

Filed on behalf of: Kolon Industries, Inc.

Entered: July 15, 2025

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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HS HYOSUNG ADVANCED MATERIALS CORP.,  
Petitioner,  
v.

KOLON INDUSTRIES, INC.,  
Patent Owner.

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Case IPR2025-00664  
Patent 9,617,663

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**PATENT OWNER'S PRELIMINARY RESPONSE**

**TABLE OF CONTENTS**

|      |                                                                                                                                       |    |
|------|---------------------------------------------------------------------------------------------------------------------------------------|----|
| I.   | Introduction.....                                                                                                                     | 1  |
| II.  | Background.....                                                                                                                       | 3  |
|      | A.    The '663 Patent (Ex.1001) .....                                                                                                 | 3  |
|      | B.    Prosecution History (Ex.1002).....                                                                                              | 4  |
|      | C.    Person of Ordinary Skill in the Art .....                                                                                       | 5  |
|      | D.    Claim Construction .....                                                                                                        | 5  |
| III. | Summary Of The Prior Art.....                                                                                                         | 6  |
|      | A.    Tamura (Ex.1006) .....                                                                                                          | 6  |
|      | B.    Fritsch (Ex.1011).....                                                                                                          | 7  |
|      | C.    Rowan (Ex.2016).....                                                                                                            | 8  |
|      | D.    Buchanan (Ex.1010).....                                                                                                         | 11 |
| IV.  | Ground 1: Petitioner Fails To Show That Tamura In View Of Fritsch,<br>Rowan, And Optionally Buchanan Renders Obvious Claims 1-3 ..... | 14 |
|      | A.    Petitioner Has Not Shown That A POSITA Would Have<br>Combined Tamura With Fritsch, Rowan, And Optionally<br>Buchanan .....      | 15 |
|      | 1.    Tamura is not analogous art.....                                                                                                | 15 |
|      | 2.    A POSITA would not have combined Tamura with<br>Rowan .....                                                                     | 21 |
|      | 3.    Petitioner fails to justify combining Tamura and Rowan<br>with Fritsch .....                                                    | 24 |
|      | 4.    A POSITA would not have been motivated to combine<br>Tamura, Fritsch, and Rowan with Buchanan.....                              | 31 |
|      | B.    The Petition Fails To Show Obviousness Of Multiple Claim<br>Limitations.....                                                    | 33 |

|      |                                                                                                                                                                                                                                                                                                             |    |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 1.   | The Petition fails to establish a reasonable likelihood of showing that the claimed “manufacturing a hybrid tire cord comprising” would have been obvious.....                                                                                                                                              | 33 |
| 2.   | Petitioner fails to show that its combination renders the claim limitation “the second step and the first step being conducted simultaneously” obvious .....                                                                                                                                                | 34 |
| 3.   | Petitioner fails to show that its combination renders the claim limitation “the third step being conducted continuously with the first and second steps” obvious.....                                                                                                                                       | 40 |
| V.   | Grounds 1 And 2: Fritsch Does Not Render Obvious A Method Of Making 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” ..... | 42 |
| VI.  | Dr. Rust’s Declaration Fails To Support His Opinions With Objective Evidence And Scientific Reasoning And Should Therefore Be Given Little To No Weight.....                                                                                                                                                | 54 |
| VII. | Conclusion .....                                                                                                                                                                                                                                                                                            | 60 |

**TABLE OF AUTHORITIES****Page(s)****CASES**

|                                                                                                                                                          |                |
|----------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| <i>Acrtic Cat Inc. v. Bombardier Recreational Prods. Inc.</i> ,<br>876 F.3d 1350 (Fed. Cir. 2017), <i>aff'd</i> ,<br>950 F.3d 860 (Fed. Cir. 2020) ..... | 29, 40         |
| <i>Airbus S.A.S. v. Firepass Corp.</i> ,<br>941 F.3d 1374 (Fed. Cir. 2019) .....                                                                         | 16, 17, 18     |
| <i>Allergan, Inc. v. Sandoz Inc.</i> ,<br>796 F.3d 1293 (Fed. Cir. 2015) .....                                                                           | 52             |
| <i>Apple Inc. v. INVT SPE LLC</i> ,<br>851 F. App'x 200 (Fed. Cir. 2021) .....                                                                           | 28             |
| <i>Arctic Cat Inc. v. Polaris Indus., Inc.</i> ,<br>795 F. App'x 827 (Fed. Cir. 2019) .....                                                              | 22             |
| <i>Ashland Oil, Inc. v. Delta Resins &amp; Refractories, Inc.</i> ,<br>776 F.2d 281 (Fed. Cir. 1985) .....                                               | 55             |
| <i>Catalina Mktg. Int'l, Inc. v. Coolsavings.com, Inc.</i> ,<br>289 F.3d 801 (Fed. Cir. 2002) .....                                                      | 33             |
| <i>Cisco Sys., Inc. v. Portsmouth Network Corp.</i> ,<br>IPR2024-00954, Paper 12 (P.T.A.B. Apr. 11, 2025) .....                                          | 13             |
| <i>DeSilva v. DiLeonardi</i> ,<br>181 F.3d 865 (7th Cir. 1999) .....                                                                                     | 14             |
| <i>Elekta Ltd. v. ZAP Surgical Sys., Inc.</i> ,<br>81 F.4th 1368 (Fed. Cir. 2023) .....                                                                  | 25             |
| <i>Facebook, Inc. v. Windy City Innovations, LLC</i> ,<br>973 F.3d 1321 (Fed. Cir. 2020) .....                                                           | 18, 24, 47, 55 |
| <i>Genetics Inst., LLC v. Novartis Vaccines &amp; Diagnostics, Inc.</i> ,<br>655 F.3d 1291 (Fed. Cir. 2011) .....                                        | 52             |

|                                                                                                                           |                |
|---------------------------------------------------------------------------------------------------------------------------|----------------|
| <i>In re Clay</i> ,<br>966 F.2d 656 (Fed. Cir. 1992) .....                                                                | 19             |
| <i>In re Deminski</i> ,<br>796 F.2d 436 (Fed. Cir. 1986) .....                                                            | 15, 31         |
| <i>In re Dilnot</i> ,<br>319 F.2d 188 (C.C.P.A. 1963) .....                                                               | 24             |
| <i>In re Enhanced Sec. Rsch., LLC</i> ,<br>739 F.3d 1347 (Fed. Cir. 2014) .....                                           | 29             |
| <i>In re Klein</i> ,<br>647 F.3d 1343 (Fed. Cir. 2011) .....                                                              | 31, 34         |
| <i>In re Wesslau</i> ,<br>353 F.2d 238 (C.C.P.A. 1965) .....                                                              | 30, 40         |
| <i>LKQ Corp. v. GM Glob. Tech. Operations LLC</i> ,<br>102 F.4th 1280 (Fed. Cir. 2024) (en banc) .....                    | 16, 31         |
| <i>NL Indus. Inc. v. Expl. Logging, Inc.</i> ,<br>915 F.2d 1584, 1990 WL 140489 (Fed. Cir. 1990) (per curiam) .....       | 24             |
| <i>Pers. Web Techs., LLC v. Apple, Inc.</i> ,<br>848 F.3d 987 (Fed. Cir. 2017) .....                                      | 23, 24, 31, 32 |
| <i>PersonalWeb Techs., LLC v. Apple, Inc.</i> ,<br>917 F.3d 1376 (Fed. Cir. 2019) .....                                   | 38             |
| <i>Polaris Indus., Inc. v. Arctic Cat, Inc.</i> ,<br>882 F.3d 1056 (Fed. Cir. 2018) .....                                 | 28             |
| <i>Sanofi-Aventis Deutschland GmbH v. Mylan Pharms., Inc.</i> ,<br>66 F.4th 1373 (Fed. Cir. 2023) .....                   | 15             |
| <i>Surgalign Spine Techs., Inc. v. LifeNet Health</i> ,<br>No. 2021-1117, 2022 WL 1073606 (Fed. Cir. Apr. 11, 2022) ..... | 46             |
| <i>Tiktok Inc. v. NTECH Props., Inc.</i> ,<br>IPR2024-01339, Paper 9 (P.T.A.B. Feb. 25, 2025) .....                       | 47             |

|                                                                                                         |               |
|---------------------------------------------------------------------------------------------------------|---------------|
| <i>TQ Delta, LLC v. Cisco Sys., Inc.</i> ,<br>942 F.3d 1352 (Fed. Cir. 2019) .....                      | 45, 53        |
| <i>United States v. Dunkel</i> ,<br>927 F.2d 955 (7th Cir. 1991) (per curiam) .....                     | 14            |
| <i>Univ. of Strathclyde v. Clear-Vu Lighting LLC</i> ,<br>17 F.4th 155 (Fed. Cir. 2021) .....           | 53            |
| <i>Upjohn Co. v. MOVA Pharm. Corp.</i> ,<br>225 F.3d 1306 (Fed. Cir. 2000) .....                        | 18, 24, 55    |
| <i>Virtek Vision Int'l ULC v. Assembly Guidance Sys., Inc.</i> ,<br>97 F.4th 882 (Fed. Cir. 2024) ..... | 46            |
| <i>Xerox Corp. v. Bytemark, Inc.</i> ,<br>IPR2022-00624, Paper 9 (P.T.A.B. Aug. 24, 2022).....          | <i>passim</i> |

## REGULATIONS

|                               |    |
|-------------------------------|----|
| 37 C.F.R. § 42.104(b)(4)..... | 13 |
|-------------------------------|----|

