **taper 26** (highlighted below) (or 30) extending from Kleinman’s shank region, as recited in claim 4. *See* Brewer, ¶[0081] (“pull groove 20 includ[ing] a first **tapered section 26** [and] a second tapered section 30”); Section VII.C, above.

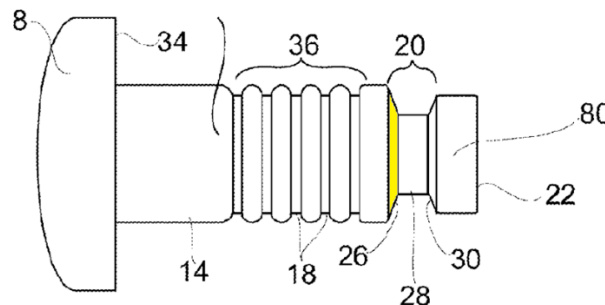


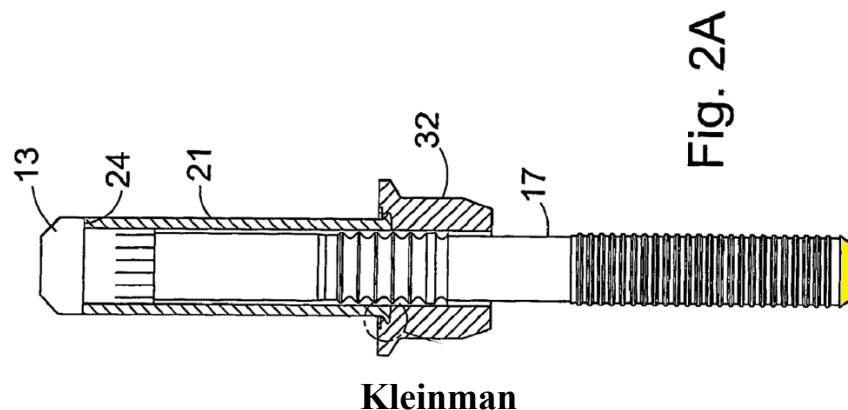
Figure 5a

Brewer

Alternatively, it was obvious to use Brewer’s end portion 80” with its tapered portions 82 and 84 instead of Brewer’s end portion 80 in the obviously modified Kleinman fastener for the same reasons as explained above in Section VII.A.3 that it was obvious to so with the obviously modified Corbett fastener. Brewer, ¶[0097]; Ex. 1002, ¶210.

As shown below, POSITAs would have also understood the **tapered tip** of Kleinman’s pull region to have similar benefits as Brewer’s taper 82 (e.g., avoiding sharp edges, guiding the installation tool, reducing weight or cost (see Section VII.A.3), which further confirms the obviousness of including such a taper

(Brewer's taper 82; Kleinman's tip taper) in the obviously modified Kleinman fastener.



Alternatively, when Brewer's breakneck groove 20' is obviously incorporated into Kleinman's fastener, as explained above in the beginning of Section VII.C, the pull region 20'/80' comprises a "tapered section 26' and "tapered section 30'." Brewer, ¶[0092], FIG. 16.

Thus, the obviously modified Kleinman fastener's pull region comprises a taper (Brewer's taper 26, 30, 26', 30', 82, or 84 or Kleinman's tip taper), as recited in claim 4. Ex. 1002, ¶¶209-214.

4. "5. The blind fastener of claim 1, wherein the mandrel does not comprise a breakneck groove."

As shown below, Brewer taught that breakneck swage fasteners (in which the tail pin breaks off at a breakneck groove 20' during installation) and non-breakneck swage fasteners (in which the tail pin does not break off during installation) were

well-known alternatives. Brewer, ¶[0092], FIGS. 15-16; *see also* Brewer, ¶¶[0082]-[0091]; Ex. 1002, ¶215.

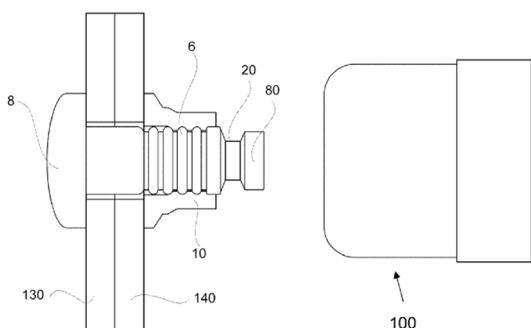


Figure 15

Brewer's Non-breakneck Embodiment

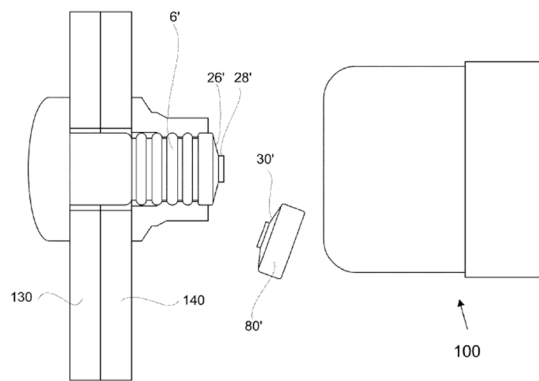


Figure 16

Brewer's Breakneck Embodiment

The original Kleinman fastener had a breakneck groove 16. Kleinman, ¶[0020], [0034], FIG. 6; Ex. 1002, ¶216.

