

Filed on behalf of: Kolon Industries, Inc.

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

HS HYOSUNG ADVANCED MATERIALS CORP.,
Petitioner,
v.

KOLON INDUSTRIES, INC.,
Patent Owner.

Case IPR2025-00663
Patent 10,196,765

PATENT OWNER'S PRELIMINARY RESPONSE

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<i>Virtek Vision Int'l ULC v. Assembly Guidance Sys., Inc.</i> , 97 F.4th 882 (Fed. Cir. 2024)	23
<i>Xerox Corp. v. Bytemark, Inc.</i> , IPR2022-00624, Paper 9 (P.T.A.B. Aug. 24, 2022).....	19, 23, 40

EXHIBIT LIST

Exhibit	Description
2001	U.S. Patent Application Publication No. 2014/0238524 A1 (“Love”)
2002	Civil Minutes – General, <i>Kolon Indus., Inc. v. HS Hyosung Advanced Materials Corp. et al.</i> , No. 8:24-cv-00415-JVS-JDE (C.D. Cal. Apr. 4, 2025), ECF No. 149
2003	Civil Minutes – General, <i>Kolon Indus., Inc. v. Hyosung Advanced Materials Corp. et al.</i> , No. 8:24-cv-00415-JVS-JDE (C.D. Cal. Aug. 21, 2024), ECF No. 68
2004	Proof of Service of Summons, Complaint, and related documents, <i>Kolon Indus., Inc. v. Hyosung Advanced Materials Corp. et al.</i> , No. 8:24-cv-00415-JVS-JDE (C.D. Cal. Mar. 5, 2024), ECF No. 15
2005	Hyosung Invalidation Trial Petition, dated Apr. 13, 2022 (original Korean document)
2006	Certified English translation of Hyosung Invalidation Trial Petition, dated Apr. 13, 2022
2007	RESERVED
2008	RESERVED
2009	Exhibit of Defendant Hyosung Advanced Materials Corp.’s Invalidity Contentions, <i>Kolon Indus., Inc. v. Hyosung Advanced Materials Corp. et al.</i> , No. 8:24-cv-00415-JVS-JDE (C.D. Cal. Mar. 17, 2025), ECF No. 146-7
2010	RESERVED
2011	File History for U.S. Patent Application No. 16/464,350
2012	RESERVED

Exhibit	Description
2013	International Search Report for International Application No. PCT/KR2017/013279
2014	Letter from Kolon Industries, Inc. to Hyosung Advanced Materials, dated Feb. 4, 2021 (original Korean document)
2015	Certified English translation of Letter from Kolon Industries, Inc. to Hyosung Advanced Materials, dated Feb. 4, 2021 (certified English translation)
2016	RESERVED
2017	Declaration of Dr. David Brookstein in Support of Patent Owner's Preliminary Response ("Brookstein")
2018	<i>Curriculum Vitae</i> of David Brookstein, Sc.D.
2019	RESERVED
2020	B.C. Goswami, J.G. Martindale, F.L. Scardino, <i>Textile Yarns: Technology, Structure, and Applications</i> (1977) (excerpts)
2021	DuPont, <i>Kevlar® Aramid Fiber Technical Guide</i> (2017)
2022	C. Lechat et al., <i>Mechanical Behaviour of Polyethylene Terephthalate & Polyethylene Naphthalate Fibres Under Cyclic Loading</i> , 41 J. Materials Sci. 1745 (2006)
2023	RESERVED
2024	<i>Young's Modulus</i> , https://depts.washington.edu/matseed/mse_resources/Webpage/Biomaterials/young's_modulus.htm (last visited July 7, 2025)
2025	Louis H. Miner, <i>KEVLAR® 49 Aramid Fibers for High Performance Composites</i> , Soc'y Auto. Eng'rs, Inc., Passenger Car Meeting, Detroit, Mich. (Sept. 26–30, 1977)

Exhibit	Description
2026	<i>HS Hyosung Advanced Materials Corp. v. Kolon Indus., Inc.</i> , IPR2025-00662 ('731 Patent), Paper 1 (Petition) (P.T.A.B. Feb. 28, 2025)
2027	Exhibit 1003 ([Corrected] Declaration of Jon Rust, Ph.D. in Support of Petition for Inter Partes Review of U.S. Patent No. 9,789,731) (Feb. 28, 2025), <i>HS Hyosung Advanced Materials Corp. v. Kolon Indus., Inc.</i> , IPR2025-00662
2028–2033	RESERVED
2034	U.S. Dep't of Transp., Nat'l Highway Traffic Safety Admin. (N.H.T.S.A.), <i>The Pneumatic Tire</i> (S. K. Clark et al. eds., Feb. 2006) (excerpt)

I. Introduction

Patent Owner Kolon Industries, Inc. (“Patent Owner” or “Kolon”) respectfully submits that the Board should deny institution of the *inter partes* review (IPR) of claims 1-6 of U.S. Patent No. 10,196,765 (the “’765 patent”). For at least the following reasons, the Petition fails to show a reasonable likelihood of prevailing as to any claim, and thus no IPR should be instituted.

First, Petitioner HS Hyosung Advanced Materials Corp. (“Petitioner” or “Hyosung”) fails to establish a motivation to combine its asserted prior art references with a reasonable expectation of success. The challenged independent claim, claim 1 of the ’765 patent, requires that, “if the secondary twist of the hybrid tire cord with a predetermined length were untwisted, a length of the aramid primarily twisted yarn would be 1.005 to 1.025 times a length of the nylon primarily twisted yarn.” Petitioner concedes its Nakayasu reference is silent on length differences between constituent yarns in a hybrid tire cord, and thus turns to Fritsch for the claimed length difference between the aramid and nylon primarily twisted yarns that compose the claimed hybrid tire cord. But a person of ordinary skill in the art (“POSITA”) would not have combined Fritsch with Nakayasu to achieve the claimed invention because Fritsch focuses on different materials with different physical and chemical properties than the aramid and nylon that the claimed hybrid

tire cord requires. Fritsch's differences render it unsuitable to combine with Nakayasu to achieve the claimed hybrid tire cord.

Second, and relatedly, Fritsch does not render obvious the claimed length difference. Leveraging hindsight and ignoring the distinctions between Fritsch and the claims, Petitioner selects a single example length difference for PEN/PET hybrid cord from the broad range of disclosed examples in Fritsch and summarily asserts that this example meets the length difference claim limitation. But Petitioner's analysis fails because a POSITA would have known that the materials disclosed in Fritsch and in all of its tested examples are meaningfully different in chemical and physical properties from the aramid/nylon hybrid tire cord of the claims. Fritsch thus does not render obvious the length difference claim limitation.

Third, Nakayasu fails to render obvious hybrid tire cords where the "aramid primarily twisted yarn has a 0.1 to 5% lower twist number than a twist number of the nylon primarily twisted yarn," as claim 1 requires. Again, Petitioner's hindsight-driven analysis selects the one example that it asserts meets this claim limitation while failing to consider Nakayasu as a whole, as required by law. When viewed as a whole, it is readily apparent that Nakayasu identifies meaningful deficiencies in the example selected by Petitioner and thus a POSITA would have pursued other better-performing examples that fall well outside the express requirements of claim 1's twist number limitation.

Finally, Petitioner fails to provide evidence or explanation in the declaration of its expert, Dr. Rust, to support its obviousness arguments. Instead, Dr. Rust simply parrots Petitioner's attorney arguments, which cannot sustain Petitioner's burden. The Petition is also deficient for this reason.

Because Petitioner has failed to show a reasonable likelihood of success in prevailing as to claim 1, which is the only independent claim, the Board should deny institution.

II. Background

A. The '765 Patent (Ex.1001)

The '765 patent, entitled "Hybrid Tire Cord and Method for Manufacturing the Same," issued on February 5, 2019, and claims priority to a Korean patent application, filed June 29, 2015. Ex.1001, [30], [45], [54].

The '765 patent relates to 2-ply aramid and nylon hybrid tire cord. The specification notes that vehicle performance and road conditions have brought about increased driving speed, resulting in a need for tire cords capable of maintaining stability and durability of tires for high-speed driving. *Id.*, 1:34-47. The '765 patent acknowledges that nylon and aramid are major materials for previous tire cords used for cap ply, but that each material individually has drawbacks. *Id.*, 1:48-67. Nylon tire cords result in flat spots and deformation in the tires, and aramid tire cords pose difficulty with tire molding. *Id.* To address problems with nylon- and aramid-only

tire cords, attempts had been made to develop hybrid tire cords that combine both aramid and nylon. *Id.*, 2:1-6. But prior art hybrid tire cords had inadequate structure and drawbacks, including low production efficiency, high manufacturing cost, high deviation in physical properties, and high defect rates. *Id.*, 2:25-3:2.

