

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent of: Gary Schmit
U.S. Patent No.: 11,998,854 Attorney Docket No. 58544-0002PS1
Issue Date: June 4, 2024
Appl. Serial No.: 18/349,347
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Title: LOW-FRICTION RECREATIONAL SLIDE SYSTEM

DECLARATION OF DR. YOUJIANG WANG

I hereby declare that all statements made of my own knowledge are true and that all statements made on information and belief are believed to be true. I further declare that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of the Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patents issued thereon.

Dated: October 9, 2024

By: 

Dr. Youjiang Wang

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I, Dr. Youjiang Wang Ph.D., of Atlanta, Georgia, declare that:

I. INTRODUCTION AND SCOPE OF WORK

1. I have been retained by Fish & Richardson P.C., on behalf of UATP IP, LLC (“Petitioner”), as an independent expert consultant in this post grant review (“PPR”) proceeding before the United States Patent and Trademark Office.

2. I have been asked by Petitioner’s Counsel (“Counsel”) to consider 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”) (UATP-1001). My opinions and the bases for my opinions are set forth below. My opinions are based on my education in mechanical engineering and textile engineering, as well as my work and research regarding textile engineering and the textile manufacturing industry.

3. In writing this Declaration, I have considered the following: 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.

4. 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

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

6. I earned a Ph.D. degree in Mechanical Engineering, with a Minor in Electrical Engineering and Computer Science, from the Massachusetts Institute of Technology (1989), an M.S. degree in Mechanical Engineering from the Massachusetts Institute of Technology (1985), and a B.S. degree in Textile Engineering from Donghua University in Shanghai, China (1982).

7. I am member of the Editorial Board of the *Textile Research Journal*, *Journal of Industrial Textiles*, *Journal of Fiber Bioengineering and Informatics*, and *Textiles and Clothing Sustainability*. I am an American Society of Mechanical Engineers Fellow. I served as chair of the Textile Engineering Division of the American Society of Mechanical Engineers from 2001-2002. I am also a professional engineer, registered with the State of Georgia since 1996.

8. I am currently a Professor (with tenure) in the School of Materials Science and Engineering at the Georgia Institute of Technology, where I teach Introduction to Textile Engineering, Fiber Science, Structure & Properties of

Polymers, Yarn & Fabric Formation Processes; Mechanics of Textile Structures, Carpet Technology, Textile Testing; Advanced Fiber Science, Fiber Mechanics; Composite Materials & Processing; and Engineering Mechanics – Statics, Polymer/Fiber Enterprises.

9. I have conducted research in the areas of dynamic analysis of yarn processing machinery and fiber dynamic friction characteristics, among other areas.

10. I am a named inventor of five issued U.S. patents relating to creeling devices and/or fabric structures: U.S. Pat. Nos. 6,260,783 (Automated Yarn Creeling Device); 8,082,761 (Method of Forming Integrated Multilayer Fabrics); 8,161,775 (Integrated Hollow Fabric Structure); 8,341,980 (Integrated Multiaxial Articles); and 8,653,194 (Quasi-Melt Processes for Single Polymer Composites and Products Thereof).

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 (UATP-1001) and relevant excerpts of its prosecution history (UATP-1002). For purposes of this Declaration, I am using November 1, 2022 as the Critical Date.

13. As part of my independent analysis for this Declaration, I have considered the following: my own knowledge and experience, including my work experience in the fields of textiles and materials; my experience in teaching those subjects; and my experience in working with others involved in those fields; the common knowledge of persons of ordinary skill prior to the Critical Date; the following publications and materials:

- U.S. Patent No. 11,998,854 to Schmit (“the ’854 patent”) (UATP-1001)
- Excerpts from the Prosecution History of the ’854 Patent (“the Prosecution History”) (UATP-1002)
- U.S. Patent No. 7,896,779 to Phillips (“Phillips”) (UATP-1004)
- U.S. Patent Publication No. 2023/0129814 to Fallgatter (“Fallgatter”) (UATP-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”) (UATP-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>) (UATP-1007)

- 6.2 *Friction*, University Physics Volume 1, openstax (retrieved from <https://openstax.org/books/university-physics-volume-1/pages/6-2-friction>) (UATP-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 (UATP-1009)
- W. Zurek et al., *Surface Frictional Resistance of Fabrics Woven from Filament Yarns*, Textile Research Journal, Vol. 55, No. 2 (1985), 113-121 (UATP-1010)
- W.D. Callister, *Materials Science and Engineering An Introduction*, ed. 7, John Wiley & Sons, Inc. (2007) (UATP-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> (UATP-1012)
- M. Watanabe, *The Frictional Properties of Nylon*, Wear, 12 (1968) 185-191 (UATP-1013)
- British Patent Publication No. 402,259 to Wicksteed (UATP-1014)

- *World's First Children's slide*, BBC NewsRound, April 17, 2012
(retrieved from <https://www.bbc.co.uk/newsround/17747678>) (UATP-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 (UATP-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>) (UATP-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/>) (UATP-1018)
- L. Nichols, *The Physics of a Playground Slide*, Sciencing.com (April 24, 2017) (retrieved from <https://sciencing.com/physics-playground-slide-8657662.html>) (UATP-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/>) (UATP-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) (UATP-1021)
- U.S. Patent No. 5,246,401 to Boatwright (UATP-1022)
- U.S. Patent No. 6,142,879 to Phillips (UATP-1023)
- U.S. Patent No. 8,695,994 to Maratta (UATP-1024)
- U.S. Patent No. 6,231,483 to Phillips (UATP-1025)
- *Friction: Friction Coefficients and Calculator*, The Engineering Toolbox (2004) (retrieved from https://www.engineeringtoolbox.com/friction-coefficients-d_778.html) (UATP-1026)
- P.J. Blau et al., *Appendix: Static and Kinetic Coefficients for Selected Materials*, ASM Handbook vol. 18 (1992) 70-75 (UATP-1027)
- N.P. Suh & M Mosleh, *The Minimum Coefficient of Friction: What Is It?*, CIRP Annuals, Vol. 43, Issue 1 (1994) 491-495 (UATP-1028)

- *Kings Island's Ultimate Fansite!*, King Island Central (retrieved from <https://kicentral.com/parkhistory/past-attractions/scrappys-slides/>) (UATP-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>) (UATP-1030)
- Declaration of Nathaniel E. Frank-White re Internet Archive record of Industrial Netting websites corresponding to UATP-1006 and UATP-1007 (UATP-1031)
- Industrial Netting Home page, archived by Internet Archive on July 28, 2021
(<https://web.archive.org/web/20210728223652/https://www.industrialnetting.com/>) (UATP-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>) (UATP-1033)
- *Sailcloth*, Dictionary.com entry (retrieved from <https://www.dictionary.com/browse/sailcloth>) (UATP-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>) (UATP-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/>) (UATP-1036)
- *Mesh*, Dictionary.com entry (retrieved from <https://www.dictionary.com/browse/mesh>) (UATP-1037)
- *Fabric*, Dictionary.com entry (retrieved from <https://www.dictionary.com/browse/fabric>) (UATP-1038)

14. 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.

15. 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 entirety.

16. 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 in Section VI 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

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

- **GROUND 1A:** Claims 1-4, 6 and 7 are obvious in view of Phillips.
See infra, Section IX.B.
- **GROUND 1B:** Claims 1-4, 6, 7, 14-17, 22-28 are obvious in view of Phillips and WN0400. *See infra*, Section IX.C.
- **GROUND 2A:** Claims 1-7 are obvious in view of Phillips and Fallgatter. *See infra*, Section IX.D.
- **GROUND 2B:** Claims 1-7, 14-17, 22-28 are obvious in view of Phillips, Fallgatter, and WN0400. *See infra*, Section IX.E.
- **GROUND 3B:** Claims 8-13 are invalid for lack of enablement. *See infra*, Section IX.F.

- **GROUND 3B:** Claims 5 and 26 are indefinite. *See infra*, Section IX.G.

V. LEGAL PRINCIPLES

18. 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

19. 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

20. 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

21. 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.

22. 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.

23. 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

24. 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

25. 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

26. 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.

27. 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.

28. Because I do not know at what date the invention as claimed was made, 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

29. 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 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. 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.

30. 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.

31. 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 in Section §II shows that I meet the qualifications of a POSITA.

B. A POSITA's Background Knowledge

1. Background of the Technology

32. As I will explain in more detail below in Section §VII, the '854 patent's inventors claim to have invented 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." UATP-1001, Abstract. But the inventors are mistaken. This technology was not new or inventive by the 2022 Critical Date of the '854 patent,

and the '854 patent claims' recitations of common recreational slide components and specification of a huge range of frictional coefficients does not add anything new to the technologies already in existence at the Critical Date. The '854 patent claims describing characteristics of commercially available meshes likewise fail to add anything new to the technologies already 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 well known before the '854 patent, as shown by prior art references like Phillips and Fallgatter.

33. I have cited numerous patent documents and other non-patent literature throughout this declaration that support my understanding, each of them preceding the '854 patent.¹ A POSITA would have known of these references and considered them representative examples regarding the state of the art. Accordingly, my obviousness analysis below in Sections §§VIII.B-E is informed by these references, as well as my personal knowledge and experience.

¹ In the limited situations in which I cite to a reference that postdates the Critical Date, I make note of this in a footnote and explain the use of the reference as adding context or providing additional discussion of well-known principles or ideas that were known prior to the Critical Date.

2. Recreational Slides

34. Slide systems that include a slide and ride vehicle have been used for decades. *See e.g.*, UATP-1004, 1:34-35 (“there are a plethora of sliding devices which are employed for recreational purposes”); UATP-1022, 1:15-17 (“As can be seen... the prior art is replete with myriad and diverse children’s slide constructions”), 1:42 (“flexible sled and slide construction”). For example, slides for recreational purposes have been well-known since at least the early 1900s. UATP-1014, 1:16-17 (1932 British patent publication describing that “[t]he chute is a common piece of amusement apparatus in children’s playgrounds”). These early slides consisted of a ladder leading to a platform and a sloped surface descending from the platform to the ground. *See id.*; UATP-1015, 2 (depicting a slide at a playground “built in 1922”); UATP-1017, 8 (depicting an advertisement for a Wicksteed slide having steps and a chute).

35. Dry slides at amusement parks, including at prominent destinations like Coney Island Parks, were used with burlap sacks or other fabric mats as a ride vehicle between the rider and the slide surface. UATP-1029, 1; *see also* UATP-1017, 2; UATP-1020, 3; UATP-1030, 1.



UATP-1029, 1

36. As illustrated in the above photograph showing the “Flying Carpet” slide at King’s Island Amusement Park, the use of fabric ride vehicles was well-known before the Critical Date. For example, the “Flying Carpet” slide was “a classic mat slide with fifteen lanes and two hills [where guests] would ride down in burlap sacks.” UATP-1029, 1. Such slides in which users sat on mats or wore a burlap sack were ubiquitous at amusement parks and at fairs. UATP-1017, 2 (describing “the big potato sack slide” at the local fair); UATP-1020, 3 (describing the slide at Belle Isle Park in Michigan as “wide enough that six burlap-sack-wearing people can ride at a time”); UATP-1030, 1 (describing original Funland slide on Belle Isle stating “Riders would...speed down atop a burlap potato sack”).



UATP-1030, 2 (showing original Giant Slide riders on mats)

37. In all their variations, the thrill of a slide comes from the speed/acceleration of descent – a fact that has been well known since the earliest slides were used. UATP-1019, 2 (describing with regard to a potato sack slide:

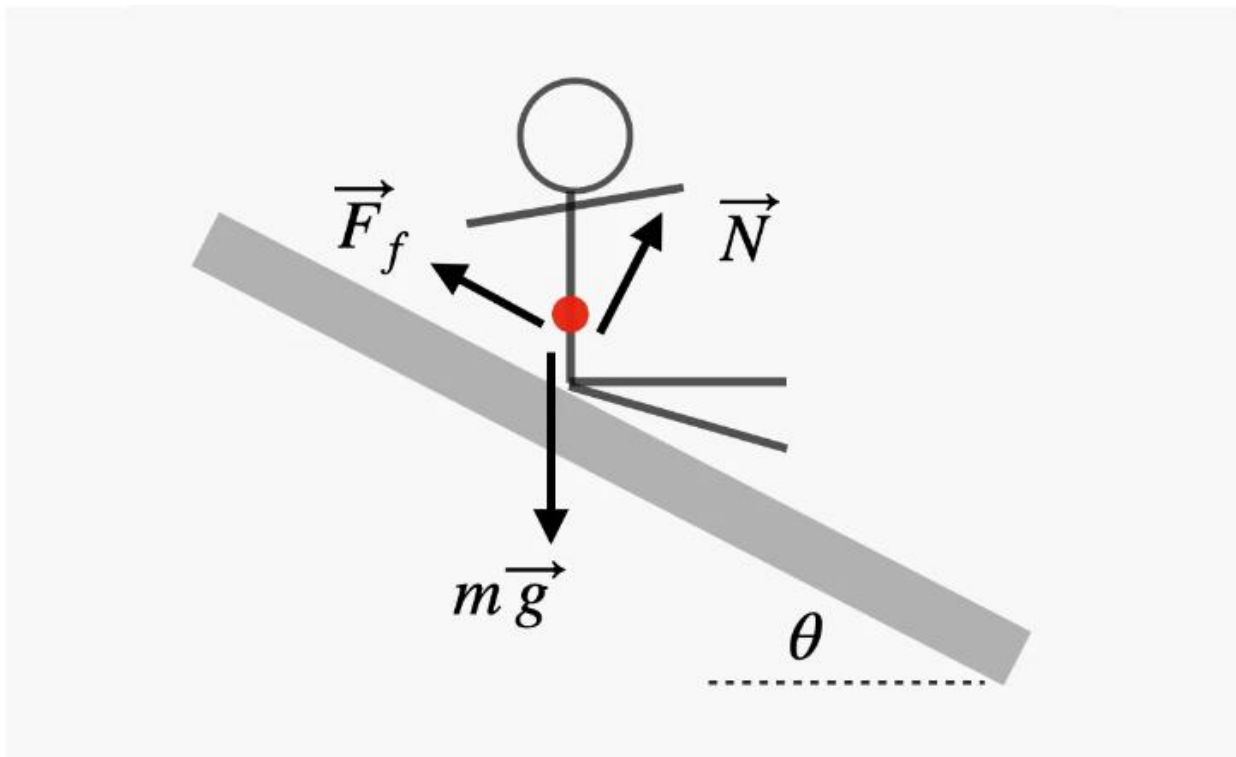
“Faster equals more fun”), UATP-1022, 1:28-29 (“the primary objective of any slide construction is to provide speed on a downward incline”), 1:36-37 (“the thrills of a rapid descent down an incline”); UATP-1020, 8 (“Speed is the important aspect of a slide – it’s what people want”); *see also* UATP-1017, 8 (showing an advertisement for Wicksteed’s slide and stating “[w]ith this design, we are able to give the slide itself a slope and a speed that would otherwise be dangerous”).

38. As I will describe below, 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. The ways that the slope of the slide, the weight of the rider, and the materials forming the slide and sliding vehicle influence the speed at which the rider/sliding vehicle descend the slide are all consequences of simple principles of physics. *See e.g.*, UATP-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”), UATP-1018, UATP-1020.

3. The Basics of Friction

39. As described above, multiple principles of physics play a role in determining the descent of a person down a slide. UATP-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 just three forces to consider: the gravitational force, the force perpendicular to the slide (we call this the normal force), and the frictional force.” UATP-1020, 3; *see also* UATP-1026, 1-2 (similar discussion of the forces on an object).



UATP-1020, 3

40. Though gravity plays an obvious role in a rider’s descent down the slide, the coefficient of friction between the rider and the slide’s surface plays an important role as well. UATP-1019, 2 (“Friction is a force that occurs whenever two objects rub against each other, such as a slide and person’s backside.”); UATP-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.” UATP-1020, 3; UATP-1008, 1. “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.” UATP-1008, 1. 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).” UATP-1020, 4; UATP-1008, 3 (describing the equations for static friction and kinetic friction).

41. Coefficients of friction (sometimes called frictional coefficients) indicate the relationship between two objects moving against each other in a system. Theoretical and measured coefficients of friction generally range between 0 and 1.0,² though in real mechanical systems the lowest achievable coefficient of friction is higher than 0. UATP-1028, 1 (describing that a friction coefficient of

² Though coefficients of friction are typically 1.0 or less, some systems will have a frictional coefficient greater than 1. However, these systems are not relevant to the present discussion.

0.05 is achievable in a hypothetical system of dry sliding surfaces when mechanical interactions are eliminated); UATP-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 of friction of 0.7 for rubber on dry concrete).

42. 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. UATP-1019, 2; UATP-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”); UATP-1027, 1 (list of factors influencing coefficient of friction between two sliding solids). For example, 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. UATP-1008, 4 (see table 6.1); *see also* UATP-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.” UATP-1020, 8.

4. Slide and Ride Vehicle Materials

43. The materials of the slide, or coatings applied to the slide, were well-known to impact the speed of descent, and were selected to lower the coefficient of friction between the slide and the rider or ride vehicle. For example, it was well-known by the Critical Date to use low-friction materials in slide surfaces and ride vehicle bottoms to form a slide that would be slippery to provide a fast ride.

UATP-1004, Abstract (describing a sliding recreational device formed from “low friction sheeting material”); UATP-1005, Abstract (describing a dry recreational slide including “a low-friction sliding surface” formed from a “flexible substrate coated with a low-friction material”); UATP-1022, 3:10-16 (describing a wax coating to “provide a very slippery interface between” a sled and slide). Similarly, it was known to adjust the material characteristics of the ride vehicle to optimize the sliding between the vehicle and slide. UATP-1023, Abstract (describing a ride vehicle with a bottom surface “clad with a low friction durable coating”); UATP-1025, Abstract (describing a carrying case with “a low friction...bottom surface to facilitate sliding the apparatus upon a suitable contact area”); UATP-1022, 3:10-16.

44. Additionally, a wide variety of slide constructions and lubricants were known and used specifically to affect the coefficient of friction between the slide and rider/vehicle. *See* UATP-1019, 2, (“Certain materials called lubricants can

reduce the effects of friction”); UATP-1022, 3:5-17 (describing a slide and sled with a hard wax coating to provide a slippery surface therebetween); UATP-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. UATP-1019, 2; UATP-1008, 4-5 (table 6.1); UATP-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”). By the Critical Date, it was well-known that the materials of the slide and of the ride vehicle influence the speed of the rider’s descent down the slide by changing the coefficient of friction between the slide’s surface and the vehicle – scratchy materials like burlap will slow down the ride, while slippery materials will result in a faster ride. UATP-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”).

45. Additionally, the use of a variety of low friction materials in constructing slides and slide materials, for example polytetrafluoroethylene (PTFE)

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

46. Materials like Teflon and nylon were well-known to be slippery and “low friction” materials. UATP-1011, 5 (describing Fluorocarbons (e.g., PTFE) and polyamides as having a characteristic of “low coefficient of friction”). The coefficients of friction between these and other common materials are known and published. Sliding (kinetic) coefficients of friction are important in a variety of fields, and have been documented and published as a result. *See* UATP-1026, 8-9 (describing nuances of frictional coefficients with regard to brakes); UATP-1027, 1 (explaining differences between frictional coefficient values in various lists).

47. An example table showing frictional coefficients between various materials are depicted below. UATP-1021, 1; *see generally* UATP-1026; UATP-1027.

Friction Coefficients

The table below provides commonly used values for friction coefficients for various materials.

Materials	Dry	Lubricated
Steel on steel	0.8	0.5
Aluminum on steel	0.6	0.5
Copper on steel	0.5	0.4
Brass on steel	0.5	0.4
Cast iron on steel	0.4	-
Brass on nylon	0.3	-
Steel on nylon	0.3	-
Teflon on nylon	0.05	0.04
Hard carbon on carbon	0.2	0.1
Copper on copper	1.3	0.8
Aluminum on aluminum	1.1	-
Nickel on nickel	0.7	0.3
Brass on brass	0.9	0.6

UATP-1021, 1

48. Simply stated, dry-lubricated slide surfaces and complementary low-friction ride vehicles, were well-known in the art before the Critical Date, including slide systems that utilized Teflon/PTFE and nylon to achieve low friction.

VII. OVERVIEW OF THE '854 PATENT

A. Overview of the '854 Patent

49. The '854 patent is directed to “[a] recreational slide system” including “a slide and a ride vehicle configured to support a rider down the slide.” UATP-1001, Abstract. The slide has “a slide surface provided with a dry lubricant material.” *Id.*, 1:15-16. “A dry slide is considered to be any slide that is free of any fluid or wet lubricant flowing down the slide surface and between a rider or the ride vehicle and the slide surface.” *Id.*, 1:43-45.

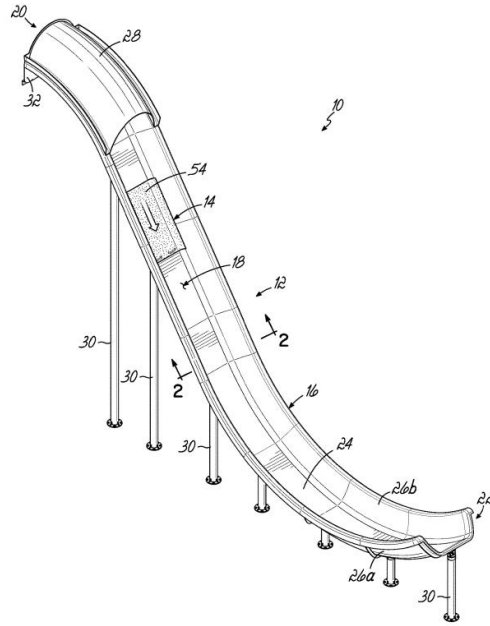


FIG. 1

UATP-1001, Fig. 1

50. 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.

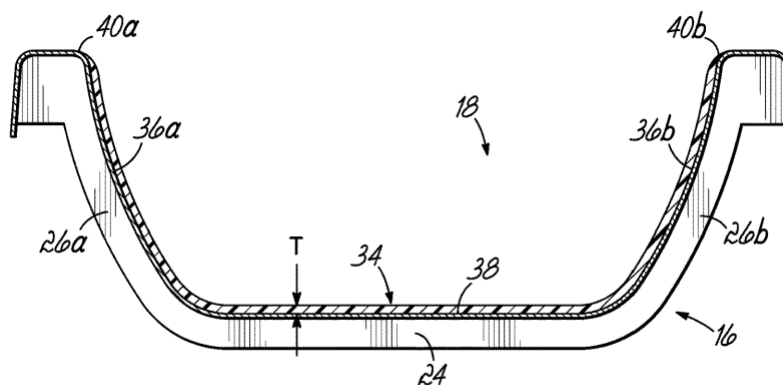


FIG. 2A

UATP-1001, Fig. 2A

51. 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.

52. 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. 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 (“[t]he 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.”), 4:26-33, 5:41-46, 6:16-21.

B. Summary of Prosecution History of the ’854 Patent

53. The inventors of the ’854 patent purport to have 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.” The materials described in the ’854 patent, however, (and, notably, not recited in the independent claims) to achieve friction coefficients within the claimed range were well-known by the Critical Date for use in forming slide surfaces and contacting surfaces of a ride vehicle. *See supra* §VI.B.4.

54. In issuing the ’854 patent, the Examiner failed to understand that the coefficient of friction between two materials is an inherent characteristic of the materials in the system – not something that the inventor invented—the claimed range of coefficients was large and overlapped with what the ’854 patent acknowledged as “typical” of dry slides at the Critical Date. UATP-1001, 1:48-51; UATP-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 – however, the '854 patent itself acknowledges that this is not the case. 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.* This stated range for the “typical dry slide” of 0.15-0.3 has significant overlap with the claimed range of 0.03-0.2 for a dry slide. *Id.* The amount of overlap is even further magnified by the '854 patent’s statement that “[a]s used herein relative to the coefficient of friction, “about” is intended to mean +/- 10%.” *Id.*, 4:34-36. The claimed range, taking into account the 10% increase signaled by the word “about,” thus overlaps with the typical dry slide range between 0.15 and 0.22 – over nearly half of the claimed range.

55. Further, and as described below, the limitations of the other independent claims related to ride vehicle materials recite characteristics of a mesh that were also well-known at the Critical Date and would have been easily identified and selected by a POSITA. As described above, polyamides, such as nylon, were well-known to be durable and low-friction materials, and the advantages of using a woven material as a sliding material were also well-known, including sliding behaviors of woven materials as well as cost and durability benefits. UATP-1011, 5; UATP-1006, 2; UATP-1007, 1; UATP-1010, 1

(“Variation of mesh size in monofilament fabrics affects the frictional resistance of these fabrics”), 3-4. Had the Examiner properly considered the prior art, the overbroad claims of the ’854 patent never would have been issued in their current form.