It was obvious to eliminate the breakneck groove 16 in the obviously modified Kleinman fastener and install the fastener as a non-breakneck fastener, as taught by Brewer, for any of the following reasons.

First, Kleinman's tail pin breaks off to avoid an excessively long tail pin extending from the installed fastener, which could disadvantageously catch on objects or people. Ex. 1002, ¶218. Incorporating Brewer's short pull region 20/80 results in a shorter installed standout, thereby substantially negating the rationale for using Kleinman's breakneck groove 16. *Id.*

Second, non-breakneck fasteners can be advantageously installed using less tool force because the tool need not generate the additional force needed to break the

breakneck 16. *Id.*, ¶219; Kleinman, ¶[0034] (“Further increase of the force applied by the tool causes the pin to break at the breakneck 16[.]”). Reducing the required tool force advantageously facilitates using smaller, lighter, less expensive installation tools. Ex. 1002, ¶219. It was obvious to modify Kleinman’s installation tool for non-breakneck use by appropriately setting the tool’s pull force not to fracture the mandrel, or by using a tool like Brewer’s which is already or obviously designed not to fracture the mandrel. *Id.*

Third, eliminating Kleinman’s breakneck 16 advantageously avoids the damaging shock on the tool, fastener, and workpieces, and associated loud noise, that could otherwise result during fracture, as was known to occur when using breakneck fasteners (e.g., pop rivets, swage fasteners with breaknecks). *Id.*, ¶220.

Fourth, eliminating Kleinman’s breakneck advantageously avoids potentially sharp/dangerous edges where Kleinman’s breakneck groove 16 fractures. *Id.*, ¶221; Kleinman, FIGS. 6A-6B.

Fifth, eliminating Kleinman’s breakneck advantageously facilitates using inexpensive surface-treated (e.g., zinc-coated, galvanized) mandrels, instead of mandrels made from entirely corrosion-resistant material, because it avoids potential corrosion at an exposed fracture location. Ex. 1002, ¶222.

Sixth, eliminating Kleinman’s breakneck advantageously avoids the need to collect, store, and dispose of broken-off pin portions. *Id.*, ¶223.

Seventh, Brewer taught that breakneck and non-breakneck swage fasteners were known alternatives. *Id.*, ¶224; Brewer, ¶[0092]. Moreover, blind fasteners with a breakneck groove 18 (below, left) or with “no” breakneck groove (below, right) were well-known alternatives. USPAP 2005/0260056A1 (Ex. 1014) (“Denham”) (published 2005), FIGS. 1-18, ¶¶[0017], [0025]; *see also* U.S. Pat. No. 4,907,922 (Ex. 1015) (“Jeal”) (published 1990), 1:34-40 (“[T]he stem may be formed with a breakneck[.]”) (emphasis added); ISO13469:2014(E) (Ex. 1018) (published 2014), p. 12 (“In some [blind rivet] cases, there is no breaker groove and the shaft does not fracture.”); Ex. 1002, ¶224.⁴

⁴ Denham, Jeal, and ISO13469:2014(E) are teaching references, which are prior art under 35 U.S.C. §102(a)(1) because they published years before the ’358 Patent’s claimed 2019 priority date. Petitioner conditionally adds Denham and Jeal to a supplemental invalidity ground C1 asserting that claim 5 was obvious over Kleinman in view of Brewer, Denham, and Jeal if the Board prefers that they be formally cited in an invalidity ground.

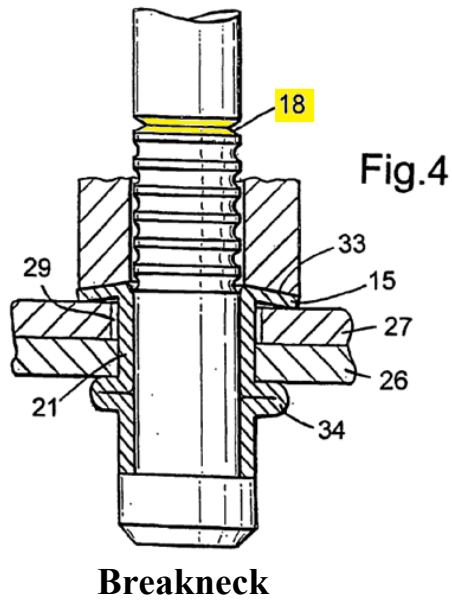
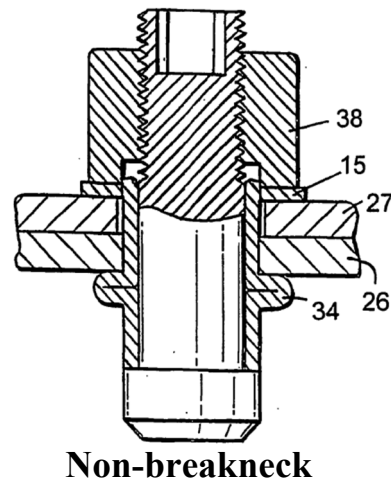


Fig. 18



Denham

Switching from Kleinman’s breakneck fastener to a non-breakneck fastener (i.e., by eliminating the breakneck 16), as taught by Brewer, amounted to no more than the obvious “simple substitution of one known element for another or the mere application of a known technique to a piece of prior art ready for the improvement” and involved no “more than the predictable use of prior art elements according to their established functions.” *KSR*, 550 U.S. at 417-18; Ex. 1002, ¶224.