The '765 patent's advances include a 2-ply aramid and nylon hybrid tire cord that avoids these drawbacks. *Id.*, 3:5-21, 3:31-43. The '765 patent's 2-ply aramid and nylon hybrid tire cord can be applied to ultra-high performance tires because of the cord's unique structure that results in high strength and fatigue resistance. *Id.* The specification explains the structure of the claimed hybrid tire cord having these improved properties:

In accordance with an aspect of the present invention, the above and other objects can be accomplished by the provision of a hybrid tire cord including a nylon primarily twisted yarn, and an aramid primarily twisted yarn, wherein the nylon primarily twisted yarn and the aramid primarily twisted yarn are secondarily twisted together, and after untwisting (post-untwist) of the secondary twisting of the hybrid tire cord having a predetermined length, a length of the aramid primarily twisted yarn is 1.005 to 1.025 times a length of the nylon primarily twisted yarn.

...

The aramid primarily twisted yarn may have a 0.1 to 5% lower twist number than a twist number of the nylon primarily twisted yarn.

...

Meanwhile, according to the present invention, although primary twisted and secondary twisting are conducted by one twister, regarding a predetermined length of the hybrid tire cord, after the secondary twist is untwisted, the length of the aramid primarily twisted yarn is 1.005 to 1.025 times the length of the nylon primarily twisted yarn. That is, the hybrid tire cord of the present invention has a merge structure having a partial covering structure.

Id., 3:33-57, 5:64-6:4. The '765 patent thus discloses and claims hybrid tire cord that provides excellent stability and durability due to its physical properties, while being more efficient to manufacture with low defect rates, solving the problems of the prior art. *Id.*, 3:17-21, 3:60-4:11, 4:52-60.

B. Prosecution History (Ex.1002)

Claim 1 of the original application leading to the '765 patent recited:

1. A hybrid tire cord comprising:
a nylon primarily twisted yarn; and
an aramid primarily twisted yarn,
wherein the nylon primarily twisted yarn and the aramid primarily twisted yarn are secondarily twisted together,
if the secondary twist of the hybrid tire cord with a predetermined length were untwisted, a length of the aramid primarily twisted yarn would be 1.005 to 1.025 times a length of the nylon primarily twisted yarn, and
the aramid primarily twisted yarn has a 0.1 to 5% lower twist number than a twist number of the nylon primarily twisted yarn.

Ex.1002, 163. The Examiner initially rejected this claim in a non-final rejection as unpatentable over Love, et al. (U.S. Patent Application Publication No. 2014/0238524 (“Love”), Ex.2001). *Id.*, 81. The Examiner asserted that Love taught nylon and aramid primarily twisted yarn that was secondarily twisted together, and if the secondary twisting were untwisted, the aramid primarily twisted yarn would have been 1.005 to 1.025 times the length of the nylon primarily twisted yarn. *Id.* The Examiner argued that, while Love did not teach the claimed difference in twist number between the aramid and nylon, this difference would have been obvious:

While Love essentially teaches the invention as detailed, he fails to specifically teach that the aramid primarily twisted yarn has a 0.1 - 5% lower twist number than a twist number of the nylon primarily twisted yarn. It would have been obvious, however, to one of ordinary skill in the art before the effective filing date of the claimed invention to have utilized such a range, since it is understood that the degree of twist and longer length both contribute to the breaking strength of the material. Finding the work range for the aramid twist being 0.1 - 5% lower than nylon would have been well within the abilities of the ordinarily skilled artisan, through routine experimentation.

Id., 82.

In response to this rejection, Patent Owner requested reconsideration and withdrawal of the rejection, arguing that “Love does not disclose, either explicitly or implicitly, that the aramid primarily twisted yarn is 1.005 to 1.025 times the length

of the nylon primarily twisted yarn in a predetermined length of the hybrid tire cord, after the secondary twist is untwisted.” *Id.*, 71-72. Patent Owner also argued that, because Love does not teach the claimed length difference range, it thus also does not teach obtaining “a **merge structure having a partial covering structure**,” though at this time the claims did not require “a merge structure having a partial covering structure.” *Id.*, 72 (original emphasis).¹ The Examiner issued a final rejection maintaining the rejection of original claim 1 as obvious in view of Love. *Id.*, 61-62.

In response to the final rejection, Patent Owner amended the claims to recite the limitation “the hybrid tire cord has a merge structure having a partial covering structure.” *Id.*, 34 (emphasis omitted). Patent Owner provided remarks along with a declaration showing additional experimental data of unexpected results of the claimed hybrid tire cord. Patent Owner stated that Love does not teach the claimed length difference range nor the claimed twist number range:

As the Office acknowledges, Love fails to teach the claimed feature that the length of the aramid primarily twisted yarn is 1.005 to 1.025 times the length of the nylon primarily twisted yarn in a

¹ Emphases added and internal quotation marks and citations omitted unless otherwise specified.

predetermined length of the hybrid tire cord, after the secondary twist is untwisted.

Love does not disclose that the twist number of aramid primarily twisted yarns may be 0.1 to 5% lower than that of the nylon primarily twisted yarns. In addition, Love does not disclose that the aramid primarily twisted yarn is 1.005 to 1.025 times the length of the nylon primarily twisted yarn in a predetermined length of the hybrid tire cord, after the secondary twist is untwisted.

Id., 38 (original emphases).

Patent Owner also explained that Love did not teach the claimed “merge structure having a partial covering structure”:

Furthermore, Love fails to teach the merge structure having a partial covering structure as defined in currently amended base claim 1.

Shepherd, which is cited as teaching the nylon and aramid yarns being twisted separately in the same direction, then twisted together in the opposite direction, fails to remedy the deficiency of Love.

The claimed feature that “the aramid primarily twisted yarn is 1.005 to 1.025 times the length of the nylon primarily twisted yarn in a predetermined length of the hybrid tire cord” allows the resulting hybrid tire cord [to] have a **merge structure having a partial covering structure**.

Id. (original emphases).

Patent Owner pointed the examiner to the superior results of the claimed hybrid tire cord shown in Table 2 of the specification:

TABLE 2 (copied from the specification)

	Example 5	Example 6	Example 7	Example 8	Comparative Example 4	Comparative Example 5	Comparative Example 6
Aramid primarily twisted yarn length / nylon primarily twisted yarn length	1.005	1.01	1.02	1.025	1	1.003	1.03
Strength at break (g/d)	13.4	13.5	13.9	13.1	13.7	12.8	12.6
Strength at break non-uniformity (g/d)	0.3	0.4	0.4	0.4	0.3	0.3	6.5
Elongation at break (%)	11.0	11.3	11.8	11.9	10.8	10.8	12.5
Elongation at break non-uniformity (%)	1.6	1.8	1.8	2.0	1.4	1.6	4.0
Shrinkage (%)	2.0	2.1	2.1	2.0	2.5	2.0	2.0
Disk fatigue $\pm 2\%$ strength maintenance percentage (%)	96	96	98	95	87.9	92	94.5
Disk fatigue $+3/-10\%$ strength maintenance percentage (%)	90.5	91.6	92.5	93.1	78.5	80.2	82.4
Bending fatigue strength maintenance percentage (%)	91.3	93.1	96.0	92.0	75.1	86.4	85.2

Id., 40-41. Patent Owner noted:

The tire cord of Comparative Example [“(Comp. Ex.)”] 4 has a merge structure (as shown in <Illustration 2>) and, it was found that it is difficult to secure stability of the tire cord because stress is intensely applied to the aramid primarily twisted yarn upon repeated tension and compression of the tire and characteristics of the tire cord are not sufficiently good.”

Id., 41.

Patent Owner explained that Examples 5-8 showed “unexpectedly superior results” due to their use of the claimed invention:

On the contrary, in case of the hybrid tire cords of Examples 5-8, because the aramid primarily twisted yarn has a lower strength maintenance percentage than the nylon primarily twisted yarn, twist number of the aramid primarily twisted yarn is increased and the length of the aramid primarily twisted yarn is controlled to be longer than the nylon primarily twisted yarn by controlling tensions during twisting.

In particular, the length of the aramid primarily twisted yarn is controlled to be 1.005 to 1.025 times the length of the nylon primarily twisted yarn, and thus fatigue energy is absorbed in the nylon primarily twisted yarn which has a lower modulus and thus having a higher fatigue property. Because the fatigue energy is absorbed in the nylon primarily twisted yarn, the tire using the claimed tire cord has improved fatigue property.

Id., 40-42.

Patent Owner also provided additional experimental data in a declaration by one of the inventors showing that the claimed hybrid tire cord has improved properties, including “superior uniformity of physical properties” and “superior fatigue resistance” over the cord disclosed in Love. *Id.*, 42-45.

