

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent of: Gary Schmit

U.S. Patent No.: 11,998,854

Attorney Docket No. [SSCO-406PGR]

Issue Date: June 4, 2024

Appl. Serial No.: 18/349,347

Filing Date: July 10, 2023

Title: LOW-FRICTION RECREATIONAL SLIDE SYSTEM

DECLARATION OF DR. JON RUST

I. INTRODUCTION AND SCOPE OF WORK

I, Dr. Jon Rust Ph.D. declare that:

1. I have been retained by Wood, Herron & Evans, LLP, on behalf of Slick Slide, LLC (“Patent Owner”), as an independent expert consultant in this post grant review (“PGR”) proceeding before the United States Patent and Trademark Office.

2. I have been asked by Patent Owner’s Counsel (“Counsel”) to respond to the Petition (“Petition”) submitted by Petitioner UATP IP, LLC (“Petitioner” or “Urban Air”) and the Declaration submitted by its consultant, Dr. Youjiang Wang (“the Wang Declaration”), regarding whether certain references teach or suggest the features recited in Claims 1-17, and 22-28 of U.S. Patent No. 11,998,854 (“the ’854 patent”) (Ex. 1001). My opinions and the bases for my opinions are set forth below.

3. My opinions are based on my education in mechanical engineering, fiber science, and fiber and polymer science, as well as my work and research regarding textile engineering, textile development, fiber science, textile engineering science, textile engineering structures, and textile engineering design.

4. In writing this Declaration, I have considered the following: the Petition, the Wang Declaration, the prior art publications cited therein, the prior art publications cited below, and my own knowledge and experience, including my teaching and work experience in the below-described fields, and my experience of working with others in those fields during the relevant period.

5. I have no financial interest in either party or in the outcome of this proceeding. I am being compensated for my work on an hourly basis for all tasks involved and am being compensated at my standard consulting rate for my services. My compensation is not dependent on the outcome of these proceedings or on any pending litigation, and my compensation is also not dependent on the content of my opinions. I have no direct financial interest in any of the parties associated with this matter.

II. QUALIFICATIONS

6. My *curriculum vitae*, which includes a more detailed summary of my background, experience, and publications, is attached as APPENDIX-A.

7. I graduated from Clemson University with a B.S. in Mechanical Engineering in 1982 and an M.S. in Fiber Science in 1985. In 1990, I earned my Ph.D., with a focus on Fiber and Polymer Science, from North Carolina State University.

8. I have 37 years of experience in the field of textile engineering and development. Since 1985, I have held various positions with NC State University's Department of Textile Engineering, Chemistry and Science ("TECS"). Between 2008 and 2014, I was the Department Head. I have served as Associate Dean for Academics in the Wilson College of Textiles and Interim Associate Dean for General Education Program Implementation for NC State University. Presently, I am Professor Emeritus of Textile Engineering in the TECS Department, a title I have held since 2020.

9. Separately, I was the Interim Director of Zeis Textiles Extension Education for Economic Development ("ZTE") between 2014 and May of 2019. ZTE provides training and certification in textiles and Lean Six Sigma, and serves the textile industry's prototyping and pilot production needs in its five laboratories – spun yarn, knitting, weaving, dyeing and finishing, and physical testing.

10. I have taught various courses at the undergraduate and graduate levels relating to textile engineering including, most recently, TMS 211,

Introduction to Fiber Science; TT 327, Yarn Production and Properties; TE 201, Textile Engineering Science; TE 301, Engineering Textile Structures I: Linear Assemblies; TE 401 and 402 and Textile Engineering Design I and II.

11. I have received over \$3 million in grant funds to conduct textile engineering research, with relevant projects including fabric development related to moisture management for use in performance apparel, textile material sustainability, color control and uniformity and process improvement related to many different textile processes. Most of my funding was sponsored by industry and therefore proprietary and not published.

12. For 17 years, I led multidisciplinary teams of students from several universities working on process improvement projects in the textile industry, including in connection with Milliken and Company, Burlington Industries, UNIFI and others.

13. While at NC State University, I received recognition for my work in textile engineering, including through awards and honors such as the Gertrude Cox Award: for *Innovative Excellence in Teaching and Learning with Technology*; the Division of Undergraduate Academic Programs Award: for *Outstanding Contributions to Undergraduate Education*; the Chancellors Creating Community Award for Outstanding Faculty Committed to Diversity; the

NC State Alumni Distinguished Undergraduate Professor; and Outstanding Teacher at NC State University.

14. Throughout my career, I have written or co-written 40 peer-reviewed journal articles, most of which focused on the subject of textile engineering. My substantial work in textile engineering also led to the issuance of the following U.S. Patents, of which I am a listed co-inventor: # **12,018,414**: “Warp Knit Fabric for Textile and Medical Applications and Methods for Manufacturing the Same”, (w/ H. Levinson, JB Davis & D Ward), June 25, 2024; # **11,001,948**: “Warp Knit Fabric for Textile and Medical Applications and Methods for Manufacturing the Same”, (w/ H. Levinson, JB Davis & B Ward), May 11, 2021; # **10,602,791**: “Multi-layered Protective Covering and Uses Thereof”, (w/ Jur, Gorga, et al), 2020; # **8,261,415** (“An Apparatus for Cotton Ginning, Processes and Methods Associated Therewith”); # **8,120,769** (“Method and System for Fiber Properties Measurement”); # **6,882,423** (“Apparatus and Method for Precision Testing of Fiber Length Using Electrostatic Collection and Control of Fibers”); # **5,774,942** (“Feedforward and Feedback Autoleveling System for Automated Textile Drafting System”); # **5,796,220** (“Synchronous drive system for automated textile drafting system”); # **5,774,943** (“Tongue and Groove Drafting Roller Autoleveling System for Automated Textile Drafting System”); # **5,761,772** (“Securing and Pressuring System for Drafting Rollers for Automated Textile

Drafting System”); and # 5,774,940 (“Draftless Sliver Coiler Packaging System for Automated Textile Drafting System”). I am also listed as a co-inventor on Chinese Patent No. **ZL200680044482.4** (“An Apparatus for Cotton Ginning, Processes and Methods Associated Therewith”).

15. Accordingly, I am an expert in the field of textile engineering, and I was an expert in this field at all times relative to this matter. As a result of my experience and frequent interaction with skilled artisans, I am familiar with the knowledge and understanding of a person of ordinary skill. In formulating my opinions set forth herein, I have relied upon my training, knowledge, and experience in the relevant art.

16. My findings, as explained below, are based on my education, experience, and background in the fields discussed above.

III. MATERIALS CONSIDERED

17. I have reviewed the ’854 patent (Ex. 1001) and relevant excerpts of its prosecution history (Ex. 1002). For purposes of this Declaration, I am using November 1, 2022 as the Critical Date. I have also considered the Petition, the Wang Declaration, the prior art publications cited therein, the prior art publications cited below, and the following:

- U.S. Patent No. 11,998,854 to Schmit (“the ’854 patent”) (Ex. 1001)

- Excerpts from the Prosecution History of the '854 Patent
("the Prosecution History") (Ex. 1002)
- The Wang Declaration (Ex. 1003)
- U.S. Patent No. 7,896,779 to Phillips ("Phillips") (Ex. 1004)
- U.S. Patent Publication No. 2023/0129814 to Fallgatter
("Fallgatter") (Ex. 1005)
- *WN0400 – 400 Micron Nylon Mesh 45% Open Area*, Industrial Netting
product page, archived by Internet Archive Wayback Machine on July
28, 2021

(<https://web.archive.org/web/20210728222259/https://www.industrialnetting.com/wn0400-400-micron-nylon-woven-mesh.html>) ("WN0400")

(Ex. 1006)
- *Woven Mesh: Nylon, Polyester or Polypropylene Plastic Mesh*,
Industrial Netting, archived by Internet Archive Wayback machine on
June 21, 2021

(<https://web.archive.org/web/20210621025620/https://www.industrialnetting.com/woven-mesh.html>) (Ex. 1007)
- *6.2 Friction*, University Physics Volume 1, openstax (retrieved
from <https://openstax.org/books/university-physics-volume-1/pages/6-2-friction>) (Ex. 1008)

- V.K. Kothari et al., *Assessment of frictional properties of some woven fabrics*, Indian Journal of Fibre and Textile Research, Vol. 19 (September 1994) 151-155 (Ex. 1009)
- W. Zurek et al., *Surface Frictional Resistance of Fabrics Woven from Filament Yarns*, Textile Research Journal, Vol. 55, No. 2 (1985), 113121 (Ex. 1010)
- W.D. Callister, *Materials Science and Engineering An Introduction*, ed. 7, John Wiley & Sons, Inc. (2007) (Ex. 1011)
- *WN0400 - 400 Micron Nylon Mesh 45% Open Area*, Industrial Netting product page, accessed at <https://www.industrialnetting.com/wn0400-400-micron-nylon-woven-mesh.html> (Ex. 1012)
- M. Watanabe, *The Frictional Properties of Nylon*, Wear, 12 (1968) 185191 (Ex. 1013)
- British Patent Publication No. 402,259 to Wicksteed (Ex. 1014)
- *World's First Children's slide*, BBC NewsRound, April 17, 2012 (retrieved from <https://www.bbc.co.uk/newsround/17747678>) (Ex. 1015)

- A.F.W. Coulson, et al., *Frictional Properties of Nylon Yarn and Their Relation to the Function of Textile Guides*, Journal of the Textile Institute Proceedings, 46:1 (January 7, 2009), 101-111 (Ex. 1016)
- R. Kisiel, *Somebody call elf 'n' safety, standards are on the slide!*, DailyMail, April 17, 2012 (retrieved from <https://www.dailymail.co.uk/news/article-2130923/Historians-discover-worlds-childrens-slide-built-90-years-ago-plank-wood.html>) (Ex. 1017)
- R. Allain, *Fair Physics: The Big Slide*, Wired (June 3, 2011) (retrieved from <https://www.wired.com/2011/06/fair-physics-the-big-slide/>) (Ex. 1018)
- L. Nichols, *The Physics of a Playground Slide*, Sciencing.com (April 24, 2017) (retrieved from <https://sciencing.com/physics-playground-slide-8657662.html>) (Ex. 1019)
- R. Allain, *The Physics of Going Fast –but Not Too Fast – on a Giant Slide*, Wired (September 23, 2022) (retrieved from <https://www.wired.com/story/the-physics-of-going-fast-but-not-too-fast-on-a-giant-slide/>) (Ex. 1020)
- PTC Windchill Risk and Reliability Help Center, *Friction Coefficients*, (retrieved from

https://support.ptc.com/help/wrr/r12.0.2.0/en/index.html#page/wrr/ReferenceGuide/prediction/friction_coefficients.html) (Ex. 1021)

- U.S. Patent No. 5,246,401 to Boatwright (Ex. 1022)
- U.S. Patent No. 6,142,879 to Phillips (Ex. 1023)
- U.S. Patent No. 8,695,994 to Maratta (Ex. 1024)
- U.S. Patent No. 6,231,483 to Phillips (Ex. 1025)
- *Friction: Friction Coefficients and Calculator*, The Engineering Toolbox (2004) (retrieved from https://www.engineeringtoolbox.com/friction-coefficients-d_778.html) (Ex. 1026)
- P.J. Blau et al., *Appendix: Static and Kinetic Coefficients for Selected Materials*, ASM Handbook vol. 18 (1992) 70-75 (Ex. 1027)
- N.P. Suh & M Mosleh, *The Minimum Coefficient of Friction: What Is It?*, CIRP Annuals, Vol. 43, Issue 1 (1994) 491-495 (Ex. 1028)
- *Kings Island's Ultimate Fansite!*, King Island Central (retrieved from <https://kicentral.com/parkhistory/past-attractions/scrappys-slides/>) (Ex. 1029)
- S. Murphy, *Is that the same giant slide we got on as children?*, Detroit Historical Society, September 9, 2022 (retrieved from

<https://detroithistorical.org/blog/2022-09-09-%E2%80%9Csame-giant-slide-we-got-children%E2%80%9D>) (Ex. 1030)

- Declaration of Nathaniel E. Frank-White re Internet Archive record of Industrial Netting websites corresponding to Ex. 1006 and Ex. 1007 (Ex. 1031)
- Industrial Netting Home page, archived by Internet Archive on July 28, 2021
(<https://web.archive.org/web/20210728223652/https://www.industrialnetting.com/>) (Ex. 1032)
- Industrial Netting Nylon page, archived by Internet Archive on May 29, 2022
(<https://web.archive.org/web/20220529115425/https://www.industrialnetting.com/nylon.html>) (Ex. 1033)
- *Sailcloth*, [Dictionary.com](https://www.dictionary.com) entry (retrieved from <https://www.dictionary.com/browse/sailcloth>) (Ex. 1034)
- Industrial Netting YouTube page, archived by Internet Archive on July 2, 2022
(<https://web.archive.org/web/20220702033025/https://www.youtube.com/user/IndustrialNetting/about>) (Ex. 1035)

- Industrial Netting Home page – screenshot of dropdown menu, archived by Internet Archive on July 28, 2021
(<https://web.archive.org/web/20210728223652/https://www.industrialnetting.com/>) (Ex. 1036)
- *Mesh*, [Dictionary.com](https://www.dictionary.com/browse/mesh) entry (retrieved from <https://www.dictionary.com/browse/mesh>) (Ex. 1037)
- *Fabric*, [Dictionary.com](https://www.dictionary.com/browse/fabric) entry (retrieved from <https://www.dictionary.com/browse/fabric>) (Ex. 1038)
- UATP information (Ex. 2001).
- *Murakami website* (<https://murakamiscreen.com/>);
<https://murakamiscreen.com/murakami-product/mesh-adhesives/> (Ex. 2002)
- *Fiber-on-fiber friction measurement using hanging fiber*, Azam Alirezazadeh, Department of Textile Engineering, University of Technology, Isfahan, Iran 2018, *Journal Of The Textile Institute*, Vol. 109, Issue 5, pp. 636 - 646 (Ex. 2003)
- *Mesh*, Merriam-Webster.com entry (retrieved from <https://merriam-webster.com/dictionary/mesh>) (Ex. 2004)

- Sheeting, Merriam-Webster.com entry (retrieved from <https://merriam-webster.com/dictionary/sheeting>) (Ex. 2005)
- Mesh, The Fairchild Books Dictionary of Textiles (Ex. 2006)
- Sheeting, The Fairchild Books Dictionary of Textiles (Ex. 2007)
- Sheeting, Merriam-Webster.com entry (retrieved from <https://merriam-webster.com/dictionary/sailcloth>) (Ex. 2008/Ex. 2005)
- Canvas, The Fairchild Books Dictionary of Textiles (Ex. 2009)
- Burlap, The Fairchild Books Dictionary of Textiles (Ex. 2010)
- Sailcloth, The Fairchild Books Dictionary of Textiles (Ex. 2011)
- Jute Burlap (retrieved from <https://fabricwholesaledirect.com/products/standard-10-oz-jute-burlap-60-inch-fabric>) (Ex. 2012)
- ASTM G115 (Ex. 2013)
- <https://koyo.jtekt.co.jp/en/support/bearing-knowledge/8-4000.html>, <https://www.amroll.com/friction-frequency-factors.html>) (Ex. 2014)
- The coefficient of friction of cartilage (Forsey, 2006) (Ex. 2015).
- ASTM D1894 (Ex. 2016)

- ASTM D883 (Ex. 2017)
- ASTM F1918 (Ex. 2018)
- Lower weight sailcloths (retrieved from [https://www.sailrite.com/shop/fabric/marine-fabric/sailcloth?srsId=AfmBOooKtVgfuRAhaF_skxS6IKy9Yk0pbSvcRhMm6MpVoHhq5lnmvxyX.\)\(Ex. 2019](https://www.sailrite.com/shop/fabric/marine-fabric/sailcloth?srsId=AfmBOooKtVgfuRAhaF_skxS6IKy9Yk0pbSvcRhMm6MpVoHhq5lnmvxyX.)(Ex. 2019))
- The weights of the fabrics (retrieved from <https://www.kayospruce.com/facts-measurements#:~:text=1.,3.785> for the standard conversion of sailcloth weight from g/m² to ounces. (Ex. 2020).
- Nylon commercially available in solid film form (retrieved from <https://www.mcmaster.com/products/nylon-film/>) (Ex. 2021)
- Dacron in many forms, retrieved from <https://foammart.com/product/dacron-roll/>) and https://foamforyou.com/outdoor-dacron-foam?srsId=AfmBOopu-5B9zLoVKgtjlSp9uUPDfGx7ckTQs_Khck86n0hnBeGTmUuH) (Ex. 2022).
- Molybdenum disulfide, Vazirisereshk, M.R. et al, “Solid lubrication with MoS₂: A Review, Lubricants, 7, 57, 2019) (Ex. 2023).

- Diamond-like carbon, Berman, D., “Graphene: a new emerging lubricant,” *Materials Today*, vol 17(1), 30 2014) (Ex. 2024).
- Static friction coefficient of some plastics against steel and aluminum under different contact conditions, Benabdallah, Science Direct, March 23, 2006 (Ex. 2025).
- All other materials and resources cited and discussed herein.

18. Note that my citations to non-patent literature throughout this Declaration reference the absolute page number added to the exhibit (as opposed to the original pagination of the document). For patent literature, I have used the column/line numbers or paragraph numbers.

19. Although this Declaration refers to selected portions of the cited references for the sake of brevity, it should be understood that these are examples, and that one of ordinary skill in the art would have viewed the references cited herein in their entirety and in combination with other references cited herein or cited within the references themselves. The references used in this declaration, therefore, should be viewed as being incorporated herein in their entireties.

20. Counsel has informed me that I should consider these materials through the lens of a person of ordinary skill in the art (“POSITA,” which is discussed below) as of the Critical Date, and I have done so. Unless otherwise

stated, my testimony below refers to the knowledge of a POSITA as of the Critical Date.

IV. SUMMARY OF CONCLUSIONS

21. This Declaration explains the conclusions that I have formed based on my analysis. To summarize those conclusions:

- **GROUND 1A:** Claims 1-4 and 6-7 are not anticipated or obvious in view of Phillips. *See infra*, Section VIII.B.
- **GROUND 1B:** Claims 1-4, 6, 7, 14-17, 22-28 are not obvious in view of Phillips and WN0400. *See infra*, Section VIII.C.
- **GROUND 2A:** Claims 1-7 are not obvious in view of Phillips and Fallgatter. *See infra*, Section VIII.D.
- **GROUND 2B:** Claims 1-7, 14-17, and 22-28 are not obvious in view of Phillips, Fallgatter, and WN0400. *See infra*, Section VIII.E.
- **GROUND 3A:** Claims 8-13 are not invalid for lack of enablement. *See infra*, Section VIII.F.
- **GROUND 3B:** Claims 5 and 26 are not indefinite. *See infra*, Section VIII.G.

V. LEGAL PRINCIPLES

22. In forming my analysis and conclusions expressed in this Declaration,

I have applied the legal principles described in the following paragraphs, which were provided to me by Counsel for the Petitioner.

A. Person of Ordinary Skill in the Art

23. I understand that the factors considered in determining the ordinary level of skill in a field of art include: the level of education and experience of persons working in the field; the types of problems encountered in the field; the teachings of the prior art regarding solutions to such problems; and the sophistication of the technology at the time of the alleged invention's effective filing date. I understand that a person of ordinary skill in the art ("POSITA") is not a specific real individual, but rather is a hypothetical individual having the qualities reflected by the factors above and knowledge of all relevant prior art references, including the references I cite in my analysis below.

B. Anticipation

24. I have been informed that a patent claim is anticipated if a single reference discloses all of the elements of the claim within the four corners of the document, and also discloses those elements as arranged in the claim.

C. Obviousness

25. I have been informed that a patent claim is invalid as "obvious" under 35 U.S.C. § 103 in light of one or more prior art references if it would have been obvious to a POSITA, taking into account (1) the scope and content of the prior art,

(2) the differences between the prior art and the claims, (3) the level of ordinary skill in the art, and (4) any so called “secondary considerations” of non-obviousness, which include: (i) “long felt need” for the claimed invention, (ii) commercial success attributable to the claimed invention, (iii) unexpected results of the claimed invention, and (iv) “copying” of the claimed invention by others.

26. I have been informed that a claim can be obvious in light of a single prior art reference or multiple prior art references. To be obvious in light of a single prior art reference or multiple prior art references, there must be a reason to modify the single prior art reference, or combine two or more references, in order to achieve the claimed invention. This reason may come from a teaching, suggestion, or motivation to combine, or may come from the reference or references themselves, the knowledge or “common sense” of one skilled in the art, or from the nature of the problem to be solved, and may be explicit or implicit from the prior art as a whole. I have been informed that the combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results. I also understand it is improper to rely on hindsight in making the obviousness determination.

27. I understand that an obviousness determination also requires that a POSITA would have had a reasonable expectation of success. This concept has been explained to me as relating to the relative likelihood or predictability - from

the perspective of a POSITA - of successfully supplementing and/or modifying the prior art in a manner that would meet the claimed limitations of the patent being challenged (here the '854 patent). I understand that the expectation of success need only be "reasonable" and, thus, does not require the absolute certainty gleaned from physically creating the proposed prior art modification.

D. Enablement

28. It is my understanding that in a post-grant proceeding, a claim is enabled if the patent specification includes details that would teach those skilled in the art how to make and use the full scope of the claimed invention without requiring undue experimentation by the POSITA. I also understand that to enable a claimed range, the patent specification needs to include details that explain how to achieve the full scope of the claimed range.

E. Indefiniteness

29. It is my understanding that in a post-grant proceeding, a claim is invalid for indefiniteness if, when read in light of the specification delineating the patent and the prosecution history, it fails to inform, with reasonable certainty, those skilled in the art about the scope of the invention.

F. Claim Construction Standard

30. It is my understanding that the claim construction standard includes construing the claim in accordance with the ordinary and customary meaning of

such claim as understood by a person of ordinary skill in the art. As explained above, I was at least a person of ordinary skill in the art before the earliest filing date of challenged patents.

31. I understand that in a post grant review proceeding, claims are interpreted under the same construction standard that is used in a United States federal court. I understand that, for purposes of my analysis in this post grant review proceeding, the meaning of terms appearing in the patent claims should be interpreted from the viewpoint of a POSITA at the time of the alleged invention. I further understand that the words of the claims are generally given their ordinary and customary meaning as understood by one of ordinary skill in the art in light of the specification and prosecution history pertaining to the patent. I understand, however, that claim terms are generally not limited by the embodiments described in the specification.

32. I have used the earliest priority date of U.S. Patent No. 11,998,854 as the point in time for claim interpretation purposes. That date was November 1, 2022 (“the Critical Date”).

VI. PERSON OF ORDINARY SKILL IN THE ART

A. A POSITA’s Ordinary Level of Skill

33. Based on my knowledge and experience in the field and my review of the ’854 patent and its file history, I believe that a person of ordinary skill in the

art as of the Critical Date (“POSITA”) would have had at least (1) a Bachelor’s degree in engineering, materials science, or a related field, with (2) experience in textile design, engineering, or fiber science.

34. With respect to claims 1-17 and 27-28 of the ’854 patent, a POSITA would also require at least 5 years of measurement and analysis experience in the field of coefficient of friction. I am relying upon Dr. Spiegelberg’s opinions in connection therewith.

35. Additional graduate education could substitute for years of experience, or significant experience in the field could substitute for formal education. For example, a person with multiple years of experience in manufacturing and material selection might be a POSITA despite not having formal education, because significant experience can substitute for education.

36. The POSITA described above would have had a basic understanding of the physical principles that dictate and influence the interactions of materials. The POSITA described above would have also been aware of general physical characteristics of various materials and would have been capable of selecting materials for various purposes based on these general and well-known characteristics. From their education and/or experience, the POSITA would have further been able to identify sources for various materials for manufacturing,

testing, and prototyping purposes, as is common for POSITAs in the specified fields.

37. Accordingly, my analysis and conclusions expressed in this Declaration are based on the perspective of a POSITA having this level of knowledge and skill. My education, technical expertise and personal knowledge discussed above shows that I meet the qualifications of a POSITA.

38. I am relying upon Dr. Spiegelberg with respect to his expertise and experience in connection with measurement and analysis experience in the field of coefficient of friction.

39. I have considered the opinion of Dr. Wang that a person of ordinary skill in the art as of the Critical Date ("POSITA") would have had at least (1) a Bachelor's degree in mechanical engineering, materials science, or a related field, with (2) 1-2 years of experience in manufacturing, product design, or a related field, or equivalent research or professional experience.

40. In my opinion, Dr. Wang's opinion is not correct, for several reasons. First, experience in textile engineering and fiber science is necessary for understanding the distinctions between mesh and sheeting, and how those interact with other materials when in contact with them. Second, experience in textile engineering and fiber science is necessary for understanding the manner in which materials with interstices are affixed to other materials, including with adhesive,

and the impact the attachment mechanism has on the interaction with other materials when in contact with them.

B. A POSITA's Background Knowledge

1. Background of the Technology

41. As I will explain in more detail below in Section VII, Claim 1 of the '854 patent, and therefore in addition all dependent claims 2-17, and Claim 27, and therefore dependent claim 28, claim a "recreational slide system includ[ing] a slide and a ride vehicle configured to support a rider down the slide" where "[t]he slide includes a slide body with a non-wet lubricated slide surface [and a] ride vehicle includes a fabric layer that forms a top surface configured to contact the rider and a mesh layer that forms a bottom surface configured to contact the slide surface" with a "coefficient of friction between the mesh layer of the ride vehicle and the non-wet lubricated slide surface is within a range of between about 0.03 to about 0.2." (Ex. 1001), Abstract, Claims 1-17.