Furthermore, even if Kleinman’s breakneck 16 (or Brewer’s groove 20’) was included in the obviously modified Kleinman fastener, the fastener still satisfies claim 5 under the USPTO’s construction of claim 5 as a negative intended use limitation. During prosecution of a continuation of the ’358 Patent, the USPTO found this limitation to an “intended use” limitation that was satisfied by Makino because Makino’s fastener was “capable of” being installed without breaking

Makino's breakneck groove 19. Ex. 1007, pp. 4-5; Ex. 1012 (Makino), FIGS. 7A-7B, 6:66-7:15. As with Makino, whether Kleinman's breakneck 16 breaks during installation depends on the fastening tool's applied force. Kleinman states that after swaging, a "[f]urther increase of the force" is needed to "break" the breakneck 16. Kleinman, ¶¶[0033]-[0034], FIGS. 1A, 4A-6B. Thus, Kleinman itself acknowledges that breakage is contingent — the groove does not break automatically during swaging, but only if the tool applies additional force. Thus, even if the obviously modified Kleinman fastener's mandrel retained Kleinman's breakneck 16 (or Brewer's groove 20'), as explained at the beginning of Section VII.C, the fastener can still be installed without breaking the neck (e.g., by applying a pull force that is less than the break strength of the groove 16/20', e.g., via Brewer's tool, which is designed not to break the pull region 20/80), so the obviously modified Kleinman fastener's mandrel — even with the breakneck 16 — satisfies claim 5 because it is capable of being installed without breaking the groove 16 (or 20') under that USPTO construction. Ex. 1002, ¶225.

For any of the above reasons, the obviously modified Kleinman fastener's mandrel does not comprise a breakneck groove, as recited in claim 5. Ex. 1002, ¶¶215-227.

5. Claims 6-7: “6. The blind fastener of claim 1, wherein the mandrel comprises a Rockwell hardness of at least HRC 25.”; “7. The blind fastener of claim 1, wherein the mandrel comprises a Rockwell hardness of at least HRC 43.”

POSITAs were motivated to make Kleinman’s mandrel from a strong, hard material of at least HRC 25 or 43 for the same reasons as explained above (Section VII.A.5) that it was obvious to do so with Corbett (e.g., withstanding deformation during swaging). Ex. 1002, ¶¶228-229, 143. It was therefore obvious to have the mandrel comprise a Rockwell hardness of at least HRC 25 (claim 6) or HRC 43 (claim 7), as recited in claims 6-7. *Id.*

6. “8. The blind fastener of claim 1, wherein the shank region comprises at least one of, a threaded region, an annular shoulder, and a groove.”

The obviously modified Kleinman fastener’s shank region 14/15/17/20 comprises an annular shoulder at the **transition** between portions 14/20 and at a **transition** between portions 14/15, and **grooves** in grooved portion 15, any of which satisfy claim 8. Corbett, ¶[0009], FIG. 1; Ex. 1002, ¶¶230-231.

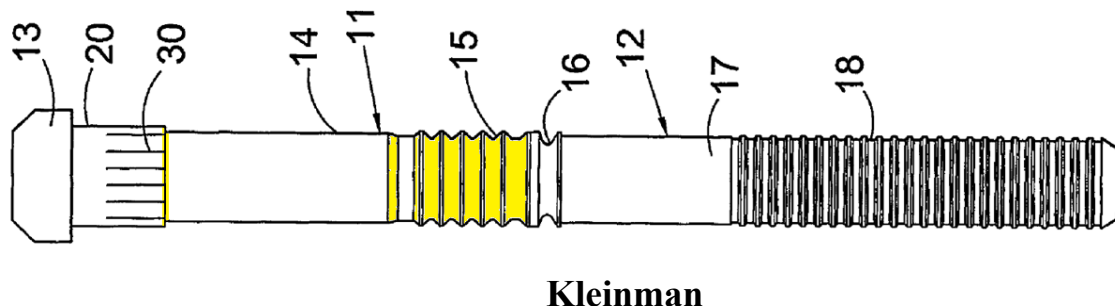
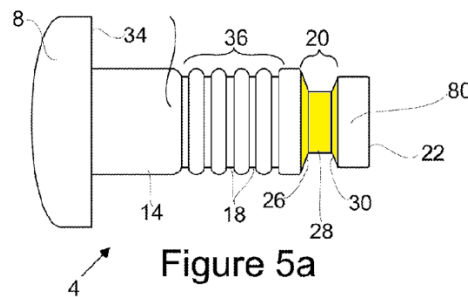


Fig. 1A

7. **“9. The blind fastener of claim 1, wherein the pull region comprises at least one of a threaded region, an annular shoulder, and a groove.”**

The obviously modified Kleinman fastener's pull region 20/80 comprises two annular shoulders 26, 30 and a groove 20, any of which satisfy claim 9.

