

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

DECLARATION OF DR. KIMBERLY CAMERON

TABLE OF CONTENTS

LIST OF DECLARATION APPENDICES AND EXHIBITS	vi
I. INTRODUCTION	1
II. EDUCATION AND WORK EXPERIENCE	2
III. SCOPE OF WORK.....	3
IV. DOCUMENTS RELIED ON	4
V. SUMMARY OF OPINIONS	4
VI. RELEVANT LEGAL PRINCIPLES AND GUIDELINES	5
A. LEVEL OF SKILL	5
B. CLAIM CONSTRUCTION	7
C. PRIOR ART AND PRIORITY DATE FOR THE '358 PATENT	10
VII. RESERVATION OF OPINIONS AS TO NON-IPR-ELIGIBLE INVALIDITY GROUNDS.....	16
VIII. TECHNOLOGICAL BACKGROUND	17
IX. THE '358 PATENT	18
X. BRIEF OVERVIEW OF THE PRIOR ART REFERENCES	19
A. Corbett (U.S.P.A.P. 2018/0111184A1) (Ex. 1003): Blind Swage Fastener.....	20
B. Kleinman (U.S.P.A.P. 2006/0251490A1) (Ex. 1006): Blind Swage Fastener	21
C. Brewer (U.S.P.A.P. 2016/0215808A1) (Ex. 1004): Swage Fastener With Improved, Short, Single-Groove, Pull Region	22
D. Kendall (U.S. Patent No. 4,702,655) (Ex. 1005): Blind Fastener With 49-52 Rc Metallic Pin/Mandrel.....	26
E. Fulbright (U.S. Patent No. 5,315,755) (Ex. 1019): Swage Fastener With 44+ HRC Pin.....	26
F. Corbett, Kleinman, Brewer, Kendall, and Fulbright Are Analogous Art	27
XI. CLAIM CONSTRUCTION: “PULL REGION COMPRISES AN AXIAL LENGTH” (CLAIMS 1-3, 16).....	28
XII. INVALIDITY GROUNDS AND ANALYSIS	35

A.	Ground A: Claims 1-20 Were Obvious Over Corbett In View Of Brewer	37
1.	Claim 1	47
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.”	59
3.	“4. The blind fastener of claim 1, wherein the pull region comprises a taper extending from the shank region.”.....	59
4.	“5. The blind fastener of claim 1, wherein the mandrel does not comprise a breakneck groove.”	61
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.” 62	
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.”	64
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.”	65
8.	“10. The blind fastener of claim 1, wherein the sleeve is generally cylindrical and the mandrel is generally cylindrical.”	65
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.”	66
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.”.....	67
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.”	68
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.”	68
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.”	69
14.	Claim 16.....	70
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.”	74
16.	“18. The method of claim 16, wherein the pull region comprises a taper or reverse taper extending from the shank region.”	74
17.	“19. The method of claim 16, wherein the mandrel does not comprise a breakneck groove.”	75
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.”	75
19.	Conclusion As To Ground A	75
B.	Ground B: Claims 6-7, 11, 14, and 20 Were Obvious Over Corbett In View Of Brewer, Kendall, and Fulbright	75
C.	Ground C: Claims 1-20 Were Obvious Over Kleinman In View Of Brewer	78
1.	Claim 1	81
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.”	87

3.	“4. The blind fastener of claim 1, wherein the pull region comprises a taper extending from the shank region.”.....	88
4.	“5. The blind fastener of claim 1, wherein the mandrel does not comprise a breakneck groove.”	90
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.” 94	
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.”	95
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.”	96
8.	“10. The blind fastener of claim 1, wherein the sleeve is generally cylindrical and the mandrel is generally cylindrical.”.....	96
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.”	98
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.”.....	98
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.”	100
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.”	100
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.”	101
14.	Claim 16	102
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.”	107
16.	“18. The method of claim 16, wherein the pull region comprises a taper or reverse taper extending from the shank region.”	107
17.	“19. The method of claim 16, wherein the mandrel does not comprise a breakneck groove.”	107
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.”	108
19.	Conclusion As To Ground C.....	108
D.	Ground D: Claims 6-7, 11, and 20 Were Obvious Over Kleinman In View Of Brewer, Kendall, and Fulbright	108
E.	Secondary Considerations	109
F.	Conclusion As To Obviousness	110
XIII.	CONCLUDING REMARKS	110

LIST OF DECLARATION APPENDICES AND EXHIBITS

Appendix	Description
A	Curriculum Vitae of Kim Cameron

Exhibit	Description
1001	U.S. Patent No. 11,885,358 (“’358 Patent”)
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	European 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”)
1020	European Patent No. 0 527 581 B1 (published 1996)

I. INTRODUCTION

1. This declaration regarding the invalidity of U.S. Patent No. 11,885,358 (“the ’358 Patent”) is submitted in connection with the proceeding identified above. I have been retained by Petitioner (Stanley Black & Decker, Inc.) as an independent expert to evaluate claims 1-20 of the ’358 Patent (“Challenged Claims”), and to provide opinions in connection with a petition for inter partes review (“IPR”) before the Patent Trial and Appeal Board (“the Petition”).

2. I have been requested to consider whether the Challenged Claims would have been obvious to a person of ordinary skill in the art (“POSITA”) based on Petitioner’s following invalidity grounds:

(A) Ground A: Claims 1-20 were obvious over U.S.P.A.P. 2018/0111184A1

(Ex. 1003) (“Corbett”) in view of U.S.P.A.P. 2016/0215808A1 (Ex. 1004) (“Brewer”);

(B) Ground B: Claims 6-7, 11, 14, and 20 were obvious over Corbett in view of Brewer, U.S. Patent No. 4,702,655 (Ex. 1005) (“Kendall”), and U.S. Patent No. 5,315,755 (Ex. 1019) (“Fulbright”);

(C) Ground C: Claims 1-20 were obvious over U.S.P.A.P. 2006/0251490A1 (Ex. 1006) (“Kleinman”) in view of Brewer; and

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

3. I am being compensated by Petitioner at my standard hourly consulting rate of \$590 for my time spent on this matter. My compensation is not contingent on the outcome of the IPR or on the substance of my opinions.

4. I have no financial interest in Petitioner or Patent Owner.

II. EDUCATION AND WORK EXPERIENCE

5. In formulating my opinions, I have relied on my knowledge, training, and experience in the relevant field, which I will summarize briefly.

6. I am a Principal Engineer at Engineering Systems Incorporated (ESi), a leading scientific and engineering firm. I specialize in mechanical engineering, materials science and metallurgy, and have extensive experience with materials evaluation, mechanical design, mechanical testing, stress analysis, failure analysis, fatigue analysis, and fracture mechanics.

7. I graduated with high honors from Princeton University with a degree in Mechanical Engineering and minors in Materials Science, Applied Mathematics and Engineering Physics. I have also received a master's and doctorate in Mechanical Engineering with a minor in Materials Science and Engineering from Stanford University. I have received numerous awards including fellowships from the Department of Defense, the National Science Foundation, and Lucent Technologies. I am a Registered Professional Engineer in both Mechanical Engineering and Metallurgy in the State of California. I am also a registered patent

agent. I have taught classes for engineers studying to take the fundamentals of engineering exam and the licensing exam for mechanical engineering.

8. Throughout my career, I have applied my deep understanding of the fundamentals of metallurgy, materials science, engineering physics, computational mathematics, and engineering mechanics to help understand and solve complex problems. Particularly relevant to my declaration here, I have worked on numerous projects across a wide variety of industries related to mechanical systems involving fasteners. I have specifically evaluated fasteners within those systems, including rivets. In particular, I have performed stress analyses, fatigue analysis and fracture mechanics evaluation on rivets, including blind rivets.

9. A copy of my curriculum vitae is attached as Appendix A to this declaration.

III. SCOPE OF WORK

10. I was requested to consider issues regarding validity of the Challenged Claims in this matter and specifically address the following topics in this declaration: the level of skill of persons who would have worked in the field around the time of the alleged invention; and if the Challenged Claims are invalid as obvious.

11. My work described in detail below involved a comparison of the subject matter recited for the Challenged Claims and the subject matter described in publications and patents that predate the earliest claimed priority date of the '358

Patent, which I understand to be February 7, 2019. I have also been asked to opine on the differences, if any exist, between the subject matter recited in the Challenged Claims and the prior art. To the extent my conclusion is that differences do exist, I have also been asked to opine on whether the subject matter recited in those claims would have been obvious to a person of ordinary skill in the art of the '358 Patent in light of information available at the earliest priority date.

12. My detailed analysis for each ground asserted is included below.

IV. DOCUMENTS RELIED ON

13. In forming the opinions expressed herewith, I reviewed the '358 Patent and its prosecution file history, the Petition's Exhibits 1003-1012, the evidence listed above in my list of declaration appendices and exhibits, the evidence discussed below, and various documents that discuss or refer to the subject matter of these references.

V. SUMMARY OF OPINIONS

14. After analyzing the prior art references and systems discussed herein, the knowledge of a person of skill in the art at the filing date of the '358 Patent, and my experience, I conclude that the Challenged Claims are invalid based on each of Petitioner's Invalidity Grounds A-D.

VI. RELEVANT LEGAL PRINCIPLES AND GUIDELINES

15. I have been informed of certain legal standards by Petitioner's attorneys and describe my understanding of those standards in this section. I am relying only on instructions from Petitioner's attorneys for these legal standards.

A. LEVEL OF SKILL

16. I understand that patents and prior art are evaluated from the perspective of a hypothetical person of ordinary skill in the art ("POSITA") with respect to the subject matter of the '358 Patent and prior art.

17. I understand that a POSITA is a hypothetical person who is presumed to be aware of pertinent art including knowledge in the art, thinks along conventional wisdom in the art, and is a person of ordinary creativity. I understand that this hypothetical POSITA is considered to have the normal skills and knowledge of a person in the technical field.

18. I understand that, in determining the level of ordinary skill of a POSITA, the following factors may be considered: (a) the levels of education and experience of persons working in the art; (b) the types of problems encountered in the field; (c) prior art solutions to those problems; and (d) rapidity with which inventions are made; (e) the sophistication of the technology; and (f) educational level of active workers in the field.

19. I consider the '358 Patent to be within the technological field related to through-hole structural fasteners with deformable locking sleeves/collars (e.g., swage fasteners, blind fasteners), which is supported by the '358 Patent at 1:4-63.

20. Given the mechanical nature of the '358 Patent, a person of ordinary skill in the art ("POSITA") with respect to the subject matter of the '358 Patent at the time of the priority date, February 7, 2019, 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.

21. I consider myself a person of ordinary skill in the art under this definition and consider myself to have been a POSITA as of the claimed February 7, 2019 priority date.

22. All opinions expressed herein are from the perspective of this hypothetical POSITA. Given the particular opinions in this declaration, I would have the same opinions even if a POSITA had less experience.

23. I have considered the issues and arrived at the conclusions discussed in this declaration from the perspective of this POSITA. I am, therefore, discussing what I believe a POSITA would have understood to be disclosed or suggested by a

prior art reference during the relevant time period when analyzing that reference's disclosure.

B. CLAIM CONSTRUCTION

24. I have applied my understanding of the legal standards concerning claim construction, as discussed below, when analyzing the Challenged Claims.

25. I have been instructed by counsel that claim construction is a matter of law for the arbiter of law to decide. I understand that in an IPR, claims are construed using the same claim construction standard that would be used to construe the claims in a civil action.

26. I understand that claim terms should be assigned their ordinary and customary meaning within the context of the asserted patent. In other words, a claim term is supposed to be given the meaning that the claim term would have to a person of ordinary skill in the art at the time of the invention in light of the teachings of the patent. I also understand that in some circumstances, a claim term may not have an ordinary and customary meaning to a person of ordinary skill in the art.

27. I understand that you look to sources such as the words of the claim, the asserted patent's specification, the prosecution history of the asserted patent (all of which are considered intrinsic evidence), as well as extrinsic evidence concerning the meaning of technical terms, the state of the art at the time of the invention, and relevant scientific principles, to determine how a person of ordinary skill in the art

would understand a claim term. I understand that the intrinsic evidence is the primary evidence considered, but that it is also useful to look at extrinsic evidence when the intrinsic evidence is not sufficient so long as the extrinsic evidence is consistent with, and not contradictory to, the intrinsic evidence.

28. I understand that the patentee can act as her own lexicographer to provide special meaning to claim terms or to intentionally disclaim any claim scope.

29. I understand that claims define the scope of the patent and the subject matter of the invention. Because of this, I understand that claim construction begins and remains focused on the claim language. I also understand that the context in which claim terms are used is very instructive in construing the claim. For example, the same term is given a consistent meaning throughout the patent, and the use of one term in a claim can provide meaning of the same term in other claims. Differences between the terms used in a claim are also useful. I further understand that when a claim lists elements separately, those elements are typically construed as distinct components of the invention.

30. I understand that a POSITA also reads claim terms in the context of the entire patent, including the specification, so claims must be construed in light of the entire specification. At the end, the interpretation of a claim term must be confirmed in view of a full understanding of what the inventors actually invented.

31. I understand that the purpose of the specification is to describe and enable the invention so a claim term cannot have broader scope than the invention that is described in the patent. I also understand that the full scope of the claims must be supported by the specification.

32. I understand that the prosecution history is also part of the intrinsic evidence. The prosecution history can provide evidence of how the Patent Office and inventors understood the terms of the patent in light of the prior art. I also understand that a patentee could make arguments or amendments during prosecution that narrow the scope of a claim term or scope of the invention.

33. I understand that extrinsic evidence including testimony from experts and inventors, dictionaries, and treatises can be considered to determine the meaning of a claim term. I understand that extrinsic evidence should not be considered when it is not in the context of the intrinsic evidence. I also understand that extrinsic evidence should not be considered unless a claim term is ambiguous after consideration of intrinsic evidence. I further understand that extrinsic evidence is given less weight than intrinsic evidence.

34. I understand that a preamble term or phrase is not limiting when a complete invention is described in the claim body and the preamble is only used to state the purpose or use of the invention. I understand that the preamble can be limiting if it recites structure or steps that are essential or gives meaning to the claim.

To determine whether the preamble is limiting, you should review the entire patent to determine what the inventors intended to have the claims encompass.

35. I understand that the preamble can be limiting if the claim is dependent on a preamble phrase and indicates it through use of an antecedent basis to define the invention, if the reference is necessary to understand the terms of the claim, and if the preamble provides additional structure or steps that is important to the claim.

36. I understand that claims can be written in means-plus-function form where the claim receives a feature of the invention by what it does rather than what it is. I understand that a claim element is a means-plus-function element when it is defined as a means or step for performing a function without description of the corresponding structure. I also understand that “mechanism,” “structure” or other generic words can also signal that a limitation is written in means-plus-function form. I understand that means-plus-function claims only cover the corresponding structure, material, or acts that are described in the specification, as well as any equivalents.

37. I also understand that generally a claim should not be limited to a preferred embodiment described in the specification, but that, in certain cases, the scope of the right to exclude may be limited by a narrow disclosure.

C. PRIOR ART AND PRIORITY DATE FOR THE '358 PATENT

38. I understand that a patent claim is invalid if it is anticipated (35 U.S.C. § 102) by a prior art reference or if it is obvious over the prior art (35 U.S.C. § 103).

39. Available Prior Art: I am informed and understand that prior art available for use in an IPR includes: (1) patents and printed publications that issued/published anywhere in the world before the effective filing date of the challenged claim/patent, and (2) patents and published applications that were based on a patent application filed before the effective filing date of the challenged claim/patent. I am informed and understand that there are certain exceptions, but am not aware of any of those exceptions being applicable to the prior art addressed here.

40. Anticipation: I am informed and understand that a patent claim is invalid under 35 U.S.C. §102 as “anticipated” if the claimed invention is not new. I am also informed and understand that for the claim to be invalid because it is not new, all of the requirements of the claim must have been described in a single piece of prior art. I understand that, for inherent anticipation, it is required that the missing descriptive material is necessarily present in the prior art.

41. Obviousness: I further understand that a patent claim is invalid if the claim, as a whole, would have been obvious (35 U.S.C. §103) to a POSITA at the time the invention was made. I understand that “obvious” (in this context) means that even if all the requirements of a claim cannot be found in a single prior art reference, a POSITA who knew about the relevant prior art would have come up with the claimed invention. I understand that an obviousness analysis takes into account: (1) the level of skill possessed by a POSITA at the time the claimed

invention was made; (2) the scope and content of the prior art; (3) what difference, if any, existed between the claim and the prior art; and (4) secondary considerations of non-obviousness, to the extent such considerations exist.

42. To assess the differences between prior art and the claimed subject matter, I understand that the claimed invention should be considered as a whole.

43. I have been advised that a patent claim composed of several elements is not proved obvious merely by demonstrating that each of its elements was independently known in the prior art. In evaluating whether such a claim would have been obvious, I understand that I may consider whether there is a motivation that would have prompted a person of ordinary skill in the art to combine the elements or concepts from the prior art in the same way as in the claimed invention.

44. I understand the rationales which may support a conclusion that a claim is obvious include:

- Combining prior art elements according to known methods to yield predictable results;
- Simple substitution of one known element for another to obtain predictable results;
- Use of known technique to improve similar devices (methods, or products) in a similar way;

- Applying a known technique to a known device (method, or product) ready for improvement to yield predictable results;
- “Obvious to try” – choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success;
- Known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations are predictable to one of ordinary skill in the art; and
- Some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention.

45. I understand that, for an obviousness argument based on a combination of prior art references, a POSITA must be shown to have a motivation to combine or modify a reference with a reasonable expectation of success. The showing of a motivation to combine helps avoid hindsight bias.

46. I also understand that the teaching, suggestion, motivation, or other reason to modify or combine the references may be supplied by the references themselves or the knowledge of a person of ordinary skill in the art. I also understand

that market forces often drive innovation compared to scientific literature, and that a motivation to combine may be supplied by these market forces.

47. I understand that an obviousness analysis focuses on what was known or obvious to a person of ordinary skill in the art and is not limited to a patentee. Therefore, any need or problem known in the field of endeavor at the time of the invention that is addressed by the asserted patent can provide a reason for combining the elements found in the prior art.

48. I understand that a single prior art reference can render a claim obvious if the missing elements of the reference are supplied by the knowledge of a person of ordinary skill in the art.

49. I understand that the inherent teachings of the prior art are also applicable to the determination of obviousness. I understand that “inherency” means that a feature not explicitly disclosed is nonetheless necessarily present, as would be understood by a POSITA.

50. I understand that a comparison of the disclosure of the prior art versus properly construed limitations of a Challenged Claim is necessary to performing an obviousness analysis.

51. I understand that it is improper to combine prior art where the references teach away from their combination. I also understand that a given course

of action often has simultaneous advantages and disadvantages, and this does not necessarily obviate obviousness or a motivation to combine.

52. I understand that I must be careful not to determine obviousness using the benefit of hindsight; many true inventions might seem obvious after the fact. I understand that when conducting an obviousness analysis, I should put myself in the position of a POSITA at the time the claimed invention was made. Using this perspective, I should not consider what is known today or what is learned from the teaching of the challenged patent.

53. I understand that, in certain circumstances, secondary considerations of non-obvious can rebut a prima facie showing of obviousness including:

- commercial success of a product due to the merits of the claimed invention;
 - a long-felt need for the solution provided by the claimed invention;
 - unsuccessful attempts by others to find the solution provided by the claimed invention;
 - copying of the claimed invention by others;
 - unexpected and superior results from the claimed invention;
 - acceptance by others of the claimed invention as shown by praise from others in the field or from the licensing of the claimed invention;
- and

- other evidence tending to show non-obviousness.

54. I am also informed and understand that secondary considerations of non-obviousness must have a pertinent connection (“nexus”) to the patent claims at issue, and the patentee bears the burden of showing that such a nexus exists.

55. Conversely, I also understand that independent invention of the subject matter by others at the time of the invention supports a finding of obviousness.

56. I understand that, ultimately, obviousness is a legal conclusion supported by factual considerations, which is based on a showing that all of the limitations of an asserted claim are present in the prior art and that the combination of the elements disclosed in the prior art is a predictable variation prompted by a known problem, design incentives, other market factors, or the knowledge of a person of ordinary skill, who would have implemented the combination with a reasonable expectation of success.