56. During prosecution as a Track 1 application, the independent claims of the ’854 patent were rejected as obvious over U.S. 2023/0129814 (“Fallgatter,” UATP-1005), or alternatively over Fallgatter and U.S. 2006/0168805, or alternatively over Fallgatter and U.S. 5,427,698. UATP-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. 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.

57. However, as I explained above (*supra* §§VI.B.3-4), these features (as well as other features indicated as allowable in the only rejection of the claims), were well-known by persons of skill in the art at the time of the patent, and further are taught by the combination of Phillips, Fallgatter, and WN0400.

VIII. APPLICATION OF PRIOR ART TO THE CHALLENGED CLAIMS

A. Overview of the Grounds

58. Below I will explain each of the grounds fully. 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

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

1. References Appearing in the Grounds

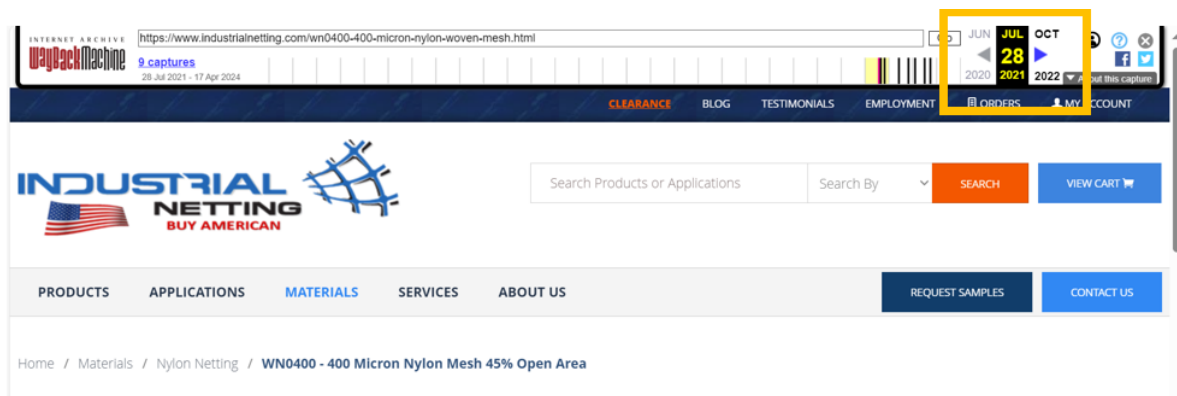
59. As I understand, each reference relied on in the above grounds pre-dates the Critical Date of the '854 patent and qualifies as prior art based on its filing date and/or publication date according to the below table.

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

2. WN0400 is a Printed Publication

60. WN0400 (UATP-1006) was published on the internet at least as of July 2021, and was generally available and known to the relevant technical community before the Critical Date. UATP-1031, 1, 7-9 (confirming WN0400 website was archived by Internet Archive as of July 28, 2021). My understanding is that a reference is a prior art printed publication if it was sufficiently publicly accessible – that is if before the Critical Date, the reference was disseminated or otherwise made available to the extent that persons interested and ordinarily skilled in the subject matter or art exercising reasonable diligence, can locate it.

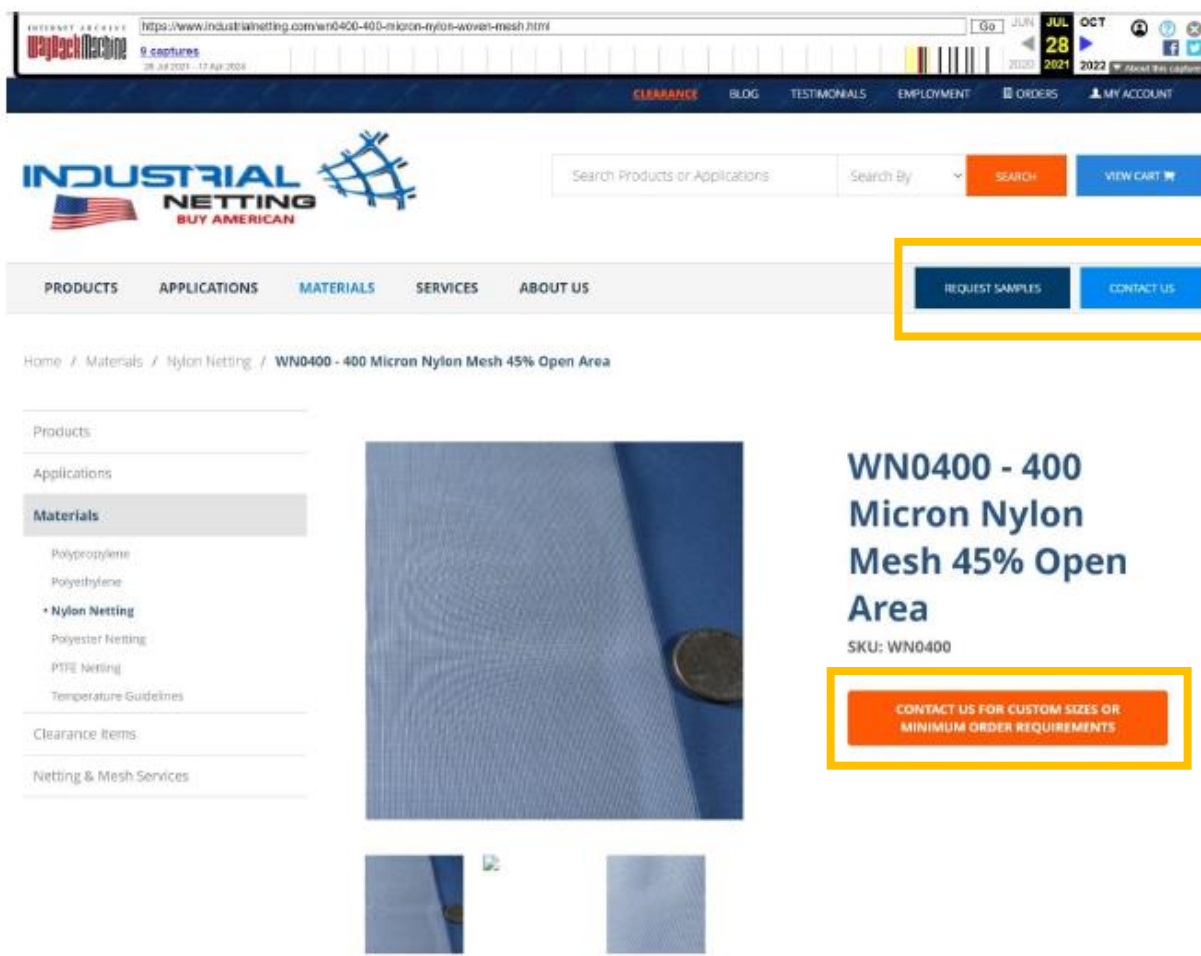
61. WN0400 was published on the internet on the Industrial Netting website by at least July 28, 2021, which the archived version corroborates. UATP-1006, 1; UATP-1012 (current version of WN0400); UATP-1031, 1 (Declaration from Internet Archive Records Request Processor), 7-9. Accordingly, WN0400 was made available to interested persons as of at least July 2021. As illustrated below in the annotated portion of WN0400 (UATP-1006, 1), the WN0400 website was archived by Internet Archive on July 28, 2021 (see yellow box around archive date). *See also* UATP-1031, 1.



62. Moreover, the WN0400 webpage (UATP-1006) itself lists a copyright of “2021.” UATP-1006, 2-3. This is highlighted below in the annotated portion of WN0400 (UATP-1006, 1) with the 2021 copyright date highlighted by a yellow box. Accordingly, WN0400 was published on the internet at least as of July 2021.



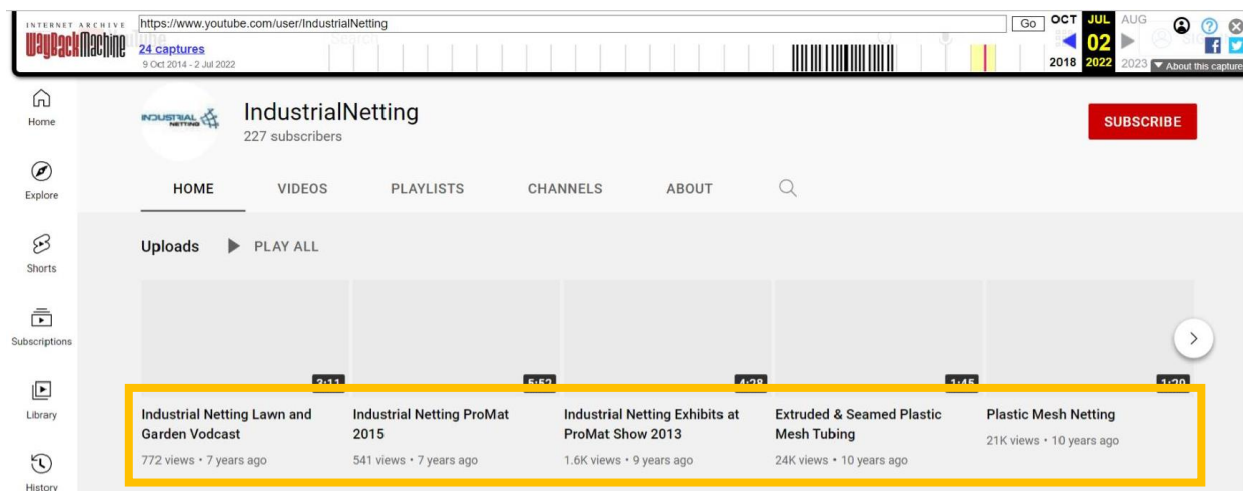
63. Industrial Nettings products (and product webpages) were disseminated to members of the public interested in purchasing and using textile meshes and nettings and locatable by such interested public and is accordingly a printed publication. WN0400 shows a product page for WN0400 - 400 Micron Mesh for the purpose of marketing and selling the product. This is clear from the button on the page reading “Contact us for custom sizes or minimum order requirements.” UATP-1006, 1. WN0400 was a webpage intended to be accessed by interested members of the public, and include means for interested members of the public to purchase the product described in WN0400 – for example, the contact us button, as well as additional buttons reading “Request samples” and “Contact us.” UATP-1006, 1 (various methods for initiating purchase or contacting Industrial Netting highlighted below with yellow boxes). Further, a POSITA would have visited a manufacturer’s page to consider a particular fabric or material in a proposed design. *Supra* §VI.A.



64. These aspects of WN0400 make clear that the page has a marketing purpose and is intended to be accessed by persons interested in nylon materials and meshes to enable them to learn about and purchase a product.

65. Additionally, as explained below, WN0400 could be located by interested members of the public because it was indexed on Industrial Nettings' website and accessible through search engines.

66. By the Critical Date, Industrial Netting was a well-known website in the textile industry that sold various types of nettings and meshes for multiple purposes. Industrial Netting had a presence on YouTube as well as Facebook and LinkedIn to advertise its name and products to interested persons. UATP-1006, 2 (showing method to “connect with us” at the bottom of the page including icons indicating links to Facebook, YouTube, LinkedIn and email); UATP-1035, 1 (Industrial Nettings YouTube page showing videos with tens of thousands of views as archived by Internet Archive July 2, 2022).



UATP-1035, 1 (YouTube page as archived by Internet Archive, yellow box added)

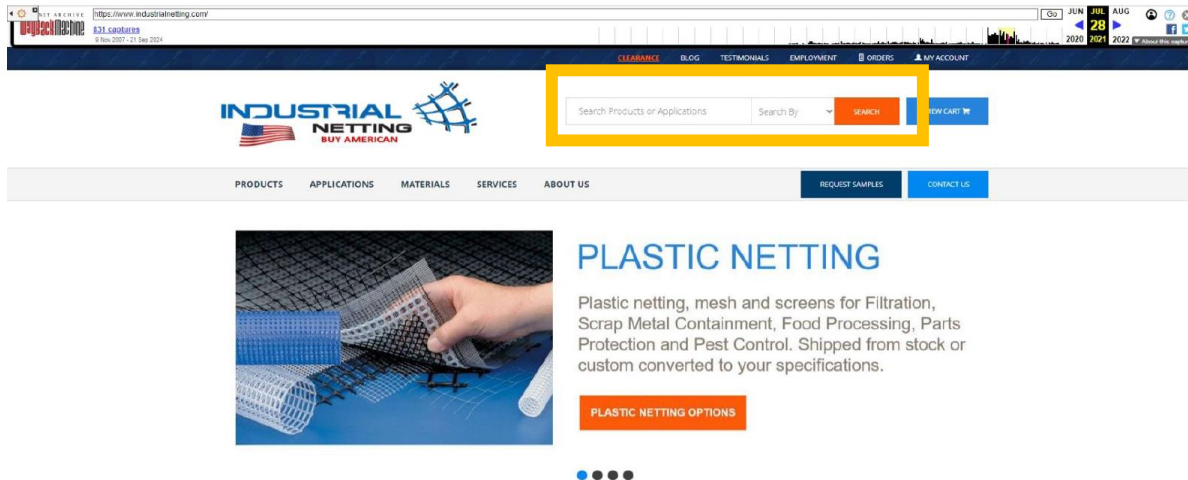
67. As the above screenshot shows, Industrial Netting uploaded multiple videos to their YouTube page. UATP-1035, 1. Several of the videos had tens of thousands of views by the Critical Date – I have highlighted the video titles and view numbers in the above with a yellow box.

68. A POSITA would have been familiar with the Industrial Netting website and would have been able to find the website (and others like it) by the Critical Date. *See supra* §VI.A (describing that a POSITA would have understood how to select and locate/purchase a required material). Well before the Critical Date, I was aware of sites like Industrial Netting that sell textiles with various characteristics for commercial or large-scale projects, as well as how to locate such sites using internet search engines. Thus, a POSITA would have known of the Industrial Netting site and/or been able to locate the Industrial Netting site as a source of textile materials. A POSITA would have been able to access the WN0400 product page, and indeed did access it.

69. WN0400 was freely available and disseminated via Industrial Nettings website. There is no indication that a person accessing the page would be required to pay to access it, and it would have been counter to the purpose of the page as described above to charge for access.

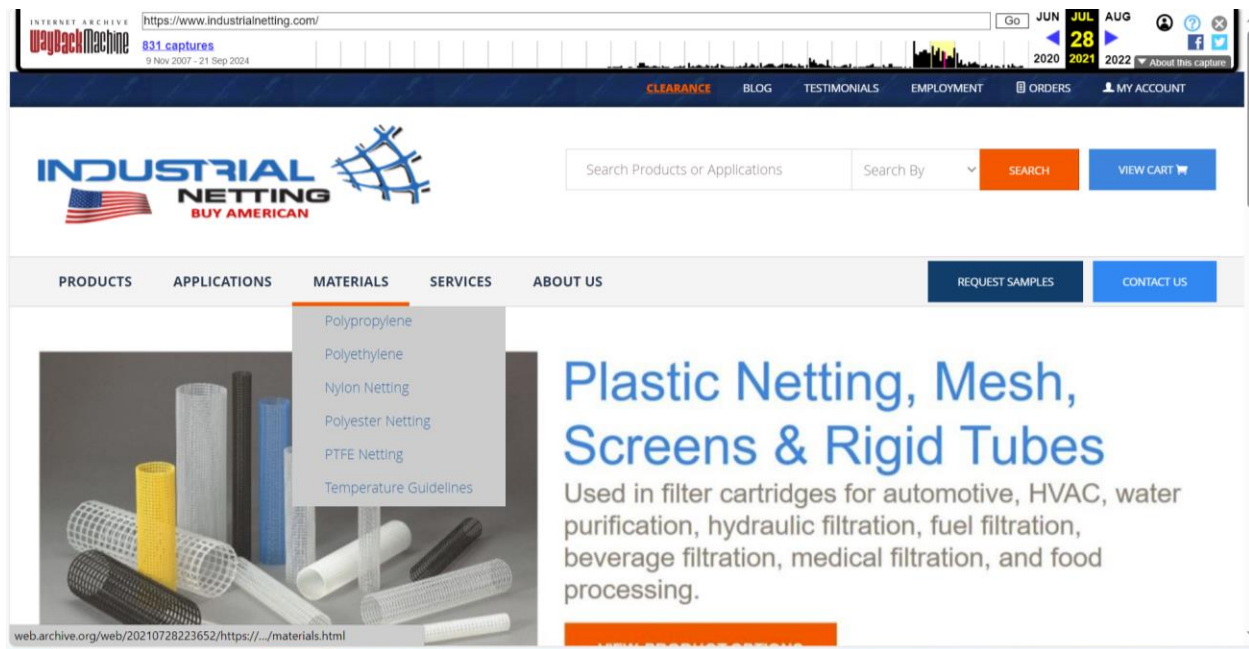
70. Additionally, on July 28, 2021, a POSITA could have easily navigated to WN0400 because the Industrial Netting website included multiple drop-down menus offering users ways to find textiles fitting various parameters: for example, searching by product, application, or material. For example, the Industrial Netting home page archived by the Internet Archive on July 28, 2021 includes a search bar

that would have allowed a user to type in a product, material or application to locate on the Industrial Netting site. UATP-1032, 1.



UATP-1032, 1 (search bar highlighted by yellow box)

71. Additionally, the Industrial Netting home page includes multiple drop down menus to allow a user to locate the products that they are searching for. The home page has drop down menus to search by product, application, material, or service. UATP-1032, 1. For example, selecting the material drop down menu provides a number of materials available from Industrial Netting, including polypropylene, polyethylene, nylon netting, polyester netting, and PTFE netting. UATP-1037, 1.



UATP-1036, 1 (drop down menu of materials selected)

72. Selection of the “Nylon Netting” option opens a page of the Industrial Netting website that includes description of nylon netting characteristics and images and links to various nylon netting options, including to WN0400. UATP-1033, 1 (Nylon Netting landing page), 3 (link to WN0400 product). Indeed, interested parties, including a POSITA, would have been able to navigate the Industrial Netting website by the described pathway or various others (for example using the search bar or other drop down menus) and would have been able to find not only the WN0400 product and page using these navigation methods but also multiple other products that would have been suitable for a POSITA’s purpose. Accordingly, a POSITA could locate WN0400 via easily navigable pathways.

73. Thus, WN0400 is a prior art printed publication.

**B. GROUND 1A: PHILLIPS ANTICIPATES OR RENDERS
OBVIOUS CLAIMS 1-4 AND 6-7**

74. Ground 1A presents two separate grounds challenging the claims over Phillips. Phillips anticipates claims 1-4 and 6-7 under §102 and also renders the claims obvious 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 (UATP-1004)

75. Phillips describes a “slide having a top surface” made of a “low friction, durable sheeting material which enables the user to traverse thereon whether the top surface is wet or dry.” UATP-1004, 2:44-52; 1:13-17 (“an exercise apparatus and recreational system composed of a plurality of interconnecting parts which include a slide having a low friction, durable top layer upon which a user can traverse in both a wet or dry condition.”), 3:16-23. “[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.” *Id.*, 1:22-25. In particular, Phillips describes the slide top surface is made of “Teflon” (PTFE). *Id.*, 4:43-46 (describing “top surface 20” of slide “composed of low friction high durable [sic] material such as . . . Teflon.”).

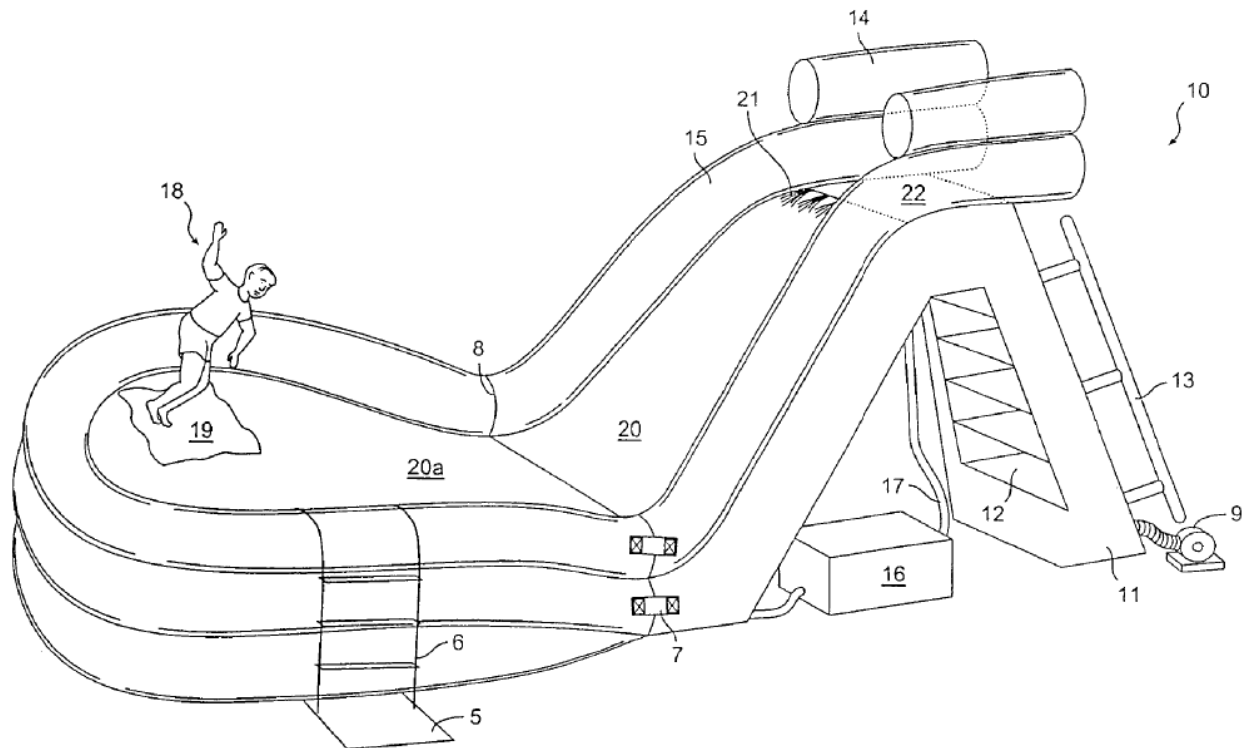


FIG. 1

UATP-1004, Fig. 1

76. Phillips describes multiple types of sliding vehicles having a low friction, fabric bottom for use with the slide. *Id.*, 2:4-11 (describing that recreational slide systems can be used with “skis, waterskis, sleds, air mats, rubber/foam mats, body boards, skimboards, knee boards, wake boards, . . . surfboards, snowboards, mountain boards, sand boards, sail boards, snow luge, street luge, knee pads, elbow pads, wrist guards, clothes, suits, shoes, socks, plush vehicles, plush animals, plush objects, . . . spheres, discs, sheets, bags and cases.”)

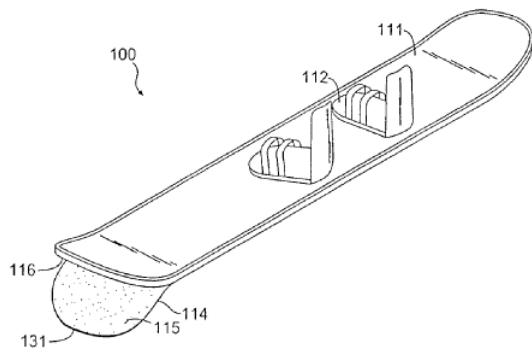


FIG. 5

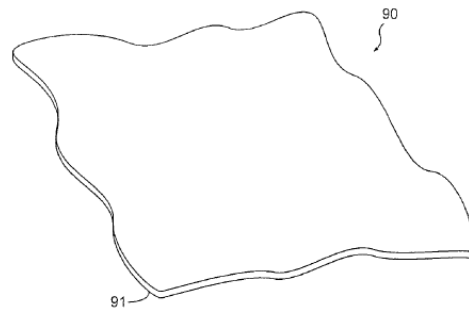


FIG. 6

UATP-1001, Figs. 5-6

77. In one example, Phillips describes a sports board as a ride vehicle that has “a top for contacting the user and a bottom for sliding upon a slide.” *Id.*, 3:12-13, 3:9-12. The sports board has “an additional low friction, durable sheeting layer appended to and supported by the bottom of the sports board.” *Id.*, 3:19-21; 3:27-32.

78. Phillips describes that “[b]oth membrane 6 and top surface 20 can each be composed of low friction high durable [sic] material such as a member selected from the group consisting of nylon, Teflon, sailcloth, Dacron, vinyl, artificial turf, synthetic carpet and polyester resins.” *Id.*, 4:43-46.

