

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. STEPHEN SPIEGELBERG

I. INTRODUCTION AND SCOPE OF WORK

I, Dr. Stephen Spiegelberg 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 chemical engineering, my post-doctoral research in mechanical engineering, and my experience in morphological engineering, adhesives, and coefficient of friction testing and analyses.

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 the University of Wisconsin-Madison with a B.S. in Chemical Engineering in 1988 and Course Emphasis: Polymers, Materials, Adhesives. I earned my Ph.D., with a focus on Polymers and Fracture Mechanics from the Massachusetts Institute of Technology.

8. Between 1993 and 1997, I was a Post-doctoral research associate at Harvard University in the Division of Applied Sciences. During that time, I examined the extensional behavior of polymeric fluids through birefringence, imaging, and force measurements. My experience included characterization of polymeric materials, analytical equipment design, integration and testing, writing of control and analysis code, and experimental verification of systems.

9. Between 1998 and 1999, I was a Post-doctoral research associated in Mechanical Engineering. During that time, I developed a high temperature extensional rheometer for examination of polymer melts.

10. Between 1996 and the present, I have served as the Co-founder, President, and Chief Scientific Officer for Cambridge Polymer Group. My work at Cambridge Polymer Group involves selection and improvement of polymeric materials for biomedical and industrial applications; Development of instrumentation for rheological, materials, and biomedical industries; Research interests include toughening of polymers, morphological engineering, radiation chemistry, polyethylene, bone cement, adhesives, hydrogels, device cleanliness,

synthetic tissue, and extensional rheology; Development of test methodologies for polymer characterization and failure analysis; Litigation consultant in medical devices, materials, pharmaceuticals, and patents. I am an officer and fellow at ASTM International, a standards organization involved in developing, amongst other things, standards for the characterization of polymeric materials. I regularly employ ASTM test methods in my laboratory to characterize polymer materials, including coefficient of friction. My laboratory is accredited by ISO 17025 to several ASTM standards.

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

III. MATERIALS CONSIDERED

12. 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) 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://murakamiscreeen.com/>); <https://murakamiscreeen.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)

- 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?srsltid=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.

13. 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.

14. 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.

15. 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 further 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

16. 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

17. 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

18. 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

29. 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

30. 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.

31. 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.

32. 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

33. 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

34. 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

35. 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.

36. 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.

37. 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

38. 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.

39. 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.

40. 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.

41. 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.

42. 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.

43. 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.

44. 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, as well as mechanical properties such as wear. 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.

45. In addition, a POSITA would also require at least 5 years of measurement and analysis experience in the field of coefficient of friction. This is necessary, for example, because the coefficient of friction between two materials in one morphology will be different than the coefficient of friction of the same two materials in a different form. The morphology of fabrics has a decisive effect on the frictional resistance occurring in friction of the fabrics. And, friction measurements are extremely dependent on the condition of the contacting surfaces on the test specimens. A POSITA without this experience would likely misunderstand, and likely misuse, coefficient of friction data for which the reported

results do not detail the protocol, morphology, and other aspects of the analysis. For example, a person without this experience would not appreciate that, for example, when details the protocol, morphology, and other aspects of the analysis such as the specified area of materials and the morphology of the materials is not disclosed or utilized, the reported results cannot be relied upon and would not be relied upon by a POSITA because the data is not representative of data called for by different protocol, morphology, and other aspects of the analysis.

B. A POSITA's Background Knowledge

1. Background of the Technology

46. 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.

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

48. 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.

49. 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."

50. 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.

51. 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

52. 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.

53. 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. In fact, Dr. Wang discusses in his declaration that burlap sacks, which are a form of a textile, will slow down the ride, citing reference Ex. 1020, 12 (paragraph 44 of Dr. Wang's declaration) and noting "the sacks are made of burlap, which is scratchy and provides some friction," which in effect teaches away from using textiles to reduce the coefficient of friction.

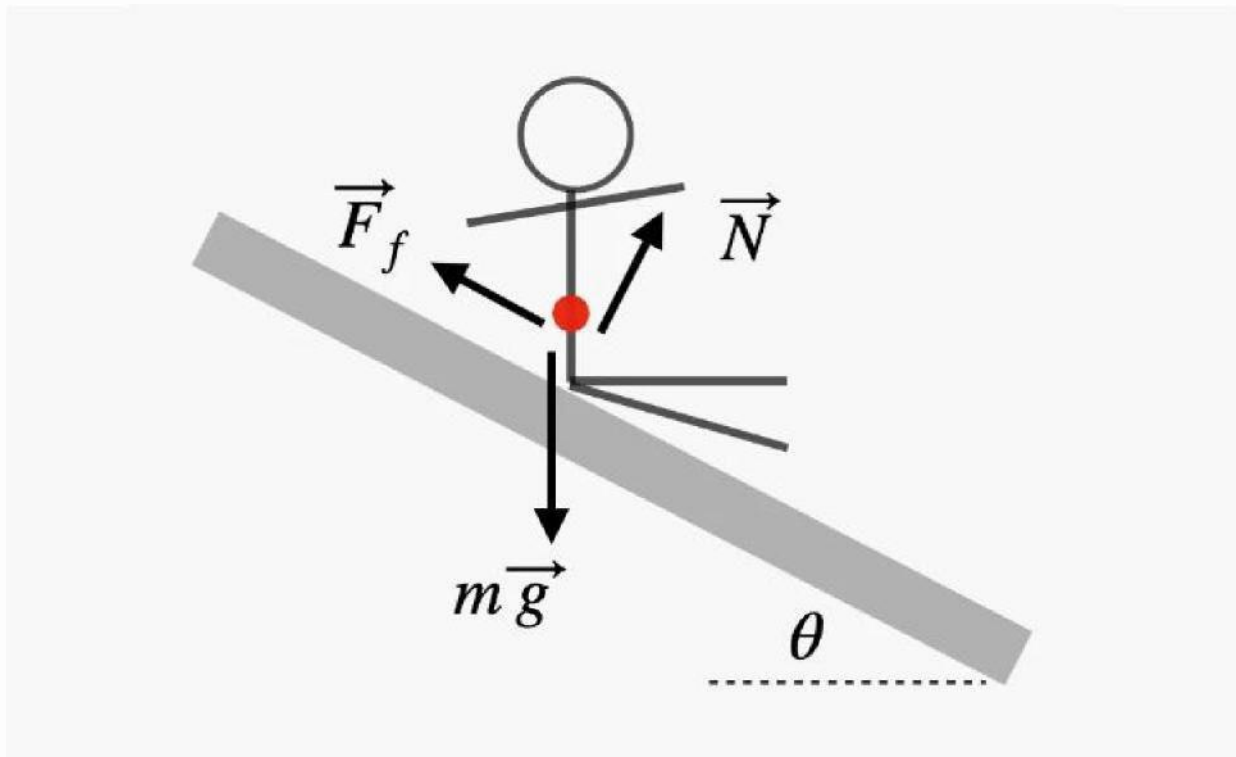
54. Dr. Wang is correct that the speed of descent on a slide can be influenced by the slope of the slide and the materials used on the surface of the slide and sliding vehicle. *See e.g.*, Ex. 1003, at Paragraph 38. In my opinion, however, Dr. Wang is not correct when he suggests that the ways that the slope of the slide, the weight of the rider, and the materials forming the slide and sliding vehicle alone 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 he relies on (Ex. 1018, Ex. 1019, Ex. 1020) discuss in any detail the impact of the morphology of 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.

55. The structure, or morphology, of the materials forming the slide and sliding vehicle, or their morphologies, have a significant effect on the resulting coefficient of friction when these two surfaces interact with each other. For instance, the coefficient of friction between two materials in the form of flat sheets will be different than the coefficient of friction of the same two materials in the form of textiles. As a macroscopic example, silicon wafers used in the computer chip industry are extremely smooth with low coefficients of friction. Ground up silicon placed on sheets, forming sandpaper, have the same material composition as the silicon wafer, but have a much higher coefficient of friction. As mentioned in Ex. 1010: “Our investigation has shown that the frictional resistance of fabrics woven from filament yarns is dependent both on the rubbing direction and fabric morphology, ” and “The morphology of fabrics has a decisive effect on the frictional resistance occurring in friction of the fabrics,...”. ASTM G115 states “Friction measurements are extremely dependent on the condition of the contacting surfaces on the test specimens.” (Ex. 2013).

3. The Basics of Friction

56. 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

57. 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.

58. Dr. Wang then suggests that “If two systems are in contact and moving relative to one another, then the friction between them is called kinetic friction...[w]hen objects are stationary, static friction can act between them.” Ex. 1008, 1. *See e.g.*, Ex. 1003, at Paragraph 40. The static friction between two objects is usually greater than the kinetic friction between the objects. *Id.*, 1, 4-5 (comparing static and kinetic frictional coefficients of various material systems). “[T]he magnitude of [the frictional] force depends on two things: One is the two surfaces that are interacting [and t]he other is the normal force (N).” Ex. 1020, 4; Ex. 1008, 3 (describing the equations for static friction and kinetic friction). In theory, Dr. Wang is correct here.

59. In real mechanical systems, the lowest achievable coefficient of friction is at least as low as 0.02. Ex. 1028, 1 (describing that a friction coefficient of 0.05 is achievable in a hypothetical system of dry sliding surfaces when

mechanical interactions are eliminated); Ex. 1008, 4-5 (table 6.1 showing a low kinetic coefficient of friction of 0.02 for steel on ice and a high kinetic coefficient that is as low as nearly 0 is not only possible, but has been achieved. Ball bearing systems typically have a coefficient of friction around 0.001-0.0015 (<https://koyo.jtekt.co.jp/en/support/bearing-knowledge/8-4000.html>, <https://www.amroll.com/friction-frequency-factors.html>) (Ex. 2014), and the coefficient of friction of cartilage has been measured as low as 0.025 (Forsey, 2006) (Ex. 2015).

60. Dr. Wang is correct that the coefficient of friction can be altered by changing the materials of the two objects rubbing against one another, or by adding another material, like a lubricant which “can reduce the effects of friction” or adding an intervening material like a slippery fabric or a piece of waxed paper between the objects. Ex. 1019, 2; Ex. 1018 (“the slide guy would take some pledge and spray it at certain spots on the slide every so often [and this] seemed to make the kids go faster”); Ex. 1027, 1 (list of factors influencing coefficient of friction between two sliding solids). For example, in the theoretical tables relied upon by Dr. Wang, a kinetic coefficient of friction for steel on dry steel is 0.3, but when the interaction is between steel and oiled (lubricated) steel, the coefficient is lowered to 0.03. Ex. 1008, 4 (see table 6.1); *see also* Ex. 1021, 1 (showing kinetic coefficients of friction in dry and lubricated systems). Comparing the speeds

achieved for a rider on a slide with a low coefficient of friction (e.g., 0.1) between slide and rider to a slide with a high coefficient of friction (e.g., 0.6) between slide and rider, “[c]learly the slippery slide is faster.” Ex. 1020, 8.

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

61. 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, Coefficient of Friction (μ) = Force of Friction (F) / 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).

62. 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.

63. 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).

64. 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.*

65. The ASTM Coefficient of Friction ASTM D1894 standard test method specified in the ‘854 patent requires demonstration of coefficient of friction under precise conditions. And, those conditions must be disclosed and specified. For example, there is a standard normal force that must be disclosed and utilized, there is a standard specified area of materials that must be disclosed and utilized, and the morphology of the materials must be disclosed and utilized. The standard force in ASTM D1894 is 200 ± 5 grams and the area is 63.5 x 63.5 mm (section 5.1), and the sled is pulled at 150 ± 30 mm/min. The standard warns that anisotropy or extrusion effects in films can result in different friction properties (note 7). The standard also requires a complete description of the plastic sample and the surfaces tested (section 11.1.1 and 11.1.2). The latter refers to the morphology of the plastic film. (Ex. 2016)

66. Based on my experience in analyzing and testing for coefficient of friction pursuant to the ASTM Coefficient of Friction ASTM D1894 standard test method specified in the ‘854 patent, if the specified normal force is not disclosed

or utilized, the reported results cannot be relied upon and would not be relied upon by a POSITA. In like manner, if the specified area of materials is not disclosed or utilized, the reported results cannot be relied upon and would not be relied upon by a POSITA. In like manner, if the morphology of the materials is not disclosed or utilized, the reported results cannot be relied upon and would not be relied upon by a POSITA.