42. This technology was new and inventive by the 2022 Critical Date of the '854 patent.

43. By way of example, the '854 patent claims' recitations of a "mesh layer" that "forms a bottom surface configured to contact the slide surface" with a "coefficient of friction between the mesh layer of the ride vehicle and the non-wet lubricated slide surface is within a range of between about 0.03 to about 0.2"

is new to the technologies in existence at the Critical Date. As I will explain below, the idea of a recreational slide with a non-wet lubricated surface for use with a ride vehicle having a mesh bottom for sliding was not known before the '854 patent. In fact, the prior art references like Phillips, Fallgatter, and WN0400 relied upon by Petitioner do not disclose this invention, and in fact teach away from the invention.

44. In like manner, Claim 22 of the '854 patent, and therefore in addition all dependent claims 23-24, claim a “mesh layer” that “forms a bottom surface of the ride vehicle that is configured to contact the non-wet lubricated recreational slide.”

45. This technology was new and inventive by the 2022 Critical Date of the '854 patent. As I will explain below, the idea of a recreational slide with a non-wet lubricated surface for use with a ride vehicle having a mesh bottom for sliding was not known before the '854 patent. Once again, the prior art references like Phillips, Fallgatter, and WN0400 relied upon by Petitioner do not disclose this invention, and in fact teach away from the invention.

46. Dr. Wang has cited numerous patent documents and other non-patent literature throughout his declaration. Assuming a POSITA would have known of these references and considered them representative examples regarding the state of the art, none teach the inventions of the '854 patent.

2. Recreational Slides

47. Dr. Wang suggests that slide systems that include a slide and ride vehicle have been used for decades. *See e.g.*, Ex. 1003, at Paragraphs 34-38. Dr. Wang notes that slides for recreational purposes have been well-known since at least the early 1900s. *Id.* None of these slide systems are relied upon to suggest that the claims of the '854 patent are disclosed. And, despite this, the '854 patent claims' recitations of a "mesh layer" that "forms a bottom surface configured to contact the slide surface" with a "coefficient of friction between the mesh layer of the ride vehicle and the non-wet lubricated slide surface is within a range of between about 0.03 to about 0.2" is new.

48. Dr. Wang also suggests that dry slides at amusement parks were used with burlap sacks or other fabric mats as a ride vehicle between the rider and the slide surface. *See e.g.*, Ex. 1003, at Paragraphs 34-38. Once again, none of these slide systems are relied upon to suggest that the claims of the '854 patent are disclosed. And, despite this, the '854 patent claims' recitations of a "mesh layer" that "forms a bottom surface configured to contact the slide surface" with a "coefficient of friction between the mesh layer of the ride vehicle and the non-wet lubricated slide surface is within a range of between about 0.03 to about 0.2" is new. A POSITA would know that a burlap fabric is a coarse fabric traditionally made from jute. The '854 patent describes weft and warp yarns with diameters in

the range of .1 to .6 mm. To understand the thickness of these yarns, .1mm is equivalent to 0.004 inches or 4 mils. In comparison, a heavy duty garbage bag is often stated as being 3 mils in thickness. According to The Fairchilds Books Dictionary of Textiles, burlap has been used in tremendous quantities for cotton bale covering, burlap bags of all kinds, coarse yarns, twine, carpet backing. (Ex. 2010). All of these uses include coarse fabric constructions, none would include fabrics as thin as 4 mils. In fact, a survey of burlap currently available via the internet makes clear that the range of burlap fabric weights is from the relatively light weight 7 ounces per square yard to the heavy duty 12 ounces per square yard. One supplier, Fabric Wholesale Direct, advertises a standard 10 ounce jute burlap fabric with the thickness of .95 mm. (Ex. 2012). Clearly this is far outside of the '854 claims.

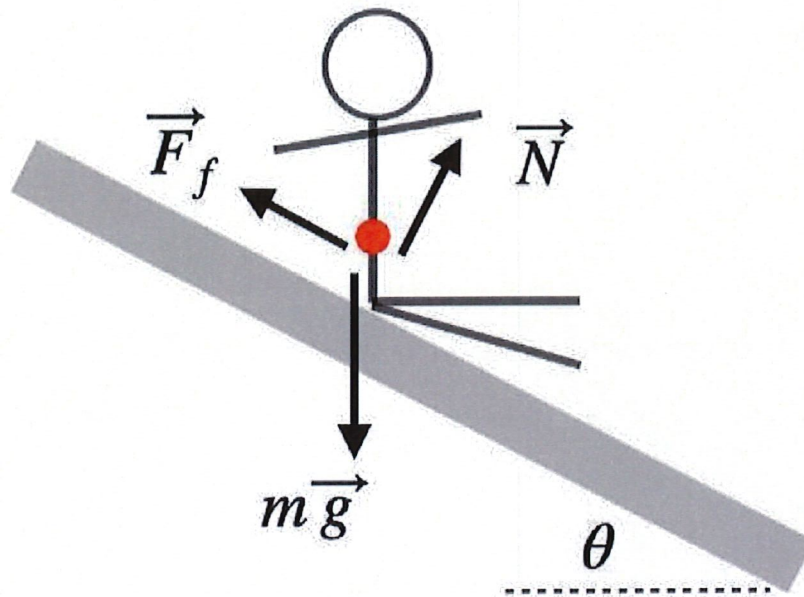
49. Dr. Wang is correct that the speed of descent on a slide can be influenced by the slope of the slide and the materials used on the surface of the slide and sliding vehicle. *See e.g.*, Ex. 1003, at Paragraph 38. In my opinion, however, Dr. Wang is not correct when he suggests that the ways that the slope of the slide, the weight of the rider, and the materials forming the slide and sliding vehicle influence the speed at which the rider/sliding vehicle descend the slide are all consequences of simple principles of physics. By way of example only, none of the references herelies on (Ex. 1018, Ex. 1019, Ex. 1020) discuss in any detail

the impact of the materials forming the slide and sliding vehicle have on the rider's experience. The references also do not discuss in any detail the impact the materials forming the slide and sliding vehicle have on the coefficient of friction. These are complex issues that are only understood through experience in the manner in which the coefficient of friction is impacted by each of these factors.

50. As such, there are several variables associated with the materials forming the slide and sliding vehicle, and they impact how the two materials interact when placed in contact with each other.

3. The Basics of Friction

51. Dr. Wang is correct that multiple principles of physics play a role in determining the descent of a person down a slide. Ex. 1019, 1 ("The laws of physics can be directly referenced when examining how a playground slide works...gravity is not the only force that determines the speed or acceleration of an object, or person, traveling down a slide"). "As a rider moves down the slide, there are three forces to consider: the gravitational force, the force perpendicular to the slide (we call this the normal force), and the frictional force." Ex. 1020, 3; *see also* Ex. 1026, 1-2 (similar discussion of the forces on an object).



Ex. 1020, 3

52. Dr. Wang is also correct that, though gravity plays an obvious role in a rider's descent down the slide, friction and the coefficient of friction between the rider and the slide's surface plays an important role as well. Ex. 1019, 2 ("Friction is a force that occurs whenever two objects rub against each other, such as a slide and person's backside."); Ex. 1008, 1 ("Friction is a force that opposes relative motion between systems in contact"). As illustrated in the figure above, the direction of the frictional force "is always parallel to the surface and its direction is *against* the motion of the person, slowing them down." Ex. 1020, 3; Ex. 1008, 1.

4. The '854 Patent Specifies The Coefficient of Friction And The Manner In Which It Is Determined

53. As will be understood by a person skilled in the art, the coefficient of friction between the ride vehicle and the slide surface is the ratio of the frictional force between two surfaces to the normal force pressing the surfaces together. That is, $\text{Coefficient of Friction (p)} = \text{Force of Friction (F)} / \text{Normal Force (N)}$. The coefficient of friction between the surfaces of the mesh material and the slide surface may be described in terms of both the static and kinetic coefficients of friction. This same information is specified in the '854 patent. (Ex. 1001, at 4:38-46).

54. I note that the '854 patent specifies the coefficient of friction, and the manner in which it is determined. In particular, the '854 patent specification discloses that the coefficient of friction between surfaces of the mesh material 46 and the slide surface 18. In like manner, claims of the '854 patent call for a "mesh layer." *Id.* at Claim 1, Claim 22, Claim 25.

55. The '854 patent goes on to specify that the coefficient of friction is to be "determined using the American Society for Testing and Materials International (ASTM) Coefficient of Friction ASTM D1894 standard test method (July, 2023)." (Ex. 1001, 11:31-44).

56. The '854 patent goes on to specify that "[f]or the ASTM D1894 test, the material specimen is attached to a sled of defined weight. This sled is pulled across another surface at a speed of 150 mm/minute." *Id.*

5.Slide and Ride Vehicle Materials

57. Generally speaking, Dr. Wang is correct that materials and coatings of materials were known to impact the coefficient of friction. In the context of a slide and ride vehicle, this would be known to impact the speed of descent. Ex. 1004, Abstract (describing a sliding recreational device formed from “low friction sheeting material”); Ex. 1005, Abstract (describing a dry recreational slide including “a low-friction sliding surface” formed from a “flexible substrate coated with a low-friction material”); Ex. 1022, 3:10-16 (describing a wax coating to “provide a very slippery interface between” a sled and slide). Similarly, it was known to apply coatings. Ex. 1023, Abstract (describing a ride vehicle with a bottom surface “clad with a low friction durable coating”); Ex. 1025, Abstract (describing a carrying case with “a low friction...bottom surface to facilitate sliding the apparatus upon a suitable contact area”); Ex. 1022, 3:10-16.

58. Nothing relied upon by Dr. Wang suggests that materials and coatings of materials known to impact the coefficient of friction would lead a POSITA to consider a mesh layer that forms a bottom surface configured to contact the slide surface. Indeed, there are many reasons why a POSITA would not be motivated to do so. For example, a mesh includes a fabric characterized by open spaces. (Ex. 2004, Ex. 2006). As I explain in more detail below, such

open spaces inform a POSITA that the coefficient of friction and friction would be increased, as compared to the sheeting, substrate, durable coating, and suitable contact area relied upon by Dr. Wang. Open spaces attendant to “mesh” would inform a POSITA that the coefficient of friction and friction would increase. In addition, these materials are not characterized by open spaces and are not “mesh” as required by the claims of the ‘854 patent.

59. Generally speaking, Dr. Wang is also correct that lubricants were known and used specifically to affect the coefficient of friction. *See* Ex. 1019, 2, (“Certain materials called lubricants can reduce the effects of friction”); Ex. 1022, 3:5-17 (describing a slide and sled with a hard wax coating to provide a slippery surface therebetween); Ex. 1018, 2 (“the slide guy would take some pledge and spray it at certain spots on the slide every so often... [t]his sure seemed to make the kids go faster”). The use of lubricants lowers the coefficient of friction between the slide surface and the rider or ride vehicle, and increases the speed of the ride as a result. Ex. 1019, 2; Ex. 1008, 4-5 (table 6.1); Ex. 1020, 4 (“the magnitude of this [frictional] force depends on two thing: one is the two surface that are interacting, which we call the coefficient of kinetic friction”), 11 (“if you want to keep your riders on the slide, you need to increase the coefficient of friction between them and the slide”); Ex. 1020, 12 (“the sacks are made of burlap, which is scratchy and provides some fiction – and because all

the riders have to wear these sacks, that makes for a more consistent, known surface that whatever clothing the riders happen to be wearing”).

60. Nothing relied upon by Dr. Wang suggests that lubricants known to impact the coefficient of friction would lead a POSITA to consider a mesh layer that forms a bottom surface configured to contact the slide surface. As explained above, a mesh includes a fabric characterized by open spaces and that would inform a POSITA that the coefficient of friction and friction would be increased. The knowledge that lubricants are known to impact the coefficient of friction would lead a POSITA to consider lubricants, and not a mesh.

61. Generally speaking, Dr. Wang is also correct that the use of a variety of low friction materials was well-known. Ex. 1023, 4:1-16 (describing a “low friction, highly durable” vehicle “composed of... sail cloth, nylon, Dacron, polyester or Texlon [to] enable the user to achieve reasonable speeds at suitable durations to create an entertaining recreational device”); Ex. 1024, 4:46-50 (describing a slide vehicle base “covered by an outer film or layer of high-density plastic such as TeflonTM or DelrinTM plastic material”), Ex. 1025, 3:7-10 (describing bottom of sliding protective case could be formed of a variety of materials including “nylon, Texlon, Dacron, polyester resins, injection molded plastics, thermoplastics and others vacuum molded plastics, polyvinyl chloride,

polyethylene” and others); Ex. 1004, 4:43-46 (describing that the slide surface and vehicle bottom can be selected from the list of “nylon, Teflon, sailcloth, Dacron, vinyl, artificial turf, synthetic carpet and polyester resins”).

62. Nothing relied upon by Dr. Wang suggests that the use of a variety of low friction materials was well-known would lead a POSITA to consider a mesh layer that forms a bottom surface configured to contact the slide surface. As explained above, a mesh includes a fabric characterized by open spaces and that would inform a POSITA that the coefficient of friction and friction would be increased. In addition, these materials (e.g., “sail cloth, nylon, Dacron, polyester, Texlon, high-density plastic such as Teflon™ or Delrin™ plastic material,” “nylon, Texlon, Dacron, polyester resins, injection molded plastics, thermoplastics and others vacuum molded plastics, polyvinyl chloride, polyethylene,” and “nylon, Teflon, sailcloth, Dacron, vinyl, artificial turf, synthetic carpet and polyester resins” are not characterized by open spaces and are not “mesh” as required by the claims of the ‘854 patent.

63. Generally speaking, Dr. Wang is also correct that materials like Teflon and nylon were well-known to be slippery and “low friction” materials. Ex. 1011, 5 (describing Fluorocarbons (e.g., PTFE) and polyamides as having a characteristic of “low coefficient of friction”).

64. However, while the coefficients of friction between these and other common materials are published, there is nothing to suggest that they were compliant with ASTM standards. Indeed, the published coefficients of friction relied upon by Dr. Wang do not comply with ASTM standards. *See* Ex. 1026, 8-9 (describing nuances of frictional coefficients with regard to brakes); Ex. 1027, 1 (explaining differences between frictional coefficient values in various lists).

65. In addition, nothing relied upon by Dr. Wang suggests that that materials like Teflon and nylon were well-known to be slippery and “low friction” materials would lead a POSITA to consider a mesh layer that forms a bottom surface configured to contact the slide surface. As explained above, a mesh includes a fabric characterized by open spaces and that would inform a POSITA that the coefficient of friction and friction would be increased. In addition, these materials (e.g., Teflon and nylon) are not characterized by open spaces and are not “mesh” as required by the claims of the ‘854 patent.

66. I also note that Fallgatter discloses that certain sliding applications would not prefer the use certain low-friction materials from the list disclosed, and thus low-friction is not the only thing a POSITA would consider in a sliding application. Fallgatter recognizes “that other materials may be available, or may become available, that may be operative [for sliding] but may have other

negative aspects. For example, high-density polyethylene, PTFE (Teflon) and fluorinated polymers may exhibit low friction, but can be unsuitable due to excessive weight and/or high cost.” Ex. 1005, [0044].

VII. OVERVIEW OF THE '854 PATENT

A. Overview of the '854 Patent

67. The '854 patent is directed to “a recreational slide system that includes a dry recreational slide” and “a ride vehicle.” Ex. 1001, 4:15-20. The recreational slide system (10) is shown in Fig. 1 of the '854 patent, a copy of which is reproduced below. The ride vehicle (14) of the slide system (10) is “configured to be positioned between a rider and a slide surface [18] of the slide [12] for sliding down the slide [12].” *Id.*

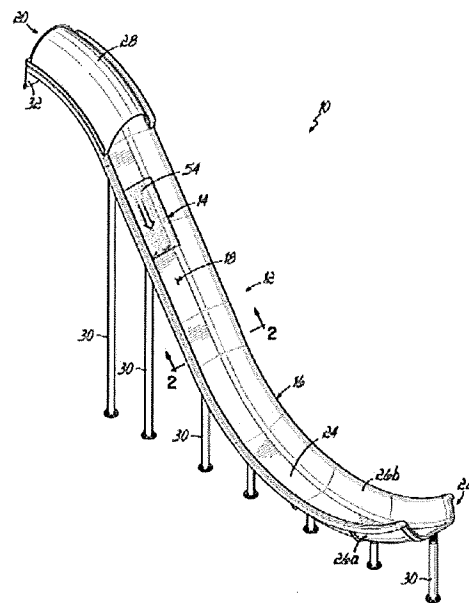


FIG. 1

Ex. 1001, Fig. 1

68. The '854 specification describes that the ride vehicle “includes a fabric layer that forms a top surface configured to contact the rider and a mesh layer that forms a bottom surface configured to contact the slide surface.” *Id.*, 2:5-8. As shown in Fig. 4 of the '854 patent, a copy of which is reproduced, the mesh layer is an open weave (as per the definition of mesh) and therefore includes “a plurality of interstitial openings that define an open area of the mesh layer.” *Id.*, 2:50-51. “[T]he open area of the mesh material 46 may be within a range of between about 25% to about 65%.” *Id.*, 10:32-33.

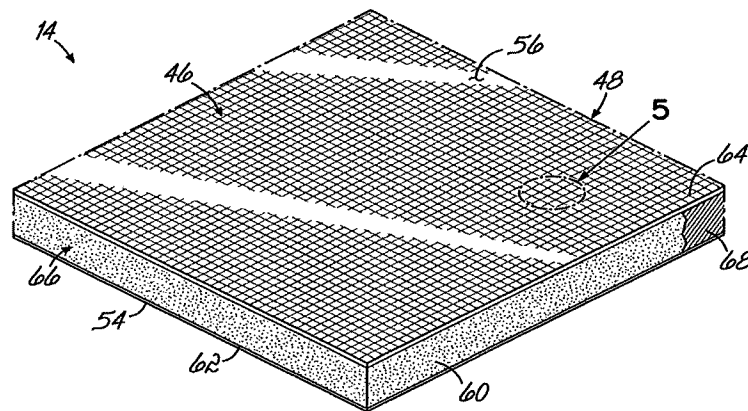


FIG. 4

69. The mesh material of this specification was developed for use with the ride vehicle based on “performance tests and analysis.” *Id.*, 11:15-17. The '854 specification describes that the mesh layer “cooperates with the slide surface to achieve an improved, i.e., reduced, coefficient of friction therebetween.” *Id.*, 5:38-40. “The resultant coefficient of between the mesh

material of the ride vehicle 14 and the slide surface 18 may be within a range of between about 0.03 to about 0.2, and particularly within a range of between about 0.05 to about 0.12, and in particular about 0.09, and therefore provides the rider with a fast rate of descent down the slide 12 (i.e., speed).” *Id.*, 5:41-46.

70. In the '854 patent, “the slide surface 18 includes a dry lubricant material provided as a coating 34 that is applied to the slide body 16 along the entire length of the slide surface 18 (i.e., between the top entrance 20 of the slide 12 to the bottom exit 22).” *Id.*, 5:56-62. “[T]he formulation for the dry lubricant material that is applied to the slide is a mixture comprising the following: (i) a resin, (ii) a lubricant, (iii) a thermal conductor, and (iv) a hardener, otherwise referred to as a hardening or curing agent.” *Id.*, 7:13-17. Fig. 2A, below, illustrates an embodiment in which “the dry lubricant coating 34 covers substantially the entirety of the sliding surface 36a, 36b, 38 of each sidewall 26a, 26b and the base wall 24.” *Id.*, 6:13-16.

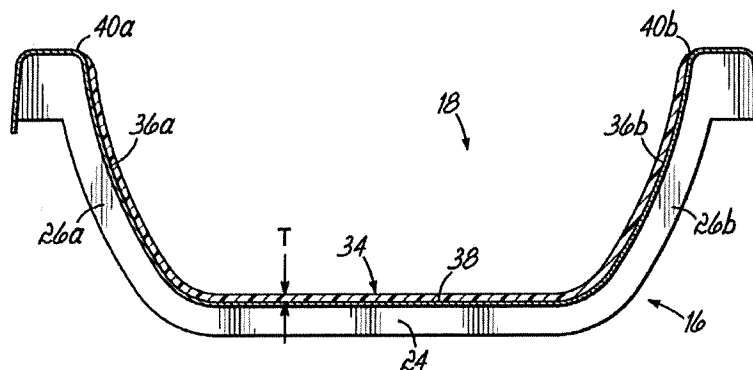


FIG. 2A

Ex. 1001, Fig. 2A

71. The '854 patent describes a “ride vehicle includ[ing] a fabric layer that forms a top surface configured to contact the rider and a mesh layer that forms a bottom surface configured to contact the slide surface.” *Id.*, 2:5-8. “The ride vehicle 14 includes a mesh material that cooperates with the slide surface 18 to achieve an improved, i.e., reduced, coefficient of friction therebetween.” *Id.*, 5:38-40.

72. As Background to the invention, the '854 patent explains that “[f]or most [slide] riders, a fast slide speed (i.e., a fast rate of descent down the slide) is more thrilling... and therefore is more desirable.” *Id.*, 1:26-29. “To this end, maintaining a low coefficient of friction between the rider or a ride vehicle that supports the rider and the slide surface provides for a fast and exciting slide.” *Id.*, 1:29-32.

73. As additional background, “[t]he coefficient of friction between a rider (or ride vehicle) and the slide surface of a typical dry slide is often within the range of between 0.15 to 0.3, and is typically about 0.25.” *Id.* at 1:48-51.

74. Unlike typical dry slides, the '854 patent describes that “[t]he coefficient of friction between the mesh layer of the ride vehicle and the non-wet lubricated slide surface may be within a range of between about 0.03 to about 0.2,

and particularly within a range of between about 0.05 to about 0.12.” *Id.*, 2:8-12, 1:48-51.

B. The ‘854 Patent Defines The Claim Term “Coefficient Of Friction”

75. The ‘854 patent defines the claim term “coefficient of friction.” Specifically, “[a]s will be understood by a person skilled in the art, the coefficient of friction between the ride vehicle and the slide surface is the ratio of the frictional force between two surfaces to the normal force pressing the surfaces together. That is, Coefficient of Friction (p)=Force of Friction (F)/Normal Force (N).” Ex. 1001, 4:38-43.

76. The ‘854 patent further defines the claim term “coefficient of friction” in terms of a specific ASTM standard. “The coefficient of friction between surfaces of the mesh material 46 and the slide surface 18 may be determined using the American Society for Testing and Materials International (ASTM) Coefficient of Friction ASTM D1894 standard test method (July, 2023), which may be used to determine both kinetic (moving) and static (starting) coefficient of friction of one surface being dragged across another.” Ex. 1001, 11:31-42. The ‘854 patent specifies that “[t]he ASTM D1894 test method can be found at www.astm.org.” *Id.* In that respect, “[f]or the ASTM D1894 test, the

material specimen is attached to a sled of defined weight” which “is pulled across another surface at a speed of 150 mm/minute.” *Id.*

C . The ‘854 Patent Defines The Claim Term “Mesh Layer”

77. “In another aspect, the mesh layer includes a plurality of interstitial openings that define an open area of the mesh layer. For example, the open area of the mesh layer may be within a range of between about 35% to about 50%.” (Ex. 1001, e.g., Claim 22). This definition of “mesh layer” is consistent with the definition relied upon by a POSITA. For example, an accepted resource in this industry is The Fairchild Books Dictionary of Textiles, which defines mesh as “Any fabric (woven, knit, crochet, lace, or knotted), which is characterized by open spaces between the yarns”. (Ex. 2006).

D. Summary of Prosecution History of the ‘854 Patent

78. The inventor of the ‘854 patent invented a system including a slide and a ride vehicle that are formed from materials that provide a low coefficient of friction between them – Claim 1 recites “a coefficient of friction between the mesh layer of the ride vehicle and the non-wet lubricated surface [of the slide] is within a range of between about 0.03 to about 0.2.” Contrary to Dr. Wang’s assessment, the materials described and claimed in the ‘854 patent to achieve friction coefficients within the claimed range were not known by the Critical Date for use in forming slide surfaces and contacting surfaces of a ride vehicle.

79. In issuing the '854 patent, the Examiner understood what the '854 patent acknowledged as “typical” of dry slides at the Critical Date. Ex. 1001, 1:48-51; Ex. 1002, 135-136. The Examiner cited the claimed range of coefficients in the reasons for allowance of the patent as being not taught or suggested by the prior art. For example, the '854 patent explicitly states in the background section that “The coefficient of friction between a rider (or ride vehicle) and the slide surface of a typical dry slide is often within a range of between 0.15 to 0.3, and is typically about 0.25.” *Id.*

80. Patent Owner filed the '854 patent as U.S. Patent Application No. 18/349,347 (the “347 application”) on July 10, 2023. Ex. 1002, 22-29. Concurrently with the application, Patent Owner filed a Track One Request for prioritized examination under 37 C.F.R. § 102(e)(1). Ex. 1002, 30-31. The Request for prioritized examination was granted on August 23, 2023. Ex. 1002, 50-51. Patent Owner then submitted an Information Disclosure Statement on October 25, 2023, citing Boatwright (Ex. 1022), Fallgatter et al., WO2023/069789, two additional references, and the Search Report under Section 17 and the Combined Search and Examination Report under Sections 17 & 18 received from the United Kingdom Intellectual Property Office in UK Patent Application No: GB2314317.5, all of which the Examiner considered. Ex. 1002, 54-59.