In view of Patent Owner's amendments and additional remarks and data, the Examiner allowed the application. *Id.*, 21-22.

C. Person Of Ordinary Skill In The Art

Solely for the purpose of this Preliminary Response, Patent Owner does not challenge Petitioner's proposed definition of a POSITA. *See* Pet. 12. Patent

Owner's expert, Dr. Brookstein, exceeds Petitioner's proposed level of skill and accordingly possesses the qualifications and experience necessary to testify based on the perspective of a POSITA. Brookstein (Ex.2017), ¶44. Patent Owner reserves the right to provide an alternative definition of a POSITA if an IPR is instituted.

D. Claim Construction

The prior art relied on in the Petition fails to disclose the subject matter of the challenged claims under any reasonable construction, including their plain meaning.²

III. Summary Of The Prior Art

A. Nakayasu (Ex.1007)

Nakayasu relates to a pneumatic radial tire with specific cords and belts. Nakayasu discloses a pneumatic radial tire with a band belt being made of a hybrid cord. Ex.1007, Abstract. Nakayasu explains that its hybrid cord includes low elastic modulus and high elastic modulus thread:

The hybrid cord includes a low elastic modulus thread and a high elastic modulus thread which are finally-twisted together, said low modulus thread having at least one low modulus fiber, first-twisted and having an elastic modulus of not more than 2000 kgf/sq.mm and said high

² Patent Owner reserves the right to advocate for claim constructions in the event the Board institutes review in this case and to argue claim constructions, as appropriate, depending on the nature of the disputes that may be raised in other proceedings.

modulus thread having at least one high modulus fiber first-twisted and having an elastic modulus of not less than 3000 kgf/sq.mm.

Id. In Table 1, Nakayasu reports properties for example tires with aramid as the high modulus thread and nylon as the low modulus thread:

TABLE 1

Tire No.	1 Ref. A	2 Ref. B	3 Ex. A	4 Ex. B	5 Ex. C	6 Ref. C	7 Ex. D	8 Ref. D	9 Ref. E
Band belt Code No. Material	1	2	3	4	5	6	7	8	9
High modulus thread	aramid 1000D	aramid 1000D	aramid 1000D	aramid 1000D	aramid 1000D	aramid 1000D	aramid 1000D	aramid 1000D	
Low modulus thread	nylon 1260D	nylon 840D	nylon 420D	nylon 420D	nylon 420D	nylon 840D	nylon 420D	nylon 840D	nylon 1260Dx2
First-twist (T/10 cm)									
High modulus thread	42.0	42.0	42.0	42.0	42.0	42.0	30.0	42.0	—
Low modulus thread	24.5	30.0	42.4	20.0	6.0	10.0	6.0	30.0	40.0
Final-twist (T/10 cm)	37.5	42.0	47.8	47.8	47.8	42.0	47.8	42.0	40.0
Stress (kgf)									
F1 at 2% elongation	2.4	1.7	1.1	0.8	0.6	1.2	0.9	1.7	1.3
F2 at 6% elongation	12.0	10.5	8.0	5.9	4.5	5.6	7.6	10.5	3.0
Cord count E (/5 cm)	50	50	50	50	50	50	50	50	50
F1 × E (kgf)	120	85	55	40	30	60	45	85	65
F2 × E (kgf)	600	525	400	295	225	280	380	525	150
Breaker cord material	aramid	aramid	aramid	aramid	aramid	aramid	aramid	steel	aramid
Test results									
Diameter change (mm)	11.4	9.5	6.1	4.5	3.4	6.7	4.9	1.9	7.2
Cut open width (mm)	0.38	0.32	0.30	0.28	0.27	0.29	0.29	0.25	0.31
Crack resistance									
Cracks	occurred	occurred	slight	non	non	slight	non	non	non
Running distance (km)	25,000	25,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
Steering stability	3.2	3.0	2.9	2.7	2.7	2.8	2.9	3.2	2.5

Id., Table 1. Petitioner's analysis focuses on the third column of Table 1, relating to Example A / hybrid cord 3. *See* Pet. 28. Nakayasu explains the results of this portion of Table 1, including the appearance of “tread groove cracks” with this hybrid cord:

The stress-elongation curve 3 is of hybrid cord 3 in Table 1, in which the thickness of the low elastic modulus thread was 420 denier, the first-twist was 42.4 turns/10 cm, and the final-twist was 47.8

turns/10 cm. Accordingly, the apparent difference in the twist number is 5.8 turns/10 cm in the direction of the final-twist of the high elastic modulus thread and 5.4 turns/10 cm in the direction of the final-twist of the low elastic modulus thread. In this tire 3, the product $F1 \times E$ of the stress $F1$ at 2 elongation and the cord count E was 55. **The tread groove cracks found after 30,000 kilometer running** was at less than five positions.

Ex.1007, 6:19-30.

As stated in the Nakayasu specification section cited above, as compared to the other example hybrid cords, cord 3 was not found to be the best performing hybrid cord or tire based on Nakayasu's test results. *Compare id.* (disclosing Example A / hybrid tire cord 3 had tread groove cracks), *with id.*, 6:31-38, 45-40 (disclosing that Example B / hybrid tire cord 4 and Example D / hybrid tire cord 7 did not have any cracks).

B. Fritsch (Ex.1023)

Fritsch relates to polyethylene terephthalate ("PET") and polyethylene naphthalate ("PEN") hybrid cabled cord. Ex.1023, [0009]. PEN and PET are both made from polyester-type polymers. *Id.*, [0004]; Brookstein, ¶48. Fritsch discloses a specific type of length difference measurement in the components of the cabled cord, which Fritsch calls a Coring level, and discloses a range of non-zero Coring levels between -25% to +25%. Ex.1023, [0029]. Fritsch also relates to a process of

making hybrid cabled cord with such a non-zero Coring level. *Id.*, [0010]. Fritsch defines the Coring level measurement as follows:

The phrase “unbalanced configuration” as used herein means that the at least two yarns have different lengths and therefore have a coring level which is not equal to zero[.] The phrase “balanced configuration” as used herein refers to a yarn having a coring level equal to zero. The difference in lengths is quantitated by determining the coring level. The coring level is measured by taking a sample of one meter of cabled cord and untwisting the cable in order to separate the two yarns which compose it. The so-separated yarns are then untwisted by the same number of turns as it took to separate the cable, and in the opposite direction, to yield the two yarns in their as-fed state. The length of each constituent yarn is then measured on the yarn in its as-fed state, and the coring level calculated using the following equation:

$$Coring = (A - B)/(B) \quad (1)$$

wherein A is the length of the yarn having the higher modulus and B is the length of the yarn having the lower modulus.

Id., [0019]-[0020]. Fritsch notes that in one preferred embodiment, the Coring level for a PEN/PET cord is between about 3% to about 15%. *Id.*, [0009], cls. 6-7, 26-27.

Fritsch discloses examples and physical properties only for PEN/PET hybrid tire cord cabled according to its methods. *Id.*, [0039]-[0042], Table 1, Fig. 2. While Fritsch acknowledges aramid and nylon are used for tire cord, it disparages polyamides, which include aramid and nylon and does not examine any aramid and

nylon hybrid cabled cord examples manufactured according to its methods (much less the Coring level of such examples). *Id.*, [0004] (stating that PET in particular “has many advantages over cords made of ... polyamide” and that “[p]olyamide ... has poor dimensional stability”), [0029] (identifying aramid and nylon as polyamides). Petitioner does not assert otherwise. Pet. 15-17.

IV. Grounds 1-2: Petitioner Fails To Show That Nakayasu In View Of Fritsch Renders Obvious Claims 1-6

Both Petitioner's Grounds 1-2 rely on the teachings of Nakayasu and Fritsch to contend independent claim 1 would have been obvious. *See* Pet. 2, 18, 39. Petitioner cobbles together Nakayasu's disclosure related to pneumatic tires made of aramid and nylon hybrid tire cord with Fritsch's disclosure, which relates to completely different hybrid tire cord material. Petitioner's approach fails for at least three reasons. First, Petitioner fails to establish an adequate motivation to combine the cited teachings with a reasonable expectation of success to arrive at the claimed invention. Second, Fritsch fails to render obvious the claimed length difference range of 1.005 to 1.025. Third, Nakayasu fails to render obvious the claimed twist number difference range of 0.1% to 5%. For at least these reasons, Petitioner has not shown a reasonable likelihood of prevailing, and institution should be denied.