67. It is known that the coefficient of friction is dependent on knowing the contact area between the two sliding surfaces, and the effective surface roughness affects this contact area (Achanta, S. On the scale dependence of coefficient of friction in unlubricated sliding contacts, 2010). When one or both of the materials can deform under normal force, the surface contact area will change, which will then change the measured coefficient of friction, resulting in a load-dependent coefficient of friction (Ibid). Kothari (Ex. 1009) comments on this, stating “Due to its low modulus, the leather deforms around the yarns in fabrics, to a larger extent, and this contributes to increase in the frictional values.”

68. Given that polymeric materials, particularly those with deformable surfaces, can exhibit different coefficient of frictions depending on the applied normal force, details about the test method and the materials and their morphology is critical when reporting coefficient of friction values. Lacking this information, a

POSITA would not gain useful information from generic tables of coefficient of friction values.

69. None of the example tables purportedly showing frictional coefficients between various materials relied upon by Dr. Wang comply with ASTM D1894 (e.g., Ex. Ex. 1026; Ex. 1027). The tables do not disclose and specify the specified normal force, specified area of materials, morphology, and test conditions are not specified, and a POSITA would not rely upon the reported results.

5. Slide and Ride Vehicle Materials

70. 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, these factors 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.

71. 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, 1 Ex. 2006, 1). 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.

72. Generally speaking, Dr. Wang is also correct that lubricants were known and used specifically to affect the coefficient of friction. *See* Ex. 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”).

73. 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 and below as well, 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.

74. 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 Teflon [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, Teflon, 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”).

75. 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, Teflon, high-density plastic such as TeflonTM or DelrinTM plastic material,” “nylon, Teflon, 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.

76. 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”).

77. 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).

78. Ex. 1026 and Ex. 1027 do not provide sufficient experimental details on how the coefficient of frictions were determined for many of the values, lacking information about surface finish, morphology, and normal force. Ex. 1027 further cautions that “If accurate friction information is required for a specific application, the use of carefully simulated conditions or instrumentation of the actual machine should be conducted in lieu of using tabulated values because even a small change in contact conditions (for example, sliding speed or

relative humidity for some materials) can result in a marked change in the measured or apparent friction coefficient.” The morphology of the two interfaces would be included in “contact conditions.” This reference further states “No single source has generated a comprehensive list of friction coefficients for materials under identical testing conditions; therefore, nearly all existing handbooks rely on compilations of data produced under a variety of testing conditions. Readers should be aware of this shortcoming and use the values only as very approximate guides.”

79. 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.

80. 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

81. 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.*

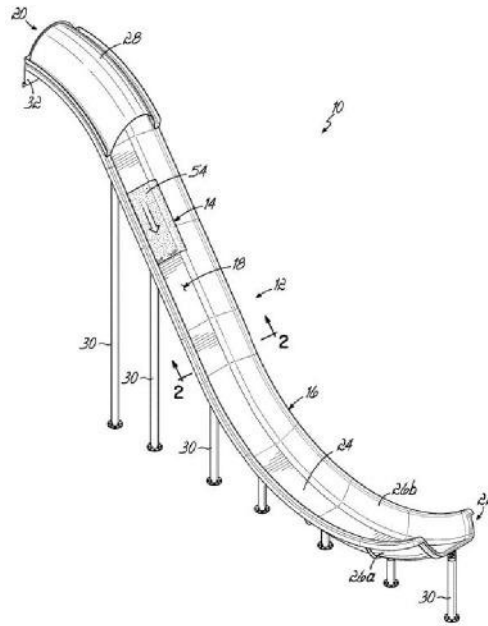


FIG. 1

Ex. 1001, Fig. 1

82. 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 below, the mesh layer is an open weave (as per the definition of mesh) and

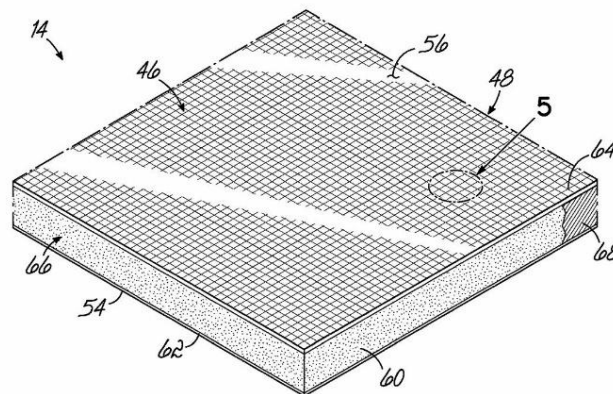


FIG. 4

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.

83. 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.

84. 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.

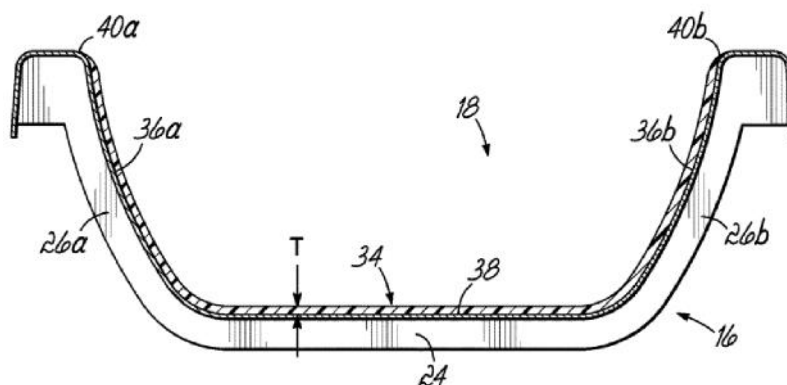


FIG. 2A

Ex. 1001, Fig. 2A

85. 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.

86. 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.

87. 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.

88. 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”

89. 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.

90. 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 ASTM D1894 Test Method Requirements

91. ASTM D1894 (Ex. 2016) provides specific experimental details that must be followed to ensure reproduceable coefficient of friction measurements between different laboratories. Additionally, ASTM D1894 has specified reporting requirements, that include details about the two material interfaces between which the coefficient of friction is measured and reported. In ASTM protocols, any statements not prefaced with the word ‘may or should’ are considered mandatory, and any reports that do not follow the mandatory aspects of the protocol are not considered in compliance with the standard. For example, Section 11.1 requires a

detailed description of the surfaces that were tested, along with a description of the apparatus used to test it. If this information is not included in a report, the testing is not compliant with ASTM D1894.

D. The '854 Patent Defines The Claim Term "Mesh Layer"

92. "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).

E. Summary of Prosecution History of the '854 Patent

93. 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.

94. 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.*

95. 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.

96. 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.

97. 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.

98. 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

99. 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

100. 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

101. 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)

102. 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.

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

104. 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.

105. 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).

106. 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,

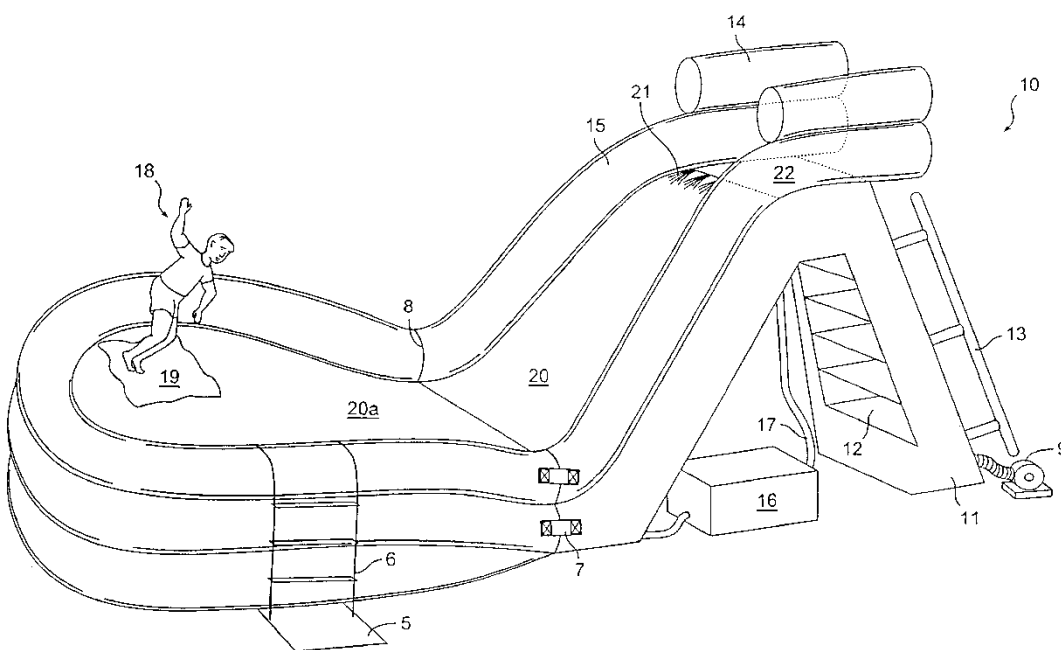


FIG. 1

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

107. Phillips describes several embodiments of sliding vehicles that include the low friction, durable membrane, such as a sports board (100) and sliding element (120). Ex. 1004, 7:6-7, 21-23.

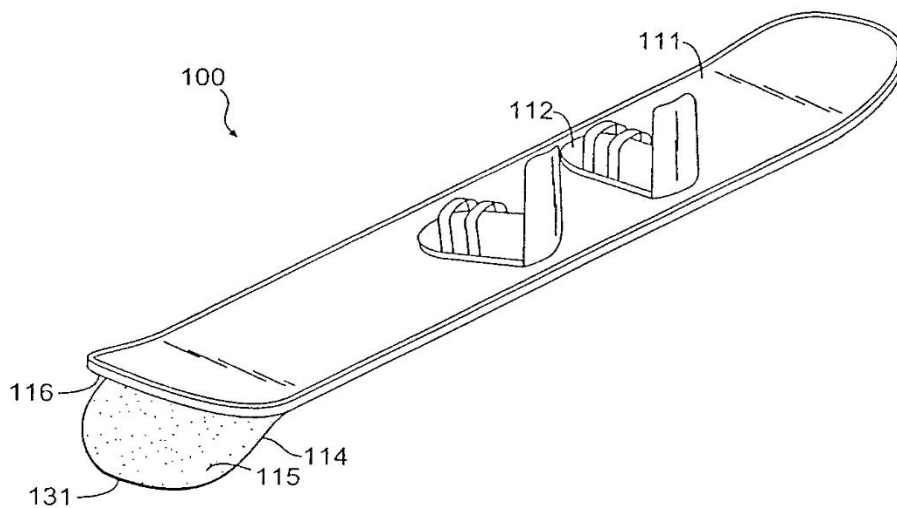


FIG. 5

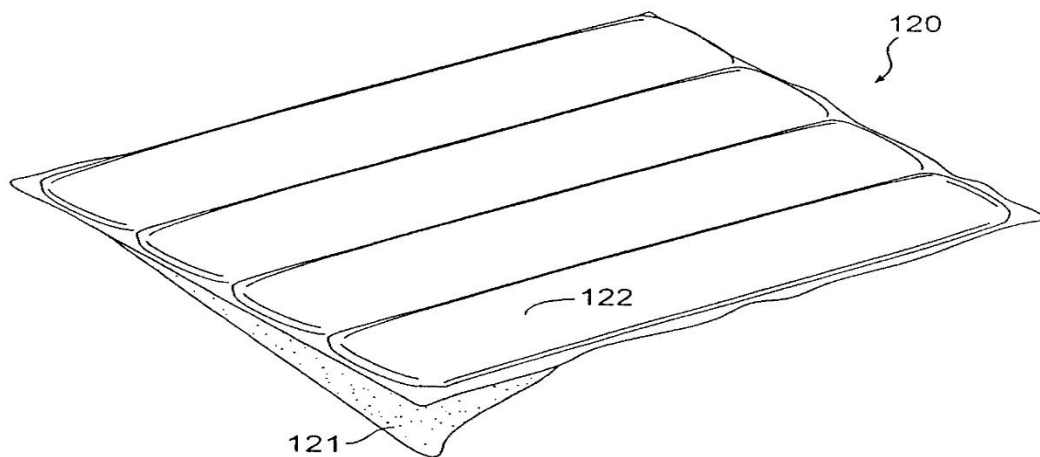


FIG. 7

108. 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.