Brewer, ¶[0072] (“pull groove 20”); Brewer, ¶[0081] (“first tapered section 26;” “second tapered section 30[.]”); Ex. 1002, ¶¶232-233.



8. “10. The blind fastener of claim 1, wherein the sleeve is generally cylindrical and the mandrel is generally cylindrical.”

The obviously modified Kleinman fastener's sleeve 21/32 and **mandrel** (Kleinman's pin 11 with Brewer's pull region 20/80) (highlighted below) are comparably cylindrical to the sleeve 102 and mandrel 112 illustrated in the '358 Patent. Ex. 1002, ¶¶234-235. If this limitation is definite, the obviously modified Kleinman fastener's sleeve 21/32 and the mandrel are as "generally" cylindrical as the '358 Patent's sleeve 102 and mandrel 112, so the obviously modified Kleinman fastener's sleeve 21/32 is generally cylindrical and its **mandrel** is generally cylindrical, as recited in claim 10. *Id.*

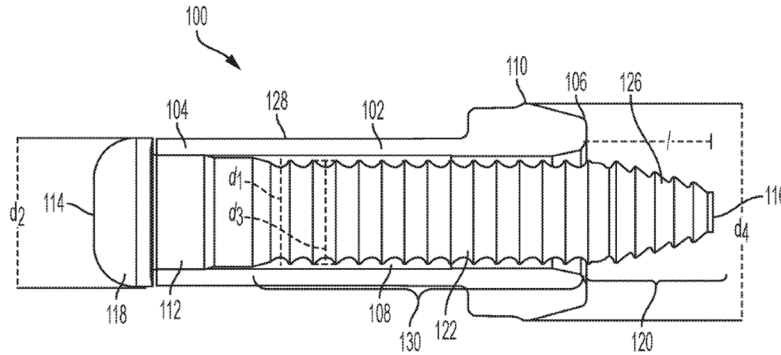
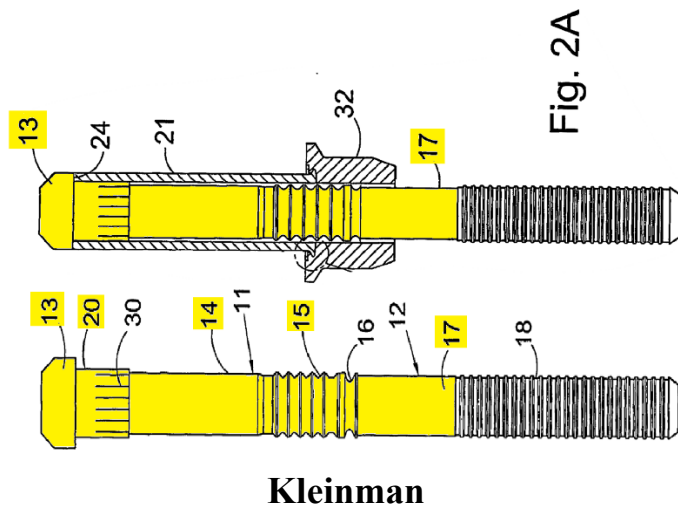
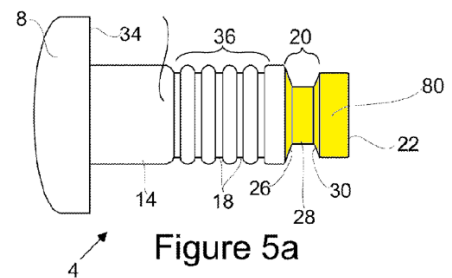


FIG. 1
'358 Patent



Kleinman

Fig. 1A



Brewer

9. "11. The blind fastener of claim 1, wherein the blind fastener comprises at least one of a metal, metal alloy, and a composite material."

Kleinman's pin 11 comprises "medium carbon alloy steel." Kleinman, ¶[0020]. The obviously modified Kleinman fastener (specifically Kleinman's pin 11) therefore comprises at least one of a metal ("carbon alloy steel"), metal alloy ("carbon alloy steel"), and a composite, thereby satisfying claim 11. Ex. 1002, ¶236.

Alternatively, it was obvious in view of Brewer to further modify the Kleinman fastener (specifically its pin/mandrel) to comprise metal or a metal alloy

for the same reasons as explained in Section VII.A.9. that it was obvious to so modify Corbett, e.g., to provide easier roll-forming, superior strength, or corrosion resistance. Brewer, ¶¶[0040], [0098]; Kleinman, ¶[0020]; Ex. 1002, ¶237.

As a result, the obviously modified Kleinman fastener comprises at least one of a metal, metal alloy, and a composite material, as recited in claim 11. Ex. 1002, ¶¶238-239.

10. “12. The blind fastener of claim 1, wherein the blind fastener is adapted to be installed in a bore in a structure, the bore having a diameter greater than the diameter of the enlarged portion.”