**EXHIBIT LIST**

| <b>Exhibit</b> | <b>Description</b>                                                                                                                                                                                                         |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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           | Patent L.R. 4-3 Joint Claim Construction and Prehearing Statement, <i>Kolon Indus., Inc. v. Hyosung Advanced Materials Corp., et al.</i> , No. 8:24-cv-00415-JVS-JDE (C.D. Cal. Feb. 20, 2025), ECF No. 133                |
| 2011           | File History for U.S. Patent Application No. 16/464,350                                                                                                                                                                    |

| <b>Exhibit</b> | <b>Description</b>                                                                                                                                                                                                                                         |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2012           | RESERVED                                                                                                                                                                                                                                                   |
| 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           | U.S. Patent No. 6,886,320 (“Rowan”)                                                                                                                                                                                                                        |
| 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           | The Textile Institute, <i>Advances in Yarn Spinning Technology: Woodhead Publishing Series in Textiles: Number 99</i> (C.A. Lawrence ed., 2010) (excerpt)                                                                                                  |
| 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 &amp; Polyethylene Naphthalate Fibres Under Cyclic Loading</i> , 41 J. Materials Sci. 1745 (2006)                                                                                  |
| 2023           | Peter R. Lord, The Textile Institute, <i>Handbook of Yarn Production: Technology, Science &amp; Economics</i> (2003) (excerpt)                                                                                                                             |
| 2024           | <i>Young’s Modulus</i> , <a href="https://depts.washington.edu/matseed/mse_resources/Webpage/Biomaterials/young's_modulus.htm">https://depts.washington.edu/matseed/mse_resources/Webpage/Biomaterials/young's_modulus.htm</a> (last visited July 7, 2025) |

| <b>Exhibit</b> | <b>Description</b>                                                                                                                                                                                                                      |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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)                                                                   |
| 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 1-3 of U.S. Patent No. 9,617,663 (the “’663 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*, as to Ground 1, Petitioner HS Hyosung Advanced Materials Corp. (“Petitioner” or “Hyosung”) fails to establish a motivation to combine its asserted prior art references. Petitioner’s obviousness argument hinges on the false premise that its lead reference, Tamura, is directed to hybrid tire cord. It is not; it never even mentions the word “tire.” Tamura is a non-analogous reference that relates to reinforcement fabric for large-diameter rubber hose. Petitioner’s Ground 1 thus fails because Tamura is an improper basis for an obviousness challenge. Even if Tamura were a proper reference for obviousness, a person of ordinary skill in the art (POSITA) would not have been combined Petitioner’s Fritsch reference with Tamura 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 method requires. Fritsch’s differences render it unsuitable to teach critical aspects of the claimed method.

*Second*, as to Ground 1, the Board should deny institution because Petitioner has failed to establish a reasonable expectation of success in combining the prior art to achieve the claimed invention. Claim 1 of the '663 patent is directed to a method for manufacturing hybrid tire cord, but Petitioner fails to establish how a POSITA would have modified Tamura or Fritsch in view of Rowan and Buchanan to arrive at the claimed method. Rowan and Buchanan disclose manufacturing methods different from the claimed method and do not address manufacturing hybrid tire cord with differing lengths of constituent yarns, as claim 1 requires.

*Third*, the Board should deny institution because both Petitioner's Grounds 1 and 2 fail to render obvious multiple limitations of claim 1. Petitioner fails to show either Ground renders obvious applying tension to result in a length difference of untwisted aramid primarily twisted yarn being 1.005 to 1.025 times longer than untwisted nylon primarily twisted yarn. Further, as to Ground 1, Petitioner fails to meet its burden to show teachings of: (1) a method of manufacturing hybrid tire cord; (2) the second step and the first step being conducted simultaneously; and (3) the third step being conducted continuously with the first and second steps.

Because Petitioner has failed to show a reasonable likelihood of success for either Ground, the Board should deny institution.

## II. Background

### A. The '663 Patent (Ex.1001)

The '663 patent, entitled "Hybrid Tire Cord and Method for Manufacturing the Same," issued on April 11, 2017, and claims priority to a Korean patent application, filed June 29, 2015. Ex.1001, Cover [30], [45], [54].

The '663 patent relates to 2-ply aramid and nylon hybrid tire cord and methods for making it. 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. Ex.1001, 1:24-37. The '663 patent acknowledges that nylon and aramid are major materials for previous tire cords for cap ply, but each material has drawbacks. *Id.*, 1:38-57. 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, Kolon and others tried to develop hybrid tire cords, but prior art hybrid tire cords had inadequate structure and drawbacks, including low production efficiency, high manufacturing cost, high deviation in physical properties, and increased defect rates. *Id.*, 1:58-63, 2:14-31.

The '663 patent's advances include a method of making a 2-ply aramid and nylon hybrid tire cord that avoids these drawbacks. Ex.1001, 2:62-3:7, 3:19-36. The '663 patent's method of manufacturing hybrid tire cord creates 2-ply aramid and

nylon hybrid tire cord that can be easily manufactured and can be applied to ultra-high performance tires because of the cord's high strength and fatigue resistance:

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.

*Id.*, 2:66-3:2, 3:19-28. The '663 patent thus discloses and claims a method of manufacturing hybrid tire cord that provides excellent stability and durability because of the resulting physical properties, while at the same time being easy to manufacture with low defect rates, solving the problems of the prior art. *Id.*, 2:62-3:7, 4:34-53.

#### **B. Prosecution History (Ex.1002)**

During prosecution of the application leading to the '663 patent, the Examiner found that three original claims, claims 9-11, recited patentable subject matter, subject to a required clarification related to the untwisting step. Ex.1002, 96-97, 99. In response to this Office Action, Patent Owner canceled claims 1-8 and amended

claim 9 to improve wording. *Id.*, 68. After these amendments, the Examiner allowed the claims. *Id.*, 11-13.

### **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. 8. 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), ¶51. 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.<sup>1</sup>

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<sup>1</sup> 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.

### III. Summary Of The Prior Art

#### A. Tamura (Ex.1006)

Tamura relates to reinforcement fabric for large-diameter rubber hose and focuses on physical properties relevant to reinforcement fabric in this application.

Ex.1006, Abstract, [0009]-[0010]. Tamura explains:

**[T]he present invention provides a large-diameter rubber hose** formed using vulcanized rubber reinforced by compounding fiber fabric and/or fiber cord, characterized in that the fiber fabric and/or fiber cord is composed of a composite fiber of aramid fiber and nylon fiber.

\*\*\*

The large-diameter rubber hose of the present invention maintains sufficient adhesive strength between the rubber layer and the reinforcing material layer even after a long period of vulcanization and hardening, effectively preventing the rubber layer and the reinforcing material layer from peeling off during use, and furthermore, when a fluid is passed through the hose, the change in the hose diameter due to the pressure of the fluid is small ....

*Id.*, [0011]-[0012].<sup>2</sup>

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<sup>2</sup> Emphases added and internal quotation marks and citations omitted unless otherwise specified.

Petitioner incorrectly asserts throughout its Petition that Tamura relates to hybrid tire cord (Pet. 2, 17-18, 29-30, 50-51), but Tamura does not disclose anything about tires or tire cords. *See infra* § IV.A.1.

**B. Fritsch (Ex.1011)**

Fritsch relates to polyethylene terephthalate (“PET”) and polyethylene naphthalate (“PEN”) hybrid cabled cord. Ex.1011, [0009]. Fritsch discloses a specific type of length difference measurement in cabled cord, which Fritsch calls a Coring level, and discloses a range of non-zero Coring levels between -25% to +25%. *Id.*, [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:

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

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 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 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), and Petitioner does not assert otherwise. Pet. 15-17.

### **C. Rowan (Ex.2016)<sup>3</sup>**

Rowan relates to a process and system for producing tire cords that combines twisting of the cabled cord with the treating of the cord “without intermediate take-

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<sup>3</sup> In the Petition, Petitioner cites U.S. Patent No. 6,886,320 as Rowan. Pet. v, 11. Petitioner, however, attached a different Rowan (U.S. Pat. No. 7,159,381) as Ex.1007. Patent Owner filed the correct Rowan as Exhibit 2016 as an Exhibit to its Brief on Discretionary Denial and cites to this correct version of Rowan throughout.

up.” Ex.2016, 2:38-53, 7:22-26. Rowan discloses an apparatus specific to its disclosed method, as shown below:

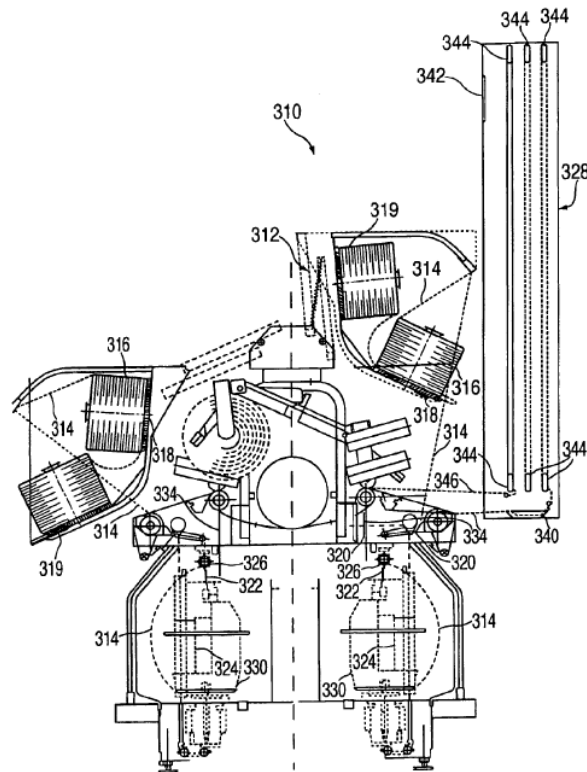


FIG. 4

*Id.*, Fig. 4. Rowan explains in detail how this apparatus works, including disclosing cabling two constituent yarns together and specific means for applying a brake:

Yarns for producing a cable first may be processed through the DCU 312. In so doing, an outer yarn 314 is pulled from the supply package 316 located in the bobbin creel 318 or reserve bobbin creel 319. The outer yarn 314 is pretensed by a tensioning device, such as brake 320. It will be appreciated that other tensioning devices ... may be substituted for or used in conjunction with the brake 320....

[T]he inner yarn 322 is drawn and unwinds from the inner supply package 324 which is held in stationary spindle container 330. The tension in the inner yarn 322 is controlled again by a tensioning device, such as a brake 326. The tension in the inner yarn 322 may be correlated with the tension in the outer yarn 314 set by brakes 320 and 326. Tension is measured and maintained via tension measuring devices known in the art ....

The outer yarn 314 and the inner yarn 322 are twisted into a cord 334 as the yarns 314 and 322 pass through spinning discs 336, which act to even any remaining differences in lengths between the yarns prior to twisting.

*Id.*, 7:34-64.