A. Petitioner Does Not Establish A Motivation To Combine Nakayasu With Fritsch To Arrive At The Claimed Invention Nor A Reasonable Expectation Of Success In Doing So

Petitioner relies on Nakayasu for limitations 1[a]-1[c]'s requirements of aramid and nylon primarily twisted yarns being secondarily twisted together. Pet. 24-25. Petitioner acknowledges that Nakayasu does not teach limitation 1[d]'s requirements of a specific length difference between the aramid primarily twisted yarn and nylon primarily twisted yarn and relies instead on Fritsch for this limitation. *Id.* 25-27. In support of its combination, Petitioner proposes combining Fritsch's teachings of "applying different tension to yarns twisted to form a cord with one yarn being longer than the other" with Nakayasu. *Id.* 18-19. But Petitioner fails to present evidence to support a motivation to combine Nakayasu and Fritsch, as Petitioner proposes, with a reasonable expectation of success.

1. Petitioner's and Dr. Rust's inconsistent arguments about a POSITA's motivation lack credibility

Petitioner argues, citing the declaration of its expert Dr. Rust, that a POSITA would have been motivated to modify the manufacture of Nakayasu's hybrid cord to have an "unbalanced" configuration where "the aramid yarn is 0.9% longer than the nylon yarn" in view of Fritsch, contending that "such a difference provides beneficial improvements to the physical properties of the tire cord." Pet. 19 (citing Ex.1003, ¶¶85-86). Dr. Rust parrots Petitioner's assertions in the cited paragraphs. Ex.1003, ¶¶85-86. Petitioner contends that there was a "well-known" general

motivation to have such “unbalanced” tire cord where the yarns of the hybrid tire cord have different lengths:

Indeed, the notion that it was desirable for a tire cord's yarns to have different yarn lengths was well-known. This itself is taught in the Fritsch reference published in 2003, which is directed to forming a hybrid tire cord and explains that altering the tension of the yarns can create an “unbalanced” tire cord where the higher modulus yarn is longer than the lower modulus yarn, resulting in improved physical properties.

Pet. 1-2.

Petitioner's contention in this IPR that it was “well-known” “that it was desirable” to “create an ‘unbalanced’ tire cord” to obtain “improved physical properties” (*id.*), is **directly contrary** to its assertions in a co-pending IPR challenging one of Patent Owner's other patents. Specifically, in IPR2025-00662, challenging Patent Owner's U.S. Patent No. 9,789,731, Petitioner makes the **exact opposite** argument, contending that a POSITA would avoid using “unbalanced” cord constructions because they often have worse physical properties: “non-uniform (or unbalanced) cord construction can often lead to uneven stress distribution within the tire and composite tire performance.... As a result, ... the tire performance would be less stable.” Ex.2026 (IPR2025-00662, Petition), 24. Dr. Rust reiterates Petitioner's statements. Ex.2027 (IPR2025-00662, Ex.1003 (Rust Decl.)), ¶77.

Thus, Petitioner and Dr. Rust have taken diametrically opposed positions that unbalanced tire cords improve physical properties (in this IPR) and that unbalanced tire cords often result in worse physical properties that are detrimental to tire performance (in another IPR). Petitioner's and Dr. Rust's advancing opposite positions in separate IPRs casts doubt on the credibility of their positions and reflects the result-oriented, hindsight-biased nature of their approach.

Furthermore, Petitioner makes no attempt to show that the purported well-known motivation to use unbalanced hybrid cords that Petitioner advances in this IPR would apply to Nakayasu's hybrid cord. Petitioner's analysis relies on Nakayasu's Example A in Table 1 to meet limitation 1[e]. Pet. 28-29. According to Nakayasu, test results for this example reveal a diameter change of 6.1mm, a cut open width of 0.30mm, slight cracks, a 30,000 km running distance, and steering stability of 2.9. Ex.1007, Table 1. Assuming Nakayasu results in an aramid/nylon hybrid tire cord with equal-length aramid primarily twisted yarn and nylon twisted yarn, and that combining Fritsch would result in a 0.9% length difference, substantiating that "such a difference provides beneficial improvements to the physical properties of the tire cord" requires more than Dr. Rust's mere repetition of these words. Pet. 19. But that is all he offers. Ex.1003, ¶85. Dr. Rust adds no reasoning or other evidence (e.g., experimental results or simulations) to support his and Petitioner's allegations of "beneficial improvements." Pet. 19; Ex.1003, ¶85.

Petitioner's statement that "a POSITA would have expected the combination to yield the predictable result of improving the physical properties of Nakayasu's tire cord" is similarly unsupported, relying only on Dr. Rust's repetition of Petitioner's statement. Pet. 23 (citing Ex.1003, ¶95).

Dr. Rust's conclusory testimony, parroting Petitioner's statements, cannot sustain Petitioner's burden to show that a POSITA would have been motivated to combine Nakayasu and Fritsch as he and Petitioner propose. *Facebook, Inc. v. Windy City Innovations, LLC*, 973 F.3d 1321, 1340-41 (Fed. Cir. 2020); *Upjohn Co. v. MOVA Pharm. Corp.*, 225 F.3d 1306, 1311 (Fed. Cir. 2000); *Xerox Corp. v. Bytemark, Inc.*, IPR2022-00624, Paper 9 at 15-17 (P.T.A.B. Aug. 24, 2022) (precedential) (according "little weight" to testimony that contains a verbatim restatement of a petition's conclusory assertions without additional supporting evidence or reasoning); *see also Pers. Web Techs., LLC v. Apple, Inc.*, 848 F.3d 987, 993-94 (Fed. Cir. 2017) ("a clear, evidence-supported account of the contemplated workings of the combination is a prerequisite to adequately explaining and supporting a conclusion that a relevant skilled artisan would have been motivated to make the combination and reasonably expect success in doing so" and a petitioner must explain "*how* the combination of the two references was supposed to work"). Nor does Dr. Rust explain how a POSITA would implement the combination. Petitioner alleges that "a POSITA would have been motivated to alter the tension of

Nakayasu's yarn" to incorporate Fritsch's teachings (Pet. 19), but Nakayasu lacks any disclosure of how its yarns are twisted, and does not suggest that tension adjustments are possible or contemplated (Brookstein, ¶65). Dr. Rust does not attempt to fill these gaps in Petitioner's analysis.

2. Petitioner improperly mixes and matches PEN/PET and aramid/nylon hybrid cords to argue obviousness

Petitioner relies on Fritsch to support its argument that combining Fritsch with Nakayasu would provide "beneficial improvements," but Fritsch fails to support Petitioner's argument. Pet. 19. Fritsch only examines the properties of hybrid tire cord comprised of PEN/PET and only contains data reflecting alleged improvements for unequal length PEN/PET cords as compared to equal length PEN/PET cords. Ex.1023, [0030], Table 1 (annotated below).

TABLE 1

Inv. Ex.	Comp. Ex.	Cord components	Coring level	Breaking Strength (N)	Elongation at Break (%)	LASE at 1.6% (N)	LASE at 3% (N)	Elongation (%) at 45 N
1	A	PEN/PEN	0	199.2	10.4	21.4	48.7	2.7
2		PEN/PET	-15%	154	n.d.	n.d.	n.d.	n.d.
3		PEN/PET	-12.2%	154.3	9.3	20.8	45.4	3.1
4		PEN/PET	-9.2%	160.8	10.2	17.5	40.5	3.4
5		PEN/PET	-6.3%	164.7	11.1	16.5	32.8	4.0
6	B	PEN/PET	-3.2%	170.1	11.4	15.7	33.9	3.9
7		PEN/PET	0	180.5	12.4	15	32.7	4.1
8		PEN/PET	0.9%	184	12.8	14.6	33.7	4.1
9		PEN/PET	4.5%	184.5	13.8	13.8	30.8	4.3
10		PEN/PET	7.7%	183.5	15.4	13.2	28.6	4.6
	C	PEN/PET	13.9%	170.4	16.3	12.8	27.6	4.7
		PET/PET	15%	170	n.d.	n.d.	n.d.	n.d.
		PET/PET	0	177.7	18.9	12.5	26.2	5.2

PEN and PET are different materials than the aramid and nylon required by the claim. Attempting to bridge this chasm, Petitioner argues that a POSITA simply would have applied the 0.9% Coring level in Inventive Example (“Inv. Ex.”) 6 for PEN/PET hybrid cord to aramid/nylon hybrid cord:

Even though Fritsch describes a Coring level of 0.9% for PEN/PET hybrid cord, a POSITA would have understood that the disclosed benefits would also apply to an aramid/nylon hybrid cord.... First, Fritsch itself contemplates an aramid/nylon hybrid cord as one of its inventive cords.... Second, an aramid/nylon hybrid cord uses material with a higher modulus (aramid) and material with a lower modulus (nylon), which is similar to a PEN/PET hybrid cord, as Fritsch describes PEN as having a higher modulus and PET having a lower modulus.... Finally, Fritsch expressly teaches that cords using aramid and nylon are “[p]olymeric yarns useful in the inventive method and product,” and expressly states such cords preferably have a coring level between -25% and 25%.

