

Filed: January 23, 2025

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

FOX Factory, Inc.,
Petitioner,

v.

SRAM, LLC,
Patent Owner.

IPR2024-00491
U.S. Patent No. 10,328,993

PETITIONER'S REPLY

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I. PRELIMINARY STATEMENT

The crux of the claimed invention of the '993 patent is that the wall thickness in the lower section of the steerer tube varies along the tube's cross-section, with the maximum wall thickness aligned with the bicycle's plane of travel. Pet., 2, 6-7. But prior art such as Denk (Ex. 1006), Valat (Ex. 1007), and Campagnolo (Ex. 1009) already disclose varying the wall thickness of a tube to increase strength/rigidity at specific points while minimizing weight. Additionally, prior art such as Galasso (Ex. 1013) and Klein (Ex. 1023) teach that a steerer tube bears the highest loads/stresses in the fore-and-aft direction aligned with the bicycle's plane of travel. Thus, it would have been obvious to a POSITA to align the maximum wall thickness with the plane of travel to increase the strength/rigidity of the steerer tube in the areas of highest load. Nothing in the Patent Owner Response refutes Petitioner's obviousness combinations.

II. LEVEL OF ORDINARY SKILL

A. Petitioner's Expert Is a POSITA Under Either Party's Definition

Petitioner's expert, Dr. Slocum, meets either party's definition because he has extensive experience in the design of mechanical structures and components in various fields, including automotive, aerospace, energy harvesters, and robotic vehicles, and has years of experience teaching courses and supervising students on all aspects of precision machine design, which he explained at length during his

deposition. Ex. 2019, 233:22-237:2, 239:5-250:19, 251:24-280:8. Dr. Slocum also published numerous patents and articles on technologies related to the subject matter of the '993 patent. Ex. 1024, ¶15.

B. Patent Owner's Criticisms of Dr. Slocum Are Unwarranted

Patent Owner's criticisms of Dr. Slocum's broad expertise in engineering and mechanical devices is unwarranted and applies equally to Patent Owner's expert, Dr. Parnell. *Id.* Dr. Parnell provides consulting services in various engineering and non-engineering fields, including medical devices, consumer electronics, fluid/heat transfer and mechanics, software design, green energy, trucks and ATVs, and strategic and budgetary planning. Ex. 2021, p. 77; Ex. 1024, ¶¶11-13. His "extensive experience" pertains to four-wheeled vehicles like trucks or cars, not two-wheeled ones like bicycles or motorcycles. Ex. 2021, ¶58; Ex. 1026, 17:7-18:5. Patent Owner's statements about Dr. Slocum's potential bias are also unwarranted and equally applicable to Dr. Parnell. POR, 2 n.2.

III. DISTRICT COURT'S CLAIM CONSTRUCTIONS

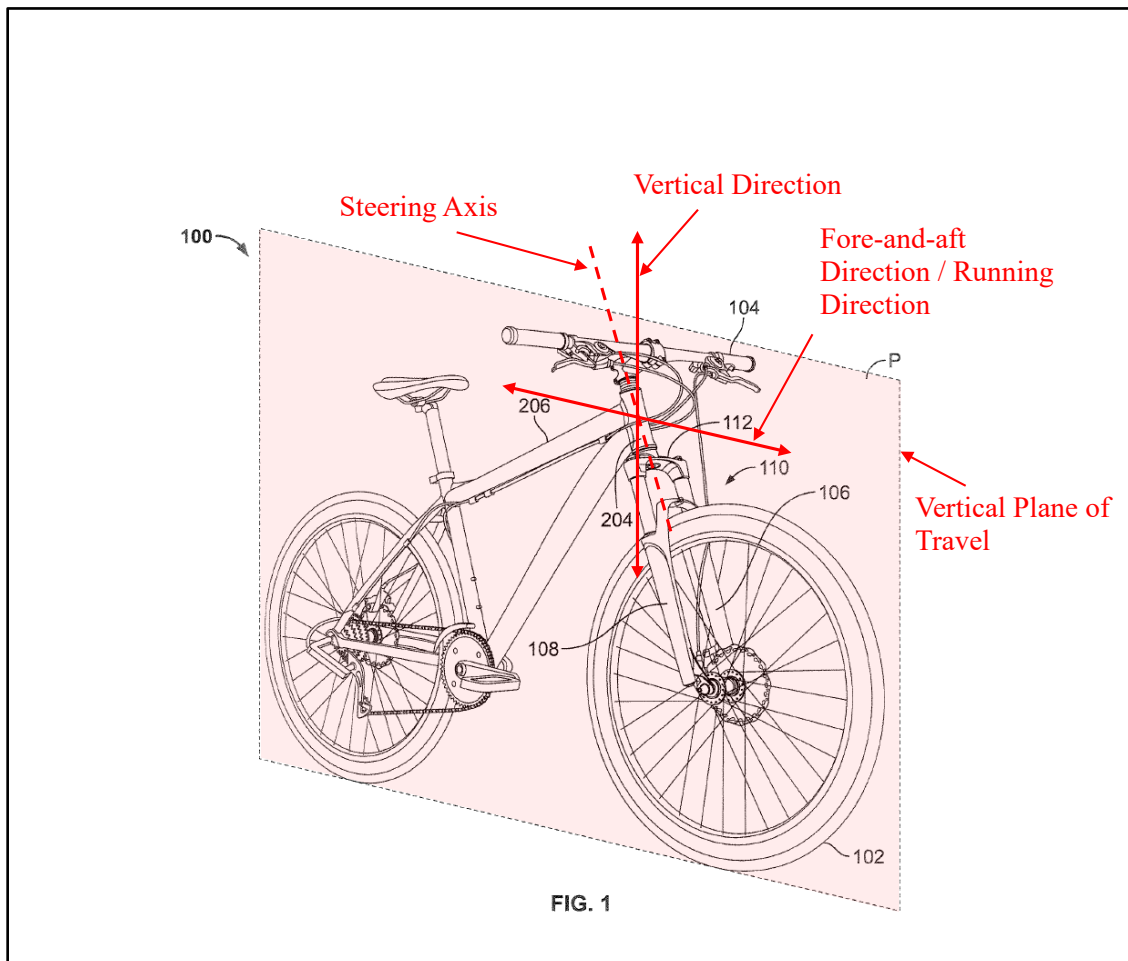
The court in the parallel district court litigation construed two claim terms of the '993 patent. Ex. 1025, 8-14. The Petition demonstrates unpatentability of the Challenged Claims under both the district court's construction and the plain and ordinary meaning. Therefore, the Board need not expressly construe these terms. *See*

Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co., 868 F.3d 1013, 1017 (Fed. Cir. 2017).