As shown below in Kleinman’s FIG. 3A, the obviously modified Kleinman blind fastener is adapted to be installed in a bore (“aperture 44”) in a structure (“panels 42, 43”), the bore 44 having a diameter greater than the diameter of the enlarged portion (“head 13”), as recited in claim 12, so the head 13 and sleeve 21 can be inserted into the aperture 44. Kleinman, ¶[0025] (“clearance fit”), ¶[0030] (fastener “inserted in a workpiece in the normal way as illustrated in FIG. 3A”), [0032]; Ex. 1002, ¶240-241. Moreover, this is an intended use limitation that is satisfied because the obviously modified Kleinman fastener is capable of such use.

Id.

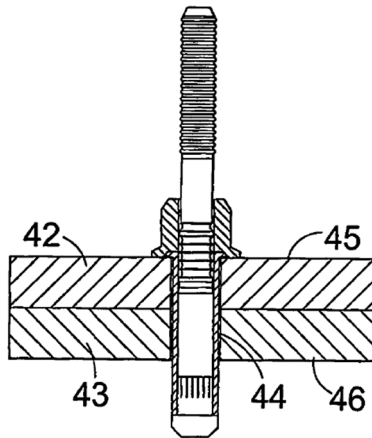


Fig.3A
Kleinman

11.“13. The blind fastener of claim 12, wherein the sleeve further comprises a collar, the sleeve is configured to deform on a first side of the structure, and the collar is configured to swage onto the shank region on an oppositely disposed second side of the structure.”

The obviously modified Kleinman fastener’s sleeve 21/32 further comprises a “collar 32” (Kleinman, ¶[0023], [0031]), and the sleeve 21/32 is configured to deform on a first/blind side of the structure 42, 43 (forming blind head 49 shown in FIG. 5A), and the collar 32 is configured to swage onto the shank portion 15 on an oppositely disposed second/non-blind side of the structure 42, 43 (shown in FIG. 5B), as recited in claim 13. Kleinman, FIGS. 4A-5B, ¶¶[0031]-[0032] (“swage the collar 32;” “The softened portion of the sleeve deforms by bulging outwardly, to progressively form a blind head [49].”); Section II, above; Ex. 1002, ¶¶242-243.

12. “14. The blind fastener of claim 12, wherein the structure comprises at least one of a metal, a metal alloy, and a composite material.”

Kleinman’s “metal panels 42, 43” comprise “metal,” so the structure 42, 43 comprises at least one of a metal, a metal alloy, and a composite material, thereby satisfying claim 14. Kleinman, ¶[0025], FIG. 3A. Moreover, it was obvious to use the obviously modified Kleinman fastener on a structure comprising metal, a metal alloy, or a composite material for the same reasons as explained above in Section VII.A.12. that it was obvious to do so with the obviously modified Corbett fastener. Ex. 1002, ¶244.

Moreover, the “structure” is not affirmatively claimed, so claim 14 is an intended use claim that is satisfied because the obviously modified Kleinman fastener is capable of being used on metal panels 42, 43, thereby satisfying claim 14. *Id.*, ¶245.

Ground C therefore renders claim 14 obvious in multiple ways. *Id.*, ¶¶244-246.

13. “15. The blind fastener of claim 12, wherein the structure is configured as at least one of an aerospace component, an automotive component, a transportation component, and a building and construction component.”

It was obvious to use the obviously modified Kleinman fastener on a structure “configured as at least one of an aerospace component, an automotive component, a transportation component, and a building and construction

component” (e.g., building or construction components like “solar power plant structures” (Brewer, ¶[0006]) or Kleinman’s “structural metal panels 42, 43”) for the same reasons as explained above in Section VII.A.13 that it was obvious to do so with the obviously modified Corbett fastener, e.g., because the modified Kleinman fastener would be well suited for such fastening applications. Kleinman, ¶[0025]; Ex. 1002, ¶247.

Moreover, the “structure” is not affirmatively claimed, so claim 15 is an intended use claim that is satisfied because the obviously modified Kleinman fastener is capable of being used on a structure 42, 43 that is configured as at least one of an aerospace component, an automotive component, a transportation component, and a building and construction component. *Id.*, ¶248.

Ground C therefore renders claim 15 obvious in multiple ways. *Id.*, ¶¶247-249.

14.Claim 16

a. Limitation 16(a): “A method for fastening, the method comprising:”

It was obvious to use the obviously modified Kleinman fastener for fastening because that is its purpose. Ex. 1002, ¶250. Use of the obviously modified Kleinman fastener provides a method for fastening structures 42, 43, as recited in limitation 16(a). *Id.*; Kleinman, FIGS. 3-5, ¶[0025] (“the fastener is used to secure together two structural metal panels 42, 43”).

b. Limitation 16(b): “inserting a first mandrel end of a blind fastener into a bore in a structure,”

Use of the obviously modified Kleinman fastener obviously involves inserting a first mandrel end (Kleinman’s “head 13”) of the obviously modified Kleinman blind fastener into a bore (“aperture 44”) in a structure 42, 43, as recited in limitation 16(b) and explained above regarding claim 12, because that is how such blind swage fasteners are used. Kleinman, ¶[0025], FIGS. 3-5; Ex. 1002, ¶251.