Rowan's alleged addition to the prior art is the ability to combine the treating sub-unit directly with the cabling unit, so that cabling and treating can be done in one step:

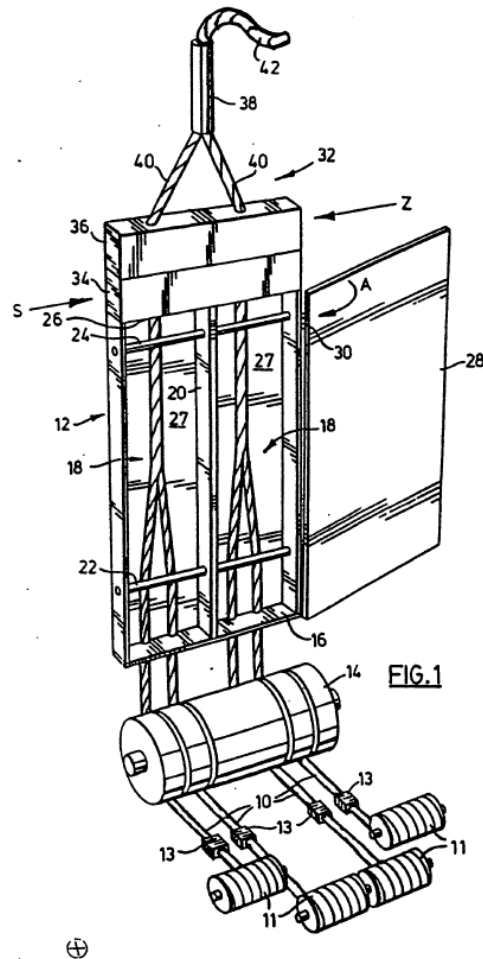
[T]he treating subunit 328 of the OCT 310 eliminates the hand[l]ing and transport operations 32, 36, 38 and 40 of process 10 in FIG. 1 and handling and transport operations 132, 136, 138, 140 and 172 of process 112 shown in FIG. 2. Individual feed yarns 314 and 322 are cabled in the DCU 312 but the raw cabled cord 334 so made is fed forward directly to a treating sub-unit 328 without any prior package take up. **This is accomplished by connecting the treating subunit directly with the DCU 312** and controlling the tension on the cord as it proceeds from the DCU to the treating sub-unit 328.

*Id.*, 7:65-8:8; *see also id.*, cl. 1.

Contrary to Petitioner's contentions, Rowan does not disclose simultaneously twisting the individual yarns in a first and second step nor does it disclose continuously twisting the hybrid cord together after the individual twisting steps. *See* Pet. 39. In fact, Rowan is completely silent on whether the individual yarns are twisted at all, and instead only addresses twisting yarns together into cabled cord. Ex.2016, 7:61-64.

**D. Buchanan (Ex.1010)**

Buchanan relates to air jet twisting composite yarns for sewing and carpet applications. Ex.1010, 2:15-26. Buchanan discloses a specific apparatus shown below containing a "false twisting apparatus 32" (*id.*, 3:36-39):



*Id.*, Fig. 1.

Buchanan discloses that this method makes yarns well suited for use as sewing thread or in carpet:

[C]omposite yarn [that] is therefore generally stronger than the individual yarns used to make it and so is ideal for use as **sewing thread** or weaving yarn in high strength applications. **This yarn may also be used to make carpet** which is more resilient than and has a different appearance than conventional carpet made from the same type of fibre.

*Id.*, 2:14-26. Buchanan further discloses that its apparatus is used for air jet twisting:

The twisting apparatus 32 is located above the second retaining pin 24. This apparatus 32 comprises a lower air jet 34 for applying twist to the yarn in the S direction and the upper air jet 36 for applying twist to the yarn in the Z direction. These jets 34, 36 are alternately actuated for equal periods of time. A compression tube 38 is located above the twisting apparatus 32.

*Id.*, 3:15-22.

Buchanan does not relate to a method of twisting yarns for hybrid tire cords, nor does it disclose twisting yarns according to the method claimed in the '663 patent. Buchanan further does not contemplate using aramid.

Patent Owner notes that Petitioner and Dr. Rust cite alternately to column/line numbers as well as paragraph numbers of Buchanan throughout the Petition and Declaration. *See, e.g.*, Pet. 13-14 (citing Ex.1010, ¶¶9, 11 and 3:50-4:5 within same paragraph), 36-37; Ex.1003, ¶¶67, 112-113. Buchanan (Ex.1010) does not include paragraph numbers. Patent Owner addresses the teachings of Buchanan to the extent that Petitioner's unclear arguments can be understood, but the Board need not be so charitable to Petitioner: it is a requirement for the Petitioner, in the Petition, to identify "[h]ow the construed claim is unpatentable .... The petition must specify where each element of the claim is found in the prior art patents or printed publications relied upon[.]" 37 C.F.R. § 42.104(b)(4). "It is not the responsibility of the Board to develop undeveloped arguments hinted at in the Petition." *Cisco*

*Sys., Inc. v. Portsmouth Network Corp.*, IPR2024-00954, Paper 12 at 17 (P.T.A.B. Apr. 11, 2025) (quoting *United States v. Dunkel*, 927 F.2d 955, 956 (7th Cir. 1991) (per curiam) (“Judges are not like pigs, hunting for truffles buried in briefs.”); *DeSilva v. DiLeonardi*, 181 F.3d 865, 866-67 (7th Cir. 1999) (“A brief must make all arguments accessible to the judges, rather than ask them to play archaeologist with the record.”)).

#### **IV. Ground 1: Petitioner Fails To Show That Tamura In View Of Fritsch, Rowan, And Optionally Buchanan Renders Obvious Claims 1-3**

Petitioner's Ground 1 relies on the teachings of three or four references: Tamura, Fritsch, Rowan, and optionally Buchanan. *See* Pet. 17. Petitioner seeks to combine disparate portions of each reference's alleged teachings, arguing that “Tamura describes a nylon yarn and an aramid yarn twisted in one direction, which are then twisted in an opposite direction to form a hybrid cord,” “Rowan describes a single twister that twists two single yarns in one direction to form two twisted yarns, and then continuously twist the yarns in an opposite direction to form a cord, especially in view of Buchanan which discloses simultaneously twisting yarns in one direction,” and “Fritsch discloses applying less tension to one yarn during twisting so that it is 0.5% to 2.5% longer than the other yarn.” *Id.* 17-18.

Petitioner's approach fails for multiple reasons. First, Petitioner fails to establish that Tamura is analogous art. Second, and relatedly, Petitioner fails to adequately establish a motivation to combine the references, and fails to adequately

support that a POSITA would have arrived at a method achieving the claimed length difference range. Third, Petitioner fails to establish a reasonable expectation of success in combining the elements of the prior art to achieve the limitations of the claimed invention. Fourth, Petitioner's prior art fails to meet multiple limitations of claim 1.

**A. Petitioner Has Not Shown That A POSITA Would Have Combined Tamura With Fritsch, Rowan, And Optionally Buchanan**

**1. Tamura is not analogous art**

Petitioner argues that Tamura and the '663 patent are analogous art "because they are ... directed to the same field of endeavor, specifically, the manufacture of cords from twisting yarn." Pet. 21-22. Petitioner is wrong. Petitioner's field of endeavor is unreasonably broad and would capture any manufacture of *any* yarn for *any* application. When the '663 patent's proper field of endeavor is considered, Tamura is not analogous art.

Prior art is analogous if (1) the art is from the same field of endeavor, regardless of the problem addressed, or (2) if the reference is reasonably pertinent to the particular problem with which the inventor is involved. *In re Deminski*, 796 F.2d 436, 442 (Fed. Cir. 1986). Petitioner only contends Tamura is analogous art under part (1), but it is not analogous art under either (1) or (2). It is Petitioner's burden to establish that a reference is analogous art. *See Sanofi-Aventis Deutschland GmbH v. Mylan Pharms., Inc.*, 66 F.4th 1373, 1379 (Fed. Cir. 2023) (reversing the Board's

finding that a reference was analogous). The analogous art requirement “applies to each reference” and “reins in the scope of the prior art and serves to guard against hindsight.” *LKQ Corp. v. GM Glob. Tech. Operations LLC*, 102 F.4th 1280, 1296 (Fed. Cir. 2024) (en banc).

First, Tamura is not from the same field of endeavor as the '663 patent. The “field of endeavor” is identified by referring to explanations of the invention’s subject matter, including the embodiments, function, and structure of the claimed invention. *Airbus S.A.S. v. Firepass Corp.*, 941 F.3d 1374, 1380 (Fed. Cir. 2019). Here, the only reasonable conclusion is that the field of endeavor for the '663 patent is methods for manufacturing **hybrid tire cords**. Brookstein, ¶73. The “Technical Field” section of the '663 patent states that the invention “relates to a hybrid tire cord” and a “method for manufacturing the same.” Ex.1001, 1:6-12. Each embodiment in the '663 patent relates to processes for producing hybrid tire cord. *Id.*, 8:54-10:67. Claim 1 of the '663 patent is directed to “[a] method of manufacturing a hybrid tire cord.” *Id.*, cl. 1. Thus, there can be no question that the “embodiments, function, and structure of the claimed invention” all relate to methods for manufacturing hybrid tire cord, and the field of endeavor is methods for manufacturing hybrid tire cord. *Airbus*, 941 F.3d 1380. Indeed, Petitioner’s expert, Dr. Rust, admits, “[t]he '663 patent is directed to manufacturing a hybrid tire cord.” Ex.1003, ¶36. And, both Petitioner and Dr. Rust focus on tire cord as the relevant

technology in addressing the background of the technology. Pet. 3-6; Ex.1003, ¶¶36-42.

Petitioner's argument that Tamura is analogous hinges on its unsupported assertion that Tamura describes or teaches hybrid tire cord. Petitioner asserts: "A POSITA would have been motivated to combine Tamura's teachings of a hybrid *tire cord* with Rowan's single twister apparatus." Pet. 18. Petitioner's assertion that Tamura teaches hybrid tire cord is no isolated mistake; it is a fundamental error that Petitioner repeats throughout its Petition:

- "Tamura ... describes the benefits of a nylon-aramid hybrid *tire cord*" (Pet. 2);
- "Tamura describes a nylon yarn and an aramid yarn twisted ... to form a hybrid *tire cord*" (*id.* 17);
- "the physical properties of Tamura's *tire cord*" (*id.* 29);
- "Tamura discloses a *tire cord* ..." (*id.*);
- "Tamura describes several embodiments of hybrid *tire cords*" (*id.* 50);
- "Tamura's *tire cord*" (*id.*); and
- "the *tire cord* disclosed by Tamura" (*id.* 51).