Pet. 21-22 (original alteration). Petitioner’s reasoning hinges on incorrect assumptions, and would not have motivated a POSITA to combine Fritsch’s teachings.

As explained further below, a POSITA would have understood that aramid and nylon have very different chemical and physical properties from PET and PEN, so a POSITA would not have been motivated to apply a length difference for PEN/PET hybrid cord to an aramid/nylon hybrid tire cord. *See Apple Inc. v. INVT*

SPE LLC, 851 F. App'x 200, 202-03 (Fed. Cir. 2021) (affirming Board's finding of no motivation to combine where although the references "both involve measuring transmission power, they do so for different reasons, on different time scales, and compare the results to different thresholds"). None of Petitioner's three purported reasons why a POSITA would have applied a 0.9% Coring level based on Fritsch to aramid/nylon hybrid cord have merit.

First, Petitioner states, "Fritsch itself contemplates an aramid/nylon hybrid cord as one of its inventive cords," citing Fritsch's published claims 8-9. Pet. 21. Those claims, however, only relate to nylon and aramid hybrid cord having "an unbalanced configuration," through their dependency on claim 1, but recite no further specifics on the "unbalanced configuration." Ex.1023, cls. 1, 8-9. There is no disclosure or suggestion anywhere in Fritsch to use the specific 0.9% Coring level for the constituents of an unbalanced configuration aramid/nylon hybrid cord. Brookstein, ¶56. A POSITA would not be motivated to use the same Coring level in hybrid cords made of vastly different materials, nor would a POSITA have had an expectation that doing so would yield favorable results. *Id.* Neither Petitioner nor its expert offer any sufficient explanation to address these critical points.

Rather than explain why a POSITA allegedly would use a 0.9% Coring level in aramid/nylon cord, Petitioner's expert merely reiterates verbatim Petitioner's conclusory statement that, "even though Fritsch describes a Coring level of 0.9% for

a PEN/PET hybrid cord, a POSITA would have understood that the disclosed benefits would also apply to an aramid/nylon hybrid cord.” Pet. 21; Ex.1003, ¶93. That conclusory assertion cannot support a reasonable likelihood of demonstrating obviousness. *See Xerox*, IPR2022-00624, Paper 9 at 15-17; *Tiktok Inc. v. NTECH Props., Inc.*, IPR2024-01339, Paper 9 at 16 (P.T.A.B. Feb. 25, 2025) (according “little or no weight” to testimony that “repeats, almost verbatim, the language in the Petition without any further explanation or supporting reasoning or evidence”); *see also Facebook*, 973 F.3d at 1340-41 (affirming the Board’s decision upholding certain claims as patentable when “the Board considered Facebook’s expert’s testimony but determined that it did not ‘add materially to Petitioner’s unpersuasive attorney argument’ because it ‘merely repeat[ed] Petitioner’s argument, nearly verbatim, without citation to the basis for his testimony.’”).

Petitioner’s unexplained substitution of materials cannot support obviousness. *See Surgalign Spine Techs., Inc. v. LifeNet Health*, No. 2021-1117, 2022 WL 1073606, at *7-8 (Fed. Cir. Apr. 11, 2022) (affirming the Board’s finding that there would have been no reasonable expectation of success to substitute a metal screw in the prior art with a bone pin because of the difference in material); *see also Virtek Vision Int’l ULC v. Assembly Guidance Sys., Inc.*, 97 F.4th 882, 886-88 (Fed. Cir. 2024) (“[T]his case involves nothing other than an assertion that because two coordinate systems were disclosed in a prior art reference and were therefore

‘known,’ that satisfies the motivation to combine analysis. That is an error as a matter of law. It does not suffice to simply be known. A reason for combining must exist.”). Dr. Rust provides no objective evidence or scientific reasoning to support the contention that a POSITA would conclude that “the disclosed benefits” of a 0.9% Coring level for PEN/PET hybrid cord would apply to aramid/nylon hybrid tire cord. Pet. 21; Ex.1003, ¶93. Indeed, because of the different physical properties of aramid and nylon compared to PET and PEN, including the difference in moduli ratio (discussed below), a POSITA would have understood that properties obtained with a Coring level used in making PEN/PET hybrid tire cord would not have predicted or rendered obvious properties of aramid/nylon hybrid tire cord made with the same Coring level. Brookstein, ¶57. A POSITA thus would have had no reasonable expectation of successfully achieving “a good combination” of properties (Pet. 21), in making aramid/nylon hybrid tire cord with the same Coring level as PEN/PET hybrid tire cord (Brookstein, ¶58).

Second, Petitioner asserts that “an aramid/nylon hybrid cord uses material with a higher modulus (aramid) and material with a lower modulus (nylon), which is similar to a PEN/PET hybrid cord.” Pet. 21. While it is true that both aramid/nylon and PEN/PET hybrid cords comprise materials of higher and lower modulus, the same can be said of *any* hybrid cord because the two materials composing that cord will not necessarily have exactly the same modulus.

Brookstein, ¶58. In effect, Petitioner is arguing that, since Fritsch discloses a 0.9% Coring level for PEN/PET cord, it would be obvious to use the same Coring level in any hybrid cord. Petitioner is wrong, and offers no support for such a sweeping assertion of obviousness. *Id.*, ¶58. Neither Petitioner nor Dr. Rust address how the ratio of moduli of a PEN/PET cord compares to that of an aramid/nylon cord—for good reason. They are vastly different. *Id.* As explained below, a POSITA would not have been motivated to pluck the 0.9% Coring level from an example of PEN/PET cord and use it in aramid/nylon cord having vastly different ratio of moduli. *Id.* Petitioner offers no reason a POSITA would do so.

As Dr. Brookstein explains, modulus is a measure of the resistance of extension of textile material. Ex.2021 (Kevlar Technical Guide), 22; Brookstein, ¶59. The modulus is therefore one of the main measures of how easily the material or yarn can be bent or stretched and provides insight into how a cord will perform as a reinforcement material. Brookstein, ¶59. A ratio of moduli, or moduli ratio, is the ratio of the moduli of two different materials. *Id.* It determines how two materials will interact with one another and the resultant physical properties of the two materials together in a hybrid configuration. *Id.*

The moduli of PEN and PET are 130 cN/dtex³ and 60 cN/dtex, respectively. Ex.2034 (The Pneumatic Tire), 16 (Table 3.10); Brookstein, ¶60. This means that the moduli ratio for PEN/PET is 130:60 or around 2:1, because the modulus of PEN is roughly twice the modulus of PET. Brookstein, ¶60. The moduli of aramid and nylon are 300 cN/dtex and 25 cN/dtex, respectively. Ex.2034, 16 (Table 3.10); Brookstein, ¶60. This means that the moduli ratio of aramid/nylon is 300:25 or 12:1, because the modulus of aramid is twelve times the modulus of nylon. Brookstein, ¶60. In Nakayasu's preferred embodiment, the moduli ratio is at least 5:1. See Ex.1007, 5:10-22 ("high elastic modulus fiber has an elastic modulus of ... preferably not less than 5000 kgf/sq.mm [and] ... low elastic modulus fiber has an elastic modulus of ... preferably not more than 1000 kgf/sq.mm"). These moduli and moduli ratios are shown in the table below:

	Modulus	Moduli Ratio
PEN	130 cN/dtex	2:1
PET	60 cN/dtex	
Aramid	300 cN/dtex	12:1
Nylon	25 cN/dtex	
Nakayasu's high modulus fiber	5000 kgf/sq.mm	5:1
Nakayasu's low modulus fiber	1000 kgf/sq.mm	

³ The abbreviation cN/dtex refers to centinewtons per decitex.

Brookstein, ¶60.

The moduli ratio of Nakayasu's preferred embodiment is *two and a half times higher* than the moduli ratio of PEN/PET cord and, for an aramid/nylon cord (as shown in Nakayasu's Table 1), the moduli ratio is at least *six times higher* than the moduli ratio of PEN/PET cord. Brookstein, ¶61.⁴ Either is an enormous difference in moduli ratios. Brookstein, ¶61. If anything, the large difference in moduli ratios would have motivated a POSITA to use a much larger difference in Coring level for aramid/nylon cord than for PEN/PET cord. *Id.* Indeed, because of the large difference in moduli ratio between PEN/PET cord and aramid/nylon cord, a POSITA would have known that the physical properties of the PEN/PET hybrid tire cord (as shown in Fritsch's Table 1) or any improvements in physical properties would *not* predictably translate to aramid/nylon hybrid tire cord.⁵ Brookstein, ¶61. That is

⁴ Different references report different moduli of the yarns, but nevertheless support the conclusion that the moduli ratio of an aramid/nylon cord is significantly higher than the moduli ratio of a PEN/PET cord—one set of references report that the moduli ratio of an aramid/nylon cord is *an order of magnitude higher* than the moduli ratio of PEN/PET cord. Ex.2022, 4; Ex.2021, 7; Brookstein, ¶61.