A. “A vertical plane of travel of the bicycle” / “plane of travel”

The district court construed this term to mean “vertical plane aligned with the running direction of the bicycle.” Ex. 1025, 8. The court found that “the plane of travel is aligned with the forward and backward direction of the bicycle or the running direction of the bicycle.” *Id.*, 9-10; *see also* Ex. 1001, 1:8-14 (similar).

The Petition’s application of the plain and ordinary meaning of “plane of travel” is consistent with the court’s construction because the running direction (or fore-and-aft travel direction) is within the “vertical plane of travel of the bicycle.” Ex. 1024, ¶20; Ex. 2021, ¶43.



Ex. 1001, FIG. 1 (annotated); Ex. 1024, ¶20.

B. “a thickness of the wall at any point in the lower section of the body varying as a function of the cross-sectional angle of the point relative to the plane of travel”

The district court construed this term to mean “a thickness of the wall at any point in the lower section of the body changing as the cross-sectional angle of the point relative to the plane of travel change.” Ex. 1025, 10. The court rejected Patent Owner’s proposed construction, which required the wall thickness to be “continuously changing,” because it would import a limitation from the

embodiments. *Id.*, 12-14. The Petition’s application of the plain and ordinary meaning is consistent with this construction. Ex. 1024, ¶¶18, 22, 24, 52-53.

IV. IT WAS KNOWN TO A POSITA BEFORE THE FILING OF THE ’993 PATENT THAT A STEERER TUBE BEARS HIGHEST LOADS IN THE PLANE OF TRAVEL

A. The Prior Art Discloses that a Bicycle Steerer Tube Experiences Highest Loads in the Plane of Travel

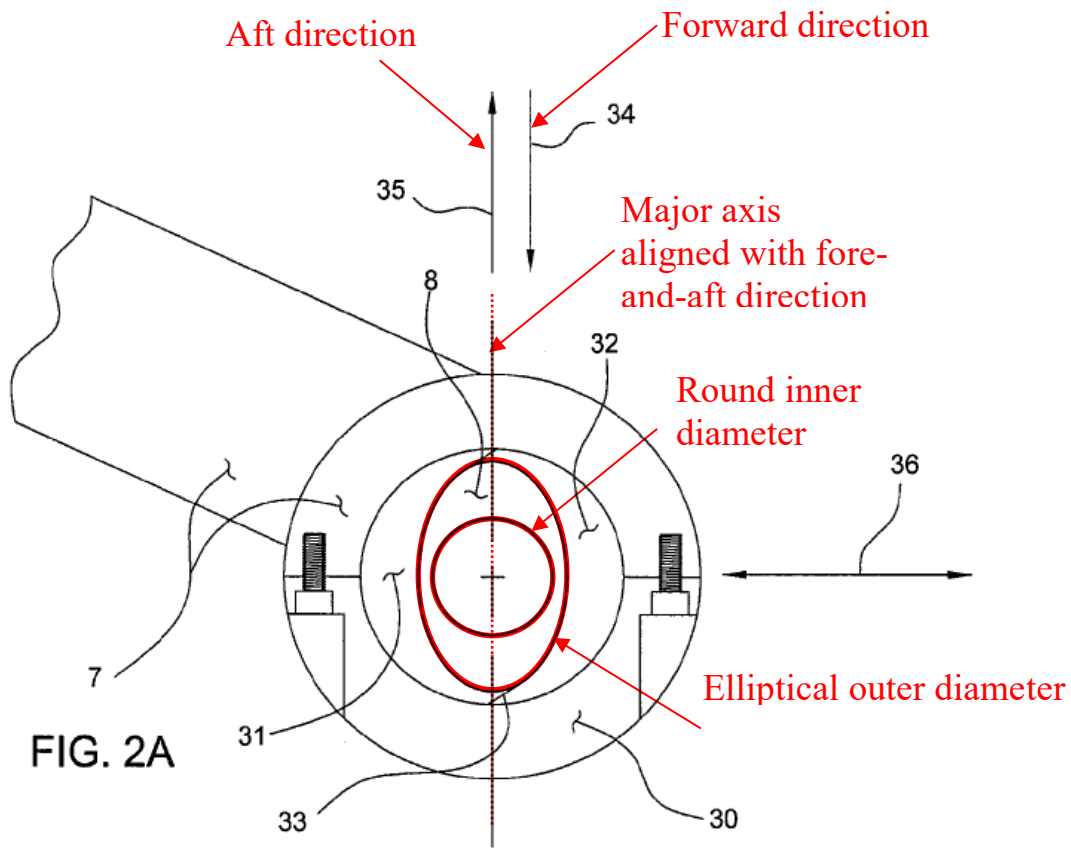
Relying only on Moechnig (discussed below), Patent Owner argues that increasing strength/stiffness in the lateral direction was more common than increasing it in the plane of travel, and that the ’993 patent “uniquely improves bicycle steerer tube technology by bucking that prior convention.” POR, 13. But Moechnig is not the only prior art in the record, nor does Moechnig contradict the general knowledge in the field that a bicycle steerer tube bears the highest loads in the plane of travel. *See, e.g.*, Ex. 1003, ¶¶89-91. Indeed, other prior-art references teach reinforcement of the steerer tube in the plane of travel (i.e., the fore-aft direction). Ex. 1024, ¶¶23-27.

For example, Klein (Ex. 1023) discloses reinforcing the strength of bicycle fork tubes, including the steerer tube, in the fore-and-aft direction. Ex. 1023, 4:21-29 (“In the front forks . . . ***The heaviest loads will come from vertical bumps or head-on impact and/or braking forces.*** . . . In a simple analysis, it appears that

increasing the strength of the fork blades and steerer fore and aft cantilever would be the correct approach.” (emphases added))¹; Ex. 1024, ¶27.