c. Limitation 16(c): “the blind fastener comprising a sleeve comprising a first sleeve end, a second sleeve end, and a cavity extending from the first sleeve end to the second sleeve end, and a mandrel configured to be at least partially received by the cavity of the sleeve, the mandrel comprising a first mandrel end disposed adjacent to the first sleeve end and comprising an enlarged portion having a diameter greater than a diameter of the cavity, a second mandrel end comprising a pull region, and a shank region extending intermediate the first mandrel end and the second mandrel end, wherein the pull region comprises an axial length no greater than 4 times a diameter of the shank region and is configured to be engaged by an installation tool”

See above regarding the identical text in limitations 1(b)-1(e). Ex. 1002, ¶252. As a result, use of the obviously modified Kleinman fastener satisfies limitation 16(c).

d. Limitation 16(d): “engaging a collet of the installation tool with the pull region of the blind fastener;”

Kleinman’s fastening tool includes “jaws 49” (Kleinman, ¶[0025]), shown in FIG. 4A) that engage the pull region. Kleinman does not state whether the jaws 49

are part of a collet or a chuck. It was obvious to integrate Kleinman's jaws 49 into a multi-jawed collet because Brewer taught that such a "collet 102" was well suited for use in the installation tool of a swage fastener like in Kleinman and Brewer. Brewer, ¶¶[0086]-[0091] and FIGS. 12-15; Ex. 1002, ¶253. Moreover, it was obvious to incorporate Kleinman's jaws 49 into a collet, as taught by Brewer, to: (a) ensure that the jaws 49 remain axially aligned with each other and circumferentially spaced from each other to correctly align with and engage the pull region 20/80; (b) cause the jaws 49 to be spring-biased radially outwardly to facilitate easier insertion of the pull region 20/80 between Kleinman's jaws 49; (c) simplify the manufacture, assembly, and disassembly of Kleinman's installation tool by reducing the number of parts; and/or (d) simplify repetitive installation of multiple fasteners having the same sized pull region 20/80 because a collet has a fixed open ID that is well suited for use in repeatedly engaging pull regions having a standard size. Ex. 1002, ¶253. Such a modification was also obvious because collets and chucks (e.g., if Kleinman's jaws 49 are part of a chuck) were well-known alternatives. *Id.*

Alternatively, it was obvious to use an installation tool like Brewer's with a collet 102 adapted to engage Brewer's pull region 20/80 to install the obviously modified Kleinman fastener because a tool like Brewer's is well suited for installing the obviously modified Kleinman fastener. *Id.*, ¶¶254-255.

Either way, it was obvious to engage a collet 49/102 of the installation tool with the pull region 20/80 of the obviously modified Kleinman blind fastener, as recited in limitation 16(d). *Id.*; Kleinman, ¶¶[0030]-[0033], FIG. 4A; Brewer, ¶¶[0086]-[0091], FIGS. 12-15.

e. **Limitation 16(e): “after the inserting, forcibly contacting the second sleeve end of the blind fastener with an anvil of the installation tool and moving the pull region distal from the second sleeve end utilizing the collet of the installation tool; and”**

Use of the obviously modified Kleinman fastener obviously involves, after the inserting, forcibly contacting the second sleeve end 32 of the blind fastener with an “anvil 47” of Kleinman’s installation tool (or anvil 112 of Brewer’s tool) and moving the pull region 20/80 distal from the second sleeve end utilizing the collet (with Kleinman’s jaws 49 and/or Brewer’s collet 102 as explained above regarding limitation 16(d)) of the installation tool, as recited in limitation 16(e), e.g., as shown in Kleinman’s FIGS. 4-5. Kleinman, ¶¶[0031]-[0033]; Brewer, ¶¶[0090], FIGS. 9-15; Section VII.C.11 (claim 13), above; Ex. 1002, ¶256. The pull region 20/80 moves distal from the second sleeve end 32 to cause the first end of the sleeve 21/32 to deform on the blind side and form the blind head 49, as shown in Kleinman’s FIGS. 4A-5B for Kleinman’s original pull region 18. Kleinman, ¶¶[0031]-[0033]; Section II, above; Ex. 1002, ¶256. Additionally, when the proximal end of the pull region 20/80 is aligned with the second sleeve end 32 of the uninstalled fastener (as was obvious as explained above regarding limitation

1(d) such that the uninstalled standout equals L), this distal movement during installation results in the entire pull region 20/80 protruding distally from the sleeve end 32. Ex. 1002, ¶256.

f. Limitation 16(f): “deforming the sleeve on a first side of the structure, and swaging the second sleeve end onto the shank region on an oppositely disposed second side of the structure, thereby securing at least a portion of the blind fastener in the structure.”