2. Element-by-Element Analysis

a) Claim 1

[1pre] A recreational slide system, comprising:

79. To the extent the preamble is limiting, Phillips discloses a recreational slide system. As I explained above, recreational slide systems that included a slide

and a ride vehicle made from a woven fabric were well-known by the Critical Date. *Supra* §§VI.B.2-4.

80. For example, Phillips describes “an exercise apparatus and **recreational system** composed of a plurality of interconnecting parts which include a **slide** having a low friction, durable top layer upon which a user can traverse in both a wet or dry condition.” UATP-1004, 1:13-17, 4:38-39 (“FIG. 1 further illustrates an infant as user 18 clearly employing **slide 10 as a recreational device**”), Fig. 1. Phillips describes a recreational system that includes a slide – accordingly, Phillips discloses a recreational slide system as claimed.

81. Additional details of the claimed “recreational slide system” disclosed by Phillips are discussed below with regard to the other limitations of claim 1. *Infra* §VIII.B.2.[1a-i]-[1c].

[1a-i] a slide

82. Phillips discloses the recreational slide system includes a slide (e.g., slide 10). UATP-1004, 2:15-17 (“FIG. 1 depicts **slide** 10 used as the focal point of the exercise apparatus and recreational system of the present invention.”). Phillips slide 10 is depicted in Figure 1 below.

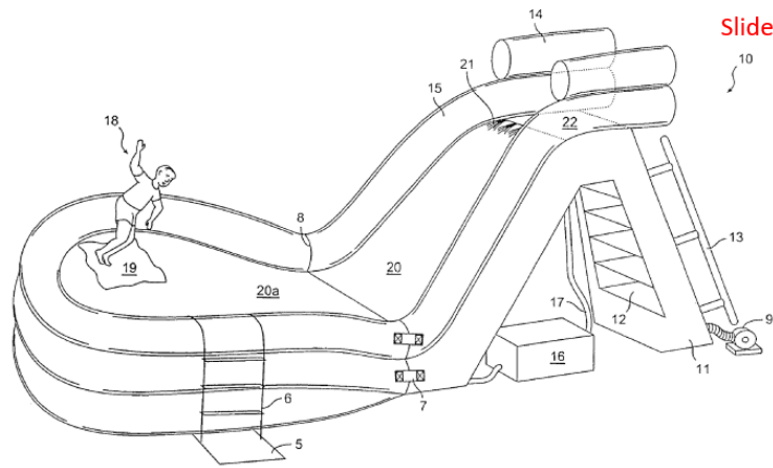


FIG. 1

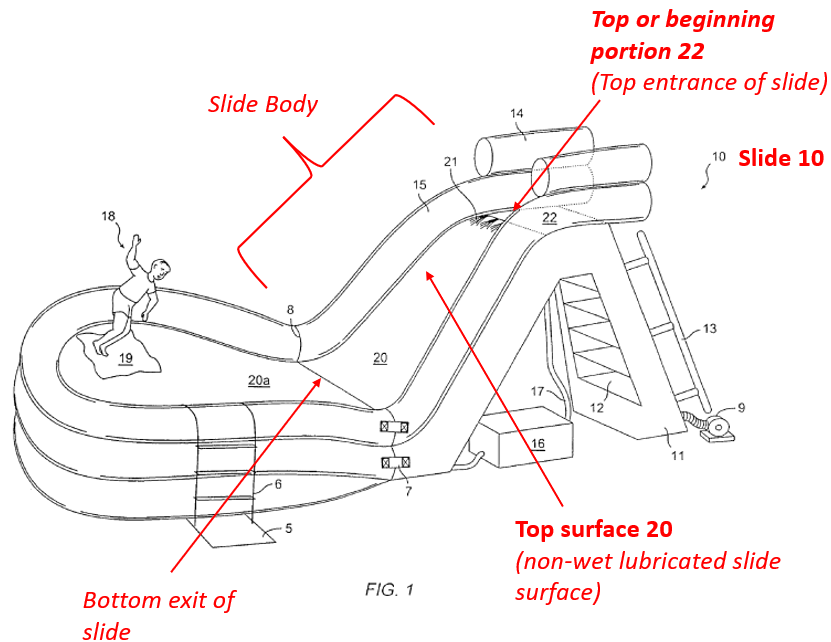
UATP-1004, Fig. 1 (annotated)

83. Accordingly, Phillips anticipates or renders obvious element [1a-i] for the reasons I described above.

[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

84. Phillips discloses a slide body (e.g., top surface 20) that has a low friction surface for use when dry. Phillips describes that the “[s]lide is provided with a top surface 20... 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.” UATP-1004, 2:19-24. As illustrated below, Phillips describes that the top surface 20 extends between a top of the slide and a bottom of the slide. UATP-1004, 4:34-37 (“Slide 10 is shown as having a top or beginning portion 22 in the form of a substantially flat pad”), 6:52-55 (describing a top of the slide), FIG. 1.

Phillips' slide accordingly includes a slide body that has a slide surface as depicted below in Figure 1.



UATP-1004, Fig. 1 (annotated)

85. Phillips' low friction slide surface provides a slide body with a non-wet lubricated slide surface that facilitates sliding. UATP-1004, 4:21-24. For example, Phillips describes that "[t]op surface 20 is 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." *Id.* Phillips also describes that "it is possible to selectively provide low friction durable sheeting material 183 to the top surface of slide 180." *Id.*, 8:20-22, Fig. 9.

86. In particular, Phillips describes that the slide body has a non-wet lubricated slide surface made of "Teflon." UATP-1004, 4:43-46

(“Both membrane 6 and top surface 20 can each be composed of low friction high durable material such as a member selected from the group consisting of nylon, Teflon, sailcloth, Dacron, vinyl, artificial turf, synthetic carpet and polyester resins”), 5:63-64, 6:6-8 (“this surface can be coated with **a low friction durable coating material** and used as a ramp as previously discussed”). Based on my knowledge and experience in the field, Teflon is a conventional and widely-used non-wet lubrication material. *Id.* A “low friction durable coating” of Teflon or similar on the slide, as Phillips describes, provides a non-wet lubricated slide surface. UATP-1004, 6:6-8.

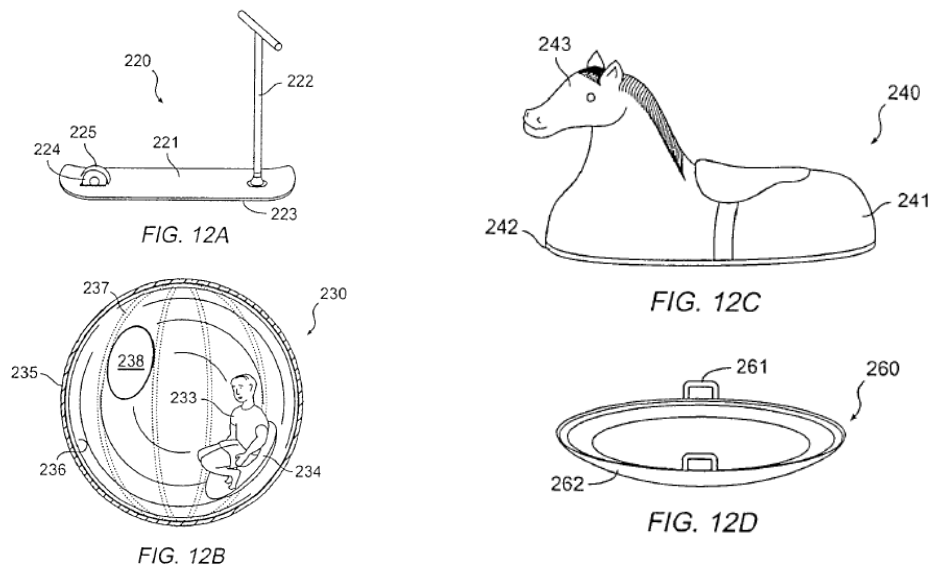
87. Accordingly, Phillips anticipates or renders obvious element [1a-ii] for the reasons explained above.

[1b-i] a ride vehicle configured to support a rider down the slide,

88. The '854 patent specification describes various ride vehicles (*see* UATP-1001, Figs. 3, 7a-b), and states that “while aspects of the present invention are shown and described in the context of certain types or configurations of ride vehicles it will be understood that the same inventive concepts related to aspects of the mesh material 46 may be implemented with different ride vehicle designs.” UATP-1001, 11:58-63. As I explained above, ride vehicles such as sacks and mats were well-known by the Critical Date. *Supra* §VI.B.2. Additionally, the prior art,

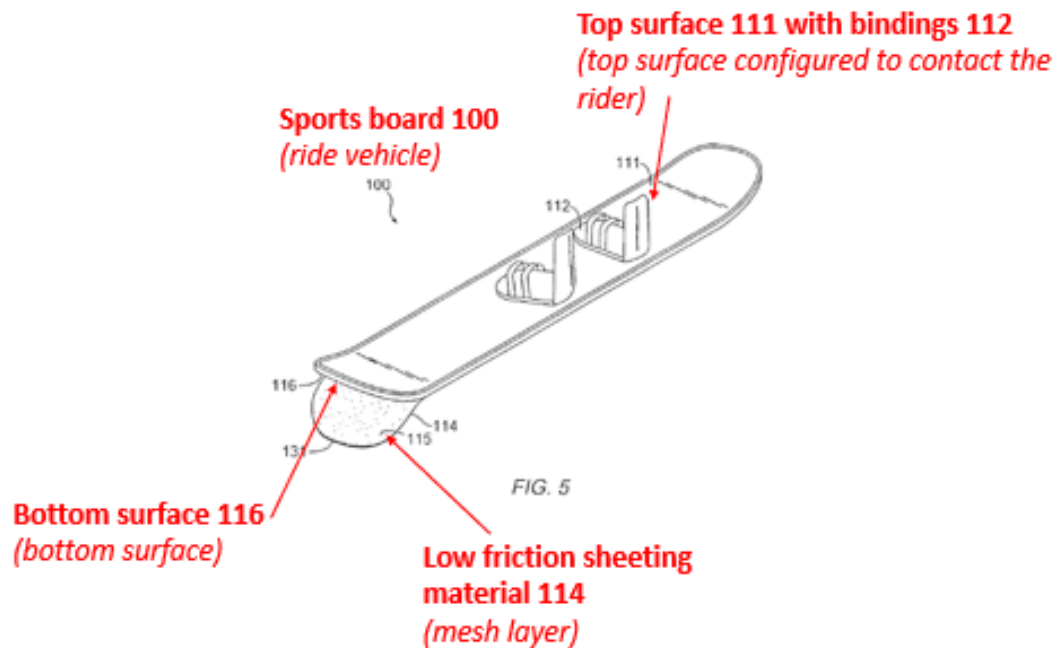
including Phillips, contemplated a variety of additional ride vehicles for use with slides by the Critical Date.

89. For example, Phillips discloses multiple ride vehicles, including a membrane 19, sports board 42 (see Figs. 4-5), sliding boards or sheets of material. UATP-1004, 8:34-36 (“Virtually any riding element can be employed by a user...”), 4:40-41 (“user 18 is supported by membrane 19 in the form of low friction durable sheeting material”), 6:16-18 (“slide 52 is shown as having an incline to induce rider 53 on sports board 54 to travel along top surface 55”), Figs. 5, 6, 12A-D. Each of Phillips ride vehicles are configured to support a rider down the slide. Examples of various ride vehicles that Phillips describes are depicted below:



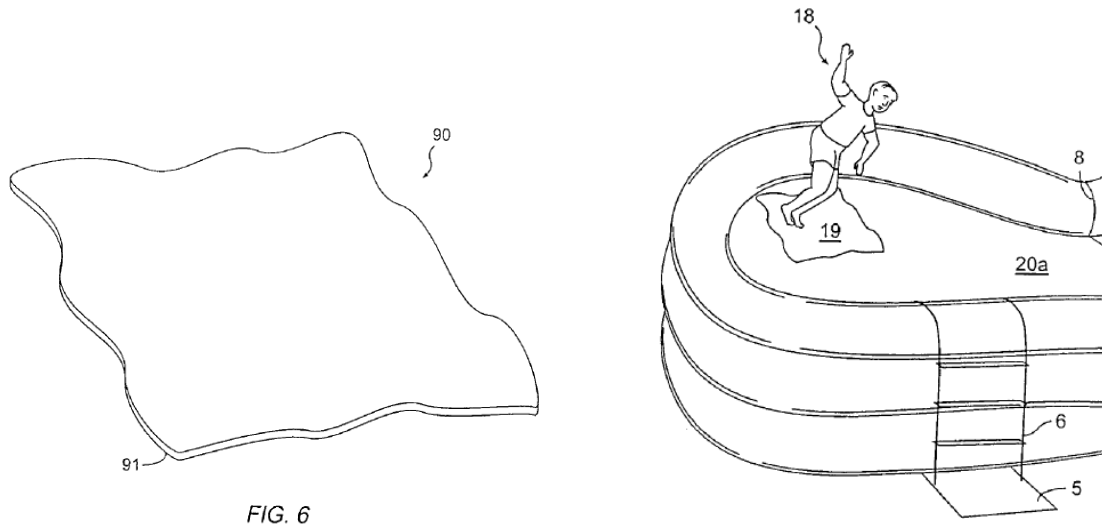
UATP-1004, Figs. 12A-12D

90. As another example, Phillips describes a sports board illustrated in Fig. 5 below. UATP-1004, 7:6-30, Fig. 5. Figures 2, 3, 4, 9, 10 and 11 all show a user supported by a sports board while using the slide. UATP-1004, Figs. 2-4, 9-11, 5:27-30 (“As shown, user 41 on sports board 42 is depicted bouncing upon trampoline surface 35 having progressed along top surface 43”), 6:16-18 (“slide 52 is shown as having an incline to induce rider 53 on sports board 54 to travel along top surface 55”), 6:52-53 (“rider 80 shown on a snow board 82 at the top of slide 71”), 7:58 (“rider 186 can employ board 187”), 7:67 (“User 193 on sports board 192 can traverse ramp 191”), 8:36-43, 1:50-2:32 (explaining that the slide system can be used by sports enthusiasts to practice their sport in seasons that it would otherwise be impossible or difficult, for example practicing snowboarding in the summer when there is no snow).



UATP-1004, Fig. 5 (annotated)

91. As another example, Phillips describes that “stand-alone sheets of [durable low friction] material can be employed to support a user as one traverses along the slide.” UATP-1004, 8:43-45, 3:29-33. Additionally, Figures 1 and 13 illustrate users supported by standalone membranes while using the slide. UATP-1004, Figs. 1, 13, 4:38-42 (“user 18 is supported by membrane 19 in the form of low friction durable sheeting material”), 7:12-14 (“As an alternative to a sports board, a rider such as user 18 of FIG. 1 can employ a flexible membrane shown as element 90 of FIG. 6”).



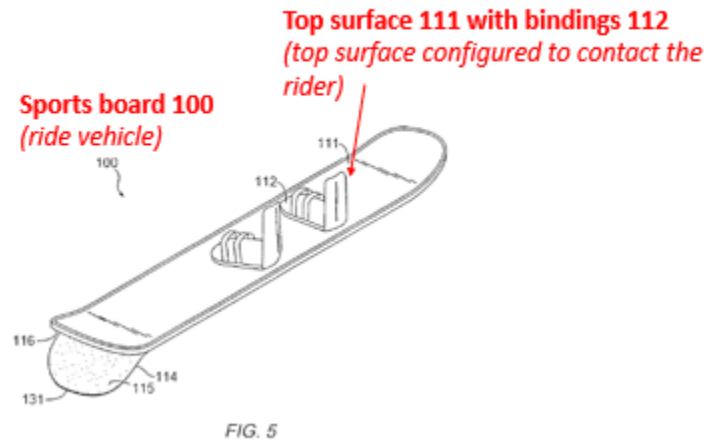
UATP-1004, Fig. 6 (left), Excerpt of Fig. 1 (right)

92. Both the sports board and the membrane are ride vehicles that support the user as the user slides down the slide. Accordingly, Phillips anticipates or renders obvious element [1b-i] for the reasons explained above.

[1b-ii] the ride vehicle including a top surface configured to contact the rider

93. Phillips’ “sports board is provided with a top for contacting the user and a bottom for sliding upon a slide.” UATP-1004, 3:12-13. It would have been obvious to a POSITA that a sports board is a ride vehicle, based on Phillips’ description that the sports board is used to support a user down a slide, and in view of the ’854 patent’s description to the effect that the ride vehicle can take on many forms. UATP-1001, 11:58-63. Phillips describes with regard to Fig. 5, that a sports board “having bindings 112 is of the shape of a snowboard having a rigid top surface 111, bindings 112 and bottom surface 116.” UATP-1004, 7:7-9;

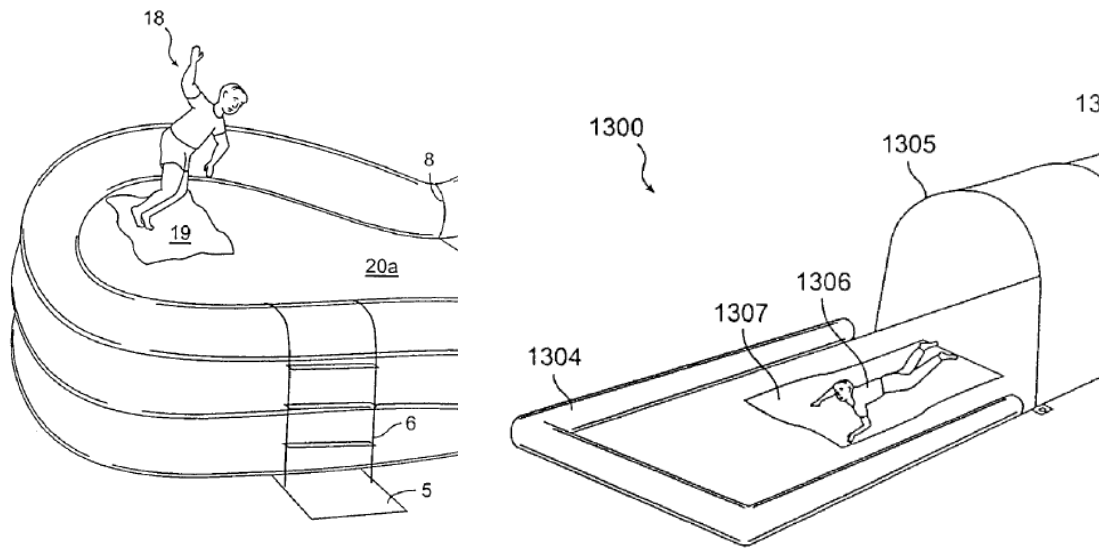
see also *id.*, 8:40-43 (describing board with a solid core covered by padding and “a bottom surface of a durable low friction sheeting material.”).



UATP-1004, Fig. 5 (annotated)

94. Phillips’ sports board accordingly is described as having a top surface for contacting the rider, for example, including bindings as illustrated in Figure 5 above. UATP-1004, 3:12-13, 7:7-9, Fig. 5. Phillips further illustrates that a user contacts a top surface of the sports board in Figures 2-4 and 9-11. UATP-1004, Figs. 2-4, 9-11.

95. Phillips’ “stand-alone sheets of [durable low friction] material” that are “employed to support a user as one traverses along the slide,” similarly providing a top surface configured to contact the rider. UATP-1004, 8:43-45, 3:29-33. As illustrated in Figures 1 and 13, the sheet (also called a membrane, see *e.g.*, UATP-1004, 9:14-19) has a top surface that contacts the rider.



UATP-1004, Excerpts from Fig. 1 (left) and Fig. 13 (right)

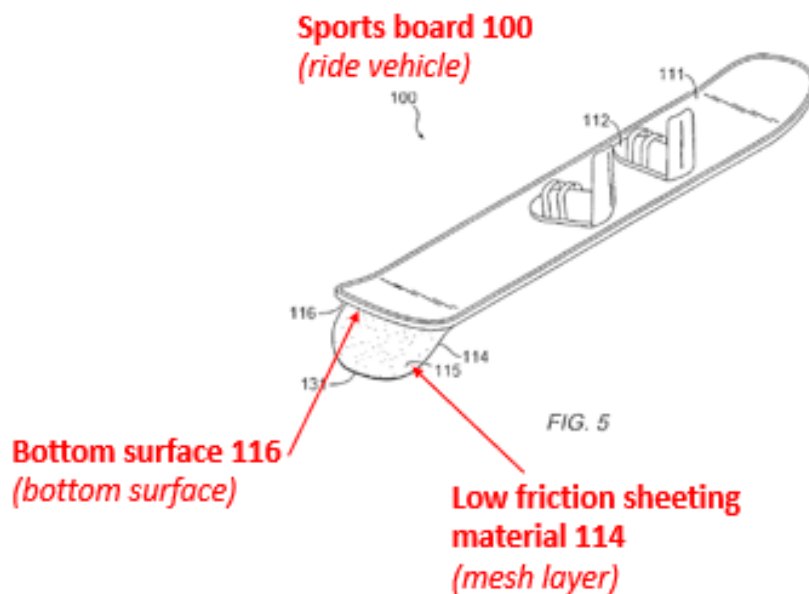
96. Accordingly, Phillips anticipates or renders obvious element [1b-ii] for the reasons explained above.

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

97. Phillips describes a ride vehicle with a mesh layer that forms a bottom surface configured to contact the slide surface. For example, the ride vehicle (e.g., Phillips' "sports board" or stand-alone sheet), has a "bottom for sliding upon a slide." UATP-1004, 3:12-13. The bottom surface of the ride vehicle is formed from a low friction sheeting material. UATP-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." UATP-1004, 5:32-35. 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.” UATP-1004, 4:43-46.

98. 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. UATP-1004, 7:10-12.



UATP-1004, Fig. 5 (annotated)

99. The durable low friction sheeting material described by Phillips provides a mesh layer. Phillips also describes “sailcloth” as a material for the layer that forms a bottom surface configured to contact the slide surface. UATP-1004,

4:43-46. Based on my knowledge and experience in the field, and my review of Phillips, a POSITA would have understood such material as a woven fabric material that provides a mesh. *Id.*

100. For example, a POSITA would have understood that sailcloth is a type of fabric traditionally used to make sails for boats. In fact, the dictionary definition of sailcloth is “any of various fabrics, as of cotton, nylon, or Dacron, for boat sails or tents” UATP-1034, 1. A POSITA would have understood that the fabric of sailcloth is a woven material (e.g., a fabric made of cotton, nylon, or Dacron) and that it a woven material comprises a mesh. *Id.*, *see also* UATP-1037, 1 (dictionary definition of mesh is “any knit, woven, or knotted fabric of open texture”); UATP-1038, 1 (dictionary definition of fabric is “a cloth made by weaving, knitting, or felting fibers”). A POSITA would have understood that a “mesh” fabric includes a fabric that is woven so that there are holes between the woven threads, and that for some fabrics, like sailcloth, the holes formed by the woven threads may be very small in size. UATP-1007, 1 (describing that a “precision weaving process creates fine mesh woven fabrics with apertures (hole sizes) as small as 50 micron”).

101. Moreover, 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. UATP-1007, 1 (describing nylon, polyester, and

polypropylene meshes); UATP-1034, 1 (describing nylon and Dacron fabrics used for making boat sails); UATP-1033, 1 (describing types of nylon mesh including woven nylon mesh), 2-5 (listing commercially available nylon mesh products for sale).

102. Accordingly, in my opinion, Phillips discloses a mesh layer forming a bottom surface of the ride vehicle for contacting the slide, because Phillips discloses that sports boards include a low friction sheeting material for sliding on the slide in a dry state and that the low friction sheeting material can be as “nylon, Teflon, sailcloth, Dacron, [and] vinyl.” UATP-1004, 7:10-12; 4:43-46. A POSITA reading Phillips would have understood that Phillips’ “sheeting material” formed of sailcloth, nylon or Dacron would have been a woven fabric, and thus a mesh.