Galasso (Ex. 1013) also discloses increasing the stiffness of a stanchion tube in the fore-and-aft direction of a bicycle or motorcycle by designing the tube to have a round inner diameter and an elliptical outer diameter with the major elliptical axis substantially aligned with the fore-and-aft direction. Ex. 1013, 4:20-29, FIGS. 1, 2A. As shown below, the thickness of such a tube is maximum along the fore-and-aft directions 34, 35, such that “*the fork will be in its’ [sic] stiffest front to rear setting.*” *Id.*, 5:10-16 (emphasis added), FIGS. 1, 2A, 3; Ex. 1024, ¶24.

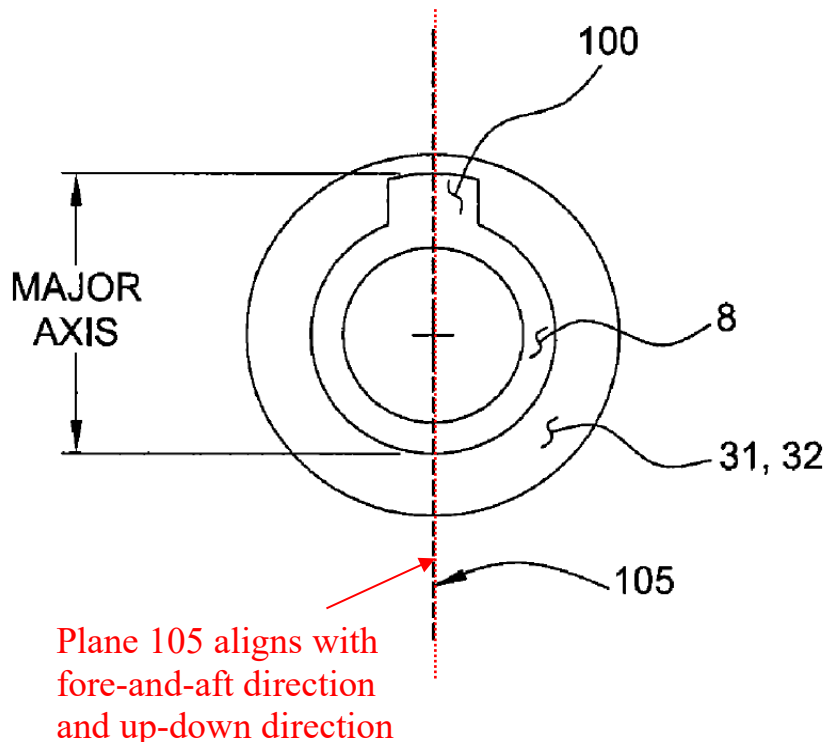
¹ Klein additionally discloses that in **fork blades** (i.e., legs), the forces are displaced to the side by “a small amount,” and therefore the “reinforcements (e.g., [thicker wall]) are shifted slightly to the inside of the fork.” Ex. 1023, 4:30-38. But Klein makes no such exception for the steerer tube.



Galasso, FIG. 2A (annotated).

Galasso discloses another suitable option having a non-round “lobe” to enhance the tube stiffness along a plane 105, which extends fore-aft and up-down relative to a vehicle. *Id.*, 4:46-57, 8:53-57, FIG. 5A (annotated below); Ex. 1024, ¶25.

FIG. 5A



Galasso, FIG. 5A (annotated).

Importantly, Galasso discloses that its tube designs can be applied to *all tubes of a fork chassis, including the steerer tube*. *Id.*, 2:45-59; Ex. 1024, ¶¶24-25. Indeed, Patent Owner’s expert acknowledges that both steerer tubes and fork legs are primarily concerned with “loads and related forces in the fore-and-aft direction” of the bicycle’s travel. Ex. 2021, ¶52.

B. Examiners of the '993 Patent and Its Chinese Counterpart Understood that a Steerer Tube Bears the Greatest Loads in the Fore-and-Aft Direction and that This Was Known Prior to the Filing of the Patent Application

During prosecution of the '993 patent, the Examiner found that Galasso discloses varying wall thickness, with “the wall thickness being at a maximum in the plane of travel of the vehicle ([s]ee figure 2A).” Ex. 1002, 42. Patent Owner did not dispute the Examiner’s analysis of Galasso and instead amended the independent claims to obtain allowance. *Id.*, 24-38. Thus, the claimed “wall thickness being at a maximum in the plane of travel” feature was not considered to be unique or novel during examination.

And like the USPTO Examiner, the reexamination decision in the Chinese counterpart application of the '993 patent (Ex. 1004) stated:

It is common knowledge in the art that the steerer tube of a bicycle bears the greatest strength in a traveling plane. Therefore, in order to enhance the strength of the steerer tube of a bicycle, those skilled in the art, under inspiration by [Denk] can apply the wall shape of the tube of FIG. 1C to [Schroeder] so that the wall thickness of the steerer tube is at a maximum in the traveling plane of the bicycle, which is obvious to those skilled in the art.

Ex. 1004, 10-11 (emphasis added); *see also id.*, 12, 18-19.

Petitioner’s expert agrees with the Examiners’ findings. Ex. 1024, ¶29.

Thus, contrary to Patent Owner’s assertion, a POSITA would have known at the time the ’993 patent application was filed that bicycle steerer tubes experience highest loads in the fore-aft plane of travel. And as evidenced by prior art, such as Denk and Campagnolo, a POSITA would have known to increase the thickness of the tube in the plane of travel (where loads are highest) to increase the strength and rigidity of the tube in that plane. *Id.*, ¶30; Ex. 1006, col. 2 (Denk disclosing that “the profile of the wall thickness over the cross[-]section may be optimally adapted to the actual requirements with regard to strength and rigidity”); Ex. 1009, 6:14-21 (Campagnolo disclosing that its bicycle tubes have “wall[s] of variable thickness, with the material concentrated in the areas designed to undergo higher stresses and removed from the areas less subject to stresses[.]”); *see also id.*, 7:29-8:3.

V. DENK IN VIEW OF MOECHNIG AND/OR SCHROEDER RENDERS THE CHALLENGED CLAIM OBVIOUS

A. A POSITA Would Have Found It Obvious to Use Denk’s Tube as a Steerer Tube and to Align the Maximum Thickness of the Tube with the Plane of Travel

1. A steerer tube is a tubular component of bicycle fork, and Denk explicitly discloses that its tubular component can be used for a bicycle fork

A POSITA would have understood that a bicycle fork includes a steerer tube, and that when prior-art references discuss “bicycle forks,” “forks,” or “fork tubes,” such discussion includes the steerer tube. Ex. 1024, ¶¶31-32; Ex. 1008, [0002]-[0003]; Ex. 1013, 2:45-63, 3:12-57; Ex. 1010, Abstract, 2:11-27; Ex. 1023, 5:49-55.