57. Unless explicitly noted, I have applied the February 7, 2019 claimed priority date in my analysis of the prior art. So, in my analysis of the prior art, I include patents and printed publications available to the public prior to February 7, 2019.

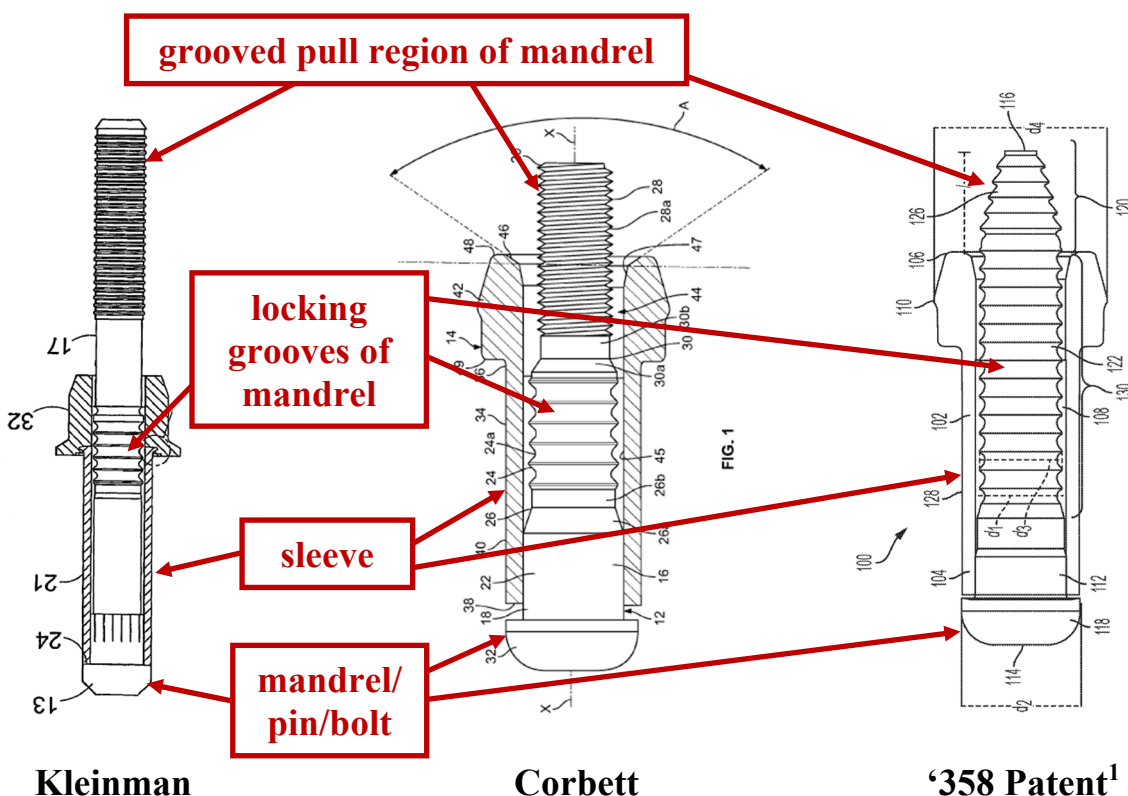
VII. RESERVATION OF OPINIONS AS TO NON-IPR-ELIGIBLE INVALIDITY GROUNDS

58. I understand that a claim is invalid as indefinite under 35 U.S.C. § 112 if a POSITA would not have understood its scope with reasonable certainty in view

of the patent's claims, specification, and prosecution history. I understand that a statute prevents Petitioner from pursuing invalidity based on indefiniteness (among other invalidity grounds) in this IPR. I have endeavored to apply the prior art to the Challenged Claims as best I can, despite their potential indefiniteness. I reserve the right to opine on the invalidity of the Challenged Claims based on non-IPR-eligible invalidity grounds in an appropriate venue.

VIII. TECHNOLOGICAL BACKGROUND

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



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

As shown above, these fasteners include a deformable sleeve surrounding a mandrel/pin/bolt that includes locking grooves and a pull region with multiple, shallow helical/threaded or annular pull grooves.

60. As sequentially shown below in Kleinman, installation involves inserting the fastener into a hole in the workpieces 42, 43. An installation tool grips and pulls the grooved pull region upwardly, 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 against locking grooves on the mandrel's shank to lock the workpieces together.

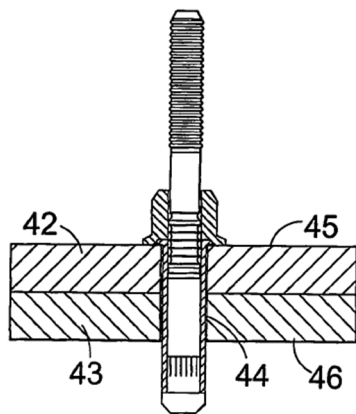


Fig.3A

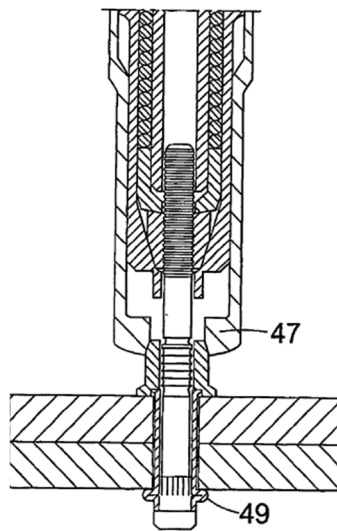


Fig. 5A

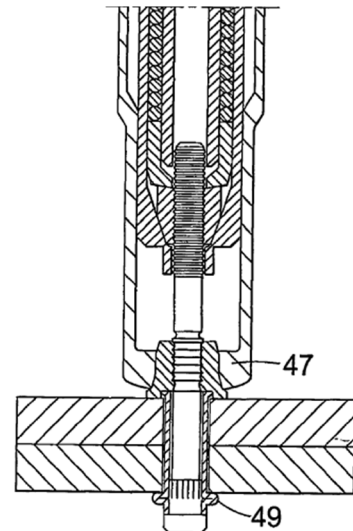


Fig. 5B

Kleinman

IX. THE '358 PATENT

61. The '358 Patent claims priority to a February 7, 2019 PCT application (PCT/US2019/016973). Ex. 1001, coversheet.

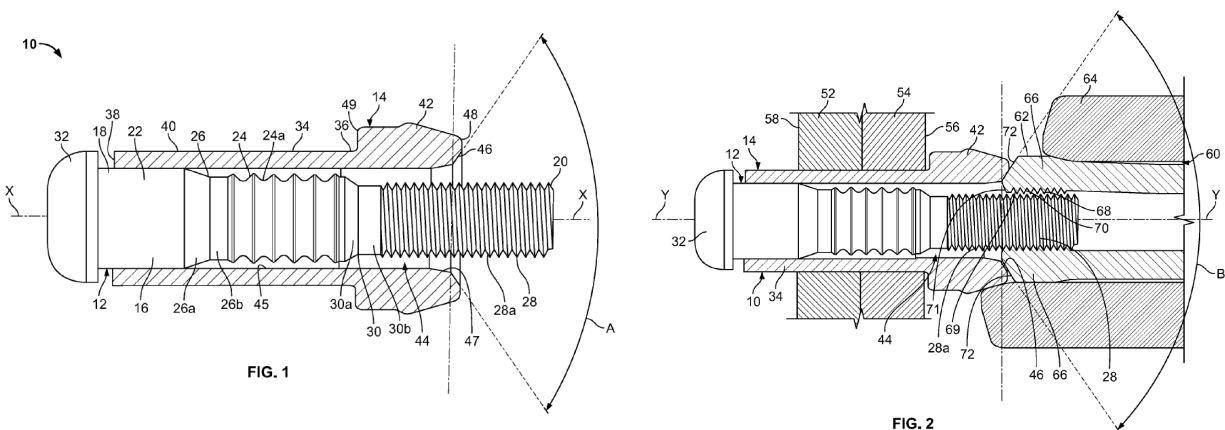
Independent claims 1 and 16 recite that “the pull region comprises an axial length no greater than 4 times a diameter of the shank region.”

X. BRIEF OVERVIEW OF THE PRIOR ART REFERENCES

19

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

65. Corbett taught a blind swage fastener 10 that was extremely similar to that described in the '358 Patent. Corbett's fastener 10 shown in Figures 1 and 2 includes a sleeve 14 and a mandrel/bolt 12 with a locking groove portion 24 and a pull region 28 with multiple² relatively small pull grooves 28a (e.g., "annular groove[s]", threads). Corbett, ¶[0009] ("plurality of pull grooves 28a"), FIGS. 1-2.

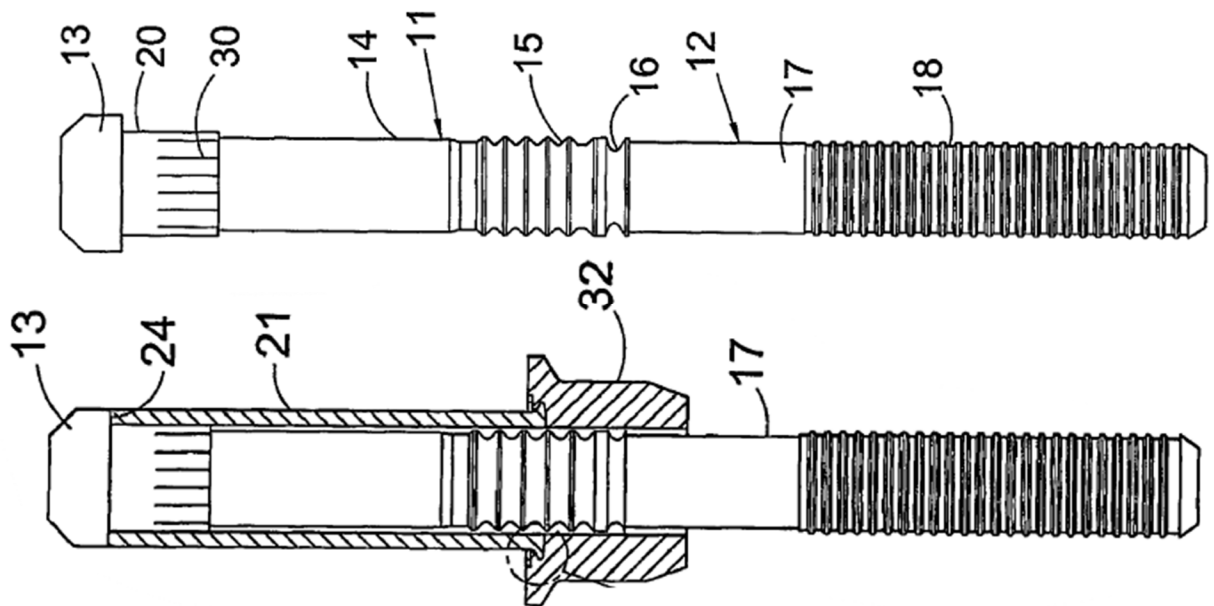


66. Corbett's installation tool 60 (above, right) uses a puller 62 with a plurality of pull grooves 70 (teeth 68, 69) that engage multiple pull grooves 28a of the fastener's pull region 28 to install the fastener and swage the sleeve's collar 42. Corbett, ¶¶[0012]-[0014], FIG. 2.

² Corbett states that the pull region 28 could alternatively comprise "a single pull groove 28a." Corbett, ¶[0009].

B. Kleinman (U.S.P.A.P. 2006/0251490A1) (Ex. 1006): Blind Swage Fastener

67. Kleinman taught a similar blind swage fastener comprising a sleeve 21/32 and a mandrel/pin 11 with a locking groove portion 15 and a pull region 18 with multiple, relatively small annular pull grooves. Kleinman, ¶¶[0020]-[0023].



Kleinman, FIGS. 1A, 2A (excerpts)

68. 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.

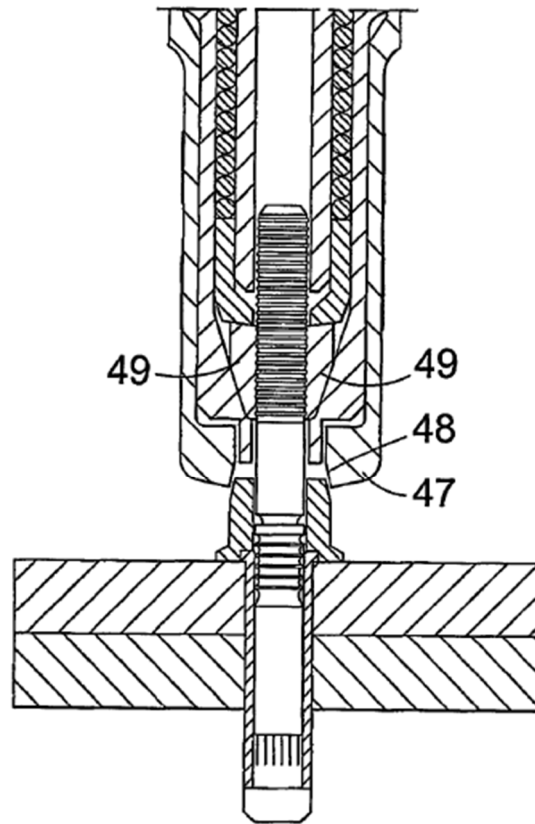


Fig. 4A

Kleinman

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

69. Brewer taught that a “problem” with conventional swage fasteners with pull regions 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]; *see also* Brewer, ¶[0015]. Brewer lists

additional disadvantages of such multi-grooved pull regions like in Corbett's or Kleinman's pull regions:

[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.

[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.

[0006] A further disadvantage of the current non-breakstem lockbolt 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).

[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.

[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.

[0009] Furthermore, any 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.

[0010] Some currently known non-breakstem lockbolt fasteners also include helical locking grooves into which the collars are swaged, which can be disadvantageous in that tampering or working loose could lead to the collar becoming unscrewed from the locking grooves.

[0011] Furthermore, the protruding end of the installed lockbolt could include sharp pull groove crests, therefore presenting a risk of injury to the operator or other personnel.

Brewer, ¶¶ [0004]-[0011].

70. 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 pull groove 20 and end portion 80:

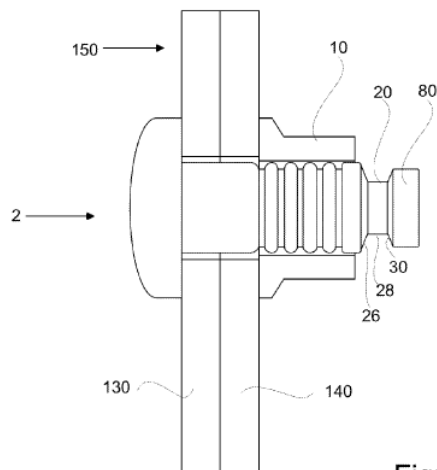


Figure 8

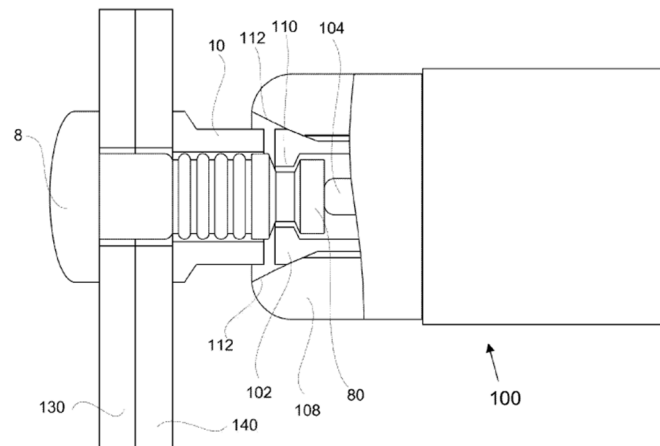


Figure 12

Brewer

71. Brewer explains 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 of the present invention is less likely to become clogged with debris than the shallower multiple grooves of prior art embodiments.

[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, ¶¶ [0015]-[0017].

72. 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.” 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 $1.2 D$)”).

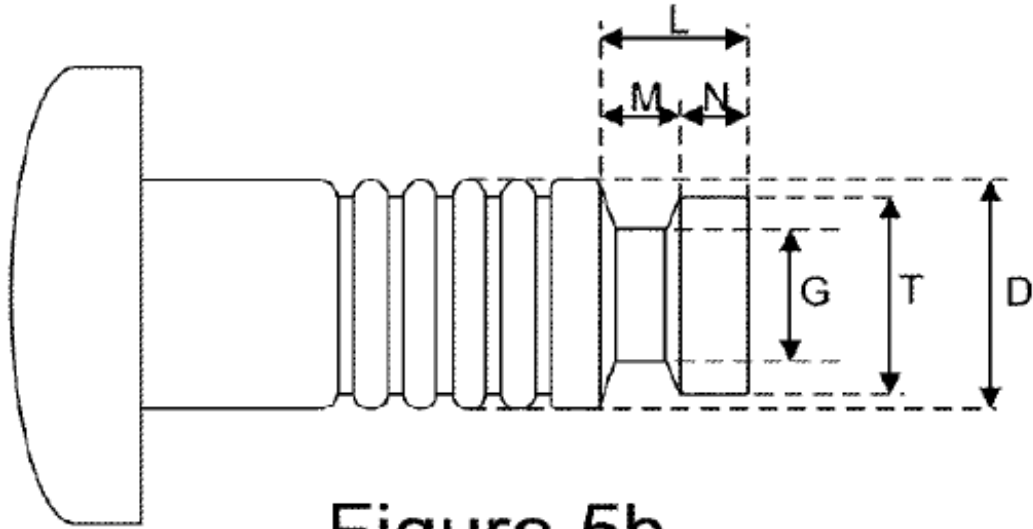


Figure 5b

Brewer

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

73. 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" provides "sufficient strength to withstand the frictional forces encountered during setting without significant yielding or wire drawing." Kendall, 3:25-42.

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

74. Fulbright taught that swage fasteners advantageously used "ferrous," 33-39 Rc pins with pull regions hardened to 48-54 Rc to enhance "strength" and "minimize the necessary overall length of the pull portion." Fulbright, 8:17-28 ("In the form of the fastener 10 of FIGS. 1-4 the pin 12 can be constructed of a ferrous

material and have a Rockwell hardness of around 33 to around 39 Rc for a grade 8 type fastener and a hardness of around 25 to around 35 Rc for a grade 5 type fastener; however, in order to enhance the strength of the pull grooves 36 and hence minimize the necessary overall length of pull portion 34, the pull portion 34 can be hardened to a Rockwell hardness of at least around 5 Rc greater than the hardness of the remainder of the shank or preferably around 15 Rc harder.”); Fulbright, FIGS. 1-7. Fulbright’s disclosure of a 33-39 Rc hardness pin whose pull grooves are hardened by an additional “preferably 15 Rc” results, either explicitly, or at least obviously, in a pull region hardness of 48 Rc (33 Rc +15 Rc) to 54 (39 Rc + 15 Rc) so as to enhance the strength of the pull grooves.

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

75. I understand that one consideration made when determining whether prior art references can be combined is whether the products or subject matter described in the references are within the same class or category of devices, addressing the same problem or market need, and would benefit from the same improvement or innovation. I considered these questions when forming my opinions about motivations to combine the prior art references and products discussed herein.

76. I have been informed that, for a reference to be considered relevant analogous prior art for obviousness purposes, it must be either (1) from the same field of endeavor as the invention, regardless of the problem addressed, or (2) if not

within the field of the inventor's endeavor, still reasonably pertinent to the particular problem with which the inventor is involved. Corbett, Kleinman, Brewer, and Kendall are analogous prior art for both of these reasons.

77. First, Corbett, Kleinman, Brewer, Kendall, Fulbright, and the '358 Patent are in the same field of through-hole fasteners with deformable locking sleeves/collars (e.g., swage fasteners, blind fasteners).