⁵ A POSITA using aramid/nylon hybrid cord instead of PEN/PET hybrid cord also would have had to account for other differences in properties, such as the differences

because a POSITA would have understood that aramid has a much greater resistance to bending and stretching compared to nylon than PEN's resistance compared to PET. *Id.* Consequently, a POSITA would have understood that the resultant strength and elongation properties of aramid/nylon hybrid cord would be substantially and unpredictably different than PEN/PET hybrid cord at any Coring level. *Id.*

There is no evidence or reasoning offered by Petitioner or Dr. Rust to suggest the properties of a PEN/PET hybrid cord would predict the properties of an aramid/nylon hybrid cord having significantly different physical properties. Accordingly, a POSITA would not have been motivated to use a 0.9% Coring level for aramid/nylon cord with a reasonable expectation of success of obtaining “the disclosed benefits” of using the same Coring level for PEN/PET hybrid cord. *Id.*

Third, Petitioner states, and Dr. Rust repeats verbatim, that “Fritsch expressly teaches that cords using aramid and nylon are ‘[p]olymeric yarns useful in the inventive method and product,’ and expressly states such cords preferably have a Coring level between -25% and 25%.” Pet. 22 (original alteration) (citing Ex.1023, ¶29); Ex.1003, ¶93 (also citing Ex.1023, ¶29). Fritsch discloses over twenty “[n]on-

in shrinkage for PEN and PET (both “2%”) and for nylon (“7%”) and aramid (“nil”). Ex.2034, 16 (Table 3.10).

limiting examples” of yarns and a broad range of Coring levels from “about 25%” to “about -25%.” Ex.1023, [0029]. The claimed range is only a very small fraction, only about 4%, of this broad range. Brookstein, ¶62. Petitioner does not even contend that Fritsch’s broad disclosure of about 25% to about -25% renders the claimed range obvious; Petitioner merely asserts that Fritsch’s broad range “includes the claimed range.” Pet. 26-27. Indeed, there would be no basis for such a sweeping assertion: the bare assertion that, just because a narrow claimed range is subsumed within a broad disclosed range means the claimed range is obvious, has been repeatedly rejected as insufficient. *Allergan, Inc. v. Sandoz Inc.*, 796 F.3d 1293, 1305 (Fed. Cir. 2015) (affirming the district court’s finding of nonobviousness because the prior art ranges were broad, “and the record shows that the claimed amounts of the two different ingredients could and did materially and unpredictably alter the property of the claimed formulation”); *Genetics Inst., LLC v. Novartis Vaccines & Diagnostics, Inc.*, 655 F.3d 1291, 1306-07 (Fed. Cir. 2011) (finding that the district court did not err in concluding the claimed range was not prima facie obvious because the claimed range was a small subset of a very broad disclosed range in the prior art); *see also Initiative for Meds., Access & Knowledge (I-Mak), Inc. v. Gilead Pharmasset LLC*, IPR2018-00390, Paper 7 at 10 (P.T.A.B. July 19, 2018) (denying institution and rejecting Petitioner’s argument that the mere fact the claimed range of “about 25% to about 35% w/w” falls within the prior art’s range of

“about 5% to about 95%” shows anticipation of the narrower claimed range). The '765 patent explains that aramid/nylon hybrid tire cords having a length difference (Coring level) of 0.5% to 2.5% have “superior fatigue resistance” under the stresses “repeatedly applied upon actual tire driving” compared to those having a length difference (Coring level) of 0% and 3%—values only slightly outside the claimed range and well within the broad range Fritsch discloses for a large variety of yarns. Ex.1001, 12:61-13:3, Table 2 (showing superior fatigue strength properties).

Petitioner also alleges a separate motivation to combine because “Fritsch provides a finite number of identified, predictable Coring levels,” and thus a POSITA would have tried the 0.9% Coring level. Pet. 22. Petitioner is wrong; Fritsch discloses a wide range of Coring levels. As detailed above, although Table 1 includes certain examples of Coring levels, Fritsch discloses a large, 50% range of Coring levels “no greater than about 25% and no less than about -25%.” Ex.1023, [0029]. In such a large range, there is an immense number of potential Coring levels, and Petitioner provides no reason for a POSITA to focus on a particular range or value, absent hindsight. Brookstein, ¶63.

If anything, Fritsch would have led a POSITA in a very different direction from the claimed invention. Fritsch teaches that a Coring level for PEN/PET “between about 3% [and] 15%” is “preferred.” Ex.1023, [0009] (“In another preferred embodiment, the two yarns comprise polyethylene terephthalate and

polyethylene naphthalate and the coring level is between about 3% to about 15%.’”), Abstract (same); *see also id.*, cls. 6-7, 26-27 (claiming both +3% to +15% and -15% to -3% and not claiming any range encompassing 0.9%). Fritsch’s preferred and claimed ranges lie outside the claimed range, and Petitioner does not address how a POSITA would have adjusted the claimed ranges for aramid/nylon hybrid cord given that the moduli ratio of such a hybrid cord is significantly higher. Brookstein, ¶63. While Petitioner argues that obviousness does not require showing that a combination is the best option, but rather only a suitable option, Petitioner has not even tried to show why a Coring level of 0.9% would have been a suitable option for aramid/nylon hybrid tire cord. Pet. 21-22. Petitioner’s argument is no more than the unsupported product of speculation and hindsight. *TQ Delta, LLC v. Cisco Sys., Inc.*, 942 F.3d 1352, 1360 (Fed. Cir. 2019); *Univ. of Strathclyde v. Clear-Vu Lighting LLC*, 17 F.4th 155, 162 (Fed. Cir. 2021) (rejecting the Board’s obviousness finding because “[t]he only support for such a finding is pure conjecture coupled with hindsight reliance on the teachings in the [patent at issue]”).

Setting aside Petitioner’s unsupported allegations that a POSITA would make one-for-one swaps for PEN and PET with aramid and nylon, while maintaining a 0.9% Coring level, Fritsch in fact **discourages** the use of aramid and nylon. *See, e.g.*, Ex.1023, [0004] (“Polyester, specifically, polyethylene terephthalate (PET), has **many advantages** over cords made of rayon or polyamide [i.e., aramid and

nylon].... Polyamide [aramid and nylon] has higher strength and durability compared to rayon but has **poor dimensional stability....**”), [0029] (identifying aramid and nylon as polyamides); *Polaris Indus., Inc. v. Arctic Cat, Inc.*, 882 F.3d 1056, 1069 (Fed. Cir. 2018) (“[E]ven if a reference is not found to teach away, its statements regarding preferences are relevant to a finding regarding whether a skilled artisan would be motivated to combine that reference with another reference.”). Thus, a POSITA reviewing Fritsch would not have been motivated to apply its teachings of a 0.9% Coring level to aramid/nylon hybrid tire cord, as claimed. There is no evidence in Fritsch or otherwise offered by Petitioner that any improvements would result from applying a 0.9% Coring level to an aramid/nylon cord. Instead, as detailed above, there is ample evidence to the contrary, given the differences between the PEN/PET cord in Inventive Example 6 and the claimed aramid/nylon hybrid tire cord.

Accordingly, Petitioner fails to sufficiently establish a motivation to combine Nakayasu with Fritsch, and a POSITA would not have had any reasonable expectation of success in using a 0.9% Coring level disclosed in Fritsch for an aramid and nylon hybrid tire cord. Petitioner's Grounds 1 and 2 thus fail.

B. Fritsch Does Not Render Obvious Hybrid Cord Where, “If The Secondary Twist Of The Hybrid Tire Cord With A Predetermined Length Were Untwisted, A Length Of The Aramid Primarily Twisted Yarn Would Be 1.005 To 1.025 Times A Length Of The Nylon Primarily Twisted Yarn”

Besides failing to establish a motivation to combine and reasonable expectation of success in combining Nakayasu with Fritsch, for similar reasons, Petitioner also fails to show that Fritsch renders limitation 1[d] obvious. Petitioner relies only on Fritsch as allegedly disclosing or suggesting aramid-nylon hybrid tire cord where, if the aramid and nylon primarily twisted yarns were untwisted from each other, “the aramid primarily twisted yarn would be 1.005 to 1.025 times longer than the nylon primarily twisted yarn.” Ex.1001, cl. 1; *see also* Pet. 25-27. But Fritsch, taken alone or together with Nakayasu, does not render obvious this limitation.