Patent Owner misrepresents Petitioner's expert's deposition by arguing that he stated that "non-frame 'fork tubes' refer only to the fork legs that hold the front wheel, but not to the overall fork itself[.]" POR, 21 n.6. That is incorrect because Petitioner's expert testified that the components of a bicycle fork include a steerer tube, two legs or prongs, and a crown, and that fork tubes refer to all tubular structures of a bicycle fork. Ex. 2019, 37:6-39:25, 67:15-25.

Contrary to Patent Owner's attorney arguments, Patent Owner's expert also considers a steerer tube as a component of "bicycle forks." See Ex. 2021, ¶¶33, 47-48, 53; *id.*, ¶26 ("A steerer tube is a key component of a bicycle fork."), ¶28 (similar); Ex. 1026, 91:1-92:12 (similar). Indeed, the '993 patent describes steerer tube 200 as a part of bicycle fork 110. Ex. 1001, 4:58-62, FIGS. 1-2.

Patent Owner nevertheless argues that a POSITA would not have known to use Denk's design as a steerer tube. POR, 20-21. That is incorrect. Denk expressly discloses that its lightweight tube design is *suitable for all tubular components* of a bicycle frame, including *fork tubes*. Ex. 1006, Abstract, cols. 1, 4; Pet., 13. Denk's claims also recite that "the lightweight component is designed in such a way that it is formed as *part of a bicycle fork*." Ex. 1006, col. 12 claim 18 (emphasis added).

For all the above reasons, a POSITA would have understood Denk's disclosure to be applicable to all tubes of a bicycle fork, including the steerer tube. Ex. 1003, ¶¶56-57; Ex. 1024, ¶33.

2. Patent Owner's argument that Denk is specific to bicycle frames is unreasonable and disregards express teachings of Denk

Patent Owner argues that Denk is concerned with gravity-related vertical forces that are not applicable to a steerer tube because the steerer tube is oriented along the vertical direction. POR, 22-24, 27-28. This is incorrect. Ex. 1024, ¶¶34-37.

As acknowledged by Patent Owner's expert, the orientation of a steerer tube is similar to that of a seat tube of the bicycle frame. Ex. 2021, ¶62. A steerer tube would at least bear loads similar to the seat tube or head tube, and Denk explicitly states that its tubular design is applicable to a seat tube and head tube. Ex. 1006, Abstract, cols. 1, 4; Ex. 1024, ¶¶35-36. Therefore, a POSITA would have readily understood that Denk's design is also applicable to steerer tubes, as confirmed by Denk's express disclosure that its tubular design can be used for bicycle forks. Ex. 1024, ¶35.

3. The actual weight or strength of Denk's tube is irrelevant to the motivation for using Denk's tube as a steerer tube

Patent Owner argues that "Denk provides no indication that it would be more lightweight than a standard steerer tube with equal wall thickness and a circular profile," or even weigh less than the lightweight steerer tube of Moechnig. POR, 25-26; *see also* Ex. 2021, ¶69. But these arguments do not undercut Denk's teachings

on how to design a lightweight tube with reinforced strength in the direction of highest loads. A POSITA would have understood how to design a suitable lightweight steer tube based on Denk's teachings using ordinary creativity. Ex. 1024, ¶38. For example, knowing that a bicycle steerer tube experiences highest loads in the plane of travel, a POSITA would have known to orient Denk's tube (as shown in Fig. 1a) so that the areas of the steerer tube wall having maximum thickness are aligned with the plane of travel. *Id.*; Ex. 1006, col. 2 (“[F]or the same overall strength and rigidity, the weight may be reduced, or for the same weight, the strength and rigidity may be significantly increased in the load direction specified by the design.”); *see also id.* (“[T]he profile of the wall thickness over the cross[-]section may be optimally adapted to the actual requirements with regard to strength and rigidity.”); Ex. 1013, Abstract, 1:49-60 (teaching tuning or adjusting the reinforcement in a chosen direction as desired); Ex. 1024, ¶38.

4. A POSITA would have been motivated to align the maximum wall thickness of Denk's tube with the plane of travel

Although Denk does not explicitly teach orienting the areas of maximum thickness with the plane of travel, Denk teaches that bicycle frames need to have high strength and rigidity in the vertical plane of the frame, which is coplanar with the plane of travel. Ex. 1006, cols. 1-2; Ex. 1024, ¶39. This would have suggested to

a POSITA to align the maximum wall thickness of a steerer tube with the plane of travel. Ex. 1024, ¶39.

Moreover, other prior art, such as Campagnolo, teaches that a bicycle tube should be mounted “with an accurate positioning, which should correspond to the real needs and *should take into account the actual stresses involved and their possible variations.*” Ex. 1009, 7:29-8:3 (emphasis added). Given that a POSITA would have known that a steerer tube bears the highest loads in the plane of travel (*see supra* Section IV), a POSITA would have been motivated to orient Denk’s tube, when implemented as a steerer tube, so that the maximum wall thickness is in the plane of travel. Ex. 1024, ¶¶39-40.

B. Patent Owner Misinterprets Moechnig and the Petition

1. Moechnig does not contradict the general knowledge in the field that a steerer tube bears the highest load in the plane of travel

Several prior-art references, such as Denk, Campagnolo, Galasso, and others, teach that the reinforcement structures of a bicycle tube should be tailored to the specific requirements of each use case. *See, e.g.*, Ex. 1013 (Galasso), 1:49-60. Denk similarly teaches adjusting the wall thickness of its lightweight tubular component to meet strength and rigidity needs. Ex. 1006, col. 2.