109. 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.

110. 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;

111. 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.

112. 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.

113. 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.

114. 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.

domestic uses such as bed sheets. See muslin bed sheeting, percale bed sheeting. It is made in medium and heavy weights in the following classifications: coarse, ordinary, lightweight, narrow, soft-filled, and wide. Sheeting also is made of linen or nylon yarns. Knitted sheeting fabric may be made for use in fitted crib and bed sheets, and these are called jersey sheets. Industrial sheeting is a plain-weave cotton fabric made of singles yarns.” (Ex. 2007). Here, 40 x 38 (and 64 x 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.

117. 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).

118. 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 a Merriam-Webster. (Ex. 2005).

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

120. 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.

121. 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.

122. 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.

123. 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.

124. 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.

125. 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”).

126. 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. 2006). Dr. Wang acknowledges that a mesh includes a fabric that is woven so that there are holes between the woven threads.

127. 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. Typical sailcloth weights are 4 ounces or higher, comprising a tighter weave. Lower weight sailcloths of 4 ounces are normally impregnated with a finish to reduce the porosity.(https://www.sailrite.com/shop/fabric/marine-fabric/sailcloth?srsId=AfmBOooKtVgfuRAhaF_skxS6IKy9Yk0pbSvcRhMm6MpVoHhq5lnmvxyX.)(Ex. 2019) The weights of the fabrics disclosed in Exhibit 1009 range between 1.8-2.0 ounces, which is much more open than typical sailcloth and would hence be inappropriately described as sailcloth (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)). 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.

128. 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 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. Furthermore, nylon is commercially available in solid film form (<https://www.mcmaster.com/products/nylon-film/>) (Ex. 2021), and Dacron is found in many forms, including fiber batting in toys and

pillows (<https://foammart.com/product/dacron-roll/>) and foam

[https://foamforyou.com/outdoor-dacron-foam?srsltid=AfmBOopu-](https://foamforyou.com/outdoor-dacron-foam?srsltid=AfmBOopu-5B9zLoVKgtjlSp9uUPDfGx7ckTQs_Khck86n0hnBeGTmUuH)

[5B9zLoVKgtjlSp9uUPDfGx7ckTQs_Khck86n0hnBeGTmUuH](https://foamforyou.com/outdoor-dacron-foam?srsltid=AfmBOopu-5B9zLoVKgtjlSp9uUPDfGx7ckTQs_Khck86n0hnBeGTmUuH)) (Ex. 2022).

129. 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.

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

131. 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.

132. 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.

133. 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.

134. In addition, while Phillips’ disclosure of a low friction material may suggest a chemical composition of material to be used, it does not suggest the morphology of it. Morphology refers to the physical structure of, for example, a

fabric, including the shape, size, and porosity and structure of its fibers. I do not understand Dr. Wang to discuss anywhere or support his suggestion through an analysis of the morphology of the Phillips' "low friction" material.

135. 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."

136. 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 are supposed to be meshes.

137. Indeed, the list in Ex. 1004, 4:43-46 relied upon by Dr. Wang includes artificial turf and synthetic carpet, which he did not include in this paragraph. These are clearly not meshes. Calling out artificial turf and synthetic carpet in the same list as nylon, Teflon, and vinyl sheets confuses, rather than clarifies, what Phillips' intent is for achieving a low friction surface. Rather than specify a series of

examples of meshes, Phillips includes a disparate collection of polymer types (nylon, Teflon™, vinyl, polyester resins, all of which are available in a variety of forms), generic products types (sailcloth, synthetic carpet, artificial turf, which can be made from a variety of materials), and one trademarked product (Dacron™, which is available in several forms) with no common thread. Whereas nylon, Teflon, and Dacron are commonly used in non-mesh formats (e.g. films), Phillips does nothing to clarify this distinction. Hence, a POSITA would not assume that the nylon, Teflon, and vinyl sheets or membranes are supposed to be meshes, and could equally assume that they should be in the form of a carpet or artificial turf.

138. 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 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.

139. 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.

140. 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.

141. 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 Phillipps teaches away from use of a mesh layer as claimed in the '854 patent, if Phillipps 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.

Additionally, the large variety of mesh configurations would need to be optimized.

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, Phillipps 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 could 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 fibers. To properly adhere monofilament fibers with an adhesive would require processing of the bottom of the ride vehicle (and monofilament fibers) before an attempt to adhere those fibers,

or at a minimum would require an evaluation of whether such processing is required.

142. 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.

143. 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.

144. 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.

145. 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.

146. 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.

147. I am an expert with years of experience in the evaluation and testing of coefficient of friction. In connection therewith, it is my opinion and experience that a designation of “low” friction does not import a coefficient of friction or a

range of coefficient of friction, to a POSITA or otherwise. For this reason, Phillips and its disclosure only demonstrates that Phillips does not disclose a coefficient of friction that is within a range of between about 0.03 to about 0.2.

148. To address this missing claim limitation from the Phillips disclosure, Dr. Wang notes that Phillips describes use of “Teflon” for the slide surface and “nylon” for the ride vehicle bottom. Ex. 1004, 4:43-46. Phillips describes that “[b]oth membrane 6 and top surface 20 can each be composed of low friction high durab[ility] material such as a member selected from the group consisting of nylon, Teflon, sailcloth, Dacron, vinyl... and polyester resins.” *Id.* Phillips’ description is that the slide surface and bottom of the ride vehicle should be “low friction” materials.

149. According to Dr. Wang, Phillips mentions these optional materials, and Ex. 1021, 1 suggests the coefficient of friction between Teflon and nylon is about 0.05. In addition, according to Dr. Wang, pairings of other materials taught by Phillips are disclosed in other references as having the following coefficient of friction, including Teflon/Teflon and nylon/nylon, among others. Ex. 1026, 5 (listing a static frictional coefficient for nylon-nylon interactions as 0.15-0.25), 7 (listing a kinetic frictional coefficient for Teflon-Teflon interactions as 0.04), Ex. 1027, 4

(listing kinetic frictional coefficient for nylon-nylon interactions as 0.07 and kinetic frictional coefficient for Teflon-Teflon interactions as low as 0.04).

150. In my opinion, Dr. Wang's analysis does not demonstrate that the claim limitation "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" is disclosed by Phillips and the accompanying friction coefficient tables upon which he relies.

151. As I explained above, the '854 patent specifies 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, at 11:31-44). The ASTM Coefficient of Friction ASTM D1894 standard test method specified in the '854 patent requires demonstration of coefficient of friction under precise conditions. And, those conditions must be disclosed and specified, as I explained above. Otherwise, reported coefficients of friction do not comply with ASTM D1894.

152. A POSITA would not rely upon reported coefficients of friction that do not comply with ASTM D1894. In addition, a POSITA would not be able to determine or conclude that a coefficient of friction disclosed as complying with

ASTM D1894 (as does the '854 patent) is met by a reported coefficient of friction that does not comply with ASTM D1984.

153. The friction coefficient between two materials is not dependent upon only the materials. To the contrary, several different factors can and do dramatically impact the friction coefficient between two materials. For example, the composition of the materials, the morphology of the materials, the environment, the normal force, and characteristics of the testing conditions and equipment.

154. I note that the references relied upon by Dr. Wang support my opinion. For example, Ex. 1027 acknowledges that “[t]he friction coefficient...is a function of several factors whose relative contributions vary on a case-by-case basis.” (Ex. 1027, 1). That same reference lists several factors that impact reported coefficient of friction data. *Id.* And, that same reference also acknowledges that “[i]f accurate friction information is required for a specific application, the use of carefully simulated conditions or instrumentation of the actual machine should be conducted in lieu of the tabulated values...”. *Id.* In culmination, that same reference provides that the reported data should not be relied upon “because even a small change in contact conditions (for example, sliding speed or relative humidity for some materials) can result in a marked change in the measured or apparent friction coefficient.” *Id.*

155. Ex. 1027 also states that “No single source has generated a comprehensive list of friction coefficients for materials under identical testing conditions; therefore, nearly all existing handbooks rely on compilations of data produced under a variety of testing conditions. Readers should be aware of this shortcoming and use the values only as very approximate guides, unless their applications are exactly the same as those methods used in generating the data.”

156. In like manner, Ex. 1009 states “The nature of the contact surfaces during the sliding action affects the frictional resistance considerable. Deformation of leather surface over the contact point has significant effect on kinetic frictional resistance. Fabric-to-metal friction is less sensitive to the morphology and type of fabric. Variation of mesh size in monofilament fabrics affects the frictional resistance of these fabrics.”

157. In like manner, Ex. 1010 states “The difference in frictional forces acting between fabrics woven from filament yarns are dependent on the morphology.” “Our investigation has shown that the frictional resistance of fabrics woven from filament yarns is dependent both on the rubbing direction and fabric morphology.” “The morphology of fabrics has a decisive effect on the frictional resistance occurring in friction of the fabrics,...”. The results in Ex. 1010 show

broad variation in COF with fabric type, and it is notable that most COF values are greater than 0.2.

158. I also note once again that Dr. Wang does not mention at all ASTM standards, and this despite the fact that the ‘854 patent requires application of the ASTM standards. In this regard, ASTM G115 provides as follows: “Friction measurements are extremely dependent on the condition of the contacting surfaces on the test specimens.” (Ex. 2013). A POSITA would understand the importance of a test standard in reliably determining COF between two materials. Ex. 1027, which reports tables of coefficient of friction, also provides some details of the test method used to obtain some of the results, and most do not use the ASTM D1894 method (a sliding flat plate on another flat plate), and instead use ball-on-flat, pin-on-disk, rotating ring, varying pull rates, and unspecified sample morphologies. Hence, these results cannot be compared with each other in the table, much less with testing results according to ASTM D1894.

159. In sum, as acknowledged by the references relied upon by Petitioner, none of the reported coefficient of friction data can be relied upon to demonstrate that coefficient of friction data is what it would be under the conditions specified by the ‘854 patent, i.e., ASTM D1894. More precisely, a POSITA with knowledge of Phillips and knowledge of the references relied upon by Petitioner, would not rely

upon the reported coefficient of friction data because it cannot be relied upon to demonstrate that coefficient of friction data is what it would be under the conditions specified by the '854 patent, i.e., ASTM D1894.

160. None of the references relied upon by Dr. Wang comply with ASTM D1894. None of the references (e.g., Ex. 1008, Ex. 1021, Ex. 1026, Ex. 1027) disclose and specify the test methods or conditions that were applied in order to generate the reported coefficient of friction data. As such, none comply with ASTM D1894.

161. 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. For these reasons, none of the references relied upon by Dr. Wang satisfy the coefficient of friction that is specified by the '854 patent.

162. Fallgatter also demonstrates that the coefficient of friction data reported in the references and relied upon by Dr. Wang is not accurate, in that the coefficient

of friction values Fallgatter reports for nylon materials are higher than Dr. Wang's references. The fact that the data reported in the references is not accurate is not at all surprising, given that the references acknowledge that that the data cannot be relied upon to demonstrate data under specified conditions, such as those specified by the '854 patent. Thus, a POSITA would not and cannot rely upon them to determine whether this claim limitation is met.