81. On November 8, 2023, the Examiner issued an Office Action citing three additional references, including Fallgatter (Ex. 1005), and making rejections under 35 U.S.C. §112 (claim 8) and § 103 (claims 1-11, 14-15, 18-24, and 27-29). Ex. 1002, 71-74. The Examiner determined that the subject matter of claims 12, 16-17, and 25-26 was not taught by the prior art and was therefore allowable. Ex. 1002, 74-75.

82. During prosecution, the independent claims of the '854 patent were rejected as obvious over U.S. 2023/0129814 ("Fallgatter," Ex. 1005), or alternatively over Fallgatter and U.S. 2006/0168805, or alternatively over Fallgatter and U.S. 5,427,698. Ex 1002, 50-51, 69-76. Applicant argued that claim 1 was distinguished over Fallgatter because (1) "Fallgatter only arbitrarily discloses a CoF of the low friction coating of the slide rather than a CoF *between* two surfaces," and Fallgatter's disclosure of "various configurations of a ride vehicle with the slide" makes it "unclear as to what materials the CoF values disclosed in Fallgatter apply," (2) "Fallgatter teaches that the bottom surface of the textile ride vehicle is coated with the low-friction coating" so "there is no teaching in Fallgatter of forming the bottom of the textile ride vehicle using a mesh layer," and (3) "Fallgatter's disclosure that the friction-reducing slide coating "has a CoF lower than the CoF of the textile substrate and about 0.25" would mean that a CoF between the slide and ride vehicle bottom "must be

greater than 0.25 and outside the range recited in claim 1.” *Id.*, 116-118.

Applicant further amended claims to incorporate subject matter deemed allowable into independent claims, including “the thermal conductor being copper,” and “the amount of interstitial openings and the size of the diameter of the thread.” *Id.*, 74, 108-114, 119-121.

83. Following the argument and amendment of the claims, the application was allowed, with the examiner stating that Fallgatter “teaches the slide system as found in claim 1” but “does not teach the coefficient of friction being between 0.03 and 0.2 [so] the two matching surfaces do not have that coefficient of friction.” *Id.*, 135.

VIII. APPLICATION OF PRIOR ART TO THE CHALLENGED CLAIMS

A. Overview of the Grounds

84. Below I explain each of the grounds relied upon by Petitioner. The grounds are summarized in this table for ease of reference:

Ground	Claims	Basis
1A	1-4, 6-7	§§102/103—Phillips
1B	1-4, 6-7, 14-17, 22-28	§103—Phillips in view of WN0400
2A	1-7	§103—Phillips in view of Fallgatter
2B	1-7, 14-17, 22-28	§103—Phillips and Fallgatter in view of WN0400

85. For purposes of my analysis, I have assumed that each reference relied on in the above grounds pre-dates the Critical Date of the '854 patent and qualifies as prior art based on its filing date and/or publication date according to the below table.

Ground	Claims	Basis
3A	8-13	§112(a)—Enablement
3B	5, 26	§112(b)—Indefiniteness

Reference	Filing Date	Publication Date	Prior Art Under
Phillips (Ex. 1004)	November 12, 2007	March 1, 2011	§102(a)(1)-(2)
Fallgatter (Ex. 1005)	October 24, 2022	April 27, 2023	§102(a)(2)
WN0400 (Ex. 1006)	N/A	July 28, 2021	§102(a)(1)

**B. GROUND 1A: PHILLIPS DOES NOT ANTICIPATE OR
RENDER OBVIOUS CLAIMS 1-4 AND 6-7**

86. Ground 1A presents two separate grounds challenging the claims over Phillips, i.e., anticipation of claims 1-4 and 6-7 under §102 and obviousness of claims 1-4 and 6-7 under §103. In Ground 1A, the two separate anticipation and obviousness challenges to the claims over Phillips are presented collectively for convenience.

1. Overview of Phillips (Ex. 1004)

87. Phillips is a U.S. Patent (7,896,779) titled “Sliding Exercise Apparatus and Recreational Device”, which issued on March 1, 2011, and which lists Worldslide, LLC as the Assignee. Ex. 1004, cover page. Phillips is directed to “an exercise apparatus and recreational system composed of a plurality of interconnecting parts which include a slide.” Ex. 1004, 1:13-15. Phillips describes multiple types of sliding vehicles for use with the slide (10). Ex. 1004, 2:3-11.

88. Fig. 1 of Phillips, a copy of which is reproduced below, illustrates one example of the slide (10).

89. Phillips describes this embodiment of the slide (10) as having “bumpers 14 and 15 and support area below top surface 20 as inflatable membranes.” Ex. 1004, 4:52-53. Phillips describes the top surface (20) of the slide as “composed of a flexible sheeting layer of a durable, low friction material enabling the user to traverse the slide whether the top surface 20 is wet or dry.” Ex. 1004, 4:21-24. Phillips consistently describes the materials used in the slide and associated elements as membranes or sheeting materials.

90. Phillips also describes different types of sliding vehicles that are configured to interact with the slide. Ex. 1004, 2:3-11. For instance, Phillips describes sliding vehicles such as sports boards, which are “supported by a low friction, durable membrane either attached to a sports board or as stand-alone sheeting material.” Ex. 1004, 1: 22-25. In the embodiment shown in Fig. 1, Phillips explains that “user 18 is supported by membrane 19 in the form of low friction durable sheeting material.” (Ex. 1004, 4:40-41).

91. Like the slide (10), Phillips consistently describes the materials used in the sliding vehicles as membranes or sheeting materials, describing that “[b]oth membrane 6 and top surface 20 can each be composed of low friction high durable material such as a member selected from the group consisting of nylon, Teflon,

sailcloth, Dacron, vinyl, artificial turf, synthetic carpet and polyester resins.” Ex. 1004, 4:43-46.

92. Phillips describes several embodiments of sliding vehicles that include the low friction, durable membrane, such as a sports board (100) and

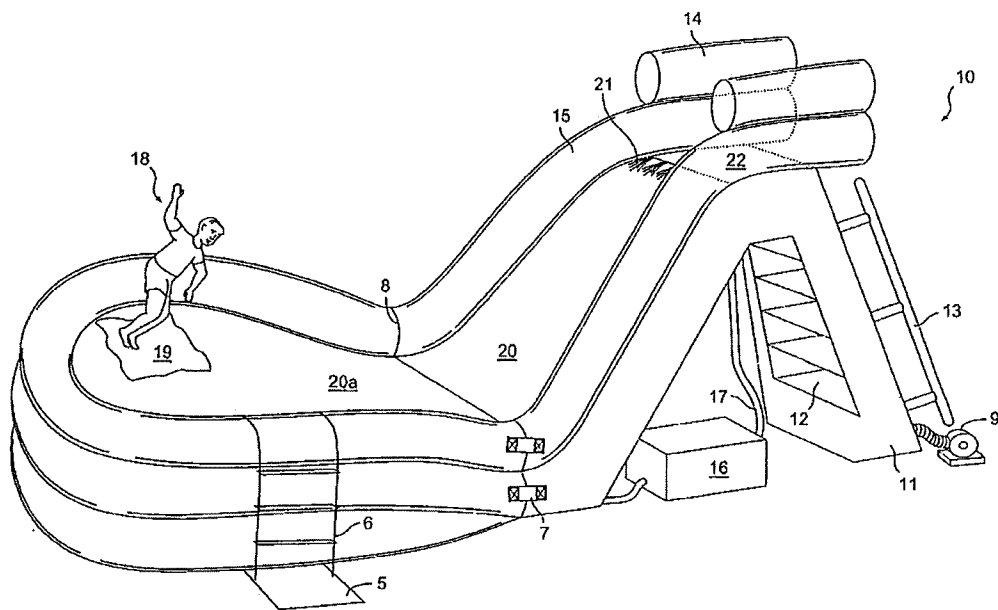


FIG. 1

sliding element (120). Ex. 1004, 7:6-7, 21-23.

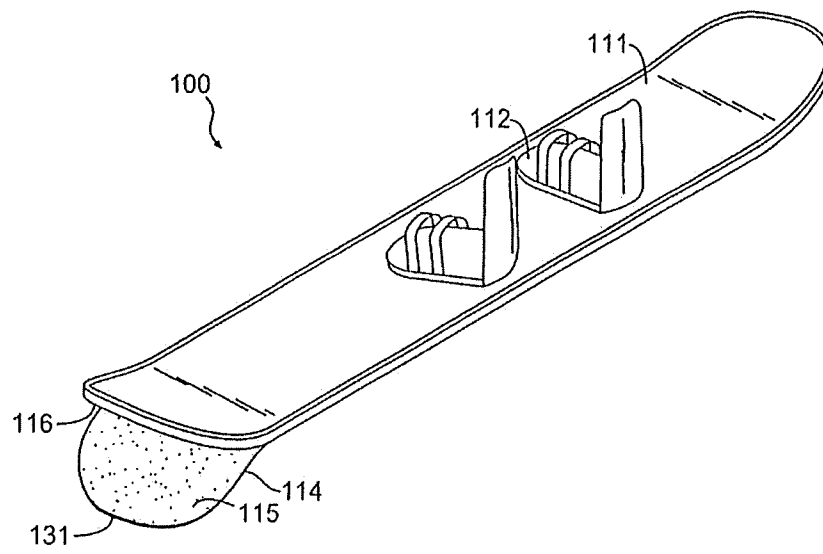


FIG. 5

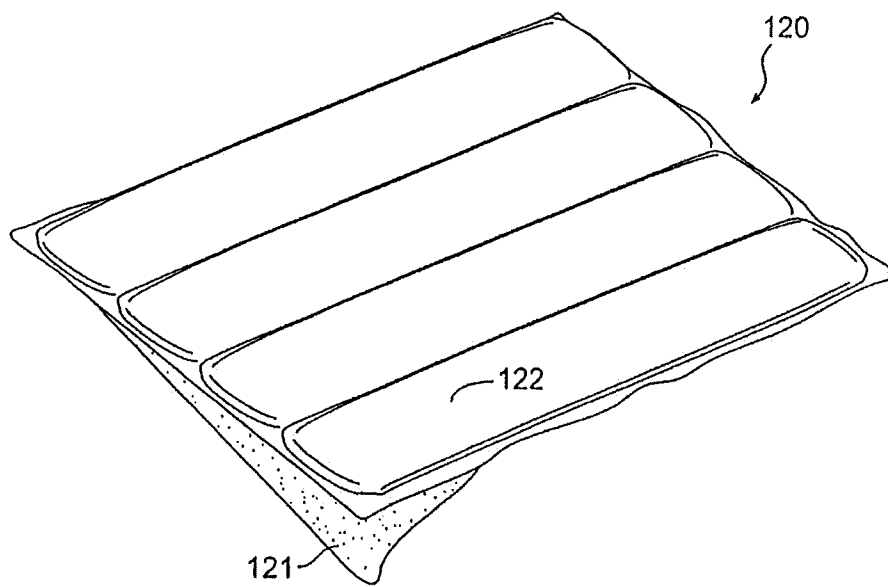


FIG. 7

93. For the sports board (100), Phillips describes that the “durable low friction sheeting material 114 can be applied to bottom surface 116 by applying adhesive 115 to sheeting material 114 and adhering it to board 111.” Ex.1004, 7:10-12. Likewise, for the sliding element (120), Phillips describes that the “low friction durable sheeting material 121 is adhered to a body section 122.” Ex. 1004, 7:23-25. Notably, in every disclosed embodiment, Phillips describes attaching the low friction, durable sheeting material to sliding vehicles using adhesive.

94. Phillips does not use the term “mesh” to describe the low friction, durable sheeting material for use with the sliding vehicles. Instead, Phillips consistently describes the material as membranes or sheeting materials.

95. Phillips does explicitly distinguish the low friction, durable sheeting material from “nylon netting.” In that regard, Phillips describes the use of nylon netting for attaching “various sliding elements 1606 can be added end-to-end or side-to-side to slide element 1602 in order to create slides of additional length and/or width.” Ex. 1004, 9:50-52. Specifically, Phillips describes that “[a]ttachment can be by any well-recognized means Such as through the use of Velcro hook and loop connectors, Snaps, Zippers, ropes, springs, nylon netting and similar expedients.” Ex. 1004, 9:53-55. This distinction highlights that nylon

netting serves a different purpose and is not equivalent to the low friction, durable sheeting material central to Phillips' slide and sliding vehicle embodiments.

2. Missing Element Analysis

a) Claim 1

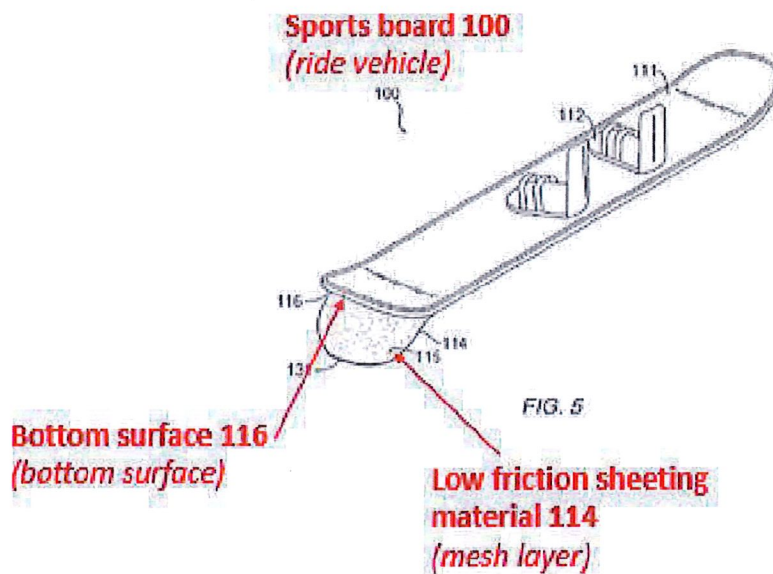
[1b-iii] and a mesh layer that forms a bottom surface configured to contact the slide surface;

96. Phillips does not disclose a mesh layer. To the contrary, Phillips uniformly and repeatedly discloses sheeting, which is not a mesh layer and is not characterized by open spaces between yarns. In this regard, a POSITA would be motivated away from a mesh layer. In addition, a POSITA would not be motivated to modify Phillips to incorporate a mesh layer.

97. The ride vehicle (e.g., Phillips' "sports board" or stand-alone sheet), has a "bottom for sliding upon a slide." Ex. 1004, 3:12-13. The bottom surface of the ride vehicle is formed from a low friction **sheeting** material. Ex. 1004, 5:27-35, 7:7-23, 8:40-43, 8:49-61, 9:9-13. Phillips describes that "the bottom surface of sports board 42 can be optionally provided with durable low friction **sheeting** material so that the present invention can be employed in a dry condition." Ex. 1004, 5:32-35.

98. The sheeting material forming the bottom surface of the ride vehicle is “composed of low friction high durable material” such as “nylon, Teflon, sailcloth, Dacron, [and] vinyl,” among others.” Ex. 1004, 4:43-46.

99. The “durable low friction sheeting material 114 can be applied to bottom surface 116 by applying adhesive 115 to sheeting material 114 and adhering it to board 111,” such that the low friction material is configured to contact the slide surface. Ex. 1004, 7:10-12.



Ex. 1004, Fig. 5 (as annotated by Petitioner)

100. Thus, Phillips repeatedly refers to the bottom surface of the ride vehicle as formed from sheeting material.

101. A POSITA would not consider the sheeting material disclosed as forming the bottom surface of the ride vehicle as a mesh layer claimed in Claim 1 of the '854 patent. As explained above, a POSITA would consider as an accepted resource in this industry The Fairchild Books Dictionary of Textiles. The Fairchild Books Dictionary of Textiles defines mesh as "Any fabric (woven, knit, crochet, lace, or knotted), which is characterized by open spaces between the yarns". (Ex. 2006). In direct contrast, the definition of sheeting is: "Usually made with carded yarns in a wide range of constructions that vary from about 40×38 to about 64×68 for industrial sheeting. Can be made in higher counts and/or combed yarns for domestic uses such as bed sheets. See muslin bed sheeting, bed sheeting. It is made in medium and heavy weights in the following classifications: coarse, ordinary, lightweight, narrow, soft-filled, and wide. Sheetting also is made of linen or nylon yarns. Knitted sheetting fabric may be made for use in fitted crib and bed sheets, and these are called jersey sheets. Industrial sheetting is a plain-weave cotton fabric made of singles yarns." (Ex. 2005, Ex. 2007). Here, 40×38 (and 64×68) refers to the number of warp yarns per inch and weft yarns per inch. These are extremely close packing of yarns that do not allow for open spaces between the yarns.

102. ASTM D883 defines ‘sheeting’ as: a form of plastic in which the thickness is very small in proportion to length and width and in which the plastic is present as a continuous phase throughout, with or without filler. (Ex. 2017).

103. The differences between sheeting and mesh, including that sheeting does not allow for open spaces between the yarns, is confirmed by lay person dictionary definitions, such as Merriam-Webster. (Ex. 2004, Ex. 2005).

104. Accordingly, the sheeting described in Phillips is not a mesh and is not characterized by open spaces between the yarns.

105. Phillips repeatedly refers to the sheeting material as a membrane. For example, Phillips discloses “the use of a highly durable low friction membrane which acts as a sheeting layer for supporting a user as the user traverses the top surface of the slide.” (Ex. 1004, 3:27-29). In like manner, Phillips discloses that “[t]he membrane itself can be composed of a low friction, durable sheeting material” and that “[t]his membrane, in addition to being used as a stand-alone flexible sheet, can also be employed in small sections which are appended to the clothing of a user...”. *Id.* at 3:29-35.

106. Membranes, and sheeting, have surfaces which are either completely or substantially without interstices or open spaces in the structure. For example,

bed sheets substantially cover the skin ensuring warmth and comfort. Mesh fabrics are clearly not a membrane as they have interstices which makes the fabric porous with significant portions of the structure open to allow fluids such as air to pass through.

107. A sheet of material, such as a sheet of Teflon, is present as a continuous phase throughout having no interstices or open spaces. Mesh fabrics are clearly not a sheet of material.

108. Membranes are defined as a thin pliable sheet of material forming a barrier or lining. Meshes are described as “a woven fabric with a permeable network made from interlacing threads or mono filament fibers.” (see ASTM F1918 for fabric mesh) (Ex. 2018), or “mesh refers to a screen, net or filter that consists of openings of a defined size; in this document, the size of the mesh refers to the size of the largest opening”. Membranes are not meshes.

109. Despite this, Dr. Wang suggests that Phillips also describes “sailcloth” as a material for the layer that forms a bottom surface configured to contact the slide surface. Ex. 1004, 4:43-46. Based on my knowledge and experience in the field, and my review of Phillips, a POSITA would not have understood such material as a woven fabric material that provides a mesh.

110. To explain, a POSITA would have understood that sailcloth is a type of fabric traditionally used to make sails for boats. As acknowledged by Dr. Wang, the dictionary definition of sailcloth is “any of various fabrics, as of cotton, nylon, or Dacron, for boat sails or tents” Ex. 1034, 1. A POSITA would not have understood that the fabric of sailcloth (e.g., a fabric made of cotton, nylon, or Dacron) comprises a mesh. *Id.*, see also Ex. 1037, 1 (dictionary definition of mesh is “any knit, woven, or knotted fabric of open texture”); Ex. 1038, 1 (dictionary definition of fabric is “a cloth made by weaving, knitting, or felting fibers”).

111. To the contrary, as explained above, a POSITA would have understood that a “mesh” according to The Fairchild Books Dictionary of Textiles defines mesh as “Any fabric (woven, knit, crochet, lace, or knotted), which is characterized by open spaces between the yarns”. (Ex. 2004, Ex. 2006). Dr. Wang acknowledges that a mesh includes a fabric that is woven so that there are holes between the woven threads.

112. Then, Dr. Wang suggests that “for some fabrics, like sailcloth, the holes formed by the woven threads may be very small in size”, citing to Ex. 1007, 1 for purported support. In my opinion, Dr. Wang’s purported supported for this suggestion is incorrect. First, the reference to which Dr. Wang refers does not

define what “sailcloth” is. Indeed, “sailcloth” is not disclosed in any manner in Ex. 1007. Thus, for Dr. Wang to suggest that sailcloth is defined as a “mesh” is unsupported. Second, sailcloth is not considered a mesh; it is a tightly woven fabric, typically made from canvas or synthetic fibers, designed to withstand strong winds and pressure, making it more like a sturdy cloth than a mesh with open gaps. (See Ex. 2011, Ex. 2019, Ex. 2020). Third, Dr. Wang’s suggestion ignores the disclosure in Phillips that the sailcloth, as disclosed as forming the bottom surface of the ride vehicle, is repeatedly and uniformly defined as sheeting material and a membrane. Membranes, and sheeting, have surfaces which are either completely or substantially without interstices or open spaces in the structure and are not a mesh layer claimed in Claim 1 of the ‘854 patent.

113. Then, Dr. Wang suggests that Phillips describes example materials including “nylon” and “Dacron,” which a POSITA would have appreciated are commonly and commercially available as a woven fabric and provide durability and low friction surfaces in a mesh form,” again citing Ex. 1007, 1 as support. This is, once again, not correct, and ignores the uniform disclosure in Phillips that these materials are disclosed as forming the bottom surface of the ride vehicle, and are repeatedly and uniformly defined as sheeting material and a membrane. Membranes, and sheeting, have surfaces which are either completely without or

substantially without interstices or open spaces in the structure and are not a mesh layer claimed in Claim 1 of the '854 patent.

114. Accordingly, in my opinion, Phillips does not disclose a mesh layer forming a bottom surface of the ride vehicle for contacting the slide. Regardless of the material (e.g., “nylon, Teflon, sailcloth, Dacron, [and] vinyl” Ex. 1004, 7:10-12; 4:43-46), because Phillips discloses that sports boards include a low friction sheeting material and membrane, a POSITA reading Phillips would not have understood that Phillips’ “sheeting material” formed of sailcloth, nylon or Dacron would have been a mesh layer.

115. The durable low friction sheeting material described by Phillips therefore does not disclose a mesh layer.

116. For several reasons, I disagree with Dr. Wang’s suggestion that “a POSITA would have been motivated to implement the bottom of the ride vehicle with a mesh...”. As background, Dr. Wang makes this suggestion in a single paragraph in his declaration, Paragraph 103. Neither the Petition nor Dr. Wang explain how a POSITA would successfully incorporate a mesh into any of the ride vehicles of Phillips while maintaining the functionality of the ride vehicle.

117. First, Dr. Wang suggests that “a POSITA would have been motivated to implement the bottom of the ride vehicle with a mesh in accordance with Phillips’ suggestions to form the bottom surface of the ride vehicle from a ‘low friction high durable material.’” This is not correct. Once again, this suggestion ignores Phillips’ repeated and uniform disclosure of forming the bottom surface of the ride vehicle as sheeting material and a membrane. Membranes, and sheeting, have surfaces which are either completely without or substantially without interstices or open spaces in the structure and are not a mesh layer claimed in Claim 1 of the ‘854 patent. By definition, sheeting material and membranes function as “barriers,” thereby providing a high level of durability.

118. Against this, Phillips’ disclosure of forming the bottom surface of the ride vehicle from a low friction high durable material does not suggest or motivate a POSITA to use the claimed “mesh layer.” Simply, nothing about low friction high durable material suggests a “mesh layer.” More particularly, nothing relied upon by Dr. Wang, suggests that a “mesh layer” would result in a low friction highly durable material.

119. Next, Dr. Wang suggests that “In particular, Phillips’ description of the low friction material as a “sheeting material” would have suggested to a POSITA that the bottom of the vehicle be formed from a woven fabric. This is

not correct. Sheeting material is typically extruded, skived, or molded, and does not contain pores or openings. And, woven substrates comprised of polymeric materials are not commonly described as “sheeting” or “membranes.”

120. Next, Dr. Wang suggests that “Indeed, Phillips expressly discloses materials of “nylon” and “sailcloth” and that “Based on Phillips description of sailcloth, a POSITA would have been prompted to utilize a woven material, such as a woven material made from “nylon.” Still, this does not suggest that a POSITA would assume that the nylon, Teflon, and vinyl sheets or membranes are supposed to be meshes.

121. Next, Dr. Wang incorrectly suggests that a POSITA would have recognized, and found obvious from Phillips’ description, that woven nylon was a conventional material that would have enhanced the “low friction” between the slide and vehicle (e.g., based on Phillips express teaching of “nylon”), and that it is a durable and widely-available material. Ex. 1011, 5 (describing nylon as having “Good mechanical strength, abrasion resistance, and toughness (i.e., durable) and low friction material); Ex. 1007, 1 (describing nylon, polyester, and polypropylene meshes); Ex. 1034, 1 (describing nylon and Dacron fabrics used for making boat sails); Ex. 1033, 1 (describing types of nylon mesh including woven nylon mesh), 2-5 (listing commercially available nylon mesh products for sale). A

POSITA would not have reason to implement the Phillips ride vehicle with a nylon mesh bottom based on Phillips' suggestion to use sailcloth and the suggestion to use materials to provide a low friction interaction between the slide and ride vehicle. That is because Phillips teaches away from mesh, through its repeated disclosure of use of membranes, and sheeting, which have surfaces which are either without or substantially without interstices or open spaces in the structure and are not a mesh layer claimed in Claim 1 of the '854 patent.