Petitioner is simply wrong. Tamura ***never mentions*** tires or tire cords or methods of manufacturing such cords. Indeed, Tamura does not contain the word "tire" at all. That is dispositive. *See Airbus*, 941 F.3d at 1380 (affirming Board

finding that reference was not analogous art because field of endeavor was “fire prevention and fire suppression,” but reference did not include term “fire” even once). Instead, Tamura discloses a relatively long fabric reinforced rubber hose for transporting oil from tankers to port. *See, e.g.*, Ex.1006, Abstract (“large-diameter rubber hose”), [0002] (“transporting a large amount of liquid using a hose”), [0009]. Tamura is therefore not within the correct field of endeavor, i.e., methods for manufacturing hybrid tire cords. Indeed, Dr. Rust provides no objective evidence or scientific reasoning to support that Tamura is analogous art and that its teachings would have been considered in the context of hybrid tire cord. *See 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).

The Petition addresses only the field-of-endeavor test, and because Tamura is not analogous art under this test, Tamura is unavailable as a reference for obviousness. Petitioner thus fails to carry its burden for Ground 1.

Petitioner did not contend that Tamura qualifies as analogous art because it is reasonably pertinent to the problem addressed by the '663 patent. It is not. A reference is “reasonably pertinent” only if its subject matter “logically would have commended itself to an inventor’s attention in considering his problem.” *Airbus*,

941 F.3d at 1382 (quoting *In re Clay*, 966 F.2d 656, 659 (Fed. Cir. 1992)). But as Tamura makes clear, its subject matter would not have commended itself to a POSITA's attention in seeking to solve the problems addressed by the '663 patent.

The '663 patent focuses on methods for manufacturing hybrid tire cord for use in tires to solve problems related to use of the tires over time. For example, the '663 patent identifies flat spots as a problem that the invention addresses. Ex.1001, 1:44-46, 7:8-11 (“When the weight of nylon primarily twisted yarns exceeds 4 times the weight of aramid primarily twisted yarns, physical properties of finally obtained hybrid tire cords become similar to those of nylon and flat spots thus occur.”). Tires develop flat spots when a car sits in place for an extended period of time. Brookstein, ¶80. That is not a problem Tamura seeks to address because large hoses do not develop flat spots from sitting for a long time, nor do flat spots present a problem in a large hose, as fluid (e.g., oil as in Tamura), can still flow through the hose despite the flat spot.

Tamura aims to solve an entirely different problems than the '663 Patent. Tamura focuses on solving durability, dimensional stability, and peeling problems related to reinforcements for large, reinforced rubber hoses. *See* Ex.1006, Abstract, [0006]-[0007]. For example, one problem Tamura addresses is that, during production of rubber hose, “heat vulcanization” is “carried out for a long period of time, such as **500 to 1000 minutes.**” *Id.*, [0003]. Such a problem does not exist

when manufacturing hybrid tire cord. For example, the '663 patent's claims do not require vulcanization, and in one example in the specification, the '663 patent describes vulcanization for only "20 minutes." *See, e.g.*, Ex.1001, 11:30-35 (rubber vulcanized for 20 minutes).

Tamura focuses on addressing problems related to manufacturing fabric that can withstand the internal pressure from large amounts of liquid (e.g., crude oil), flowing through the hose, by providing durability and dimensional stability and avoiding peeling of the reinforcing layer from the rubber layer. *See* Ex.1006, Abstract, [0002], [0006]-[0007], [0009] ("The present invention ... aims to provide a large-diameter rubber hose that maintains the adhesive strength between the rubber layer and the reinforcing material layer even after long-term vulcanization, does not peel off from the rubber layer during use, and exhibits little change in hose diameter due to fluid pressure even when transporting fluid, and has excellent durability and dimensional stability."). Another aspect of Tamura is to create fabric reinforcement that can withstand elevated temperatures from fluid flowing through the hose. *See id.*, [0004]. These problems are inapplicable to hybrid tire cord for tires, as tires are not designed to address large amounts of liquid flowing **within** the tire or any temperatures of such liquid.

Thus, Tamura does not meet the reasonably pertinent portion of the analogous art test. POSITAs looking to improve methods of manufacturing hybrid *tire cord*

would not have been motivated to look to Tamura nor would they have been motivated to pursue teachings in Tamura to address problems related to tire cords.

Accordingly, because Tamura is directed to a different field of endeavor and different problems in its application than the '663 patent, Tamura is not analogous art and unavailable for use in an obviousness combination against the '663 patent. For this reason alone, Petitioner's Ground 1 therefore fails to demonstrate a reasonable likelihood of establishing obviousness of any claim.

**2. A POSITA would not have combined Tamura with Rowan**

Even if Tamura were analogous art (and it is not), Petitioner fails to justify combining Tamura with Rowan. In asserting a motivation to combine Tamura with Rowan, Petitioner argues that Rowan teaches combining a two-step process for producing raw hybrid cord into a single machine, and "Tamura also teaches the same two-step process for producing a raw cord, and a POSITA would have been motivated to combine Tamura's two-step process with Rowan's teachings of single apparatus for performing the same steps simultaneously and continuously." Pet. 18. Petitioner argues that the advantages of the one-step process would have motivated POSITAs to use Rowan's apparatus to perform Tamura's two-step process, citing case law allegedly supporting the continuous running of these separate processes. *Id.* 19. On multiple fronts, Petitioner is wrong.

First, Petitioner's motivation to combine arguments appear to presume that Tamura's "two-step process for producing a raw cord" is a ring twist process requiring "separate and independently operated machines," a process allegedly improved upon by Rowan's one-machine technique. *See, e.g., id.* 18-19. But Tamura does not disclose a machine for producing its cord. Tamura provides minimal discussion of its method of manufacturing the hose reinforcing fabric, stating merely that "[t]he above-mentioned composite fiber cord is obtained by lower twisting a predetermined number of aramid fibers and nylon fibers, each of which is individually twisted, and then upper twisting the resulting fibers together" and that the fabric is woven together "in a conventional manner." Ex.1006, [0018]. Nothing in Tamura indicates that there was any challenge in twisting the fibers to create Tamura's fabric. Petitioner's reading of a ring twisting process into Tamura, to justify improving Tamura by using Rowan's single machine, appears to be an attempt to "create a problem with the prior art in hopes of creating a motivation to combine." *Arctic Cat Inc. v. Polaris Indus., Inc.*, 795 F. App'x 827, 833-34 (Fed. Cir. 2019) (affirming Board's rejection of motivation to combine arguments).

Second, Petitioner's motivation reasoning is, at best, less than clear. The claims require three twisting steps: two in which individual yarns of aramid and nylon are separately twisted to form an aramid primarily twisted yarn and a nylon primarily twisted yarn, respectively; and a third in which the two primarily twisted

yarns are twisted together to form a plied yarn. *See* Ex.1001, cl. 1. The two individual yarn twisting steps are performed “simultaneously” and the third plied yarn twisting step is performed “continuously with the first and second steps.” *Id.* Petitioner asserts “a POSITA would have been motivated to combine Tamura’s two-step process with Rowan’s teachings of a single apparatus for performing the same steps simultaneously and continuously.” Pet. 18. The two “steps” that Petitioner refers to are apparently: (1) “twisting a single thread of yarn into a ply”; and (2) “twisting two or more plies into a cord.” *Id.*; *see also id.* 10-11 (characterizing Tamura’s two steps similarly); Ex.1003, ¶75 (“performing the twisting steps simultaneously and continuously”). But, Petitioner’s characterization conflates the claim language and makes unclear what steps in its proposed combination are being performed “simultaneously” and what steps are performed “continuously.”

Petitioner and Dr. Rust are also silent on *how* a POSITA would modify Tamura in view of Rowan and instead limit their to *why* a POSITA would have been motivated to do so. Pet. 18-22.<sup>4</sup> Without an explanation of *how* to combine them, Petitioner’s proposed combination of Tamura and Rowan fails. *See Pers. Web*

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<sup>4</sup> Petitioner’s analysis cites Rowan (Ex.1007) at paragraph 39 to support its motivation to combine (*see* Pet. 19); but like Buchanan mentioned above, Rowan does not include paragraph numbers.

*Techs., LLC v. Apple, Inc.*, 848 F.3d 987, 993-94 (Fed. Cir. 2017) (“*Pers. Web Techs. I*”) (a petitioner must explain “how the combination of the two references was supposed to work”) (original emphasis). Petitioner’s cited cases (*i.e.*, *In re Dilnot*, 319 F.2d 188, 194 (C.C.P.A. 1963); *NL Indus. Inc. v. Expl. Logging, Inc.*, 915 F.2d 1584, 1990 WL 140489, at \*2 (Fed. Cir. 1990) (per curiam)), are inapplicable because they relate only to whether it was within the skill of a POSITA to modify a prior art process to a continuous one, and neither provides clarity to Petitioner’s deficient analysis. Petitioner had to provide objective evidence or scientific reasoning to support its arguments, but failed to do so. *Facebook*, 973 F.3d at 1340-41; *Upjohn*, 225 F.3d at 1311; *Xerox*, IPR2022-00624, Paper 9 at 15-17; *see also Pers. Web Techs. I*, 848 F.3d at 994 (“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”).

Accordingly, Petitioner has failed to justify combining Tamura and Rowan.

### **3. Petitioner fails to justify combining Tamura and Rowan with Fritsch**

A POSITA also would not have been motivated to combine Tamura and Rowan (and optionally Buchanan) with Fritsch.

First, Petitioner proposes to combine Fritsch’s teachings of “applying different tension to yarns twisted to form a cord with one yarn being longer than the

other” with Tamura and Rowan. Pet. 25. Tamura, however, says nothing about applying tension to yarns to manufacture its cords. *See generally* Ex.1006. It is Rowan that involves use of a “tensioning device.” Ex.2016, 7:34-64. Thus, Petitioner needed to provide a rationale to modify use of Rowan’s “tensioning device” to apply different tensions, as Fritsch discloses. But Petitioner presents no argument that a POSITA would have been motivated to apply Fritsch’s teachings to Rowan. Pet. 25-29. Rather, Petitioner argues that “a POSITA would have been motivated to use one or more of [Fritsch’s] Coring levels with Tamura to achieve improved physical properties,” without addressing Rowan. *Id.* 27. Petitioner only asserts a reasonable expectation of success in combining Rowan with Fritsch (which also fails, as detailed later in this section), but never provides any reason to combine them in the first place. That is fatal. *See Elekta Ltd. v. ZAP Surgical Sys., Inc.*, 81 F.4th 1368, 1376 (Fed. Cir. 2023) (while a reasonable expectation of success finding can be implicit, a motivation to combine determination must be explicit).