103. To be clear, even if not expressly described by Phillips, which it is, 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.” *Id.*, 5:27-35, 7:7-23, 8:40-43, 8:49-61, 9:9-13. 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. Indeed, Phillips expressly discloses materials of “nylon” and “sailcloth.” UATP-1004, 4:43-46. 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.” UATP-1034, 1; UATP-1037, 1; UATP-1038, 1. 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. UATP-1011, 5 (describing nylon as having “Good mechanical strength, abrasion resistance, and toughness (i.e., durable) and low friction material); UATP-1007, 1 (describing nylon, polyester, and polypropylene meshes); UATP-1034, 1 (describing nylon and Dacron fabrics used for making boat sails); UATP-1033, 1 (describing types of nylon mesh including woven nylon mesh), 2-5 (listing commercially available nylon mesh products for sale). A POSITA would have had reason to implement the ride vehicle with a nylon mesh bottom based on Phillips’ suggestion to use such woven fabric materials (i.e., nylon, sailcloth, etc.) and the suggestion to use materials to provide a low friction interaction between the slide and ride vehicle. Further, a POSITA would have had a reasonable expectation of success in implementing the ride vehicle with a nylon mesh bottom for all the reasons explained above, 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 (*supra* §§VI.B.1-4).

104. Accordingly, a POSITA plainly would have been prompted to use a “nylon” mesh material, based on Phillips’ teachings, rendering obvious [1b-iii].

[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.

105. Phillips describes a slide system that provides a coefficient of friction between the mesh layer of the ride vehicle and the non-wet lubricated slide surface that is within the range of between about 0.03 and about 0.2. I note that Phillips expressly advocates for “low friction” between slide and ride vehicle, and specifies materials that achieve “low friction.” 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 (UATP-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. UATP-1027, 7; UATP-1026, 3 (interactions between ice and brass); 5 (interactions between ice samples), 7 (interactions between snow and PTFE). Phillips’ description of the slide as a device for practicing snow sports emphasizes what Phillips’ intends when describing a “low friction” interaction between the slide and ride vehicle.

106. For example, Phillips describes use of “Teflon” for the slide surface and “nylon” for the ride vehicle bottom. UATP-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 that the slide surface and bottom of the ride vehicle should be a “low friction” materials and direction to use materials like nylon and Teflon provides a frictional coefficient within the claimed range. UATP-1021, 1.

107. The Teflon and nylon materials described by Phillips provide “low friction” within the claimed range. The coefficient of friction between Teflon and nylon is about 0.05. Such a value is well within the claimed range, and nearer the lower end of the recited range. UATP-1021, 1 (listing a dry coefficient of friction for Teflon-nylon interactions as 0.05). I note that pairings of other materials taught by Phillips likewise result in a coefficient of friction well within the claimed range, including Teflon/Teflon and nylon/nylon, among others. UATP-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), UATP-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).

108. Further, Teflon's low friction properties are observed in low coefficients of friction in interactions with a variety of diverse materials, confirming 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. For example, sliding interactions between Teflon (PTFE) and clean and dry steel 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). UATP-1026, 7. Interactions between Teflon and various metals have kinetic frictional coefficients ranging between 0.08 (Chromium moving on Teflon) and 0.27 (Steel moving on Teflon). UATP-1027, 5.

109. Although measured values of sliding (kinetic) coefficients of friction may differ slightly depending on which material is fixed or sliding in some testing methods and may vary with differences in environment, geometries and procedures used in testing (*see e.g.*, UATP-1013 and UATP-1016), the general “low friction” characteristic of Teflon means that whether Teflon is the fixed or sliding material, the coefficient of friction between Teflon and other materials remains “low” – and well within the claimed range of frictional coefficients. For example, in the table below I have summarized 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. UATP-1027, 5. Although the measured

coefficient of friction is different where Teflon is fixed versus where Teflon is moving on another material, the frictional coefficients of any of the materials interacting with Teflon are uniformly low – that is, the highest measured frictional coefficient is 0.27 (between Teflon and steel) and the kinetic coefficient of friction is generally lower than 0.2.

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

110. Beyond the express teachings of “low friction” materials that a POSITA would have recognized as disclosing coefficients of friction within the claimed range, a coefficient of friction within this range was inherent in Phillips’ system that utilizes a Teflon slide surface and a nylon mesh layer. 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—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). The evidence confirms Phillips’ system provides a coefficient of friction that is well below 0.2—about 0.05—and thus within the claimed range. UATP-1021, 1 (reporting sliding coefficient of friction for Teflon-nylon interaction as 0.05). As discussed above, though measured coefficients of friction between materials may differ depending on which material is sliding over the other, interactions between various materials and Teflon generally have a low coefficient of friction of 0.2 or below, and this is necessarily the case for coefficients of friction between Teflon and the described materials, such as nylon. UATP-1026, 5; UATP-1021, 1. Interaction between Teflon and nylon with the nylon sliding over fixed Teflon would have a coefficient of friction around the reported 0.05.

111. In some cases, for reasons of safety and expense, a POSITA designing a slide system may desire a slighter slower descent rate. For example, a POSITA might consider a slower ride (and a higher coefficient of friction) for multi-person rides or for rides designed for younger children. Alternatively, in some cases, a POSITA may desire a lower friction interaction between the slide and ride vehicle so that if a high friction surface collides with or otherwise interacts with the surface, there is not dangerous or destabilizing deceleration. In some cases,

selection of the fabric for the ride vehicle bottom could be made with these concerns in mind.

112. The low coefficient of friction of Phillips' slide system is confirmed by the fact that the materials described by Phillips are the same as the '854 patent itself. Like the '854 patent, Phillips teaches "Teflon" slide surface and "nylon" ride vehicle bottom. Phillips' "recreational system" (UATP-1004, 1:13-17) is just like the system described in the '854 patent and uses the same materials, and would 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* UATP-1004, 4:43-46 ("nylon... Teflon...") *with* UATP-1001, 8:9-10 ("the lubricant, such as PTFE") 7:40-41, 10:51-53 ("Nylon"). The claimed slide system and the materials described in the '854 patent are the same as those described by Phillips. Accordingly, the slide and ride vehicle taught by Phillips would 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. *Supra* §§V.B-C. This is the case here.

113. I note that the '854 patent itself 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.”.

UATP1001, 1:48-51. The '854 claims attach a numeric range calling out a known property of materials in the prior art, but the '854 patent does not offer any explanation as to why this particular range is significant or necessary to the slide system.

114. Additionally, as I described above, the '854 patent's claimed range of coefficients of friction is so broad as to be meaningless in distinguishing over prior slide systems. *Supra* §VII.B. The low end of the range is “0.03.” This is close to the lowest frictional coefficient that can theoretically be achieved in physical systems.³ UATP-1028, 1. The high end of the range is “0.2.” This overlaps with the range that the '854 patent ascribes to “typical” dry slides – from “0.15-0.3.” UATP-1001, 1:48-51. Based on my review of the '854 patent specification, the '854 patent lacks any explanation of significance or criticality to such a broad

³ And the '854 patent lacks enabling description of how to achieve such a low coefficient of friction in a slide system, and in particular fails to provide 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.

range. The claimed range thus amount to a recitation of a known property of known materials in the prior art. Again, as I noted above, the claimed range even encompasses prior “typical” slides. Moreover, the prior art, such as Phillips, describes a slide system that achieves “low friction” via Teflon and nylon slide and vehicle materials, just like the ’854 patent.

115. Even if not anticipated by Phillips (which it is), a POSITA would 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. I note here again that Phillips expressly advocates for “low friction,” which would have prompted a POSITA to reduced coefficient of friction in order to promote a fast and exhilarating sliding experience. *Supra* §VI.B.2. As described above, “the primary objective of any slide construction is to provide speed on a downward incline.” UATP-1022, 1:28-29; *see also* UATP-1018, 2 (stating “Faster equals more fun”). As the ’854 patent itself acknowledges in the Background section, a POSITA knew that even “typical” slides had a coefficient of friction of 0.15 (UATP-1001, 1:48-51), and a POSITA would have been motivated based on Phillips’ teachings to achieve low friction when implementing a slide system according to Phillips’ teachings.

116. Phillips provides specific examples of known low-friction materials that would have led a POSITA to achieve a coefficient of friction of between about

0.2 and 0.03. As described above, a POSITA would 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 have been predictably implemented to achieve a coefficient of friction of about 0.05. UATP-1021, 1 (listing a dry coefficient of friction for Teflon-nylon interactions as 0.05); *see also*, UATP-1026, 5, 7. Additionally, even if the reported dry coefficient of friction between Teflon and nylon of 0.05 were a static coefficient of friction, this would have likely been higher than a sliding coefficient between the materials. UATP-1008, 4 (“the coefficients of kinetic friction are less than their static counterparts”). These materials (e.g., nylon and Teflon) were both known by the Critical Date to have low frictional coefficients and to be durable, and a POSITA would have recognized that their use would fulfill the objectives that Phillips advocates. UATP-1011, 5 (describing nylon and PTFE (Teflon) as low friction materials and describing that nylon additionally has “Good mechanical strength, abrasion resistance, and toughness”); UATP-1004, 4:43-46. A POSITA would have had a reasonable expectation of success in implementing Phillips’ slide system using nylon and Teflon materials for all of the reasons discussed above, as well as because these materials were well-known and commercially available materials suggested for use by Phillips. UATP-1004, 4:34-36; *supra* §§VI.B.1-4.

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 and would have had a reasonable expectation of success as a result. Further, 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 at least because these materials were known to be low friction materials, and typical frictional coefficients for dry slides fell within the claimed range. *Supra* §VI.B.4; UATP-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]. Accordingly, Phillips teaches or renders obvious [1c] for the reasons explained above.

b) Claim 2

[2] The recreational slide system of claim 1, wherein the coefficient of friction is kinetic coefficient of friction.

117. Phillips teaches claim 2. Static friction is the friction between two systems that are “in contact and stationary relative to one another,” while kinetic friction is friction between “two systems [that] are in contact and moving relative to one another.” UATP-1008, 1. Once an object is in motion, it is easier to keep it in motion, and “the coefficients of kinetic friction are less than their static

counterparts.” UATP-1008, 4. A POSITA would have understood that in the context of a recreational slide system, the kinetic coefficient of friction or “sliding” frictional coefficient between the slide surface and the vehicle that slides on the surface is an appropriate measure of the slippery-ness between the two materials, and thus a measure of the speed (and fun) of the ride. UATP-1022, 3:10-16 (describing applying coatings to a slide and vehicle to “provide a very slippery interface between”); UATP-1018, 2 (describing that on a slide “Faster equals more fun”), UATP-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”); UATP-1020, 8 (“Speed is the important aspect of a slide – it’s what people want”).

118. As described above, Phillips’ description that the slide includes a low friction sliding surface for a ride vehicle and list of low-friction materials would have motivated a POSITA to select materials for the slide surface and vehicle bottom that would have fallen within the claimed range of between about 0.03 to about 0.2 for kinetic coefficient of friction. UATP-1004, 2:44-52; 1:13-17, 3:16-23, 4:43-46. In particular, a POSITA would have understood that from Phillips’ list of materials, Teflon and nylon are known to be durable and low friction, and thus ideal for use in Phillips’ slide system. UATP-1011, 5. As described above, a POSITA would have been motivated to implement the slide system using materials

described by Phillips that would achieve a low friction interaction between the slide and ride vehicle as Phillips suggests, and would have had a reasonable expectation of success in doing so because nylon and Teflon materials were known to be low friction materials. *Supra.* §VI.B.4. A POSITA would have understood that Phillips' slide surface and vehicle bottom, formed from materials that Phillips lists such as Teflon and nylon, would have a kinetic coefficient of friction within the range claimed in Element [1c]. UATP-1021, 1 (listing a dry coefficient of friction for Teflon-nylon interactions as 0.05).

c) Claim 3

[3] The recreational slide system of claim 1, wherein the slide surface includes a dry lubricant material.

119. Phillips teaches claim 3. Phillips describes a “slide having a top surface...provided with said low friction, durable sheeting material which enables the user to traverse thereon whether the top surface is wet or dry.” UATP-1004, 2:44-52. Phillips further describes that the slide surface “this surface can be coated with a low friction durable coating material and used as a ramp as previously discussed.” *Id.*, 6:6-8.

120. A POSITA would have understood that Phillips' disclosure is consistent with the '854 patent's preferred embodiment of “a dry lubricant in the form of a coating” (UATP-1001, 2:21-22) where the “dry lubricant” is a “non-wet lubricant.” UATP-1001, 4:47-51. Phillips' low friction durable sheeting material

or low friction durable coating material provides a low friction material (lubricant material) on the slide surface that lowers the coefficient of friction between the slide and the ride vehicle for a dry recreational slide.

d) Claim 4

[4] The recreational slide system of claim 3, wherein the dry lubricant material comprises a dry lubricant coating over the slide surface.

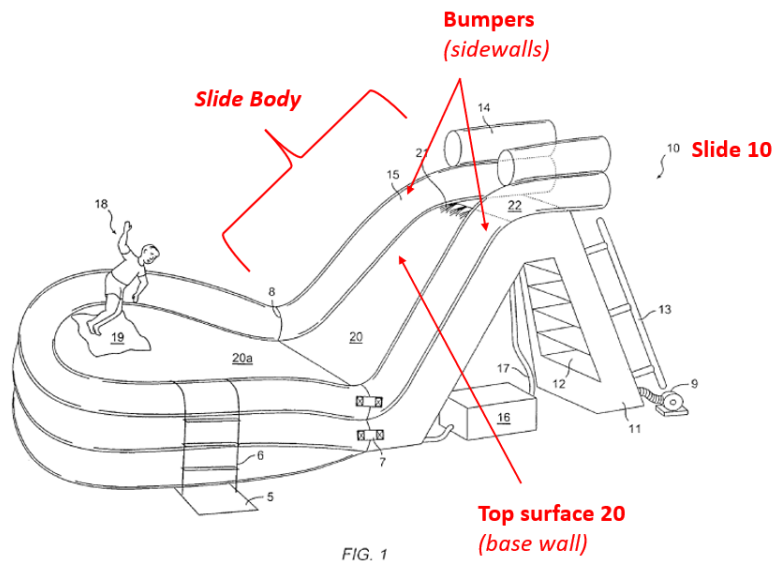
121. Phillips teaches a dry lubricant coating over the slide surface. Phillips teaches that the low friction surface of the slide is a low friction coating. UATP-1004, 6:6-8 (“this surface can be coated with **a low friction durable coating material** and used as a ramp as previously discussed”). Accordingly, Phillips’ low friction durable material on the slide surface is described as a coating over the slide surface. *Id.*, 5:58-6:8.

122. It would have been obvious to a POSITA to implement Phillips’ slide system with a dry lubricant low friction coating, in accordance with Phillips express teachings, to simplify maintenance of the slide, allow customization of the slide surface, and decrease costs associated with manufacture of the slide. A POSITA would have recognized from Phillips’ teachings that a coating applied to a slide can be easily reapplied or touched up to keep the slide experience consistent, and can be changed or altered relatively easily to allow for customization of the ride experience. UATP-1004, 8:19-29.

e) 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.

123. Phillips teaches claim 6. Phillips describes that the “slide 10 is provided with bumpers 14 and 15 to define top surface 20 and to prevent the inadvertent slippage from top surface 20.” UATP-1004, 4:25-27.



UATP-1004, FIG. 1 (annotated)

124. As described above (*supra* §VIII.B.2.[1a-i] (Ground 1A)), Phillips also describes that “[t]op surface 20 [i.e., base wall] is 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.” UATP-1004, 4:21-24, 6:6-8 (“this surface can be coated with a **low friction durable coating material** and used as a ramp as previously discussed”). Accordingly, Phillips discloses that the slide body

includes a base wall and sidewalls, and that the top surface (base wall) includes a durable low friction material (dry lubricant coating) over the sliding surface.

f) 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.

125. Phillips teaches claim 7. Phillips describes that various sloped surfaces of a recreational slide system “can be selectively coated with a durable, low friction surface enabling user 193 to employ the present invention in a dry state.” UATP-1004, 8:7-10; 6:6-8 (“this surface can be coated with **a low friction durable coating material** and used as a ramp as previously discussed”).

126. For example, Phillips describes that a ramp, interior of a cylindrical member, or half-pipe can be a part of the slide assembly, and can be coated with the durable low friction material. UATP-1004, 5:58-64 (describing that “Horizontal ramp surface 1401 and sloping ramp surface 1402...can be coated with durable low friction sheeting material to enable wet or dry use”), 8:7-10 (“As with ramp 191, the interior of cylindrical member 294, can be selectively coated with a durable, low-friction surface enabling user 193 to employ the present invention in a dry state”), 6:5-11 (describing a pyramid structure that “can be coated with a low friction durable coating material”), FIGS. 10, 13, 14A-D.

127. A POSITA would have understood that, like the various components of the recreational slide system the Phillips describes, at least part of the bumpers

on the slide edges are beneficially coated in the low friction coating to allow a user to engage with the bumpers during play or training, as it would be disadvantageous if the ride vehicle were to be slowed down if it accidentally impacts the edges during its descent (or if it purposely impacts the bumpers during practice of a sports trick). UATP-1004, 4:25-27, 1:50-62, 5:58-6:11. For example, it would have been obvious to a POSITA to coat at least a lower portion of the bumpers with the low friction material to allow the ride vehicle to continue down the slide if the vehicle contacted the bumper, rather than causing a jerky ride or stopping the forward motion of the ride vehicle by leaving the bumper un-coated.

128. Additionally, a POSITA would have understood that applying the low friction coating to only the base wall would encourage chipping and wear at the edges of the coating, diminishing the area of the sliding surface and resulting in a higher CoF at the edges and an inconsistent ride experience depending on where the ride vehicle contacts the slide. Having a continuous and uniform coating of the low friction material would discourage chipping or wear at the edges of the sliding surface, allowing for a uniform ride experience over time. A POSITA would have been motivated to apply the low friction coating to at least a portion of the sidewalls to provide ride consistency.

C. GROUND 1B: PHILLIPS-WN0400 RENDERS CLAIMS 1-4, 6-7, 14-17, AND 22-28 OBVIOUS

1. WN0400 Overview (UATP-1006)

129. WN0400 is a product specification describing a nylon mesh. UATP-1006, 1. For example, WN0400 describes a product titled “WN0400 – 400 Micron Nylon Mesh 45% Open Area.” *Id.* The product is woven from “Monofilament Nylon 6 fiber 42 threads per inch” and includes “400 micron hole opening[s] with 45% open area.” *Id.* The specifications describe that the hole size is 400 micron or about 0.016 inches. *Id.*, 1 (“400 Micron Nylon), 2 (“400 micron hole opening”), 3 (“Hole Size (in): 0.016”) .



UATP-1006, 1

2. The Phillips-WN0400 Combination

a) The Combination

130. Multiple reasons would have prompted a POSITA to implement Phillips' "low friction" slide system (described above §VIII.B.1) with a low friction bottom formed from nylon mesh having the characteristics taught by WN0400, to achieve known benefits, as articulated below.

131. 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). UATP-1004, 4:43-46, 5:12-16, 7:9-27, 7:53-55. As described above, a POSITA would have been aware that various materials described by Phillips are often woven: for example, nylon, Dacron, sailcloth, etc., are conventionally implemented as woven fabrics. UATP-1004, 4:43-46. For example, a POSITA would have understood that sailcloth is a woven fabric comprising nylon, Dacron, or other materials. UATP-1034, 1. A POSITA would have recognized that woven fabrics are a mesh, having holes that can vary depending on the purpose of the mesh fabric. UATP-1037, 1; UATP-1038, 1; UATP-1007, 1. 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. UATP-1004, 5:12-16, 7:9-27, 7:53-55; UATP-1011, 5.

132. Moreover, a POSITA would have been motivated to choose a woven nylon (e.g. nylon mesh), in accordance with WN0400’s suggestions as a known durable and low-friction material. UATP-1011, 5 (describing “Major Application Characteristics” of polyamides (nylons) as “Good mechanical strength, abrasion resistance, and toughness; low coefficient of friction”). WN0400 provides a suitable example of a woven nylon mesh, which a POSITA would have predictably looked to when implementing Phillips’ teachings. UATP-1006, 1. A POSITA, as described above, would have been able to select an appropriate material and would have further been able to find a source for purchasing or acquiring the selected

material. *Supra* §VI.A (Level of Skill of the POSITA), §VIII.A.2 (WN0400 Navigation Discussion).

133. In the resulting system, the fabric-bottomed ride vehicle includes a nylon forming the bottom surface, based on Phillips’ teachings, and has woven mesh characteristics suggested by WN0400. UATP-1004, 4:43-46; UATP-1006, 1-3. It would 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, which describes particular characteristics of a durable and low friction nylon mesh.

b) Reasons for the Combination

134. Multiple reasons would have prompted a POSITA to implement the Phillips slide system with a ride vehicle including a nylon mesh bottom surface, having characteristics in accordance with the teachings of WN0400.

135. First, a POSITA would 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.*, UATP-1004, 2:19-24. A POSITA would have recognized such construction as promoting fast sliding that enhances a user’s excitement and enjoyment when using the slide system, furthering Phillips’ express objectives. UATP-1004, Abstract (“sliding exercise apparatus and recreational device for entertainment and

[] to enhance gymnastic and board skills”); UATP-1020, 8 (“Speed is the important aspect of a slide – it’s what people want”); UATP-1018, 2 (describing with regard to a potato sack slide: “Faster equals more fun”), UATP-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 the nylon mesh described by WN0400 as providing a low-friction/slippery surface to implement Phillips teachings. UATP-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”); UATP-1011, 5 (describing nylon as durable and low friction); UATP-1006, 2 (“Excellent resistance to wear”). A POSITA would have understood that implementing the ride vehicle of Phillips with a nylon mesh bottom as taught by WN0400 would have achieved the “low friction” requirement of Phillips.

136. Second, a POSITA would have been motivated to utilize nylon mesh for the ride vehicle bottom based on Phillips express teachings of a fabric (e.g., nylon, Dacron, sailcloth) for use in the slide and vehicle surfaces. UATP-1004, 4:43-46. A POSITA would have been familiar with the characteristics of nylon, including its durability and low friction coefficient over many surfaces, consistent

with Phillips' suggestions. UATP-1011, 5 (describing nylon as having the characteristics of being durable and low friction); see also UATP-1006, 2 ("Excellent resistance to wear"). A POSITA would have found the commercially available mesh material described in WN0400 (or any number of others like it) and would have understood that it was a suitable option for providing a woven textile low-friction bottom for the ride vehicle. Moreover, a POSITA would have been motivated to implement Phillips' "nylon" bottom surface in accordance with WN0400 to facilitate sourcing by utilizing a material commercially available from nylon mesh suppliers. UATP-1006, 1 (including button to inquire about purchase).

137. Third, a POSITA would 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. "The differences in frictional forces acting between fabrics woven from filament yarns are dependent on the morphology of the fabrics and the rubbing direction." UATP-1010, 1. Additionally, "[v]ariation of mesh size in monofilament fabrics affects the frictional resistance of these fabrics." UATP-1009, 1. In fact, nylon meshes of varying mesh sizes (Table 1, Group IV) have slightly different coefficients of friction, with the finest meshes having a higher coefficient of friction than the coarsest meshes. *Id.*, 4 (Table 2 showing coefficients of friction of Fabric Nos. 13-15 against fabric, leather, and metal surfaces with the finest mesh (13) have a

higher coefficient of friction than the coarsest mesh (15) in all cases). Indeed, mesh fabrics with relatively larger apertures between strands were known to have an advantageously lower coefficient of friction (e.g., compared to more tightly woven fabrics). *Id.* A POSITA would have looked for nylon meshes that have larger apertures to take advantage of the lower frictional coefficients, while still covering the bottom surface of the ride vehicle with durable nylon material. A POSITA would have understood that WN0400 is a mesh having a weave that includes holes of 400 micron (or about 0.016 inches) and 45% open area and would have further understood that this mesh would be a suitable option for use as the bottom surface of the ride vehicle. UATP-1006, 2-3.

138. Fourth, a POSITA would have understood that a monofilament mesh fabric may also provide an advantage in sliding over surfaces. Textured fabrics have “high surface hairiness and loops” that can interact with surfaces that the fabric slides over, increasing the frictional coefficient of such fabrics over a variety of surfaces. UATP-1009, 4. In contrast, “[m]onofilament yarns are a single continuous filament which produces a relatively smooth surface” and “the straight-through pores of monofilament fabrics offer minimal flow restriction and surface loading of particles.” UATP-1007, 1. A POSITA would 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, as well as minimal flow restriction. UATP-1007, 1.

139. Fifth, a POSITA would have understood that there are a variety of available options for suitable nylon meshes that could be used as a bottom surface of a ride vehicle, and would have sought out a commercially available nylon mesh that had large apertures between threads. A POSITA would have found, for example, a variety of nylon meshes available from commercial suppliers (e.g., Industrial Netting) and would have been prompted to utilize a nylon mesh having characteristics described by WN0400 – 400 Micron Nylon Mesh 45% Open Area mesh as a suitable option. UATP-1006, 1-3; UATP-1033, 1-5 (showing multiple nylon mesh products available). A POSITA would have recognized WN0400 as a suitable durable, low friction option for forming the bottom surface of Phillips ride vehicle (i.e., sports board or membrane) based on Phillips’ description of appropriate materials and characteristics. UATP-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 an appropriate choice in view of this knowledge, but even if a POSITA was unaware of these relationships they would have recognized WN0400 as a suitable option for forming the bottom surface of Phillips’ ride vehicle based on Phillips’ disclosure alone.