163. For these reasons, it is my opinion that a POSITA would not rely upon coefficients of friction that do not comply with ASTM D1894, and would not rely upon any of the references relied upon by Petitioner. In addition, a POSITA would not be able to determine or conclude that the coefficient of friction data disclosed in the references relied upon by Petitioner as complying with ASTM D1894 (as does the '854 patent).

164. As a specific example, the '854 patent specifies 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." (Ex. 1001, 11:39-44). In addition the ASTM Coefficient of Friction ASTM D1894 standard test method specified in the '854 patent requires demonstration of coefficient of friction under additional precise conditions. For example, there is a standard normal force that must be disclosed and utilized, there is a standard specified area of materials that

must be disclosed and utilized, and the morphology of the materials must be disclosed and utilized, as I explained above.

165. None of the references disclose these conditions, and none suggest that the specific conditions required by ASTM D1894 (the specific conditions required by the '854 patent) are met. And, once again, I note that the references acknowledge that the data cannot be relied upon to demonstrate data under specified conditions, such as those specified by the '854 patent. Thus, a POSITA would not and cannot rely upon them to determine whether this claim limitation is met.

166. Next, Dr. Wang discussed Teflon and suggests that Teflon's low friction properties are observed in low coefficients of friction in interactions with a variety of diverse materials. (Ex. 1003, at Paragraph 108 and on). This does not confirm that the kinetic frictional coefficient between Teflon and nylon would be around 0.05 given any number of constructions or characteristics of the nylon material. To the contrary, and as acknowledged by the references that he relies upon and as I explain above, the data cannot be relied upon to demonstrate data under specified conditions, such as those specified by the '854 patent. For example, sliding interactions between Teflon (PTFE) and clean and dry steel are reported to have a frictional coefficient of between 0.05-0.2, and sliding interactions between Teflon and snow have a frictional coefficient of between 0.02 (dry at 0°C) and 0.05

(wet at 0°C). Ex. 1026, 7. And, interactions between Teflon and various metals are reported to have kinetic frictional coefficients ranging between 0.08 (Chromium moving on Teflon) and 0.27 (Steel moving on Teflon). Ex. 1027, 5. This data does not comply with ASTM D1894, and it also cannot be relied upon to demonstrate data under specified conditions, such as those specified by the ‘854 patent.

167. It is for these same reasons that I disagree with Dr. Wang’s opinions provided with respect to measured values of sliding (kinetic) coefficients of friction, including at Paragraph 109 and on. That Teflon may have “low friction” characteristics does not mean that whether Teflon is the fixed or sliding material, the coefficient of friction between Teflon and other materials necessarily remains “low” and certainly not within the claimed range of frictional coefficients.

168. For example, Dr. Wang references the table below and purports to summarize information related to the measured coefficients of friction between Teflon and various materials where Teflon is the fixed material and where Teflon is the moving material. Ex. 1027, 5.

Material Pair	Teflon as fixed material		Teflon as moving material	
	Static CoF	Kinetic CoF	Static CoF	Kinetic CoF
Teflon-Al alloy 6061-T6	0.24	0.19	0.19	0.18
Teflon-Cr plate	0.09	0.08	0.21	0.19

Teflon-Ni (0.001 P)	0.15	0.12	0.22	0.19
Teflon-Steel, 1032	0.27	0.27	0.18	0.16
Teflon-Ti-6Al-4V	0.17	0.14	0.23	0.21
Teflon-TiN (Magnagold)	0.15	0.12	0.16	0.11

169. This data does not comply with ASTM D1894, and it also cannot be relied upon to demonstrate data under specified conditions, such as those specified by the '854 patent, as explained above.

170. Next, Dr. Wang suggests that a coefficient of friction within the claimed range was inherent in Phillips' system that utilizes a Teflon slide surface and a nylon mesh layer. According to Dr. Wang, the frictional coefficient between a vehicle having a woven nylon bottom and a slide coated in Teflon (or indeed coated in nylon or various other materials disclosed by Phillips) would necessarily have a frictional coefficient within the claimed range because the coefficient of friction is a *property* of the interaction between the two surface materials (e.g., the ride vehicle bottom and the slide surface coating).

171. Dr. Wang is mistaken. While the coefficient of friction is a property of the interaction between the two surface materials, it is a property that depends on more than just the chemistry of the two surfaces, and further depends upon the morphology of the surfaces and how the coefficient or friction testing is performed.

Dr. Wang's own references acknowledge that coefficient of friction data cannot be relied upon to demonstrate data under specified conditions, such as those specified by the '854 patent. Thus, a POSITA would not and cannot rely upon them to determine whether this claim limitation is met, and it is pure speculation to suggest that coefficient between a vehicle having a woven nylon bottom and a slide coated in Teflon (or indeed coated in nylon or various other materials disclosed by Phillips) would necessarily have a frictional coefficient within the claimed range.

172. In short, Dr. Wang's reliance upon references that show a coefficient of friction that is well below 0.2—about 0.05—and thus within the claimed range. Ex. 1021, 1 (reporting sliding coefficient of friction for Teflon-nylon interaction as 0.05), cannot be relied upon to determine whether the coefficient of friction under the ASTM D1894 conditions specified in the '854 patent are satisfied. The measured coefficients of friction between materials may differ depending on which material is sliding over the other, the morphology of the material, and interactions between various materials and Teflon, such as reported in Ex. 1026, 5; Ex. 1021, 1, are not to be relied upon under the ASTM D1894 conditions specified in the '854 patent are satisfied.

173. The coefficient of friction of Phillips' slide system is also not confirmed by the fact that the materials described by Phillips have the same

chemistry as the '854 patent itself (which they indeed are not). Dr. Wang alleges that, like the '854 patent, Phillips teaches “Teflon” slide surface and “nylon” ride vehicle bottom. However, Phillips’ “recreational system” (Ex. 1004, 1:13-17) is not just like the system described in the '854 patent and does not use the same materials in terms of their morphology, and would not accordingly result in a coefficient of friction between 0.3 and 0.2 (as claimed) between the slide surface (Teflon) and ride vehicle bottom (nylon). *Compare* Ex. 1004, 4:43-46 (“nylon... Teflon...”) *with* Ex. 1001, 8:9-10 (“the lubricant, such as PTFE”) 7:40-41, 10:51-53 (“Nylon”). Accordingly, the slide and ride vehicle taught by Phillips would not have necessarily had a coefficient of friction within the claimed range. I understand that where the claimed device is substantially identical to the prior art device in structure and composition, the prior art device anticipates or renders obvious the claimed device. (Wang Declaration, at §§V.B-C). This is not the case here.

174. I note that the '854 patent acknowledges in the Background section that prior “typical” dry slides achieved a coefficient of friction within the claimed range:

“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.”.

Ex. 1001, 1:48-51. However, the typical dry slide did not incorporate the required mesh layer. As such, the reported data in the '854 patent has no applicability to the claims of the '854 patent.

175. Additionally, the '854 patent's claimed range of coefficients of friction is not so broad as to be meaningless in distinguishing over prior slide systems. The low end of the range is "0.03." This is a low frictional coefficient and the high end of the range is "0.2." As explained below, this is enabled by the '854 patent, and a POSITA would have, based on the teachings of the '854 patent, details as to how to achieve a coefficient of friction of 0.03 with the epoxy-based dry lubricant described in the '854 patent and various claims.

176. A POSITA would not have found it obvious from Phillips' teachings to select materials for the slide surface coating and ride vehicle from Phillips' list to achieve low friction below 0.2. Just because "low friction" has some benefits in the context of slides, this would not have prompted a POSITA to reduce coefficient of friction to achieve the claimed range. It would also not prompt a POSITA to rely upon the materials disclosed in Phillips to achieve the claimed range. That is because Fallgatter, as explained above, discloses that the coefficient of friction of the disclosed materials is greater than 0.25.

177. Accordingly, while Phillips provides specific examples of known low-friction materials, that would not have led a POSITA to achieve a coefficient of

friction of between about 0.2 and 0.03. As described above, a POSITA would not have been prompted to select Teflon and nylon materials that achieve low friction between slide surface and vehicle (e.g., below the 0.15 coefficient of friction value that was “typical” of dry slides). Here again, as explained above, the Teflon and nylon mesh would not have been predictably implemented to achieve a coefficient of friction of about 0.05, pursuant to the precise conditions specified in the ‘854 patent. In this regard, once again, the data reported at Ex. 1021, 1 (listing a dry coefficient of friction for Teflon-nylon interactions as 0.05) and Ex. 1026, 5, 7 is not reliable for the precise conditions specified in the ‘854 patent. These materials (e.g., nylon and Teflon) were not known by the Critical Date to have low frictional coefficients under the precise conditions specified in the ‘854 patent and a POSITA would therefore not have had a reasonable expectation of success in implementing Phillips’ slide system using nylon and Teflon materials for all of the reasons discussed above. Moreover, Fallgatter recognizes “that other materials may be available, or may become available, that may be operative 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].

178. 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.

179. 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.

180. 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.

181. That also does not demonstrate that the coefficient of friction between the two materials falls within the claimed range under the ASTM standards required by the '854 patent.

182. 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 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 could 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 fibers. To properly adhere monofilament fibers would require processing of the bottom of the ride vehicle before an attempt to adhere those fibers, or at a minimum would require an evaluation of whether such processing is required.

183. 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.

184. 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

185. 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)

186. 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

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.

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

Polyethylene

• Nylon Netting

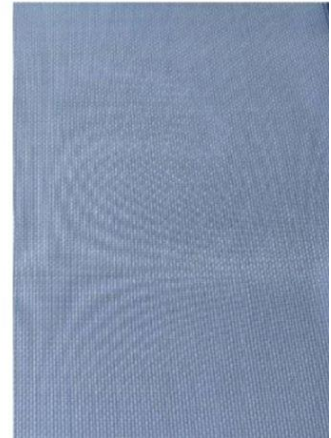
Polyester Netting

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

187. 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.

188. 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.

189. 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.

190. 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 based on the discussion shown below.

191. 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. Ex. 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.

192. 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. Ex. 1011 does not specify nylon mesh (in fact, it offers as examples bearings, gears, bushings, handles, and jacketing for wires, none of which are meshes), nor does WN0400 describe the mesh as having a low coefficient of friction. These details do not suggest to a POSITA that WN0400 provides a suitable example of a low friction woven nylon mesh, and to that extent Phillips would teach away.

193. 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 very different from a mesh.

b) Reasons Why A POSITA Would Not Employ The Combination

194. 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.

195. 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.

196. 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.

197. Dr. Wang's analysis of Ex. 1009 is, in my opinion, incorrect. It is notable that this reference demonstrates that the majority of the fabrics do not meet the claims limitations of the '854 patent. Details are shown in Figures 1 and 2 below, which plot the results from Ex. 1009 for the polymeric fabrics. The fabrics that are made of polyester, a component of some sailcloths and Dacron fabric, do not meet the claims limitations; however, as noted in the caption, all these fabrics have densities below what would be sold as sailcloth, and would require additional coating treatments. Based on the data in the tables of Ex. 1009, a POSITA would not be inclined to use a nylon fabric, or either Dacron or sailcloth fabric since they do not meet the claims of the '854 patent.

198. Instead, a POSITA would use a film or sheet. Benabdallah (Ex. 2025) performed COF measurements of nylon against polished aluminum, with one set of results shown in Figure 3. 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, lead to several observations: (1) The COF determined between two substrates 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 (Ex. 2025) is reporting static COF values, and the values for Kothari are dynamic. If Benabdallah (Ex. 2025) 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 2 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 2). However, Specimen 14 is listed as having the lowest

density (23 g/m² vs. 36 for the fine and 69 g/m² for the coarse). The trend of COF with mesh density is illustrated in Figure 4, 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.