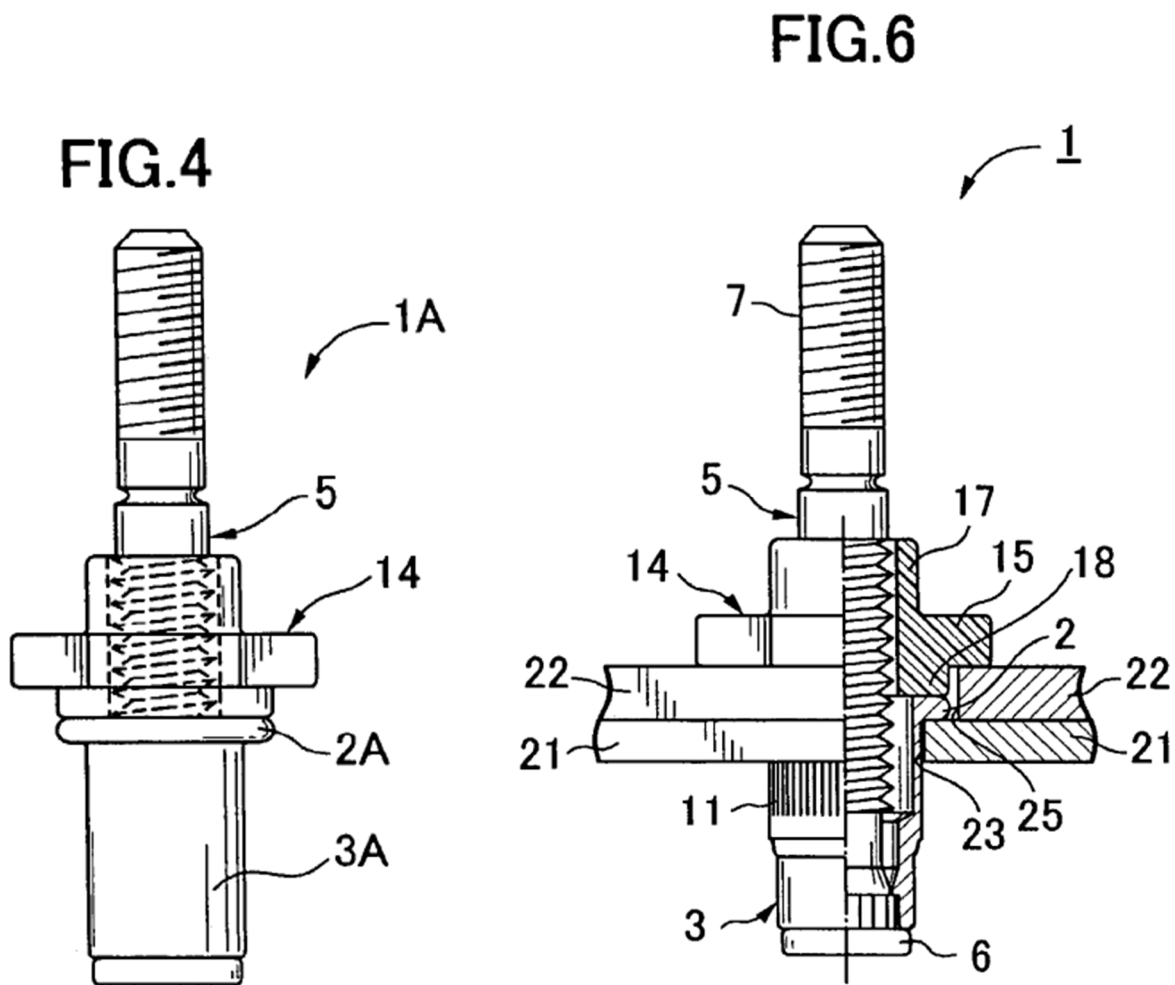
78. Second, Corbett, Kleinman, Brewer, Kendall, and Fulbright are alternatively analogous art because their pull regions are reasonably pertinent to the particular problem faced by the '358 Patent's inventor and by Corbett, Kleinman, Brewer, and Fulbright, i.e., providing a pull region that can be effectively gripped and pulled by a fastening tool during installation to deform the blind side of the sleeve into a blind head and/or swage the non-blind side of the sleeve/collar against the locking grooves on the non-blind side, as explained above.

79. As a result, POSITAs would have obviously looked to Brewer, Kendall, and Fulbright for ways to improve Corbett or Kleinman.

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

80. During prosecution of a continuation of the '358 Patent, the USPTO rejected various claims as anticipated by U.S. Patent No. 7,156,596 (Ex. 1012) (Makino). *See* Prosecution History Of U.S. Application No. 18/404,525 (Continuation Of The '358 Patent), October 2, 2025, Office Action (Ex. 1013), pp.

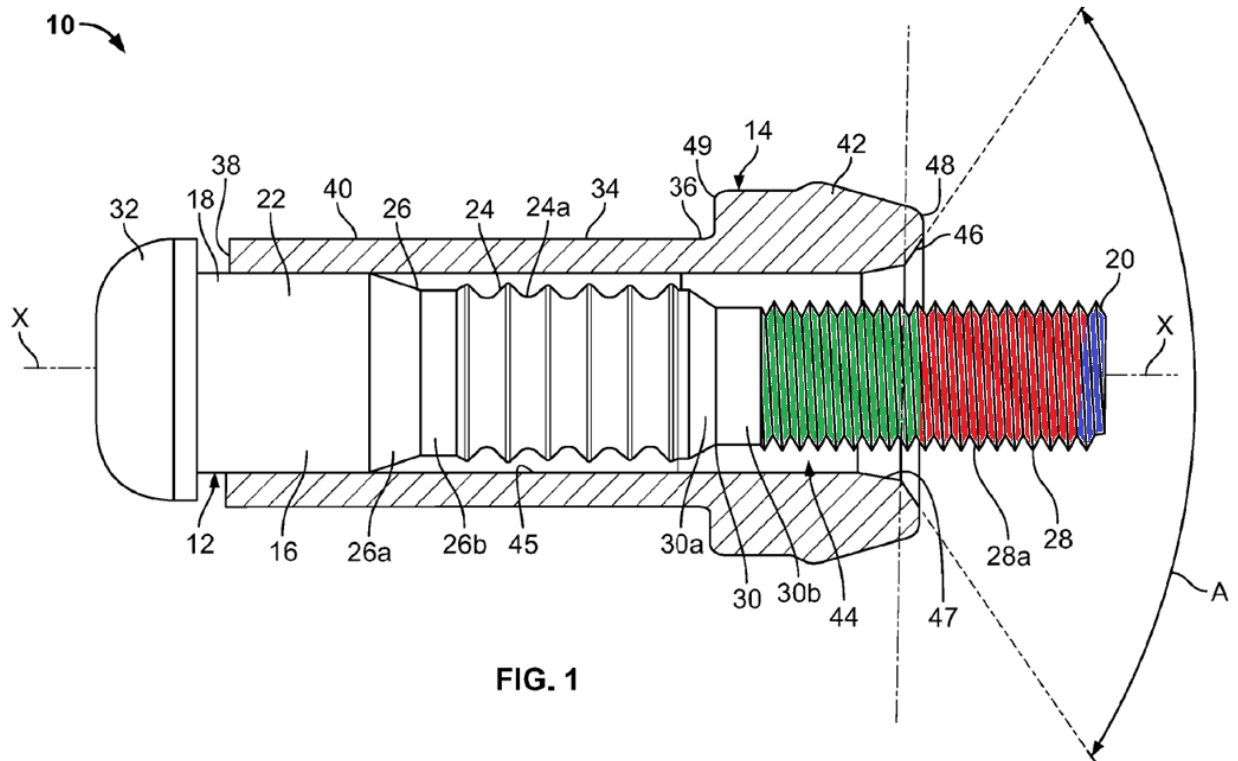
3, 5). In particular, the USPTO found that Makino (shown below) disclosed that “the pull region is shown to have a length less than 3 times the shank diameter at the major diameter of the shank (at 9).” Ex. 1013, pp. 2-3. The USPTO went on to explain that “[s]ince the claims do not put any structural limitations on the ‘pull region’ it can be read as having any length including one which is less than 1 times the shank diameter.” Ex. 1013, p. 3.



The rejections over Makino (US 7,156,569) have been maintained adapting applicants' new claim terminology and adopting a broad interpretation of the "pull region". Indeed the claims do not put any structural limitation of the "pull region" so it is not required to be the entire length of element 7 or even the length where it is engaged with the pull tool 26. In fact the "pull region" could be read as any length less than the shank diameter in which case there is no reliance on the drawings.

Ex. 1013, p. 5. Under the USPTO's non-structural construction of the functional term "pull region," the pull region can be any portion of a multi-grooved region, even as little as **one tooth/groove** (as highlighted in blue in the below paragraph's illustration of FIG. 1 of Corbett). Under the USPTO's construction, Corbett anticipates (even without modification in view of Brewer) at least claims 1-5, 8-10, and 12-19 of the '358 Patent. Similarly, under the USPTO's construction, Kleinman anticipates (even without modification in view of Brewer) at least claims 1-4 and 8-15 of the '358 Patent.

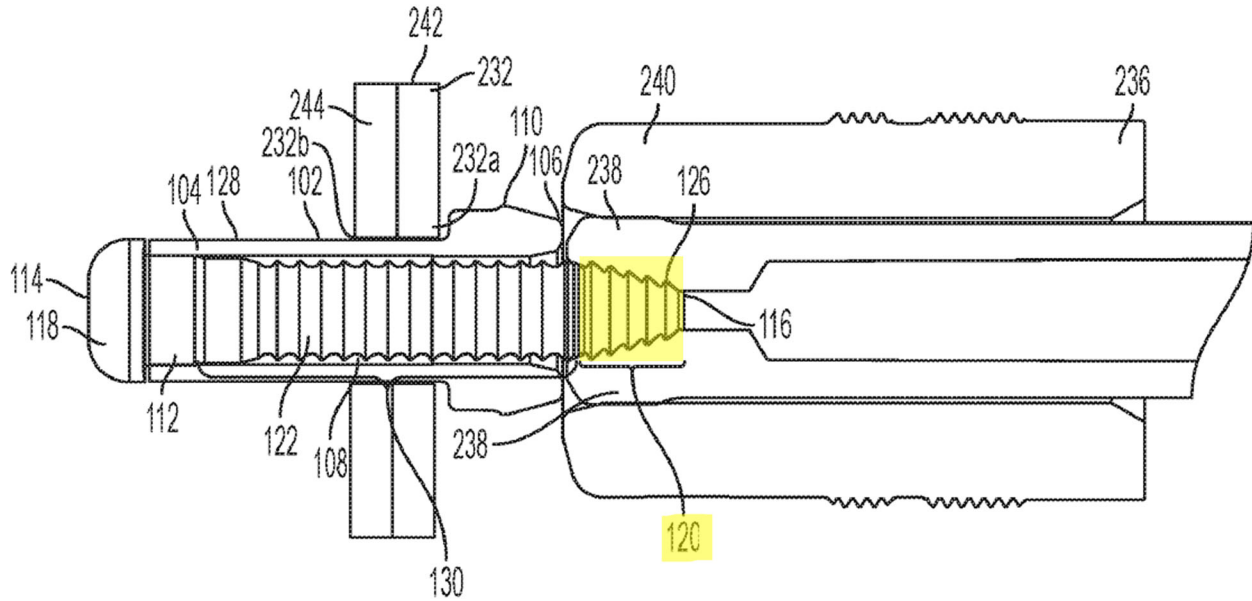
81. I have been informed that Petitioner asserts that this limitation is indefinite because it is not clear whether "pull region" means: (A) any region capable of being engaged by the installation tool (**even one of multiple grooves**) under the intended use construction adopted by the USPTO in a continuation of the '358 patent (Ex. 1013, pp. 3, 5), as explained above; (B) the mandrel region protruding from the sleeve (~**red+blue** below) ("standout"); or (C) the entire region having structures (e.g., grooves) configured to be engaged by an installation tool (**green+red+blue**).



Petitioner asserts that this limitation is also unclear 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. I have been informed that because Petitioner cannot pursue indefiniteness here, Petitioner has conservatively proposed, solely for purposes of this petition, the narrowest definition most favorable to PO: 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.” Several facts support this construction over a “standout” construction.

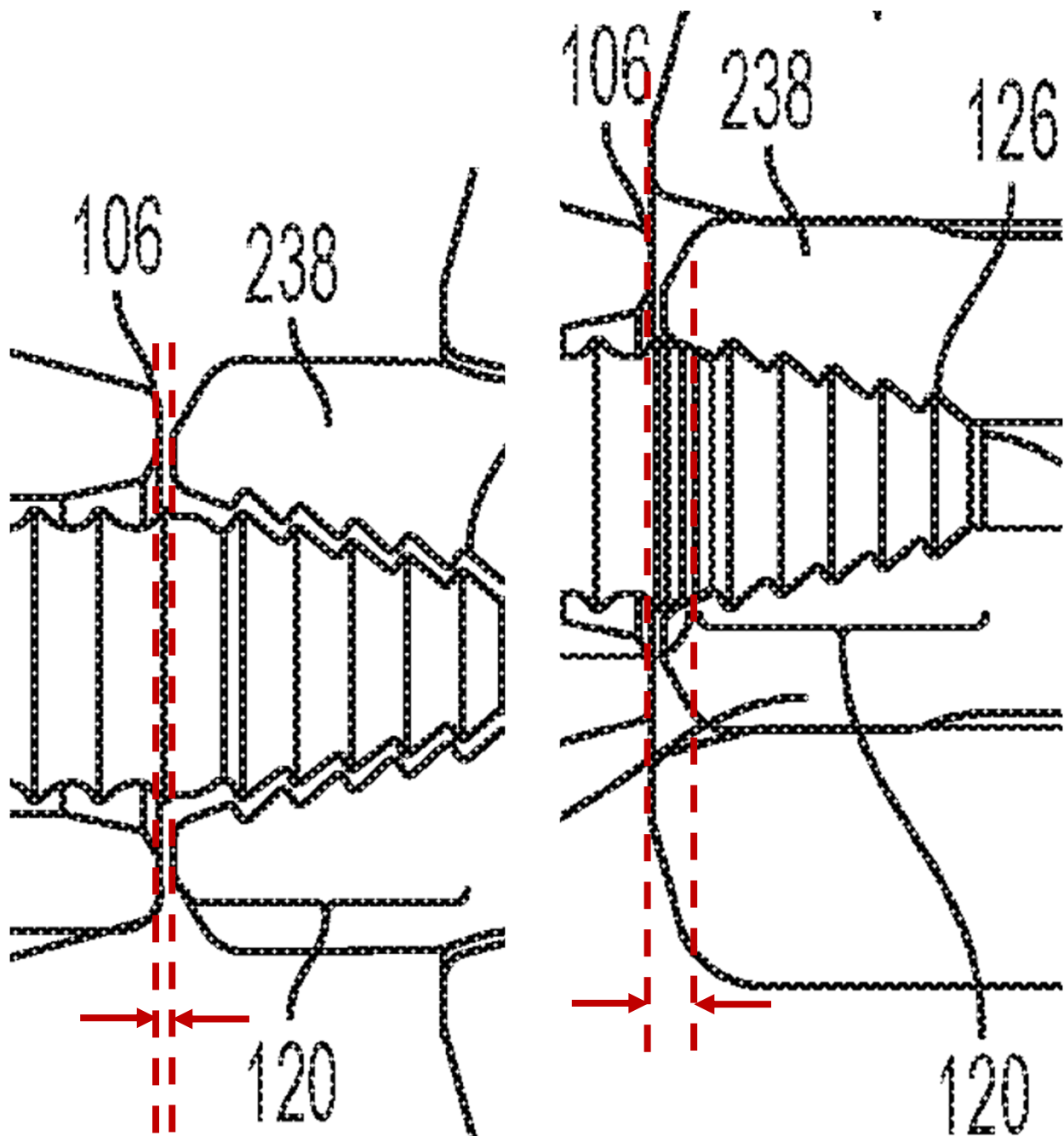
82. *First*, independent claims 1 and 16 of the '358 Patent require the pull region to be “configured to be engaged by an installation tool.”

83. *Second*, the specification confirms that the “pull region 120 [is] configured to be engaged by an installation tool.” ’358 Patent, 4:27-28 and FIGS. 2A-2B.



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

84. *Third*, FIGS. 2A-2B of the ’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)

85. *Fourth*, during prosecution of the ‘358 Patent, 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) in “*Jones’* pin 16,” not by the pin’s **standout** from the sleeve 12. Ex. 1011, pp. 4-5.

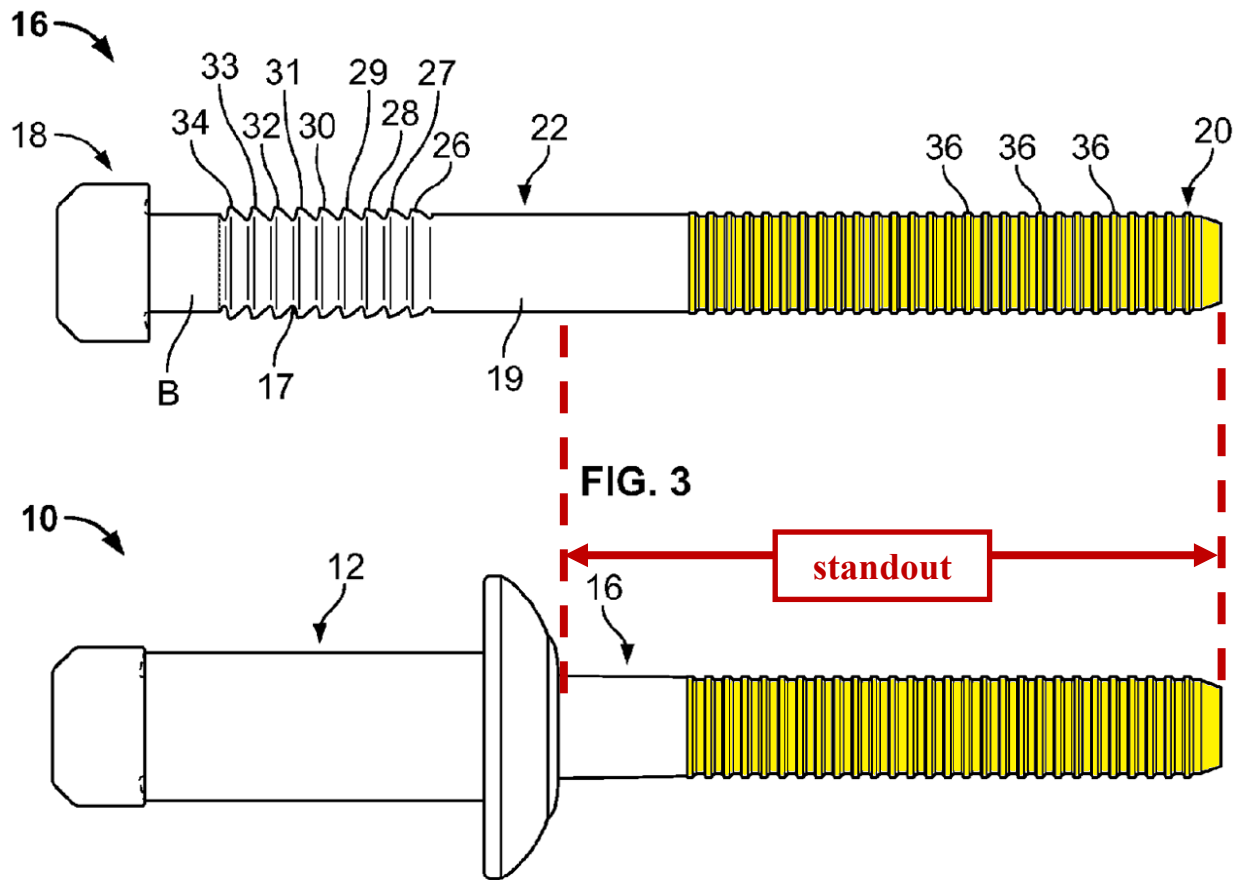
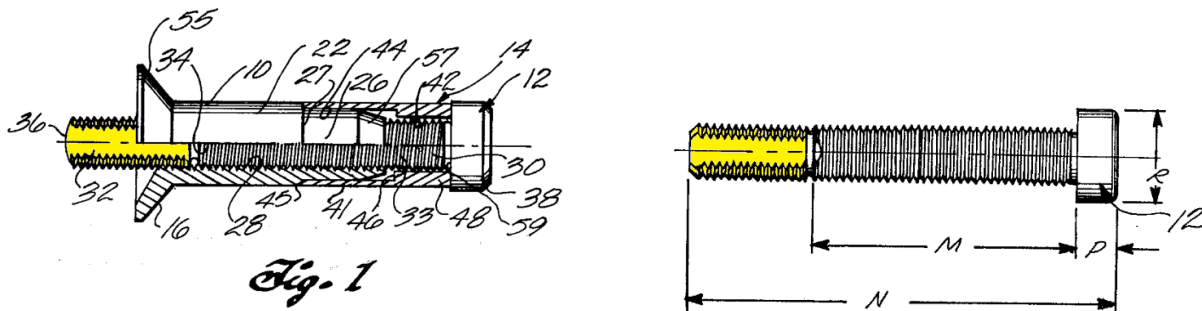


FIG. 1
Jones

86. *Fifth*, while prosecuting the European counterpart to the '358 Patent, 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 distance “N-M” in FIG. 2). Patent Owner mistakenly failed to account for dimension P when asserting the length of the pull region as “N-M”.