140. Sixth, a POSITA would have been prompted to combine Phillips and WN0400 because doing so was the application of known techniques (WN0400's commercially available nylon mesh) to a known device (the Phillips recreational slide system) ready for improvement to yield predictable results (benefits articulated above). Ride vehicles like Phillips describes were known, and it would have been obvious to a POSITA to apply a mesh bottom per WN0400, just as Phillips instructs. UATP-1004, 5:32-35, 7:10-12; *supra* §VI.B.2. Indeed, giant slides at amusement parks utilized fabric mats or burlap sacks as ride vehicles well before the Critical Date – accordingly, the use of a woven fabric mesh as a vehicle to support a rider down a slide was not a new technique, and a POSITA would have not only been able to make the combination, but would have had a reasonable expectation of success in view of the ubiquity of using a mesh fabric as a ride vehicle. Additionally, I note that a POSITA would 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 have been implemented by using the WN0400 nylon mesh (or a similar mesh) as the ride vehicle bottom – a material already disclosed by Phillips as appropriate for such a system, without significantly altering or hindering the structure and function of the Phillips ride vehicle and slide system.

3. Element-by-Element Analysis

a) Claim 1

[1pre]-[1b-ii] A recreational slide system, comprising: 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; and a ride vehicle configured to support a rider down the slide, the ride vehicle including a top surface configured to contact the rider

141. See elements [1pre]-[1b-ii] (Ground 1A). *Supra* §§VIII.B.2.[1pre]-[1b-ii]. As I explained above, recreational slide systems that included a slide and a ride vehicle made from a woven fabric for sliding down the slide were well-known by the Critical Date. *Supra* §§VI.B.2-4.

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

142. Phillips-WN0400 provides [1b-iii]. For example, Phillips describes that the membrane forming the bottom surface of the ride vehicle is made of a “nylon.” UATP-1004, 4:43-46. A POSITA would have appreciated Phillips’ suggested material of nylon would provide a durable and low friction material forming the bottom surface of the ride vehicle, and that the WN0400 nylon mesh would be a suitable material that would also fulfil the requirements of low friction and being durable. UATP-1004, 4:43-46; UATP-1006, 2; *supra* §VIII.C.2 (Phillips-WN0400 Combination). In the Phillips-WN0400 combination, the low-friction bottom is formed from a nylon mesh, in accordance with the suggestions of WN0400 (“WN0400 – 400 Micron Nylon Mesh 45% Open Area”). UATP-1006,

1. As described above, the nylon mesh low friction bottom of the Phillips-WN0400 combination contacts the slide surface while the user slides down the slide. *Supra* §VIII.B.2.[1b-iii] (Ground 1A).

[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.

143. See element [1c] (Ground 1A). *Supra* §§VIII.B.2.[1c]. In the Phillips-WN0400 combination, the characteristics of the nylon forming the mesh layer are those described in WN0400, but the analysis regarding the coefficient of friction remains the same. *Supra* §VIII.C.2.

b) Claims 2-4 and 6-7

144. See claims [2]-[7] (Ground 1A). *Supra* §§VIII.B.2.[2]-[7].

c) 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.

145. Phillips-WN0400 provides claim [14]. WN0400 describes a “400 Micron Nylon Mesh” formed from “Monofilament Nylon 6 fiber 42 threads per inch.” UATP-1006, 2. First, a POSITA would have understood that the description of the nylon “mesh” with a number of threads per inch indicates that WN0400’s mesh is a woven mesh. *Id.*; UATP-1037, 1. In the combined system, the mesh has a woven configuration—WN0400 expressly describes a thread count per inch, confirming the mesh structure. UATP-1006, 2 (“42 threads per inch”).

In a woven fabric “[w]arp threads run lengthwise [and w]eave threads run across the width of a fabric at right angles to the warp.” UATP-1007, 1 (explaining the formation of a woven mesh). The nylon mesh of WN0400 is accordingly a weave of warp and weft threads formed of monofilament synthetic fibers. *Id.*, 1 (“Monofilament synthetic fibers can be woven very precisely to create industrial textiles with narrow pore distribution...Choose from a range of plastic mesh sizes made from Nylon”); UATP-1006, 1 (“400 Micron Nylon Mesh”), 2 (“Monofilament Nylon”).

146. To be clear, a POSITA would have understood that nylon is a man-made or “synthetic” polymer material. UATP-1011, 5 (listing Polyamides or “nylons” in a table of “Trade Names, Characteristics , and Typical Applications for a Number of Plastic materials”). Accordingly in the Phillips-WN0400 combination, the bottom surface of the ride vehicle is formed from a nylon mesh manufactured from monofilament synthetic fibers.

d) Claim 15

[15] The recreational slide system of claim 14, wherein the monofilament synthetic fibers comprise a polyamide monofilament structure.

147. Phillips-WN0400 provides claim [15]. As described above in claim [14], WN0400 describes a “400 Micron Nylon Mesh” formed from “Monofilament Nylon 6 fiber 42 threads per inch.” UATP-1006, 2; *supra* §VIII.C.2.[14]. A POSITA would have understood that the nylon monofilaments are formed from a

“polyamide” material – nylon. UATP-1011, 5 (listing “nylon” as a tradename for polyamide materials).

148. A POSITA would have been familiar with nylon as an example of a commercially produced and available polyamide product. Indeed, the '854 patent recognizes that nylon is an example of a polyamide material. UATP-1001, 2:40-41 (“the monofilament synthetic fibers may be a polyamide monofilament structure such as Nylon”), 3:17-20 (“the monofilament synthetic fibers may be a polyamide monofilament structure such as Nylon, and preferably Nylon 6 (polycaprolactam)”), 10:51-56 (“the warp and weft threads 70, 72 of the mesh material 46 are formed of a polyamide monofilament structure, such as Nylon 6... which proved during testing to yield the lowest coefficient of friction in combination with the dry lubricant coating 34.”). Accordingly in the Phillips-WN0400 combination, the bottom surface of the ride vehicle is formed from a nylon (polyamide) mesh manufactured from monofilament fibers.

e) 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.

149. Phillips-WN0400 provides claim [16]. A POSITA would have understood that a woven material or mesh is formed from warp threads and weft threads. In a woven material, “[w]arp threads run lengthwise in a fabric [and w]eft

or filling threads run across the width of a fabric at right angles to the warp.

UATP-1007, 1. Monofilament fabrics, like WN0400, “are produced with equal yarn diameters and equal thread counts in both the warp and weft directions.” *Id.*

150. As described above in claim [14], WN0400 describes a “400 Micron Nylon Mesh” formed from “Monofilament Nylon 6 fiber 42 threads per inch.”

UATP-1006, 2; *supra* §VIII.C.2.[14]. WN0400 describes that the mesh has “42 threads per inch,” defining a “400 micron hole opening with 45% open area.”

UATP-1006, 2.

151. A POSITA would have understood from these teachings that the WN0400’s nylon 6 threads have a diameter of about 0.2mm. A POSITA would have understood that from the information about the thread count and hole size in WN0400, the diameter of the threads can be calculated, as I will explain below. Additionally, a POSITA would have understood that “monofilament fabrics are produced with equal yarn diameters and equal thread counts in both the warp and weft directions.” UATP-1007, 1.

152. Because WN0400 describes that there are 42 threads per inch in the nylon mesh, the spacing from center of a thread to the next center of the parallel adjacent thread is about 0.6mm. From this, a POSITA would have understood that 1 inch is equal to 25.4 mm, and 25.4 mm divided by 42 threads (per inch) is

0.605mm. Thus, a center of a thread is found in the nylon mesh every 0.605mm (about every 0.6mm).

153. WN0400 also describes that the mesh has a 400 micron hole opening, or a 0.4mm hole opening. UATP-1006, 2. Additionally, WN0400 also describes that the mesh has a 0.016 inch hole size (length of interstitial opening) which is about 0.406mm. *Id.*, 2 (400 micron hole opening), 3 (0.016 inch hole size). A POSITA would have understood that the holes are bounded by threads of the mesh. Accordingly, WN0400 has about a 0.4mm gap between adjacent warp threads and between adjacent weft threads. *See* UATP-1007, 1 (“Since monofilament fabrics are produced with equal yarn diameters and equal thread counts in both the warp and weft directions, the mesh opening is square”). As described above, a center of a fiber occurs every 0.6mm in the mesh, and the edges of the fiber bound the hole. A POSITA would have understood from this information that each nylon monofilament fiber has a diameter of about 0.2mm so that adjacent threads are 0.6mm from center to center and to define a 0.4mm gap between adjacent fibers (one length of the square opening).

154. Accordingly in the Phillips-WN0400 combination, the bottom surface of the ride vehicle is formed from a nylon (polyamide) mesh manufactured from monofilament fibers with a diameter of about 0.2mm.

f) 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%.

155. Phillips-WN0400 provides claim [17]. As described above in claim [14], WN0400 describes a “400 Micron Nylon Mesh” formed from “Monofilament Nylon 6 fiber 42 threads per inch.” UATP-1006, 2; *supra* §VIII.C.2.[14]. WN0400 describes that the mesh has an open area of 45%. UATP-1006, 1 (“400 Micron Nylon Mesh 45% Open Area”), 2 (“45% open area), 3 (“Open Area 45%”). WN0400 describes a woven mesh, which a POSITA would have understood is formed from warp and weft threads woven together that form mesh openings (e.g., interstitial openings) between them. *See* UATP-1007, 1 (“Warp threads run lengthwise in a fabric. Weft or filling threads run across the width of a fabric at right angles to the warp. Since monofilament fabrics are produced with equal yarn diameters and equal thread counts in both the warp and weft directions, the mesh opening is square.”). Additionally, WN0400 shows that the construction of the nylon mesh is a woven construction having holes through it. UATP-1006, 1.



UATP-1006, 1

156. A POSITA would have understood that WN0400's description of a 45% open area mesh with 400 micron hole opening is a mesh with interstitial openings defining a mesh with 45% open area. A POSITA would have further understood that the mesh described in WN0400 includes interstitial openings from the image of the mesh shown above. UATP-1006, 1.

157. Accordingly in the Phillips-WN0400 combination, the bottom surface of the ride vehicle is formed from a nylon mesh manufactured from monofilament

fibers and having an open area of 45% -- well within the claimed “range of between about 35% to about 50%.”

g) Claim 22

[22pre] A ride vehicle configured to support a rider down a non-wet lubricated recreational slide, the ride vehicle comprising:

158. See elements [1a-i]-[1b-i] (Ground 1A). *Supra* §§VIII.B.2.[1a-i]-[1b-i]. As I explained above, recreational slide systems that included a ride vehicle made from a woven fabric (e.g., fabric mats, burlap or potato sacks) for sliding down the slide were well-known by the Critical Date. *Supra* §§VI.B.2-4.

[22a-i] an elongate body that extends between a first end and an opposite second end,

159. Phillips-WN0400 provides element [22a-i]. The '854 patent describes that “the ride vehicle 14... includes a flexible elongate body 48 that extends between a first end 50 and an opposite second end 52 to define a length of the ride vehicle 14.” UATP-1001, 9:18-51.

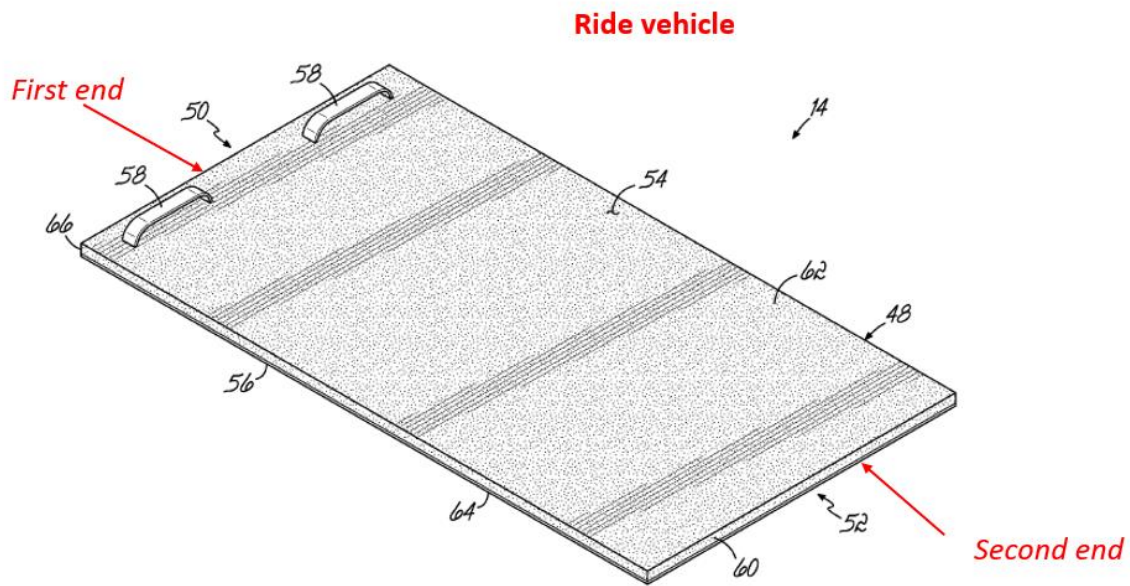
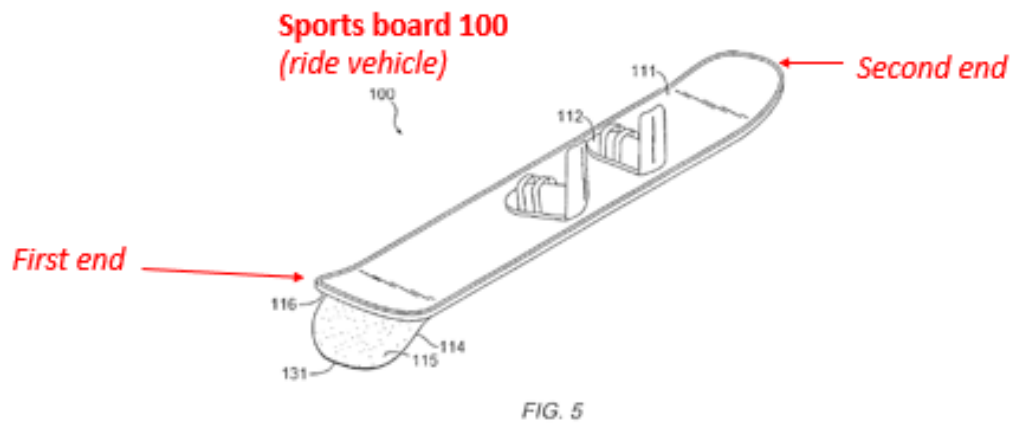


FIG. 3

UATP-1001, Fig. 3 (annotated)

Phillips-WN0400 provides “an elongate body that extends between a first end and an opposite second end,” consistent with the description of the ’854 patent.

160. Phillips describes a ride vehicle such as “a sports board” in “the shape of a snowboard or a flexible membrane that supports a rider on the slide.” UATP-1004, 7:6-8, 7:14-18 (“[m]embrane 90 can take on a number of geometrical shapes as well as thicknesses and physical characteristics so long as bottom surface 91 is composed of low friction durable sheeting material” and may be “in the form of a rectangle... upon which a user would sit or lie upon.”).



UATP-1004, Fig. 5 (annotated)

161. A POSITA would have understood that a snowboard has an elongate body between a first and second end, and would have appreciated that this is illustrated in Phillips’ Figure 5. UATP-1005, Fig. 5. Additionally, a POSITA would have understood that Phillips’ membrane can also be formed as an elongate shape between first and second ends based on Phillips’ disclosure that the membrane can be rectangular. UATP-1004, 7:14-18. Phillips’ snowboard-shaped sports board and rectangular membrane are both elongate bodies extending between first and second ends.

[22a-ii] the body including a central core positioned between

162. Phillips-WN0400 provides element [22a-ii]. The ’854 patent describes 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 [forming the top

surface 54] and a mesh layer 64 [forming the bottom surface].” UATP-1001, 9:63-10:1.

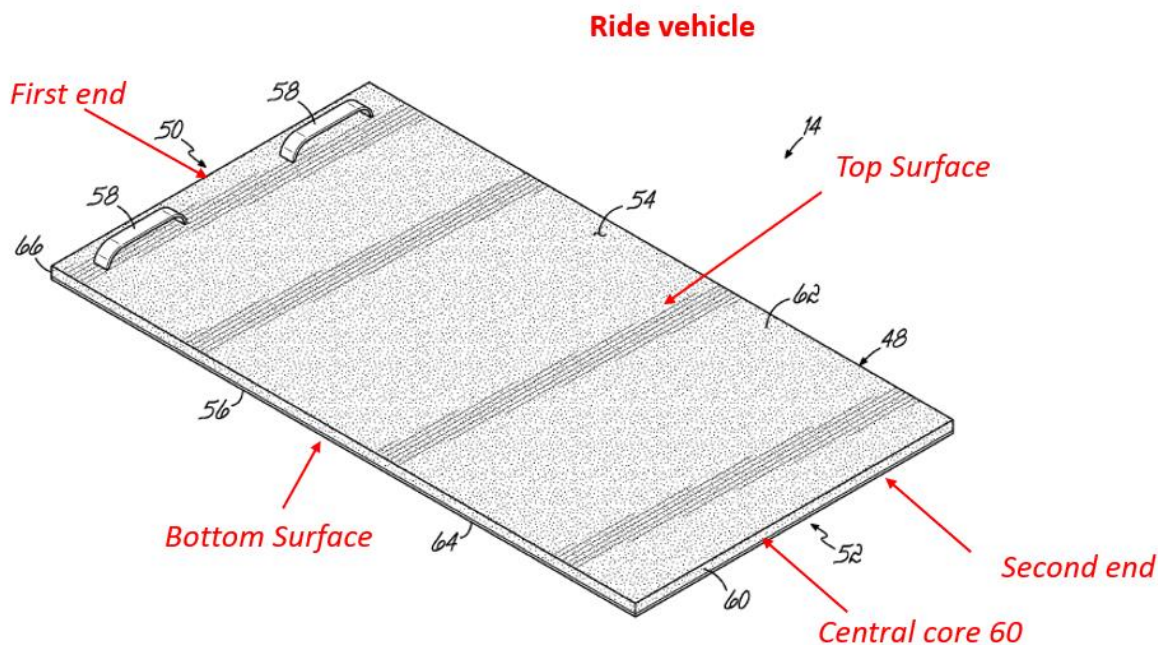


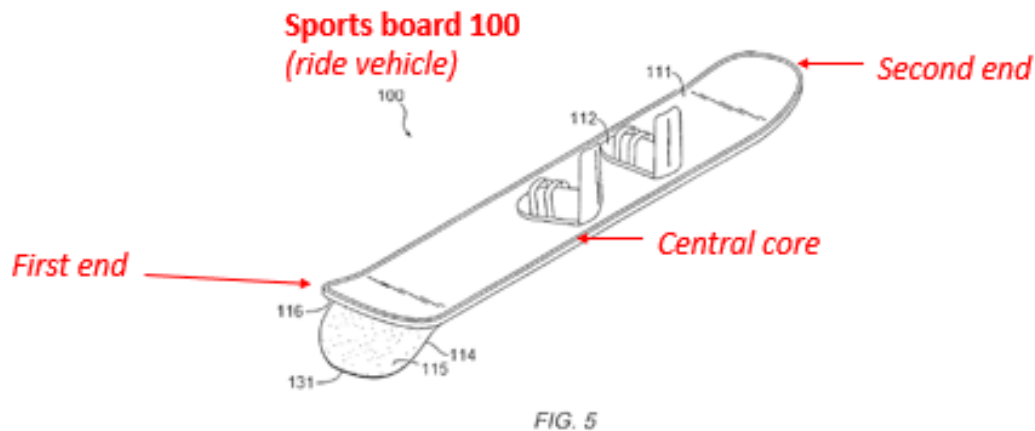
FIG. 3

UATP-1001, Fig. 3 (annotated)

Phillips-WN0400 provides “the body including a central core,” consistent with the description of the ’854 patent.

163. Phillips describes a sports “board 100 having bindings 112 is of the shape of a snowboard having a rigid top surface 111, bindings 112 and bottom surface 116.” UATP-1004, 7:6-9. Based on Phillips’ description the board 100 extends between the rigid top surface 111 and the bottom surface 116. *Id.*, 7:6-9, Fig. 5. A POSITA would have understood from this disclosure and from Figure 5

that Phillips' sports board has a central core (i.e., the board itself) that is positioned between the top surface 111 and the bottom surface 116.



Phillips, Fig. 5 (annotated)

164. Additionally, Phillips describes that “dedicated boards consisting of nothing more than **a solid core** surrounded by selective padding and a bottom surface of a durable low friction sheeting material can be employed as well.”

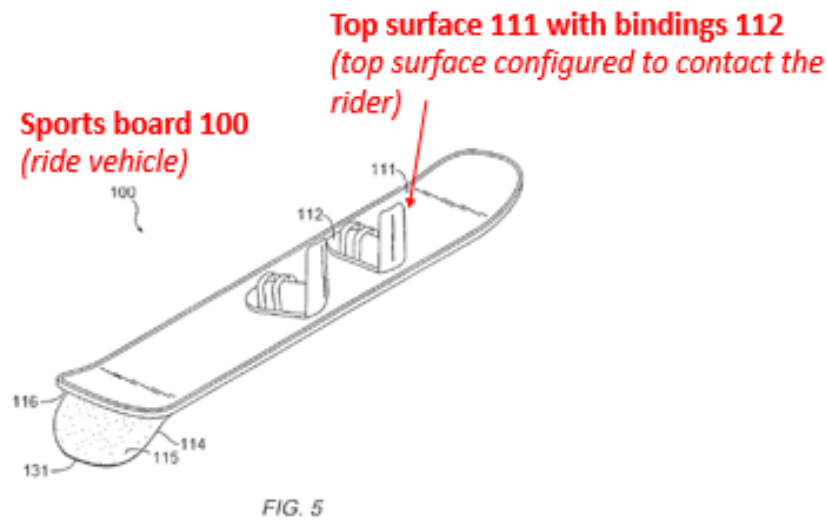
UATP-1004, 8:40-43. Accordingly, Phillips describes that the sports board includes or can include a central core between the top surface (i.e., top surface 111 and/or padding) and the bottom surface 116.

165. A POSITA would have recognized that a sports board or other ride vehicle having a central core would provide a measure of padding (or at least material) between the rider and the slide surface that would be beneficial in absorbing bumps and heat from sliding, and preventing the user from becoming injured while riding the slide. A POSITA would have appreciated that it is

beneficial to provide some material (i.e., central core) to absorb impacts as the rider travels down the slide to provide a smooth ride experience rather than a jarring one. In particular, the sports boards described by Phillips rely on a central core to allow the user to practice snowboarding techniques and tricks, and a POSITA would have been motivated to implement the ride vehicle with a central core based on Phillips' teachings. UATP-1004, 8:34-48.

[22a-iii] a top surface of the ride vehicle

166. Phillips-WN0400 provides element [22a-iii]. As described above (§VIII.B.2.[1b-ii] (Ground 1A), Phillips describes that a rider is supported on a top surface of the ride vehicle. UATP-1004, 3:12-13; 7:7-9; 8:40-43. For example, Phillips describes with regard to Fig. 5, that a sports board “having bindings 112 is of the shape of a snowboard having a rigid top surface 111, bindings 112 and bottom surface 116.” UATP-1004, 7:7-9; *see also id.*, 8:40-43 (describing board with a solid core covered by padding and “a bottom surface of a durable low friction sheeting material.”).