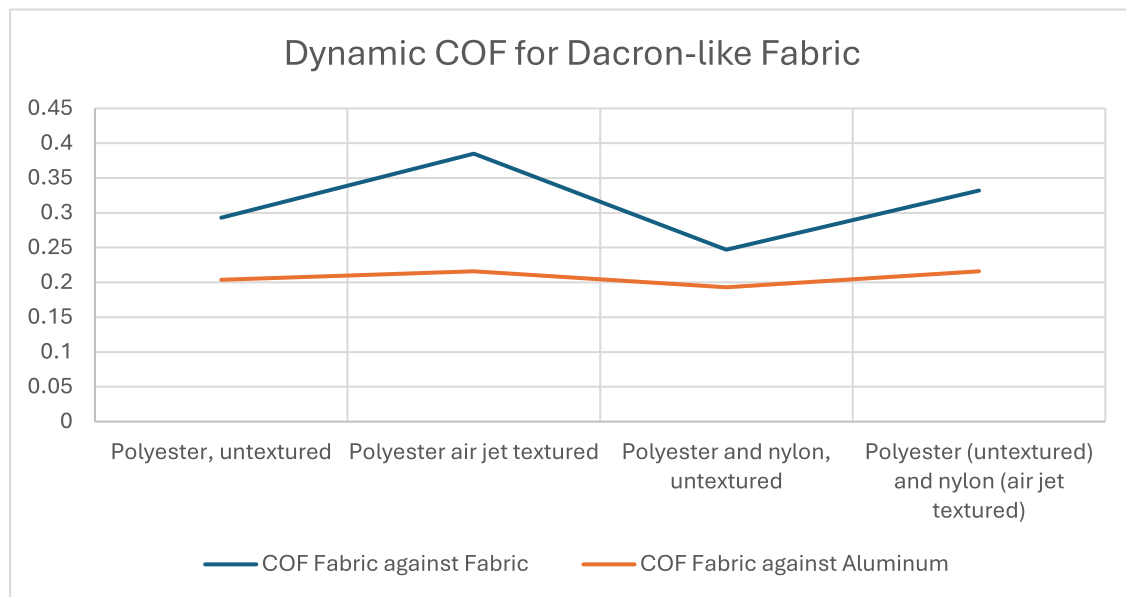


Figure 1: Dynamic coefficient of friction values reproduced from Kothari and Gangal, Tables 1 and 2. The blue area shows the claim range of the '854 patent. Only one of the fabrics has a COF in the claimed range. The polyester fabric is analogous to Dacron sailcloth. Based on the weights of the fabrics 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 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.

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)

³ See for example https://www.sailrite.com/shop/fabric/marine-fabric/sailcloth?srsId=AfmBOooKtVgfuRAhaF_skxS6IKy9Yk0pbSvcRhMm6MpVoHhq5lnmvxyX. (Ex. 2019)

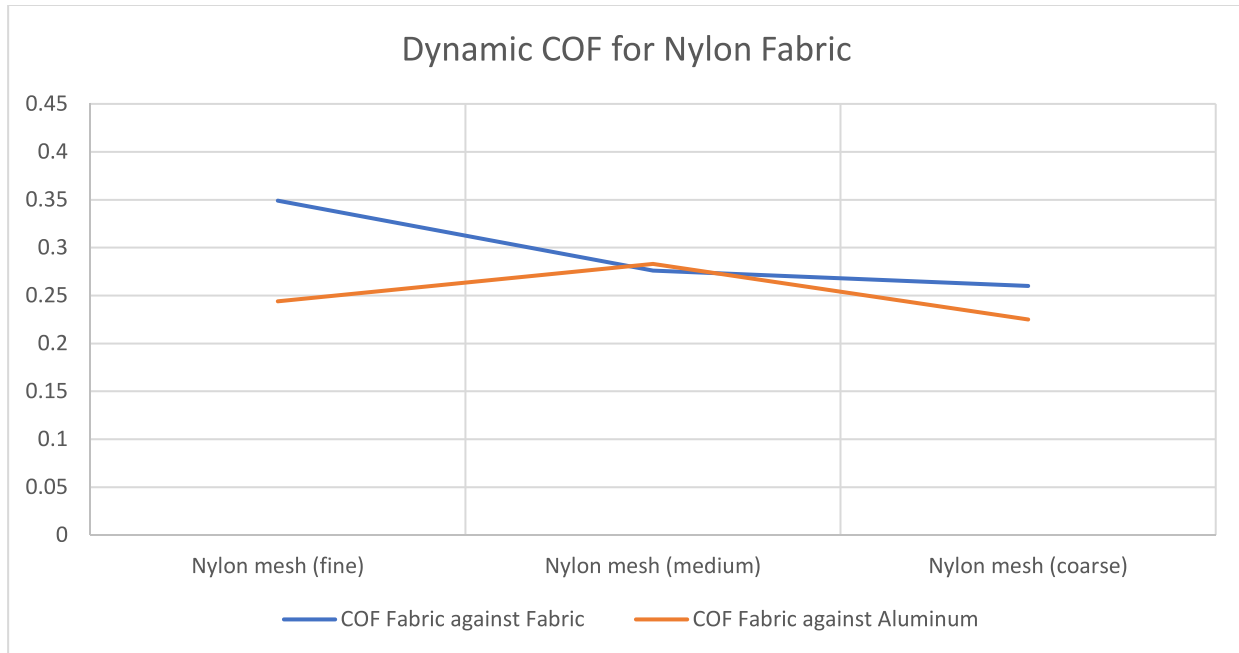


Figure 2: Dynamic coefficient of friction values reproduced from Kothari and Gangal, Tables 1 and 2 (the mesh description on the X-axis is based on Kothari's description, and not the actual properties of the mesh). The blue area shows the claim range of the '854 patent. None of the fabrics has a COF 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.

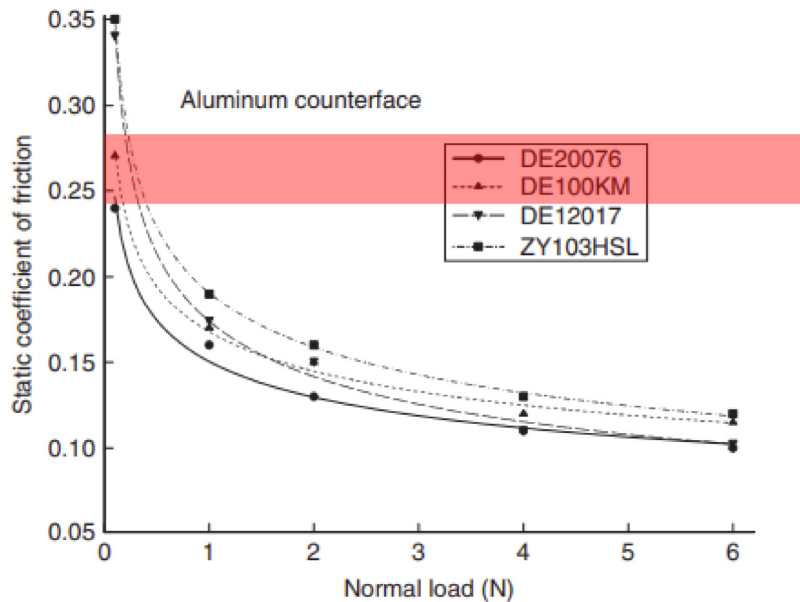


Figure 3: Reproduced from Benabdallah, Figure 4. ZY103HSL is described as a Nylon 66 injection-molded plate with a surface roughness of $R_a=0.3 \mu\text{m}$. The aluminum counterface was 6061 aluminum with a surface roughness of $R_a = 1.68 \mu\text{m}$. The red region shows the dynamic COFs obtained for nylon mesh against polished aluminum from Kothari and Gangal.

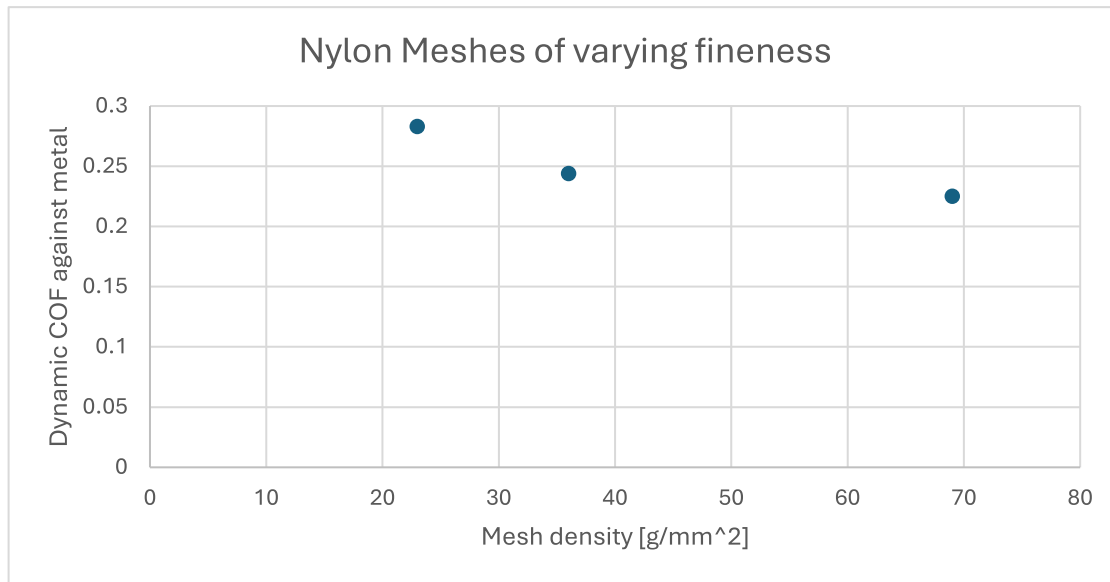
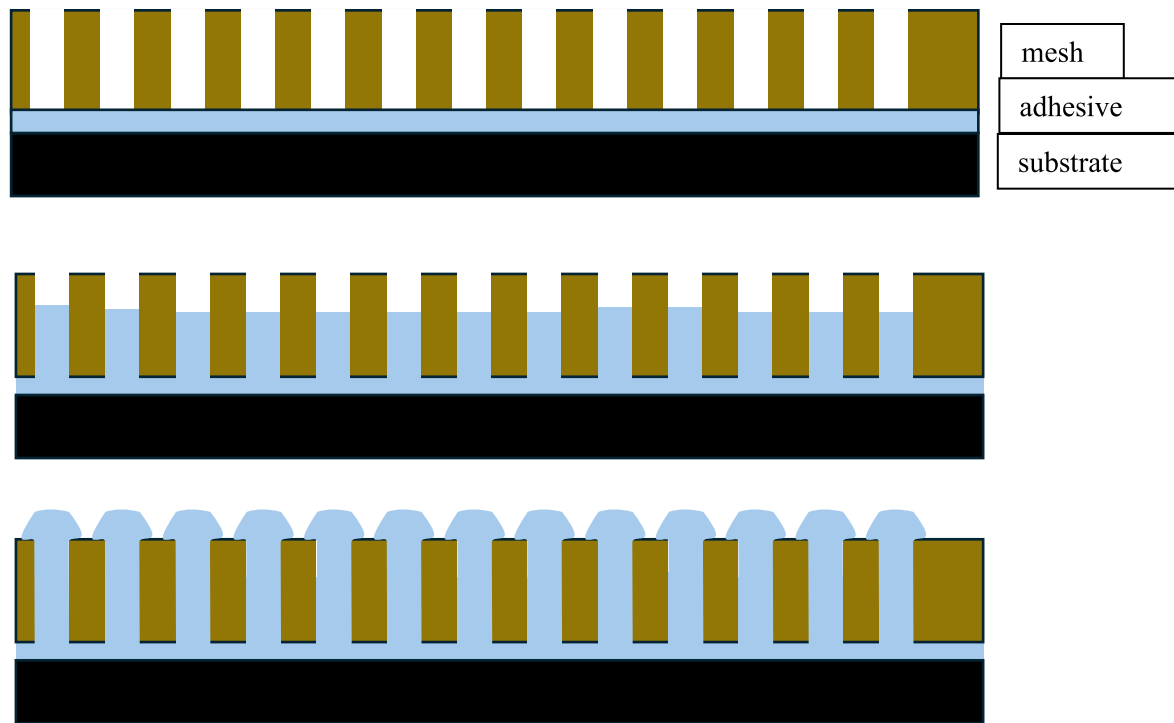


Figure 4: Dynamic coefficient of friction values reproduced from Kothari and Gangal, Tables 1 and 2. The trend shows that a lower mesh density has a higher COF.