D2 (Ex. 1008), FIGS. 1-2 (excerpt)

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

87. *Sixth*, Corbett confirms that in this art, the pull region can extend into sleeve such that only a “a portion of the pull portion 28 extends outwardly from ... the sleeve 14.” Corbett, ¶[0011] (emphasis added). This further confirms that “pull region” does not mean standout.

88. For the purposes of this declaration, I have therefore considered “pull region” to mean “a region configured to be engaged by an installation tool,” rather than a region protruding from the sleeve (i.e., standout).

89. To the extent that Patent Owner proposes a different construction, I reserve the right to respond and provide further analysis of the claims.

XII. INVALIDITY GROUNDS AND ANALYSIS

90. In this section, I provide a detailed explanation of how Petitioner's Invalidity Grounds A-D invalidate the Challenged Claims.

91. I have also indicated where the knowledge of a person of ordinary skill in the art at the time the alleged invention was made would have made various

limitations obvious. The citations below are illustrative, not exhaustive, of the disclosure contained within that reference or demonstrated by that product. For any particular citation or disclosure, I reserve the right to introduce additional disclosure or images to the extent allowed. I further reserve the right to introduce other text, figures, or disclosure from the same or other documents concerning that reference to provide additional context for the citation. Where I provide a citation to a particular figure, the citation should be understood to encompass the disclosure relating to that figure and vice versa. I also reserve the right to rely upon other documentation or information produced in this proceeding, such as deposition testimony or evidence relied on by Patent Owner's experts, to explain or provide additional context to the cited portion of each reference discussed herein.

92. As explained below, it is my opinion that the Challenged Claims would have been obvious to a POSITA based on the following grounds:

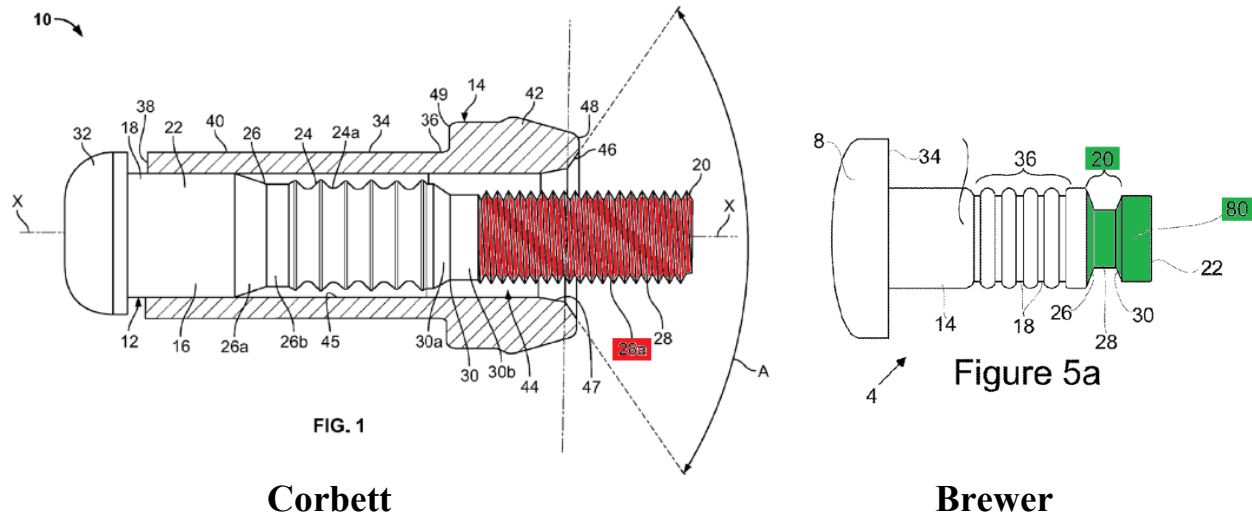
- (A) Ground A: Claims 1-20 were obvious over Corbett in view of Brewer;
- (B) Ground B: Claims 6-7, 11, 14, and 20 were obvious over Corbett in view of Brewer, Kendall, and Fulbright;
- (C) Ground C: Claims 1-20 were obvious over Kleinman in view of Brewer; and
- (D) Ground D: Claims 6-7, 11, and 20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

93. At times, I discuss both Corbett and Kleinman together. However, my opinions as to the Corbett-based invalidity Grounds A-B do not in any way depend on Kleinman. Conversely, my opinions as to the Kleinman-based invalidity Grounds C-D do not in any way depend on Corbett.

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

94. Brewer taught that a “problem” with conventional swage fasteners with pull regions 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]; *see also* Brewer, ¶¶ [0004]-[0011] (identifying additional disadvantages of multi-groove pull regions); *see also* Sections X.A., X.C., above. 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 “single pull groove 20” and “end portion 80”). Brewer, ¶¶ [0015]-[0017], [0072]-[0076]; Brewer, FIGS. 8, 12; Section X.C., above.

95. As shown below, it was obvious to modify Corbett's fastener 10 in view of Brewer by replacing the **multiple pull grooves 28a** of Corbett's multi-groove/threaded/toothed pull portion 28 with Brewer's **single-groove pull region 20/80**.



POSITAs would obviously adjust an axial length of Corbett's shank region 16/24/26/30 (e.g., to axially extend through the entire length of the sleeve 13) so Brewer's pull region 20/80 appropriately protrudes from the sleeve 14 to be accessible by the installation tool, e.g., as explained in greater detail below in Section XII.A.1.d.i (paragraphs 112-117).

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

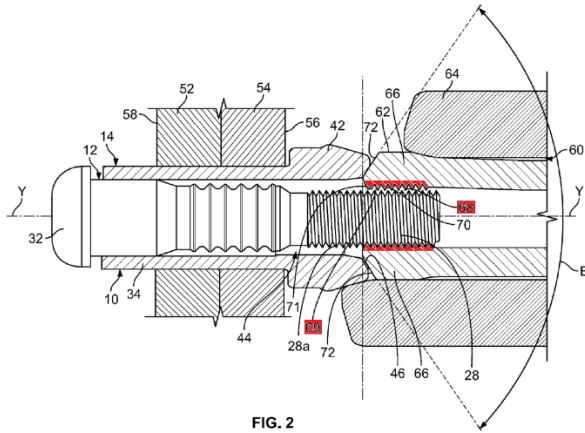


FIG. 2

Corbett

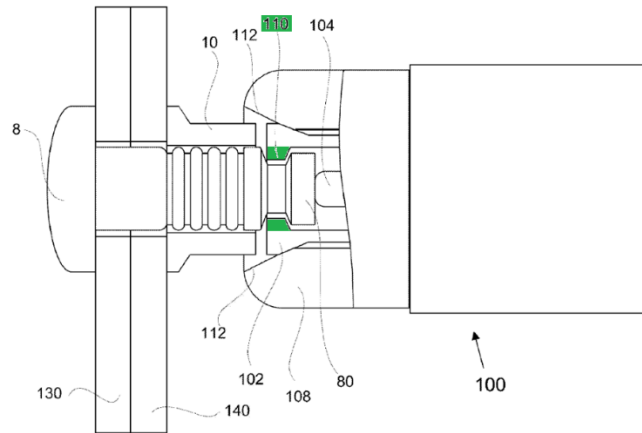


Figure 12

Brewer

Corbett, ¶[0012]; Corbett, FIG. 2; Brewer, ¶[0088] (“[A]n internal lip 110 of the collet 102 engages with the single pull groove 20[.]”); Brewer, FIGS. 5A, 12.

97. Corbett’s installation tool 60, Kleinman’s installation tool, and Brewer’s installation tool 100 are each configured to install their swage fasteners using a single stroke of their installation tool. Corbett, ¶¶[0013]-[0014] and FIG. 2; Kleinman, ¶¶[0032]-[0033] and FIGS. 4A-5B; Kleinman, ¶[0028] (acknowledging that Kleinman’s installation tool can alternatively utilize a two-stroke installation process, e.g., if the mandrel is pushed toward a blind side of the sleeve); Brewer, ¶¶[0086]-[0091] and FIGS. 10-15. The obviously modified Corbett (or Kleinman) installation tool would obviously have retained that single-stroke installation capability so that the obviously modified Corbett (or Kleinman) fastener can be installed via a single stroke of the installation tool. Even if Corbett’s (or Kleinman’s) tool did not facilitate one-stroke installation, it would have been obvious to have

adapted Corbett's tool 60 (or Kleinman's tool) for one-stroke installation, e.g., by ensuring that the tool's pull stroke is sufficiently long that a first portion of the stroke pulls the mandrel relative to the sleeve to form the blind head, and a second portion of the stroke swages the collar onto the near-side of the mandrel. POSITAs were motivated to facilitate such one-stroke installation because a one-stroke installation is easier and faster than when multiple strokes are used. A multi-stroke installation requires the tool to disengage from the pull region, move, and reengage the pull region between strokes, which was slower and more complex than when a single stroke was used.

98. POSITAs would be motivated to make these modifications to 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] ("A problem with [a prior art fastener with a multi-grooved/toothed pull region] is that the crests of the teeth of the installation tool may not engage sufficiently with the shallow grooves provided on 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, ¶ [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.”); 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.”));
- 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] (“Furthermore, any 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 current non-breakstem lockbolt 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]).

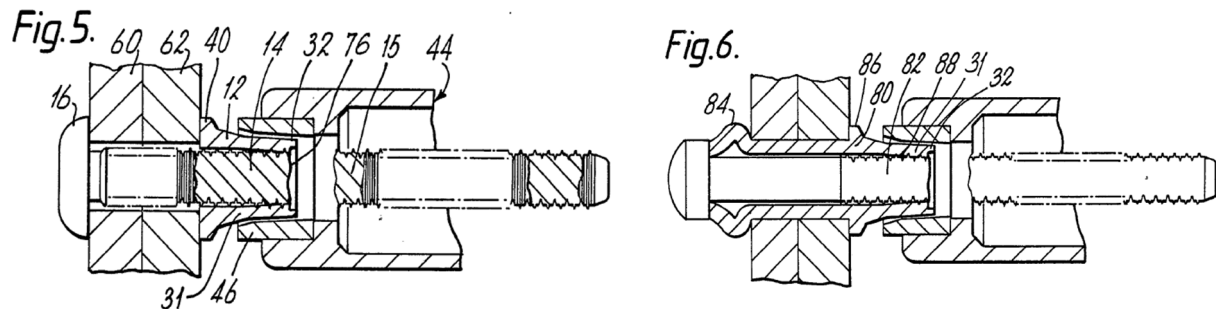
See Section X.C., above.

99. 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.

100. 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.

101. 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: facilitating pulling of the pin/mandrel relative to the sleeve to install the fastener. Corbett, ¶ [0015] (recognizing the cross-applicability of teachings about “blind fastener[s]” and “other types of fasteners”); EP0365227A1 (published 4/25/90)

(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); Ex. 1017 (published 1990), p. 30.



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].

102. 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.”). Installing a blind swage fastener merely requires a relatively longer pulling stroke to account for formation of the blind head before

swaging the sleeve. The sleeve is swaged by an anvil of the installation tool in the same way when installing blind or non-blind swage fasteners.

103. Corbett's sleeve 14 and puller 62 include matching conical/sloped surfaces 46, 72, which help to "align the puller 62 properly with the pull portion 28" during installation. Corbett, ¶[0010]-[0013], FIG. 2. As explained above, Brewer's single groove pull region 20/80 advantageously makes appropriate tool-to-pull-region alignment easier. With the obviously modified Corbett fastener and installation tool, Corbett's alignment feature and Brewer's more easily aligned single pull groove would obviously synergistically work together to make it easier to align the tool and pull region in the obviously modified Corbett fastener.

104. Alternatively, POSITAs would have recognized that the single pull groove of Brewer could improve tool-to-pull-region alignment over the arrangement of Corbett even without Corbett's conical-surface based alignment feature. But again, Corbett's and Brewer's alignment features were not mutually exclusive, so they could be synergistically combined, as explained above. Regardless of whether Corbett's alignment feature is retained or omitted when Brewer's pull region 20/80 is obviously incorporated into Corbett's fastener, the obviously modified Corbett fastener and tool satisfy every limitation in the Challenged Claims.

105. A person of ordinary skill in the art would be familiar with a variety of possible mechanical designs to implement blind swage fasteners and their

installation tools like Corbett's (or Kleinman's), and more generally, mechanical designs for blind swage fasteners and their installation tools. One of skill in the art would understand that substituting the structure in a prior art reference with the exact structure recited in this claim element was an obvious design choice, requiring no more than routine experimentation. Such a modification would simply apply one of a finite number of well-known techniques or structural features in a predictable manner, to achieve well-known, predictable results.

106. To the extent Patent Owner contends that any other limitation is missing from Corbett (or Kleinman), it would have been obvious for a person of skill in the art to modify the reference and include that limitation for the reasons discussed herein.

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

1. Claim 1

a. Limitation 1(a): "A blind fastener comprising:"

108. The obviously modified Corbett fastener 10 is a "blind fastener" (Corbett, ¶[0007]), as recited in limitation 1(a). Corbett, ¶¶[0011]-[0014], FIGS. 1-2.

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”

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

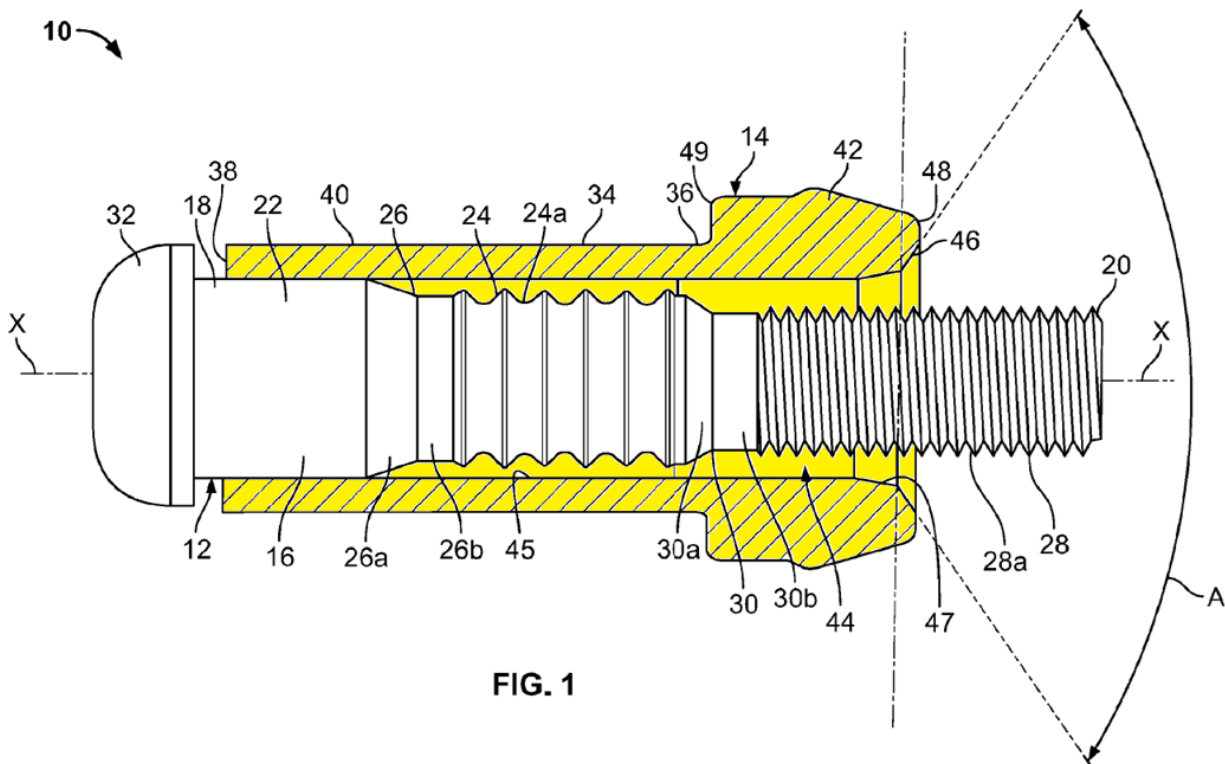
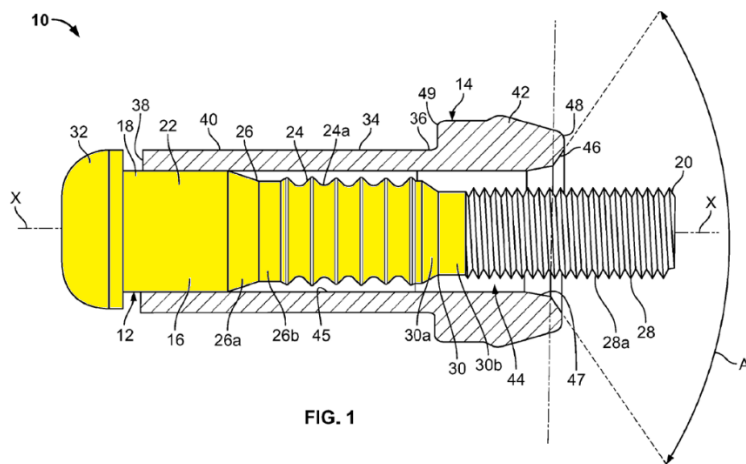


FIG. 1

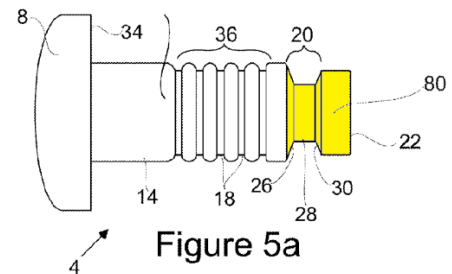
Corbett

- 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,”

110. As highlighted below, the obviously modified Corbett fastener includes a **mandrel** (Corbett’s “bolt 12” with Brewer’s pull region 20/80) 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 (end of the mandrel opposite head 32) 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, as recited in limitation 1(c). Corbett, ¶[0009] and FIGS. 1-2; Brewer ¶[0072] and FIGS. 8, 12.



Corbett



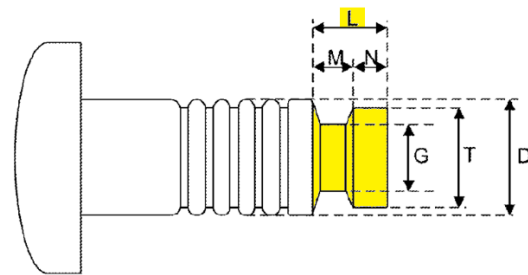
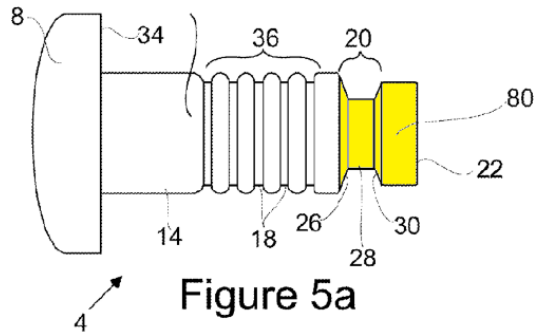
Brewer

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

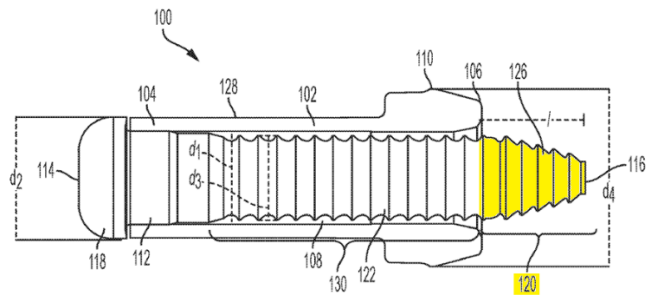
111. Assessment of this limitation requires identifying and measuring the pull region and shank of the obviously modified Corbett fastener.