122. Finally, in a single paragraph, Dr. Wang suggests that a POSITA would have had a reasonable expectation of success in implementing the ride vehicle with a nylon mesh bottom "because implementing Phillips' ride vehicle in accordance with Phillips' suggestions would have required, at most, trivial modification, and because ride vehicles with fabric surfaces for sliding on slides were well-known by the Critical Date." Dr. Wang's suggestion here is incorrect and unsupported.

123. Dr. Wang is wrong because implementing Phillips' ride vehicle in accordance with Phillips' suggestions would suggest to a POSITA to use, through its repeated disclosure, membranes and sheeting. These surfaces would be without interstices or open spaces in the structure.

124. Dr. Wang's suggestion is unsupported because modifying Phillips would not at all require a trivial modification. To the contrary, an incredible amount of research, analysis, and testing would be required. To explain, while Phillips teaches away from use of a mesh layer as claimed in the '854 patent, if Phillips did suggest otherwise, a POSITA would have to evaluate the impact of a material with a completely different morphology (sheeting and membrane versus mesh) on the interaction between the ride vehicle and the slide surface. A POSITA would also have to evaluate whether such a modification would impact the durability of the ride vehicle. A POSITA would also have to evaluate the mechanism by which the different material is affixed to the bottom of the ride vehicle. For example, Phillips discloses the use of adhesive for this purpose. However, use of an adhesive with the mesh layer required by claims of the '854 will dramatically and negatively impact the interaction between the ride vehicle and the slide surface. This negative effect would intensify as the size of the mesh interstices or open spaces increases. For example, adhesive would penetrate the interstices or open spaces in the structure of a mesh layer and interact with the slide surface. A POSITA would also have to consider that the '854 patent claims that the mesh layer be formed of monofilament material. To properly adhere this, the adhesive must encapsulate the monofilament material or the monofilament material must be treated in some way to allow it to adhere with adhesive,

assuming that is even possible. Material with an adhesive would require processing of the bottom of the ride vehicle (and monofilament material) before an attempt to adhere, or at a minimum would require an evaluation of whether such processing is required. Chemical treatment such as etching would have to be evaluated in order to significantly alter the surface characteristics, which would negatively alter frictional properties.

125. Dr. Wang does not mention any of these factors (e.g., morphology, durability, affixing to the bottom of the ride vehicle, Phillips disclosure of adhesive as the mechanism of affixing to the bottom of the ride vehicle). He also does not substantively address any of these factors. Neither the Petition nor Dr. Wang address how a POSITA would successfully incorporate a mesh into any of the ride vehicles of Phillips while maintaining the functionality of the ride vehicle. In short, simply stating that something would be a trivial modification, without any discussion whatsoever of how to successfully achieve it, in my opinion does not make it so, at least in the context of the '854 patent, Phillips, and affixing material to the bottom of a ride vehicle.

126. Accordingly, a POSITA would not have been prompted to use a mesh layer, based on Phillips' teachings. Indeed, a POSITA would be motivated not to use a mesh layer, including based on Phillips' disclosure of membranes and

sheeting. These surfaces would be without interstices or open spaces in the structure, rendering this claim limitation nonobvious.

[1c] wherein a coefficient of friction between the mesh layer of the ride vehicle and the non-wet lubricated slide surface is within a range of between about 0.03 to about 0.2.

127. It is my opinion, as explained below, that Phillips does not disclose a coefficient of friction that is within a range of between about 0.03 to about 0.2.

128. At most, Phillips expressly advocates for “low friction” between slide and ride vehicle, and specifies materials that achieve “low friction.” For example, Phillips describes that the slide system may be used as a substitute for a snowy or icy slope to allow users to practice snow sports year round (Ex. 1004, 1:50-2:32, 4:25-32, 4:64-7:5); snow and ice are well-known to have very low friction coefficients in interactions with a variety of materials. Ex. 1027, 7; Ex. 1026, 3 (interactions between ice and brass); 5 (interactions between ice samples), 7 (interactions between snow and PTFE). However, an expressed intent to replicate these interactions does not, by itself, establish that Phillips’ system successfully achieves the same low-friction dynamics.

129. The references in Phillips to “low friction” between slide and ride vehicle, and its specification of materials that achieve “low friction” do not

inform a POSITA regarding the coefficient of friction or the range of coefficient of friction.

130. In a single paragraph, Dr. Wang suggests “[a] POSITA would have recognized that implementation of Phillips’ slide system with the materials suggested by Phillips – nylon and Teflon – would require, at most, trivial modifications of the ride vehicle bottom, as explained above.” Dr. Wang provides no explanation, and no support, for this suggestion. In the same paragraph, Dr. Wang suggests that “as also explained above, a POSITA and would have had a reasonable expectation of success as a result.” Dr. Wang provides no explanation, and no support, for this suggestion. In the same paragraph, Dr. Wang suggests that “a POSITA would have had a reasonable expectation of achieving the claimed invention including the range of frictional coefficients between the ride vehicle bottom and slide surface using nylon and Teflon materials...”. The only support that Dr. Wang provides for this suggestion is that “these materials were known to be low friction materials, and typical frictional coefficients for dry slides fell within the claimed range, citing to §VI.B.4 and Ex. 1002, 1:48-51. In the resulting slide system, a coefficient of friction between the ‘nylon’ mesh layer of the ride vehicle and the ‘Teflon’ non-wet lubricated slide surface is within a range of between about 0.03 to about 0.2, as recited by Element 1[c].” As explained above, that materials are considered

“low friction” does not suggest that they fall within the claimed range, and that also does not suggest that the coefficient of friction between the two materials falls within the claimed range, and that also does not suggest that the coefficient of friction between the two materials falls within the claimed range under the ASTM standards required by the ‘854 patent.

131. Dr. Wang’s suggestion that “implementation of Phillips’ slide system with the materials suggested by Phillips – nylon and Teflon – would require, at most, trivial modifications of the ride vehicle bottom, as explained above” is incorrect and unsupported.

132. Dr. Wang is wrong because, as explained above, undertaking that implementation would not demonstrate that the slide system falls within the claimed range, and that also does not demonstrate that the coefficient of friction between the two materials falls within the claimed range.

133. Dr. Wang’s suggest is unsupported because modifying Phillips would not at all require a trivial modification. To the contrary, an incredible amount of research, analysis, and testing would be required. To explain, while Philipps teaches away from use of a mesh layer as claimed in the ‘854 patent, if Phillips did suggest otherwise, a POSITA would have to evaluate the impact of a material with a completely different morphology (sheeting versus mesh) on the interaction between the ride vehicle and the slide surface. A POSITA would also

have to evaluate whether such a modification would impact the durability of the ride vehicle. A POSITA would also have to evaluate the mechanism by which the different material is affixed to the bottom of the ride vehicle. For example, Phillips discloses the use of adhesive for this purpose. However, use of an adhesive with the mesh layer required by claims of the '854 will dramatically and negatively impact the interaction between the ride vehicle and the slide surface. For example, adhesive would penetrate the interstices or open spaces in the structure of a mesh layer and interact with the slide surface. A POSITA would also have to consider that the '854 patent claims that the mesh layer be formed of monofilament material. To properly adhere this, the adhesive must encapsulate the monofilament material or the monofilament material must be treated in some way to allow it to adhere with adhesive, assuming that is even possible. Material with an adhesive would require processing of the bottom of the ride vehicle (and monofilament material) before an attempt to adhere, or at a minimum would require an evaluation of whether such processing is required. In addition, a chemical treatment such as etching would have to be evaluated in order to significantly alter the surface characteristics, which would negatively alter frictional properties.

134. Dr. Wang does not mention any of these factors (e.g., morphology, durability, affixing to the bottom of the ride vehicle, Phillips disclosure of

adhesive as the mechanism of affixing to the bottom of the ride vehicle). He also does not substantively address any of these factors. In short, simply stating that something would be a trivial modification, without any discussion whatsoever, in my opinion does not make it so, at least in the context of the '854 patent, Phillips, and achieving a coefficient of friction as claimed in the '854 patent.

135. Accordingly, a POSITA would not have been prompted to rely upon the materials disclosed in Phillips to achieve a coefficient of friction as claimed in the '854 patent.

b) Claims 2-4 and 6-7

136. I understand that if an independent claim is not anticipated or rendered obvious, then dependent claims are also not anticipated or rendered obvious. As explained above, it is my opinion that Claim 1 of the '854 patent is not anticipated or rendered obvious by Phillips. For the same reasons, it is my opinion that Claims 2-4 and 6-7 of the '854 patent are not anticipated or rendered obvious by Phillips.

C. GROUND 1B: PHILLIPS-WN0400 DOES NOT RENDER CLAIMS 14, 6-7, 14-17, AND 22-28 OBVIOUS

1. WN0400 Overview (Ex. 1006)

137. WN0400 is a SKU (Stock Keeping Unit) representing a product specification for nylon netting that is allegedly available from the company Industrial Netting.¹ Ex. 1006. WN0400 is considered by Industrial Netting to be “Nylon Netting,” as can be seen in the screenshot from Ex. 1006

reproduced to the right. The WN0400 SKU is for a product titled “400 Micron Nylon Mesh 45% Open Area.” Industrial Netting describes WN0400 as a

Home / Materials / Nylon Netting / **WN0400 - 400 Micron Nylon Mesh 45% Open Area**

Products

Applications

Materials

Polypropylene

Polysthylene

• **Nylon Netting**

Polyester Netting

PTFE Netting

Temperature Guidelines

Clearance Items

Netting & Mesh Services



Nylon Mesh woven from “Monofilament Nylon 6 fiber 42 threads per inch” and which includes “400 micron hole opening[s] with 45% open area.” Ex. 1006.

2. The Phillips-WN0400 Combination

a) The Combination

138. Dr. Wang asserts that there are reasons why a POSITA would be prompted to implement Phillips’ “low friction” slide system with a bottom formed from nylon mesh having the characteristics taught by WN0400. Dr. Wang is not correct.

¹ Patent Owner does not concede that WN0400 qualifies as a printed publication, but does not dispute this assertion based on the arguments presented in Sections VII-X of this paper.

139. As background, and as explained above, Dr. Wang's opinion ignores the uniform disclosure in Phillips that the materials are disclosed as forming the bottom surface of the ride vehicle, and are repeatedly and uniformly defined as sheeting material and a membrane. Membranes, and sheeting, have surfaces which are either without or substantially without interstices or open spaces in the structure and are not a mesh layer claimed in Claim 1 of the '854 patent. Accordingly, in my opinion, Phillips does not disclose a mesh layer forming a bottom surface of the ride vehicle for contacting the slide. Regardless of the material (e.g., "nylon, Teflon, sailcloth, Dacron, [and] vinyl" Ex. 1004, 7:10-12; 4:43-46), because Phillips discloses that sports boards include a low friction sheeting material and membrane, a POSITA reading Phillips would not have understood that Phillips' "sheeting material" formed of sailcloth, nylon or Dacron would have been a mesh layer.

140. Thus, the "low friction" disclosed by Phillips is limited to membranes and sheeting, which have surfaces which are either without or substantially without interstices or open spaces in the structure and are not a mesh layer claimed in Claim 1 of the '854 patent. Phillips, therefore, teaches that a material incorporating no interstices or open spaces is what results in low friction.

141. A mesh, as explained above, includes a fabric characterized by open spaces. (Ex. 2004, Ex. 2006). Such open spaces inform a POSITA that the

coefficient of friction and friction would be increased, as compared to the sheeting, substrate, durable coating, and suitable contact area relied upon by Dr. Wang. Open spaces attendant to “mesh” would inform a POSITA that the coefficient of friction and friction would increase because [Expert to insert analysis here].

142. As described above, Phillips teaches that both a slide surface and ride vehicle bottom would have a low friction surface (e.g., “Teflon” and “nylon,” or other materials). Ex. 1004, 4:43-46, 5:12-16, 7:9-27, 7:53-55. As described above, a POSITA may have been aware that various materials described by Phillips may be woven: for example, nylon, Dacron, sailcloth, etc., are conventionally implemented as woven fabrics. Ex. 1004, 4:43-46. For example, a POSITA would have understood that sailcloth is a woven fabric comprising nylon, Dacron, or other materials. UATP-1034, 1. However, a POSITA would have recognized that the woven fabrics disclosed in Phillips are not a mesh, and do not have holes that could be characterized as a mesh. Ex. 1037, 1; Ex. 1038, 1; Ex. 1007, 1. To the extent a POSITA would have found it obvious to select one of these materials (e.g., “nylon”) for the bottom of the ride vehicle in view of Phillips express teachings to do so, a POSITA would have only employed a sheeting or membrane. Ex. 1004, 5:12-16, 7:9-27, 7:53-55; Ex. 1011, 5.

143. Dr. Wang then suggests that a POSITA would have been motivated to choose a woven nylon mesh, in accordance with WN0400's suggestions as a known durable and low-friction material. Ex. 1011, 5 (describing "Major Application Characteristics" of polyamides (nylons) as "Good mechanical strength, abrasion resistance, and toughness; low coefficient of friction"). This statement lacks particularity and does not suggest to a POSITA that WN0400 provides a suitable example of a woven nylon mesh, and to that extent Phillips would teach away.

144. As such, it would not have been obvious to a POSITA to select a nylon mesh to implement a ride vehicle with a low-friction bottom surface as Phillips teaches, based on the nylon mesh construction of WN0400, including because Phillips teaches that sheeting or membranes results in low friction, and a POSITA would understand that to be the opposite of a mesh.

b) Reasons Why A POSITA Would Not Employ The Combination

145. Multiple reasons would have prompted a POSITA to not implement the Phillips slide system with a ride vehicle including a nylon mesh bottom surface or any teaching of WN0400.

146. First, a POSITA would not have been motivated to implement a nylon mesh bottom of the ride vehicle based on the teachings of Phillips and WN0400 to provide a vehicle with "low friction" between the slide and vehicle.

See e.g., Ex. 1004, 2:19-24. A POSITA would have recognized that sheeting or membranes, not mesh, would promote fast sliding that enhances a user's excitement and enjoyment when using the slide system, furthering Phillips' express objectives. Ex. 1004, Abstract ("sliding exercise apparatus and recreational device for entertainment and [] to enhance gymnastic and board skills"); Ex. 1020, 8 ("Speed is the important aspect of a slide – it's what people want"); Ex. 1018, 2 (describing with regard to a potato sack slide: "Faster equals more fun"), Ex. 1022, 1:28-29 ("the primary objective of any slide construction is to provide speed on a downward incline"), 1:36-37 ("the thrills of a rapid descent down an incline"). Phillips describes "nylon" as a material to implement its "low friction" ride vehicle bottom surface, and a POSITA would have recognized that mesh described by WN0400 as providing the opposite of a low-friction/slippery surface to implement Phillips teachings. Ex. 1004, 1:22-25 ("a user can slide upon a surface which can be inclined while being supported by a low friction, durable membrane either attached to a sports board or as a stand-alone sheeting material"). In sum, a POSITA would not have understood that implementing the ride vehicle of Phillips with a nylon mesh bottom or based on WN0400 would have achieved the "low friction" requirement of Phillips.

147. Second, a POSITA would not have been motivated to utilize nylon mesh for the ride vehicle bottom based on Phillips express teachings of a nylon,

Dacron, or sailcloth for use in the slide and vehicle surfaces. Ex. 1004, 4:43-46. A POSITA would have been familiar with the characteristics of nylon, including that as a sheeting material uniformly and repeatedly described by Phillips as the morphology resulting in durability and low friction coefficient over many surfaces, consistent with Phillips' suggestions. Ex. 1011, 5 (describing nylon as having the characteristics of being durable and low friction); *see also* Ex. 1006, 2 ("Excellent resistance to wear"). A POSITA would have found mesh material and WN0400 and would have understood that it was not a suitable option for providing a woven textile low-friction bottom for the ride vehicle, including because Phillips teaches the opposite.

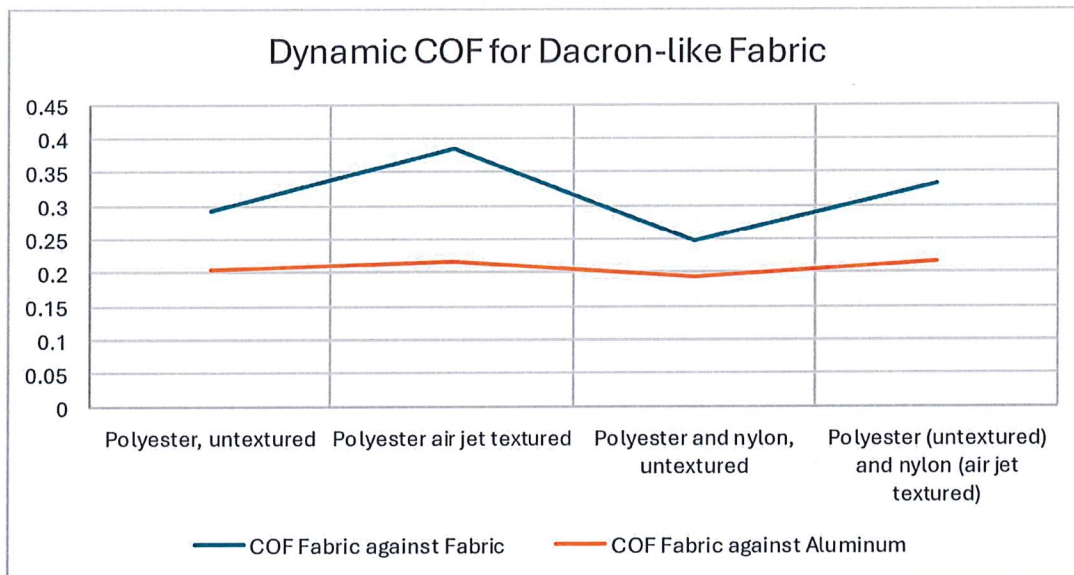
148. Instead, a POSITA would use a film or sheet. In this regard I have reviewed the opinions of Dr. Spiegelberg and rely in part upon them. Benabdallah (Ex. 2025) performed COF measurements of nylon against polished aluminum, with one set of results shown in Figure 6. The static COF values for nylon against aluminum range between 0.24 to 0.1. These results, taken in combination with the results from Kothari (Ex. 1009), lead to several observations: (1) The COF determined between two depends both on the chemistries of the substrates and their morphology (e.g. sheet vs. fabric); (2) Fabric morphologies tend to have a higher COF than solid sheets, as shown in Figure 6. Note that Benabdallah is reporting static COF values, and the values for Kothari are dynamic. If

Benabdallah were to report dynamic COF values, the disparity between the solid sheets and fabric would be even greater; (3) Kothari further states that variation in mesh size in monofilament fabrics affects the frictional resistance of these fabrics. The results in Figure 6 show a non-monotonic trend in COF vs mesh coarseness of fabric-against-aluminum based on the mesh description, so a POSITA would not have guidance about what is the appropriate mesh coarseness to achieve a low COF. Dr. Wang states in paragraph 251 that Ex. 1009 shows that the finest meshes have higher coefficient of friction compared to coarser meshes. Ex. 1009 does not show this. Rather, Specimen 14 is described as a medium nylon mesh (between fine and coarse), yet it has the highest COF of the three nylon meshes when tested against aluminum (see Figure 5). However, Specimen 14 is listed as having the lowest density (23 g/m² vs. 36 for the fine and 69 for the coarse). The trend of COF with mesh density is illustrated in Figure 7, and shows that the lowest density mesh has the highest COF, which is the opposite of Dr. Wang's interpretation of this Exhibit. At best, a POSITA would be confused as to which

direction they should move in terms of mesh coarseness based on this Exhibit.

Additionally, the Phillips patent provides no guidance on this matter.

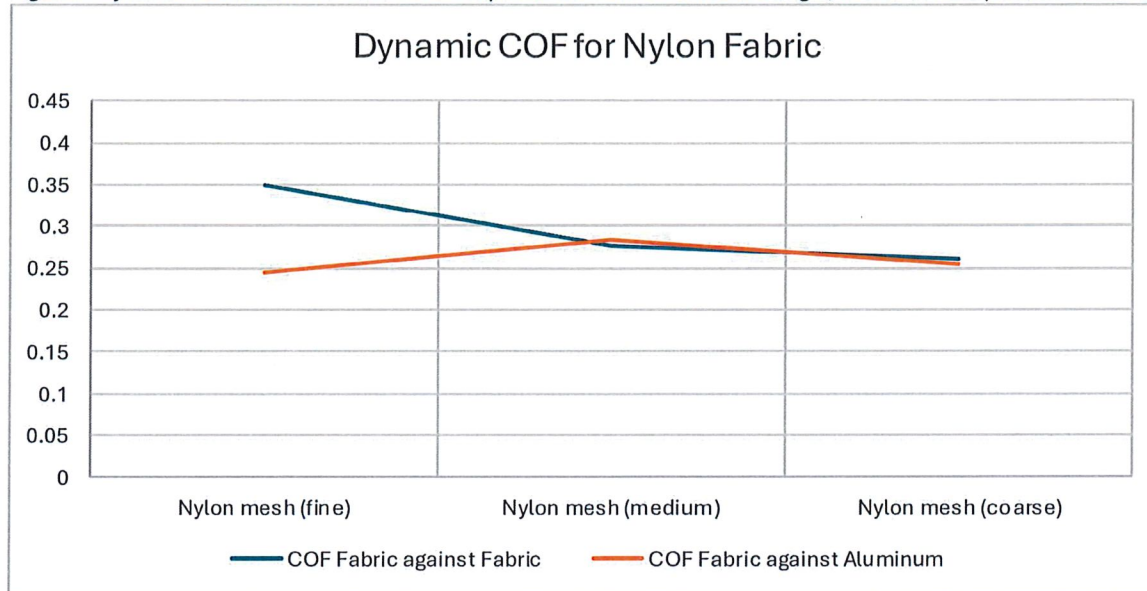
Figure 1: Dynamic coefficient of friction values reproduced from Kothari and Gangal, Tables 1 and 2. The blue area shows the claim range of the '845 patent. Only one of the fabrics has a COF in the claimed range. The polyester fabric is analogous to Dacron sailcloth. Based on the weights of the fabrics described in Table 1 of Kothari, these four fabrics have equivalent sailcloth weights of 1.8-2.0 ounces². Typical sailcloth weights are 4 ounces or higher, comprising a tighter weave. Lower weight sailcloths



² See <https://www.kayospruce.com/facts-measurements#:~:text=1..3.785> for the standard conversion of sailcloth weight from g/m² to ounces. (Ex. 2020).

are normally impregnated with a finish to reduce the porosity.³ There is no notable trend that would guide a POSITA as to which fabric configuration would be most suitable.

Figure 2: Dynamic coefficient of friction values reproduced from Kothari and Gangal, Tables 1 and 2 (the mesh description



on the X-axis is based on Kothari's description, and not the actual properties of the mesh). The blue area shows the claim range of the '845 patent. None of the fabrics has a COF in the claimed range. Additionally, the results suggest that increasing the coarseness of the mesh gradually reduces the coefficient of friction, indicating that a tighter mesh weave like the sailcloth examples in Phillips would have an even higher COF.

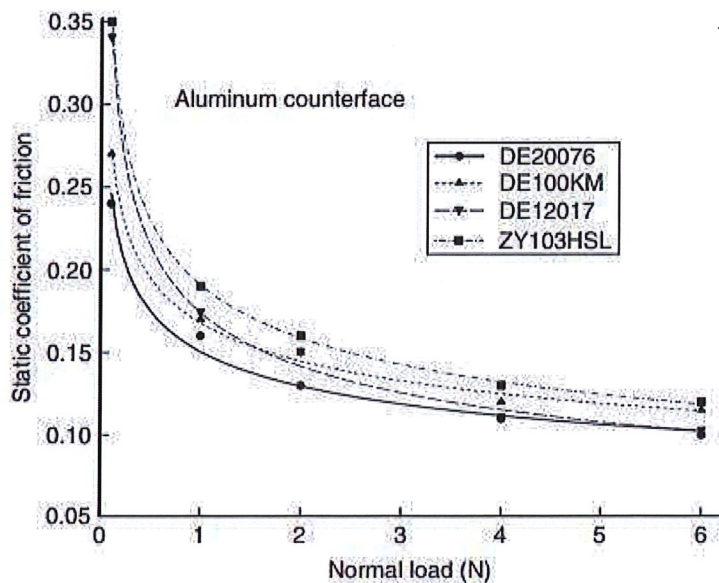


Figure 3: Reproduced from Benabdallah "Static friction coefficient of some plastics against steel and aluminum under different contact conditions," *Tribology International*, 40 (2007) 66-73, Figure 4. ZY103HSL is described as a Nylon 66 injection-molded plate with a surface roughness of $R_a=0.3 \mu\text{m}$. The aluminum counterface was 6061 aluminum with a

³ See for example https://www.sailrite.com/shop/fabric/marine-fabric/sailcloth?srltid=AfmBOooKtVgfuRAhaF_sksS6IKy9Yk0pbSvcRhMm6MpVoHhq5lnmvxyX. (Ex. 2019)

surface roughness of $R_a = 1.68 \text{ } \mu\text{m}$. The red region shows the dynamic COFs obtained for nylon mesh against polished aluminum from Kothari and Gangal.