Second, Petitioner repeatedly asserts that a POSITA would have applied Fritsch’s Coring levels to create an unbalanced cord (i.e., length difference between the two yarns) to result in improved physical properties of the tire cord. *See, e.g.*, Pet. 1-2 (“[T]he notion that yarns will achieve different untwisted lengths based on the amount of tension applied to them during twist was a well-known property of such materials” and “altering the tension of the yarn can create an **‘unbalanced’ tire**

**cord, resulting in improved physical properties.”), 16 (“Fritsch’s inventors discovered that ‘modulat[ing] the tension on the individual plies’ [during manufacturing] can result in an ‘**unbalanced configuration**’ where one yarn is longer than the other when untwisted [and] [t]his **results in a cord with ‘greater tensile strength retention.**’”), 26 (“Fritsch provided experimental results that shows **an improvement with unbalanced configurations ....**”), 29 (same); *see also* Ex.1003, ¶¶69, 96 (same). But these arguments are **directly contrary** to Petitioner’s 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 takes the diametrically-opposite tack with respect to unbalanced tire cords, criticizing that they “compromise tire performance”: “non-uniform (or **unbalanced**) cord construction often lead to uneven stress distribution within the tire and compromise tire performance” and make the tire “less stable.” Ex.2026 (IPR2025-00662, Petition), 24; Ex.2027 (IPR2025-00662, Ex.1003 (Rust Decl.)), ¶77. Petitioner’s hindsight-biased approach, arguing benefits of unbalanced configurations in this proceeding while simultaneously alleging detriments to unbalanced configurations in another, cannot be reconciled. Petitioner’s result-oriented, contradictory positions further highlight the deficiencies in Petitioner’s motivation to combine arguments. Petitioner’s Ground 1 analysis fails for this additional reason.**

Third, Petitioner's argument that a POSITA would have combined Tamura, Rowan, and Fritsch fails for additional reasons. Petitioner argues that, based on Fritsch's teachings, "a POSITA would have been motivated to alter the tension so that the aramid yarn is 0.9% longer than the nylon yarn" in the proposed combination.

Pet. 25. Petitioner asserts:

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 materials 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%.

*Id.* 27-28. Petitioner's reasoning hinges on incorrect assumptions, and would not have motivated a POSITA to combine Fritsch's teachings.

As detailed further below (*see infra* § V), a POSITA would have understood that aramid and nylon have very different chemical and physical properties from PEN and PET, so a POSITA would not have been motivated to apply a length difference for PEN/PET hybrid cord in making 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"). Fritsch discloses PEN/PET hybrid tire cord and its properties—not methods of making aramid and nylon hybrid tire cord meeting the limitations of the claims of the '663 patent, and in fact discourages the use of aramid and nylon. *See, e.g.*, Ex.1011, [0004] ("Polyester, specifically, polyethylene terephthalate (PET), has many advantages over cords made of rayon or polyamide [e.g., nylon and aramid].... Polyamide [e.g., nylon and aramid] has higher strength and durability compared to rayon but has poor dimensional stability.... Another polyester, polyethylene naphthalate (PEN), provides even better mechanical properties, including modulus, breaking strength, and elongation, for use in tires than PET."); *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."). On the other hand, Tamura criticizes PET fiber for its application, because it "does not necessarily have sufficient heat resistance," so "thermal degradation occurs." Ex.1006, [0004].

Third, Petitioner's obviousness argument fails because Petitioner disregards the conflicting teachings of its chosen references. It is impermissible to "stitch together an obviousness finding from discrete portions of prior art references without considering the references as a whole." *In re Enhanced Sec. Rsch., LLC*, 739 F.3d 1347, 1355 (Fed. Cir. 2014). Petitioner argues that a POSITA could apply the disclosure in Fritsch related to adjusting tensions to Tamura, but as detailed above, Petitioner's combination requires using Rowan's twisting with Tamura, and Rowan does not disclose using tensioning to adjust individual yarn lengths, much less using unbalanced tensions. *See* Ex.2016, 7:34-60. To the contrary, Rowan teaches that its machine functions to even any differences in length before twisting. *Id.*, 7:61-64 ("spinning discs 336 ... act to **even any** remaining differences **in lengths** between the yarns prior to twisting"). A POSITA thus would not have been motivated to apply Fritsch's disclosure of adjusting tension for PEN/PET hybrid tire cord to achieve different yarn lengths with Rowan's approach to manufacturing hybrid tire cord, which uses even yarn lengths. Brookstein, ¶96.

While Petitioner relies on Fritsch to argue that its proposed combination would use yarns of different lengths, Petitioner fails to address Rowan's contrary teachings. Petitioner thus engages in an erroneous obviousness analysis by cherry-picking only those teachings that it believes support its obviousness arguments, while disregarding teachings against its proposed modifications. *See Arctic Cat Inc.*

*v. Bombardier Recreational Prods. Inc.*, 876 F.3d 1350, 1360 (Fed. Cir. 2017) (“we have held that it is error to fail to consider the entirety of the art,” because “the prior art could contain one reference suggesting a combination and others critiquing or otherwise discouraging the same,” and “[e]ven a single reference can include both types of statements”), *aff’d*, 950 F.3d 860 (Fed. Cir. 2020); *In re Wesslau*, 353 F.2d 238, 241 (C.C.P.A. 1965) (“It is impermissible within the framework of section 103 to pick and choose from any one reference only so much of it as will support a given position, to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one of ordinary skill in the art.”).

Furthermore, while Petitioner and Dr. Rust point to Fritsch’s “butterfly pulley” and assert Fritsch teaches that tension on the yarn can be unbalanced by wrapping the two yarns around the butterfly pulley an unequal number of times, they fail to explain how this teaching would apply to Rowan. Pet. 43; Ex.1003, ¶126. Rowan does not disclose any pulleys, let alone “butterfly pulleys.” Moreover, there is no discussion of wrapping the yarn around the tensioning device, such as a brake, in Rowan. *See* Ex.2016, 7:34-45. Petitioner and Dr. Rust have therefore failed to explain *how* a POSITA would have been able to combine Fritsch’s teachings with Rowan to modify Tamura to achieve any kind of unbalanced hybrid tire cord, let alone why a POSITA would have been motivated to do so. *See Pers. Web Techs. I*,

848 F.3d at 993-94 (a petitioner must explain “*how* the combination of the two references was supposed to work”) (original emphasis).

Accordingly, for this additional reason, Petitioner's Ground 1 fails to show a reasonable likelihood of success.

**4. A POSITA would not have been motivated to combine Tamura, Fritsch, and Rowan with Buchanan**

Petitioner's “optional[]” reference Buchanan also would not have been combined with Tamura, Rowan, and Fritsch. Petitioner argues that Buchanan and the '663 patent are in the same field of endeavor because they relate to “the manufacture of cords from twisting yarn.” Pet. 21-22. As detailed above, this “field of endeavor” is overly broad. *Supra* § IV.A.1. Instead, the field of endeavor for the '663 patent is manufacturing hybrid *tire* cords (*supra* § IV.A.1), and Buchanan, like Tamura, does not relate to this field. Buchanan instead relates to yarn applications for sewing and carpet. Ex.1010, 2:15-26. Accordingly, Buchanan neither relates to the same field of endeavor nor is reasonably pertinent to the particular problem with which the '663 inventors were involved. *See Deminski*, 796 F.2d at 442; *LKQ*, 102 F.4th at 1296. Buchanan is therefore not analogous art and not available for an obviousness analysis. *See In re Klein*, 647 F.3d 1343, 1348 (Fed. Cir. 2011).

Setting aside that Buchanan is not analogous prior art, Petitioner fails to justify modifying Rowan in view of Buchanan to achieve simultaneous twisting. Petitioner

argues that “a POSITA would have been motivated to look to Buchanan in order to give effect to Rowan’s teachings, specifically an apparatus that twists a thread into a yarn, and does so *simultaneously* in order that the yarns can be twisted into a cord *continuously* as taught by Rowan,” asserting that, “[i]f the yarns are not twisted at the same time, then the apparatus could not ‘treat[] the cord in a continuous process without intermediate take-up’ as required by Rowan.” Pet. 23-24 (original alterations and emphases). First, Petitioner is wrong: nothing in Rowan nor Buchanan requires that the individual plies be twisted simultaneously. Second, a process can also be continuous—i.e., lacking an intermediate take-up, such that the yarns move within one machine from individual twisting, twisting together, and dipping in adhesive—without the two individual yarns being twisted simultaneously. Thus, Petitioner’s argument is logically flawed, and Dr. Rust merely repeats this logically flawed argument verbatim, which merits no weight. Ex.1003, ¶¶85-86; *Xerox*, IPR2022-00624, Paper 9 at 15-17.

Third, even Petitioner’s argument were logically sound, Petitioner and Dr. Rust fail to discuss *how* a POSITA would have used Buchanan to modify Rowan to achieve simultaneous twisting of the individual plies. *See Pers. Web Techs. I*, 848 F.3d at 993-94. Rowan and Buchanan disclose different twisting apparatuses for different cord applications. A POSITA would not have known how to apply anything from the Buchanan apparatus to the Rowan apparatus. Brookstein, ¶101.

For example, Buchanan performs its twisting by a “lower air jet” while Rowan, to the extent that it discloses twisting a yarn, does so via spinning discs. *Compare* Ex.1010, 3:16-19, *with* Ex.2016, 7:61-64. Modifying Rowan to implement Buchanan’s teachings at minimum would require complex mechanical modifications, and Petitioner fails to address them at all.

For this additional reason, Petitioner fails to show a reasonable likelihood of success for its Ground 1.

**B. The Petition Fails To Show Obviousness Of Multiple Claim Limitations**

Even if Tamura, Rowan, Fritsch and possibly Buchanan could properly be combined (and they cannot), the combination would not meet multiple limitations of independent claim 1.