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

112. Depending on the construction of the limitation “pull region,” Brewer’s pull region might comprise just the groove 20, or the groove 20 and end portion 80. To be conservative solely for the purpose of this opinion, I will treat the pull region as being the combination of the groove 20 and end portion 80 because that is more favorable to the validity of the patent than if “pull region” encompassed only the groove 20. Brewer, FIGS. 5, 9-15 & ¶[0088]. *See* Section XI, above (construing “pull region” as “a region configured to be engaged by an installation tool”); Brewer, FIGS. 5, 8-15. Petitioner’s invalidity grounds would more strongly satisfy the dimensional relationships recited in limitation 1(d) and claims 2-3, 16, and 17 if the axial length of Brewer’s pull region was just the axial length of the groove 20 (i.e., excluding the axial length of the end portion 80). As a result of this conservative analysis, the combination of Brewer’s pull groove 20 and end portion 80 (highlighted below, left) is the claimed “pull region.”



Brewer, FIGS. 5a-5b



'358 Patent, FIG. 1

113. 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].

114. Even if "pull region" meant the extent to which the mandrel extends out of the sleeve (i.e., standout), it was still obvious to make the axial length of the pull region in the obviously modified Corbett fastener 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 to minimize mandrel material cost or weight, while still providing easy tool access to the pull region 20/80 and/or improved tool stability during installation. Indeed, POSITAs would have understood that one of the intended benefits of Brewer's relatively short pull region 20/80 is to advantageously reduce the pull

region's installed standout. *See* Fulbright, 8:23-24 (recognizing the known desire in the art to “minimize the necessary overall length of [a mandrel's] pull portion”).

115. It was well known in the art to provide an interference fit between a blind fastener's sleeve and mandrel to keep the pieces properly assembled before and during installation. For example, Kleinman discloses an “interference fit” between Kleinman's sleeve 21/32 and the “slightly oversize portion 20” of Kleinman's mandrel's shank region to keep the sleeve and mandrel held together. Kleinman, ¶[0024] (“The sleeve is assembled on the pin shank 12 so that the sleeve end face 24 abuts the annular face of the pin head 13, there being an interference fit between the ribbed oversize portion 20 of the pin and the tail end portion of the sleeve 21[.]”). Similarly, Corbett discloses or would obviously have an interference fit between Corbett's sleeve 14 and the thickest portion 22 of Corbett's mandrel's shank to keep the sleeve and mandrel held together. This interference fit mitigates a desire to provide further standout (e.g., such that pull region standout is larger than Brewer's dimension L) because the interference fit tends to prevent the mandrel from sliding into the sleeve 14 during installation in a manner that might impede the installation tool from grabbing the pull region 20/80.

116. As a result, under either construction of “pull region,” the pull region of the obviously modified Corbett has an axial length L corresponding to the length of the pull region of Brewer's fastener.

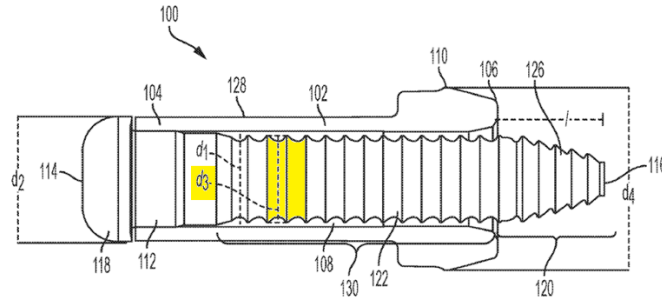
117. It would alternatively be obvious to extend the shank region slightly such that the pull region 20/80 begins slightly distally from the end of the sleeve 14, e.g., by 0.01-0.05 times the shank diameter D , to allow accommodation of tolerances and a degree of slippage of the mandrel into the sleeve while enabling the installation tool to grip and pull the protruding pull region 20/80. As explained below, Brewer's pull region 20/80 has an axial length L that is 0.936 times the shank diameter D . In such a case, the overall standout would be 0.947-0.986 times the shank diameter D . As a result, if the axial length of the pull region was defined by standout (contrary to my opinion as explained above), the resulting axial length would be 0.947-0.986 times the shank diameter D , which falls within the dimensional relationship recited in this limitation 1(d) and claims 2-3 and 16-17.

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

118. I have been informed that Petitioner asserts that this limitation is indefinite because it is unclear whether the term diameter refers to (a) maximum diameter (e.g., at ref. 112 in FIG. 1), (b) an intermediate diameter (e.g., d_1 in FIG. 1), (c) a maximum/"major diameter" of the grooved portion of the shank (d_3 in FIG. 1), or (d) a minimum/"root³ diameter" of the grooved portion. *See* '358 Patent, FIG.

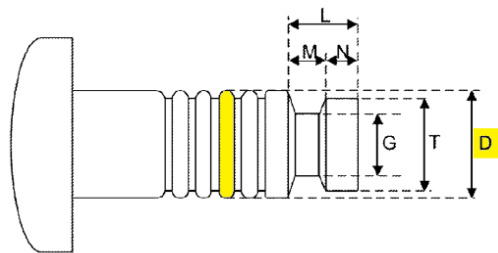
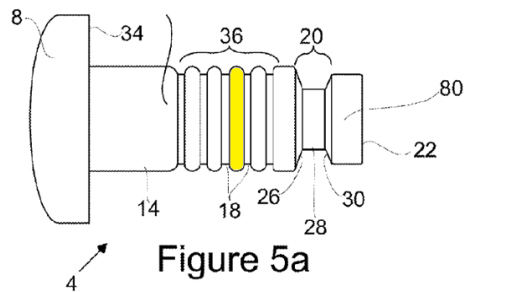
³ The '358 Patent mistakenly equates a "major" diameter with a "root" diameter. '358 Patent, 4:38 ("The diameter, d_3 , of the shank region 122 can be the major diameter (e.g., root) of the shank region 122."). Dimension d_3 in FIG. 1 of the '358 Patent illustrates a major diameter (i.e., the maximum diameter of the

1, 4:31-39. Nevertheless, for the purposes of this declaration, I have analyzed this claim element based on the '358 Patent's description of "a diameter, d_3 , of the shank region 122," '358 Patent, 4:31-32, and the illustration of d_3 as being the maximum diameter of the grooved portion of the shank. '358 Patent, FIG. 1, 4:31-39.

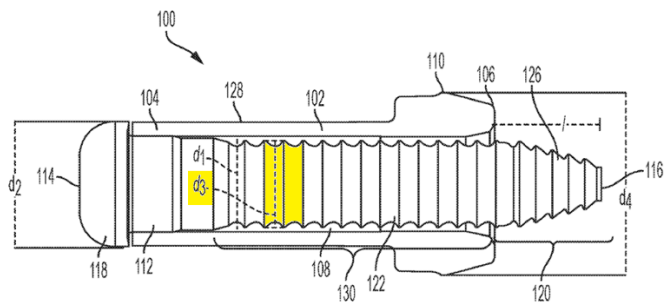


119. Brewer's "maximum diameter [D] of the locking portion 36" of Brewer's shank and the maximum diameter D of Corbett's locking portion 24 both correspond to how the '358 Patent illustrates d_3 as being the maximum diameter of the grooved portion of the shank. Brewer, ¶[0072], FIGS. 5a-5b; Corbett, ¶[0010], FIG. 1.

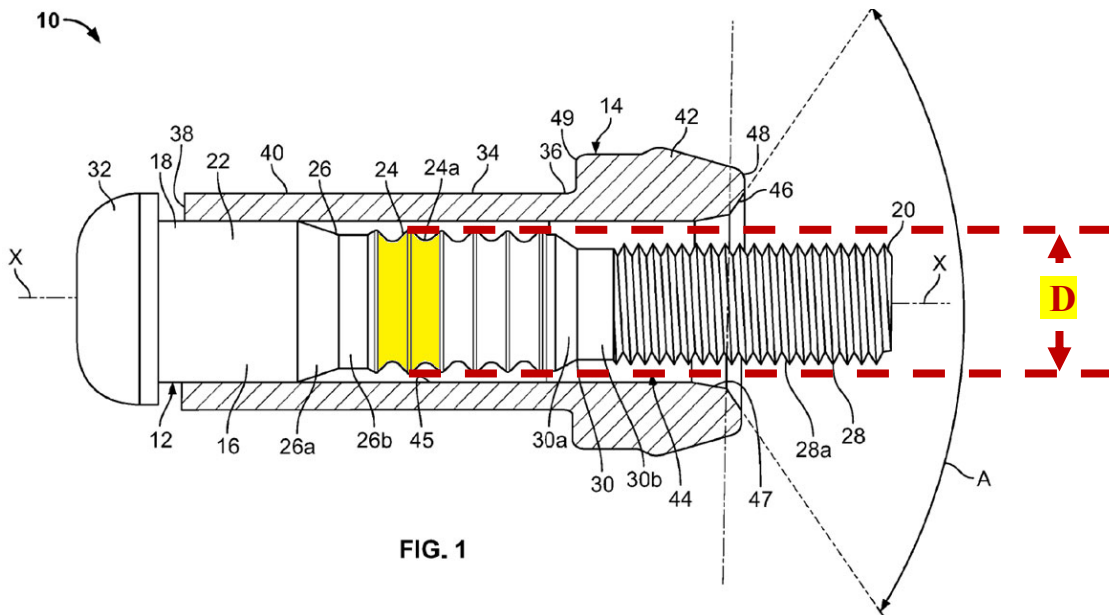
grooved/locking portion 122). A "root" diameter of this grooved portion would be the minimum diameter at the base of the grooves.



Brewer, FIGS. 5a-b



'358 Patent, FIG. 1



Corbett (annotated)

120. Brewer's and Corbett's diameter D is therefore "a diameter of the shank region," as recited in claim 1, as best I can understand this limitation despite its potential indefiniteness as to which diameter is being claimed. See ¶118, above.

121. If “diameter” meant maximum shank diameter (including the region outside the locking groove portion), the relevant diameter in the obviously modified Corbett fastener is even larger than D 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] (“[T]he shank 16 includes a cylindrical-shaped smooth portion 22..., a grooved portion 24..., and a first transition portion 26 located intermediate the smooth portion 22 and the grooved portion 24.”); Corbett, FIG. 1. 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).

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

122. 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)”).

123. In the obviously modified Corbett fastener, it was obvious to maintain Brewer’s “prefer[red]” relationship/ratio 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 claim 1 (“no greater than 4”), claim 2 (“no greater than 3.8”), claim 3 (“no greater than 2”), claim 16 (“no greater than 4”), and/or claim 17 (“no greater than 3.8”), for multiple reasons.

124. First, Brewer teaches that this relationship is “prefer[red].” Brewer, ¶[0025].

125. Second, Brewer’s single pull groove 20 and pulling shoulder 30 facilitate 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, i.e., diameter D. Brewer, ¶[00080] (listing exemplary D measurements). Fastener (e.g., bolts, swage fasteners) size nomenclature was commonly based on this diameter D, as was done in Brewer. 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.

126. Third, Brewer’s L:D relationship advantageously limits the installed pull region standout, which reduces the risk of having the protruding pull region unintentionally catch on an object or person. Fulbright, 8:23-24 (recognizing the known desire in the art to “minimize the necessary overall length of [a mandrel’s] pull portion”).

127. Fourth, Brewer's L:D relationship advantageously reduces the mandrel's material cost and weight by reducing the length L of the pull region relative to the shank diameter D (which is generally proportional to fastener nominal size).

128. Fifth, Brewer's L:D relationship (and relationship claimed in claims 1-3, 16-17) 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 (e.g., relative to nominal size), as taught by Brewer.

129. It was therefore obvious to have selected a pull region axial length (e.g., $L=0.936 D$; $L = 0.7 D$ to $1.2 D$) for the obviously modified Corbett fastener that was no greater than 4, 3.8, and/or 2 times a diameter of the shank region, as recited in claims 1-3 and 16-17.

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).

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

131. 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 obviously modified to pull Brewer’s pull region 20/80), as recited in limitation 1(e). *See* Section XII.A, above; Corbett, ¶¶[0012]-[0014]; Brewer, ¶¶ [0086]-[0091].

132. Ground A therefore renders obvious/unpatentable every limitation in claim 1.

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.”**

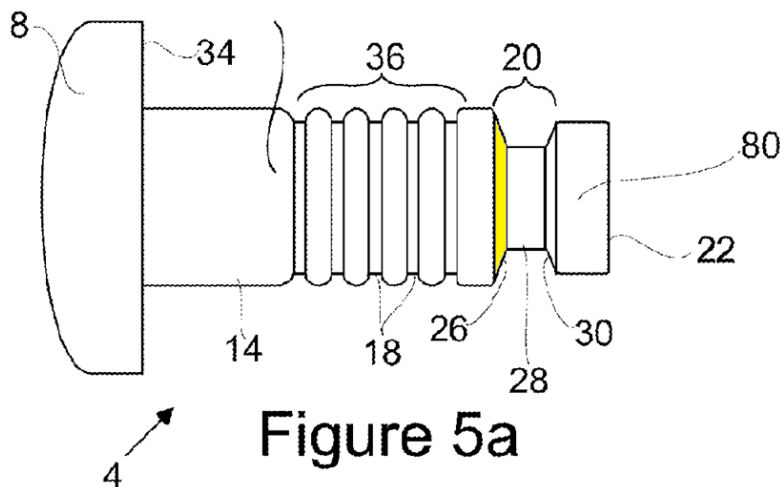
133. As explained above regarding limitation 1(d), the obviously modified Corbett fastener’s pull region 20/80 comprises an axial length (e.g., 0.936 D, 0.7-1.2 D) no greater than 3.8 (claim 2) or 2 (claim 3) times the diameter D of the shank region, as recited in claims 2-3.

134. Ground A therefore renders obvious/unpatentable every limitation in claims 2 and 3.

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

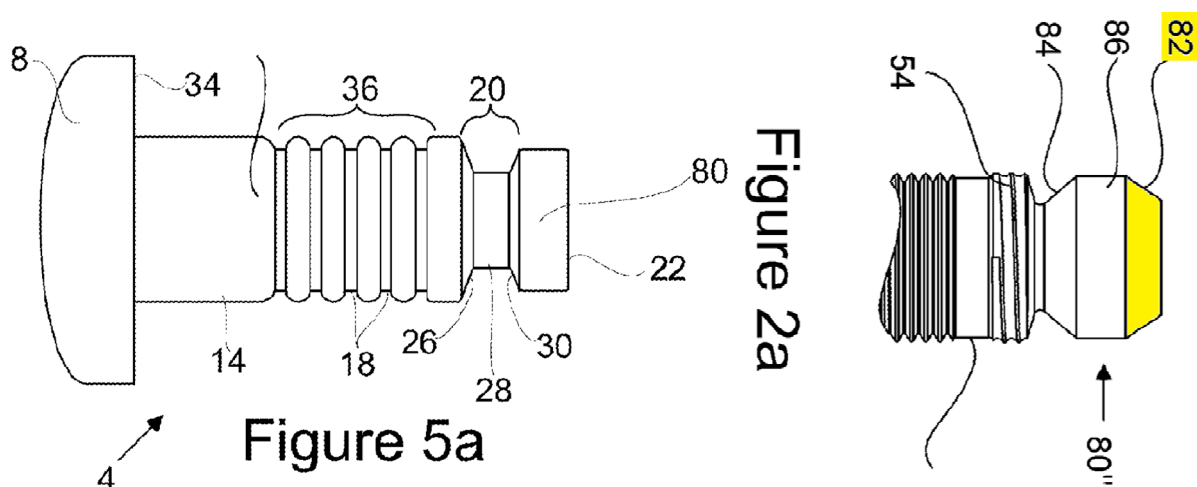
135. The obviously modified Corbett fastener’s pull region 20/80 comprises a **taper 26** (highlighted below) (or 30) extending from Corbett’s shank region

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[.]”); Section XII.A, above.



Brewer

136. 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].



Brewer

137. 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 the sharp angle of end portion 80, 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 for fastening. Brewer, ¶[0097]. In this alternative obvious modification to Corbett, the pull region 20/80" comprises a **taper 82** (or 84), as recited in claim 4.

138. Ground A therefore renders obvious/unpatentable every limitation in claim 4.

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

139. 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 of the fastener 10."); Brewer, ¶ [0092] ("[T]he end of the pin tail 6 [mandrel] does not break off during installation[.]"); Brewer, FIGS. 12-15 (illustrating installation method whereby the pin tail 6 does not break off). Since neither Corbett's nor Brewer's mandrel includes a breakneck groove, the obviously modified Corbett fastener's mandrel would likewise not comprise a breakneck groove.

140. Moreover, it was obvious to omit a breakneck groove because non-breakneck fasteners were well known alternatives to breakneck fasteners. Brewer, ¶ [0092]; Corbett, ¶[0014]. It was also obvious to omit a breakneck groove for the same reasons as explained below that it was obvious to omit a breakneck groove from the obviously modified Kleinman fastener.

141. Furthermore, during prosecution of the ‘358 Patent’s continuation, the USPTO found this no-breakneck-groove 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. 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.

142. Ground A therefore renders obvious/unpatentable every limitation in claim 5.

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.”