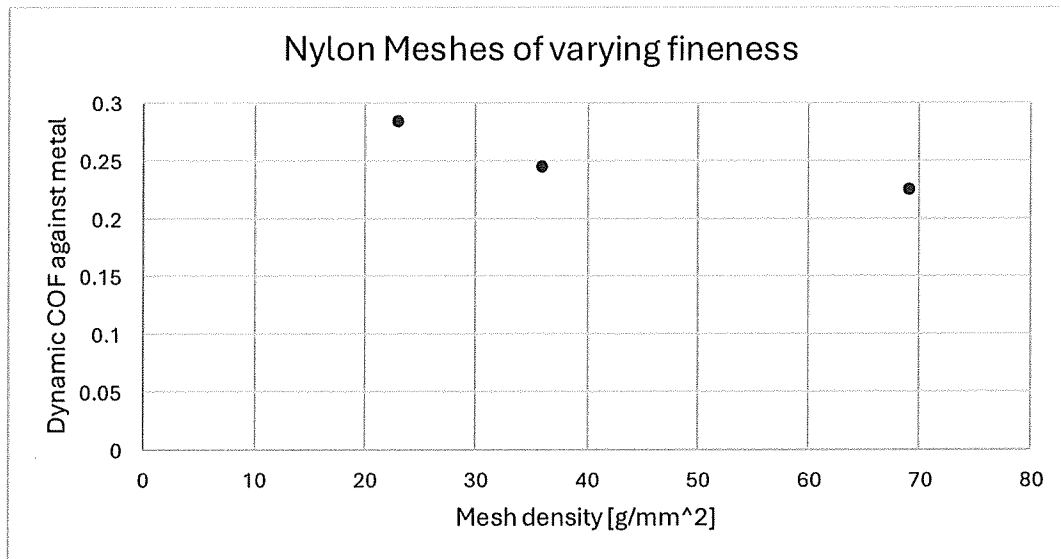


Figure 4: Dynamic coefficient of friction values reproduced from Kothari and Gangal, Tables 1 and 2. The trend shows that a lower mesh density has a higher COF

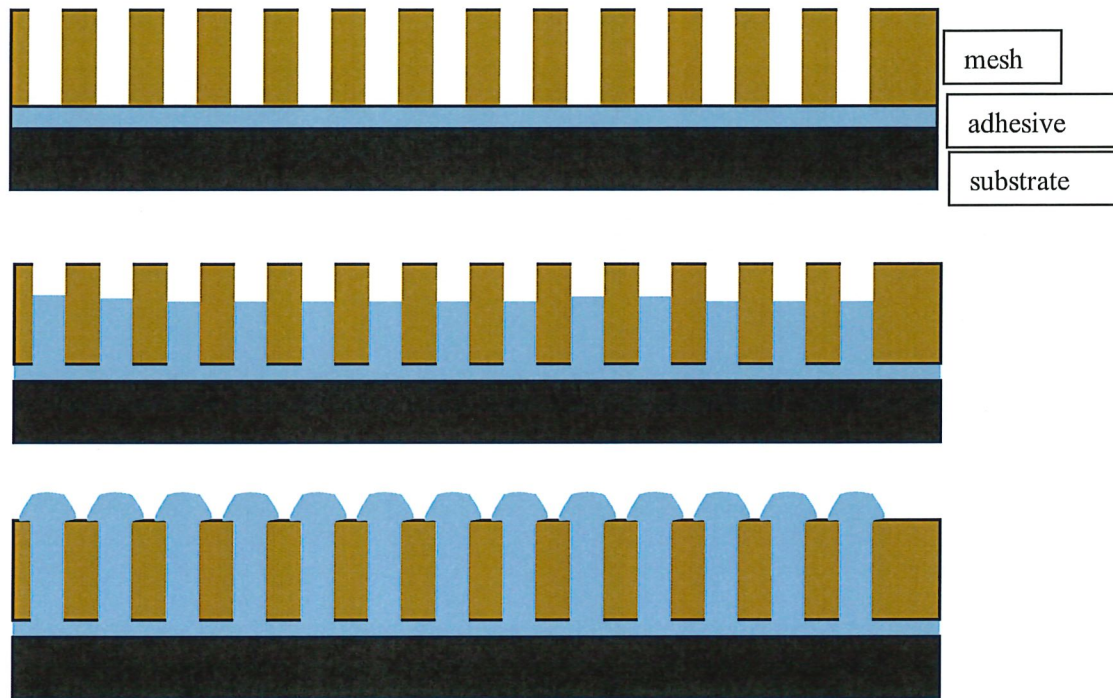
149. Wang is requiring that a POSITA interpret Philips examples as being meshes, despite examples given that are not called meshes and are more likely interpreted as solid sheets or films, while ignoring the teachings in Exhibit 1009's data that fabrics in general do not yield dynamic COFs in the ≤ 0.2 range. Dr. Wang's COF examples that meet the claim limitations lack sufficient experimental details about the form of the materials to draw any conclusions about the applicability of these results to mesh versions of the materials. However, the tables of COF results that Wang provides are consistent with solid sheets of polymers, not meshes, and under specific conditions as indicated in exhibit 1027.

Table 1—Construction details of the woven fabrics studied for frictional properties								
Fabric No.	Fabric description	Sett (threads/cm)		Linear density (tex)		Yarn crimp (%)		Fabric weight (g/m ²)
		Warp	Weft	Warp	Weft	Warp	Weft	
Group I								
1	Nylon web fabric	77	49	15.1	4.72	2.6	2.3	69
Group IV								
13	Fine mesh nylon monofilament bolting fabric	82	79	2.8	2.3	4.6	3.0	36
14	Medium mesh nylon monofilament bolting fabric	50	47	2.3	2.7	2.9	2.8	23
15	Coarse mesh nylon monofilament bolting fabric	21	20	15.1	17.0	2.6	2.3	69

Table 2—Frictional properties of textured and monofilament fabrics						
Fabric No.	Fabric-to-Fabric		Fabric-to-Leather		Fabric-to-Metal	
	$(F/N)_s$	$(F/N)_h$	$(F/N)_s$	$(F/N)_h$	$(F/N)_s$	$(F/N)_h$
1	0.817	0.548	0.887	0.750	0.281	0.272
2	0.868	0.592	0.892	0.773	0.299	0.276
3	0.695	0.486	0.798	0.684	0.262	0.259
4	0.813	0.525	0.826	0.692	0.277	0.268
5	0.813	0.566	0.927	0.747	0.277	0.270
6	1.152	0.823	0.968	0.781	0.309	0.296
7	0.722	0.492	0.743	0.659	0.246	0.242
8	0.816	0.543	0.776	0.663	0.261	0.259
9	0.342	0.293	0.569	0.545	0.208	0.204
10	0.473	0.385	0.694	0.625	0.226	0.216
11	0.274	0.247	0.563	0.543	0.194	0.193
12	0.361	0.332	0.663	0.623	0.222	0.216
13	0.375	0.349	0.642	0.575	0.250	0.244
14	0.358	0.276	0.618	0.564	0.298	0.283
15	0.292	0.260	0.406	0.397	0.229	0.225

150. Furthermore, when using an open pore system like that suggested in the '854 patent, adhesives based on curing epoxies (2 part) or cyanoacrylates will wick into the open pores, obscuring the air pockets and possibly coating the mesh. Use of a pressure sensitive adhesive will avoid this issue but must be done with care. Use of a sheet, film, or very tight woven structure will minimize concerns about wicking, which may be why the Phillips patent is unconcerned about the use of adhesives. A potential wicking action of adhesive through a mesh

applied to a substrate is shown below. The adhesive becomes the friction bearing surface, rather than the mesh.



151. Third, a POSITA would not have understood that selecting a “looser” mesh fabric (e.g., a more open weave) has the advantage of sliding with low friction over a surface because of the spacing of the threads. In fact, Phillips teaches the opposite.

152. As acknowledged by Dr. Wang, “The differences in frictional forces acting between fabrics woven from filament yarns are dependent on the morphology of the fabrics and the rubbing direction.” Ex. 1010, 1. Additionally, “[v]ariation of mesh size in monofilament fabrics affects the frictional resistance of these fabrics.” Ex. 1009, 1.

153. Fourth, a POSITA would not have understood that a monofilament mesh fabric may also provide an advantage in sliding over surfaces. As explained above, Kothari states that variation in mesh size in monofilament fabrics affects the frictional resistance of these fabrics. The results in Figure 6 show a non-monotonic trend in COF vs mesh coarseness of fabric-against-aluminum based on the mesh description, so a POSITA would not have guidance about what is the appropriate mesh coarseness to achieve a low COF. Dr. Wang states in paragraph 251 that Ex. 1009 shows that the finest meshes have higher coefficient of friction compared to coarser meshes, but as explained above, Ex. 1009 does not show this. A POSITA would therefore not have been motivated to use the WN0400 which is formed from monofilament threads to achieve these advantages of a smoother thread surface leading to a lower frictional coefficient between the fabric and surfaces that the fabric slides over.

154. Fifth, a POSITA would not have understood that there are a variety of available options for suitable nylon meshes that could be used as a bottom surface of a ride vehicle, and would have sought out a commercially available nylon mesh that had large openings between threads. While a POSITA would have known of meshes available from commercial suppliers, a POSITA would have recognized that WN0400 is not a low friction option for forming the bottom surface of Phillips ride vehicle based on Phillips' uniform and repeated

description of appropriate materials and characteristics, i.e., sheeting. Ex. 1004, 4:43-46, 5:12-16, 7:9-27, 7:53-55. A POSITA would have additionally been aware of general characteristics of monofilament-based fabrics and the relationship of aperture sizes to frictional effects and would have understood that WN0400 was not an appropriate choice in view of this knowledge.

155. Sixth, a POSITA would not have been prompted to combine Phillips and WN0400 because doing so was not the application of known techniques (WN0400's nylon mesh) to a known device (the Phillips recreational slide system) ready for improvement to yield predictable results. Ride vehicles like Phillips describes were known, but Phillips teaches that sheeting results in low friction, and a POSITA would understand sheeting to be the opposite of a mesh. Thus, it would not have obvious to a POSITA to apply a mesh bottom per WN0400, because Phillips instructs the precise opposite to achieve low friction. Ex. 1004, 5:32-35, 7:10-12.

156. While giant slides at amusement parks utilized fabric mats or burlap sacks as ride vehicles well before the Critical Date, those were not adhered to a ride vehicle. In addition, they would not have resulted in a low coefficient of friction (and Dr. Wang has not suggested otherwise). Accordingly, the use of a woven fabric mesh as a vehicle to support a rider down a slide would have been a new technique, and taught away by the prior art, including Phillips itself.

157. Seventh, a POSITA would not have known to make the combination, and Dr. Wang's suggestion otherwise is wrong and unsupported. That is because in order to adhere a woven fabric, monofilament, or mesh to the bottom of a ride vehicle, processing of the bottom of the ride vehicle would be required. To explain, while the sheeting disclosed in Phillips may adhere to the bottom of a ride vehicle, a woven fabric, monofilament, and mesh would have reduced material to affix to the bottom of the ride vehicle. In order to do so, the bottom of the ride vehicle would need to be etched or scored, or put through a like process, to ensure proper affixing. Chemical treatment such as etching would have to be evaluated in order to significantly alter the surface characteristics, which would negatively alter frictional properties. In addition, Phillips teaches that adhesive is relied upon to affix to the bottom of the ride vehicle.

158. Eighth, it is more difficult to soundly adhere mesh fabrics with 45% open spaces as in the '854 patent to another fabric such as the fabric lining in '854 than it is a sheeting material which has a much greater surface area for bonding due to the lack of the interstices or voids in the mesh structure. A company called Murakami (<https://murakamiscreen.com/>) (Ex. 2002) makes screens for screen printing. They also sell mesh adhesives for attaching those screens to the supporting frames. From the Murakami website: "MS-Bond 005, 100, and 300 are mesh adhesives designed for the bonding of screen mesh to

frame instantly. Three viscosity types are designed to help the glue penetrate through the mesh and make contact with the frame for strong adhesion.” Bonding the mesh to the frames requires that the adhesive penetrate through the mesh, thereby surrounding the filaments or yarns to ensure a strong bond. Surely, in the case of the modified Phillips ride vehicle, the WN0400 nylon mesh must be firmly attached to the ride vehicle so as not to separate during use.

159. Ninth, the mesh in the ‘854 patent is specifically chosen to have a low coefficient of friction (see 10:51-60) with the non-wet lubricated slide surface of the ‘854 patent which makes adhering it to any surface by an adhesive difficult. This further emphasizes the need for the adhesive to be applied to the mesh so as to penetrate the mesh and create a secure attachment. In such a manner, the coefficient of friction would no longer be between the mesh fabric and the non-wet lubricated slide surface, as claimed in the ‘854 patent, but rather between the adhesive covering the mesh fabric and the sliding surface of Phillips. This nullifies the entire concept of the ‘854 patent. Instead, the modified Phillips ride vehicle would have the resultant coefficient of friction between the adhesive covering the mesh fabric and the slide surface, which would be much greater. In that regard, the adhesive would destroy the low friction aspect of the sports board of Phillips.

160. In paragraphs 88-92 of his declaration, Dr. Wang again suggests that the '779 patent anticipates or renders obvious the ride vehicle of the '854 patent. He states that "... Phillips discloses multiple ride vehicles, including a membrane 19, sports board 42 (see Figs. 4-5), sliding boards or sheets of material." The '854 patent, however, does not disclose a membrane on the '854 ride vehicle but rather a mesh layer that, in one preferred embodiment, includes 44% voids or open spaces. (Ex. 1001, 10:25-30). A person skilled in the art, understanding the Philips disclosure, would not combine a mesh fabric or open weave fabric such as the WN0400 nylon mesh with the Philips ride vehicle. There are two issues with this hypothetical scenario.

161. It would be much more difficult to soundly adhere mesh, including with 45% open spaces, as in WH0400 than it is a sheeting material. That is because the sheeting material disclosed in Phillips has a much greater surface area for bonding due to the lack of the interstices or voids in the mesh structure. As noted above, Murakami (<https://murakamiscreen.com/>) (Ex. 2002) makes screens for screen printing. They also sell mesh adhesives for attaching those screens to the supporting frames. From the Murakami website: "MS-Bond 005, 100, and 300 are mesh adhesives designed for the bonding of screen mesh to frame instantly. Three viscosity types are designed to help the glue penetrate through the mesh and make contact with the frame for strong adhesion." Bonding

the mesh to the frames requires that the adhesive penetrate through the mesh, thereby surrounding the filaments or yarns to ensure a strong bond. This would adversely affect the desired “low friction” CoF sought by Phillips, as the adhesive would be engaged with the sliding surface rather than the WN0400 nylon mesh.

162. This further emphasizes the need for the adhesive to be applied to the mesh so as to penetrate the mesh and create a secure attachment. In such a manner, the coefficient of friction would no longer be between the mesh fabric and the non-wet lubricated slide surface of the ‘854 patent but rather between the adhesive covering the mesh fabric and non-wet lubricated slide surface of the ‘854 patent. This nullifies the entire concept of the ‘854 patent. Instead, the modified Phillips ride vehicle would have a resultant coefficient of friction between the adhesive covering the mesh fabric and the slide surface, which would be much greater than the claimed CoF range of the ‘854 patent. To that end, the adhesive would completely destroy the low friction aspect of the sports board of Phillips.

163. I note that Dr. Wang does not mention much less substantively address these issues. Thus, in my opinion, Dr. Wang’s analysis is wrong and unsupported.

164. Therefore, a POSITA would not have had a reasonable expectation of success in attempting the combination suggested by Dr. Wang. Additionally, I

note that a POSITA would not have had a reasonable expectation of success in making the proposed modifications for all of the reasons described above and also because WN0400's teachings of mesh characteristics would not have been implemented by using the WN0400 nylon mesh (or a similar mesh) as the ride vehicle bottom – a material uniformly and repeatedly opposed by Phillips as appropriate for such a system. And, as noted above, the combination would significantly alter and hinder the structure and function of the Phillips ride vehicle and slide system.

3. Element-by-Element Analysis

a) Claim 1

[1b-iii] and a mesh layer that forms a bottom surface configured to contact the slide surface;

165. As explained above, Phillips and WN0400 would not be combined to achieve this limitation. For example, Phillips describes that the bottom surface of the ride vehicle is sheeting or a membrane, the opposite of a mesh layer. In addition, as explained above, a POSITA would not have appreciated Phillips' suggestion of material of nylon to suggest that the WN0400 nylon mesh would be a suitable material that would also fulfil the requirements of low friction and being durable. In the Phillips-WN0400 combination, the low-friction bottom would not be formed from a nylon mesh, in accordance with the suggestions of Phillips.

[1c] wherein a coefficient of friction between the mesh layer of the ride vehicle and the non-wet lubricated slide surface is within a range of between about 0.03 to about 0.2.

166. As explained above, Phillips discloses adhesive for the manner of attachment, and Dr. Wang does not suggest any alternative. The need for the adhesive would need to be applied to the mesh so as to penetrate the mesh and create a secure attachment. In such a manner, the coefficient of friction would no longer be between the mesh fabric and the non-wet lubricated slide surface of the '854 patent but rather between the adhesive covering the mesh fabric and non-wet lubricated slide surface of the '854 patent. This nullifies the entire concept of the '854 patent as the coefficient of friction between the adhesive covering the mesh fabric and non-wet lubricated slide surface would be much greater. In that regard, the adhesive would destroy the low friction aspect of the sports board of Phillips.

b) Claims 2-4, 6-7, and 14-17

167. I understand that if an independent claim is not anticipated or rendered obvious, then dependent claims are also not anticipated or rendered obvious. As explained above, it is my opinion that Claim 1 of the '854 patent is not rendered obvious by the combination of Phillips and WN0400. For the same reasons, it is my opinion that Claims 2-4, 6-7, and 14-17 of the '854 patent are not rendered obvious.

c) Claims 22-26

168. As explained above, it is my opinion that the “mesh layer” required by Claim 1 of the ‘854 patent is not rendered obvious by the combination of Phillips and WN0400. This claim term is also required by Claims 22-26. For the same reasons, it is my opinion that Claims 22-26 are not rendered obvious.

d) Claims 27-28

169. As explained above, it is my opinion that the “mesh layer” and “wherein a coefficient of friction between the mesh layer of the ride vehicle and the non-wet lubricated slide surface is within the range of between about 0.03 to about .0.2” required by Claim 1 of the ‘854 patent is not rendered obvious by the combination of Phillips and WN0400. These claims terms are also required by Claims 27-28. For the same reasons, it is my opinion that Claims 27-28 are not rendered obvious.

D. GROUND 2A: PHILLIPS-FALLGATTER DOES NOT RENDER CLAIMS 1-7 OBVIOUS

1. Fallgatter Overview (UATP-1005)

170. Fallgatter describes “[a] portable dry recreational slide” with “a low-friction sliding surface upon which a rider may slide without application of water, oil, soap or any other temporary lubricant.” Ex. 1005, Abstract; *see also id.*, at [0005].

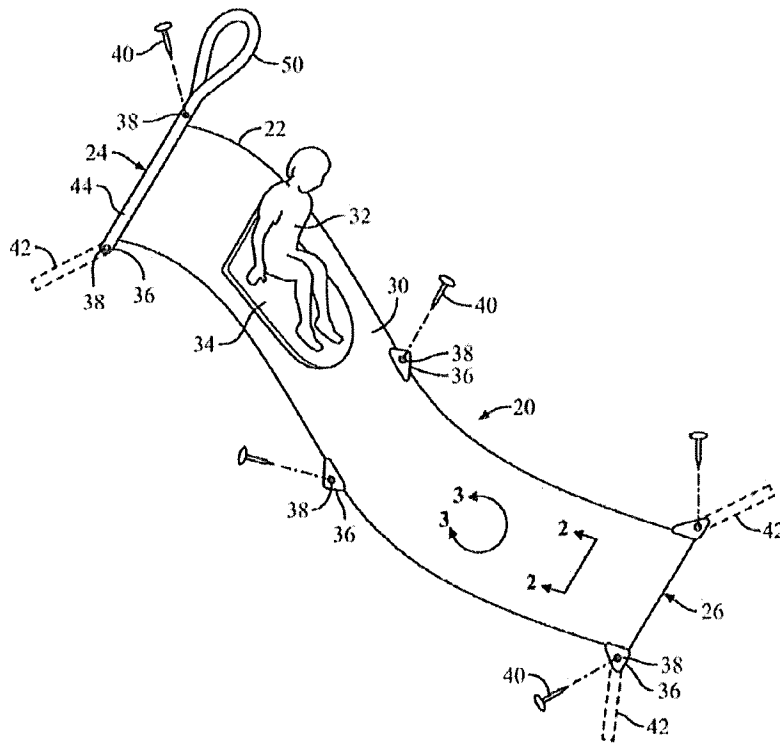


FIG. 1

Ex. 1005, Fig. 1

171. Fallgatter discloses a “portable dry recreational slide that can be stored and transported in a compacted configuration.” Ex. 1005, [0035]. “The slide body is made of a low-friction textile, most preferably a textile substrate such as a woven nylon, woven polyester or non-woven polyethylene with a low friction coating such as a silicone coating.” Ex. 1005, [0006]. The “friction-reducing coating...defines the sliding surface.” Ex. 1005, [0042].

172. Fallgatter further describes that “the dry slide includes one or more vehicles which participants can use to distribute weight and/or which include low-friction surfaces so as to enhance the sliding experience.” Ex. 1005, [0006]. The

“textile vehicle 60 can comprise a body 61 formed of a textile that is the same or similar to the slide body 22.” Ex. 1005, [0046]. Fallgatter describes that “a bottom surface 62 of the textile vehicle 60 comprises a low-friction coating 54. In that regard, “[w]hen a rider uses the textile vehicle 60, the low-friction bottom surface 62 of the textile vehicle 60 slides over the low-friction slide surface 30, providing enhanced sliding performance.” Ex. 1005, [0006]. Thus, according to Fallgatter, enhanced sliding performance is achieved in a system where the bottom surface of the textile vehicle and the slide surface include the low-friction coating.

173. Fallgatter further describes that “[p]referably, the low-friction coating 54 has a static coefficient of friction less than about 0.30, more preferably less than about 0.25, and even more preferably about 0.21 or less.” Ex. 1005, [0042]. Fallgatter also describes that “[t]he friction-reducing coating comprises a silicone compound and having a dry coefficient of friction less than a coefficient of friction of the textile substrate and less than about 0.25. Ex. 1005, [0016]. Thus, it logically follows that the textile substrate without the coating must have a coefficient of friction greater than 0.25.

2. The Phillips-Fallgatter Combination

a) The Combination

174. Based on my knowledge and experience in the field and my review of Phillips and Fallgatter, there are multiple reasons why a POSITA would not and

could not implement Phillips' "low friction" slide system with Fallgatter to achieve the "mesh layer" or "wherein a coefficient of friction between the mesh layer of the ride vehicle and the non-wet lubricated slide surface is within the range of between about 0.03 to about .0.2" required by Claims 1-7 of the '854 patent. As I explained above (Section VIII.B.), Phillips uniformly and repeatedly describes a sheeting material or membrane, which is the opposite of and teaches away from a mesh layer. Dr. Wang acknowledges that "Phillips does not expressly define a numeric value for coefficient of friction to achieve its 'low friction' objective." Petition at 60, ll. 6-7. In addition, as I explained above, Phillip's disclosure of "low friction" does not disclose the claimed coefficient of friction. In addition, as explained above, Phillips' description that the low friction surfaces of the slide surface and the bottom of the ride vehicle can include a low friction material such "Teflon" (i.e., PTFE), "nylon," "sailcloth," or "Dacron," for example, does not disclose a mesh layer.

175. Dr. Wang suggests that "Fallgatter provides a straightforward suggestion of numerical frictional coefficient between the slide and vehicle in a slide system" citing Ex. 1005, [0006] ("The coating defines the sliding surface upon which riders may slide, and preferably has a coefficient of friction of about 0.25 or less."), [0012] (the sliding surface has a dry coefficient of friction of less than about 0.25 [and in] further embodiments the sliding surface can have a dry

coefficient of friction of about 0.21 or less”), [0013] (“a flexible woven textile substrate... having a friction-reducing coating deposited on a bottom surface thereof so that the bottom surface has a dry coefficient of friction less than about 0.25”), [0016] (“a dry coefficient of friction less than ...about 0.25”); [0036] (“The coating defines the sliding surface upon which riders may slide, and preferably has a coefficient of friction of about 0.25 or less.”); [0042] (“A low-friction coating 54 preferably is applied to the substrate layer 52, and defines the sliding surface 30 [and] has a static coefficient of friction less than about 0.30, more preferably less than about 0.25, and even more preferably about 0.21 or less”).

176. I disagree. Fallgatter uses a textile that has a low friction coating (silicone) on top of the nylon, PET or PE woven textile to achieve a $\text{COF} < 0.25$. In paragraph 227, Dr. Wang opines that “there is nothing in Fallgatter requiring that the coefficient of friction between the coated surface and an uncoated textile bottom must be higher than 0.25.” Rather than requiring this situation, Fallgatter is acknowledging that a friction-reducing coating is required to be deposited on the textile in order to achieve a $\text{COF} < 0.25$, and that the textile on its own will not achieve the $\text{COF} < 0.25$. Therefore, the uncoated textile in Fallgatter’s examples must have a $\text{COF} > 0.25$, otherwise the friction-reducing coating would be unnecessary (see text below from Fallgatter). Fallgatter hence teaches that the

material on its own will not achieve the necessary COF, and that friction-reducing coating needs to be applied. The '854 patent does not require the application of a friction-reducing coating to the mesh in order to achieve its $\text{COF} < 0.2$.

177. In addition, Dr. Wang suggests that Fallgatter describes use of a “woven textile” such as “nylon, polyester and polyethylene” thereby providing a mesh layer. Ex. 1005, [0006] (“Vehicles can also be made of the same or similar material”), [0009]. Dr. Wang is not correct. Even if a POSITA would have been prompted to utilize a woven material, such as a woven material made from “nylon,” this does not suggest that a POSITA would assume that the nylon is to be a mesh, as explained above.