Moechnig discloses one particular use case. Specifically, Moechnig teaches decreasing fore-aft stiffness of the steerer tube (i.e., increasing compliance in the

fore-aft direction) **not** because the loads experienced by the steerer tube are less in the fore-and-aft direction and higher in a lateral direction, but instead to achieve two benefits. Ex. 1024, ¶43. First, Moechnig discloses decreasing the fore-aft stiffness to “decrease ... the amount of force that is transmitted to the rider therein increasing the comfort level associated with the use of [a] bicycle.” Ex. 1008, [0049]. Second, Moechnig discloses that decreasing the fore-aft stiffness would distribute the load over a greater duration of impact, “increase[] [the] compliance of [the] steerer [tube] to fore and aft loading,” and “provide greater fore and aft impact performance as compared to steerer assemblies of comparable weight.” *Id.* Nowhere does Moechnig teach that the highest loads do not occur in the fore-and-aft direction, or in the plane of travel of the bicycle. Ex. 1024, ¶¶23-30, 43.

Instead, Moechnig teaches a preferred use case that provides different lateral and fore-and-aft performances. Ex. 1008, [0049]; *see* Ex. 1013, 1:30-48 (teaching different riders prefer different stiffness of the fork). Moechnig’s particular use case is not contrary to the common knowledge that a steerer tube bears the highest loads in the plane of travel. Ex. 1024, ¶44. Indeed, a POSITA would have understood that to withstand the high loads in the plane of travel, one could either increase the stiffness/strength of the tube in the fore-aft direction, or increase compliance of the tube in that direction to bend with the load. *Id.* It is a matter of design choice, and while some engineers will increase the tube compliance in the fore-art direction to

manage loads, others will increase stiffness in that direction (like in Denk, Galasso, Klein, Campagnolo). *Id.*

Thus, Patent Owner's argument that a POSITA would not have oriented Denk's tube to have the maximum wall thickness in the plane of travel based on Moechnig is contrary to the design principle of adapting structural reinforcements based on specific use cases. *Id.*, ¶45. It is also contrary to prior-art teachings on increasing strength/rigidity of the steerer tube in the plane of travel. *See* Ex. 1013, 1:45-60; Ex. 1006, cols. 1-22; Ex. 1023, 4:21-29; Ex. 1024, ¶45.

2. Patent Owner misconstrues Moechnig's significance and contribution in the Petition

Importantly, Petitioner never relied on Moechnig for the motivation to increase strength/stiffness of the steerer tube in the fore-aft direction. Indeed, when discussing dependent claims, Patent Owner's expert admits that "the Grounds do not rely upon Moechnig to provide the claimed steerer tube." Ex. 2021, ¶129.

Instead, the Petition relies on Moechnig primarily for its undisputed disclosure of the conventional manner of mounting a steerer tube on a bicycle. *See, e.g.*, Pet., 13-15, 51, 54; *see also* the AAPA (Ex. 1001, 1:8-32, FIGS. 1-2); Ex. 1003, ¶¶38-39.

**VI. VALAT IN VIEW OF MOECHNIG, DENK, AND/OR SCHROEDER
RENDERS THE CHALLENGED CLAIM OBVIOUS**

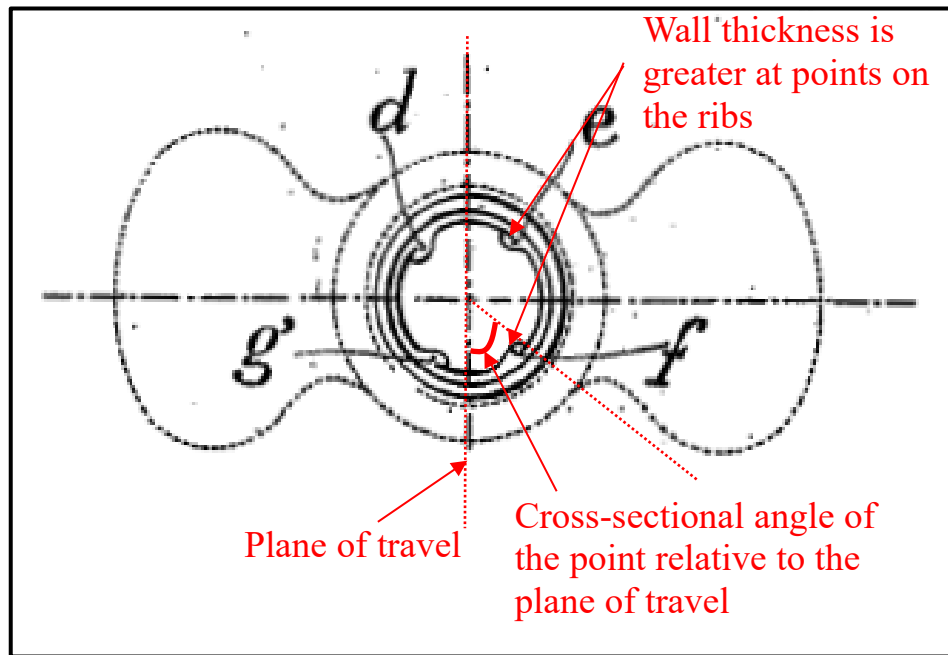
A. Patent Owner Misinterprets Valat's Disclosure and the Petition

1. Valat discloses varying wall thickness

Patent Owner contends that the Petition wrongly identifies Valat as showing multiple “configurations” or embodiments in Figures 1 and 2, and asserts that there is only one embodiment. POR, 33-35. Patent Owner misconstrues Valat. Valat's Figure 1 shows a first configuration of a steerer tube having greater wall thickness (and greater external diameter) in the lower section of the tube where the loads are greatest. Ex. 1007, 1:44-51, 1:58-60, 1:70-78. In this first configuration, the steerer tube does not have the helical reinforcement ribs, although the location of the helical ribs is illustrated in dotted lines. *Id.*, Fig. 1, 1:58-60. Valat's Figure 2 shows a second configuration with helical ribs formed in the lower part *a*. *Id.*, 1:79-90. That is, Valat's first configuration is a base configuration to which Valat teaches adding additional reinforcement structures, such as the helical ribs shown in Figure 2, and other alternative reinforcements shown in Figures 3-5. *Id.*, 2:5-16, Figs. 3-5; Ex. 1024, ¶¶50-51. A POSITA would have understood that both configurations in Figures 1 and 2 are suitable options for a steerer tube. Ex. 1024, ¶50.