199. 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 Exhibit 1009 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.

200. 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. Wicking action of adhesive through a mesh applied to a substrate is shown below. In this example, the adhesive becomes the friction bearing surface, not the mesh.



201. 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.

202. 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.

203. 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.

204. 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 not 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.

205. 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 that sheeting has frictional properties that are very different from 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.

206. 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.

207. 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 carefully designed adhesion process, to ensure proper affixing without compromising the low friction surface, assuming that would be even possible. In addition, Phillips teaches that adhesive is relied upon to affix to the bottom of the ride vehicle.

208. 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.

209. 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.

210. 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.

211. First issue is that 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/>) 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.

212. The second issue is that 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.

213. 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.

214. 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;

215. 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, a very different form from a mesh layer. In addition, as explained above, a POSITA would not have appreciated Phillips' suggestion of using nylon as a material to suggest that the WN0400 nylon mesh

would be a suitable form of the 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.

216. 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

217. 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

218. 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

219. 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 (Ex. 1005)

220. 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].

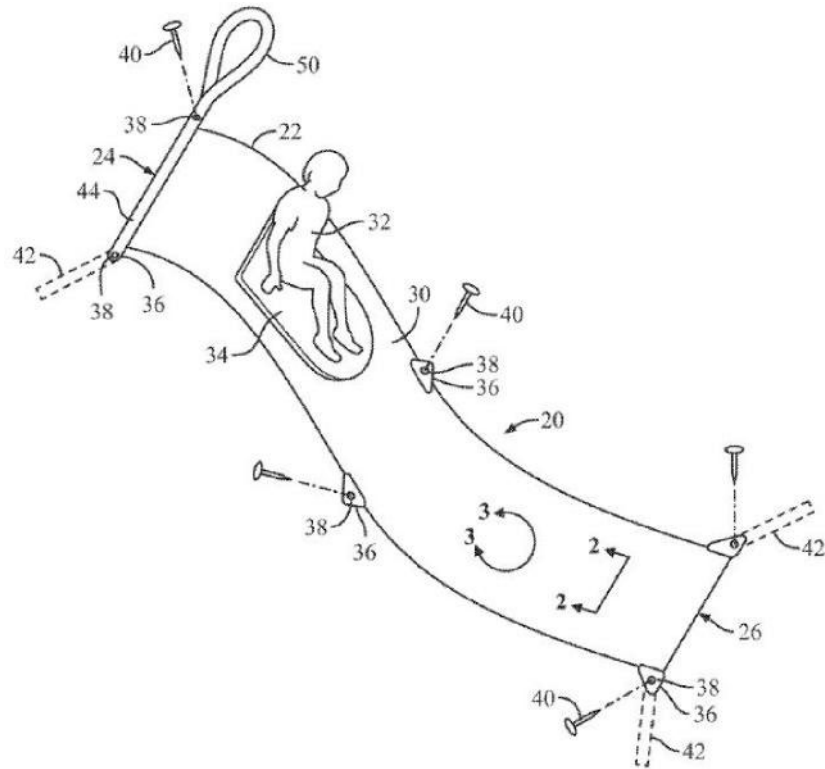


FIG. 1

Ex. 1005, Fig. 1

221. 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].

222. 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.

223. 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

224. 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 very different from and teaches away from a mesh layer. In addition, as I explained above, Phillip's disclosure of "low friction" does not disclose the claimed coefficient of friction. 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 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.

225. 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”).

226. 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 $COF < 0.25$. 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. Fallgatter hence teaches that the textile 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 $\text{COF} < 0.2$.

227. 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 with the properties specified in the '854 patent, as explained above.

228. 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;

229. As explained above, Phillips does not disclose a mesh layer. (Section VIII.B.). 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.

230. 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].

231. 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. In addition, a POSITA would assume that the material needs to be coated with a low friction material.

232. 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]).

233. Thus, a POSITA would understand that Fallgatter is not disclosing that the low friction surface is a nylon mesh layer, but rather a low coefficient material on top of a nylon textile or alternatively, a nonwoven textile.

234. 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.

235. 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 $\text{COF} < 0.25$, 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.

236. 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).

237. 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.

238. 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” (Ex. 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” (Ex. 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

239. 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

240. 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 (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;

241. 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.

242. As also explained above, the required mesh layer is not disclosed by Fallgatter. 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 low coefficient of friction surface is to be a nylon 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 as the low coefficient of friction surface. 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.

243. 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.

244. 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.

245. 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; E0x. 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.

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

b) Claims 2-7 and 14-17

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

c) Claims 22-26

248. See claims [22-26] (Ground 1A). *Supra* §§VIII.B.

d) Claims 27-28

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

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

250. 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.

251. 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. For example, molybdenum disulfide, a commonly used dry lubricant, can achieve coefficient of friction levels in this range (Vazirisereshk, M.R. et al, “Solid lubrication with MoS₂: A Review, Lubricants, 7, 57, 2019) (Ex. 2023). Similarly, diamond-like carbon is used as a solid lubricant with reported values from 0.001-0.05. (Berman, D., “Graphene: a new emerging lubricant,” Materials Today, vol 17(1), 30 2014) (Ex. 2024).

252. 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). They are also achievable as noted above.

253. Dr. Wang has not supported his position that a lubricant blended with a resin, a thermal conductor and a hardener would no longer effectively serve as a lubricant capable of achieving a coefficient of friction between 0.03 and 0.06, 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.

254. 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.

255. 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.

256. 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.

257. 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.

258. Contrary to Dr. Wang's suggestion, a POSITA would have recognized that heat effects from the short time that the ride vehicle slides over the slide surface are likely to be an important factor and would explain how to achieve a frictional coefficient between 0.03 and 0.06.

259. 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.

260. 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.

261. 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 INDEFINITE
UNDER 35 U.S.C. § 112**

262. 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

263. 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.

264. 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.

265. 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).

266. 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.

267. 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.

268. 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.

269. 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.

270. 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...” Ex. 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.

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

i. Claim 26 is not indefinite

272. 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.

273. 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.

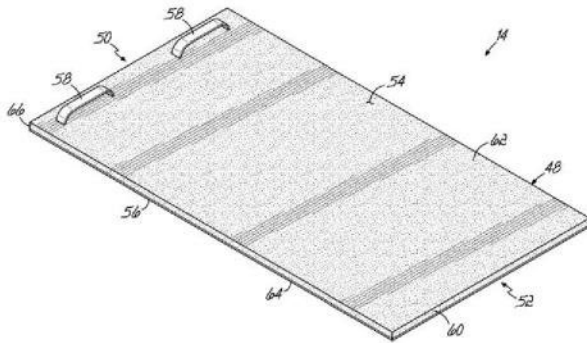


FIG. 3

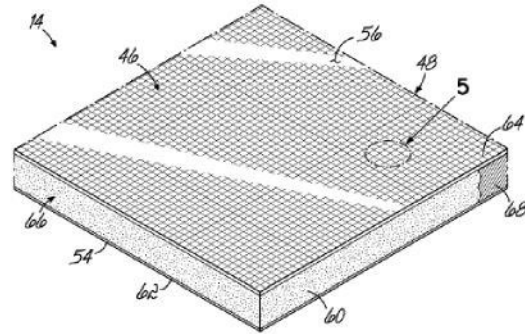


FIG. 4

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

274. 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.

275. 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.

276. 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.

277. 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 suggestion 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.

278. 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.”

279. 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.

280. 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

281. 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]	The recreational slide system of claim 8, wherein the dry lubricant material applied to the slide surface comprises: 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.
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. Stephen Spiegelberg

SIGNATURE: 

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APPENDIX-A

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EXPERIENCE

- 1996-present **Cambridge Polymer Group, Inc.** Boston, MA
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- 2017-2020 **De Novo Materials, LLC** Boston, MA
Co-founder and Principal. Developing novel materials and devices for the medical device field.
- 2007-2011 **Hydrospine, Inc.** Boston, MA
Co-founder and Chief Executive Officer. Building medical device technology for nucleus replacement in the intervertebral disc in the spine.
- 1998-1999 **Massachusetts Institute of Technology** Cambridge, MA
Post-doctoral research associate in Mechanical Engineering. Developed high temperature extensional rheometer for examination of polymer melts.
- 1993-1997 **Harvard University** Cambridge, MA
Post-doctoral research associate in the Division of Applied Sciences. Examined the extensional behavior of polymeric fluids through birefringence, imaging, and force measurements. Led a team of NASA engineers to design, fabricate, and test rheometer flown on an un-manned sounding rocket. Experience includes fluid preparation and rheological characterization, equipment design, integration and testing, writing of control and analysis code, and experimental verification of system.
- 1987 **Kimberly-Clark Corporation** Neenah, WI
Intern in adhesives laboratory. Synthesized and characterized novel pressure-sensitive adhesive.

EDUCATION

- Massachusetts Institute of Technology** Cambridge, MA
Ph.D. in Chemical Engineering, June 1993, minor in French. Thesis under Robert E. Cohen (ChE) and Ali S. Argon (ME): *Probing the Limits of Toughening by Diluent-Induced Localized Plasticization in Polymer Blends*.
Course Emphasis: Polymers, Fracture Mechanics
- University of Wisconsin-Madison** Madison, WI
B.S. in Chemical Engineering with honors, August 1988. Thesis under Stuart L. Cooper: *The Effects of Isopropyl Azodicarboxylate Modification on Polyisoprene and Polybutadiene*.
Course Emphasis: Polymers, Materials, Adhesives.
- University College London** London, England
Studied senior unit operations course as part of UW-Madison's overseas program.