178. Therefore, it would not have been obvious to a POSITA to select materials from the list provided by Phillips that would achieve a coefficient of friction between the slide and the ride vehicle within the range claimed in the '854 patent. Fallgatter teaches that the material on its own will not achieve the necessary COF, in particular because without coating, the claimed coefficient of friction would not be met. In addition, a POSITA would not be motivated by Phillips or Fallgatter to use the claimed mesh layer.

3. Element-by-Element Analysis

a) Claim 1

[1b-iii] and a mesh layer that forms a bottom surface configured to contact the slide surface;

179. As explained above, Phillips does not disclose a mesh layer. To the contrary, Phillips uniformly and repeatedly discloses sheeting or membrane, which is not a mesh layer and is not characterized by open spaces between yarns. In this regard, a POSITA would be motivated away from a mesh layer. In addition, a POSITA would not be motivated to modify Phillips to incorporate a mesh layer.

180. Dr. Wang suggests that the required mesh layer is disclosed by Fallgatter. Specifically, he suggests that “Even if Phillips did not expressly describe a “mesh layer”...this conventional feature would have been obvious based on Fallgatter’s suggestions...Fallgatter describes use of a ‘woven textile’ such as “nylon, polyester and polyethylene” thereby providing a mesh layer. Ex. 1005, [0006] (“Vehicles can also be made of the same or similar material”), [0009].

181. Dr. Wang is not correct. Even if a POSITA would have been prompted to utilize a woven material, such as a woven material made from “nylon,” this does not suggest that a POSITA would assume that the nylon is to be a mesh, as explained above.

182. Indeed, Fallgatter also demonstrates that when an inventor is trying to specify a mesh or fabric, they call it as such, rather than requiring a POSITA to interpret what is meant by a ‘sheet’:

“In accordance with another embodiment, the present specification disclose a portable dry recreational slide apparatus, comprising a slide body that is changeable from a compacted configuration to a deployed configuration. The slide body is configured so that when it is in the deployed configuration it has a longitudinal axis and is elongated along the longitudinal axis from a start end to a finish end. The slide body has a thickness less than about 0.2 mm and a density of about 150 g/m² or less. The slide body further comprises a flexible textile substrate comprising a woven or non-woven fabric chosen from the group consisting of nylon, polyester and polyethylene, and a friction-reducing coating deposited on the textile substrate. The friction-reducing coating comprises a silicone compound and having a dry coefficient of friction less than a coefficient of friction of the textile substrate and less than about 0.25.” (Ex. 1005, [16].

183. Thus, a POSITA would understand that Fallgatter is not disclosing a mesh layer.

184. To the extent Fallgatter discloses a mesh layer (it does not), then a POSITA would not be motivated to use it in combination with Phillips, for the same reasons explained above with respect to the purported Phillips-WN0400 combination.

[1c] wherein a coefficient of friction between the mesh layer of the ride vehicle and the non-wet lubricated slide surface is within a range of between about 0.03 to about 0.2.

185. Fallgatter uses a textile that has a low friction coating (silicone) on top of the nylon, PET or PE woven textile to achieve a COF < 0.25. In paragraph 227, Dr. Wang opines that “there is nothing in Fallgatter requiring that the coefficient of friction between the coated surface and an uncoated textile bottom must be higher than 0.25.” Rather than requiring this situation, Fallgatter is acknowledging that a friction-reducing coating is required to be deposited on the

textile in order to achieve a COF < 0.25 , and that the textile on its own will not achieve the COF < 0.25 . Therefore, the uncoated textile in Fallgatter's examples must have a COF > 0.25 , otherwise the friction-reducing coating would be unnecessary (see text below from Fallgatter). Fallgatter hence teaches that the material on its own will not achieve the necessary COF, and that friction-reducing coating needs to be applied.

186. During prosecution of the '854 patent, Fallgatter was cited in a rejection of this claim element. Ex. 1002, 71-72. The applicant argued that Fallgatter "arbitrarily discloses a CoF of the low friction coating of the slide rather than *between* two surfaces," fails to specify the particular surfaces interacting including identifying a particular ride vehicle embodiment, and describes a frictional coefficient that would be higher than the disclosed 0.21 when a ride vehicle with a textile bottom is used on the slide surface. *Id.*, 117-118 (emphasis in original).

187. I disagree that a POSITA would have understood that the notion of a coefficient of friction of a slide coating by itself is nonsensical. To the contrary, a POSITA would have further understood that Fallgatter describes a frictional coefficient resulting from the required coating, which would according to Fallgatter be located between the two interacting surfaces.

188. In addition, the applicant correctly asserted that “a CoF between the mesh layer and the low-friction slide surface... must be greater than 0.25” (UATP-1002, 118). Fallgatter’s description that the slide’s friction reducing coating has “a dry coefficient of friction less than a coefficient of friction of the textile substrate and less than about 0.25” (UATP-1005, [0016]), outside the claimed range. The relevant portion of the paragraph reads, in full:

The slide body further comprises a flexible textile substrate comprising a woven or non-woven fabric chosen from the group consisting of nylon, polyester and polyethylene, and a friction-reducing coating deposited on the textile substrate. The friction reducing coating comprises a silicone compound and having a dry coefficient of friction less than a coefficient of friction of the textile substrate and less than about 0.25.

Ex. 1005, [0016].

b) Claims 2-7

189. I understand that if an independent claim is not anticipated or rendered obvious, then dependent claims are also not anticipated or rendered obvious. As explained above, it is my opinion that Claim 1 of the ‘854 patent is not anticipated or rendered obvious by Phillips in combination with Fallgatter. For the same reasons, it is my opinion that Claims 2-7 of the ‘854 patent are not anticipated or rendered obvious.

E. GROUND 2B: PHILLIPS-FALLGATTER-WN0400 DOES NOT RENDER CLAIMS 1-7, 14-17, AND 22-28 OBVIOUS

1. Phillips-Fallgatter-WN0400 Combination

a) The Combination

190. For the reasons described above, a POSITA would not be motivated to combine Phillips and WN0400 (Section VIII.C.), and a POSITA would not be motivated to combine Phillips and Fallgatter (Section VIII.D.). In addition, for the reasons described above, a POSITA would not combine a mesh layer (as suggested by Dr. Wang in connection with WN0400 and Fallgatter) with Phillips. (Section VIII.B.). The purported combination of Phillips-Fallgatter-WN0400 is contrary to both of these, and therefore a POSITA would not be motivated to make such a combination.

2. Element-by-Element Analysis

a) Claim 1

[1b-iii] and a mesh layer that forms a bottom surface configured to contact the slide surface;

191. As explained above, Phillips does not disclose a mesh layer forming a bottom surface of the ride vehicle for contacting the slide, regardless of the materials disclosed (e.g., “nylon, Teflon, sailcloth, Dacron, [and] vinyl”). For example, because Phillips discloses that sports boards include a low friction sheeting material and membrane, a POSITA reading Phillips would not have understood that Phillips’ “sheeting material” formed of sailcloth, nylon or Dacron would have been a mesh layer. In addition, as explained above, a POSITA would

not have been motivated to implement the bottom of the ride vehicle with a mesh layer. Once again, this suggestion ignores Phillips' repeated and uniform disclosure of forming the bottom surface of the ride vehicle as sheeting material and a membrane. Membranes, and sheeting, have surfaces which are substantially without interstices or open spaces in the structure and are not a mesh layer claimed in Claim 1 of the '854 patent.

192. As also explained above, the required mesh layer is not disclosed by Fallgatter. (Section VIII.D.). Even if a POSITA would have been prompted to utilize a woven material, such as a woven material made from "nylon," this does not suggest that a POSITA would assume that the nylon is to be a mesh, as explained above. Indeed, Fallgatter also demonstrates that when an inventor is trying to specify a mesh or fabric, they call it as such, rather than requiring a POSITA to interpret what is meant by a 'sheet'. (Ex. 1005, [16]). Thus, a POSITA would understand that Fallgatter is not disclosing a mesh layer. To the extent Fallgatter discloses a mesh layer (it does not), then a POSITA would not be motivated to use it in combination with Phillips, for the same reasons explained above with respect to the purported Phillips-WN0400 combination.

193. Also as explained above, a POSITA would not combine WN0400 with Phillips, and therefore would not combine WN0400 with Phillips and Fallgatter. For example, the "low friction" disclosed by Phillips is limited to

membranes and sheeting, which have surfaces which are substantially without interstices or open spaces in the structure and are not a mesh layer claimed in Claim 1 of the '854 patent. Phillips, therefore, teaches that a material incorporating no interstices or open spaces is what results in low friction.

194. A mesh, as explained above, includes a fabric characterized by open spaces. (Ex. 2004, Ex. 2006). Such open spaces inform a POSITA that the coefficient of friction and friction would be increased, as compared to the sheeting, substrate, durable coating, and suitable contact area relied upon by Dr. Wang. Open spaces attendant to “mesh” would inform a POSITA that the coefficient of friction and friction would increase.

195. Therefore, a POSITA would not have recognized that both Phillips and Fallgatter encourage the use of a nylon material, such as the woven nylon mesh of WN0400. Ex. 1004, 4:43-46; Ex. 105, [0016], [0036]; Ex. 1006, 1; Ex. 1011, 5.

[1c] wherein a coefficient of friction between the mesh layer of the ride vehicle and the non-wet lubricated slide surface is within a range of between about 0.03 to about 0.2.

196. See element [1c] (Ground 2A). *Supra* §VIII.D.

b) Claims 2-7 and 14-17

197. See claims [2-7] (Ground 2A). *Supra* §§VIII.D.

c) Claims 22-26

198. See claims [22-27] (Ground 1A). *Supra* §§VIII.B.

d) Claims 27-28

199. See claims [27-28] (Ground 1B). *Supra* §§VIII.C.

**F. GROUND 3A: CLAIMS 8-13 ARE ENABLED
UNDER 35 U.S.C. § 112**

200. In my opinion, Claims 8-13 are enabled by the specification of the '854 patent, because the '854 patent provides ample details that would explain to the POSITA how to achieve the full claimed range of frictional coefficients (“a range of between about 0.03 to about 0.2” see claim 1) while also using the dry lubricant composition recited in claim 8 and further specified in claims 9-13.

201. As described above, my understanding of the requirements of enablement in a post-grant proceeding is that the patent specification must provide sufficient details to a POSITA to allow the POSITA to make and use the claimed invention. *Supra* §V.D. Here, as I explained above, claim 1 recites frictional coefficients that are understandable and reasonable to a POSITA. By way of example, the low end of the claimed range, about 0.03, is well known and understandable to a POSITA. Such a claimed range can and is achievable by a POSITA, including with respect to air pockets formed between the interacting materials.

202. These frictional coefficient values on the lowest end of the claimed range – between 0.03 to 0.06, for example – are enabled by the specification in the context of a dry lubricant coating on the slide, the dry lubricant “includ[ing] a resin, a lubricant, a thermal conductor, and a hardener” as claim 8 requires. As conceded by Dr. Wang, the very lowest of these values are reported for interactions involving ice and snow. Ex. 1027, 7; Ex. 1026, 3 (interactions between ice and brass); 5 (interactions between ice samples), 7 (interactions between snow and PTFE).

203. These low frictional coefficient values (between 0.03 and 0.06) are what are typically observed only in testing coefficients of friction between pure materials, and a POSITA would expect to achieve such results using a composition that includes a resin, a thermal conductor and a hardener in addition to the lubricant material. This is because the addition is a lubricant coating, thereby lowering the coefficient of friction.

204. A POSITA would know that the dry lubricant material compositions disclosed in the ‘854 patent result in such a low coefficient of friction, and a POSITA would know to use the dry lubricant material (including materials other than lubricant materials) to achieve these low frictional coefficient of friction values.

205. The '854 patent describes that “the dry lubricant material is an anti-friction or friction reducing material in the form of a dry lubricant coating 34 on the surface 18 of the slide 12.” Ex. 1001, 7:10-13. The '854 patent describes commercial epoxies containing silicone or PTFE for coating the slide. *Id.*, 7:2135. However, these commercial epoxies suggested by the '854 patent for use in the slide coating would provide the lowest claimed range of frictional coefficients – they contain additional components that temper the low friction properties of included lubricants. Notably, the '854 patent states “[t]he lubricity of the dry coating 34 and the resulting coefficient of friction between the slide surface 18 and the ride vehicle 14 is primarily influenced by the lubricant present in the dry lubricant material,” such that a POSITA would have understood that the frictional coefficient is not in any significant way influenced by other materials present in the coating.

206. In fact, the '854 patent's direction to add more lubricant material to the commercial epoxy solves the purported issue raised by Dr. Wang. The '854 patent describes that “the lubricant is mixed into the resin described above to increase the amount of lubricant in the coating material.” *Id.*, 7:46-48. Given this direction from the '854 patent, it would be a simple and routine matter for a POSITA to determine how much additional lubricant should be added to obtain a

mixture that would have a coefficient of friction with a mesh ride vehicle between 0.03-0.06.

207. Similarly, the '854 patent's suggestion that the inclusion of a thermal conductor (e.g., copper) in the dry lubricant coating may "improve[] heat absorption and heat transfer away from the sliding surface 18 or the slide" resulting in an "improved (i.e., reduced) and consistent coefficient of friction between the sliding surface 18 and the ride vehicle 14" provides even more instruction to a POSITA and enables the claimed low range of frictional coefficients in the context of the dry lubricant coating composition. *Id.*, 7:65-8:2.

208. A POSITA would not only have been enabled to practice the invention within the low end of the claimed range but would understand that it was indeed possible to practice the invention of claims 8-13 which require the dry lubricant to include additional and high-friction materials such as epoxy. *See Ex. 1028*, 1.

209. For these reasons the '854 patent provides a detailed roadmap and information to a POSITA of how to achieve the full scope of the range including the low 0.03-0.06 coefficient of friction in a system in which the slide is coated in a dry lubricant coating that "includes a resin, a lubricant, a thermal conductor, and a hardener," as claim 8 requires. The '854 patent offers specific suggestions to increase the amount of lubricant in a commercial epoxy system or to add copper before describing that the composition should be prepared as is

conventional for epoxy mixtures. *See e.g.*, Ex. 1001, 7:21-345 (advocating for use of commercial epoxy-based lubricants), 8:22-24 (listing commercial hardening agents for use), 9:8-41 (describing that the components are mixed “using any conventional mixing apparatus.”). These instructions fully enable details that would allow a POSITA to prepare a “dry lubricant material includ[ing] a resin, a lubricant, a thermal conductor, and a hardener” that achieves a coefficient of friction between the coating and a ride vehicle in “a range of between about 0.03 to about 0.2” as claim 8 requires. Accordingly, the ’854 patent provides details that would have allowed a POSITA to achieve the full claimed range of the lowest frictional coefficients with the claimed dry lubricant composition of claims 8-13.

210. Dr. Wang does not independently challenge enablement of claims 9-13. Thus, because a POSITA would have been enabled to practice the full scope of the claimed range in claim 8, and as claims 9-13 depend from claim 8, a POSITA would be enabled to practice the claimed scope of these claims as well.

G. GROUND 3B: CLAIMS 5 AND 26 ARE NOT INDEFINITE UNDER 35 U.S.C. § 112

211. The scope of the claim language of these two claims is not unclear, and accordingly the claims are patentable because they are not indefinite under 35 U.S.C. § 112.

i. Claim 5 is not indefinite

212. As described above, my understanding is that a claim is indefinite if it might have several meanings, and a POSITA would not be able to make a confident choice as to which meaning is appropriate. *Supra* §V.E.

213. Claim 5 recites “wherein the dry lubricant coating includes a thickness that is within a range of between about 1 micron to about 5 micron.” A POSITA would easily understand the scope of this claim, and there is only one reasonable meaning.

214. As a preliminary matter, Dr. Wang suggests that the claim could be understood to require that there are at least some regions of the dry lubricant coating that have the claimed thickness, because the coating “*includes* a thickness” within a particular range. Such an interpretation would require that there are at least some locations on the slide that have a thickness within the range (but would not include any guidance about how much of the slide requires the claimed thickness to be present).

215. Dr. Wang’s suggestion is not reasonable, and unsupported, and a POSITA would understand that this is not appropriate. Dr. Wang’s suggestion is not reasonable because it ignores the claim language itself, i.e., “the dry lubricant coating includes a thickness that is within a range of between about 1 micron to about 5 micron.” The claim language does not suggest in any manner that only

portions of the coating must have the claimed thickness. Dr. Wang's suggestion is not supported because he does not offer any explanation of whether a POSITA would hold this understanding, or explain why.

216. As conceded by Dr. Wang, the claim could be understood to require that the dry lubricant coating has a thickness in the claimed range across *the entirety* of the coating. This understanding interprets the word "includes" to mean something like "has" so that the coating has the claimed thickness range. A slide that has a coating that has a thickness within the claimed range across the whole slide surface would meet this understanding.

217. As a third possibility, Dr. Wang suggests the claim could further be understood to mean that the dry lubricant coating may have any thickness that is 1-5 microns or greater, given that a coating thicker than 1-5 microns would necessarily "include[] a thickness ... within the range of between about 1 micron to about 5 micron" as the claim recites, because the coating would include and surpass the required thickness. This understanding interprets the word "includes" to mean something like "contains within" so that any thickness greater than the claimed thickness contains the thinner range within it and meet this understanding of the claim language.

218. Dr. Wang's suggestion is not reasonable, and unsupported, and a POSITA would understand that this is not appropriate. Dr. Wang's suggestion is

not reasonable because it ignores the claim language itself, i.e., “the dry lubricant coating includes a thickness that is within a range of between about 1 micron to about 5 micron.” The claim language does not suggest in any manner that a coating of 1-5 microns or greater would fall within its scope, and this ignores the fact that the claim language requires that the thickness is “within” the range. Dr. Wang’s suggestion is not supported because he does not offer any explanation of whether a POSITA would hold this understanding, or explain why.

219. The ’854 patent need not provide additional details that make clear the intended meaning of “wherein the dry lubricant coating includes a thickness that is within a range of between about 1 micron to about 5 micron” as claim 5 recites, because a POSITA has that understanding. Still, the ’854 patent describes that “the dry lubricant coating 34 includes a thickness T which may be substantially constant over at least the sliding surface 38 of the base wall 14” and that “[t]he thickness T of the dry lubricant coating 34 may be within a range of between about 1 micron to about 5 micron...” UATP-1001, 6:22-26, 6:46-47. This description does not simply mirror the claim language, and does provide guidance as to the singular reasonable interpretation of the claim.

220. Accordingly, the scope of claim 5 is clear and the claim is patentable because it is not indefinite.

i. Claim 26 is not indefinite

221. Claim 26 recites “The ride vehicle of claim 22, wherein the central core is surrounded by a fabric liner that is positioned between the central core and the fabric layer and the woven mesh layer.” This may be the first mention of “the fabric layer” in the claims, but it is disclosed in the specification, along with figures directing a POSITA to this element, and so it is clear from the claims where the fabric liner is in relation to the other components of the ride vehicle. The '854 specification does provide details or guidance that would allow the POSITA to confidently discern the meaning of the claim language, and claim 26 is not indefinite as a result.

222. The '854 patent describes, with reference to figures 3 and 4, that “the body 48 of the ride vehicle 14 is defined by a flexible central core 60 that is sandwiched between an outer fabric layer 62 and a mesh layer 64 formed of the mesh material.” Ex. 1001, 9:63-66.

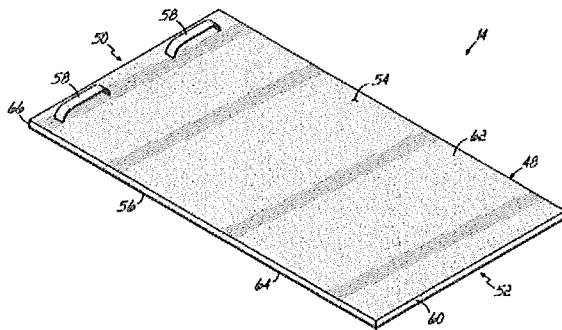


FIG. 3

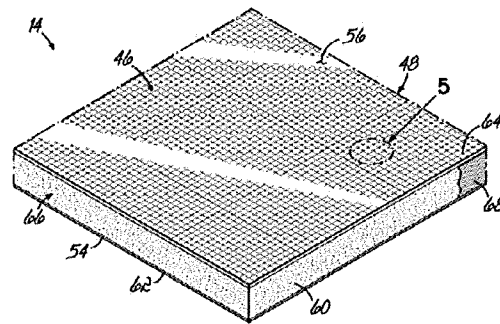


FIG. 4

Ex. 1001, Figs. 3 (left) and 4 (right)

223. The '854 patent further describes that the “fabric layer 62 forms the top surface 54 of the ride vehicle 14, and the mesh layer 64 forms the bottom surface.” *Id.*, 9:6610:1. “The fabric layer 62 and the mesh layer 64 may be coupled together at a seam that extends around a sidewall 66 of the ride vehicle 14.” *Id.*, 10:4-6. The '854 patent describes that the central core of the ride vehicle “may be enclosed or surrounded with a fabric liner 68 ... positioned between the central core 60 and the fabric layer 62 and the mesh layer 64.” *Id.*, 10:9-16. It is clear from the language of claim 26 (“wherein the central core is surrounded by a fabric liner that is positioned between the central core and the fabric layer and the woven mesh layer”) how to interpret the positioning of the fabric liner with regard to the other components of the ride vehicle.

224. Dr. Wang incorrectly offers several alternatives that this term could be understood to mean. He is incorrect. The claim term is clear, in that the central core is surrounded by a fabric liner, and the fabric liner is positioned between the central core and the fabric liner and the woven mesh layer. In other words, the claim language clearly describes that the fabric liner is positioned between the central core, and the fabric liner, and the woven mesh layer.

225. The alternative potential meanings offered by Dr. Wang simply ignores the claim language itself. And, Dr. Wang does not offer any reason why

a POSITA would understand this claim term with the alternative potential meanings that Dr. Wang offers.

226. Dr. Wang's alternative potential meanings also ignore the claim language itself. For example, Dr. Wang suggests "A first potential meaning of the claim is that the claimed fabric liner (1) is positioned between the central core and the fabric layer and (2) is additionally and separately positioned between the central core and the woven mesh layer." This ignores key language of the claim, including that "the central core is surrounded by a fabric layer" and also ignores that the "fabric liner is positioned between the central core and the fabric liner and the woven mesh layer." Dr. Wang also ignores the disclosures of Figures 3 and 4, and the description in the '854 patent of them. A POSITA would not have understood this to be a possible understanding of the claim language based on the specification.

227. Alternatively, Dr. Wang suggests the language of claim 26 ("wherein the central core is surrounded by a fabric liner that is positioned between the central core and the fabric layer and the woven mesh layer") could be understood to mean that the fabric liner must be positioned between the fabric layer and the woven mesh layer. The clear language of the claim requires that the fabric liner is positioned between the central core and the fabric layer and the woven mesh layer,

but once again Dr. Wang ignores the claim language, including that the “fabric liner is positioned between the central core.”

228. Yet another example of the possible meaning of the language of claim 26 (“wherein the central core is surrounded by a fabric liner that is positioned between the central core and the fabric layer and the woven mesh layer”) suggested by Dr. Wang is that the fabric liner is formed as a belt that surrounds a perimeter outer edge of the core and spans between the fabric layer and the woven mesh layer at the edges of the ride vehicle. This ignores key language of the claim, which does not discuss a “belt that surrounds a perimeter outer edge of the core” and does not discuss a span between the fabric layer and the woven mesh layer at the edges of the ride vehicle. In addition, examples of potential arrangements that fall within, or outside, the claim scope does not suggest that the claim is indefinite or not easily understood to have a single meaning by a POSITA.

229. Accordingly, a POSITA would have understood that claim 26 is clear because there is only one possible meaning of the claim language and the ’854 patent specification does provide clarity that would have allowed the POSITA to confidently choose the appropriate meaning of the claim. Thus, the scope of claim 26 is clear and the claim is patentable because it is not indefinite.

IX. CONCLUSION

230. I currently hold the opinions set expressed in this declaration. But my analysis may continue, and I may acquire additional information and/or attain supplemental insights that may result in added observations.