**1. The Petition fails to establish a reasonable likelihood of showing that the claimed “manufacturing a hybrid tire cord comprising” would have been obvious**

Petitioner treats the preamble as limiting. *See* Pet. 29-30; Ex.1003, ¶97 (referring to the preamble as a “limitation”). Indeed, the preamble is limiting because the preamble provides antecedent basis for the body of the claim. *Catalina Mktg. Int’l, Inc. v. Coolsavings.com, Inc.*, 289 F.3d 801, 808 (Fed. Cir. 2002); Ex.1001, cl. 1 (reciting in the body of the claim “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”).

Petitioner relies on Tamura alone for the claimed “method of manufacturing a hybrid tire cord.” Pet. 29-30. Petitioner’s entire argument is that Tamura discloses this limitation: “Tamura discloses a tire cord made from twisting two primarily twisted yarns of different materials: nylon and aramid, i.e. *a hybrid tire cord*.” *Id.*, 29 (original emphasis). As discussed above (*supra* IV.A.1), Petitioner is simply wrong—Tamura does not disclose “tire cord” or any method of making it; to the contrary, Tamura never even mentions the word “tire.” Tamura instead discloses hose reinforcement fabric. Ex.1006, Abstract, [0009]-[0010], cls. 1-7.

Petitioner offers nothing to fill the gap between Tamura’s hose reinforcement fabric and the claimed method of manufacturing a hybrid tire cord. Petitioner does not contend that Tamura’s method of creating hose reinforcement fabric somehow renders the claimed method of manufacturing a hybrid tire cord obvious. Even if Petitioner had done so, its argument would still fail because, as discussed above (*supra* IV.A.1), Tamura is not analogous prior art, and thus cannot be used in an obviousness analysis. *See Klein*, 647 F.3d at 1348.

For at least this reason, Petitioner’s Ground 1 fails.

**2. Petitioner fails to show that its combination renders the claim limitation “the second step and the first step being conducted simultaneously” obvious**

Claim 1 recites “the second step and the first step being conducted **simultaneously**” where “the first step” is “primarily twisting an aramid filament

yarn in a first direction to form an aramid primarily twisted yarn” and the “second step” is “primarily twisting a nylon filament yarn in a second direction to form a nylon primarily twisted yarn.” Ex.1001, cl. 1. Petitioner asserts that, because Tamura discloses that both a nylon thread and an aramid thread are “lower twist[ed],” both are twisted simultaneously. Pet. 32 (original alteration). Petitioner is incorrect.

Both Petitioner and Dr. Rust describe Tamura’s process as a two-step process, where the yarns are individually twisted, and then later separately twisted together, each in discrete steps. *Id.* 18; Ex.1003, ¶75. According to Petitioner, this process relates to a two-step ring-twisting method that was prevalent in the industry. Pet. 18-19, 32-33. In this process, individual yarns were twisted separately and with different twisters, and then the yarns were twisted together, again with a different twister. *See, e.g.*, Ex.1011, [0005]. In fact, Fritsch’s discussion of ring twisting makes clear that “ring-twister machine[s] [are] disadvantageous as [they] require[] multiple steps to yield the final product; the constituent yarns must first be twisted *separately* and then combined in another step to be twisted into a cabled cord.” *Id.*; *see* Ex.1003, ¶78. The process of separately twisting each individual yarn was by no means simultaneous. Brookstein, ¶109. Thus, even accepting Petitioner’s contention that Tamura used a two-step ring-twisting process, Tamura’s lower twisting does not suggest simultaneous operation. *Id.*

The reference to “lower twist[ed]” yarns in Tamura merely refers to the individual twists in both yarns and has no relation to whether the yarns are twisted **simultaneously**, as claim 1 requires. Ex.1006, [0018]; Brookstein, ¶109. Dr. Rust offers no evidence to support his conclusory assertion that Tamura discloses simultaneous performance of the twisting. As shown below (highlighting text in common), Dr. Rust's Declaration does nothing but repeat “verbatim, the conclusory assertion for which it is offered to support” and does not “cite to any additional supporting evidence or provide any technical reasoning to support his statement.” *Xerox*, IPR2022-00624, Paper 9 at 15-17 (emphasis omitted).

| Petition 32.                                                                                                                                                                                                                                                                                                                                                                                | Rust Decl. (Ex.1003), ¶106.                                                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b><i>“the second step and the first step being conducted simultaneously”</i></b>: Tamura discloses that the nylon thread and the aramid thread are both “lower twist[ed],” before the two yarns are “upper twist[ed] ... together.” Ex. 1006, ¶18. A POSITA would understand that both threads being “lower twist[ed]” means both threads are twisted <b><i>simultaneously</i></b>.</p> | <p>106. With respect to the limitation <b><i>“the second step and the first step being conducted simultaneously,”</i></b> Tamura discloses that the nylon thread and the aramid thread are both “lower twist[ed],” before the two yarns are “upper twist[ed] ... together.” Tamura at ¶18. In my opinion, a POSITA would understand that both threads being “lower twist[ed]” means both threads are twisted <b><i>simultaneously</i></b>.</p> |

This is precisely the type of expert testimony that is “entitled to little weight.” *Id.* Petitioner's argument that Tamura discloses conducting the first and second steps simultaneously is thus devoid of any factual support and insufficient to show Tamura teaches this limitation.

Petitioner also argues that Rowan discloses a single apparatus that simultaneously twists two types of threads. Pet. 32-33. Petitioner relies on Rowan's statement that the "OCT 310 cables and treats the cord in a continuous process without intermediate take-up in a manner yet to be described." Ex.2016, 7:22-24. However, while Rowan discloses combining the ring twisting method into a single machine, nowhere does Rowan disclose that the first and second steps (i.e., the steps of primarily twisting the aramid filament yarn and primarily twisting the nylon filament yarn) are conducted simultaneously. *See id.*, 7:28-64.

Indeed, Petitioner acknowledges that Rowan "does not depict where the yarns are individually twisted" and thus does not depict where, or when, the steps of primarily twisting the aramid filament yarn and primarily twisting the nylon filament yarn occur. Pet. 35-36. Yet Petitioner summarily contends that "a POSITA would understand that the twisting, *i.e. first and second step*, **must occur simultaneously** since each yarn is removed from the spool, tensioned, twisted into a cord, and treated in one 'continuous process without intermediate take-up.'" *Id.*, 36 (original italics; bold emphasis added) (citing Ex.1007, 7:22-24; Ex.1003, ¶111). But this discussion relates to a continuous process of twisting the plies together and then treating the plies—not of individually twisting the yarn into plies and then twisting the plies together. Brookstein, ¶110. Dr. Rust, again, simply repeats the Petition, adding no analysis. *Compare* Pet. 32-36, with Ex.1003, ¶¶107-111.

To the extent that Petitioner contends Rowan inherently discloses the limitation (e.g., based on its contention that the twisting “must occur” simultaneously), Petitioner has not established that the simultaneous aspect of the claims is necessarily present in Rowan, as required for inherency. *PersonalWeb Techs., LLC v. Apple, Inc.*, 917 F.3d 1376, 1382 (Fed. Cir. 2019) (inherency requires “that the natural result flowing from the operation as taught would result in the performance of the questioned function”) (emphasis omitted). Simply put, Petitioner fails to meet its burden that Rowan teaches performing the first and second steps simultaneously, as Petitioner alleges.

Petitioner offers another back-up position by “optionally” pointing to Buchanan (Pet. 36-38). Buchanan is directed to a method of air jet false twisting yarns. *See* Ex.1010, 3:36-39 (“In the passages, the strands are twisted and plied together by the false twisting apparatus 32 in alternating S and Z bundle directions of twist, with equally spaced nodes of zero twist in between.”). Air jet false twisting is a process by which yarns are twisted and **untwisted** such that bulk is imparted to the yarn, but the fibers **are not ultimately twisted together** when they exit the process. *Id.*; Ex.2019 (Advances in Yarn Spinning Technology), 11; Ex.2020 (Textile Yarns – Technology, Structure, and Applications), 184 (Fig. 12.33); Brookstein, ¶111. For Buchanan’s purpose, both of its air jets 34, 36, must operate. *See, e.g.*, Ex.1010, 1:36-42 (“alternating twisting means”). And the output of this

process does not meet claim 1's requirements to "secondarily twisting ... aramid primarily twisted yarn and ... nylon primarily twisted yarn." Ex.1001, cl. 1; Brookstein, ¶111.

The fact that Buchanan's yarns are twisted by the same apparatus does not indicate simultaneous operation. Brookstein, ¶112. Indeed, a single apparatus, e.g., Buchanan's false twister, may act on two yarns in serial operation. *Id.* Nothing in Buchanan itself suggests simultaneous operation, and Petitioner's only support is its *ipse dixit* testimony of Dr. Rust (*compare, e.g.,* Pet. 22, *with* Ex.1003, ¶84).

Further, Petitioner's hindsight-biased picking and choosing is exemplified by its attempt to incorporate Buchanan. In discussing Buchanan's teachings, Dr. Rust acknowledges the following:

Buchanan ... teaches a second twisting apparatus that occurs after the first, a 'twisting apparatus 32' that has an 'upper air jet 34 for applying twist to the yarn in the [opposite] Z direction' that is actuated alternately with the lower air jet (resulting in a yarn that has "alternating S and Z bundle directions of twist, with equally spaced nodes of zero twist in between).

Ex.1003, ¶113 (cited in Petition at 37-38). But, he summarily "do[es] not include that apparatus in [his] combination." *Id.* His only explanation is that "it is not necessary to achieve the well-known benefits of the combination." *Id.* In other words, Dr. Rush improperly picks only so much of Buchanan as he believes supports

his combination and discards that which he deems unnecessary. *Arctic Cat*, 876 F.3d at 1360; *Wesslau*, 353 F.2d at 241. Even if such an approach were permissible (and it is not), Dr. Rust is wrong: Buchanan discloses only one twisting apparatus 32 with two air jets, 34 and 36, and expressly states that “jets 34, 36 are alternately actuated for equal periods of time.” Ex.1010, 3:15-21. Petitioner and Dr. Rust do not explain why a POSITA would have departed from this explicit disclosure, aside from a hindsight-biased attempt to apply Buchanan's teachings to claim 1.

Accordingly, Petitioner has not shown that its Ground 1 renders the claimed simultaneous twisting obvious.