143. POSITAs were motivated to make Corbett’s (or Kleinman’s) mandrel from a strong, hard material of at least HRC 25 or 43 to resist damaging deformation when the sleeve is swaged onto the mandrel. After swaging, a hard mandrel (specifically its locking groove section), for example having a hardness of at least

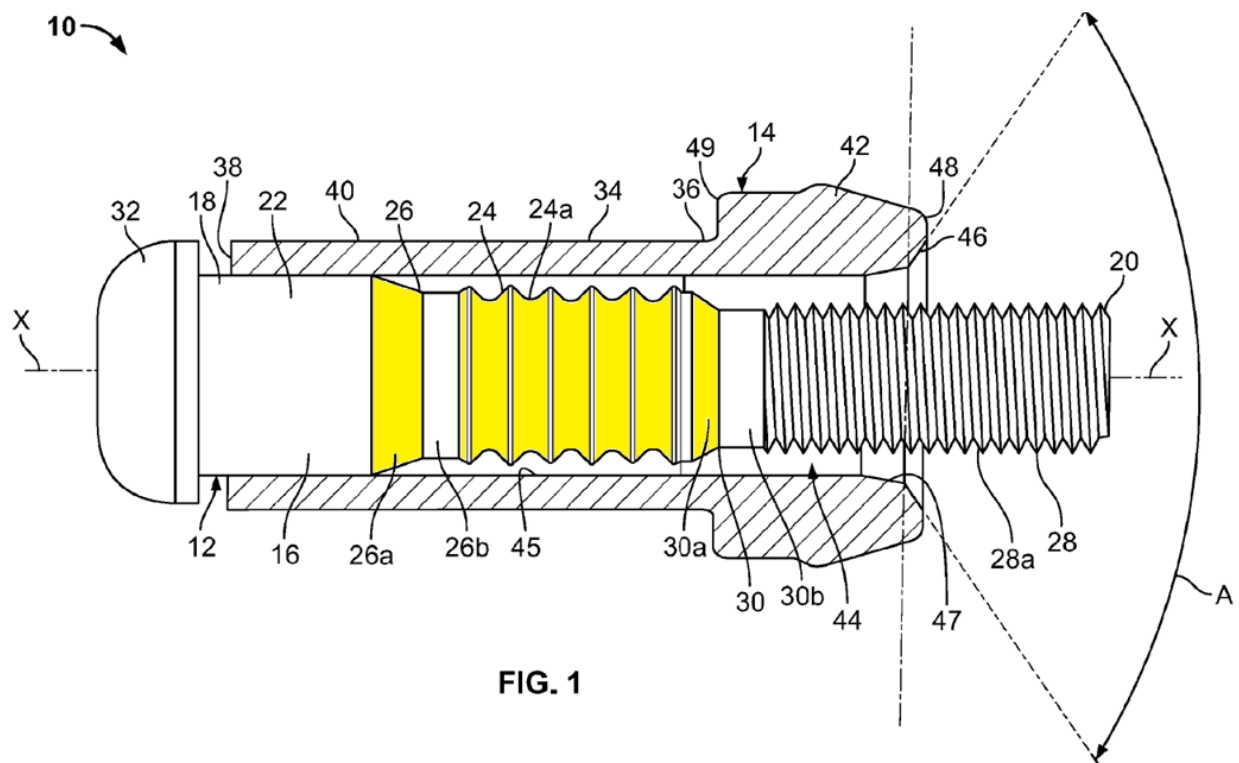
HRC 25 or 43, is better able to retain its shape to maintain the installed fastener's strength. Choosing "at least HRC 25" (claim 6) or "at least HRC 43" (claim 7) was also a mere matter of design choice and obvious optimization of a known result-effective parameter to avoid failure/crushing of the mandrel, particularly because such hard pins were well known to be advantageous in this field for these reasons. *See, e.g.*, Kendall, 3:25-42 (teaching that "a high hardness pin 12 made of alloy steel AISI 8740 and having a Rockwell hardness of around 49-52 Rc" provides "sufficient strength to withstand the frictional forces encountered during setting without significant yielding or wire drawing."); Fulbright, 8:17-28 (teaching that a mandrel pull region hardness of 48-54 Rc enhances "strength" and "minimize[s] the necessary overall length of the pull region"); European Patent No. 0 527 581 B1 (Ex. 1020) (published 1996), 12:35-46 (teaching, in connection with blind swage fasteners, that "[t]he strength of pin member[/mandrel/bolt] 12 is very significant and hence the pin member 12 can be constructed of a ferrous or other material having a Rockwell hardness of between around 38Rc to around 42Rc or higher such as a 4130 steel of aircraft quality" and that "4130 steel ha[s] a Rockwell hardness of between around 43Rc to around 47Rc"). 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.

144. Ground A therefore renders obvious/unpatentable every limitation in claims 6 and 7.

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.”**

145. 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.

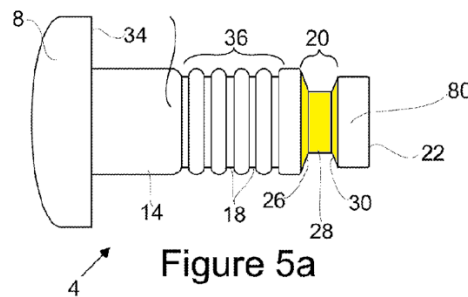


Corbett

146. Ground A therefore renders obvious/unpatentable every limitation in claim 8.

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.”**

147. 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] (“The single pull groove 20 includes a first tapered section 26 [and] a second tapered section 30[.]”).



148. Ground A therefore renders obvious/unpatentable every limitation in claim 9.

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

149. I have been informed that Petitioner asserts that this limitation is indefinite as to the scope of the term “generally” (both instances). The obviously modified Corbett fastener’s sleeve 14 and mandrel (highlighted below) (combination of 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. 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.

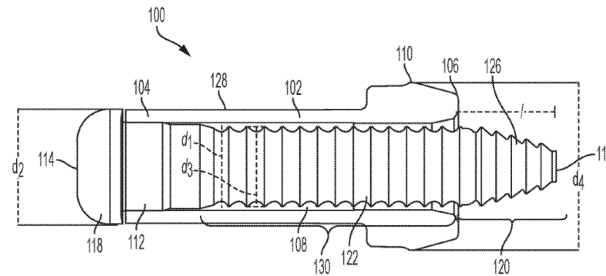


FIG. 1
'358 Patent

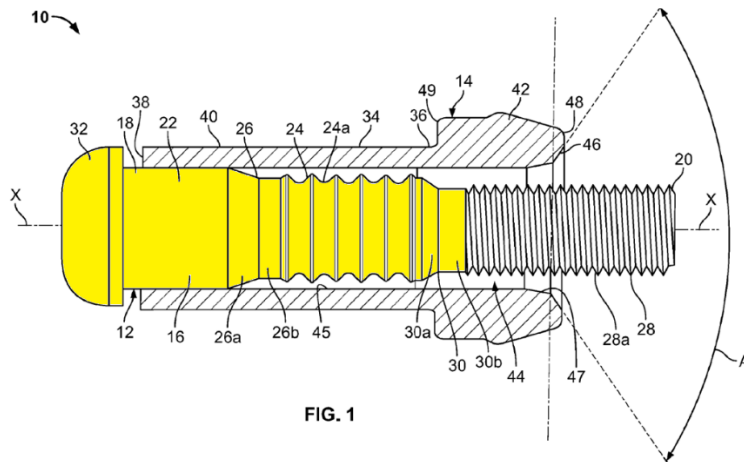


FIG. 1
Corbett

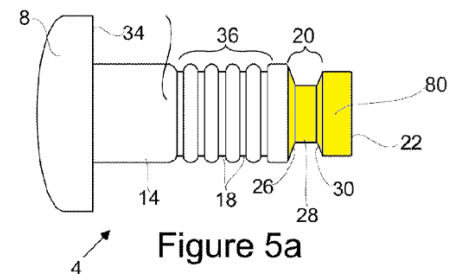


Figure 5a
Brewer

150. Ground A therefore renders obvious/unpatentable every limitation in claim 10.

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.”

151. Brewer taught that the mandrel/pin of swage fasteners like disclosed in Brewer and Corbett 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 be made from “stainless steel or aluminum” to avoid “a corrosion risk.” Brewer, ¶ [0040]. It was obvious in view of Brewer to make the mandrel in the obviously modified Corbett fastener from metal (e.g., stainless steel or aluminum) to provide easier roll-forming, superior strength, and/or corrosion resistance.

152. 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.

153. Ground A therefore renders obvious/unpatentable every limitation in claim 11.

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.”

154. The obviously modified Corbett blind fastener is adapted to be installed in a bore (“holes of the work pieces 52, 54”) 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. Moreover, the obviously modified Corbett fastener is capable of such use with the recited structure.

155. Ground A therefore renders obvious/unpatentable every limitation in claim 12.

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.”

156. The obviously modified Corbett fastener’s sleeve 14 comprises a collar (“head 42” (Corbett, ¶ [0010] and 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.

157. Ground A therefore renders obvious/unpatentable every limitation in claim 13.

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.”

158. It was well known to use fasteners like those disclosed in Corbett and/or Brewer 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. Moreover, nearly every structure comprises metal or a “composite material”

comprising multiple materials. It was obvious to use the obviously modified Corbett fastener on a structure 52, 54 comprising metal, a metal alloy, and/or a composite material because these are the types of structures typically secured using such fasteners. *See, e.g.*, Kleinman, ¶[0025] (“structural metal panels 42, 43”). 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.

159. Moreover, the obviously modified Corbett fastener is capable of being used on a structure 52, 54 comprising metal, a metal alloy, or a composite material, as recited in claim 14.

160. Ground A therefore renders obvious/unpatentable every limitation in claim 14.

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.”

161. It was known in the art to use fasteners like those disclosed in Corbett and/or Brewer to fasten together structures like “solar power plant structures” (Brewer, ¶ [0006]). Moreover, Corbett and Brewer disclose that their fasteners are used to fasten together two workpieces (Corbett’s “work pieces 52, 54”; Brewer’s “workpiece members 130 and 140”) of a structure that is a “construction component” by virtue of the fact that it was constructed from multiple workpieces. Corbett, FIG.

2, ¶[0011]; Brewer FIGS. 6-15, ¶[0082]. It was obvious to use the obviously modified Corbett fastener on such structures (e.g., Brewer’s “solar power plant structures”, Corbett’s workpieces 52, 54) because POSITAs would have appreciated that the modified Corbett fastener would be well suited for such fastening applications. As a result, with the obviously modified Corbett fastener, it was 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 multiple workpieces 52, 54), as recited in claim 15.

162. Moreover, 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.

163. Ground A therefore renders obvious/unpatentable every limitation in claim 15.

14.Claim 16

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

164. It was obvious to use the obviously modified Corbett fastener for fastening because that is the purpose of such fasteners. Use of the obviously modified Corbett fastener provides a method for fastening structures 52, 54, as

recited in limitation 16(a). *See* Corbett, FIG. 2; Corbett, ¶[0011] (“[T]he fastener 10 is adapted to secure a plurality of work pieces 52, 54 together.”).

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

165. 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 are used.

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”

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

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;”

167. 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.

168. Even if Corbett's jaws 66 and puller 62 were not part of a collet already (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 in Corbett and Brewer. Brewer, ¶¶[0086]-[0091] ("split collet 102") and FIGS. 12-15; Corbett, ¶[0012] ("puller 62 is a split collet"). 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 between the jaws 66. As a result, it was 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).

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"**

169. 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]; Section XII.A.11. (claim 13), above. 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."). 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.

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."

170. 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 XII.A.11. (claim 13), above.

171. Ground A therefore renders obvious/unpatentable every limitation in claim 16.

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.”

172. *See* above regarding the identical text in claim 2, so use of the obviously modified Corbett fastener 10 satisfies claim 17.

173. Ground A therefore renders obvious/unpatentable every limitation in claim 17.

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

174. 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.

175. Ground A therefore renders obvious/unpatentable every limitation in claim 18.

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

176. *See* above regarding the identical limitation in claim 5. Use of the obviously modified Corbett fastener 10 satisfies claim 19.

177. Ground A therefore renders obvious/unpatentable every limitation in claim 19.

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.”

178. *See* above regarding the identical limitation in claim 11. Use of the obviously modified Corbett fastener satisfies claim 20.

179. Ground A therefore renders obvious/unpatentable every limitation in claim 20.

19. Conclusion As To Ground A

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

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

181. 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 to satisfy claims 6-7, 11, and 20, which 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.

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.

182. Kendall taught, in connection with blind swage 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" provides "sufficient strength to withstand the frictional forces encountered during setting without significant yielding or wire drawing." Kendall (Ex. 1005), 3:25-42. Fulbright taught, in connection with a swage fastener like Corbett's or Kleinman's, that hardening a "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; ¶74, above. Kendall's and Fulbright's "Rc" is the same as the '358 Patent's "HRC." Both refer to Rockwell hardness C. It was obvious to form the mandrel (a.k.a. pin) of the obviously modified Corbett (or Kleinman) fastener from alloy steel with at least HRC 25 (claim 6) or at least HRC 43 (claim 7), as taught by Kendall of Fulbright, to provide sufficient strength to withstand the pulling (e.g., to

form the blind head), swaging of the sleeve/collar into the locking grooves of the mandrel, and/or frictional forces encountered during setting without significant yielding or wire drawing of the mandrel/pin. Ex. 1007, p. 6 (USPTO finding, in connection with a continuation of the '358 Patent, that it was obvious to modify a blind swage fastener's pin/mandrel to comprise metal with a hardness "greater than Rockwell 45 Hrc" in view of Kendall's teaching that "the material [is] well suited for blind fastener[s]").

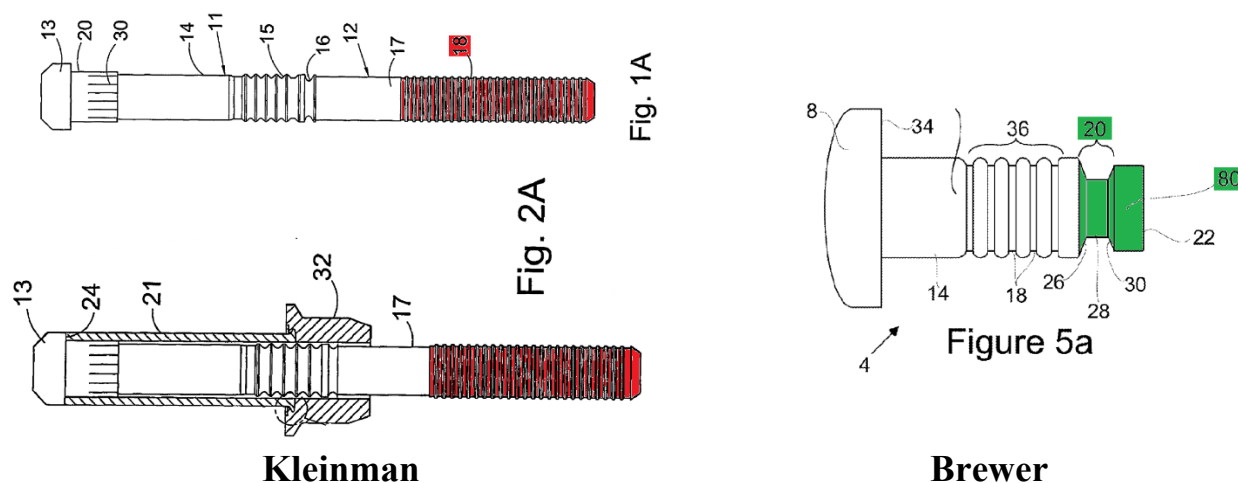
183. Moreover, selecting a fastener material comprising metal (claims 11, 20) and/or having "at least HRC 25" (claim 6) or "at least HRC 43" (claim 7) was a mere matter of obvious design choice and optimization of a known result-effective parameter (hardness) to avoid failure/crushing of the mandrel. 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.

184. It was obvious to use the obviously modified Corbett fastener on a structure comprising metal, as recited in claim 14, because Kendall taught that such fasteners were well suited for use on structures comprising metal (e.g., "aluminum"). Kendall, 3:44-45.

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

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

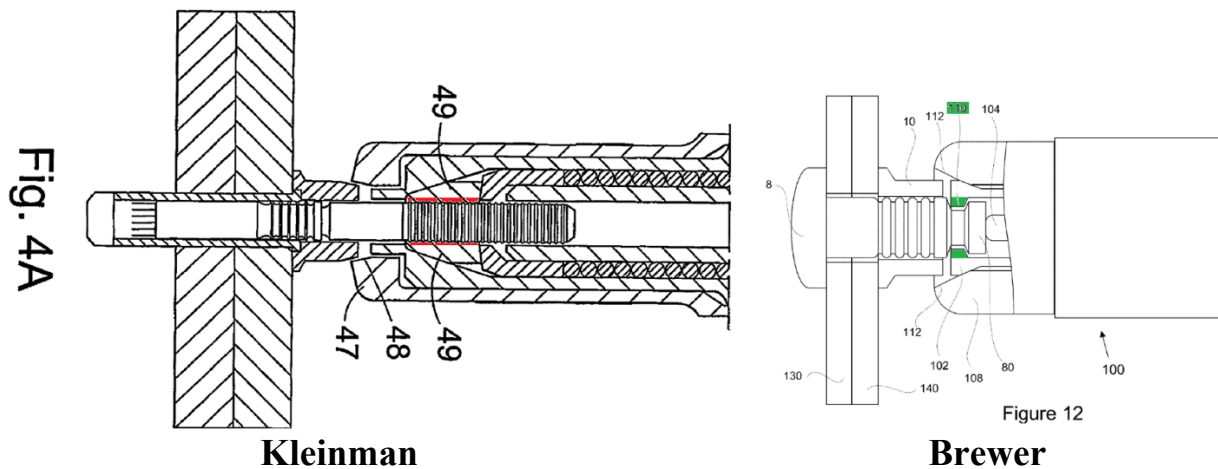
186. Kleinman's blind swage fastener has a pull region with multiple grooves. It was obvious to modify Kleinman's blind swage fastener and installation tool in view of Brewer in the same manner and for the same reasons as discussed above in Section XII.A that it was obvious to so modify Corbett. Thus, as shown below, it was obvious to modify Kleinman's fastener in view of Brewer by replacing the **multiple pull grooves** of Kleinman's multi-grooved "pulling groove portion 18" (Kleinman, ¶[0018]) with Brewer's **single-groove pull region 20/80**.



It was obvious to axially size Kleinman's shank region 14/15/17/20 (e.g., by shortening Kleinman's straight portion 17) 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 in further detail below in Section XII.C.1.d.i..

187. As shown below, it was also obvious to correspondingly modify Kleinman's installation tool by replacing the **multiple 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.



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 102 to install the modified Kleinman fastener with a single groove pull region 20/80, as explained in greater detail below in paragraph 254.

188. POSITAs would be motivated to make these modifications in view of Brewer for the same reasons as with Corbett, as explained above in Section XII.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; improving the tool's engagement with the pull region; and/or providing quicker and simpler installation). Brewer, ¶¶[0003]-[0011], [0015]-[0017], [0072]; Brewer, FIGS. 8, 12; Sections X.B, X.C., XII.A, above.

189. 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 in Section XII.C.4 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. 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]. 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.

190. 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] ("In the embodiment discussed above, the end of the pin tail 6 does not break off during installation.... However, in the alternative embodiment ... in FIG. 16, the end portion 80' of the pin tail 6' is caused to break off during installation[.]").

191. The obviously modified Kleinman fastener and installation tool satisfies every limitation in claims 1-20.

1. Claim 1

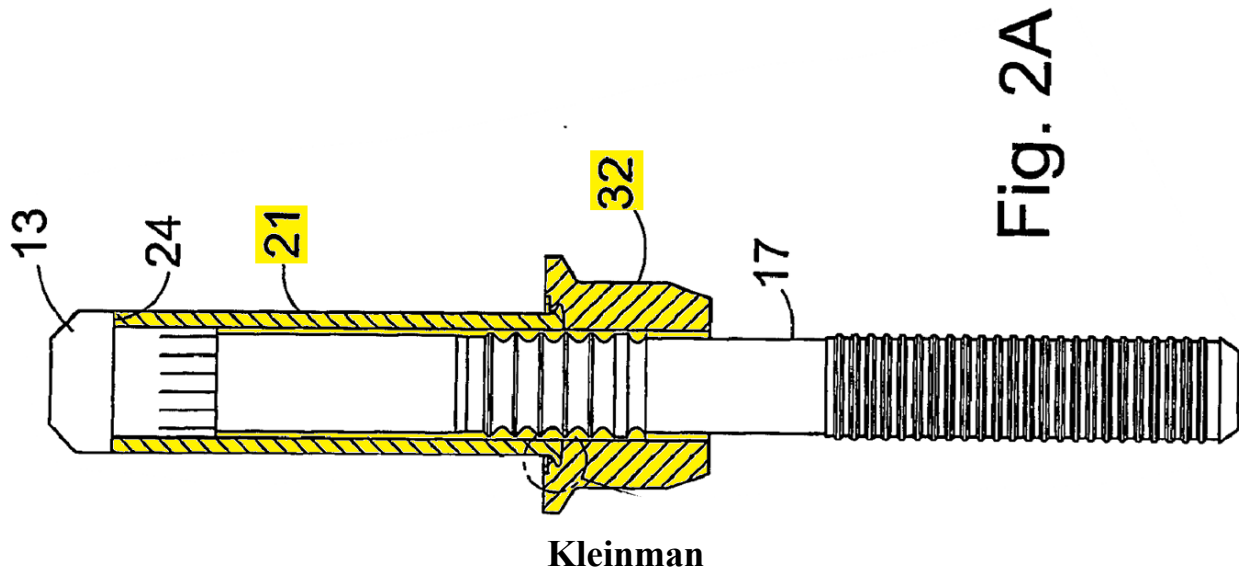
a. Limitation 1(a): "A blind fastener comprising:"

192. The obviously modified Kleinman fastener is a "blind fastener" (Kleinman, title, ¶[0007]), as recited in limitation 1(a). Kleinman, FIGS. 2A, 3-5, ¶¶[0031]-[0032].