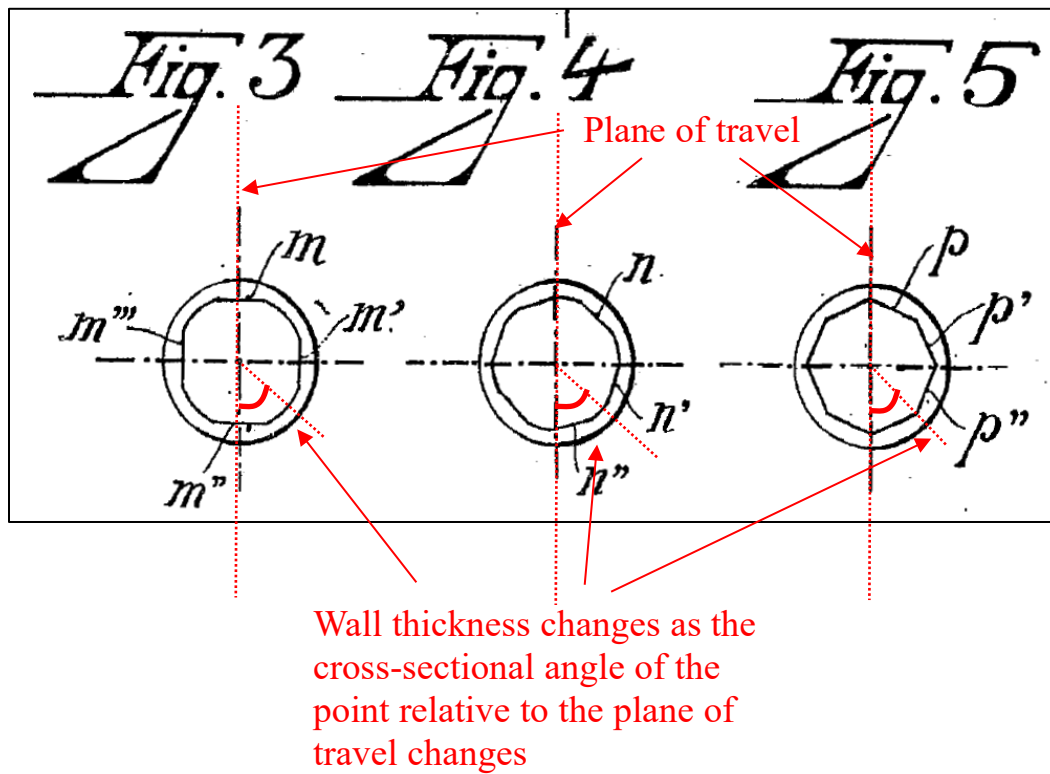
Moreover, Valat's inclusion of helical reinforcement ribs in Figure 2 (annotated below) would cause the wall thickness to vary. *Id.*, ¶52. Patent Owner's argument to the contrary is based on the rejected claim construction that the

thickness of the wall must be “continuously varying.” *Id.*; POR, 31-33; *see supra* Section III.B. Under the district court’s construction, the wall thickness does not need to change continuously as the cross-sectional angle relative to the plane of travel changes.



Ex. 1007, Fig. 2 (excerpted, annotated).

Valat’s alternative reinforcement arrangements in the lower section of the tube body in Figures 3-5 would also cause the wall thickness to vary, as illustrated below.



Id., Figs. 3-5 (annotated).

Thus, Valat discloses a steerer tube with varying wall thickness across the cross-section. Ex. 1024, ¶53.

2. **Valat's Figure 1 configuration, when modified in view of Denk to have an elliptical inner contour in the lower section, would have a maximum wall thickness in the plane of travel**

Valat suggests to a POSITA to consider various reinforcement arrangements that would vary the wall thickness. Ex. 1007, 2:5-7 (“[A]ny form and disposition of the reinforcements, as well as any number can be provided.”). Denk is one such reference that teaches a reinforcement arrangement in the form of an elliptical inner contour. Ex. 1024, ¶54. A POSITA, recognizing that a steerer tube bears the greatest

loads in the plane of travel, would have been motivated to modify Valat in view of Denk to orient the elliptical inner contour so that the areas with the maximum wall thickness are aligned with the plane of travel. *Id.*; *see also supra* Section IV.

3. Valat’s steerer tube has a circular outer cross-section in the upper and lower sections

Valat discloses that, “[a]s shown in Figure 1[,] for example[,] a tube is chosen of greater *external diameter* in the part 1 where the reinforcements 2 are to be formed.” Ex. 1007, 1:102-105 (emphasis added). Valat’s discussion of “diameter” would inform a POSITA that the tube has a circular cross-section. Ex. 1003, ¶182. Patent Owner’s criticism of using Figure 2 to show the circular outer cross-sections of the steerer tube is unwarranted because a POSITA would have understood that, even after swaging, the tube’s exterior remains circular. Ex. 1024, ¶52; *contra* POR, 35-36. In fact, Valat discloses with respect to the Figure 2 configuration that the tube has “the same *external diameter* over its whole length,” thus suggesting to a POSITA that the tube has a circular outer cross-section. Ex. 1007, 1:70-77 (emphasis added); *see also* POR, 35 (Patent Owner acknowledging that the Figure 2 configuration has “a constant exterior diameter”).

B. A POSITA Would Have Been Motivated to Modify Valat with Denk’s Elliptical Inner Cross-Section

Patent Owner argues that converting Valat’s internal rib structure into Denk’s elliptical interior shape offers no benefit, but that is incorrect. POR, 41, 44. A

POSITA would have understood that such modification would allow the wall thickness to change smoothly and continuously, thereby reducing stress concentration or failure points. Ex. 1003, ¶¶154, 156. A POSITA would also have known that it would have been easier to manufacture a steerer tube with an elliptical inner surface than creating reinforcement ribs on the inner wall. *Id.*, ¶154. Additionally, a POSITA would have understood that Denk's inner elliptical contour in the lower section of Valat's steerer tube would improve the strength/rigidity of Valat's steerer tube in the plane of travel of the bicycle where higher loads/stresses occur, and reduce weight by having lesser wall thickness in areas of lower stress.² *Id.*, ¶¶155, 157.