**3. Petitioner fails to show that its combination renders the claim limitation “the third step being conducted continuously with the first and second steps” obvious**

Petitioner asserts that Tamura discloses conducting the third step continuously with the first and second steps because it discloses “upper twisting” of the two yarns. Pet. 39. However, Tamura's disclosure of “upper twisting” has nothing to do with the process being conducted continuously. As explained above, according to Petitioner, Tamura relates to a ring twisting process, and thus the steps of individual twisting the yarns and then twisting the yarns together are distinct and would be completed with different twisters. Pet. 18; Ex.1003, ¶75. Those distinct processes on different twisters are by no means a continuous process. Brookstein, ¶113.

The “upper twisting” disclosed in Tamura refers to twisting of the yarns together and is unrelated to whether the yarns are twisted continuously. *See* Ex.1006, [0018]; Brookstein, ¶114. Petitioner alleges that Tamura “discloses that the ‘upper twist[ing]’ of the two yarns occurs immediately after the two yarns are twisted from fibers.” Pet. 39 (original alteration). But Petitioner cites nothing from Tamura to support this proposition—for good reason. Tamura contains no such disclosure; Tamura does not state **when** upper twisting occurs. Brookstein, ¶114. Petitioner’s argument that Tamura discloses “the third step being conducted continuously with the first and second steps” is unsupported and insufficient to show obviousness.

Petitioner also relies on Rowan but admits that Rowan does not disclose the first and second steps, and therefore Rowan does not disclose or suggest that the third step is conducted continuously with the first and second steps. Pet. 35. The portions of Rowan that Petitioner cites (Ex.2016, 7:61-64, 7:23-24), simply state that the “OCT” (one-machine cabled and treated cord unit) “cables and treats the cord in a continuous process” and adds that “the cord may be fed directly from the DCU to the treating equipment without intermediate take-up.” *Id.*, 8:61-63. These portions of Rowan do not refer to individual twisting of filaments into yarns (i.e., what would correspond to the “first and second steps”). As discussed above, this disclosure relates to a continuous process of twisting the plies together and then treating the

plies—not of individually twisting the plies and then twisting the plies together. Brookstein, ¶115. Petitioner thus fails to show that Rowan's disclosure supports obviousness.

Finally, Petitioner argues that “[o]ptionally, it would have been obvious to further include Buchanan” based on Buchanan's teachings of “compression tube 38.” But “compression tube 38” does not perform any twisting. *Id.*, ¶116. Rather, Buchanan states that “the bundles 40 ... **partially untwist**” in compression tube 38. Ex.1010, 3:50-4:3. There is no twisting process in compression tube 38 to render obvious this limitation of claim 1. Buchanan therefore does not teach this limitation either.

Because none of Petitioner's references disclose or suggest the continuous process required by claim 1, Petitioner has failed to show a reasonable likelihood of prevailing on Ground 1.

**V. Grounds 1 And 2: Fritsch Does Not Render Obvious A Method Of Making 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”**

In both Grounds 1 and 2, Petitioner relies only on Fritsch as allegedly disclosing or suggesting making 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. 44-46, 56-60. But Fritsch does not disclose this limitation, and Petitioner fails to show that Fritsch, alone or combined with Tamura, would have rendered this limitation obvious.

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. 45-46 (also arguing that a POSITA would have been motivated to apply Fritsch’s disclosure of “a Coring level of 0.9% to Tamura’s aramid-nylon hybrid cord”); *id.* 59-60 (arguing that, if “Fritsch does not expressly disclose an aramid-nylon tire cord with a Coring level of 0.9%, a POSITA would have considered it obvious to apply Fritsch’s teaching of a 0.9% Coring level to the nylon-aramid hybrid cord taught by Fritsch”). Fritsch, however, only discloses a 0.9% Coring level *for a hybrid tire cord made of entirely different materials*—PEN and PET—not aramid and nylon. Brookstein, ¶120; Ex.1011, Table 1 (example 6). Petitioner relies on Table 1, Figure 2, and paragraphs 41-42 of Fritsch for disclosure of a 0.9% Coring level, but all of that disclosure exclusively relates to PEN/PET hybrid cord. Ex.1011, [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 inventive examples

with non-zero Coring levels). In particular, as shown below, the 0.9% Coring level is associated with the “PEN/PET” cord in Inv. Ex. 6.

| 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                    |
| 11       | C         | PEN/PET         | 13.9%        | 170.4                 | 16.3                    | 12.8             | 27.6           | 4.7                    |
| 12       |           | PEN/PET         | 15%          | 170                   | n.d.                    | n.d.             | n.d.           | n.d.                   |
| 13       |           | 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. 44-46 (no mention of PEN or PET), 58-60 (same). They show the 0.9% Coring level in Figure 2 (*id.*), without acknowledging that this figure graphs the PEN/PET cords of Inv. Exs. 1-10 and Comp. Ex. B (Ex.1011, [0042]). They only acknowledge that the 0.9% Coring level is for PEN/PET cord in addressing an alleged motivation to combine Fritsch with Tamura. Pet. 27 (“Fritsch describes a Coring level of 0.9% for a PEN/PET hybrid cord[.]”); Ex.1003, ¶94 (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. 27; Ex.1003, ¶¶93-94. 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. *See* Pet. 27; Ex.1003, ¶¶93-94. Furthermore, while Petitioner and Dr. Rust declare that Inv. Ex. 6 with its 0.9% Coring level has “good” properties, the paragraph of Fritsch they cite to support this contention (Fritsch’s paragraph 40) says nothing about this Inv. Ex. 6—identifying only favorable properties achieved with Inv. Exs. 2-5 and 7-8. Ex.1011, [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, LLC v. Cisco Sys., Inc.*, 942 F.3d 1352, 1360 (Fed. Cir. 2019) (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. None of Petitioner’s three purported reasons why a POSITA would have applied this 0.9% Coring level 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. 27. Those claims, however, only relate to nylon and aramid hybrid cord having “an

unbalanced configuration,” through their dependency on claim 1. Ex.1011, cls. 1, 8-9. There is no disclosure or suggestion anywhere in Fritsch to use the specific 0.9% Coring level for aramid/nylon hybrid cord, nor does Fritsch contain any specific teachings of Coring levels for aramid/nylon cord. Brookstein, ¶122. A POSITA would not have been motivated to use the same Coring levels for PEN/PET cords in hybrid cords made of vastly different materials, nor would a POSITA have an expectation that doing so would yield favorable results. *Id.* Neither Petitioner nor its expert offer any explanation to address these critical points. 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).

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, “[e]ven 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. 27; Ex.1003, ¶94. 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.’”).

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. 27; Ex.1003, ¶94. Indeed, because of the different physical properties of aramid and nylon compared to PEN and PET, including the difference in moduli ratio (discussed below), a POSITA would have understood that properties of a PEN/PET hybrid tire cord with a given Coring level would not have predicted or rendered obvious properties of aramid/nylon hybrid tire cord with the same Coring level. Brookstein, ¶123. A POSITA thus would have had no reasonable expectation of successfully achieving “a good combination” of properties (Pet. 27), in making

aramid/nylon hybrid tire cord with the same Coring level as PEN/PET hybrid tire cord (Brookstein, ¶123).

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. 27. 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 have exactly the same modulus. Brookstein, ¶124. 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.* Neither Petitioner nor Dr. Rust address how the ratio of moduli of a PEN/PET cord compares to those 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, ¶125. The modulus is 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, ¶125. 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/dtex<sup>5</sup> and 60 cN/dtex, respectively. Ex.2034 (The Pneumatic Tire), 16 (Table 3.10); Brookstein, ¶126. This means that the moduli ratio for a PEN/PET hybrid cord would be 130:60 or around 2:1, because the modulus of PEN is roughly twice the modulus of PET. Brookstein, ¶126. The moduli of aramid and nylon are 300 cN/dtex and 25 cN/dtex, respectively. Ex.2034, 16 (Table 3.10); Brookstein, ¶126. This means that the moduli ratio of an aramid/nylon hybrid cord would be 300:25 or 12:1, because the modulus of aramid is twelve times the modulus of nylon. Brookstein, ¶126. The moduli and moduli ratios are listed in the table below:

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<sup>5</sup> The abbreviation cN/dtex refers to centinewtons per decitex.

|        | Modulus (cN/dtex) | Moduli Ratio |
|--------|-------------------|--------------|
| PEN    | 130               | 2:1          |
| PET    | 60                |              |
| Aramid | 300               | 12:1         |
| Nylon  | 25                |              |

*Id.*

As shown in the table above, the moduli ratio of an aramid/nylon cord is thus at least **six times higher** than the moduli ratio of PEN/PET cord. *Id.*, ¶127.<sup>6</sup> A six times difference is an enormous difference in moduli ratios. Brookstein, ¶127. If anything, the six times difference in moduli ratios would have motivated a POSITA to use a much larger Coring level (or length difference) for aramid/nylon cord than for PEN/PET cord. *Id.* Indeed, because of the six times 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) would **not** predictably translate to aramid/nylon hybrid tire cord. *Id.* That is

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<sup>6</sup> 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, ¶127.

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 these hybrid materials would be substantially and unpredictably different.<sup>7</sup> Brookstein, ¶127. Accordingly, a POSITA would not have been motivated to use a 0.9% Coring level for aramid/nylon cord with a reasonable expectation of obtaining “the disclosed benefits” of that Coring level for PEN/PET hybrid cord. *Id.*

Third, Petitioner states, and Dr. Rust merely 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. 28 (original alteration); Ex.1003, ¶94 (both citing Ex.1011, [0029]). Fritsch discloses over twenty “[n]on-limiting examples” of yarns and a broad range of Coring levels from “about 25%” to “about -25%.” The claimed range is a very small fraction, only about 4%, of this broad

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

range. Brookstein, ¶128. 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. 45, 58. Indeed, there would be no basis for such an assertion. *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 are 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). The '663 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, 12:1-26, Table 2 (showing superior fatigue strength properties).

If anything, Fritsch would have led a POSITA in a very different direction from the claimed invention. Fritsch teaches that a Coring level for a PEN/PET

hybrid cord “between about 3% [and] 15%” is “preferred.” Ex.1011, [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%). That “preferred” range is outside the claimed range, and Petitioner does not address how a POSITA would have accomplished the claimed range for aramid/nylon hybrid cord in view of the fact that its moduli ratio is six times higher. Brookstein, ¶129. 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 suitable for aramid/nylon hybrid tire cord. Pet. 28. Petitioner’s argument is nothing more than the product of hindsight. *TQ Delta*, 942 F.3d at 1360; *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]”).