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"

193. As highlighted below, the obviously modified Kleinman fastener includes a sleeve 21/32 comprising a first sleeve end (left/blind end shown below),

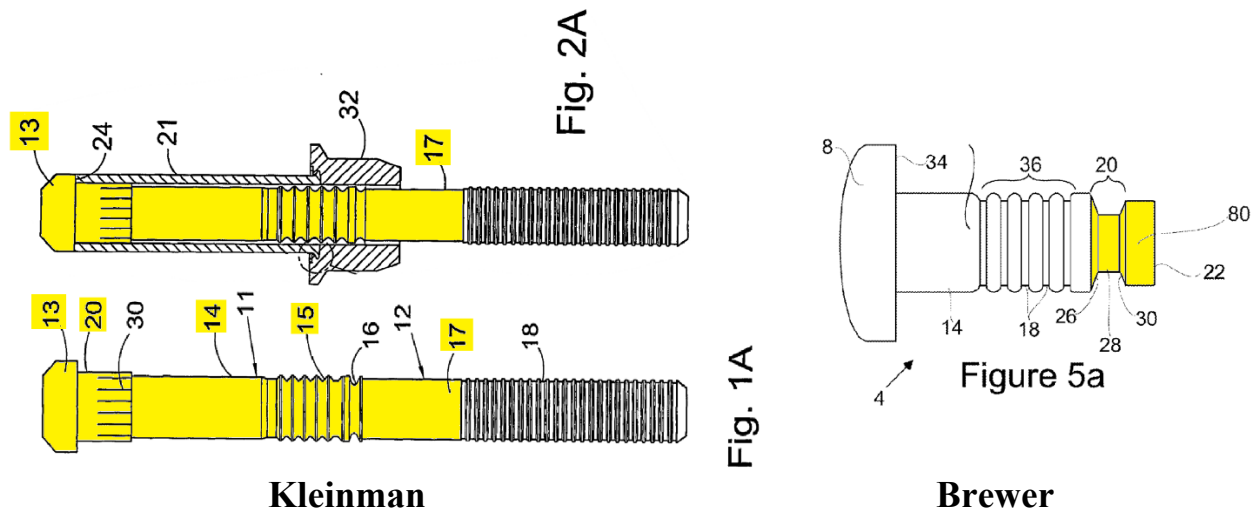
a second sleeve end (right, collar 32 end shown below), and a cavity extending from the first sleeve end to the second sleeve end, as recited in limitation 1(b). Kleinman, ¶¶[0020]-[0023], FIG. 2A.



- 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,”

194. 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.



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

195. 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

196. 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 XII.A.1.d.i.

197. 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 XII.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.

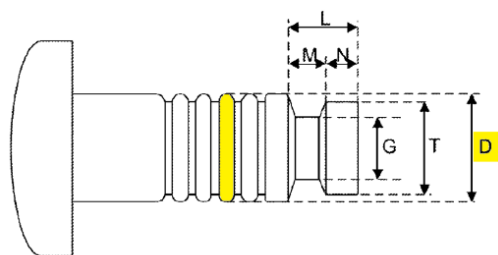
198. As a result, under either construction of "pull region," it was obvious to have the axial length of the pull region be Brewer's length L.

199. Alternatively, it was also obvious to have the pull region 20/80 in the obviously modified Kleinman fastener standout from the sleeve 21/32 by 0.947-0.986 times the shank diameter D for the same reasons as explained above in Section XII.A.1.d.i regarding Corbett. In such a case, the overall standout would be 0.947-0.986 times the shank diameter D. As a result, if the axial length of the pull region was defined by standout (contrary to my opinion as explained above), the resulting axial length would be 0.947-0.986 times the shank diameter D, which falls within the dimensional relationship recited in this limitation 1(d) and claims 2-3 and 16-17.

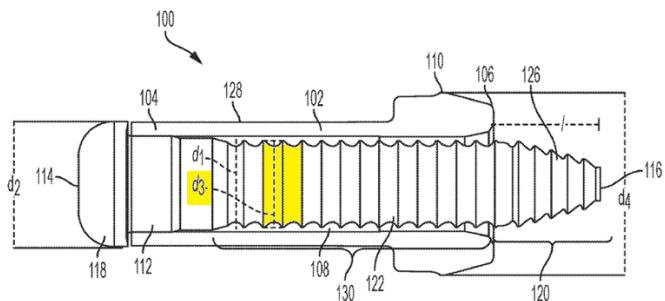
ii. "A Diameter [D] Of The Shank Region" in Brewer

200. As shown below and/or explained above in Section XII.A.1.d.ii, Brewer's diameter D and the maximum diameter D of Kleinman's locking portion

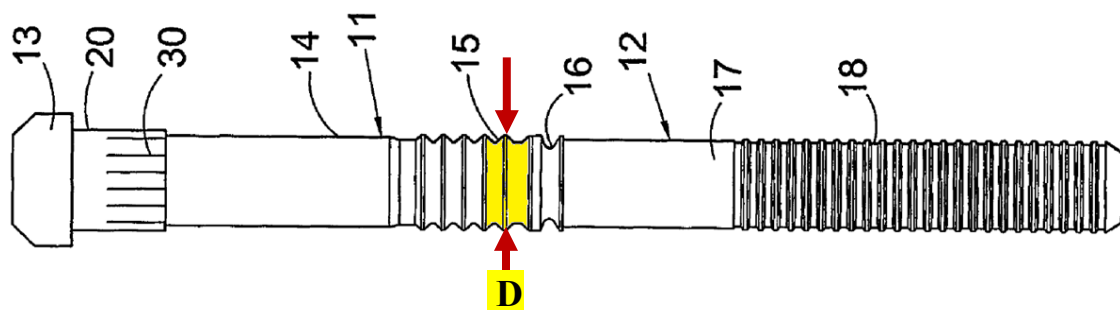
15 both correspond to the '358 Patent's **diameter d_3** , so Brewer's and Kleinman's diameters D are the claimed “diameter of the shank portion.”



Brewer, FIG. 5b



'358 Patent, FIG. 1



Kleinman (annotated)

Fig. 1A

201. If the claimed “diameter” meant maximum diameter of the shank (not limited to the locking portion), 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 the locking groove portion 15 of Kleinman’s shank (or the locking groove portion 36 of Brewer’s shank). Kleinman, ¶[0020], FIG. 1A. 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).

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

202. 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)").

203. In the obviously modified Kleinman fastener, it was obvious to maintain Brewer's preferred dimensional relationship/ratio 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 claim 1 ("no greater than 4"), claim 2 ("no greater than 3.8"), claim 3 ("no greater than 2"), claim 16 ("no greater than 4"), and/or claim 17 ("no greater than 3.8"), for the same reasons as explained above in Section XII.A.1.d.iii regarding Corbett, e.g.: it is "prefer[red];" Brewer's single pull groove 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].

204. As a result, the obviously modified Kleinman 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).

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

205. 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 Brewer's obviously modified installation tool (see paragraph 254, below)), as recited in limitation 1(e). *See* Sections X.B, VIII, XII.C, above; Kleinman, FIGS. 3-5, ¶¶[0030]-[0033]; Brewer, ¶¶[0086]-[0091].

206. Ground C therefore renders obvious/unpatentable every limitation in claim 1.

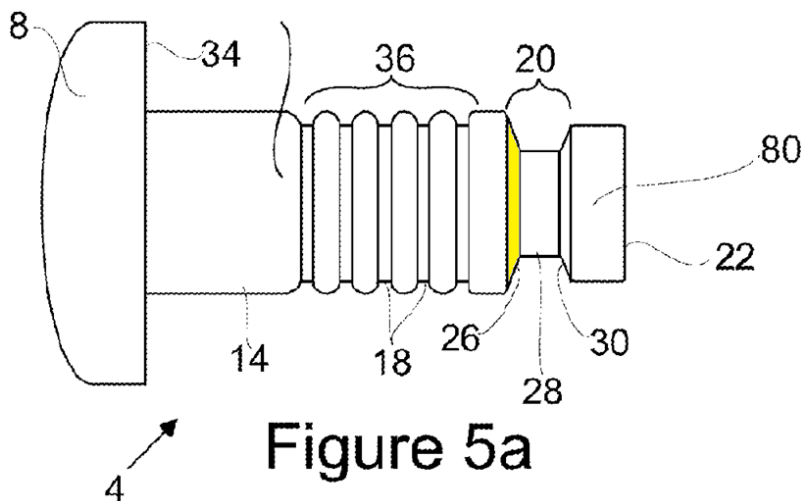
2. Claims 2-3: “2. The blind fastener of claim 1, wherein the pull region comprises an axial length no greater than 3.8 times the diameter of the shank region.”; “3. The blind fastener of claim 1, wherein the pull region comprises an axial length no greater than 2 times the diameter of the shank region.”

207. As explained above regarding limitation 1(d), in the obviously modified Kleinman fastener, the 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.

208. Ground C therefore renders obvious/unpatentable every limitation in claims 2-3.

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

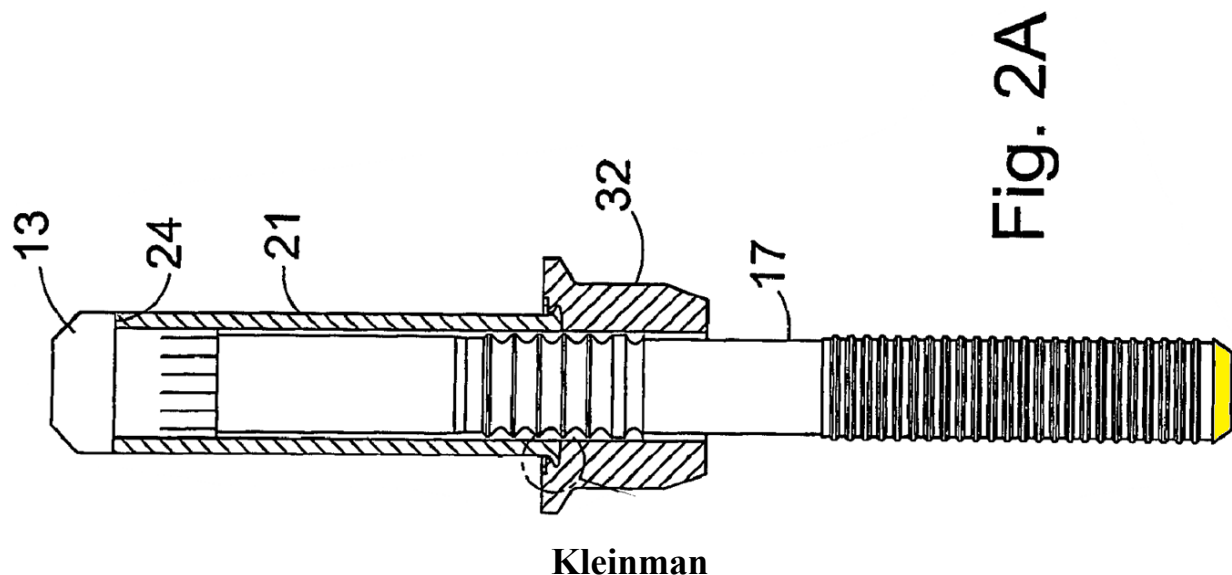
209. In the obviously modified Kleinman fastener, the pull region 20/80 comprises a **taper 26** (highlighted below) (or 30) extending from Kleinman’s shank region, as recited in claim 4. *See* Brewer, ¶[0081] (“The single pull groove 20 includes a first **tapered section 26** [and] a second tapered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



Brewer

210. 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 XII.A.3 that it was obvious to so with the obviously modified Corbett fastener. Brewer, ¶[0097].

211. As shown below, POSITAs would have also understood the tapered tip of Kleinman's pull region to have been similar benefits as Brewer's taper 82 (e.g., avoiding sharp edges, guiding the installation tool, reducing weight or cost (see Section XII.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.



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

213. 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.

214. Ground C therefore renders obvious/unpatentable every limitation in claim 4.

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

215. 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 in the art. Brewer, ¶[0092], FIGS. 15-16; *see also* Brewer, ¶¶[0082]-[0091].

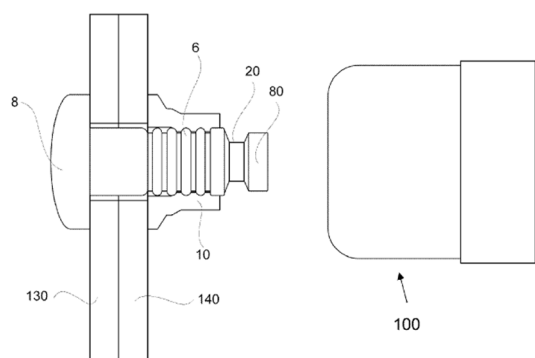


Figure 15

Non-breakneck Pull Region 20/80

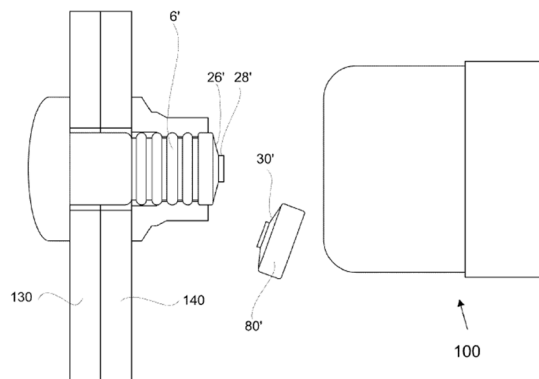


Figure 16

Breakneck Pull Region 20/80'

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

217. 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.

218. *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. Incorporating Brewer's short pull region 20/80 results in a short installed standout, thereby negating the rationale for using Kleinman's breakneck groove 16.

219. *Second*, non-breakneck fasteners can be advantageously be installed using less tool force because the tool need not generate the additional force needed to break the breakneck 16. 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 the use of smaller, lighter, less expensive installation tools. It was obvious to use Brewer's installation tool (see paragraph 254, below), which is already and/or obviously designed not to break the shank, or modify Kleinman's installation tool for non-breakneck use by setting the tool's pull force be less than the tensile strength of the weakest portion of the shank, as taught by Brewer in connection with Brewer's non-breakneck embodiments, so that the mandrel does not break during installation. Brewer, ¶¶[0086]-[0092] and FIGS. 10-16.

220. *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).

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

222. *Fifth*, eliminating Kleinman's breakneck advantageously facilitates the use 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.

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

224. *Seventh*, Brewer taught that breakneck and non-breakneck swage fasteners were known alternatives. Brewer, ¶[0092]. Moreover, as shown below, blind fasteners with a breakneck groove 18 (below, left) or with "no" breakneck groove (below, right) were well-known alternatives. USPAP 2005/0260056 A1 (published 10/11/01) (Ex. 1014) ("Denham"), FIGS. 1-18, ¶¶[0017], [0025]; U.S. Pat. No. 4,907,922 (Ex. 1015) ("Jeal"), 1:34-40 ("[T]he stem may be formed with a breakneck[.]"); 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.").

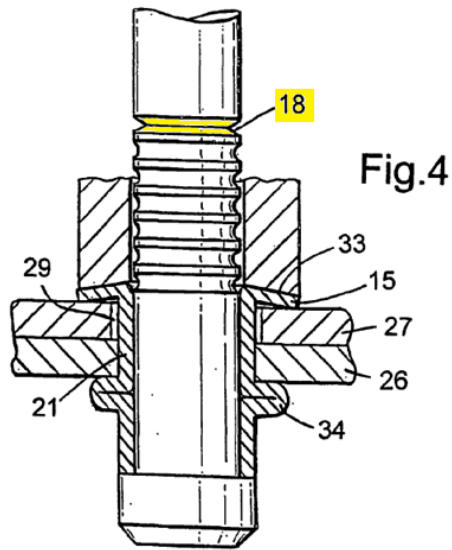
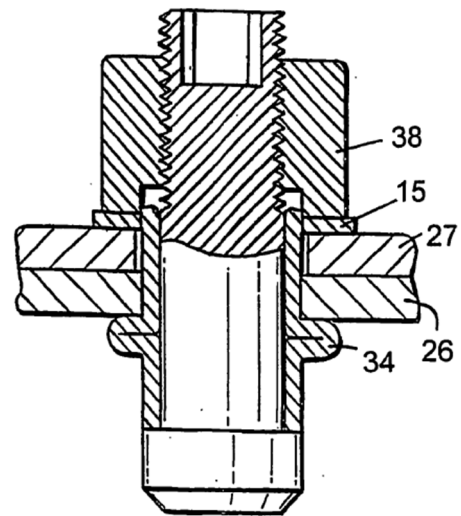


Fig.18



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 Int’l. Co. v. Teleflex Inc.*, 550 U.S. 398, 417-18 (2007).

225. During prosecution of a continuation of the ‘358 Patent, the USPTO found this “no breakneck groove” limitation to be 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 amount of force applied by

the fastening tool. 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 XII.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’), so the obviously modified Kleinman fastener’s mandrel – even with the breakneck 16 –is capable of being installed without breaking the groove 16 (or 20’).

226. For any of the above reasons, the obviously modified Kleinman fastener’s mandrel does not comprise a breakneck groove, as recited in claim 5.

227. Ground C therefore renders obvious/unpatentable every limitation in claim 5.

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.”

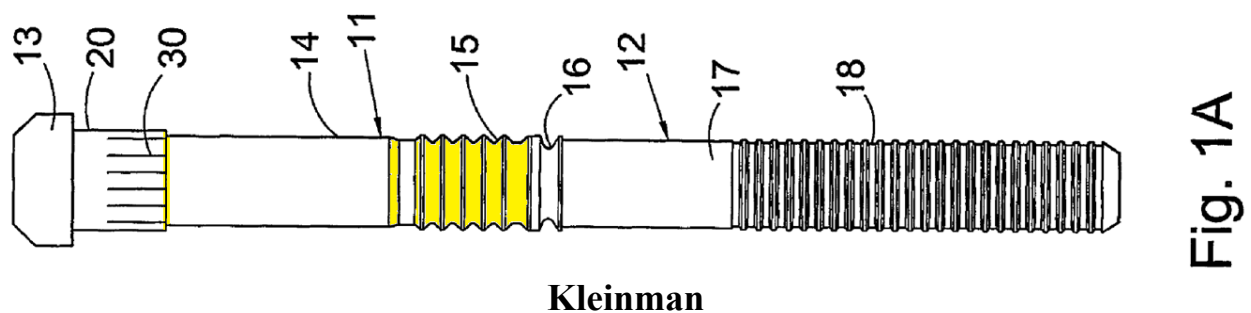
228. POSITAs were motivated to make Kleinman’s mandrel from a strong, hard material of at least HRC 25 or 43 for the same reasons as explained above that it was obvious to do so with Corbett (e.g., to resist damaging deformation when the sleeve is swaged onto the mandrel, obvious hardness optimization). 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. As a result, in the obviously modified Kleinman fastener, 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.

229. Ground C therefore renders obvious/unpatentable every limitation in claim 6-7.

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.”

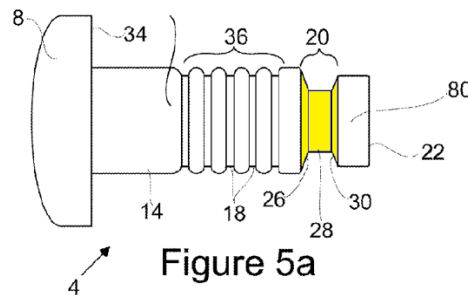
230. The obviously modified Kleinman fastener’s shank region 14/15/17/20 comprises an annular shoulder at the **transition** between portions 14/20 and at a **transition** between portions 14/15 and **grooves** in grooved portion 15, any of which satisfy claim 8. Corbett, ¶[0009], FIG. 1.



231. Ground C therefore renders obvious/unpatentable every limitation in claim 8.

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.”**

232. 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. *See* Brewer, ¶ [0072] (“pull groove 20”); Brewer, ¶[0081] (“The single pull groove 20 includes a first tapered section 26 [and] a second tapered section 30[.]”); Brewer, FIG. 5a.



233. Ground C therefore renders obvious/unpatentable every limitation in claim 9.

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

234. I have been informed that Petitioner asserts that this limitation is indefinite as to the scope of the term “generally” (both instances). In the obviously modified Kleinman fastener, the 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. To the extent 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.