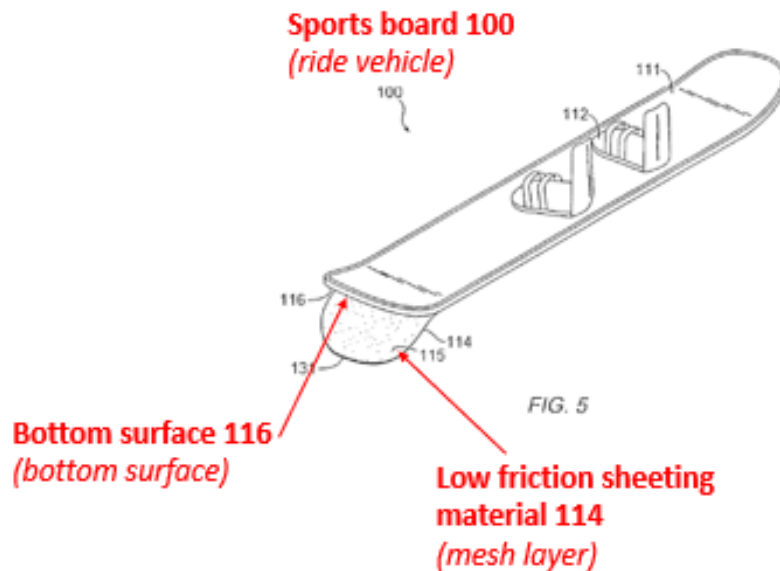


UATP-1004, Fig. 5 (annotated)

167. A POSITA would have understood that the central core extends between the top surface and the bottom surface of the sports board, and accordingly is adjacent to the top surface.

[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;

168. Phillips-WN0400 provides element [22a-iv]. As described above (§VIII.C.3.[1b-iii] (Ground 1B)), in the Phillips-WN0400 combination, the bottom surface of the sports board or membrane is formed from the nylon mesh described by WN0400. *Supra* §VIII.C.2 (Phillips-WN0400 Combination); UATP-1004, 3:12-13, 5:27-35, 7:7-23, 8:40-43, 8:49-61, 9:9-13.



UATP-1004, Fig. 5 (annotated)

169. Further, the nylon mesh low friction bottom of a membrane or sports board of the Phillips-WN0400 combination contacts the dry (non-wet) slide surface while the user slides down the slide. *Supra* §VIII.B.2.[1b-iii] (Ground 1A); UATP-1004, 5:32-35 (“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.”).

[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%.

170. Phillips-WN0400 provides element [22b]. As described above, in the Phillips-WN0400 combination, the bottom surface of the sports board or

membrane is formed from the nylon mesh described by WN0400. *Supra* §VIII.C.3.[1b-iii] (Ground 1B); §VIII.B (Phillips-WN0400 Combination).

171. Additionally, as described above (*supra* §VIII.C.3.[17] Ground 1B), WN0400 describes a “400 Micron Nylon Mesh 45% Open Area” formed from “Monofilament Nylon 6 fiber 42 threads per inch.” UATP-1006, 1-2. A POSITA would have understood that WN0400’s description of a 45% open area mesh with 400 micron hole opening is a mesh with interstitial openings defining a mesh with 45% open area. Accordingly in the Phillips-WN0400 combination, the bottom surface of the ride vehicle is formed from a nylon mesh manufactured from monofilament fibers and having an open area of 45% — well within the claimed “range of between about 35% to about 50%”.

h) Claim 23

[23] The ride vehicle of claim 22, wherein the woven mesh layer comprises a weave of threads formed of monofilament synthetic fibers.

172. See Claim [14] (Ground 1B). *Supra* §VIII.C.3.[14].

i) Claim 24

[24] The ride vehicle of claim 22, wherein the monofilament synthetic fibers comprise a polyamide monofilament structure.

173. See Claim [15] (Ground 1B). *Supra* §VIII.C.3.[15].

j) Claim 25

[25pre] A ride vehicle configured to support a rider down a non-wet lubricated recreational slide, the ride vehicle comprising:

174. See element [22pre] (Ground 1B). *Supra* § VIII.C.3.[22pre]. As I explained above, recreational slide systems that included a ride vehicle made from a woven fabric (e.g., fabric mats, burlap or potato sacks) for sliding down the slide were well-known by the Critical Date. *Supra* §§VI.B.2-4.

[25a-i] an elongate body that extends between a first end and an opposite second end,

175. See element [22a-i] (Ground 1B). *Supra* §VIII.C.3.[22a-i].

[25a-ii] the body including a central core positioned between

176. See element [22a-ii] (Ground 1B). *Supra* §VIII.C.3.[22a-ii].

[25a-iii] a top surface of the ride vehicle

177. See element [22a-iii] (Ground 1B). *Supra* §VIII.C.3.[22a-iii].

[25a-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;

178. See element [22a-iv] (Ground 1B). *Supra* §VIII.C.3.[22a-iv].

[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.

179. Phillips-WN0400 provides [25b]. As described above, in the Phillips-WN0400 combination, the bottom surface of the sports board or membrane is

formed from the nylon mesh described by WN0400. *Supra* §VIII.C.3.[1b-iii] (Ground 1B).

180. Additionally, as described above (*supra* §VIII.C.3.[16] (Ground 1B)), WN0400 describes a “400 Micron Nylon Mesh” formed from “Monofilament Nylon 6 fiber 42 threads per inch.” UATP-1006, 1-2. WN0400 also describes that the mesh has “42 threads per inch,” defining a “400 micron hole opening with 45% open area.” UATP-1006, 2. As described above, a POSITA would have understood from these teachings that the WN0400’s nylon 6 threads have a diameter of about 0.2mm. *Supra* §VIII.C.3.[16].

181. Accordingly in the Phillips-WN0400 combination, the bottom surface of the ride vehicle is formed from a nylon (polyamide) mesh manufactured from monofilament fibers with a diameter of about 0.2mm. *Supra* §VIII.C.2 (Phillips-WN0400 Combination).

k) 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.

182. Phillips-WN0400 provides claim [26]. The ’854 patent describes that “[t]he central core 60...may be enclosed or surrounded with a fabric liner 68 ... the fabric liner 68 is positioned between the central core 60 and the fabric layer 62 and the mesh layer 64.” UATP-1001, 10:11-16.

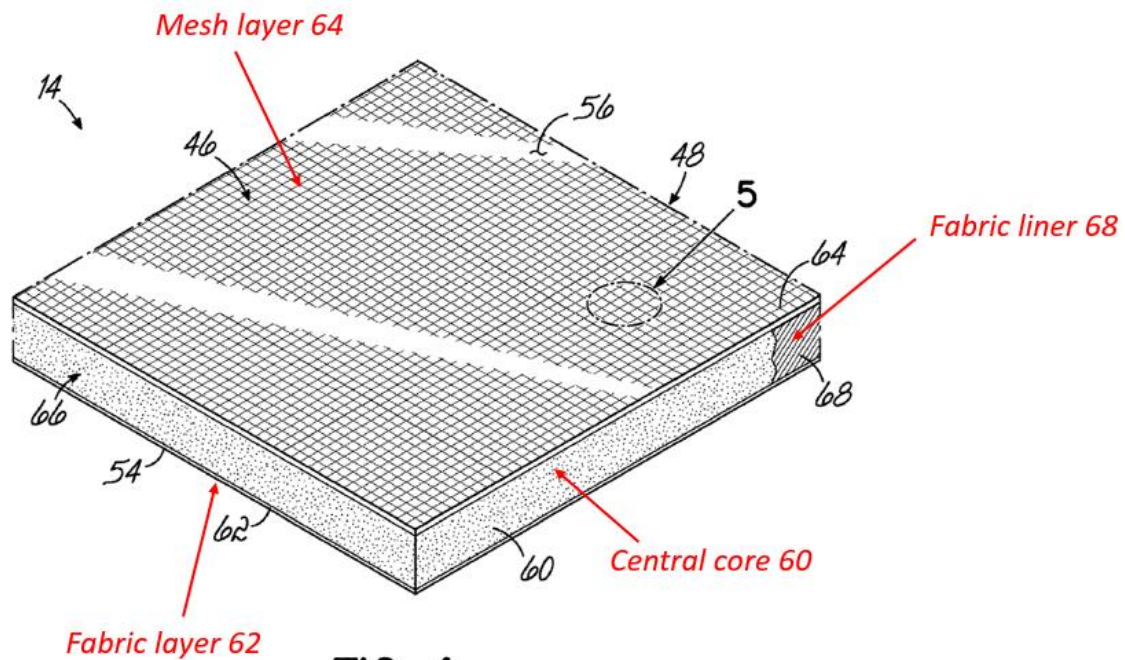


FIG. 4

UATP-1001, Fig. 4 (annotated)

183. Phillips-WN0400 provides “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,” consistent with the description of the ’854 patent.

184. Phillips describes that ride vehicles can be “a solid core **surrounded by** selective padding and a bottom surface of a durable low friction sheeting material can be employed as well.” UATP-1004, 8:40-43 (emphasis added). A POSITA would have appreciated that Phillips’ “selective padding” surrounds the core and functions as a fabric liner that is positioned between the core and the durable low friction sheeting material forming the bottom surface of the vehicle.

Id. From Phillips' description, a POSITA would have understood that the selective padding **surrounds** the core and thus is also positioned on a top side of the core (toward the top surface of the ride vehicle) in addition to being positioned on the underside of the core (toward the bottom surface of the ride vehicle).

185. To the extent that the claim requires an additional fabric layer, it would have been obvious to a POSITA to implement Phillips' ride vehicle with a top surface formed from a fabric layer to provide a continuous cover for the user to contact. UATP-1004, 7:18-27; FIG. 7. It would have also been obvious to a POSITA that the bindings 112 formed on the top surface of the sports board may include a fabric layer. See UATP-1004, Fig. 5.

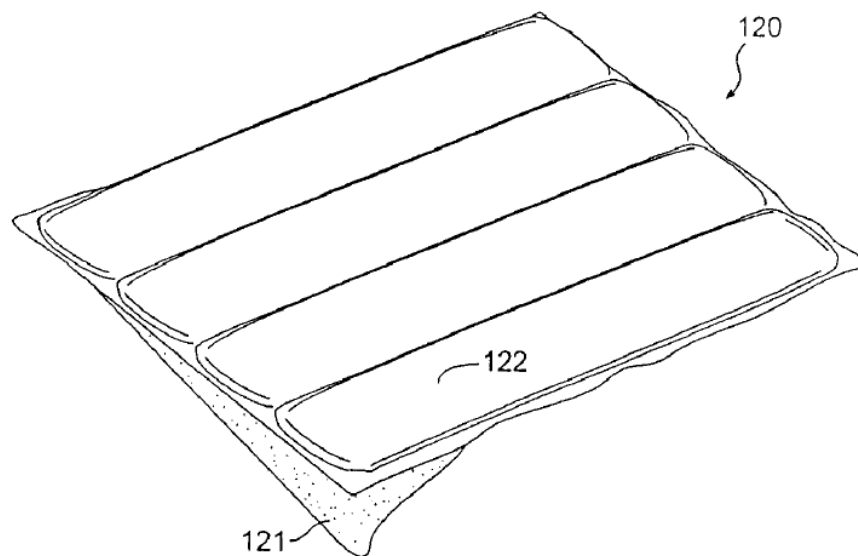


FIG. 7

UATP-1004, Fig. 7

186. As another example, in Figure 7, Phillips illustrates an example ride vehicle in which “membrane 121 could be adhered to a three dimensional sliding element 120...low friction durable sheeting material 121 is adhered to a body section 122 which can be inflated or provided with stuffing material to take on a three-dimensional configuration.” For example, a fabric layer forming a top surface of the ride vehicle could be used to hold the padding in place on the ride vehicle. A POSITA would have recognized that it would be advantageous to include a top fabric layer to hold padding in place where padding is provided surrounding the solid core of a sports board as well. UATP-1004, 8:40-43.

187. Accordingly, Phillips-WN0400 renders obvious 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.

l) Claim 27

[27pre] A recreational slide system, comprising:

188. See element [1pre] (Ground 1A). *Supra* §VIII.B.2.[1pre].

[27a] the ride vehicle of claim 22; and

189. See elements [22pre]-[22b] (Ground 1B). *Supra* §§VIII.C.3.[22pre]-[22b].

[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;

190. See elements [1a-i]-[1a-ii] (Ground 1A). *Supra* §§VIII.B.2.[1a-i]-[1a-ii].

[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.

191. See element [1c] (Ground 1B). *Supra* §§VIII.B.2.[1c].

m) Claim 28

[28] The recreational slide system of claim 27, wherein the coefficient of friction is kinetic coefficient of friction.

192. See Claim [2] (Ground 1A). *Supra* §VIII.B.2.[2].

D. GROUND 2A: PHILLIPS-FALLGATTER RENDERS CLAIMS 1-7 OBVIOUS

1. Fallgatter Overview (UATP-1005)

193. 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.” UATP-1005, Abstract; *see also id.*, at [0005].

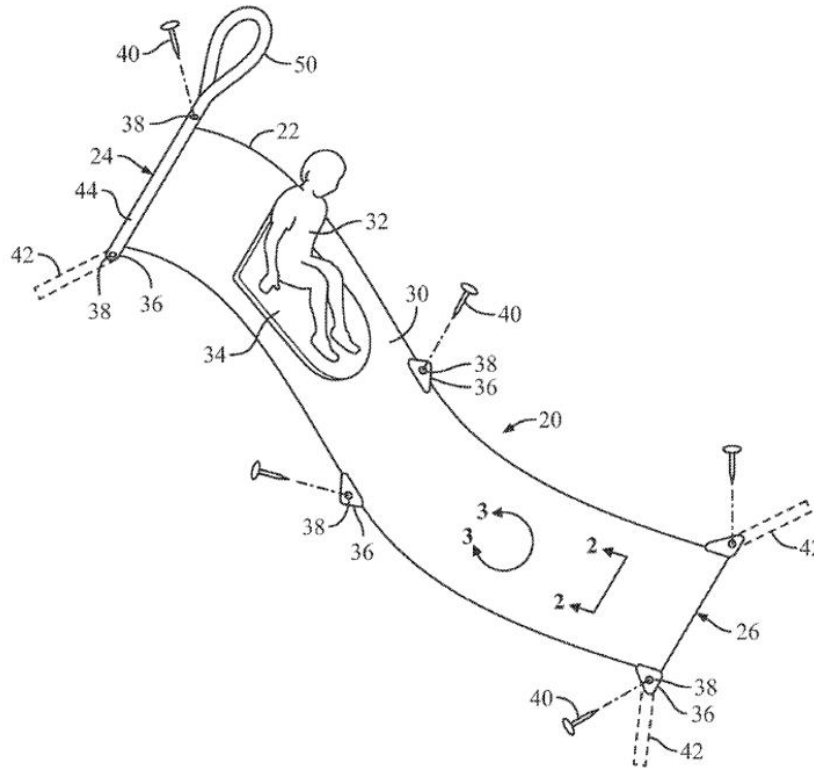


FIG. 1

UATP-1005, Fig. 1

194. Fallgatter describes that “[t]he slide body is made of a low-friction textile, most preferably a woven textile substrate such as a woven nylon, polyester or polyethylene with a low friction coating such as a silicone coating.” *Id.*, [0006]; *see also id.*, [0008] (“The slide body comprises a flexible textile substrate comprising a woven fabric and a friction-reducing coating deposited on the textile substrate.”), [0009]. “[T]he 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.” *Id.*, [0006]; *see also* [0012] (“a sliding

surface is defined atop the friction-reducing coating, and the sliding surface has a dry coefficient of friction less than about 0.25...[or] about 0.21 or less”).

195. Fallgatter describes what is meant by a “low-friction” sliding surface, stating that “[t]he coating defines the sliding surface upon which riders may slide, and preferably has a coefficient of friction of about 0.25 or less” or “0.21 or less.” *Id.*, [0006], [0012]. Fallgatter further describes that “[t]he friction-reducing coating has a coefficient of friction less than a coefficient of friction of the textile substrate.” *Id.*, [0008].

2. The Phillips-Fallgatter Combination

a) The Combination

196. Based on my knowledge and experience in the field and my review of Phillips and Fallgatter, multiple reasons would have prompted a POSITA to implement Phillips’ “low friction” slide system with a kinetic coefficient of friction value and woven fabric vehicle bottom (as suggested by Fallgatter), to achieve known benefits, as articulated below. As I explained above (*see e.g.*, §VIII.1 and §§VIII.2.[1.pre]-[1.c]), Phillips describes a dry recreational slide with a “low friction” and high durability coating for use with a fabric bottom ride vehicle. UATP-1004, 1:13-25, 4:21-24, 8:20-22. In particular, Phillips describes 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. UATP-1004, 4:43-46. A POSITA would have understood that these materials provide low kinetic friction when sliding against a wide variety of materials, and would have further understood that nylon would provide a suitable low-friction and highly durable bottom surface for a ride vehicle, and that Teflon would provide a suitable material for forming the sliding surface of the slide as it is well-known to low friction coefficients when interacting with most materials. UATP-1021, 1; UATP-1027, 4-5; UATP-1011, 5. While Phillips is clear that the surface is “low friction” and provides specific materials that provide known coefficients of kinetic friction (e.g., Teflon and nylon, which exhibit coefficient of friction of about 0.05 (*supra*, §VIII.B.2.[1.c] (Ground 1A))), Phillips does not expressly articulate numerical values of the coefficient of friction. Fallgatter provides a straightforward suggestion of numerical frictional coefficient between the slide and vehicle in a slide system. UATP-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”).⁴

197. In the resulting system, the slide surface includes a “low friction” coating (e.g., “Teflon”/PTFE) and a fabric bottom vehicle, based on Phillips’ teachings, to achieve a numerical coefficient of friction suggested by Fallgatter. UATP-1004, 4:43-46; UATP-1005, [0006], [0012]-[0013], [0016], [0036], [0042]. In the Phillips-Fallgatter combination, the slide would have been implemented using materials selected to achieve a friction coefficient between the coated slide and the bottom of the ride vehicle of less than 0.21, as Fallgatter teaches is an appropriate frictional coefficient to strive for in the low-friction relationship

⁴ Even if Fallgatter’s specified coefficients of friction between the slide surface and ride vehicle are static coefficients of friction, a POSITA would have understood that the kinetic coefficient of friction range of the same objects and materials would be at least as low as the static coefficient of friction values cited in Fallgatter. *Supra* §VI.B.3.

between a recreational slide and slide vehicle. UATP-1004, 4:43-46; UATP-1005, [0006], [0012]-[0013], [0016], [0036], [0042].

198. It would 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 that Fallgatter provides, and further, making such a material selection would have been well within the POSITA's level of skill. *Supra* §VI.A; UATP-1004, 4:43-46; UATP-1005, [0006], [0012]-[0013], [0016], [0036], [0042]. Indeed, a POSITA implementing a slide system in accordance with Phillips' teachings would have been prompted to look to similar references, like Fallgatter, that describe numerical target friction coefficients for a recreational slide. *Id.* UATP-1005, [0012] ("about 0.21 or less."), [0006] ("The coating defines the sliding surface upon which riders may slide").

b) Reasons for the Combination

199. Multiple reasons would have prompted a POSITA to implement Phillips' slide using materials to achieve a low numerical coefficient of friction between the slide and the ride vehicle, in accordance with Fallgatter's express teachings.

200. First, a POSITA would have been motivated to combine the teachings of Phillips and Fallgatter to provide a recreational slide with a low numerical coefficient of friction between the slide and the ride vehicle, in accordance with

Phillips' and Fallgatter's express objectives, to enhance system performance by providing a fast and fun ride experience to users. UATP-1004, Abstract ("sliding exercise apparatus and recreational device for entertainment and [] to enhance gymnastic and board skills"), 3:16-23; UATP-1020, 8 ("Speed is the important aspect of a slide – it's what people want"); UATP-1018, 2 (describing with regard to a potato sack slide: "Faster equals more fun"), UATP-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 expressly teaches the desirability of "low friction" between slide and vehicle (without any reservations against being too low), which a POSITA would have recognized as promoting fast sliding that enhances a user's excitement and enjoyment when using the slide system.

201. A low kinetic coefficient of friction less than 0.21 would have predictably increased acceleration as a rider slides down the slide surface, and would have been readily achieved based on Phillips and Fallgatter's express teachings of a Teflon/PTFE slide surface and fabric (e.g., nylon, Dacron, sailcloth). UATP-1004, 4:43-46; UATP-1005, [0016], [0036], [0043]; UATP-1021, 1 (interactions between nylon and Teflon have a coefficient of friction of 0.05). Indeed, Teflon/PTFE is widely known as a low friction material that exhibits a kinetic coefficient of friction with nylon and other materials well below 0.21.

UATP-1011, 5 (listing both nylon and Teflon with characteristic of low friction); UATP-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), UATP-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). Because “[f]riction works against gravity to slow a person’s descent on a slide,” but “[w]ithout friction, a slide would accelerate the rider too quickly,” a lower frictional coefficient allows a person to accelerate to a greater speed.

202. Second, a POSITA would have been motivated to combine the teachings of Phillips and Fallgatter to achieve Phillips’ directive to provide a durable, low-friction layer on each of the slide and ride vehicle. UATP-1004, UATP-1004, 1:13-25, 4:21-24, 8:20-22; UATP-1005, [0006], [0036], [0042], [0047]. While Phillips does not expressly define a numeric value for the coefficient of friction to achieve its “low friction” objective, a POSITA would have understood that the sliding contact between the two low friction surfaces (e.g., Teflon and nylon, or other material) would have an associated low coefficient of friction. *Supra*, §VIII.B.2.[1c] (Ground 1A); UATP-1021, 1 (Nylon-Teflon interactions have a coefficient of friction of 0.05).

203. A POSITA would have looked to Fallgatter's teaching of an appropriate maximum friction coefficient for a similar recreational slide to guide implementation of Phillips' system. UATP-1004, 1:13-17 ("The present invention is directed to [a] recreational system ... which include[s] a slide having a low friction, durable top layer upon which a user can traverse in both a wet or dry condition."); UATP-1005, [0002] ("The present disclosure relates to the field of dry recreational slides"). A POSITA would have understood that various combinations of the materials that Phillips' teaches can be used for the slide and vehicle would achieve coefficients of friction in the range taught by Fallgatter.

204. For example, the coefficient of friction between Teflon and nylon is about 0.05—below the 0.21 maximum taught by Fallgatter. UATP-1021, 1 (listing a dry coefficient of friction for Teflon-nylon interactions as 0.05). Pairings of other materials taught by Phillips likewise result in a coefficient of friction well below Fallgatter's maximum value, including Teflon/Teflon and nylon/nylon, among others. UATP-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), UATP-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).

205. Accordingly, a POSITA would have been motivated to make the combination because Fallgatter provides additional details for implementation of Phillips' system.

206. Third, a POSITA would have been motivated to predictably combine Phillips and Fallgatter to utilize a material for the ride vehicle bottom that promotes low friction with the slide surface. A POSITA would have understood that selection of materials for a low friction slide coating and low friction ride vehicle bottom determines the coefficient of friction between the coating and vehicle. *Supra* §VIB.3. A POSITA would have been motivated to combine the teachings of Phillips and Fallgatter to guide the selection of materials, consistent with Phillips' and Fallgatter's suggested materials. UATP-1004, 4:43-46; UATP-1005, [0012], [0006]. For example, POSITA would have been motivated to implement a "woven" fabric for the ride vehicle bottom based on Fallgatter's express teaching to use a "woven textile substrate." UATP-1005, [0006] ("Vehicles can also be made of the same or similar material"). A POSITA would have thus predictably utilized a "woven" nylon, Dacron, sailcloth, etc. UATP-1004, 4:43-46; UATP-1005, [0011]. In fact, the dictionary definition of sailcloth is "any of various fabrics, as of cotton, nylon, or Dacron, for boat sails or tents" UATP-1034, 1. A POSITA would have understood that the fabric of sailcloth is a woven material (e.g., a fabric made of cotton, nylon, or Dacron). *Id.*, *see also*

UATP-1038, 1 (dictionary definition of fabric is “a cloth made by weaving, knitting, or felting fibers”). Indeed, Phillips expressly describes use of materials such as nylon, and a POSITA would have found it obvious to implement the nylon layer as a “woven textile” in accordance with Fallgatter. UATP-1004, 4:43-46; UATP-1005, [0006], [0013].

207. Fourth, a POSITA would have understood that application of Phillips’ low friction sliding surface to the slide as a coating, as both Phillips and Fallgatter teach, would allow for simple upkeep and maintenance. UATP-1004, 4:43-46, 5:63-64, 6:6-8; UATP-1005, [0006], [0042]. A POSITA would have understood that application of a low-friction coating simplifies slide maintenance, allows for customization of the slide surface and decreases costs associated with slide manufacture. A coating applied to a slide can be easily reapplied or touched up to keep the slide experience consistent, and can be changed or altered relatively easily to allow for customization of the ride experience. UATP-1004, 8:19-29.

208. Relatedly, a POSITA would have understood that the application of Phillips’ low friction sliding surface to the slide as a coating, as Fallgatter teaches, would allow for customization of the coefficient of friction between the ride vehicle and the sliding surface in different areas of the slide, as Phillips teaches. UATP-1004, 8:19-29. For example, Phillips describes that “it is possible to selectively provide low friction durable sheeting material 183 to the top surface

of slide 180.” *Id.*, 8:20-22, Fig. 9. Application of different coatings, or the absence of applied coating in various locations of the slide, can provide obstacles or foot-holds for a rider. UATP-1004, 8:19-29.