Use of the obviously modified Kleinman fastener obviously involves deforming the sleeve 21/32 on a first/blind side 46 of the structure 42, 43 (bottom side in Kleinman FIGS. 3A-5B) to form “blind head 49,” and swaging the second sleeve end 32 onto the shank portion 15 on an oppositely disposed second/non-blind side 45 of the structure 42, 43 (top side in Kleinman FIGS. 3A-5B), thereby securing at least a portion of Kleinman’s obviously modified blind fastener in the structure 42, 43, as recited in limitation 16(f), because that is how blind swage fasteners are used and shown in Kleinman’s FIGS. 3A-5B. Kleinman, ¶[0032] (“The softened portion of the sleeve [21/32] deforms by bulging outwardly, to progressively form a blind head [49] in contact with rear face 46 of the workpiece [42, 43].”); Kleinman, ¶[0033] (“[T]he anvil 47 is pushed down over the exterior of the collar, so that the anvil throat 48 swages the collar 32 radially inwardly into the locking grooves 15 on the pin” 11.); Kleinman, ¶[0025]; Section VII.C.11 (claim 13), above; Ex. 1002, ¶257.

The obvious use of the obviously modified Kleinman fastener therefore renders obvious claim 16. Ex. 1002, ¶¶250-258.

15. “17. The method of claim 16, wherein the pull region comprises an axial length no greater than 3.8 times the diameter of the shank region.”

See above regarding the identical text in claim 2, so use of the obviously modified Kleinman fastener satisfies claim 17. *Id.*, ¶¶259-260.

16. “18. The method of claim 16, wherein the pull region comprises a taper or reverse taper extending from the shank region.”

As explained above regarding claim 4, the obviously modified Kleinman fastener’s pull region comprises a taper (any of Brewer’s tapers 26, 26’, 82 or Kleinman’s tip taper) or reverse taper (Brewer’s taper 30, 30’, or 84) extending from the shank region, as recited in claim 18. *Id.*, ¶¶261-262.

17. “19. The method of claim 16, wherein the mandrel does not comprise a breakneck groove.”

See above regarding the identical limitation in claim 5, so use of the obviously modified Kleinman fastener satisfies claim 19. *Id.*, ¶¶263-264.

18. “20. The method of claim 16, wherein the blind fastener comprises at least one of a metal, a metal alloy, and a composite material.”

See above regarding the identical limitation in claim 11, so use of the obviously modified Kleinman fastener satisfies claim 20. *Id.*, ¶¶265-266.

Claims 1-20 were therefore obvious/unpatentable over Kleinman in view of Brewer (Ground C). Ex. 1002, ¶¶186-267.

D. Ground D: Claims 6-7, 11, and 20 Were Obvious Over Kleinman In View Of Brewer, Kendall, and Fulbright

Claims 6-7, 11, and 20 recite:

6. The blind fastener of claim 1, wherein the mandrel comprises a Rockwell hardness of **at least HRC 25**.

7. The blind fastener of claim 1, wherein the mandrel comprises a Rockwell hardness of **at least HRC 43**.

11. The blind fastener of claim 1, wherein the blind fastener comprises at least one of a **metal**, metal alloy, and a composite material.

20. The method of claim 16, wherein the blind fastener comprises at least one of a **metal**, a metal alloy, and a composite material.

If not already obvious over Kleinman in view of Brewer (Ground C above), it was obvious to modify Kleinman's fastener, as applied to claims 1 and 16, in view of Kendall and/or Fulbright to satisfy claims 6-7 (mandrel hardness of at least HRC 25 or 43) and 11 and 20 (fastener comprising metal) for the same reasons as explained above in Section VII.B that it was obvious to modify Corbett's fastener in view of Kendall and/or Fulbright to satisfy these claims, e.g., to provide sufficient strength to withstand the frictional, pulling, and/or swaging forces encountered during installation. Kendall, 3:25-42 ("a high hardness pin 12 made of

alloy steel AISI 8740 and having a Rockwell hardness of around 49-52 Rc”); Fulbright, 8:17-28 (citing advantages in swage fastener of ferrous mandrel with 44+ Rc pull region); Ex. 1002, ¶¶268-270.

Claims 6-7, 11, and 20 were therefore obvious/unpatentable over Kleinman in view of Brewer, Kendall, and Fulbright (Ground D). Ex. 1002, ¶¶268-270.

E. Secondary Considerations

No secondary considerations favor nonobviousness. *Id.*, ¶¶271-275. For example, the challenged claims solved no long-felt need. *Id.*

F. Conclusion

Grounds A-D demonstrate a reasonable likelihood that Petitioner will prevail against at least one challenged claim, so trial should be instituted and claims 1-20 of the '358 Patent cancelled as obvious/unpatentable.

VIII. MANDATORY NOTICES (37 C.F.R. § 42.8(A)(1))

A. Related Matters (37 C.F.R. § 42.8(b)(2))

To Petitioner’s knowledge, the '358 Patent is not directly involved in any related matter.