Patent Owner's criticism that Petitioner does not explain why Denk's elliptical shape is better than Valat's internal ribs is meritless because obviousness

² Patent Owner contends that "Denk does not explain that its tubular frame component would be lighter in weight than the rib-reinforced tube in Valat." POR, 42. But when considering the structural designs taught in Denk and Valat, a POSITA would not have compared the weights of the tubes; rather, a POSITA would have applied those design principles and ordinary creativity to design a steerer tube of appropriate weight and strength. Ex. 1024, ¶60.

does not require the modification to be better or preferred over the original. *PAR Pharm., Inc. v. TWI Pharms., Inc.*, 773 F.3d 1186, 1197-98 (Fed. Cir. 2014); *see also In re Fulton*, 391 F.3d 1195, 1200 (Fed. Cir. 2004). More specifically, a motivation to modify or combine does not require a showing of deficiency or “known problem with the prior art system.” *Unwired Planet, LLC v. Google Inc.*, 841 F.3d 995, 1002-03 (Fed. Cir. 2016). Rather, “any need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 420 (2007). Here, a POSITA would have recognized Denk’s inner elliptical cross-section to be “a *suitable* option,” even if not “the *best* option,” for improving strength of the steerer tube in the plane of travel while lowering weight, and thus would have been motivated to try it. *Intel Corp. v. Qualcomm Inc.*, 21 F.4th 784, 800 (Fed. Cir. 2021) (citation omitted).

Patent Owner further argues that modifying Valat with Denk’s elliptical inner contour would be contrary to Valat’s “primary purpose” and “principle of operation,” which is to provide support around the entire junction between the steerer tube and the fork bridge. POR, 39-40. Although Valat discloses that a steerer tube is more likely to experience fractures “on its perimeter at entry to the fork bridge,” nowhere does Valat require reinforcements around the *entire* perimeter of the tube. Ex. 1007, 1:44-51. Moreover, Valat teaches that “any form and disposition

of the reinforcements, as well as any number, can be provided.” *Id.*, 2:5-7. Valat also discloses alternative embodiments as shown in Figures 3-5, which would not have reinforced Valat’s steerer tube along the entire junction with the fork bridge. Ex. 1024, ¶56. A POSITA, recognizing that a steerer tube bears greater loads in the plane of travel, would have been motivated to add reinforcements in the form of an elliptical inner contour per the teachings of Denk, and such a modification would not have run counter to the principles of Valat. *Id.*

VII. BOTH DENK AND VALAT DISCLOSE OR RENDER OBVIOUS A STEERER TUBE WITH GREATER OUTER DIAMETER IN THE LOWER SECTION THAN IN THE UPPER SECTION

A. Denk Alone, or in View of Moechnig, Discloses Greater Outer Diameter in the Lower Section

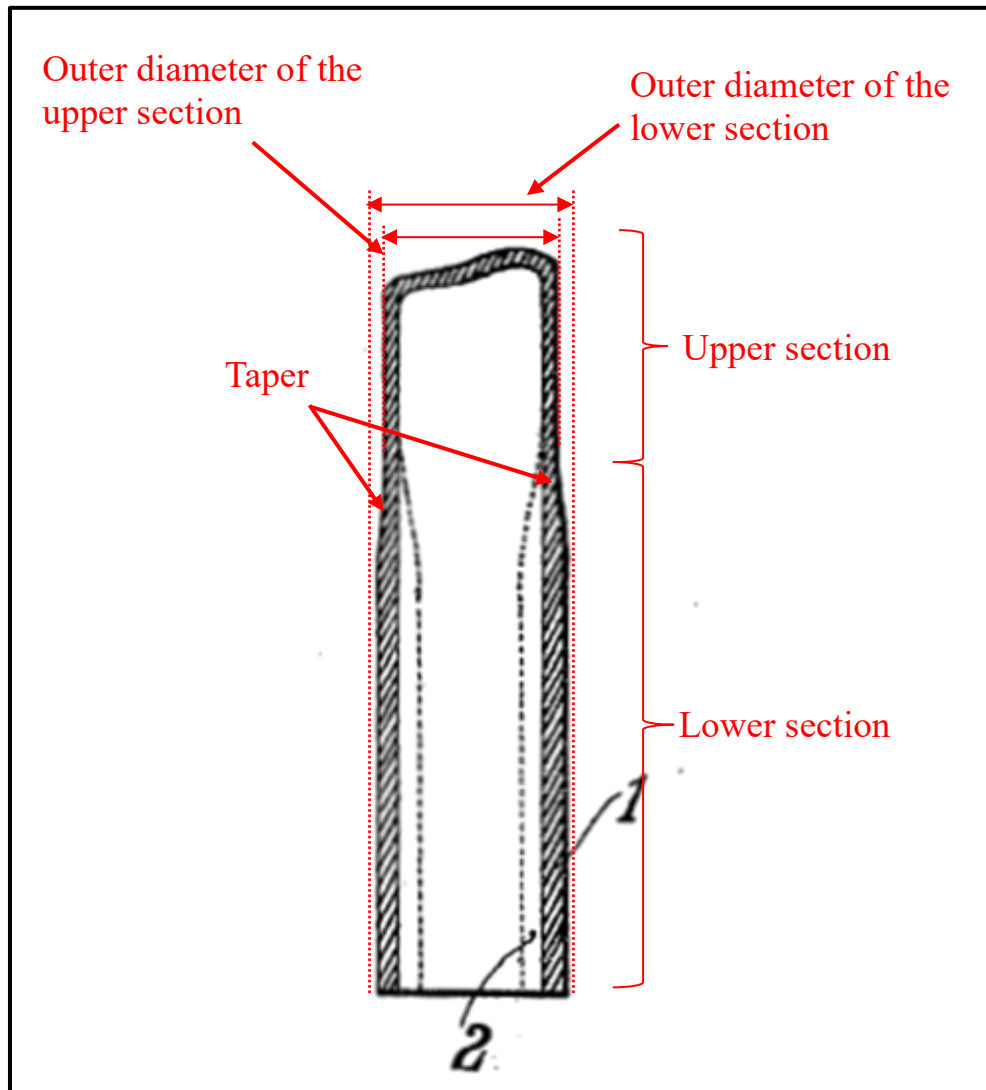
Figure 11 of Denk explicitly shows a tube having two sections that are joined by a tapering region, and an outer diameter of one section of the tube is greater than an outer diameter of the other section. Pet., 26-28; Ex. 1024, ¶63.