Petitioner argues that the claimed length difference corresponds to a “Coring level[]” of 0.5% to 2.5% in Fritsch and that Fritsch discloses or suggests aramid-nylon tire cord with “a Coring level of 0.9%.” Pet. 26-27 (arguing that a POSITA would have been motivated to apply Fritsch’s disclosure of “a Coring level of 0.9% to Nakayasu’s aramid-nylon hybrid cord”). As detailed above, Fritsch, however, only discloses a 0.9% Coring level *for entirely different materials*—PET and PEN—not aramid and nylon. Brookstein, ¶70; Ex.1023, Table 1 (Example 6). Petitioner relies on Table 1, Figure 2, and paragraphs [0041]-[0042] of Fritsch for

disclosure of a 0.9% Coring level, but all of that disclosure exclusively relates to PEN/PET hybrid cord. Ex.1023, [0041] (referring to “an appropriate coring level of PEN with PET”), [0042] (referring to “PEN yarn” and “PET yarn” and explaining that Figure 2 shows the properties of the examples in Table 1), Table 1 (below, showing “PEN/PET” as the “Cord components” for all examples). In particular, as shown below, the 0.9% Coring level is associated with the “PEN/PET” cord in Inventive Example 6.

TABLE 1								
Inv. Ex.	Comp. Ex.	Cord components	Coring level	Breaking Strength (N)	Elongation at Break (%)	LASE at 1.6% (N)	LASE at 3% (N)	Elongation (%) at 45 N
1	A	PEN/PEN	0	199.2	10.4	21.4	48.7	2.7
		PEN/PET	-15%	154	n.d.	n.d.	n.d.	n.d.
		PEN/PET	-12.2%	154.3	9.3	20.8	45.4	3.1
		PEN/PET	-9.2%	160.8	10.2	17.5	40.5	3.4
		PEN/PET	-6.3%	164.7	11.1	16.5	32.8	4.0
5	B	PEN/PET	-3.2%	170.1	11.4	15.7	33.9	3.9
		PEN/PET	0	180.5	12.4	15	32.7	4.1
6		PEN/PET	0.9%	184	12.8	14.6	33.7	4.1
7		PEN/PET	4.5%	184.5	13.8	13.8	30.8	4.3
8		PEN/PET	7.7%	183.5	15.4	13.2	28.6	4.6
9	C	PEN/PET	13.9%	170.4	16.3	12.8	27.6	4.7
10		PEN/PET	15%	170	n.d.	n.d.	n.d.	n.d.
		PET/PET	0	177.7	18.9	12.5	26.2	5.2

Id., Table 1 (annotated).

In addressing the claim limitation, Petitioner and Dr. Rust ignore that they are relying on disclosure about PEN/PET cord. Pet. 25-27 (no mention of PEN or PET). They show the 0.9% Coring level in Figure 2 (*id.*), without acknowledging that this figure graphs the PEN/PET cords of Inventive Examples 1-10 and Comparative

Example B (Ex.1023, [0042]). They only acknowledge that the 0.9% Coring level is for PEN/PET cord in addressing an alleged motivation to combine Fritsch with Nakayasu. Pet. 21 (“Fritsch describes a Coring level of 0.9% for a PEN/PET hybrid cord”); Ex.1003, ¶93 (same). And in that context, Petitioner and Dr. Rust only assert that a Coring level of 0.9% provides “a good combination of” properties for “PEN/PET hybrid cord” that “would also apply to an aramid/nylon cord.” Pet. 21; Ex.1003, ¶¶90, 93. They do not even try to explain why a POSITA would have been motivated to use this Coring level for PEN/PET cord in cord composed of entirely different materials—aramid and nylon. *Id.* Furthermore, while Petitioner and Dr. Rust declare that Inventive Example 6 with its 0.9% Coring level has “good” properties and Fritsch “show[s] a benefit” using this Coring level, paragraph 40 of Fritsch, which they cite to support this contention, says nothing about Inventive Example 6—identifying only favorable properties achieved with Inventive Examples 2-5 and 7-8. Ex.1023, [0041].

Petitioner has simply plucked the 0.9% Coring level for PEN/PET cord and applied it to aramid/nylon cord in hindsight, in an improper attempt to reconstruct the claimed invention. *TQ Delta*, 942 F.3d at 1360 (rejecting expert testimony that “improperly ‘relied on the [challenged] patent itself’ as a ‘roadmap’”) (original alteration). Petitioner fails to support why a POSITA would apply a 0.9% Coring level for PEN/PET cord to cord composed of two entirely different materials—

aramid and nylon—that, as explained above, have very different properties. *See supra* Section IV.A.2. Petitioner's attempts to justify its hindsight reconstruction fail.

Accordingly, Petitioner's Ground 1 also fails because Petitioner has failed to show a reasonable likelihood of demonstrating that Nakayasu and Fritsch render obvious making aramid/nylon hybrid tire cord where, “if the secondary twist of the hybrid tire cord with a predetermined length were untwisted, the aramid primarily twisted yarn would be 1.005 to 1.025 times longer than the nylon primarily twisted yarn.”

C. Nakayasu Does Not Render Obvious A Hybrid Cord Where, “The Aramid Primarily Twisted Yarn Has A 0.1 To 5% Lower Twist Number Than A Twist Number Of The Nylon Primarily Twisted Yarn”

Petitioner argues that “Nakayasu discloses a tire cord embodiment where its *aramid primarily twisted yarn* has a *0.9% lower twist number* than that of its *nylon primarily twisted yarn*.” Pet. 28 (original emphasis). To support this argument, Petitioner cites a portion of Table 1 in Nakayasu and points to Example A (reproduced and annotated below).

Tire No.	1 Ref. A	2 Ref. B	3 Ex. A
Band belt Code No. <u>Material</u>	1	2	3
High modulus thread	aramid 1000D	aramid 1000D	aramid 1000D
Low modulus thread	nylon 1260D	nylon 840D	nylon 420D
<u>First-twist (T/10 cm)</u>			
High modulus thread	42.0	42.0	42.0
Low modulus thread	24.5	30.0	42.4
Final-twist (T/10 cm)	37.5	42.0	47.8

Id. 29. Petitioner ignores that Table 1 also discloses six other inventive examples, none of which meet the claimed twist number difference limitation.

TABLE 1

Tire No.	1 Ref. A	2 Ref. B	3 Ex. A	4 Ex. B	5 Ex. C	6 Ref. C	7 Ex. D	8 Ref. D	9 Ref. E
Band belt Code No. Material	1	2	3	4	5	6	7	8	9
High modulus thread	aramid 1000D	aramid 1000D	aramid 1000D	aramid 1000D	aramid 1000D	aramid 1000D	aramid 1000D	aramid 1000D	
Low modulus thread	nylon 1260D	nylon 840D	nylon 420D	nylon 420D	nylon 420D	nylon 840D	nylon 420D	nylon 840D	nylon 1260Dx2
First-twist (T/10 cm)									
High modulus thread	42.0	42.0	42.0	42.0	42.0	42.0	30.0	42.0	—
Low modulus thread	24.5	30.0	42.4	20.0	6.0	10.0	6.0	30.0	40.0
Final-twist (T/10 cm)	37.5	42.0	47.8	47.8	47.8	42.0	47.8	42.0	40.0
Stress (kgf)									
F1 at 2% elongation	2.4	1.7	1.1	0.8	0.6	1.2	0.9	1.7	1.3
F2 at 6% elongation	12.0	10.5	8.0	5.9	4.5	5.6	7.6	10.5	3.0
Cord count E (/5 cm)	50	50	50	50	50	50	50	50	50
F1 × E (kgf)	120	85	55	40	30	60	45	85	65
F2 × E (kgf)	600	525	400	295	225	280	380	525	150
Breaker cord material	aramid	aramid	aramid	aramid	aramid	aramid	aramid	steel	aramid
Test results									
Diameter change (mm)	11.4	9.5	6.1	4.5	3.4	6.7	4.9	1.9	7.2
Cut open width (mm)	0.38	0.32	0.30	0.28	0.27	0.29	0.29	0.25	0.31
Crack resistance									
Cracks	occurred	occurred	slight	non	non	slight	non	non	non
Running distance (km)	25,000	25,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
Steering stability	3.2	3.0	2.9	2.7	2.7	2.8	2.9	3.2	2.5

Ex.1007, Table 1 (annotated).

When Nakayasu is viewed as a whole, as required, it is clear that a POSITA would not have been motivated to pursue the twist number difference disclosed in Example A. *See In re Enhanced Sec. Rsch., LLC*, 739 F.3d 1347, 1355 (Fed. Cir. 2014) (holding it is impermissible to “stitch together an obviousness finding from discrete portions of prior art references without considering the references as a whole”). Notably, Nakayasu identifies problems with Example A, stating that it had groove cracks after 30,000 kilometers. Ex.1007, 6:19-30 (“The tread groove cracks found after 30,000 kilometer running was at less than five positions.”). Examples B and D, on the other hand, exhibited no groove cracks at all. *Id.*, 6:31-38, 6:45-49.