B. Real-Parties-In-Interest (RPIs) (37 C.F.R. § 42.8(b)(1))

The real parties in interest (RPIs) to this petition are: Petitioner Stanley Black & Decker, Inc.; Black & Decker Europe; Stanley Engineered Fastening LLC; Avdel UK Limited; Stanley Black & Decker Engineered Fastening

(Nantong) Co., Ltd.; Stanley Engineered Fastening Industrial Deutschland GmbH; Stanley Engineered Fastening France SAS; Stanley Engineered Fastening India Private Limited; Stanley Engineered Fastening Italy S.r.l.; Stanley Engineered Fastening Benelux B.V.; Stanley Engineered Fastening Eastern Europe SP.Z O.O.; Stanley Engineered Fastening Spain, S.L.U.; Newfrey LLC; Infastech (Malaysia) Sdn Bhd; Infastech (Singapore) PTE. LTD.; Infastech Intellectual Properties Pte. LTD.; Infastech Fastening Systems (Wuxi) Limited; Nippon Pop Rivets & Fasteners, LTD.; Shanghai Emhart Fastening System Co., Ltd.; Tucker GmbH; Tucker Fasteners Limited; Refal Industria E Comercio De Rebites E Rebitadeiras LTDA; Infastech (China) Limited; Infastech (China) Limited - Beijing Branch (Pe); Infastech (Labuan) Limited; Infastech (Mauritius) Limited; Infastech (Shenzhen) Limited; Infastech Company Limited; Infastech Holdings (Malaysia) Sdn Bhd; Infastech Receivables Company Pte. LTD.; Infastech Tyt Precision Manufacturing (Shenzhen) Limited; Infastech/Tri-Star Limited; Infastech/Tri-Star Limited - Taiwan Branch (PE); Avdel Holding Limited; Emhart Guangzhou (Hong Kong) Limited; Emhart Harttung A/S; Emhart Harttung Inc.; Emhart International Holding Ltd; Emhart International Limited; Emhart Teknologies (Thailand) LTD.; Nelson Fastener Systems de Mexico SA de CV; Nelson Soudage de Goujons SAS; Nelson Stud Welding Canada Inc.; Nelson Stud Welding International, LLC; Nelson Stud Welding, Inc.; and Black And Decker, S.A. de C.V..

No other party has authority to direct or control (i) the timing of, filing of, content of, or any decisions or other activities relating to this Petition or (ii) any timing, future filings, content of, or any decisions or other activities relating to the future proceedings related to this Petition. All of the costs associated with this Petition are expected to be borne by one or more of these RPIs.

The RPIs have other related entities and subsidiaries, but Petitioner does not presently believe that these other related entities or subsidiaries are RPIs. To avoid any potential dispute and to show good faith, all of the RPIs' related entities and subsidiaries nonetheless agree to be estopped under the provisions of 35 U.S.C. § 315 to the same extent that Petitioner is estopped under this statute.

C. Counsel And Service Information (37 C.F.R. § 42.8(b)(3)&(4))

Concurrently filed with this Petition is a Power of Attorney appointing and hereby designating the following Lead and Backup Counsel, per 37 C.F.R. § 42.10(b):

Lead Counsel	Back-Up Counsel
Jack S. Barufka (Reg. No. 37,087) PILLSBURY WINTHROP SHAW PITTMAN LLP <u>Postal and Hand Delivery Address</u> 7900 Tysons One Place, Suite 500 McLean, Virginia 22102 Telephone: 703.770.7712 Facsimile: 703.770.7901 jack.barufka@pillsburylaw.com	Benjamin L. Kiersz (Reg. No. 51,875) PILLSBURY WINTHROP SHAW PITTMAN LLP <u>Postal and Hand Delivery Address</u> 7900 Tysons One Place, Suite 500 McLean, Virginia 22102 Telephone: 703.770.7714 Facsimile: 703.770.7901 benjamin.kiersz@pillsburylaw.com

Please address all correspondence to the lead counsel at the address shown above. Petitioner consents to electronic service by email at: jack.barufka@pillsburylaw.com, benjamin.kiersz@pillsburylaw.com, and docket_ip@pillsburylaw.com.

IX. FEES

The Office is authorized to charge \$51,875 and any present/future fees due for this petition to Deposit Account No. 033975.

X. STANDING (37 C.F.R. § 42.104(A))

Petitioner certifies that the '358 Patent is available for IPR and Petitioner is not barred or estopped from challenging the claims on the grounds identified herein.

Respectfully submitted,

October 21, 2025

/Jack S. Barufka/

Jack S. Barufka (Reg. 37,087)

Certificate of Word Count

Pursuant to 37 CFR § 42.24(d), I hereby certify that the number of words in the attached petition (excluding the table of contents, table of authorities, mandatory notices under § 42.8, the certificates of service and word count, and appendix/table of exhibits, per 37 C.F.R. § 42.24(a)(1)), based on the word count feature of the word-processing system used to prepare this petition, is 13,914.

October 21, 2025

/Benjamin L. Kiersz/
Benjamin L. Kiersz (Reg. 51,875)

Certificate of Service

Pursuant to 37 CFR §§ 42.6 and 42.105, I hereby certify that true copies of this PETITION FOR *INTER PARTES* REVIEW UNDER 37 C.F.R. § 42.100 and all exhibits thereto were served October 21, 2025, on Patent Owner as indicated below:

Patent Owner's Correspondence Address Of Record (via Priority Mail Express®)

29270 - K&L Gates LLP - Howmet Aerospace Inc.
K&L Gates Center
210 Sixth Avenue
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October 21, 2025

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