209. Fifth, a POSITA would have understood that application of a low friction sliding surface to the slide as a coating, as Fallgatter teaches, would be economical compared to formation of a slide by a unitary construction incorporating low friction materials. A low-friction coating, for example, including high amounts of Teflon, may be expensive, but would likely be less expensive than a unitary slide component formed from a material that includes Teflon throughout. A POSITA would have appreciated that application of a low-friction coating on a slide body could achieve cost savings by making use of economical manufacturing practices, and using the smallest possible amount of low-friction coating material to achieve the low-friction interaction between the slide surface and the ride vehicle bottom. A POSITA would have understood that the application of a low friction coating which can be applied to a commercially available slide that is formed from a less costly material, so that the slide does not have to be specially manufactured or formed from a material that includes the low friction materials throughout the slide construction.

210. Sixth, a POSITA would have been prompted to combine Phillips and Fallgatter because doing so was the application of known techniques (Fallgatter’s

teaching of an appropriate CoF for a low friction coating and a ride vehicle) to a known device (Phillips' recreational slide system) ready for improvement to yield predictable results (benefits articulated above). As described above, recreational slides were well known by the Critical Date. *Supra* §VI.B.2. Additionally, the idea of coating the slide with a lubricant to achieve a lower coefficient of friction was not a new concept by the Critical Date – it too was well-known. *Supra* §§VI.B.2-3; UATP-1019, 2; UATP-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”); UATP-1027, 1 (list of factors influencing coefficient of friction between two sliding solids). A POSITA would have understood that the application of a low-friction coating to a slide and selection of a low friction material for a ride vehicle bottom were well-known and would have been easily implemented in Phillips' recreational slide. Further, a POSITA would have been aware that Fallgatter's disclosed maximum coefficient of friction of 0.21 between a dry slide and a ride vehicle was a well-known characteristic of conventional dry slides – the '854 patent makes as much clear. UATP-1001, 1:48-51 (“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.”).

211. For all of the above reasons, a POSITA would have had a reasonable expectation of success in making the proposed modifications. Additionally, a POSITA would have had a reasonable expectation of success in making the combination because Fallgatter's teachings would have been implemented by selecting materials from the list already disclosed by Phillips, without significantly altering or hindering the structure and function of Phillips' slide.

3. Element-by-Element Analysis

a) Claim 1

[1pre]-[1a-i] A recreational slide system, comprising: a slide

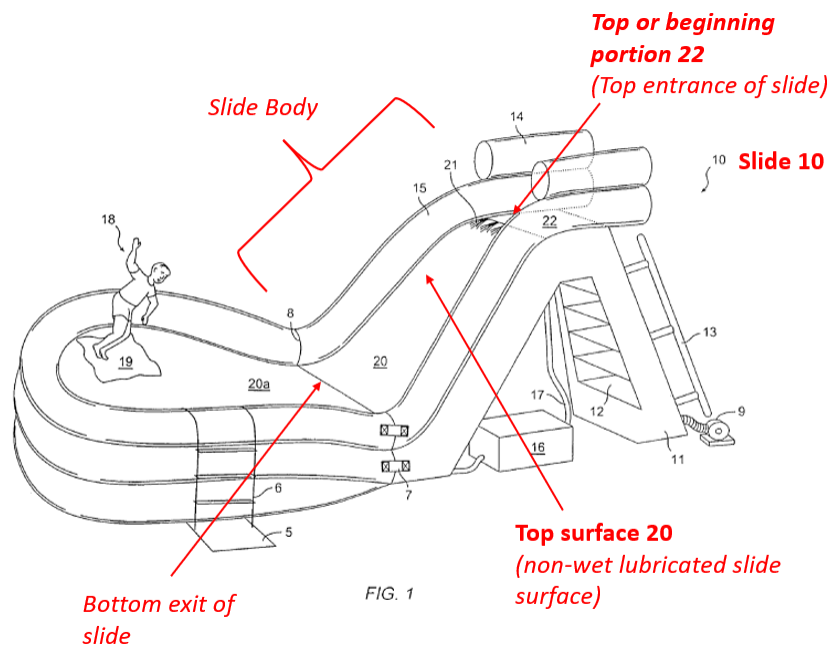
212. See Elements [1pre]-[1a-i] (Ground 1A). *Supra* §§VIII.B.2.[1pre]-[1a-i]. As I explained above, recreational slide systems that included a slide and a ride vehicle for sliding down the slide were well-known by the Critical Date. *Supra* §§VI.B.2-4.

[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

213. Phillips-Fallgatter provides [1a-ii]. As described above, Phillips discloses a slide body (e.g., top surface 20) that extends between a top of the slide and a bottom of the slide and has a low friction surface for use when dry. *Supra* §VIII.B.2.[1a-ii]. For example, Phillips describes that the "[s]lide is provided with a top surface 20... 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.” UATP-1004, 2:19-24; *see also id.*, 4:34-37, 6:54-55, FIG. 1.

214. As illustrated below, Phillips describes that the top surface 20 extends between a top of the slide and a bottom of the slide. UATP-1004, 4:34-37 (“Slide 10 is shown as having a top or beginning portion 22 in the form of a substantially flat pad”), 6:52-55 (describing a top of the slide), FIG. 1. Phillips’ slide accordingly includes a slide body that has a slide surface as depicted below in Figure 1.



UATP-1004, Fig. 1 (annotated)

215. As also discussed above, a POSITA would have recognized Phillips’ low friction slide surface as a slide body with a non-wet lubricated slide surface, because it facilitates sliding. UATP-1004, 4:21-24 (“Top surface 20 is 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.”), 8:20-22; 6:6-8, Fig. 9; *supra* §VIII.B.2.[1a-ii].

216. To the extent that this claim element is taken to require a separate coating of the slide surface providing the lubricated slide surface, the combination discloses this structure. Both Phillips and Fallgatter describe a low friction coating applied to the slide surface. UATP-1004, 4:43-46, 5:63-64. 6:6-8; UATP-1005, [0006], [0042]. As described above, Phillips describes that in the slide system, “sloping ramp surface 1402 ... can be coated with durable low friction sheeting material to enable wet or dry use.” UATP-1004, 5:62-64; 6:6-8; 4:43-46; *supra* §VIII.B.2.[1a-ii]. Additionally, Fallgatter describes a similar slide that includes a durable substrate layer and a “low-friction coating 54 preferably is applied to the substrate layer 52, and defines the sliding surface 30.” UATP-1005, [0042], [0016] (“The slide body further comprises a flexible textile substrate.... And a friction-reducing coating deposited on the textile substrate”), [0006], [0017], [0019], [0036], [0042]-[0043]. For example, Fallgatter describes that “[t]he slide body is made of a low-friction textile . . . with a low friction coating such as a silicone coating [which] defines the sliding surface upon which riders may slide.” UATP-1005, [0006].

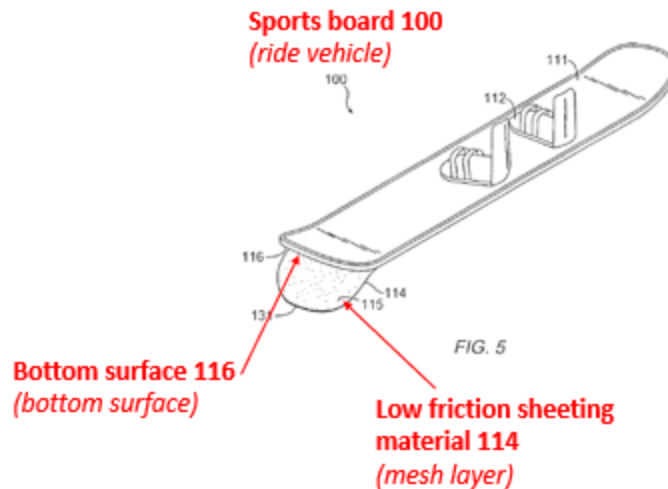
217. Accordingly, Phillips-Fallgatter render obvious element [1a-ii].

[1b-i]-[1b-ii] a ride vehicle configured to support a rider down the slide, the ride vehicle including a top surface configured to contact the rider

218. See Elements [1b-i]-[1b-ii] (Ground 1A). *Supra* §§VIII.B.2.[1b-i]-[1b-ii].

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

219. Phillips-Fallgatter provides [1b-iii]. As described above, a POSITA would have understood that the bottom surface of the ride vehicle is formed from a low friction sheeting mesh material configured to contact the slide surface. *Supra* §VIII.B.2.[1b-iii] (Ground 1A); UATP-1004, 4:43-46, 5:27-35, 7:7-23, 8:40-4, 8:49-61, 9:9-13. Phillips describes that a sports board includes “a bottom surface of a durable low friction sheeting material” such as “nylon, Teflon, sailcloth, Dacron, [and] vinyl,” among others.” UATP-1004, 4:43-46; 7:10-12.



UATP-1004, Fig. 5 (annotated)

220. Even if Phillips did not expressly describe a “mesh layer” (which it does), this conventional feature would have been obvious based on Fallgatter’s suggestions. *Supra*, §VIII.D.2 (Phillips-Fallgatter combination). Fallgatter describes use of a “woven textile” such as “nylon, polyester and polyethylene” thereby providing a mesh layer. UATP-1005, [0006] (“Vehicles can also be made of the same or similar material”), [0009]. A POSITA would have implemented the bottom of the vehicle with a “woven textile” mesh in accordance with Phillips and Fallgatter’s suggestions in order to enhance “low friction” between the slide and vehicle and to utilize durable and widely-available materials. *Supra*, §VIII.D.2 (Phillips-Fallgatter combination); UATP-1004, 3:19-23 (“and an additional low friction, durable sheeting layer appended to and supported by the bottom of the

sports board”), 3:25-32; 4:38-49; 5:30-35, 7:6-27, 8:40-9:13; UATP-1005, [0006], [0036], [0042], [0047], .

[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.

221. Phillips-Fallgatter provides [1c]. As described above (§VIII.D.2 (Phillips-Fallgatter Combination)), Phillips-Fallgatter is implemented with the slide surface and ride vehicle bottom formed from materials selected from Phillips’ list to achieve a coefficient of friction between the materials of less than 0.21, as Fallgatter teaches is an appropriate value for a recreational slide. UATP-1005, [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”), [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.”), [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”); UATP-1004, 4:43-46.

222. During prosecution of the '854 patent, Fallgatter was cited in a rejecting this claim element. UATP-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). However, these arguments fail to recognize Fallgatter’s teaching that 0.21 is an upper limit of the coefficient of friction between the slide surface and ride vehicle.

223. First, as the applicant identified in the response, “a person skilled in the art would recognize CoF as a measurement of friction between two surfaces.” UATP-1002, 117. A POSITA would have understood that the notion of a coefficient of friction of a slide coating by itself is nonsensical. *Supra* §VI.B.3; UATP-1019, 2 (“Friction is a force that occurs whenever two objects rub against each other, such as a slide and person’s backside.”); UATP-1008, 1 (“Friction is a force that opposes relative motion between systems in contact”). A POSITA would have further understood that Fallgatter describes a frictional coefficient

between two surfaces, as a coefficient of friction requires. Indeed, the only two interacting surfaces that Fallgatter describes are the slide surface and the vehicle bottom, and a POSITA would have understood Fallgatter's frictional coefficient to be a coefficient of friction between the slide surface and the vehicle bottom, as claimed. A POSITA would have recognized, as stated above, that two objects must interact in order for there to be friction, and that Fallgatter's described coefficient of friction refers to friction between the slide and the vehicle described throughout Fallgatter. UATP-1019, 2; UATP-1008, 1. Further, the applicant's reference to Fallgatter's description of a "static" coefficient of friction (see UATP-1002, 117 referencing UATP-1005, [0042]) is misplaced, given that the kinetic coefficient of friction between two surfaces is lower than the static coefficient of friction therebetween. *Supra* §VI.B.3; UATP-1008, 1, 4-5 (explaining that the static friction between two objects is usually greater than the kinetic friction between the objects and comparing static and kinetic frictional coefficients of various material systems). Even if Fallgatter's statement "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," refers to a static friction between the slide surface and the ride vehicle, the corresponding kinetic friction would be predictably lower. UATP-1005, [0012]; UATP-1008, 1, 4-5.

224. Second, Fallgatter’s alleged failure to identify a particular vehicle bottom is a red herring, as Fallgatter’s frictional coefficient is described as an upper limit to the acceptable coefficient of friction between the surfaces, not as a particular value associated with a specific embodiment. *See* UATP-1005, [0012] (“the sliding surface can have a dry coefficient of friction of about 0.21 **or less**”) (emphasis added). A POSITA would have understood Fallgatter’s teaching as an instruction that the coefficient of friction between the sliding surface and any ride vehicle should be 0.21 or less – not as a specific value associated with one particular ride vehicle.

225. Third, applicant’s assertion that “a CoF between the mesh layer and the low-friction slide surface... must be greater than 0.25” (UATP-1002, 118) misinterprets Fallgatter’s description that the slide’s friction reducing coating has “a dry coefficient of friction less than a coefficient of friction of the textile substrate and less than about 0.25” (UATP-1005, [0016]). 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.

UATP-1005, [0016].

226. In this paragraph, Fallgatter describes that the textile substrate forming the slide body is coated in a “friction-reducing coating.” *Id.* Further, Fallgatter describes that the friction-reducing coating accomplishes its friction-reducing objective: the coefficient of friction between the coated slide surface and a vehicle bottom is lower than the frictional coefficient between an uncoated textile substrate and vehicle bottom. Accordingly, Fallgatter is describing here that the coating is a lubricating coating that operates to reduce the friction between the slide surface and the ride vehicle. *Supra* §§VI.B.3-4

227. As described above, a frictional coefficient of a surface alone (e.g., in the absence of interaction with a second surface) is nonsensical and Applicant’s assertion that Fallgatter somehow means that the slide surface *by itself* has a coefficient of friction of 0.21 or lower is baseless and nonsensical in itself. *Supra* §VI.B.3. Additionally, Applicant’s assertion that the frictional coefficient between the coated surface and an uncoated textile bottom must be higher than 0.25 is baseless – 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. Fallgatter describes that the coefficient of friction between the coated slide surface and a vehicle bottom is lower than that of an uncoated slide surface and vehicle bottom – but says nothing about the vehicle bottom itself in the relevant paragraph. UATP-1005, [0016].

228. Although the applicant was able to convince the examiner with these baseless arguments, the resulting allowance and issuance of claim 1 was in error for all of the reasons just described. A POSITA would have understood that Fallgatter provides an upper limit of 0.21 as an acceptable coefficient of friction between the sliding surface and the bottom of the ride vehicle. UATP-1004, [0012]; UATP-1001, 1:48-51.

229. Further, a POSITA would have recognized that Fallgatter's disclosed frictional coefficient of 0.21 itself falls within the claimed range, according to the '854 patent. UATP-1001, 2:34-36, *see also* 1:48-51 ("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"). The '854 patent defines that "[a]s used herein relative to the coefficient of friction, "about" is intended to mean +/- 10%." UATP-1001, 2:34-36. Accordingly, the claimed range with the +/- 10% that the '854 patent intends the word "about" to indicate would have been understood by a POSITA to be a range from 0.027 to 0.22. Accordingly, Fallgatter's disclosed coefficient of friction of "about 0.21 or less" is within the claimed range of the '854 patent – that is, between 0.027 to 0.22.

230. As described above, in the Phillips-Fallgatter combination various combinations of the materials listed by Phillips, such as Teflon and nylon, are used to form the sliding surface and the ride vehicle bottom achieving a coefficient of

friction therebetween that would be 0.21 or lower, and within the claimed range of about 0.03 to 0.2 +/- 10% (e.g., in the range of 0.027 to 0.22).

b) Claim 2

[2] The recreational slide system of claim 1, wherein the coefficient of friction is kinetic coefficient of friction.

231. Phillips-Fallgatter provides claim 2. As described above, the Phillips-Fallgatter combination implements Phillips slide with a low friction sliding surface for a ride vehicle with Fallgatter's teaching that an appropriate coefficient of friction of the "sliding surface upon which riders may slide" is less than 0.21. *Supra* §VIII.E.2 (Phillips-Fallgatter Combination); UATP-1005, [0006], [0012]; UATP-1004, 2:44-52; 1:13-17, 3:16-23, 4:43-46.

232. A POSITA would have understood that static friction is the friction between two systems that are "in contact and stationary relative to one another," while kinetic friction is friction between "two systems [that] are in contact and moving relative to one another." UATP-1008, 1. Once an object is in motion, it is easier to keep it in motion, and "the coefficients of kinetic friction are less than their static counterparts." UATP-1008, 4. A POSITA would have understood that Fallgatter's disclosed upper limit for the coefficient of friction is a kinetic coefficient of friction – that is, it is a coefficient of friction associated with the ride vehicle sliding on the slide surface. UATP-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] (“ sliding surface is defined atop the friction-reducing coating... the sliding surface can have a dry coefficient of friction of about 0.21 or less”); *supra* §VIII.D.2 (Phillips-Fallgatter Combination), §VIII.D.4.[1c] (Ground 2A).

233. Even if Fallgatter’s coefficient of friction were to be understood as a disclosure of a static coefficient of friction (that is, a coefficient of friction between the slide surface and the ride vehicle when the ride vehicle is stationary on the surface), a POSITA would have understood that the *kinetic* coefficient of friction between the slide surface and the ride vehicle would be even lower. UATP-1008, 1-2 (explaining the difference between static and kinetic friction, including “Once in motion, it is easier to keep [the crate] in motion than it was to get it started, indicating that the kinetic friction force is less than the static friction force”).

234. While the context in which Fallgatter discusses the coefficient of friction of the sliding surface makes clear that the coefficient of friction is a kinetic coefficient (in contrast to where Fallgatter explicitly describes a static coefficient of friction, *see* UATP-1005, [0042]), a POSITA would have understood that it would be simple to achieve a kinetic coefficient of friction within the claimed range using the various materials listed by Phillips with the teaching of Fallgatter to select materials for achieving a coefficient of friction –whether static or kinetic – lower than 0.21.

c) Claim 3

[3] The recreational slide system of claim 1, wherein the slide surface includes a dry lubricant material.

235. See Claim [3] (Ground 1A). *Supra* §VIII.B.2.[3].

d) Claim 4

[4] The recreational slide system of claim 3, wherein the dry lubricant material comprises a dry lubricant coating over the slide surface.

236. As described above (*supra* §VIII.D.3[1a-ii] (Ground 2A)), Phillips-Fallgatter provides a dry lubricant coating over the slide surface. Both Phillips and Fallgatter separately teach that the low friction surface of the slide can be a low friction coating. UATP-1004, 6:6-8 (“this surface can be coated with ***a low friction durable coating material*** and used as a ramp as previously discussed”); UATP-1005, [0006] (“[t]he slide body is made of a low-friction textile, most preferably a woven textile substrate such as a woven nylon, polyester or polyethylene with a low friction coating such as a silicone coating [which] defines the sliding surface upon which riders may slide.”), [0012]. Fallgatter similarly describes a coated slide: “low-friction coating 54 preferably is applied to the substrate layer 52, and defines the sliding surface 30.” UATP-1005, [0042].

237. It would have been obvious to a POSITA to implement Phillips’ slide system with a dry lubricant low friction coating – as both Phillips and Fallgatter teach – to simplify maintenance of the slide, allow customization of the slide

surface, and decrease costs associated with manufacture of the slide. *See supra* §VIII.D.2 (Reasons for Phillips-Fallgatter Combination). A coating applied to a slide can be easily reapplied or touched up to keep the slide experience consistent, and can be changed or altered relatively easily to allow for customization of the ride experience. UATP-1004, 8:19-29.

e) 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.

238. Phillips-Fallgatter provides claim [5], based on Fallgatter’s teaching that “the coating 54 [has] a thickness of about 0.009-0.013 mm, and more preferably about 0.011 mm.” UATP-1005, [0043]. Fallgatter’s disclosed thickness range of 0.009mm to 0.013mm is equal to a 9-13 micron range. The ’854 patent states that “[t]he thickness T of the dry lubricant coating 34 may be within a range between above 1 micron to about 5 micron...[h]owever, the thickness T of the dry lubricant coating 34 may taper along each sidewall sliding surface.” UATP-1001, 6:25-32. However, the claim does not specify which location on the slide body “includes” the claimed thickness.

239. It would have been obvious to a POSITA that a coating, as Phillips and Fallgatter both teach, would have a decreasing thickness at the edges of the coating, such that a coating that is 9-13 microns at a thickest section would have a

decreasing thickness towards the edges, including a thickness of 1-5 micron as the coating tapers out toward an edge. Moreover, a POSITA would have understood that a thinner layer of low friction coating would be more economical for covering a slide, while still achieving the desired low friction surface and would have been motivated to apply as thin a coating as possible. A POSITA would have understood that Fallgatter's teaching of a coating with thickness of 9-13 microns to be a teaching to minimize coating thickness, and it would have been obvious to a POSITA that the coating of Phillips-Fallgatter includes a thickness of 1-5 micron.

f) 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.

240. See Claim [6] (Ground 1A). *Supra* §VIII.B.2.[6].

g) 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.

241. See Claim [7] (Ground 1A). *Supra* §VIII.B.2.[7].

**E. GROUND 2B: PHILLIPS-FALLGATTER-WN0400
RENDERS CLAIMS 1-7, 14-17, AND 22-28 OBVIOUS**

1. Phillips-Fallgatter-WN0400 Combination

a) The Combination

242. Multiple reasons would have prompted a POSITA to implement Phillips-Fallgatter's "low friction" slide system (described above §§VIII.D.2) with

a nylon mesh bottom taught by WN0400, to achieve known benefits, as articulated below.

243. 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). UATP-1004, 4:43-46, 7:9-12, 7:14-23, 8:40-42, 8:55-59, 9:1-13.

Fallgatter further teaches that a vehicle can include a “woven textile substrate” as the bottom surface. UATP-1005, [0006]; UATP-1004, 4:43-46. In particular, Fallgatter describes that “[t]he slide body is made of a low-friction textile, most preferably a woven textile substrate such as a woven nylon...[v]ehicles can also be made of the same or similar material as used to make the slide body.” UATP-1005, [0006].

244. As described above, a POSITA would have been aware that various materials described by Fallgatter and Phillips are conventionally woven or can be woven: for example: nylon, Dacron, sailcloth, etc. §VIII.C.2 (Phillips-WN0400 Combination); UATP-1004, 4:43-46; UATP-1005, [0011]. For example, a POSITA would have understood that sailcloth is a woven fabric comprising nylon, Dacron, or other materials. UATP-1034, 1. A POSITA would have recognized that woven fabrics are a mesh, having holes that can vary depending on the purpose of the mesh fabric. UATP-1037, 1; UATP-1038, 1; UATP-1007, 1.

245. It would have been obvious to choose one of these materials for the bottom of the ride vehicle, and a POSITA would have been motivated to choose nylon because it is described by both Phillips and Fallgatter as an appropriate material, and it is well-known to be a durable and low-friction material. UATP-1004, 5:12-16, 7:9-27, 7:53-55; UATP-1005, [0006], [0011], [0009], [0016], [0036]; UATP-1011, 5.

246. A POSITA, motivated to select a woven nylon fabric for the ride vehicle bottom surface, would have looked to references that describe various nylon fabrics to select an appropriate fabric, and would have found WN0400 as one suitable nylon mesh for use as the bottom surface of the ride vehicle. A POSITA would have been motivated to choose a woven nylon (e.g. nylon mesh), in accordance with WN0400's suggestions as a known durable and low-friction material. UATP-1011, 5 (describing "Major Application Characteristics" of polyamides (nylons) as "Good mechanical strength, abrasion resistance, and toughness; low coefficient of friction"). A POSITA, as described above, would have been able to select an appropriate material and would have further been able to find a source for purchasing or acquiring the selected material. *Supra* §VI.A (Level of Skill of the POSITA), §VIII.A.2 (WN0400 Navigation Discussion).