AFFILIATIONS

ASTM: F04.15.17 Co-Chair on Medical Device Cleanliness
F04.11 Co-Chair on Acrylic Bone Cement
Member of F04, F42, F23, D20, E55
Secretary for Committee F04: 2014-2021
Board of Directors Nominating Committee: 2021, 2024
F04 Member-At-Large: 2022-2024
F04 ASTM Fellow: 2022
Technical lead on multiple polymer test standards
Subject matter expert support on standards for additive manufacturing, medical device cleaning, accelerated aging, medical grade plastic designation, UHMWPE, PEEK, PMMA, bone cement, hydrogels, analytical testing, and perfluoro-compound analysis.
Global Collaboration Forum for Personal Protective Equipment, Advisory Board Member: 2021-2023
Orthopedic Research Society
Reviewer of abstracts for presentations and posters (2011-2016)
FDA/CDRH/Staff College Faculty

JOURNAL REVIEWER

Biomacromolecules
Colloids and Interfaces
Computers and Fluids
Journal of ASTM International
Journal of Rheology
Journal of Biomaterials Science
Journal of Biomedical Materials Research
Journal of Polymer Engineering
Journal of Orthopaedic Research
Macromolecules

GRANT REVIEWER

American Chemical Society
NIH

RECEIVED GRANTS

NSF/SBIR/Phase I DMI-9661335 (PI) A Force Transducer for Normal Force Measurements in Shear Characterization of Polymeric Materials	01/01/1997-06/30/1997
NSF/SBIR/Phase I DMI-0060427 (PI) An Instrument for Swelling Measurements of Crosslinked Polymers	01/01/2001-06/30/2001
NIH/SBIR/Phase I 1 R43 CA247832-01 (PI) Preventing Pneumothorax During Transthoracic Lung Biopsy	09/18/2019 – 1/18/2021
NIH/SBIR/Phase 2	09/25/2022 – 9/25/2024

PANEL MEMBER

FDA Peer Review Panel (2005)

MARKETED INVENTIONS

CaBER™ capillary breakup extension rheometer, sold by ThermoFisher
ECiMA™ highly crosslinked UHMWPE, sold by Corin Group, Ltd.
E-MAX™ highly crosslinked UHMWPE, sold by Renovis Surgical
I-HIP™ using highly crosslinked UHMWPE, sold by Iconacy Orthopedic Implants
Vivacit-E™ highly crosslinked UHMWPE, sold by Zimmer-Biomet
iPoly XE™ highly crosslinked UHMWPE, sold by Conformis
iBalance highly crosslinked UHMWPE, sold by Arthrex
Novation XLE Vitamin E polyethylene, sold by Exactech

OUTREACH

Participant in Boston Private Industry Council Biotech Career Panel and Shadow Day (2006-2008)
Judge in MIT Program in Polymer Science and Technology poster contest (2011-2013, 2019)
Member of Winchester Conservation Commission (2007 - 2011)
University of Wisconsin-Madison Chemical Engineering Visiting Committee, 2017-2021
Lecturer at Northeastern University in biomedical materials and device design (2018-present)
Animal Rescue League of Boston, Advisory Committee (2018-present), Board member (2024-present)

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38. Muratoglu, O., Spiegelberg, S.H., "Cross-linking of antioxidant-containing polymers," US Patent 9441081 September 13 (2016).
39. Muratoglu, O., Spiegelberg, S.H. "Methods for Making Oxidation Resistant Polymeric Material," US Patent 9561306, February 7 (2017).
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42. Muratoglu, O., Spiegelberg, S.H. "Methods for Making Oxidation Resistant Polymeric Material," US Patent 10821632, Nov 3 (2020).

AWARDS/CITATIONS

ASTM Award of Appreciation, Committee F04 on Medical and Surgical Materials and Devices, 2001
 ASTM Robert E. Fairer Award, 2004.
 ASTM Award of Appreciation, Committee F04 on Medical and Surgical Materials and Devices, 2011.
 ASTM Leroy Wyman Engineering Award, 2012.
 University of Wisconsin-Madison College of Engineering Distinguished Achievement Award, 2017.

ASTM Patrick G. Laing Award, 2018.

ASTM Award of Merit, Committee F04 on Medical and Surgical Materials and Devices, 2022.

CONFERENCE PRESENTATIONS/POSTERS

1. Spiegelberg, S., Bader, R., “Considering a medical device manufacturing change? Also consider the risks,” MEDevice Boston, Sept 25, Boston, MA (2024).
2. Malito, L.G., Kozak, A., Spiegelberg, S., Bellare, A., Pruitt, L. “Characterization methods for structure-property relationships in clinical formulations of UHMWPE,” 8th International UHMWPE Meeting, October 19th, Torino, Italy (2017).
3. Bellare, A., Spiegelberg, S.H., “Increasing the toughness of PEEK-hydroxyapatite composites,” 3rd Annual PEEK Conference, April 27-28th, Washington, DC (2017).
4. Kozak, A., Leisinger, S., Spiegelberg, S., Narayan, V., “Fatigue crack propagation testing in UHMWPE,” 7th International UHMWPE Conference, October 22-23rd, Philadelphia, PA (2015). (poster).
5. Bellare, A., Kozak, A., Spiegelberg, S.H., “The role of thermal history on the semi-crystalline morphology and impact strength of PEEK,” 2nd International PEEK Conference, April 23-24, Washington, DC. (2015). (poster)
6. Spiegelberg, S.H., Kozak, A., Bellare, A., “Morphology and impact strength of PEEK containing hydroxyapatite,” 2nd Annual PEEK Conference, April 23-24, Washington, DC. (2015).
7. Turner, N., Spiegelberg, S., Le, K.-P., Song, L., “Molecular weight characterization to assess aging in ultra-high molecular weight polyethylene,” *Orthopaedic Research Society*, 60th Annual Meeting, Las Vegas, NV (2015). (poster)
8. Spiegelberg, S.H. “Failure analysis in medical applications of polymeric materials,” MedTech Polymers 2013, Houston, TX (2013).
9. Bellare, A., Le, K.-P., Yau, S.-S., Spiegelberg, S., “Macromolecular and morphological characterization of medical grade PEEK polymers,” 1st International PEEK Meeting, Philadelphia, PA (2013).
10. Spiegelberg, S., Segura, C., Peiserich, M., Rufner, A., “A comparison of small punch results on aged highly crosslinked UHMWPE,” *Society for Biomaterials*, Annual Meeting, Boston, MA (2013). (poster)
11. Spiegelberg, S., Turner, N., Wilson-Hill, T., Pletcher, D., Rufner, A., Miller, D. “Extraction analysis of Vitamin E-grafted polyethylene,” *Society for Biomaterials*, Annual Meeting, Boston, MA (2013).
12. Braithwaite, G.J.C., Spiegelberg, S.H., Stark, N., Guo, N., Rufner, A., Freiberg, A. “Evidence of permanent oxidative stabilization of bearing materials in crosslinked Vitamin E grafted polyethylene,” *American Association of Orthopedic Surgeons*, Annual Meeting, Chicago, IL (2013).
13. Besemer, D; Guo, M; Rufner, A; Pletcher, D; Stark, N., Spiegelberg, S., “Evidence of Vitamin E Grafting to Polyethylene,” *Orthopaedic Research Society*, 58th Annual Meeting, San Antonio, TX, p. 1055 (2013). (poster)
14. Spiegelberg, S.H. “The use of antioxidants in plastics for medical applications,” AMI conference on Medical Grade Polymers, Philadelphia, PA (2011).
15. Spiegelberg, S.H., “Assessing the Cleanliness of Medical Devices,” AMI conference on Medical Grade Polymers, Philadelphia, PA (2010).
16. Braithwaite, G.J.C.; Heuer, E.G.; Miller, B.L.; Thomas, B.; Spiegelberg, S.H.; “Ranking Antioxidant Activity by Oxidation Induction Time,” *Orthopaedic Research Society*, 56th Annual Meeting, New Orleans, LA (2010). (poster)
17. Braithwaite, G.J.C.; McCormack, C.A.M.; Berlin, J.A.; Spiegelberg, S.H.; “Towards an artificial functional spinal unit for long-term in vitro testing,” *Orthopaedic Research Society*, 56th Annual Meeting, New Orleans, LA (2010). (poster)

18. Muratoglu, O.K., Burroughs, B.R., Malhi, A., Christensen, S.D., Wannomae, K.K., Oral, E., Spiegelberg, S.H., Harris, W.H., "Two Second Generation Highly Crosslinked UHMWPEs Show Improved Mechanical Properties and Fatigue Strength," *Orthopaedic Research Society*, 51st Annual Meeting, Washington, DC (2005).
19. Bhattacharyya, S., Spiegelberg, S.H., Harris, W.H., Muratoglu, O.K., "Mechanical Elimination of Free Radicals in UHMWPE After Radiation" *Orthopaedic Research Society*, 50th Annual Meeting, San Francisco, CA (2004).
20. Bhattacharyya, S., Matrisciano, L., Spiegelberg, S.H., Harris, W.H., Muratoglu, O.K., "Mechanical Elimination of Residual Free Radicals in an Irradiated UHMWPE Rod: Advantages Over Melting," *Orthopaedic Research Society*, 50th Annual Meeting, San Francisco, CA (2004). (poster)
21. Spiegelberg, S. "ASTM Activities for Assessing Cleanliness of Medical Devices," *Materials & Processes for Medical Devices*, ASM International, Anaheim, CA (2003).
22. Campbell, P., Spiegelberg, S., McKellop, H. "Assessment Of Contamination On Hip Simulator Particles Used For In Vitro Testing Assessment Of Contamination On Hip Simulator Particles Used For In Vitro Testing," *Society for Biomaterials*, 29th Annual Meeting, Reno, NV (2003). (poster)
23. Greenbaum, E.S.; Muratoglu, O.K.; Spiegelberg, S.H.; Harris, W.H. "Ultrasonic Radiation: An Unsuccessful Method for Eliminating Residual Free Radicals in Irradiated UHMWPE," *Society for Biomaterials*, 29th Annual Meeting, Reno, NV (2003). (poster)
24. Spiegelberg, S.H.; Deluzio, K.J.; Muratoglu, O.K. "Extractable Residue from Recalled Inter-Op Acetabular Shells, " *Orthopaedic Research Society*, 49th Annual Meeting, New Orleans, LA, p. 1346 (2003). (poster)
25. Greenbaum, E.S.; Muratoglu, O.K.; Spiegelberg, S.H.; Harris, W.H. "Ultrasonic Radiation: An Unsuccessful Method for Eliminating Residual Free Radicals in Irradiated UHMWPE," *Orthopaedic Research Society*, 49th Annual Meeting, New Orleans, LA (2003). (poster)
26. Perinchief, R.S., Muratoglu, O.K., Spiegelberg, S.H., Harris, W.H., "On the surface morphology of surgically retrieved UHMWPE tibial knee inserts," *Society for Biomaterials*, 28th Annual Meeting, Tampa, FL (2002).
27. Muratoglu, O.K., Perinchief, R.S., Spiegelberg, S.H., Bragdon, C.R., O'Connor, D.O., Rubash, H.E., Jasty, M., Harris, W.H., "On the changes of adhesive/abrasive wear mechanism of polyethylene tibial knee inserts upon crosslinking: an *in vitro* simulated gait study," *Society for Biomaterials*, 28th Annual Meeting, Tampa, FL (2002) (poster).
28. Spiegelberg, S.; Kurtz, S.; Muratoglu, O.; Greer, K.; Costa, L.; Wallace, S.; Cooper, S., "Interlaboratory reproducibility of swell ratio measurements for crosslinked UHMWPE," *Orthopaedic Research Society*, 47th Annual Meeting, Dallas, TX (2002). (poster)
29. Muratoglu, O.K.; Perinchief, R.S.; Jasty, M.; Rubash, H.E.; Bragdon, C.R.; Harris, W.H.; Spiegelberg, S.H.; O'Connor, D.O.; "On the changes of an adhesive/abrasive wear mechanism of polyethylene tibial knee inserts upon crosslinking: an *in vitro* simulated gait study," *Orthopaedic Research Society*, 47th Annual Meeting, Dallas, TX (2002). (poster)
30. Braithwaite, G.J.C., Spiegelberg, S.H., "A Technique for Characterizing Complex Polymer Solutions in Extensional Flows," *Society of Rheology*, 72nd Annual Meeting, Hiltonhead, SC (2001).
31. Braithwaite, G.J.C., Spiegelberg, S.H., "Capillary breakup to determine the extensional properties of polymeric fluids," *Northeastern Meeting of the American Chemical Society*, Durham, NH (2001).
32. Spiegelberg, S.H., Schaffner, S., "The determination of accelerated aging conditions to simulate the oxidation observed in shelf-aged gamma-sterilized UHMWPE liners," *Society for Biomaterials*, 26th Annual Meeting, Kono, HI (2000).
33. Kurtz, S., Muratoglu, O., Gsell, R., Buchanan, F., Currier, B., Greer, K., Gualtieri, G., Johnson, R., Schaffner, S., Sevo, K., Shen, F., Spiegelberg, S., Yau, S., "Interinstitutional reproducibility study of standard accelerated aging methods for ultrahigh molecular weight polyethylene," *Orthopaedic Research Society*, 46th Annual Meeting, Orlando, FL (2000).