TABLE OF CLAIMS

Claim 1	
[1pre]	A recreational slide system, comprising:
[1a-i]	a slide
[1a-ii]	including a slide body with a non-wet lubricated slide surface that extends between a top entrance of the slide and a bottom exit of the slide; and
[1b-i]	a ride vehicle configured to support a rider down the slide,
[1b-ii]	the ride vehicle including a top surface configured to contact the rider
[1b-iii]	and a mesh layer that forms a bottom surface configured to contact the slide surface;
[1c]	wherein a coefficient of friction between the mesh layer of the ride vehicle and the non-wet lubricated slide surface is within a range of between about 0.03 to about 0.2.
Claim 2	
[2]	The recreational slide system of claim 1, wherein the coefficient of friction is kinetic coefficient of friction.
Claim 3	
[3]	The recreational slide system of claim 1, wherein the slide surface includes a dry lubricant material.
Claim 4	
[4]	The recreational slide system of claim 3, wherein the dry lubricant material comprises a dry lubricant coating over the slide surface.
Claim 5	

[5]	The recreational slide system of claim 4, wherein the dry lubricant coating includes a thickness that is within a range of between about 1 micron to about 5 micron.
Claim 6	
[6]	The recreational slide system of claim 4, wherein the slide body includes a base wall and a pair of sidewalls and the dry lubricant coating covers a sliding surface of the base wall.
Claim 7	
[7]	The recreational slide system of claim 6, wherein the dry lubricant coating covers at least a portion of the pair of sidewalls.
Claim 8	
[8]	The recreational slide system of claim 3, wherein the dry lubricant material includes a resin, a lubricant, a thermal conductor, and a hardener.
Claim 9	
[9]	<p>The recreational slide system of claim 8, wherein the dry lubricant material applied to the slide surface comprises:</p> <p>20% to 30% by weight of the resin; 30% to 50% by weight of the lubricant; 1% to 5% by weight of the thermal conductor; and 20% to 30% by weight of the hardener.</p>
Claim 10	
[0]	The recreational slide system of claim 9, wherein the resin comprises a silicon-based epoxy resin.
Claim 11	
[1]	The recreational slide system of claim 9, wherein the lubricant comprises polytetrafluoroethylene.
Claim 12	

[12]	The recreational slide system of claim 9, wherein the thermal conductor comprises copper.
Claim 13	
[13]	The recreational slide system of claim 9, wherein the hardener comprises an anhydride-based or an amine-based catalyst.
Claim 14	
[14]	The recreational slide system of claim 1, wherein the mesh layer of the ride vehicle comprises a weave of threads formed of monofilament synthetic fibers.
Claim 15	
[15]	The recreational slide system of claim 14, wherein the monofilament synthetic fibers comprise a polyamide monofilament structure.
Claim 16	
[16]	The recreational slide system of claim 14, wherein the weave of threads comprises a plurality of weft threads each having a thread diameter within a range of between 0.1 mm to 0.6 mm and a plurality of warp threads each having a thread diameter within a range of between about 0.1 mm to about 0.6 mm.
Claim 17	
[17]	The recreational slide system of claim 14, wherein the mesh layer includes a plurality of interstitial openings that define an open area of the mesh layer, wherein the open area of the mesh layer is within a range of between about 35% to about 50%.
Claim 22	
[22pre]	A ride vehicle configured to support a rider down a non-wet lubricated recreational slide, the ride vehicle comprising:
[22a-i]	an elongate body that extends between a first end and an opposite second end,

[22a-ii]	the body including a central core positioned between
[22a-iii]	a top surface of the ride vehicle
[22a-iv]	and a woven mesh layer that forms a bottom surface of the ride vehicle that is configured to contact the non-wet lubricated recreational slide;
[22b]	wherein the mesh layer includes a plurality of interstitial openings that define an open area of the mesh layer, wherein the open area of the mesh layer is within a range of between about 35% to about 50%.
Claim 23	
[23]	The ride vehicle of claim 22, wherein the woven mesh layer comprises a weave of threads formed of monofilament synthetic fibers.
Claim 24	
[24]	The ride vehicle of claim 22, wherein the monofilament synthetic fibers comprise a polyamide monofilament structure.
Claim 25	
[25pre]	A ride vehicle configured to support a rider down a non-wet lubricated recreational slide, the ride vehicle comprising:
[25a-i]	an elongate body that extends between a first end and an opposite second end,
[25a-ii]	the body including a central core positioned between
[25a-iii]	a top surface of the ride vehicle
[22a-iv]	and a woven mesh layer that forms a bottom surface of the ride vehicle that is configured to contact the non-wet lubricated recreational slide;
[25b]	wherein the mesh layer includes a plurality of weft threads each having a thread diameter within a range of between 0.1 mm to 0.6

	mm and a plurality of warp threads each having a thread diameter within a range of between about 0.1 mm to about 0.6 mm.
Claim 26	
[26]	The ride vehicle of claim 22, wherein the central core is surrounded by a fabric liner that is positioned between the central core and the fabric layer and the woven mesh layer.
Claim 27	
[27pre]	A recreational slide system, comprising:
[27a]	the ride vehicle of claim 22; and
[27b]	a slide including a slide body with a non-wet lubricated slide surface that extends between a top entrance of the slide and a bottom exit of the slide;
[27c]	wherein a coefficient of friction between the mesh layer of the ride vehicle and the non-wet lubricated slide surface is within a range of between about 0.03 to about 0.2.
Claim 28	
[28]	The recreational slide system of claim 27, wherein the coefficient of friction is kinetic coefficient of friction.

DATE: 1/9/2025

NAME: Dr. Jon Rust

SIGNATURE: Jon F. Rust

JON PAUL RUST

APPENDIX-A

Curriculum Vitae

GENERAL INFORMATION

Professional Address Wilson College of Textiles
Box 8301
North Carolina State University
Raleigh, NC 27695-8301

EDUCATION

NC State University	PhD	Fiber and Polymer Science	1990
Clemson University	MS	Fiber Science	1985
Clemson University	BS	Mechanical Engineering	1982

EMPLOYMENT HISTORY

Wilson College of Textiles
North Carolina State University

7/2020-present	Professor Emeritus of Textile Engineering
7/2020	Phased retirement,
7/2020 – 7/2023	Professor – one half time
12/2018 – 5/2019	Associate Dean for Academic Programs
7/2017 – 11/2018	Interim Associate Dean for Academic Programs

Department of Textile Engineering, Chemistry and Science

2008 - 2014	Head of Department
2005 - 2020	Alumni Distinguished Undergraduate Professor
2000 - 2008	Associate Head, Director of Undergraduate Programs
1999 - 2023	Professor
1998 - 2000	Program Director: Textile Engineering
1994 - 1999	Associate Professor
1992 - 2004	Director: Milliken / NC State Summer Challenge
1990 - 1994	Assistant Professor
1985 - 1990	Instructor, Research Assistant and PhD Candidate

Zeis Textiles Extension Education for Economic Development

12/2014 – 5/2019 Interim Director

Division of Undergraduate Academic Programs
North Carolina State University

2008 - 2009 Interim Associate Dean for General Education Implementation

HONORS AND AWARDS

2015	Chancellors Creating Community Award for Outstanding Faculty, for a strong commitment to diversity
2014	Faculty-2-Faculty Mentor Award Citation
2012	Gertrude Cox Award: for <i>Innovative Excellence in Teaching and Learning with Technology</i>
2008	Division of Undergraduate Academic Programs Award: for <i>Outstanding Contributions to Undergraduate Education</i>
2006 - 2007	College of Textiles Board of Governors Award nominee
2005 - 2006	College of Textiles Board of Governors Award nominee
2005	Division of Undergraduate Academic Programs Award: Ephraim I. Schecter Award for <i>Excellence in Undergraduate Assessment</i>
2005	NC State Alumni Distinguished Undergraduate Professor
2001	Outstanding Teacher at NC State University
1997 - 1998	College of Textiles Board of Governors Award nominee
1992	Outstanding Teacher at NC State University
1992	Alumni Outstanding Teaching Award, NCSU Alumni Association
1992	Member of the Academy of Outstanding Teachers
1988	Tessilli Grant, Italian Trade Commission and ACIMIT

ADMINISTRATIVE ACCOMPLISHMENTS

Associate Dean for Academic Programs (12/2018 – 5/2019)

Interim Associate Dean for Academic Programs (7/2017 – 12/2018)

- Faced more than 50% turnover of the Academic Programs staff during 2017 – 2018
- Reorganized Academic Programs with fewer staff while improving student services
- Coordinated a move of all Academic Programs staff to a new suite: room 2418
- Renamed to: Center for Academic, Career and Student Services (ACSS) for Recruitment, Diversity, Advising, Scholarships, Careers
- Grew enrollment in Masters and PhD programs

Interim Director, Zeis Textiles Extension (12/2014 – 5/2019)

- Led the department through a period of growth resulting in significant increases in revenue generation each year
 - ZTE labs have recorded multiple all time highs in revenue generation during my time as Interim Director
 - ZTE professional education, textiles and Lean Six Sigma combined have generated increased net revenue over the previous year in back-to-back years
- Led laboratory and professional education space modernization
 - Air vortex spinner, 12 spindle lab spinner with Amsler STG 4000
 - Sample weaving, drawing-in and sample warping equipment
 - Narrow tenter, curing systems, donations from Ralph Lauren
 - Shima Seiki, corizon (loan), warp knitting (Allergan), Tirtex jacquard equipment
 - New paint, flooring in classrooms, break areas, second floor pod 4 hallway
 - New A/V equipment in classroom 2431

Department Head, Textile Engineering, Chemistry and Science (11/2008 – 12/2014)

- Led the department through a period of growth from 22 to 29 tenured / tenure-track faculty:
 - Undergraduate enrollment has doubled since 2009, > 50% female – a first in 2013, > 24% self-identify in UPA surveys as other than white – a first in 2013
 - Placement for undergraduate students has remained above 90%
 - Graduate (MS) enrollment has increased by 60% despite losing most TA funding, > 50% of graduate students are female – a first in 2013
 - Added a new degree previously in the TATM Department: Textile Technology
 - Added seven faculty previously in the TATM Department
 - Significant curriculum revisions were completed for Textile Technology and Polymer and Color Chemistry programs
 - Received outstanding ABET accreditation review of Textile Engineering Program
 - Research expenditures and new research funding have grown despite elimination of the National Textile Center
 - Added two Assistant Professors in nonwovens, one in nanocomposites, one in forensics, one Associate Professor in Protection and Comfort – one of five was female, one was from an underrepresented minority group
 - Added a new Research Professor in textile composites
 - Led the department through a successful graduate program review

- Directed a thorough renovation of department laboratory facilities (approx. 15,000 ft²) during a period of major budget reductions:
 - DataColor Color Science Laboratory (1021 ft²)
 - Forensic Analytical Laboratory (1345 ft²)
 - Textile Chemistry Undergraduate Teaching Laboratories (3551 ft²)
 - Tissue Engineering Laboratory (362 ft²)
 - Antimicrobial Test Facility and Medical Textiles Laboratory (980 ft²)
 - Forensic and Textile Microscopy Laboratory (1038 ft²)
 - Textile Engineering Analog and Digital Circuits Laboratory (921 ft²)
 - Tri-component Melt-spinning and Wet-spinning Extrusion Laboratories (1755 ft²)
 - Nanocomposites Laboratory (1120 ft²)
 - Nano-extended Textile Group Laboratory (485 ft²)
 - Textile Engineering / Textile Technology Senior Design Laboratory (2000 ft²)

Interim Associate Dean for General Education Implementation (August 2008 – July 2009)

- Led CUE in:
 - Developing the rationale and objectives for each GEP category
 - Refining details of the US Diversity and Global Knowledge categories
 - Populating GEP category course lists
 - Creating a structure for review of new courses for addition to the GEP lists
 - Performing initial course reviews to improve the GEP course approval process
- Led UCCC in facilitating the curriculum revision process where:
 - Hundreds of curriculum actions were processed
 - Most curricula were successfully revised to include the new GEP requirements
- Interfaced with Registration and Records to design a new student degree audit structure

Associate Head: TECS (August 2000 – November 2008)

- Led all aspects of administration of the Textile Engineering and Textile Chemistry (later Polymer and Color Chemistry) undergraduate programs:
 - Course and curricular revisions
 - Program assessment
 - Undergraduate and graduate course scheduling
 - Undergraduate student advising
- Increased the diversity of the faculty as Chair (or member) of numerous faculty searches
- Served on numerous department, COE and COT committees
- Served the university as Chair of UCCC, CUE and CUPR (two years)

Director: Milliken / NC State Summer Challenge (May 1992 – August 2008)

- Begun in 1992 in collaboration with SUCCEED, an NSF funded education coalition
- More than \$1.8 MM in funding from Milliken and Company and the NSF
- University – Industry coalition providing summer project improvement experiences for graduate and undergraduate students from NC State University.
- In 2004, Milliken and Company decided to change the program and hire the students and the Director directly. The program continued through the summer of 2008.
- Over 17 years, hundreds of students from NC State University, the University of NC – Charlotte and North Carolina A&T State University participated.

RESEARCH FUNDING RECORD with Funding source

Development of a Portable Pneumatic Splicing System for Heavy Denier Continuous Filament Yarns, (w/ A. Seyam & T. Ghosh), All-American Hose, LLC, \$49,000, 7/2014 – 12/2014

Laboratory Pad Applications, (w/ J. Willoughby), Nike Inc., \$10,000 1/2014 – 6/2014.

Innovation Platform for Material Sustainability in Textile Structures, (w/ D. Hinks, S. Khan, and M. McCord), Nike Inc., \$1,201,327, 8/2013 – 7/2016.

Magnolia / NCSU Summer Challenge 2003: Process Improvement at Magnolia Finishing Location, Milliken and Company, \$144,195, 5/03 – 4/04.

Magnolia / NCSU Summer Challenge 2002: Color Control Center, Mercerization, Finishing and Wet Process Control, Milliken and Company, \$129,269, 5/02 – 4/03.

Magnolia / NCSU Summer Challenge 2001: Pre-dryer Control, A-Frame Standardization, and Wet Processing Control, Milliken and Company, \$133,876, 5/01 – 4/02.

Air-jet Re-engineering, (w/ Tim Clapp, Roy Johnson), Petree and Stoudt, \$10,000, 12/00 – 6/01.

Magnolia Energy Cost Reduction, Shade Variability Reduction, and Information Processing, Milliken and Company, \$134,510, 5/00-4/01.

Colorant Yield at Cypress Chemical Plant, Milliken and Company, Cypress Chemical Plant, \$16,450, 5/99 – 4/00.

Apex Change-over Time Reduction, Milliken and Company, Magnolia Finishing Location, \$124,812, 5/99 – 4/00.

Thermosol Change-over Time Reduction, Milliken and Company, Magnolia Finishing Location, \$130,500, 5/98 – 4/99.

Dye-range Change-over Time Reduction, Milliken and Company, Magnolia Finishing Location, \$119,011, 5/97 – 4/98.

Spun Yarn Development, (w/ Tim Clapp), UNIFI Inc., \$500,000, 1/95 - 1/97. 5 patents awarded

Thermosol Cost Reduction, Milliken and Company, Magnolia Finishing Location, \$138,608, 5/96 - 4/97.

Waste Reclamation, Milliken and Company, Magnolia Finishing Location, \$150,000, 5/95 - 4/96.

QIP for the Magnolia Finishing Location of Milliken and Company, Magnolia Finishing Location, \$150,000, 5/94 - 4/95.

Fingerprinting and Backward Quality Projection in Textile Products, (with M. Suh and W. Oxenham), National Textile Center, \$230,000, 3/94 - 3/96.

QIP with Milliken and Company, (with A. Chen, T. Brown and T. Johnson), Milliken Research Corporation, \$203,318, 1/93 -12/93.

QIP with Milliken and Company, (with A. Chen, T. Brown and T. Johnson), NSF through (SUCCEED), \$209,225, 1/93 - 12/93. Paper: *ASEE*.

QIP for the Magnolia Finishing Plant I of Milliken & Company, (with J. Trevino and A. Chen), Milliken Research Corporation, \$60,000, 6/92-8/92. Papers: *4th Annual Total Quality Symposium*

Spinframe Motor Performance Testing Project, North Carolina Alternative Energy Corporation, \$29,575, 5/92-12/93.

CIM in the Fiber, Textile and Apparel Industrial Complex, (with P. Grady and et.al.), National Textile Center, \$476,644, 3/92-3/94. Papers: *IEEE, ISA*.

Maximization of Quality, Productivity and Profitability for US Cotton Spinning Industries under CIM, HVI, and On-Line Process Control, (with M. Suh and W. Oxenham), National Textile Center, \$299,219, 3/92-3/94.

Carding of Nonwoven Webs, Nonwovens Cooperative Research Center, \$53,000, 1/92 - 4/94. Refereed papers: *Textile Research J* (3)

Design, Fabrication and Testing of a Mechanical Stylus Surface Analyzer, (with R. Barker and I. Shalev), James River Corporation, \$154,974, 9/91-6/93. Refereed papers: 3, *Textile Research J* and *TAPPI*.

Yarn Hairiness and the Process of Winding, State Appropriated, \$48,700, 1/91-12/92. Papers: *Textile Research J*

Controlling Sliver Evenness Through Monitoring at the Drawframe, State Appropriated, \$800, 8/90-6/91. Refereed papers: *J Textile Institute*

Fiber Assembly in Friction Spinning. (with P.R. Lord), State Appropriated, \$3555, 8/89-6/91. Refereed papers: 4, *J Textile Institute* and *Textile Research J*

PATENTS

1. U.S. Patent No. 12,018,414: **“Warp Knit Fabric for Textile and Medical Applications and Methods for Manufacturing the Same”**, (w/ H. Levinson, JB Davis & D Ward), June 25, 2024
2. US Patent # 11,001,948: **“Warp Knit Fabric for Textile and Medical Applications and Methods for Manufacturing the Same”**, (w/ H. Levinson, JB Davis & B Ward), May 11, 2021
3. US Patent # 10,602,791: **“Multi-layered Protective Covering and Uses Thereof”**, (w/ Jur, Gorga, et al), 2020
4. U.S. Patent No. 8,261,415: **“An Apparatus for Cotton Ginning, Processes and Methods Associated Therewith”**, (w/Alex Poole and Wesley Burgess, former UG students), 2012
5. U.S. Patent No. 8,120,769: **“Method and System for Fiber Properties Measurement”**, (w/ M. Tompkins, former student), 2012
6. China Patent # ZL200680044482.4: **“An Apparatus for Cotton Ginning, Processes and Methods Associated Therewith”**, (w/ D. Poole and W. Burgess, former UG students), 2011
7. U.S. Patent No. 6,882,423: **“Apparatus and Method for Precision Testing of Fiber Length Using Electrostatic Collection and Control of Fibers”**, (w/ Stroupe, Byrd and Brenzovich, UG students), 2005
8. U.S. Patent No. 5,774,942: **“Feedforward and Feedback Autoleveling System for Automated Textile Drafting System”**, (w/ T. Clapp, C. Farrington and S. Peykamian), 1998
9. U.S. Patent No. 5,796,220: **“Synchronous drive system for automated textile drafting system”**, (w/ T. Clapp, C. Farrington and D. Bowen), 1998
10. U.S. Patent No. 5,774,943: **“Tongue and Groove Drafting Roller Autoleveling System for Automated Textile Drafting System”**, (w/ T. Clapp, C. Farrington and D. Bowen), 1998
11. U.S. Patent No. 5,761,772: **“Securing and Pressuring System for Drafting Rollers for Automated Textile Drafting System”**, (w/ T. Clapp, C. Farrington, D. Bowen, R. Saunders and M. Thomas), 1998
12. U.S. Pat. No. 5,774,940: **“Draftless Sliver Coiler Packaging System for Automated Textile Drafting System”**, (w/ T. Clapp, C. Farrington and D. Bowen), 1998

LEADERSHIP ACTIVITIES RELATED TO TEACHING AND LEARNING:

Dr. Rust created several courses at NC State including TE 105, TE 501, and several others that were offered as special topics classes but never formalized. TE 105 came about as a direct result of his efforts in assessment. As TE Program Director, he led curriculum restructuring that included working with other faculty to develop new courses. After finding assessment data suggesting the TE curriculum needed additional experiences in engineering ethics, acceptance of other cultures and appreciation of diversity, he added in-class and out-of-class assignments relating to multi-cultural experiences and engineering ethics in senior design (TE 402).

As a participant in SUCCEED (an NSF funded initiative in Engr. Ed.), Dr. Rust (with other faculty from NCSU, Duke, NCA&T, and UNCC) developed a partnership program with several industrial companies. Milliken was the most significant, providing about \$2 million in grants to NC State (\$1.5 million for Rust) for team-based summer internship activities as well as in-class educational activities. To share experiences and the NCSU / Milliken model, he **presented 8 times** between **7/1993 and 2/1999** on industry / university partnerships and team-based multi-disciplinary inter-institutional summer internships in the following venues: 4th Annual Total Quality Symposium, American Soc. for Quality Control, Frontiers in Education Conf., ASEE Total Quality Education Conf., SUCCEED Conf.'s and other universities.

As a result of those partnerships with industry, he was in a unique situation to obtain and utilize information relevant to assessment from industry employers and recent graduates that he had helped place in careers. In 1999, Dr. Rust began a restructuring of the Textile Engineering curriculum through assessment – based review of the program.

The initial efforts in implementing assessment in the Textile Engineering (TE) program began in 1998 and are listed below.

1. May 1, 1998: TE faculty interview recent graduates and employers of our graduates and request information about the perception of the program, as well as suggestions for improvement.
2. Fall 1998: Rust leads TE faculty to restructure the curriculum to meet perceived needs as determined from the May 1998 surveys.
3. May 1999: A new TE curriculum is approved by the University (Provost's Office).
4. February 4, 2000: Rust leads the first assessment meeting of Textile Engineering faculty (7 of 11) to develop educational objectives, determine key constituencies, and identify individuals who will represent the key constituencies.
5. February 7 – 18, 2000: Rust collected additional data from faculty with regard to educational objectives, key constituency groups and representatives of that group. Individuals were identified to make contact with key constituency representatives.
6. February 18, 2000: Rust presents educational objectives to the College of Engineering EC 2000 team for input before contacting constituency representatives.
7. February 21 – April 10, 2000: TE faculty collect responses from constituency groups with regard to educational objectives (*survey*), discussed the suggestions, and made changes where deemed appropriate.

Dr. Rust led this team effort to begin implementing assessment of undergraduate education with documentation in TE. Many people contributed in many ways to the successful assessment efforts that resulted in a very glowing review during the ABET accreditation visit in the fall of 2004. While leading the TE program in assessment, Dr. Rust also was key in leading NC State in assessment of undergraduate education, the first research intensive university to do so.

With regard to assessment of undergraduate education within the NC State community, Dr. Rust presented, conducted workshops, and participated in round tables with university faculty and administrators regularly. During the period from August 2000 to December 2002, Dr. Rust performed the following university service toward implementing assessment.

Pres'n on NCSU Assessment activities to President Broad's cabinet (the Off. of the Pres.)	2000
Pres'n on NCSU Assessment activities to the Univ. assessment roundtable	2000
Pres'n on NCSU Assessment activities (regarding CUPR) to the COE ABET team	2000
Undergraduate Academic Program Review, A presentation to the CUE,	9/7/01
Undergraduate Academic Program Review, A presentation to LEADS (Dept. Heads),	10/2/01
Undergraduate Academic Program Review, A workshop for the NC State COE,	10/9/01
Undergraduate Academic Pro. Rev., A presentation to the NC State Faculty Senate,	10/30/01
Undergraduate Academic Program Review, The Fall CUPR workshop,	11/09/01
Undergraduate Academic Program Review, A workshop for the NC State COM,	12/6/01
Undergraduate Academic Program Review, A "Last Chance" workshop,	1/18/02
CUPR 2002, Where are we? Where do we go?, CUPR's "Peggy Maki" Retreat,	5/16/02

All of these interactions with university faculty and administrators were in addition to his being named the first chair of the ad hoc Committee on Undergraduate Academic Program Review (CUPR). Dr. Rust was the Chair of CUPR for the first two years (2000 – 2002). Dr. Rust also served the University Committee on Courses and Curricula (UCCC) for 6 years and chaired the committee in 2000-2001. Dr. Rust has also served on the board of the Campus Writing and Speaking Program (CWSP) from 2003 to 2008.

As NC State led the nation in undergraduate assessment for Research Intensive Universities (Research I universities), Dr. Rust found many opportunities to speak abroad, nationally (5) and internationally (4) on the assessment efforts at NC State. During the period of 7/2001 to 11/2008, Dr. Rust co-presented many times at conferences engaged with improving teaching and learning. For his efforts in leading assessment – based undergraduate academic program review, Dr. Rust received the inaugural Ephraim L. Schecter Award for Excellence in Undergraduate Assessment at NC State University.

CURRICULUM DEVELOPMENT

As Textile Engineering Program Director, Dr. Rust has led a Program review and restructuring effort with the goal of increasing enrollment in Textile Engineering through Program diversity and flexibility. In the spirit of ABET 2000, it was our goal that the new Textile Engineering Program embrace multi-disciplinary design efforts and offer students the opportunity to follow unique and diverse curricula while building enrollment.

Textile Engineering enrollment had always been low by design and demand for textile engineers had always exceeded supply. This restructuring effort centered on curricular diversity, flexibility and providing students with the tools requisite for the fields in which they will work, as determined through employer and alumni surveys. The Program Curricular restructuring was completed in 1999 with four new Concentrations: Machine Design, Information System Design, Textile Product Engineering, and Chemical Processing. Subsequently, building enrollment was accomplished: 1. Using a new optional freshman TE class (TE 105) to give early interaction between students and faculty, 2. more interaction with the COE freshmen and 3. greater involvement with College of Textiles high school recruiting efforts.