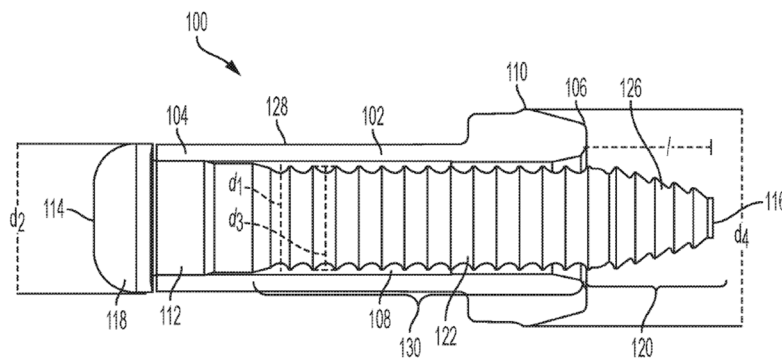
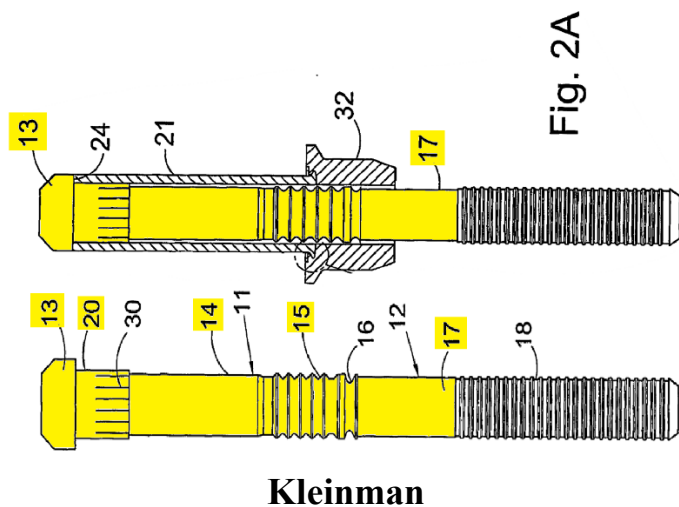
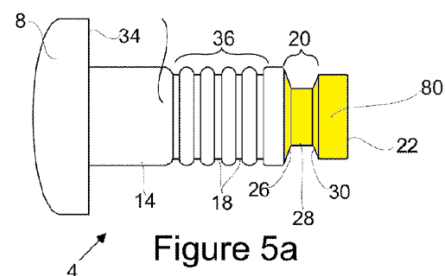


FIG. 1
'358 Patent



Kleinman

Fig. 1A



Brewer

235. Ground C therefore renders obvious/unpatentable every limitation in claim 10.

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.”

236. 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.

237. 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 XII.A.9. that it was obvious modify Corbett’s to do so, e.g., to provide easier roll-forming, superior strength, or corrosion resistance for the mandrel. Brewer, ¶¶[0040], [0098]; Kleinman, ¶[0020].

238. 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.

239. Ground C therefore renders obvious/unpatentable every limitation in claim 11.

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.”

240. 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 (“metal 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” of sleeve into aperture 44); Kleinman, ¶[0030] (fastener “inserted in a workpiece in the normal way as illustrated in FIG. 3A”); Kleinman, ¶[0032]. Moreover, the obviously modified Kleinman fastener is capable of such use.

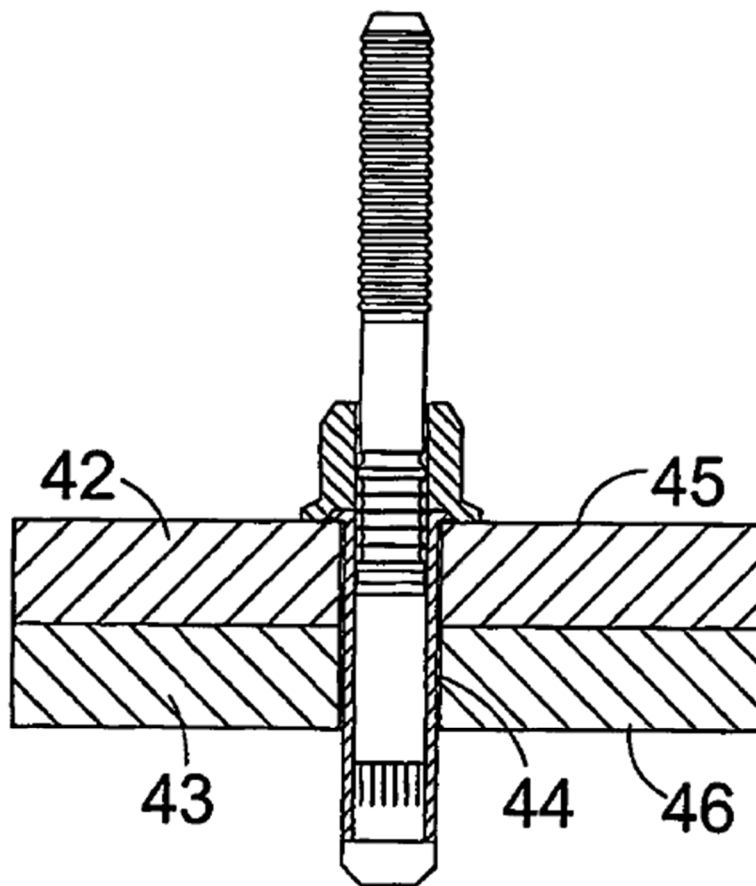


Fig.3A

Kleinman

241. Ground C therefore renders obvious/unpatentable every limitation in claim 12.

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.”

242. 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 VIII, above.

243. Ground C therefore renders obvious/unpatentable every limitation in claim 13.

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.”

244. 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 XII.A.12. that it was obvious to do so with the obviously modified Corbett fastener.

245. Moreover, the obviously modified Kleinman fastener is capable of being used on metal panels 42, 43.

246. Ground C therefore renders obvious/unpatentable every limitation in claim 14 in multiple ways.

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.”

247. It was obvious to use the obviously modified Kleinman fastener on a structure 42, 43 “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 such as “solar power plant structures” (Brewer, ¶[0006]) or “structural meal panels 42, 43” (Kleinman, ¶[0025])) for the same reasons as explained above in Section XII.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.

248. Moreover, 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.

249. Ground C therefore renders obvious/unpatentable every limitation in claim 15 in multiple ways.

14.Claim 16

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

250. It was obvious to use the obviously modified Kleinman fastener for fastening because that is the purpose of such fasteners. Use of the obviously modified Kleinman fastener provides a method for fastening structures 42, 43, as recited in limitation 16(a). *See* 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,”

251. 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.

- 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”

252. See above regarding the identical text in limitations 1(b)-1(e). 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;”

253. 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] (“split collet 102”) and FIGS. 12-15. Moreover, it was obvious to incorporate Kleinman’s jaws 49 into a collet 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 objects having a standard size. 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 in the art.

254. 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 Brewer's tool 100 is well suited for such use and both tools function in substantially the same way (i.e., by gripping the pull region and pulling it relative to an anvil to form the fastener and swage the sleeve's collar onto the mandrel). Brewer, ¶¶[0082]-[0091]. For example, it was obvious to set Brewer's installation tool's pulling stroke length to be long enough that both (1) a first portion of the stroke pulls Kleinman's mandrel relative to the sleeve to form the blind head 49 (Kleinman, FIGS. 4A-5A), and (2) a second portion of the stroke swages Kleinman's collar 32 onto the locking portion 15 (Kleinman, FIGS. 5A-5B), as taught by Kleinman. It was likewise obvious to have Brewer's installation tool's pull force be sufficient to swage Kleinman's collar 32 onto the

locking portion 15, as taught by Kleinman and Brewer. Kleinman, FIGS. 5A-5B; Brewer, FIGS. 9-15.

255. Either way, it was obvious to engage a collet 49 and/or 102 of the installation tool with the pull region 20/80 of the obviously modified Kleinman blind fastener, as recited in limitation 16(d).

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”

256. 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 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] and FIGS. 9-15; Section XII.C.11 (claim 13), above. 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 VIII, above. 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 standout equals L), this distal movement results in the entire pull region 20/80 protruding distally from the sleeve end 32.

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.”

257. 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 XII.C.11 (claim 13), above.

258. Ground C therefore renders obvious/unpatentable every limitation in claim 16.

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.”

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

260. Ground C therefore renders obvious/unpatentable every limitation in claim 17.

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

261. 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.

262. Ground C therefore renders obvious/unpatentable every limitation in claim 18.

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

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

264. Ground C therefore renders obvious/unpatentable every limitation in claim 19.

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.”

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

266. Ground C therefore renders obvious/unpatentable every limitation in claim

19. Conclusion As To Ground C

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

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

268. 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.

(emphasis added).

269. If not already obvious over Kleinman in view of Brewer (as explained above in Ground C), it was obvious to further 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 XII.B that it was obvious to modify Corbett's fastener in view of Kendall to satisfy these claims, e.g., to provide sufficient strength to withstand the pulling, swaging, and/or frictional forces encountered during setting without significant yielding or wire drawing of the mandrel/pin. 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 using ferrous mandrel with 44+ Rc pull region).

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

E. Secondary Considerations

271. I understand that that secondary considerations of non-obviousness are not part of the prima facie obviousness analysis but can be used to rebut allegations of obviousness.

272. To the extent Patent Owner attempts to rely on any secondary considerations of non-obviousness, I reserve the right to address those at a later time.

273. I am not aware of any secondary considerations that would weigh in favor of finding the Challenged Claims nonobvious.

274. For example, the Challenged Claims did not solve any long felt but unresolved need. Rather, as explained above, Brewer already solved the problem to which the Challenged Claims were focused, e.g., a swage fastener with a short pull region. Similarly, as explained above, Corbett, Kleinman, and/or Brewer already solved the additional problems to which the Challenged Claims were directed, e.g., a swage fastener (e.g., a blind swage fastener) with a short pull region (relative to a diameter of the shank) that can be effectively installed using an installation tool. For the same reasons, I am not aware of any failure of others to solve the problem identified by the named inventors; commercial success; copying; any unexpected results resulting from the chosen solution, which was known in the art; or any industry recognition or praise regarding this particular claimed invention.

275. Even if evidence of secondary considerations existed and had a nexus to the challenged claims, in my opinion, they would be insufficient to overcome the clear obviousness of the challenged claims, as explained above.

F. Conclusion As To Obviousness

276. In view of this record, claims 1-20 were obvious/unpatentable over Grounds A-D.

XIII. CONCLUDING REMARKS

277. In summary and in view of the above considerations, I find that a POSITA would have found that: (A) claims 1-20 were obvious over Corbett in view

of Brewer; (B) claims 6-7, 11, and 20 were obvious over Corbett in view of Brewer and Kendall; (C) claims 1-20 were obvious over Kleinman in view of Brewer; and (D) claims 6-7, 11, and 20 were obvious over Kleinman in view of Brewer and Kendall.

278. I understand that any additional rulings regarding claim construction, any change in position on claim construction by the parties, or on receipt of any additional relevant information, may require me to amend or supplement my opinions. I will do so in a timely manner should a response to that additional information, changed position on claim construction, or ruling relevant to claim construction be warranted.

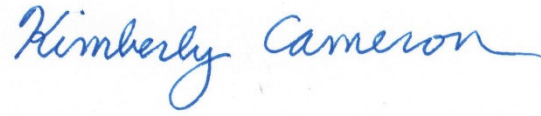
279. In signing this declaration, I understand that the declaration will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I acknowledge that I may be subject to cross-examination in this case and that cross-examination will take place within the United States. If cross-examination is required of me, I will appear for cross-examination within the United States during the time allotted for cross-examination.

280. I declare that all statements made herein of my knowledge are true, and that all statements made on information and belief are believed to be true, and that these statements were made with the knowledge that willful false statements and the

like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

[SIGNATURE ON FOLLOWING PAGE]

Dated: October 21, 2025



Kimberly K. Cameron, Ph.D.

Attachment: Appendix A (Curriculum Vitae of Kim Cameron)

Appendix A



KIMBERLY K. CAMERON, Ph.D., P.E.

PRINCIPAL

kkcameron@engsys.com

Dr. Kimberly Cameron is a Principal for ESi in the Mechanics and Materials practice. She specializes in design, failure analysis, and risk assessments of engineering structures and components. She has conducted hundreds of investigations on a wide variety of engineering structures, from miniature biomedical devices to large scale process equipment. She has also taught classes for engineers preparing to take the fundamentals of engineering exam and the professional engineering licensing examination in both Civil Engineering and Mechanical Engineering.

Dr. Cameron has performed multidisciplinary investigations on biomedical devices, pipelines, consumer electronics, consumer products, aircraft structures, industrial machinery, heat exchangers and cooling fins, refrigeration products, power-plant components, solar panels, pressure vessels, and vehicle components. The common thread in each of Dr. Cameron's investigations is the application of the fundamentals of metallurgy, materials science, engineering physics, computational mathematics, and engineering mechanics to help understand and solve complex problems.

Dr. Cameron is a registered patent agent, with experience in both the patent application process, as well as intellectual property disputes. In particular, she has experience in biomedical, automotive, electrical, mechanical, and materials science fields and has provided numerous invalidity and infringement reports. She has testified in federal and state court as well as in front of the ITC and in arbitration.

Areas of Specialization

Metallurgy	Product Design	Biomedical Devices
Plastics & Composites	Structural Engineering	Oil & Gas
Corrosion	Product Recalls	Energy & Power
Materials Selection	Root Cause Investigations	Consumer Products & Electronics
Mechanical Engineering	Regulatory Compliance	Automotive & Aviation
Intellectual Property Matters	Failure Analysis	Electrical Equipment

Education

Ph.D. Mechanical Engineering, minor Materials Science & Engineering, Stanford University, CA, 2004

M.S. Mechanical Engineering, Stanford University, CA, 2000

B.S.E. Mechanical and Aerospace Engineering. Certificates: Engineering Physics, Applied & Computational Mathematics, Materials Science & Engineering, Woodrow Wilson School of Public Policy & International Affairs, Princeton University, NJ, 1999

Licensed Professional Engineer (P.E.)

Mechanical Engineer, State of California License No. 33732

Metallurgical Engineer, State of California.....License No. 1969

Professional Affiliations/Honors

American Society of Mechanical Engineers

Member

TMS

Member

Department of Defense

Fellowship

National Science Foundation

Fellowship

Lucent Technologies

Graduate Fellowship

Positions Held

Engineering Systems Inc., Sunnyvale, California

Principal, Mechanics, 2011 – Present

Exponent, Menlo Park, California

Senior Engineer, Mechanics & Metallurgy, 2004 – 2011

Publications/Presentations

“Crack Growth and Arrest in Steam Turbine Casings,” EPRI 3002003504, EPRI, Palo Alto, CA, December 2014.

M. H. Anderson, D. Cislo, J. Saavedra, and **K. Cameron**, Why International Inventors Might Want to Consider Filing Their First Patent Application at the United States Patent Office & the Convergence of Patent Harmonization and E-Commerce, 30 Santa Clara High Tech. L.J. 555 (2014).

“Increasing Reliability of Small Punch Fracture Toughness Testing with Acoustic Emission Monitoring,” Proceedings, 3rd International Conference on Small Sample Test Techniques, September 2014. (with D. Purdy and J. Foulds).

“Small Punch Fracture Toughness Evaluation of Combustion Turbine Materials,” EPRI 3002001468, EPRI, Palo Alto, CA, December 2013. (with D. Purdy, J. Foulds and J. Rodgers).

“Small Punch Testing for Fracture Toughness” by J. Foulds, J. Rodgers, **K. Cameron** and P. Sullivan, EPRI, Palo Alto, CA: 2013. 3002000250.

“The Effect of Low Sulfur Content on the Weldability of Linepipe Steel” by **K. Cameron** and A.M. Pettinger, Proceedings of the 9th International Pipeline Conference, September 2012.

- “Effectiveness of Hydrostatic Testing for High Strength Pipe Material” by **K.K. Cameron** & A.M. Pettinger, Proceedings, 8th International Pipeline Conference, October 2010.
- “Axial Loads from Soil Movement Challenge Pipeline Integrity” by **K.K. Cameron** & A.M. Pettinger, PipeLine Gas Technology, November 2009.
- “Assessing Pipeline Integrity Using Fracture Mechanics and Currently Available Inspections Tools” by **K.K. Cameron** & A.M. Pettinger, Journal of Pipeline Engineering, October 2009.
- “Assessing Pipeline Integrity Using Fracture Mechanics and Currently Available Inspections Tools” by **K.K. Cameron** & A.M. Pettinger, Proceedings, 2008 Evaluation and Rehabilitation of Pipelines Conference, Clarion Technical Conferences, Scientific Surveys Ltd., Prague, Czech Republic, October 2008.
- “Fatigue Damage in Bulk Metallic Glass I: Simulation” by **K.K. Cameron** & R. Dauskardt, Scripta Materialia 2006; 54(3):349–353.
- “Fundamentals of Engineering in a Flash” by **K.K. Cameron**, PPI, August 2006.
- “Transmission Electron Microscopy Structure and Platinum-like Temperature Coefficient of Resistance in a Ruthenate-Based Thick Film Resistor with Copper Oxide” by **K.K. Cameron**, G. Crosbie, J. Jiang, & X. Pan, J. Appl. Phys. 2000; 88:1124–1128.

Selected Project Experience

Failure analysis, design analysis, material selection, mechanical testing, finite element analysis, fatigue and fracture evaluation, and development of various implantable medical devices including cardiovascular implants (heart valves, stents, catheters, pacemakers), orthopedic implants (screws, plates, pins, hip implants, spinal implants), cranial implants, etc.

Design and failure analysis of various fluid and drug delivery systems including implantable pumps, drug eluting stents, syringes, patches, microneedles, CPAP machines, anesthesia machines, insulin and other drug delivery pumps, balloon respirators, etc.

Design and failure analysis of other types of medical devices including surgical tools, scooters, hospital beds, physical therapy equipment, refrigerated portable coolers, etc.

Performed analyses to support FDA submissions.

Evaluated the design, pipeline integrity management program, in-line inspection tools, leak detection systems, control room management and operation and maintenance practices, of both liquid and gas pipeline systems under both 49 CFR 195 and 192.

Evaluated pipeline construction practices of various pipeline systems and performed pipeline failure investigations after various landslide events.

Assisted the Inter-American Development Bank with a pipeline integrity study and supervision of implementing a pipeline integrity management program. This included geotechnical site investigations, fracture mechanics, metallurgical investigations, in-line inspection data, and external inspection data.

Evaluated welding procedures and determined the effect of welding defects and other construction factors on pipeline integrity.

Evaluated pipe-soil interactions, mechanical and welded joints, welding procedures, in-line inspection tools, regulatory compliance, and the overall integrity of pipeline systems.

Failure analysis of various insulated steel oil and water pipeline systems, including behavior of the polyurethane foam and jacket materials.

Design evaluation and failure analyses of pipe couplings and fittings, including finite element analyses, as well as analysis of various plumbing fixtures and components.

Performed design and failure analyses of various gas distribution systems made of polyethylene and steel pipe, including the evaluation of compression couplings.

Retained as an expert for the United States Patent and Trademark Office in the evaluation of a patent claim dispute relating to large diameter pipes.

Evaluated the design of a hydrogenerator system. Performed a finite element analysis and fatigue analysis of the rotors, thrust bridge, and head cover to assess the design.

Evaluated the design of various pumps, rotors, bearings, seals and insulation systems.

Thermal analyses of industrial heat exchangers and cooling fins, nuclear reactor heads, and welds.

Failure analysis of various refrigeration systems and components and HVAC system components.

Performed design analysis of various solar panel system components and assisted in design changes to meet standardized safety testing.

Developed testing protocols and conducted failure analyses and design reviews for various consumer electronic devices and accessories, electrical connectors, power cords, and jacket sleeves.

Design of electrical connectors and various components of several consumer electronic devices including phones, tablets, and computers.

Design evaluation of various consumer products, including washing machines, refrigerators, various child containment products, hand and power tools, security and display systems, coffee machines, exercise machines, cooling sleeves and pads, consumer electronic accessories, breast pumps, baby bottles, etc.