34. Edidin, A., Muth, J., Spiegelberg, S., Schaffner, S., "Sterilization of UHMWPE in nitrogen prevents oxidative degradation for more than 10 years," *Orthopaedic Research Society*, 46th Annual Meeting, Orlando, FL (2000).
35. Schaffner, S., Spiegelberg, S.H., "The calibration of an accelerated aging model to simulate the oxidation observed in shelf-aged, gamma-sterilized UHMWPE liners," *Orthopaedic Research Society*, 46th Annual Meeting, Orlando, FL (2000). (poster)
36. Tripathi, A., Spiegelberg, S.H., and McKinley, G.H., "Studying the extensional flow and breakup of complex fluids using filament rheometers," *Int. Congress of Rheology*, Cambridge, UK (2000).
37. Spiegelberg, S.H., Kurtz, S.M., Edidin, A.A., "Effects of molecular weight distribution on the network properties of radiation- and chemically-crosslinked ultra high molecular weight polyethylene," *Society for Biomaterials*, 25th Annual Meeting, Providence, RI (1999).
38. Spiegelberg, S.H., Schaffner, S.R., "Oxidation profiles in shelf-stored ultra high molecular weight polyethylene samples," *Society for Biomaterials*, 25th Annual Meeting, Providence, RI (1999).
39. Spiegelberg, S.H., McKinley, G.H., "A Source of Interfacial Porosity in Cemented Femoral Stems," *Orthopaedic Research Society*, Anaheim, CA, (1999).
40. Spiegelberg, S.H., McKinley, G.H., "Characterization of the curing of acrylic bone cement using multiharmonic frequency analysis," *Society for Biomaterials*, San Diego, CA (1998). (poster)
41. Spiegelberg, S.H., McKinley, G.H., "Extensional Viscosity and Birefringence Measurements of Viscous Polymer Solutions in Filament Stretching Flows," *AIChE '96*, Chicago, IL (1996).
42. Spiegelberg, S.H., McKinley, G.H., "Elastic and Viscous Contributions to Stress in Extensional Rheometry of Viscous Polymer Solutions," *XIth Int. Cong. on Rheol.*, Quebec City, Quebec (1996). (poster)
43. Spiegelberg, S.H., McKinley, G.H., "The Extensional Rheology of Non-Newtonian Materials," *Third Microgravity Fluid Physics Conference*, NASA-LeRC, Cleveland, OH (1996).
44. Spiegelberg, S.H., McKinley, G.H., "Experimental Observations in Extensional Flows of Viscous Polymer Solutions," *Unresolved Experimental Dilemmas*, University of Wales, UK (1996).
45. Spiegelberg, S.H., Ables, D.C., and McKinley, G.H., "Extensional Rheology of Polymer Solutions: Polystyrene Boger Fluids," *AIChE '95*, Miami, FL, (1995).
46. Pakdel, P., Spiegelberg, S.H., and McKinley, G.H., "Cavity Flow of Viscoelastic Fluids," *AIChE '95*, Miami, FL, (1995).
47. Spiegelberg, S.H., Ables, D.C., and McKinley, G.H., "Extensional Behavior of Polymer Solutions," *Society of Rheology 67th Annual Meeting*, Sacramento, CA (1995).
48. Spiegelberg, S.H., and McKinley, G.H., "Generation and Deformation of Newtonian and Non-Newtonian Liquid Bridges," *AIChE '94*, San Francisco, CA, (1994).
49. Spiegelberg, S.H., Gaudet, S., and McKinley, G.H., "The Extensional Rheology of Non-Newtonian Materials," *Second Microgravity Fluid Physics Conference*, NASA-LeRC, Cleveland, OH (1994).
50. Spiegelberg, S.H., Argon, A.S., and Cohen, R.E., "Limits of Toughening by Localized Plasticization," *ANTEC '93*, New Orleans, LA (1993).
51. Spiegelberg, S.H., Argon, A.S., and Cohen, R.E., "Measurements of Craze Velocities in Polystyrene/Polybutadiene Blends," *MRS Symposium*, San Francisco, CA (1992).
52. Spiegelberg, S.H., Argon, A.S., and Cohen, R.E., "Measurements of Craze Velocities in Glassy Polystyrene in the Presence of Low Molecular Weight Polybutadiene Diluents," *ACS Fall Meeting*, Washington, DC, (1990).

SHORT COURSES/SYMPOSIUMS/WORKSHOPS

1. Workshop on "Precision and Bias in ASTM Standards," ASTM F04, May 7th, 2024, Philadelphia, PA (workshop co-chair). Presentation on "Lessons learned in bone cement ILS"
2. Workshop on "Setting Acceptance Limits for Cleaning Validation of Medical Devices," ASTM F04, May 9th, 2023, Denver, CO (workshop co-chair and organizer).

3. Workshop on “Fast-Tracking Standards Development to Address Personal Protective Equipment (PPE) Shortages due to the COVID-19 Pandemic,” ASTM F23/F04 Virtual Workshop, Sept 9-10, 2020 (workshop co-chair).
4. “Accelerated Aging of Medical Devices,” ASTM Workshop on Accelerated Aging Methods and Testing Techniques for Medical Devices, May 14, 2019, Denver, CO (workshop co-chair and organizer).
5. “Size (and shape) matter: Challenges and Strategies for difficult molecular weight and polymer architecture analysis,” ASTM D20 Workshop on Polymer Characterization, Nov 8, 2018, Washington, DC.
6. “Heater-Cooler Systems,” presented at the Workshop on Reprocessing of Re-usable Medical Devices, ASTM Workshop, Nov 11, 2016, Orlando, FL (workshop co-chairman and organizer).
7. “Medical Device Cleaning: Design, Clean, Verify,” Reprocessing of Reusable Medical Devices, FDA Public Workshop, Silver Spring, MD, June 8-9, 2011.
8. “Medical Device Cleanliness: How Clean is Clean Enough?,” ASTM Workshop, San Antonio, TX (2010). (workshop chairman and organizer).
9. “From Explantation to Analysis: the black hole in medical explant shipping,” ASTM Workshop, Miami FL (2008). (workshop chair and organizer).
10. ASTM Symposium on Cleanliness of Biomedical Devices, Reno, NV (2005). (symposium chair and organizer).
11. “ASTM Activities in Cleanliness of Biomedical Devices,” ASTM Workshop on *The Art and Science of Cleanliness in Biomedical Devices*, Kansas City, MO (2003). (workshop chair and organizer).
12. “Analytical techniques for assessing the effects of radiation on UHMWPE,” *Society for Biomaterials*, 27th Annual Meeting, St. Paul, MN (2001).
13. Spiegelberg, S.H., and McKinley, G.H., “Rheology and the non-Newtonian Fluid Dynamics in the Processing of Polymeric Materials,” *presented at the NASA Lewis Research Center*, Cleveland, June (1995).

INVITED LECTURES

1. “What is that residue? When visual assessment and TOC is not enough in cleaning testing,” Cleaning Validation Summit 2022, (PharmaEd Resources), San Diego, CA December 1-2 (2022).
2. “ASTM Activities in Cleaning Validation,” Cleaning Validation Summit 2021 (PharmaEd Resources), San Diego, CA, February 11 (2021).
3. “ASTM Activities in Cleaning Validation,” Cleaning Validation Summit 2019 (PharmaEd Resources), San Diego, CA, October 9 (2019).
4. “ASTM Activities in Cleaning Validation,” Cleaning Validation Summit 2018 (PharmaEd Resources), Philadelphia, PA, September 12 (2018).
5. “ASTM Activities in Cleaning Validation,” Cleaning Validation Summit 2017 (PharmaEd Resources), Philadelphia, PA, October 3 (2017).
6. “Developing a Testing Plan for Medical Device Design Verification,” MD&M East, New York NY, June 14 (2017).
7. “Lessons in Poly,” Arthroplasty Orthopedic Technology & Innovation Forum, sponsored by Arthrex, Naples, FL, April 7, (2017).
8. “ASTM Material Test Methods for Analytical Testing and Assessing Device Cleanliness,” Peru Workshop on Medical Device Regulation and Standards (ANSI/INACAL), Lima, Peru, January 25-26, (2017).
9. “Refurbishing, reconditioning, rebuilding, remarketing, remanufacturing, and services of medical devices performed by third party entities and original equipment manufacturers,” Panel member discussion at FDA public forum, Silver Springs, MD, October 27-28, (2016).
10. “From Implantables to Wearables: The Biocompatibility and Regulatory Requirements,” Panel member discussion at ANTEC/SPE 2016, Indianapolis, IN, May 22nd (2016).
11. Spiegelberg, S.H., “Biomedical Applications of Hydrogels,” Empirical Testing Seminar Series, American Academy of Orthopedic Surgeons, March 26-27, Las Vegas, NV (2015).

12. Spiegelberg, S.H. "Failure analysis in medical applications of polymeric materials," MD&M Chicago, October 16 (2014).
13. Spiegelberg, S.H. "Advanced Solutions: Vivacit-E Polyethylene Technologies," American Academy of Orthopedic Surgeons, Zimmer Exhibition, March 13 (2014).
14. "Biomedical applications and considerations for hydrogels," FX conferences webinar, August 7, 2012. <http://www.fxconferences.com/Biomedical-Applications-and-Considerations-for-Hydrogels-P985.aspx>
15. "Are all crosslinked UHMWPEs equal?," Biomet E-Volve Webinar, broadcast on March 10, 2009. http://www.orlive.com/biomet/videos/e-volve-?cmpid=active_redirect
16. "E-Poly HXLPE Technology," Biomet lecture series, (October 2, Chicago, IL; October 16, St. Louis, MO; December 4, Atlanta, GE) 2008.
17. "Assessing the Cleanliness of Medical Devices," Orthopaedic Manufacturing & Technology Exposition and Conference, OMTEC 2007, June 20-21st, Rosemont, IL, 2007.
18. "The Rheological Characterization of Materials for Biomedical Applications," TA Instruments User Conference, Newport, RI, May 9-10, 2006.
19. "Case studies on the impact of medical device cleanliness on clinical performance," Johnson & Johnson Symposium on Correlating Preclinical Models to Clinical Outcomes, Newark, NJ, December 7, 2005.
20. "Characterization of crosslinked UHMWPE", *UHMWPE for Arthroplasty: from synthesis to implant*, University of Torino, Torino, Italy, March 18, 2005.
21. "Retrieval analysis of highly crosslinked PE in TKA," 2nd Annual Tribology Forum, European Federation of National Associations of Orthopaedics and Traumatology 6th Annual Congress, Helsinki, Finland, June 8th, 2003.
22. "Analytical techniques to assess biomedical components", Department of Physics Seminar Series, University of Memphis, Memphis TN, February 2003.
23. "Analytical techniques to assess biomedical components," *Surfaces in Biomaterials Lecture Series*, FDA/Center for Devices and Radiological Health, Rockville, MD, February 4, 2002.
24. "Analytical techniques for assessing the effects of radiation on UHMWPE," UHMWPE workshop at the American Standard Testing Materials Conference, Phoenix, AZ, May 8, 2001.
25. "Inter-Op: A Scientific Analysis," Sulzer Orthopedics 11th Annual Total Knee, Hip and Shoulder Arthroplasty Seminar, Avon, CO, August 16, 2001.
26. "Analytical techniques for assessing the effects of radiation on UHMWPE," International Atomic Energy Agency Consultant's Meeting on *Post-Irradiation Stability of Radiation Sterilized Medical Implants*, University of Maryland, Aug. 29, 2000.
27. "Analysis of the transient behavior of biopolymers with DSC and Rheology," plenary talk at Thermal Analysis Fall Workshop, Framingham, MA, Dec 14, 1999.
28. "Analysis of the transient behavior of biopolymers with DSC and Rheology," plenary talk at Midwest Thermal Analysis Spring Symposium, MN, Vadnais Heights, April 21, 1999.
29. "Extensional Rheometry of Polymer Solutions," Department of Chemical Engineering Seminar Series, Brigham Young University, Provo, UT, February 18, 1999.