Although Denk states that in “exemplary embodiments” the tube has the same cross-sections along its length, Denk also discloses that “within the scope of the invention[,] it is also possible for adjacent cross[-]sections to have a different design,” and one approach is to continually change the cross-sections in the longitudinal direction. Ex. 1006, cols. 6, 8. From this, a POSITA would have understood Figure 11 as disclosing a tube with one section having a larger diameter

than the other section. Ex. 1024, ¶63. Furthermore, a POSITA would have known, based on common knowledge and the teachings of Moechnig, Valat, and Schroeder, to position the tapered tube such that the section with the larger diameter forms the lower section of the steerer tube when mounted on a bicycle. *Id.*, ¶64 (citing Ex. 1007, 1:70-78; Ex. 1010, 6:16-26, FIGS. 1B-2; Ex. 1008, Figs. 2-3). This configuration is preferred to better withstand the greater loads experienced by the lower section of the steerer tube compared to the upper section. *Id.*

B. Valat Discloses Greater Outer Diameter in the Lower Section

As discussed above, Patent Owner mistakenly considers Valat as disclosing only one embodiment as shown in Valat's Figure 2. Ex. 1024, ¶65. In fact, Valat's Figure 1 configuration discloses a steerer tube having lower and upper sections joined by a tapering region, wherein the lower section has an outer diameter greater than that of the upper section, as illustrated below. *Id.*



Valat, Fig. 1 (annotations added).

The Petition proposes to modify Valat's thicker wall in the lower section of *the first configuration in Figure 1* to have Denk's inner elliptical cross-section, instead of Valat's helical ribs, to reinforce the high-load areas of the wall while minimizing weight. Pet., 52-53, 67; Ex. 1003, ¶¶154-157, 188-189. Because Valat's steerer tube in Figure 1 would have been modified to have Denk's inner elliptical contour using processes other than swaging (for example, machining), Valat's

steerer tube (modified in view of Denk) would continue to have a lower section with a greater outer diameter than the upper section. Ex. 1024, ¶66.

Patent Owner's contrary argument is based on Valat's steerer tube configuration shown in Figure 2, which includes reinforcement ribs created via swaging that might reduce the outer diameter of the lower section. *Id.* But the Figure 2 configuration and the swaging process are not relevant to Petitioner's combination, and Patent Owner's reliance on them is unavailing. *Id.*

VIII. BOTH DENK AND VALAT DISCLOSE OR RENDER OBVIOUS A CIRCULAR INNER CROSS-SECTION IN THE UPPER SECTION OF THE STEERER TUBE

A. Denk Alone, or in View of Moechnig, Teaches an Inner Circular Cross-Section in the Upper Section of the Tube

Denk discloses that in the Figure 1a embodiment, "it is possible for the elliptical inner cross-sectional contour to continually transition into a circular inner cross-sectional contour in a certain area of the tube." Pet., 34-35 (quoting Ex. 1006, col. 8); Ex. 1003, ¶¶117-121. From this, a POSITA would have understood Denk as disclosing a tube having an inner circular cross-section in the upper section of the tube and an inner elliptical cross-section in the lower section of the tube (as in Figure 1a). Ex. 1003, ¶118; Ex. 1024, ¶¶69-70.

Moechnig additionally discloses a steerer tube having an elliptical inner cross-section in a lower section, which transitions to a circular inner cross-section in the

upper section of the steerer tube. Ex. 1008, [0035]-[0036], [0038], FIGS. 1-4; Pet., 35; Ex. 1003, ¶119; Ex. 1024, ¶70. Patent Owner acknowledges that Moechnig shows “an interior shape that transitions between elliptical to circular.” POR, 54. Thus, Moechnig supports Denk’s disclosure of an inner circular cross-section in the upper section of the tube. Ex. 1024, ¶¶70-71.

B. Valat Discloses an Inner Circular Cross-Section in the Upper Section of the Tube

Valat’s Figure 2 explicitly shows the inner circular cross-sectional shape of the upper section. *Id.*, ¶67. Valat’s disclosure that the reinforcement ribs taper away towards the upper section would have further confirmed to a POSITA that the inner cross-section of the upper section remains circular. *Id.*; Valat, 1:86-90. Because the Petition proposes to modify *only* the lower section of Valat’s Figure 1 configuration in view of Denk’s elliptical inner cross-section, a POSITA would have understood the upper sections of both configurations to have circular inner cross-sections, as evidenced by the cross-sectional image in Figure 2. Ex. 1024, ¶67.

IX. THE MAJOR AND MINOR DIAMETERS OF THE ELLIPTICAL INNER CROSS-SECTION IN DENK, AND IN VALAT MODIFIED IN VIEW OF DENK, WOULD DECREASE IN THE TAPERING REGION

As discussed above, Denk discloses a tube with a tapering region and an elliptical inner contour in the lower section that transitions to a circular inner contour in the upper section. *See supra* Sections VII, VIII. Valat also discloses a taper, and

Valat modified in view of Denk would have an elliptical inner contour in the lower section and a circular inner contour in the upper section. *Id.* It would have been obvious to a POSITA that when the inner elliptical contour transitions over the tapering region to a circular contour, both the major and minor diameters of the elliptical cross-section would necessarily decrease over the tapering region and would become equal, which would be the inner diameter of the upper section. Ex. 1024, ¶72.

Furthermore, Moechnig is objective evidence of how the major and minor diameters of an elliptical contour decrease over a tapering region as the tube transitions to a circular contour. Pet., 42-44, 79, 81; Ex. 1003, ¶¶137-138; Ex. 1008, [0038]. Based on Moechnig's teachings and common sense, a POSITA would have understood that in Denk, and in Valat modified in view of Denk, the major and minor diameters in the taper region of the lower section would decrease as a function of proximity to the upper section of the steerer tube. Ex. 1024, ¶73.

Dated: January 23, 2025

Respectfully submitted,

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CERTIFICATION UNDER 37 C.F.R. § 42.24(d)

Pursuant to 37 C.F.R. § 42.24(d), the undersigned hereby certifies that the foregoing **Petitioner's Reply** contains 5,542 words, excluding the parts exempted under 37 C.F.R. § 42.24(c), as measured by the word-processing system used to prepare this paper.

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CERTIFICATE OF SERVICE

The undersigned certifies that a copy of the foregoing **Petitioner's Reply** was served electronically via email on January 23, 2025, in its entirety on the following:

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