PUBLICATIONS

Peer-Reviewed: Research

1. Yao, Tong, B.D. Choules, J.P. Rust and M.W. King, "The Development of an In Vitro Test Method for Predicting the Abrasion Resistance of Textile and Metal Components of Endovascular Stent Grafts", *Journal of Biomedical Materials Research B: Applied Biomaterials*, 00 Month 2013, (wileyonlinelibrary.com) DOI: 10.1002/jbm.b.33026.
2. Lee, S., J.P. Rust, H. Hamouda, Y.R. Kim and R.H. Borden, "Fatigue Cracking Resistance of Fiber Reinforced Asphalt Concrete", *Textile Research J*, 75(2), 123-128 (2005)
3. Ikiz, Y., J. Rust, J. Trussel and W. Jasper, "Fiber Length Measurement by Image Processing", *Textile Research J*, 71(10), 905-910 (2001)
4. Rust, J., Y. Ikiz, J. Trussel and W. Jasper, "Dealing with Fiber Crossovers in Fiber Length Measurement by Image Processing", *Transactions of the 2000 EFS Conference*, Raleigh, NC (Nov. 2-3, 2000)
5. Guldemet, B. and J.P. Rust, "The Effects of Feed Sliver Moisture Content on Rotor Spinning Performance and Rotor-Spun Yarn Properties", *Textile Research J*, 71(3), 271-274 (2001)
6. Peykamian, S. and J.P. Rust, "Fabric Softness Classification Using Linear and Non Linear Models", *Textile Research J*, 201-204, 70,3(March, 2000)
7. Peykamian, S. and J.P. Rust, "Yarn Quality Indexing Using a Mechanical Stylus", *Textile Research J*, (November, 1998)
8. Lord, P.R., J.P. Rust and F. Fenercioglu, "Balloon Irregularities In Ring Spinning", *J Textile Institute* 89, p.498(1998)
9. Peykamian, and Rust, "Yarn Surface Profilometry Using a Mechanical Stylus", 1996 ASME International Mechanical Engineering Congress and Exposition, Textile Engineering Division, *Conf Proc*, Atlanta, GA (November 19, 1996)
10. Fryer, L.F., and J.P. Rust, "Effects of Cotton Fiber Blending and Processing on HVI Measurements - Part II", *Textile Research J* (1996)
11. Fryer, L.F., J.P. Rust and P.R. Lord, "Effects of Cotton Fiber Blending and Processing on HVI Measurements - Part I", *Textile Research J* (1996)
12. Peykamian, S. and J.P. Rust, "Yarn Surface Using a Mechanical Stylus", *ASME/96 Technical Conference - The Winter Mtg.* (November 1996)
13. Clark, M.J. and J.P. Rust, "Real-time Control of Carding through Fiber Load Measurement", *ASME Textile Engineering Division Conference*, Atlanta (October 9&10, 1995)
14. Fryer, L.F. and J.P. Rust, "High Volume Instrumentation Testing", *ASME Textile Engineering Division Conference*, Atlanta (October 9&10, 1995)
15. Gutierrez H.M. and J.P. Rust, "System Identification for a Photodiode-Based Monitoring System", *J of the ISA*, 34 (1995)
16. Peykamian, S. and J.P. Rust, "Yarn Surface Analysis Using MSSA", *ISA; International Conference and Exhibition*, Toronto (May 26, 1995)

17. Gutierrez, H.M. and J.P. Rust, "System Identification for a Photodiode-Based Monitoring System", *ISA; International Conference and Exhibition, Conference Proceedings*, Toronto (May 26, 1995)
18. Gutierrez, H.M. and Rust, "Modeling and Simulation for Control in Carding", *Textile Research J* (1995)
19. Rust, J.P. and H.M. Gutierrez, "Mathematical Modeling and Simulation for Roller-top Carding", *Textile Research J*, 64,573 (October, 1994)
20. Grady, P.L., L.F. Fryer, G.L. Hodge and J.P. Rust, "Computer-Integrated Management of Yarn Manufacturing", *IEEE Transactions on Industry Applications* (October, 1993)
21. Rust, J.P., T.L. Keadle, I. Shalev and R.L. Barker, "Evaluation of Surface Softness Parameters of Paper Products by Mechanical Stylus Scanning", *TAPPI Conference Proceedings*, (February, 1994)
22. Allen, D.B., J.P. Rust, I. Shalev and R.L. Barker, "Mechanical Stylus Surface Analysis Instrumentation for use on Soft Tissue Paper Products", *TAPPI Conference Proceedings*, (February, 1994)
23. Rust, J.P. and E. Koella IV, "Carding Fiber Load Measurement", *Textile Research J*, 64, 364 (1994)
24. Rust, J.P., T.L. Keadle, D.B. Allen, I. Shalev and R.L. Barker, "Tissue Softness Evaluation by Mechanical Stylus Scanning", *Textile Research J*, 64(3), 163-168 (1994)
25. Grady, P.L., L.F. Fryer, J.P. Rust and G.L. Hodge, "CIM Systems for Yarn Manufacturing", *Proceedings of The Instrument Society of America (ISA) National Conference* (September, 1993)
26. Grady, P.L., L.F. Fryer, G.L. Hodge and J.P. Rust, "Computer-Integrated Management of Yarn Manufacturing", *Proceedings of The Institute of Electrical and Electronics Engineers (IEEE) 1993 Annual Textile, Fiber and Film Industry Technical Conference (May, 1993)*
27. Rust, J.P. and S. Peykamian, "Yarn Hairiness and the Process of Winding", *Textile Research J*, 62, 11, 685-689 (1992)
28. Lord, P.R., M. Govindaraj, J.R. Rust and S. Peykamian, "On-Line Control of the Ratch Setting on a Drawframe", *J Textile Institute*, 83, 3, 399 (1992)
29. Lord, P.R. and J.P. Rust, "Fiber Assembly in Friction Spinning", *J Textile Institute*, 82, 4, 465-478 (1991)
30. Rust, J.P. and P.R. Lord, "Variations in Yarn Properties Caused by a Series of Design Changes in a Friction Spinning Machine", *Textile Research J*, 61, 11, 645-655 (1991)
31. Lord, P.R. and J.P. Rust, "Twist Dist. in Open-End Friction Spinning", *J Textile Institute*, 81, 2, 211-213(1990)
32. Lord, P.R. and J.P. Rust, "The Surface of the Tail in Open-End Friction Spinning", *J Textile Institute*, 81, 1, 100-103 (1990)
33. Lord, P.R., J.P. Rust and M. Govindaraj, "Fluid Vortices In Friction Spinning", *J Textile Institute*, Letter to the Editor, 79, 3, 517-519 (1988)
34. Rust, J.P. and H. M. Behery, "Effect of Production Variables on the Properties of Ultrasonically Bonded Nonwovens", *INDA-TEC, The International Nonwovens Technology Conference, Conference Proceedings*, Philadelphia, 120-137 (1986)

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1. Bresciani, M. J., J. H. Griffiths and J. P. Rust, "Assessment at North Carolina State University: Adapting to Change in the Workplace", *J for Research and Practice in Assessment*, 3:1 (January, 2009)
2. Anson, Chris M., Michael Carter, Deanna P. Dannels and Jon Rust. "Mutual Support: CAC Programs and Institutional Improvement in Undergraduate Education", *Language and Learning Across the Disciplines*, 6 25-37 (August, 2003)

3. Brown T., A. Chen, T. Johnson and J. Rust, "Quality Improvement Partnerships", *In Conference Proceedings, Fourth Annual Total Quality Symposium, "Making the Transition to Education "*, Kansas City MO (July 27- 30, 1993)
4. Hands, C.R. and J.P. Rust, "Inter-departmental and Inter-institutional Experiences Associated with Industry/University Partnerships", *ASEE Total Quality Education, IL/IN Sectional Conference Proceedings*, Purdue University (March 16-18, 1995)
5. Rust, J.P., H. Hamouda, E.R. Hewitt, J.W. Shelnut, and T. Johnson, "Qual Impr Partnerships with Industry Using Proc Improvement Teams of Students and Faculty", *J of Engineering Education* (July, 1994)
6. Rust, J.P. and C.J. Allen, "Quality Improvement Partnerships, The Milliken/SUCCEED University Challenge", *ASEE Regular Conference Proceedings*, Baton Rouge (March 24-25, 1994)

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1. Rust, J.P. and H.E. Behery, "Effect of Production Variables on the Properties of Ultrasonically Bonded Nonwovens", *INDA-TEC, The International Nonwovens Technical Conference, Conference Proceedings*, Philadelphia, 120-137 (1986)
2. Grady, P.L., L.F. Fryer, J.P. Rust and G.L. Hodge, "CIM Systems for Yarn Manufacturing", *The Instrument Society of America National Conference, 1993 Conference, Conference Proceedings*, Chicago, IL September, 19-24, 1993.
3. Allen, D.B. , J.P. Rust, I. Shalev and R. Barker, "Mechanical Stylus Surface Analysis Instrumentation for use on Soft Tissue Paper Products", *TAPPI Conference Proceedings* (February 1994)
4. Rust, J.P., T.L. Keadle, I. Shalev and R.L. Barker, "Evaluation of Surface Softness Parameters of Paper Products Using Mechanical Stylus Scanning", *TAPPI Conference Proceedings* (February 1994)
5. Lord, P.R. and J.P. Rust, "Blending as a Systemic Problem", *1994 Beltwide Cotton Conference Proceedings*, San Diego (January 5-8)
6. Fryer, L.F., J.P. Rust, and P.R. Lord, "Influence of Cotton Variables on Subsequent Process Performance", *1994 Beltwide Cotton Conference Proceedings*, San Diego (January 5-8)
7. Rust, J.P. and S. Peykamian, "Yarn Quality Measurement (New Perspectives)", *1994 Beltwide Cotton Conference Proceedings*, San Diego (January 5-8)
8. Peykamian, S. and J.P. Rust, "Yarn Quality Indexing through MSSA", *ISA Textile Division, Conference Proceedings*, Raleigh, NC (January 10, 1995)
9. Rust, J.P. "Card Fiber Load Measurement and Control", *ISA Textile Division, Conference Proceedings*, Raleigh, NC (January 1995)

PRESENTATIONS

Research

1. Rust, Ikiz, Trussel and Jasper, "Dealing with Fiber Crossovers in Fiber Length Measurement by Image Processing", Presented at the 2000 Engineered Fiber Selection Conference, Raleigh, NC (November 2-3, 2000)
2. Rust "Fiber Preparation Reengineering", Invited lecture at Clemson University's Performance Improvement Forum, Clemson, SC (September 1998)
3. Peykamian and Rust, "Yarn Surface Profilometry Using a Mechanical Stylus", 1996 International Mechanical Engineering Congress and Exposition, Textile Engineering Division, Atlanta (November 19, 1996)
4. Clark and Rust, "Real-time Control of Carding through Fiber Load Measurement", *ASME Textile Engineering Division Conference*, Atlanta (October 9 & 10, 1995)
5. Fryer and Rust, "High Volume Instrumentation Testing", ASME Textile Engineering Division Conference, Atlanta (October 9 & 10, 1995)
6. Peykamian and Rust, "Yarn Surface Analysis Using MSSA", ISA; International Conference and Exhibition, Toronto (May 26, 1995)

7. Gutierrez and Rust, "System Identification for a Photodiode-Based Monitoring System", ISA; International Conference and Exhibition, Toronto (May 26, 1995)
8. Rust, "Carding Fiber Load Measurement and Control", ISA Textile Division, Raleigh, NC (Jan., 1995)
9. Peykamian and Rust, "Yarn Quality Indexing through MSSA", ISA Textile Division, Raleigh, NC (January 10, 1995)
10. Rust and Seyam, "Monitoring, Simulation and Control for Carding", Hercules Inc. (1994)
11. Rust and Peykamian, "Yarn Quality Measurement (New Perspectives)", 1994 Beltwide Cotton Conference, San Diego (January 5-8)
12. Fryer, Rust, and Lord, "Influence of Cotton Variables on Subsequent Process Performance", 1994 Beltwide Cotton Conference, San Diego (January 5-8)
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18. Govindaraj, Lord and Rust, "Automatic Roller Setting on a Drawframe by Monitoring Sliver at the Drafting Zone", Poster session, Fall 1991 Conference, The Fiber Society (1991)
19. Rust and Behery, "Effect of Production Variables on the Properties of Ultrasonically Bonded Nonwovens", INDA-TEC, The International Nonwovens Technical Conference, Philadelphia, (1986)

PRESENTATIONS

Education

1. Rust, J., "So You Want to Become a Department Head", Provost's New Department Head Orientation workshop, 9/19/2014, Raleigh
2. Rust, J., "Question to Ask Your Department Head", Provost's New Faculty Orientation workshop, 8/6/2012, Raleigh
3. Rust, J., Session Chair at: Eastman Chemical Center of Excellence proposal workshop, 8/6/2013, Raleigh
4. Rust, J., "Getting Started in Administration", Advance workshop: Leadership for a Diverse Campus, 1/23/2013, Raleigh
5. Rust, J., "Educating for Success: Employer Perspective on Student Outcomes," Moderator, 2006 NC State Undergraduate Assessment Symposium, NC State University, Raleigh, NC, April 7, 2006
6. Rust, J. and J. Griffiths, "Using Grading Rubrics to Facilitate the Assessment Process and Development of an Appreciation for Diversity while Improving Learning", 6th Annual Assessment Conference at Texas A&M, College Station, TX, February 23 - 25, 2006
7. Rust, J., M. Bresciani and C. Goode-Vick, "Engaging in Genuine Assessment: A Balancing Act Between Administrators and Faculty", 2005 Annual Meeting of the Southern Association of Colleges and Schools - the Commission on Colleges, Atlanta Dec. 3-6, 2005
8. Rust, J. and M. McCord, "Assessment of Undergraduate Education at NC State University: The Textile Engineering Program," 2nd Annual National Undergraduate Assessment Symposium, North Carolina State University, Raleigh, NC, April 16, 2004
9. Rust, J. and M. McCord, "Using Rubrics in Courses to assist in Grading and Assessing Program Outcomes," 2nd Annual National Undergraduate Assessment Symposium, NC State University, Raleigh, NC, April 16, 2004

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11. Rust, J., M. Bresciani and J. Griffiths, "Assessing the Impact of Our Assessment Process", Fifteenth International Conference on Assessing Quality in Higher Education", Capetown, S. Africa, July 14 – 17, 2003
12. Rust, J., S. Blanchard, C. Goode-Vick and J. Tector, "Departmental Perspectives of Implementing Assessment-Based Undergraduate Academic Program Review," Inaugural National Undergraduate Assessment Symposium, North Carolina State University, Raleigh, NC, April 8, 2003
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14. Rust, J., C. Anson, M. Bresciani and D. Dannels, "Permanent Change: Case Studies of Continuous Program Review and Assessment, Fourteenth International Conference on Assessing Quality in Higher Education", Vienna, Austria, June 2002
15. Rust, J., M. Carter, C. Anson and D. Dannels, "Mutual Support: Communication-Across-the-Curriculum Programs and Institutional Improvement in Undergraduate Education," Sixth National Writing Across the Curriculum Conference, Rice University, Houston, TX, March 7, 2002
16. Rust, J., J. Allen and M. Bresciani, "Transformations at NC State University: Assessment, Program Development, and Continuous Improvements." Thirteenth International Conference on Assessing Quality in Higher Education, Glasgow, Scotland, July 26, 2001
17. Rust, J., "CUPR 2002: Where are we? Where do we go?", CUPR's Peggy Maki Retreat, NC State University, Raleigh, NC, May 16, 2002
18. Rust, J., Undergraduate Academic Program Review, A "Last Chance" workshop, NC State University, Raleigh, NC, January 18, 2002
19. Rust, J., Undergraduate Academic Program Review, A workshop for the NC State College of Management, NC State University, Raleigh, NC, December 6, 2001
20. Rust, J., Undergraduate Academic Program Review, The Fall CUPR workshop, NC State University, Raleigh, NC, November 9, 2001
21. Rust, J., Undergraduate Academic Program Review, A presentation to the NC State Faculty Senate, NC State University, Raleigh, NC, October 30, 2001
22. Rust, J., Undergraduate Academic Program Review, A workshop for the NC State College of Engineering, NC State University, Raleigh, NC, October 9, 2001
23. Rust, J., Undergraduate Academic Program Review, A presentation to LEADS, NC State University, Raleigh, NC, October 2, 2001
24. Rust, J., Undergraduate Academic Program Review, A presentation to the Council on Undergraduate Education, NC State University, Raleigh, NC, September 7, 2001
25. Rust, J., "Education, Research and Extension in Textile Engineering", Invited lecture at Clemson University, Clemson, SC (October 10, 1997)
26. Hands, C. and J. Rust, "Inter-departmental and Inter-institutional Experiences Associated with Industry/University Partnerships", At: ASEE Total Quality Education, IL/IN Sectional Conference Proceedings, Purdue (March 16-18, 1995)
27. Rust, J., "Educational Benefits Provided by SUCCEED's Multi-disciplinary Total Quality Systems Course", Ist Annual SUCCEED Symposium, Raleigh, NC(January 31, 1995)
28. Rust, K. and T. Shelnutt, "Quality Improvement Partnerships", At: Frontiers in Education Conference, Silicon Valley Edition (November 2-7, 1994)
29. Rust, J., "Peer-based Team Internships", North Carolina Textile Foundation, NC State University, Raleigh, NC, (October 19, 1994)
30. Rust, J., "Industry/University Partnerships: Team-based Multi-disciplinary Inter-institutional Summer Internships", Invited lecture at SUCCEED Conference in Clemson, SC (February 12, 1999)

31. Rust, J., "Quality Improvement Partnerships, The Milliken/SUCCEED University Challenge", American Society for Quality Control: Raleigh Chapter, (August 23, 1994)
32. Brown, Chen, Johnson and Rust, "Quality Improvement Partnerships", Fourth Annual Total Quality Symposium, "Making the Transition to Education", Kansas City MO, (July 27-30, 1993)

COMMITTEE SERVICE AND LEADERSHIP

North Carolina State University

2017 – 2019	Administrative Board of the Graduate School	Member
2017 – 2019	Graduate Operations Council	Member
2017 – 2019	Associate Deans of Academic Affairs	Member
2013 - 2016	Writing Competency ad-hoc Committee	Member
2013	Graduate School Dean Nomination Committee	Member
2012 - 2013	Strategic Translational Leadership Program	Member
2012 - 2014	Eastman Chem. CoE Research Steering Team	Member
2012	Leading Change workshop (Provost's Office)	Member
2011 - 2012	Task Force on Review of Academic Programs	Member
2011 - 2012	GEP Competency Task Force	Member
2011	MAE Review of Graduate Programs	Member
2010	ADVANCE Climate Survey and Workshop	Member
2008 - 2014	Department Heads Steering Committee	Member
2008 - 2009	Interim Assoc. Dean for GEP Implementation	
2006 - 2009	Intellectual Property Committee	Member
2002 - 2008	Campus Writing and Speaking	Member
2007 - 2008	Council on Undergraduate Education (CUE)	Chair
2007	Provost's Working Group on Faculty Development	Member
2006 - 2007	Council on Undergraduate Education	Member
2006	Food Science Ext. UG Academic Rev. Team	Member
2004	Off of Provost Search: Assistant Director for Assessment	Chair
2002	Council on Undergraduate Education	Member
2002 - 2005	UG Academic Program Review	Member
2000 - 2002	UG Academic Program Review (CUPR)	Chair
2000 - 2001	Courses and Curricula (UCCC)	Chair
1998 - 2004	Courses and Curricula	Member
1996 - 1998	Honors and Awards	Member
1992 - 1995	Outreach and Extension	Member

Wilson College of Textiles

2018 – 2019	Associate Dean for Academic programs	
2017 - 2018	Interim Associate Dean for Academic programs	
2014 - 2019	Interim Director of Zeis Textiles Extension	
2008 - 2016	Dean's Core Council	Member
2008 - 2016	Dean's Full Council	Member
2001 - 2012	Centennial Scholars Reading and Interviewing	Member
2010 - 2011	Innovation Design Center	Member
2010 - 2011	NC Textile Foundation Director Search	Member
2006 - 2007	TE/TT/PCC Task Force	Member
2006 - 2007	Textiles Online Programs Advisory Comm.	Member
2005 - 2007	Courses and Curricula	Member
2002 - 2004	Courses and Curricula	Chair

2002 - 2003	Academic Task Force	Chair
2000 - 2002	Courses and Curricula	Member
1996 - 1998	Honors and Awards	Co - Chair

College of Engineering

2022	Textile Engineering ABET Coordinator	
2008 - 2014	Dean's and Department Head's	Member
2008 - 2014	Dean's Executive Committee	Member
1998 - 2009	Courses and Curricula	Member
1998 - 2009	Coordinators of Advising	Member
1998 - 2007	Scholarship	Member
1999 - 2000	ABET	Member
1998 - 2000	Graduate Studies	Member
1991 - 2000	Open-House and Recruiting	Member
1990 - 1991	Television and Video Advisory	Member

Department of Textile Engineering, Chemistry and Science

2022	Textile Engineering ABET Coordinator	
2008 - 2014	Department Head	
2000 - 2008	Associate Head: Undergraduate Academic Programs	
1998 - 2000	Textile Engineering Program Director	
2006 - 2007	Peer Review of Teaching	Chair
2006 - 2007	Post Tenure Review	Chair
2005 - 2006	Textile Engineering Faculty Search	Co - Chair
2004 - 2005	Courses and Curricula	Member
2002 - 2003	Textile Chemistry Curriculum Revision Task Force	Chair
2001 - 2003	Courses and Curricula	Member
2003 - 2004	Textile Engineering Faculty Search	Member
2002 - 2003	Textile Engineering Faculty Search	Member
1999 - 2008	Faculty mentor (Drs. Gorga and Joines)	
1999 - 2000	Comprehensive Review of Tenured Faculty	Member
1999 - 2000	Textile Engr. Faculty Search	Chair
1998 - 2000	Textile Engineering Program Director	Director
1998 - 1999	Graduate Studies	Member
1995 - 1996	Textile Material Science Faculty Search	Member
1993 - 1994	Graduate Studies	Member
1991 - 1992	Textile Engineering Faculty Search	Member
1990 - 1997	Courses and Curricula	Member
1990 - 1991	Safety	Member

PROFESSIONAL CONSULTING

Toll Firm, Goodlettsville, TN	2023 - 2024
MacCord and Mason PLLC, Greensboro, NC	2020 - 2022
Arent Fox LLP, New York	2019 - 2022
Clapp, Moroney, Vucinich, Beeman, Scheley, Pleasanton, CA	2020 - 2022
Denlea and Carton LLP, New York	2021
RatnerPrestia, Philadelphia	2019 - 2020
Morgan Lewis and Bockius LLP, Miami	2019
Jones Day, Chicago	2018 - 2019
Bunker and Ray, Philadelphia	2018
Finnegan, Henderson, Farabow, Garrett & Dunner, LLP, Washington DC	2015 - 2016
Duane Morris LLP, Philadelphia	2016
Merlin Law Group, Tampa FL	2011 - 2016
Smith Gambrel and Russell, LLP, Jacksonville, FL	2014 - 2015
Law Office of James Toomey, NY, NY	2014
Miranda, Sambursky, Slone, Sklarin, Verveniotes LLP, Mineola, NY	2014
Adams and Reese LLP, Jacksonville, FL	2013 - 2014
Ray Lego and Associates, Greenwood Village, CO	2013 - 2014
Personal Safety Products LLC, Englewood, CO	2013 - 2014
Woodard, Emhardt, Moriarty, McNett and Henry LLP, Indianapolis	2013 - 2014
Cameron LLP, Washington, DC	2012 - 2013
Peterson Bernard, West Palm Beach, FL	2012 - 2013
Bob Barker Company, Fuquay-Varina, NC	2012
Lewis and Roca, LLP, Minden, NV	2011
Brown and James Law Firm, Kansas City, MO	2011
Ray Lego and Associates, Salt Lake City, UT	2011
LongFiber Inc., Portland, OR	2009
Lewis and Roca, LLP Minden, NV	2009
Custom Technical Solutions, Gastonia, NC	2009
Crumley and Associates, Greensboro, NC	2008
Cohen, Milstein, Hausfeld & Toll PLLC, Philadelphia, PA	2005 - 2008
Milliken and Company, Spartanburg, SC	2005 - 2008
IT3, Raleigh, NC	2007
Carolina Technical Solutions Inc., Bethania, NC	2004
Blackwell, Sanders, Peper and Martin, St. Louis, MO	2002 - 2003
Milliken and Company, Judson Plant, Greenville, SC	2001 - 2003
Milliken and Company, Monarch Plant, Union, SC	2001 - 2003
Milliken and Company, Gilliland Plant, Laurens, SC	2001 - 2003
Hoge, Fenton, Jones and Appel, San Jose, CA	2001
Bob Barker Co., Fuquay - Varina, NC	2001
Akin, Hunt, & Fearon P.C., Fuquay - Varina, NC	2001
Akins, Gump, Strauss, Hauer & Feld, LLP, Philadelphia, PA	2000 - 2001
Williams and Connolly, Washington, DC	1999 - 2001
National Textiles Inc., Mountain City, TN and Forest City, NC	1999
Milliken and Company, Enterprise Plant, Marietta, SC	1998
Swift Denim, P.O. Box 759, Erwin, NC	1997
Sara Lee Knit Products, Winston-Salem, NC	1997
Burlington Industries Inc., 3330 W. Friendly Dr., Greensboro, NC	1997
Burlington Industries Inc., 3330 W. Friendly Dr., Greensboro, NC	1996
Burlington Fabrics Inc., 3330 W. Friendly Dr., Greensboro, NC	1996

Milliken and Company, Dewey Plant, Inman, SC	1995
Gibbs International, Inc., Spartanburg, SC	1995
Kimberly Clark Corp., Neenah, WI	1995
Richards, Medlock and Andrews, 4500 Renaissance Tower, Dallas	1995
Willian, Brinks, Hofer, Gilson & Lione: NBC Tower, Suite 3600, Chicago	1994
Petree Stockton, Inc., 4100 Lake Boone Trail, Raleigh	1994
Milliken and Company, Cypress Plant, Blacksburg, SC	1994
Milliken and Company, Cypress Plant, Blacksburg, SC	1993
Murata Inc., Charlotte, NC	1992