Accordingly, both Petitioner’s Grounds 1 and 2 fail because Petitioner has failed to show a reasonable likelihood of demonstrating that Fritsch alone, or together with Tamura, renders 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.”

**VI. 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 it does not provide any support or evidence that fills in the gaps in Petitioner's arguments, especially for critical claim limitations. Petitioner 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 his Declaration 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.

For example, Petitioner contends that even though Fritsch discloses a 0.9% Coring for PEN/PET hybrid cord, a POSITA would nonetheless apply that Coring level to aramid/nylon hybrid cord. Pet. 27-28, 59-60. But rather than explaining and providing evidence for why a POSITA would have done so, Dr. Rust simply repeats Petitioner's attorney arguments, as shown in the table below, with identical language highlighted.

| Petition 27-28.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Rust Decl. (Ex.1003), ¶94.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
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| <p>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, ¶94. First, Fritsch itself contemplates an aramid/nylon hybrid cord as one of its inventive cords. Ex. 1011, 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</p> | <p>94. In my opinion, 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</p> |

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| <p>having a higher modulus and PET having a lower modulus. Ex. 1011, ¶¶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.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <p>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 teaches such <i>[sic]</i> cords preferably have a coring level between -25% and 25%. <i>Id.</i>, ¶29.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <p><b>Petition 59-60.</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <p><b>Rust Decl. (Ex.1003), ¶¶182-183.</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <p>To the extent Patent Owner argues that Fritsch does not expressly disclose an aramid-nylon tire cord with a Coring level of 0.9%, a POSITA would have considered it obvious to apply Fritsch's teaching of a 0.9% Coring level to the nylon-aramid hybrid cord taught by Fritsch. Ex. 1003, ¶182. As discussed in Ground 1 and above, Fritsch discloses numerous benefits of having a positive Coring level, including a Coring level of 0.9%. See Section VIII.A.3. For example, a Coring level of 0.9% had a good balance of high Breaking Strength of 184 (second highest among the tested cords) and a relatively high Elongation at Break percentage of 12.8%. Ex. 1011, ¶40. For all the reasons mentioned there, a POSITA would similarly be motivated to apply this teaching to another embodiment in Fritsch. Ex. 1003, ¶182.</p> <p>A POSITA would also have a reasonable expectation of success in combining these teachings from the same reference. Ex. 1003, ¶183. Fritsch</p> | <p>182. Alternatively, in my opinion, a POSITA would have also considered it obvious to apply Fritsch's teaching of a 0.9% Coring level to the nylon-aramid hybrid cord taught by Fritsch. As I discussed in Ground 1 and above, Fritsch discloses numerous benefits of having a positive Coring level, including a Coring level of 0.9%. See Section VII.A.1(iii). For example, a Coring level of 0.9% had a good balance of high Breaking Strength of 184 (second highest among the tested cords) and a relatively high Elongation at Break percentage of 12.8%, as well as other desirable physical properties. Fritsch at ¶40. For all the reasons I discussed in Ground 1, a POSITA would similarly be motivated to apply this teaching to another embodiment in Fritsch.</p> <p>183. In my opinion, a POSITA would also have a reasonable expectation of success in combining these teachings from the same reference. Fritsch</p> |

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| teaches that the Coring level of 0.9% is achievable by altering the tension of the ICBT direct cabling device, which is also used for the aramid-nylon embodiment. <i>Id.</i> Thus, a POSITA would have expected the combination to yield the predictable result of improving the physical properties of Fritsch's aramid-nylon tire cord. <i>Id.</i> | teaches that the Coring level of 0.9% is achievable by altering the tension of the ICBT direct cabling device, which is also used for the aramid-nylon embodiment. Thus, a POSITA would have expected the combination to yield the predictable result of improving the physical properties of Fritsch's aramid-nylon tire cord. |
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Petitioner also argues that a POSITA would have been motivated to combine Tamura with Rowan, but Dr. Rust similarly repeats the statements in the Petition and does not provide any additional evidence or reasoning in support, as shown in the comparison table below:

| <b>Petition 20-21.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>Rust Decl. (Ex.1003), ¶¶79-81.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
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| A POSITA would have been further motivated to combine Tamura and Rowan because Rowan expressly contemplates using its one-machine process with the process described in Tamura for forming a hybrid cord. Ex. 1003, ¶79. As discussed above, Rowan describes a two-step process where a single thread of yarn is twisted into a twisted yarn, and then multiple twisted yarns are twisted into a tire cord. This is the same process described in Tamura. Moreover, Rowan notes that it is directed to tire cords made from “nylons” and “aramids,” the two materials disclosed by Tamura. Ex. 1007, 6:40-43. Thus, a POSITA would understand that Rowan's teachings is simply the use of a known | 79. In addition, Rowan expressly teaches that its one-machine process can be used for manufacturing tire cords as described in Tamura. As discussed above, Rowan describes a two-step process where a single thread of yarn is twisted into a twisted yarn, and then multiple twisted yarns are twisted into a tire cord. This is the same process described in Tamura. Moreover, Rowan notes that it is directed to tire cords made from “nylons” and “aramids,” the two materials disclosed by Tamura. Rowan at 6:40-43. Thus, a POSITA would understand that Rowan's teachings is simply the use of a known technique to improve a similar device (Tamura) in the same way. |

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| <p>technique to improve a similar device (Tamura) in the same way.</p> <p>...</p> <p>A POSITA would have had a reasonable expectation of success in combining Tamura with Rowan. As discussed above, Rowan's one-machine process applies to the same two-step process and the same nylon and aramid materials described in Tamura. Accordingly, a POSITA would expect the combination to successfully result in Tamura's teachings being performed in Rowan's machine such that the steps are performed simultaneously and continuously. Ex. 1003, ¶81.</p> | <p>...</p> <p>81. In my opinion, a POSITA would have had a reasonable expectation of success in combining Tamura with Rowan. As discussed above, Rowan's one-machine process applies to the same two-step process and the same nylon and aramid materials described in Tamura—and such one-machine processes were well-known. Thus, a POSITA would expect the combination to successfully result in Tamura's teachings being performed in Rowan's machine such that the steps are performed simultaneously and continuously.</p> |
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As another example, Petitioner argues and Dr. Rust simply repeats that it would be obvious to combine Fritsch's teachings with Tamura to achieve an unbalanced hybrid tire cord, as shown in the comparison table below:

| <b>Petition 43-44.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Rust Decl. (Ex.1003), ¶¶127-128.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                    |
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| <p>Fritsch further teaches that the yarn with "higher modulus" will have a longer length than the yarn with "lower modulus," and therefore will have less tension applied during twisting. <i>Id.</i>, ¶¶20, 25. "Modulus" refers to a material's ability to resist being deformed. Ex. 1003, ¶127. A POSITA would understand that aramid yarn has a higher modulus than nylon yarn. <i>Id.</i> Tamura confirms this, stating that "aramid fibers ... are superior in ...</p> | <p>127. Fritsch further teaches that the yarn with "higher modulus" will have a longer length than the yarn with "lower modulus," and therefore will have less tension applied during twisting. <i>Id.</i>, ¶¶20, 25. "Modulus" refers to a material's ability to resist being deformed, and it was well-understood that aramid yarn has a higher modulus than nylon yarn. Tamura confirms this, stating that "aramid fibers ... are superior in ... elastic modulus,"</p> |

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| <p>elastic modulus,” whereas “nylon fibers reduces the overall modulus of the composite fiber.” Ex. 1006, ¶¶15, 6. As discussed above, it would have been obvious to apply Fritsch’s teachings to Tamura. When combined, Tamura’s nylon yarn, having a lower modulus, would have a <b>higher tension applied</b> than the aramid yarn, which has a higher modulus. This results in the aramid yarn having a longer length than the nylon yarn. Ex. 1003, ¶128.</p> | <p>whereas “nylon fibers reduces the overall modulus of the composite fiber.” Tamura at ¶¶15, 6. 128. As I discussed above, it would have been obvious to apply Fritsch’s teachings to Tamura. When combined, Tamura’s nylon yarn, having a lower modulus, would have a <b>higher tension applied</b> than the aramid yarn, which has a higher modulus. This results in the aramid yarn having a longer length than the nylon yarn.</p> |
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As one more example, Dr. Rust reiterates Petitioner’s arguments in contending that Rowan discloses the first and second twisting steps being performed simultaneously:

| Petition 35-36.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Rust Decl. (Ex.1003), ¶111.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
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| <p>Based on the foregoing, a POSITA would understand that the two yarns are pulled from a package, tensioned and twisted into a cord <b>simultaneously</b>. Ex. 1003, ¶111. As discussed above, Rowan describes that the DCU apparatus twists each individual yarn strand into “a twisted single yarn,” <i>i.e. first and second step</i>, prior to being twisted together into a cord. Ex. 1007, 4:5-14. Although Figure 5 does not depict where the yarns are individually twisted into a twisted single yarn, a POSITA would understand that the twisting, <i>i.e. first and second step</i>, must occur simultaneously since each yarn is removed from the spool, tensioned, twisted into a cord, and treated in one</p> | <p>111. In my opinion, based on these teachings, a POSITA would understand that the two yarns are pulled from a package, tensioned and twisted into a cord <b>simultaneously</b>. As discussed above, Rowan describes that the DCU apparatus twists each individual yarn strand into “a twisted single yarn,” <i>i.e. first and second step</i>, prior to being twisted together into a cord. Rowan at 4:5-14. Although Figure 5 does not depict where the yarns are individually twisted into a twisted single yarn, a POSITA would understand that the twisting, <i>i.e. first and second step</i>, must occur simultaneously since each yarn is removed from the spool, tensioned, twisted into a cord, and treated in one</p> |

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| “continuous process without intermediate take-up.” Ex. 1007, 7:22-24; Ex. 1003, ¶111. | “continuous process without intermediate take-up.” Rowan at 7:22-24. |
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Accordingly, because the evidence on which Petitioner's case is conclusory and merely repeats Petitioner's attorney argument in the form of an expert declaration, it 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.

## VII. 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 13,992 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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