Example B has a **110%** higher aramid twist number (higher twist number % = $((42-20)/20)$) and Example D has a **400%** higher aramid twist number (higher twist number % = $((30-6)/6)$). *Id.*, Table 1. In addition, Nakayasu's Example A ranked lower on the Steering stability scale than reference examples with significantly different twist numbers. *Id.* Accordingly, a POSITA would not have been motivated to pursue Example A in Nakayasu and instead would have pursued a drastically larger twist number difference based on disclosed examples with meaningfully improved performance. Brookstein, ¶76. As a result, a POSITA would not have found limitation 1[e] to have been obvious over Nakayasu.

V. Dr. Rust's Declaration Fails To Support His Opinions With Objective Evidence And Scientific Reasoning And Should Therefore Be Given Little To No Weight

The Petition cites Dr. Rust's Declaration (Ex.1003) throughout as supporting Petitioner's arguments, but Dr. Rust's Declaration does not provide any support or evidence that fills in the gaps in Petitioner's arguments, especially for critical claim limitations. Petitioner therefore relies on expert testimony that merely regurgitates its attorney arguments to supplement teachings missing from the references themselves. Indeed, aside from content on the expert's background, materials considered, and discussion of applicable legal standards, the declaration simply parrots the attorney arguments in the Petition, largely using exactly the same wording in the Petition, and adding no evidence to support Dr. Rust's opinions.

Dr. Rust's parroting of attorney arguments should be given (at most) "little weight" because it does nothing but "repeat[], *verbatim*, the conclusory assertion[s] for which it is offered to support." *Xerox*, IPR2022-00624, Paper 9 at 15-17 (original emphasis) (according "little weight" to testimony that contains a verbatim restatement of a petition's conclusory assertions without additional supporting evidence or reasoning, also noting it is "particularly problematic in cases where, like here, expert testimony is offered not simply to provide a motivation to combine prior-art teachings, but rather to *supply a limitation missing from the prior art*"); see also *Upjohn*, 225 F.3d at 1311 ("Lack of factual support for expert opinion going to factual determinations, however, may render the testimony of little probative value in a validity determination.") (quoting *Ashland Oil, Inc. v. Delta Resins & Refractories, Inc.*, 776 F.2d 281, 294 (Fed. Cir. 1985)); *Facebook*, 973 F.3d at 1340-41 (affirming the Board's decision upholding a claim as "the Board considered Facebook's expert's testimony but determined that it did not add materially to Petitioner's unpersuasive attorney argument").

For example, Petitioner's obviousness theory relies on its contention that even though Fritsch's disclosure of a 0.9% Coring level is for PEN/PET hybrid cord, a POSITA would nonetheless apply that Coring level to aramid/nylon hybrid cord. Pet. 21-22. Without this conclusion, Petitioner's theory fails and it cannot establish obviousness of claim 1. But rather than explaining and providing evidence for the

critical finding that a POSITA would have applied Fritsch's PEN/PET Coring levels to aramid/nylon cord, Dr. Rust simply repeats Petitioner's conclusory attorney arguments, adding no additional reasoning or evidence, as shown in the table below, with identical language highlighted.

Petition 21-22.	Rust Decl. (Ex.1003), ¶93.
Even though Fritsch describes a Coring level of 0.9% for a PEN/PET hybrid cord, a POSITA would have understood that the disclosed benefits would also apply to an aramid/nylon hybrid cord. Ex. 1003, ¶93. First, Fritsch itself contemplates an aramid/nylon hybrid cord as one of its inventive cords. Ex. 1023, cls. 8-9. Second, an aramid/nylon hybrid cord uses material with a higher modulus (aramid) and material with a lower modulus (nylon), which is similar to a PEN/PET hybrid cord, as Fritsch describes PEN as having a higher modulus and PET having a lower modulus. Ex. 1023, ¶¶20-21. Finally, Fritsch expressly teaches that cords using aramid and nylon are “[p]olymeric yarns useful in the inventive method and product,” and expressly states such cords preferably have a coring level between -25% and 25%. <i>Id.</i>, ¶29.	93. It is also my opinion that, even though Fritsch describes a Coring level of 0.9% for a PEN/PET hybrid cord, a POSITA would have understood that the disclosed benefits would also apply to an aramid/nylon hybrid cord. First, Fritsch itself contemplates an aramid/nylon hybrid cord as one of its inventive cords. Fritsch at cls. 8-9. Second, an aramid/nylon hybrid cord uses material with a higher modulus (aramid) and material with a lower modulus (nylon), which is similar to a PEN/PET hybrid cord, as Fritsch describes PEN as having a higher modulus and PET having a lower modulus. Fritsch at ¶¶20-21. Third, Fritsch expressly teaches that cords using aramid and nylon are “[p]olymeric yarns useful in the inventive method and product” and expressly teachessuch [<i>sic</i>] cords preferably have a coring level between -25% and 25%. <i>Id.</i>, ¶29.
Petition 22-23.	Rust Decl. (Ex.1003), ¶¶94-95.
Furthermore although Fritsch is directed to altering the tension of an apparatus called a direct cabler, a POSITA would	94. Furthermore, it is also my opinion that although Fritsch is directed to altering the tension of an apparatus

have nevertheless found it obvious to apply Fritsch's teachings to any apparatus for twisting yarn, including ring twisters, as a POSITA would be motivated by the benefits of an "unbalanced configuration" as described in Fritsch regardless of the type of twister used for manufacturing the tire cord. Ex. 1003, ¶94.

A POSITA would have had a reasonable expectation of success in combining the references. Ex. 1003, ¶95. A POSITA would have understood that Fritsch's method of modulating the tensions would have been well-within the skill of an ordinary artisan to implement in the manufacture of tire cords. *Id.* Fritsch also explains that its method is useful for all sorts of yarn materials, including "aramid, nylon-6, nylon-6,6, and nylon-4,6," the same materials disclosed by Nakayasu. Ex. 1023, ¶29. In addition, Fritsch specifically teaches applying an unbalanced configuration of hybrid cord using nylon-6 yarn and aramid yarn or using nylon-6,6 yarn and aramid yarn. Ex. 1023, cls. 8-9. Thus, a POSITA would have expected the combination to yield the predictable result of improving the physical properties of Nakayasu's tire cord. Ex. 1003, ¶95.

called a direct cabler, a POSITA would have nevertheless found it obvious to apply Fritsch's teachings to any apparatus for twisting yarn, including ring twisters, as a POSITA would be motivated by the benefits of an "unbalanced configuration" as described in Fritsch regardless of the type of twister used for manufacturing the tire cord.

95. In my opinion, a POSITA would have had a reasonable expectation of success in combining the references. A POSITA would have understood that Fritsch's method of modulating the tensions would have been well-within the skill of an ordinary artisan to implement in the manufacture of tire cords. Fritsch also explains that its method is useful for all sorts of yarn materials, including aramid, nylon-6, nylon-6,6 and nylon-4,6," the same materials disclosed by Nakayasu. Fritsch at ¶29. In addition, Fritsch specifically teaches applying an unbalanced configuration of hybrid cord using nylon-6 yarn and aramid yarn. Fritsch at cls. 8-9. Thus, a POSITA would have expected the combination to yield the predictable result of improving the physical properties of Nakayasu's tire cord.

Accordingly, because the evidence on which Petitioner's case is conclusory and deserves little to no weight, for this additional reason, the Petition does not present a reasonable likelihood of prevailing sufficient to merit institution. In the

face of such deficient evidence, a trial to determine whether Petitioner can show by a preponderance of the evidence that it has established unpatentability would waste the Board's resources, and institution should therefore be denied.

VI. Conclusion

For the reasons set forth above, the Board should deny the Petition for Inter Partes Review.

Respectfully submitted,

Dated: July 15, 2025

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CERTIFICATE OF COMPLIANCE WITH 37 C.F.R. § 42.24

I hereby certify that this Patent Owner's Preliminary Response complies with the word count limitation of 37 C.F.R. § 42.24(b)(1) because the Patent Owner's Preliminary Response contains 9,254 words using Microsoft Word's counting feature, excluding the cover page, signature block, and the parts of the Patent Owner's Preliminary Response exempted by 37 C.F.R. § 42.24(b)(1).

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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. § 42.6(e), I certify that on this 15th day of July, 2025, a true and correct copy of the foregoing **Patent Owner's Preliminary Response and all Exhibits** were served by electronic mail on Petitioner's lead and backup counsel at the following email addresses:

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