247. In the resulting system, the fabric-bottomed ride vehicle includes a nylon mesh forming the bottom surface, based on Phillips and Fallgatter's

teachings, with the characteristics taught by WN0400 UATP-1004, 4:43-46; UATP-1005, [0006], [0011], [0009], [0016], [0036]; UATP-1006, 1-3. In the Phillips-Fallgatter-WN0400 combination, the ride vehicle would have been implemented using the nylon mesh material described by WN0400, as Phillips and Fallgatter both suggest that a woven low-friction material like nylon is appropriate for a recreational slide. UATP-1004, 4:43-46; UATP-1005, [0006] (“The slide body is made of a low-friction textile, most preferably a woven textile substrate such as a woven nylon...[v]ehicles can also be made of the same or similar material as used to make the slide body”), [0009], [0016], [0036]. It would have been obvious to a POSITA to select a nylon mesh to achieve a ride vehicle with a low-friction bottom surface as Phillips and Fallgatter teach, and a POSITA, implementing a slide surface in accordance with Phillips’ and Fallgatter’s teachings would have been prompted to look to similar references, like WN0400, that describe the particular characteristics of a durable and low friction nylon mesh.

b) Reasons for the Combination

248. Multiple reasons would have prompted a POSITA to implement the Phillips-Fallgatter slide system with a ride vehicle including a nylon mesh bottom surface, having characteristics in accordance with the teachings of WN0400.

249. First, a POSITA would have been motivated to implement a nylon mesh bottom of the ride vehicle based on the teachings of Phillips and Fallgatter to

provide a vehicle with “low friction” between the slide and vehicle, which a POSITA would have recognized as promoting fast sliding that enhances a user’s excitement and enjoyment when using the slide system. UATP-1004, Abstract (“sliding exercise apparatus and recreational device for entertainment and [] to enhance gymnastic and board skills”); UATP-1020, 8 (“Speed is the important aspect of a slide – it’s what people want”); UATP-1018, 2 (describing with regard to a potato sack slide: “Faster equals more fun”), UATP-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 and Fallgatter describe nylon as a material for the ride vehicle that would achieve a low friction interaction with the slide, and a POSITA would have recognized that a nylon mesh provides a slippery surface. UATP-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”), 4:34-36; UATP-1005, [0006]. A POSITA would have looked for references, like WN0400 that describe commercially available nylon meshes. A POSITA would have understood that implementing the ride vehicle of Phillips-Fallgatter with a nylon mesh bottom as taught by WN0400 would have achieved the “low friction” and durable requirements of Phillips Fallgatter. UATP-1004,

1:22-25; UATP-1011, 5 (describing nylon as durable and low friction); UATP-1006, 2 (“Excellent resistance to wear”).

250. Second, a POSITA would have been motivated to look to a nylon mesh for the ride vehicle bottom based on Phillips and Fallgatter’s express teachings of a fabric (e.g., nylon, Dacron, sailcloth) for use in the slide and vehicle surfaces. UATP-1004, 4:43-46; UATP-1005, [0011]. A POSITA would have been familiar with the characteristics of nylon, including its durability and low friction coefficient over many surfaces. UATP-1011, 5 (describing nylon as having the characteristics of being durable and low friction); *see also* UATP-1006, 2 (“Excellent resistance to wear”). A POSITA would have found the commercially available mesh material described in WN0400 (or any number of others like it) and would have understood that it was a suitable option for providing a woven textile low-friction bottom for the ride vehicle. Additionally, a POSITA would have been motivated to implement Phillips’ “nylon” bottom surface in accordance with WN0400 to facilitate sourcing by utilizing a material commercially available from nylon mesh suppliers. UATP-1006, 1 (including button to inquire about purchase).

251. Third, a POSITA would have understood that selecting a “looser” mesh fabric (e.g., a more open weave) may provide an advantage in sliding over a surface because of the spacing of the threads relative to a more tightly woven fabric. “The differences in frictional forces acting between fabrics woven from

filament yarns are dependent on the morphology of the fabrics and the rubbing direction.” UATP-1010, 1. Additionally, “[v]ariation of mesh size in monofilament fabrics affects the frictional resistance of these fabrics.” UATP-1009, 1. In fact, nylon meshes of varying mesh sizes (Table 1, Group IV) have different coefficients of friction, with the finest meshes having a higher coefficient of friction than the coarsest meshes. *Id.*, 4 (Table 2 showing coefficients of friction of Fabric Nos. 13-15 against fabric, leather, and metal surfaces with the finest mesh (13) have a higher coefficient of friction than the coarsest mesh (15) in all cases). Indeed, mesh fabrics with larger apertures between strands have an advantageously lower coefficient of friction than more tightly woven fabrics. UATP-1010, 1, 3-4 (showing in Table 2 that nylon meshes that are larger in mesh size (e.g., fabric no. 15) have a lower coefficient of friction against fabric, leather or metal than a nylon mesh with finer mesh size (e.g., fabric no. 13).

252. A POSITA would have looked for nylon meshes that have larger apertures to take advantage of the lower frictional coefficients, while still covering the bottom surface of the ride vehicle with durable nylon material. A POSITA would have understood that WN0400 is a mesh having a weave that includes holes of 0.016 inches and 45% open area and would have further understood that this mesh would be a suitable option for use as the bottom surface of the ride vehicle. UATP-1006, 2 (400 micron hole opening), 3 (0.016 inch hole size).

253. Fourth, a POSITA would have understood that a monofilament mesh fabric may also provide an advantage in sliding over surfaces. Textured fabrics have “high surface hairiness and loops” that can interact with surfaces that the fabric slides over, increasing the frictional coefficient of such fabrics over a variety of surfaces. UATP-1009, 4. In contrast, “[m]onofilament yarns are a single continuous filament which produces a relatively smooth surface” and “the straight-through pores of monofilament fabrics offer minimal flow restriction and surface loading of particles.” UATP-1007, 1. Further, a POSITA would 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, as well as minimal flow restriction. UATP-1007, 1.

254. Fifth, a POSITA would have understood that there are a variety of available options for suitable nylon meshes that could be used as a bottom surface of a ride vehicle, and would have sought out a commercially available nylon mesh that had large apertures between threads. A POSITA would have found, for example, a variety of nylon meshes available from Industrial Netting and would have selected a nylon mesh including WN0400 – 400 Micron Nylon Mesh 45% Open Area mesh as a suitable option. UATP-1006, 1-3; UATP-1033, 1-5 (showing multiple nylon mesh products available). A POSITA would have recognized

WN0400 as a suitable durable, low friction option for forming the bottom surface of Phillips ride vehicle (i.e., sports board or membrane) based on Phillips' and Fallgatter's description of appropriate materials and characteristics. UATP-1004, 4:43-46, 5:12-16, 7:9-27, 7:53-55; UATP-1005, [0006]; [0011], [0009], [0016], [0036]. 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 an appropriate choice in view of this knowledge, but even if a POSITA was unaware of these relationships they would have recognized WN0400 as a suitable option for forming the bottom surface of Phillips' ride vehicle based on Phillips' disclosure alone.

255. Sixth, a POSITA would have been prompted to combine Phillips, Fallgatter, and WN0400 because doing so was the application of known techniques (WN0400's commercially available nylon mesh) to a known device (the Phillips-Fallgatter recreational slide system) ready for improvement to yield predictable results (benefits articulated above). Ride vehicles like that Phillips describes were known, and it would have been obvious to a POSITA to apply a mesh bottom per WN0400, just as Phillips instructs. UATP-1004, 5:32-35, 7:10-12; *supra* §VI.B.2. Indeed, giant slides at amusement parks utilized fabric mats or burlap sacks as ride vehicles well before the Critical Date – accordingly, the use of a woven fabric mesh as a vehicle to support a rider down a slide was not a new technique, and a

POSITA would have not only been able to make the combination, but would have had a reasonable expectation of success in view of the ubiquity of using a mesh fabric as a ride vehicle.

256. Additionally, a POSITA would have had a reasonable expectation of success in making the proposed modifications for all of the reasons explained above and because WN0400's teachings would have been implemented by using the WN0400 nylon mesh (or a similar mesh) as the ride vehicle bottom – a material already disclosed by Phillips and Fallgatter as appropriate for such a system, without significantly altering or hindering the structure and function of the Phillips-Fallgatter ride vehicle and slide system.

2. Element-by-Element Analysis

a) Claim 1

[1pre]-[1b-ii] A recreational slide system, comprising: 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; and a ride vehicle configured to support a rider down the slide, the ride vehicle including a top surface configured to contact the rider

257. See elements [1pre]-[1b-ii] (Ground 1A). *Supra* §§VIII.B.2.[1pre]-[1b-ii]. As I explained above, recreational slide systems that included a slide and a ride vehicle made from a woven fabric for sliding down the slide were well-known by the Critical Date. *Supra* §§VI.B.2-4.

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

258. Phillips-Fallgatter-WN0400 provides [1b-iii]. Fallgatter describes that “[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.” UATP-1005, [0046], [0048]. Fallgatter further describes that the slide body and the ride vehicle can be formed from “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.” UATP-105, [0016], [0036] (“Vehicles can also be made of the same or similar material as used to make the slide body”). Phillips similarly describes that the membrane forming the ride vehicle may “be composed of low friction high durable material such as a member selected from the group consisting of nylon, Teflon, sailcloth, Dacron, vinyl, artificial turf, synthetic carpet and polyester resins.” UATP-1004, 4:43-46. Phillips and Fallgatter are in agreement about the types of materials that are appropriate for a ride vehicle bottom intended to have a low coefficient of friction with a dry slide – in particular, materials that are known to be both durable and generally low friction, like nylon. UATP-1004, 4:43-46; UATP-105, [0016], [0036]. A POSITA would have recognized that both Phillips and Fallgatter encourage the use of a nylon material, such as the woven nylon

mesh of WN0400. UATP-1004, 4:43-46; UATP-105, [0016], [0036]; UATP-1006, 1; UATP-1011, 5.

259. In the Phillips-Fallgatter-WN0400 combination, the low-friction bottom of the membrane, sports board, or other ride vehicle is formed from the “WN0400 – 400 Micron Nylon Mesh 45% Open Area” taught by WN0400. UATP-1006, 1-2.; *supra* §VIII.E.1 (Phillips-Fallgatter-WN0400 Combination). As described above, the nylon mesh covered low friction bottom of a membrane or sports board of the Phillips-Fallgatter-WN0400 combination contacts the slide surface while the user slides down the slide. *Supra* §VIII.B.2.[1b-iii] (Ground 1A).

[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.

260. See element [1c] (Ground 2A). *Supra* §VIII.D.3.[1c].

b) Claims 2, 4 and 5

261. See claims [2], [4], [5] (Ground 2A). *Supra* §§VIII.D.3.[2], [4], [5].

c) Claims 3, 6 and 7

262. See claims [3], [6], [7] (Ground 1A). *Supra* §§VIII.B.2.[3], [6], [7].

d) Claims 14-17

263. See claims [14]-[17] (Ground 1B). *Supra* §§VIII.C.3.[14]-[17].

e) Claim 22

[22pre]-[22a-ii] A ride vehicle configured to support a rider down a non-wet lubricated recreational slide, the ride vehicle comprising: an elongate body that extends between a first end and an opposite second end, the body including a central core positioned between a top surface of the ride vehicle

264. See Elements [22pre]-[22a-ii] (Ground 1B). *Supra*

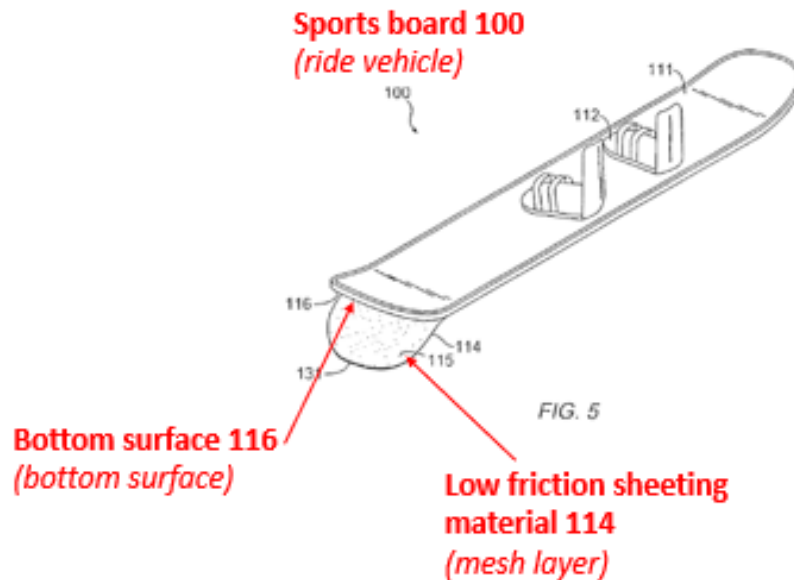
§§VIII.C.3.[22pre]-[22a-ii]. As I explained above, recreational slide systems that included a ride vehicle made from a woven fabric (e.g., fabric mats, burlap or potato sacks) for sliding down the slide were well-known by the Critical Date.

Supra §§VI.B.2-4.

[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;

265. Phillips-Fallgatter-WN0400 renders [22a-iv] obvious. As described above, in the Phillips-Fallgatter-WN0400 combination, the bottom surface of the sports board or membrane is formed from the nylon mesh described by WN0400.

Supra §VIII.E.2.[1b-iii] (Ground 2B); UATP-1004, 3:12-13, 5:27-35, 7:7-23, 8:40-43, 8:49-61, 9:9-13.



UATP-1004, Fig. 5 (annotated)

266. Further, the nylon mesh low friction bottom of a membrane or sports board of the Phillips-Fallgatter-WN0400 combination contacts the slide surface while the user slides down the slide. *Supra* §VIII.B.2.[1b-iii] (Ground 1A); UATP-1004, 5:32-35 (“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.”).

[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%.

267. Phillips-Fallgatter-WN0400 provides element [22b]. As described above, in the Phillips-Fallgatter-WN0400 combination, the bottom surface of the

sports board or membrane is formed from the nylon mesh described by WN0400. *Supra* §VIII.C.3.[1b-iii] (Ground 1B); §VIII.E.1 (Phillips-Fallgatter-WN0400 Combination).

268. Additionally, as described above (*supra* §VIII.C.3.[17] Ground 1B), WN0400 describes a “400 Micron Nylon Mesh 45% Open Area” formed from “Monofilament Nylon 6 fiber 42 threads per inch.” UATP-1006, 1-2. A POSITA would have understood that WN0400’s description of a 45% open area mesh with 400 micron hole opening is a mesh with interstitial openings defining a mesh with 45% open area. Accordingly in the Phillips-Fallgatter-WN0400 combination, the bottom surface of the ride vehicle is formed from a nylon mesh manufactured from monofilament fibers and having an open area of 45% -- well within the claimed “range of between about 35% to about 50%.”

f) Claims 23-24

269. See Claim [14]-[15] (Ground 1B). *Supra* §§VIII.C.3.[14]-[15].

g) Claim 25

[25pre]-[25a-iii] A ride vehicle configured to support a rider down a non-wet lubricated recreational slide, the ride vehicle comprising: an elongate body that extends between a first end and an opposite second end, the body including a central core positioned between a top surface of the ride vehicle

270. See Elements [22pre]-[22a-iii] (Ground 1B). *Supra* §§VIII.C.3.[22pre]-[22a-iii]. As I explained above, recreational slide systems that included a ride vehicle made from a woven fabric (e.g., fabric mats, burlap or

potato sacks) for sliding down the slide were well-known by the Critical Date.

Supra §§VI.B.2-4.

[25a-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;

271. See Element [22a-iv] (Ground 2B). *Supra* §VIII.E.2.[22a-iv].

[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.

272. Phillips-Fallgatter-WN0400 provides [25b]. As described above, in the Phillips-Fallgatter-WN0400 combination, the bottom surface of the sports board or membrane is formed from the nylon mesh described by WN0400. *Supra* §VIII.E.2.[1b-iii] (Ground 2B).

273. Additionally, as described above (*supra* §VIII.C.3..[16] (Ground 1B)), WN0400 describes a “400 Micron Nylon Mesh” formed from “Monofilament Nylon 6 fiber 42 threads per inch.” UATP-1006, 1-2. WN0400 also describes that the mesh has “42 threads per inch,” defining a “400 micron hole opening with 45% open area.” UATP-1006, 2. A POSITA would have understood from these teachings that the WN0400’s nylon 6 threads have a diameter of about 0.2mm. *Supra* §VIII.C.3.[16].

274. Accordingly in the Phillips-Fallgatter-WN0400 combination, the bottom surface of the ride vehicle is formed from a nylon (polyamide) mesh manufactured from monofilament fibers with a diameter of about 0.2mm.

h) 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.

275. See claim [26] (Ground 1B). *Supra* §VIII.C.3.[26].

i) Claim 27

[27pre] A recreational slide system, comprising:

276. See element [1pre] (Ground 1A). *Supra* §VIII.B.2.[1pre].

[27a] the ride vehicle of claim 22; and

277. See elements [22pre]-[22b] (Ground 2B). *Supra* §§VIII.E.2.[22pre]-[22b].

[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;

278. See elements [1a-i]-[1a-ii] (Ground 1A). *Supra* §§VIII.B.2.[1a-i]-[1a-ii].

[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.

279. See element [1c] (Ground 2A). *Supra* §VIII.D.3.[1c].

j) Claim 28

[28] The recreational slide system of claim 27, wherein the coefficient of friction is kinetic coefficient of friction.

280. See Claim [2] (Ground 2A). *Supra* §VIII.D.3.[2].

**F. GROUND 3A: CLAIMS 8-13 ARE NOT ENABLED
UNDER 35 U.S.C. § 112**

281. Claims 8-13 are unpatentable due to lack of enablement by the specification of the '854 patent, because the '854 patent lacks 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.

282. 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 spans a huge range of values – from the lowest theoretical values achieved only in systems with ice or snow to values that the '854 patent admits are common in the prior art. UATP-1028, 1; UATP-1001, 1:48-51 (“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”).

283. These frictional coefficient values on the lowest end of the claimed range – between 0.03 to 0.06, for example – are not 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 mentioned above, the very lowest of these values are reported only for interactions involving ice and snow. UATP-1027, 7; UATP-1026, 3 (interactions between ice and brass); 5 (interactions between ice samples), 7 (interactions between snow and PTFE). Even under ideal testing conditions, interactions between Teflon and nylon have a coefficient of friction of 0.05 in dry conditions and 0.04 in lubricated conditions. UATP-1021, 1; *see also* UATP-1026, 3 (0.05 coefficient of friction between greased cadmium samples), 4 (0.05 lowest coefficient of friction between greased diamond samples), 7 (0.04 coefficient of friction between PTFE samples).

284. These low frictional coefficient values (between 0.03 and 0.06) are what are typically observed only in testing coefficients of friction between pure materials, and a POSITA would not expect to achieve such results using a composition that includes a resin, a thermal conductor and a hardener in addition to the lubricant material. This is because the addition of other non-lubricating materials to the composition would be expected to increase the friction between the slide surface and the ride vehicle above the frictional coefficient that describes the interaction between the slide surface formed of a pure lubricating material and a

ride vehicle. The '854 patent describes various dry lubricant material compositions, but lacks any guidance as to how to use the dry lubricant material (including materials other than lubricant materials) to achieve these low frictional coefficient of friction values.

285. 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.” UATP-1001, 7:10-13. The '854 patent describes commercial epoxies containing silicone or PTFE for coating the slide. *Id.*, 7:21-35. However, the commercial epoxies suggested by the '854 patent for use in the slide coating would not provide the lowest claimed range of frictional coefficients – they contain additional components that temper the low friction properties of included lubricants.⁵ Although 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,” a POSITA would have understood that the frictional coefficient is influenced by other materials present in the coating.

⁵ Further, if these commercial epoxies could indeed achieve such low frictional coefficients (which they cannot) it would be an important discovery for the scientific community and would not be unknown to a POSITA.

286. The '854 patent's direction to simply add more lubricant material to the commercial epoxy does not solve the issue that the lowest frictional coefficients are not enabled. 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. However, there is no guidance as to 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, or indeed anything to support that the claimed low range could be achieved by simply mixing lubricant into a commercial product. 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" fails to enable the claimed low range of frictional coefficients in the context of the dry lubricant coating composition. *Id.*, 7:65-8:2. 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 negligible and that the addition of copper – not known for being a low friction material – would not explain how to achieve a frictional coefficient between 0.03 and 0.06.

287. A POSITA would not only have been not enabled to practice the invention within the low end of the claimed range but would understand that it was

not 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 UATP-1028, 1. The '854 patent provides **no explanation** 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 merely offers 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.*, UATP-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 fall far short of the details that would be required to 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 no 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.

288. Accordingly, a POSITA would not 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 not be enabled to practice the claimed scope of these claims either.

G. GROUND 3B: CLAIMS 5 AND 26 ARE INDEFINITE UNDER 35 U.S.C. § 112

289. Above, claims 5 and 26 are challenged as obvious over combination of the prior art references, based on at least one interpretation of the claim language. However, the scope of the claim language of these two claims is unclear, and accordingly the claims are further unpatentable because they are indefinite under 35 U.S.C. § 112.

i. Claim 5 is indefinite

290. 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.

291. 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.” There are multiple possible meanings of this claim language that a POSITA would not have been able to choose between, and for that reason claim 5 is indefinite. As a first example, 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).

292. Alternatively, 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.

293. As a third possibility, 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.

294. The '854 patent does not provide 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. The '854 patent describes that “the dry lubricant coating 34 includes a thickness T which may be substantially constant over at least the sliding surface 38 of the base wall 14” and that “[t]he thickness T of the dry lubricant coating 34 may be within a range of between about 1 micron to about 5 micron...” UATP-1001, 6:22-26, 6:46-47. This description merely mirrors the claim language and does not provide any guidance as to the interpretation of the claim. Additionally, the '854 patent describes that in some embodiments the thickness may taper, but fails to explain how this information impacts the subject matter of claim 5, that is, how tapering of the thickness impacts or does not impact the claimed “the dry lubricant coating includes a thickness that is within a range of between about 1 micron to about 5 micron.” *Id.*, 6:30-46, 6:65-7:9, Figs. 2A-C.

295. Accordingly, the scope of claim 5 is unclear and the claim is unpatentable because it is indefinite.

i. Claim 26 is indefinite

296. 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 is the first mention of “the fabric

layer” in the claims, and so it is unclear from the claims where the fabric liner is in relation to the other components of the ride vehicle. The ’854 specification does not provide details or guidance that would allow the POSITA to confidently discern the meaning of the claim language, and claim 26 is indefinite as a result.

297. 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.” UATP-1001, 9:63-66.

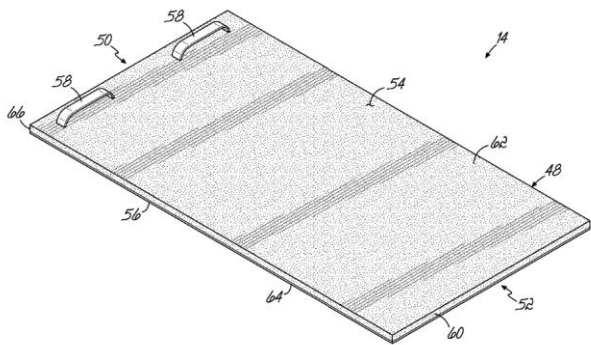


FIG. 3

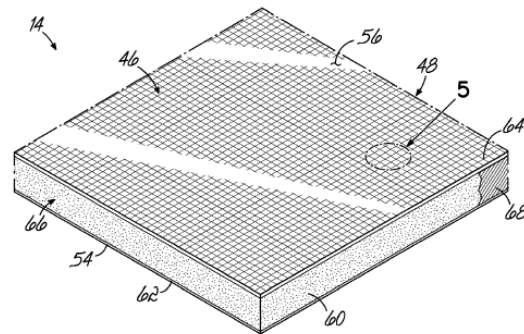


FIG. 4

UATP-1001, Figs. 3 (left) and 4 (right)

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.*, 9:66-10:1. “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.

298. It is unclear 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. 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 would look like a club sandwich, with the layers from the bottom up being the mesh layer, the fabric liner, the core, the fabric liner, and the fabric layer. To meet this meaning of the claim, for example, the central core could be enclosed by a fabric liner, and the central core and fabric liner could be positioned within an envelope with a top surface formed from the fabric layer and a bottom surface formed from the mesh. A POSITA would have understood this to be a possible understanding of the claim language based on the specification.

299. Alternatively, 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.

For example, this understanding of the claim language would not be met by the above example, but would require that the fabric liner is disposed between the fabric layer and the woven mesh layer, for example at a seam. Given that the '854 patent describes the mesh layer and top layer may be coupled together at a seam, this understanding of the claim language would have also been a possible meaning of claim 26. *Id.*, 10:4-6.

300. 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”) 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. A fabric liner formed as an outer edge of the ride vehicle (see UATP-1001, Fig. 5) would meet this possible meaning of claim 26, with or without the fabric liner additionally extending along a top or bottom surface of the central core.

301. Accordingly, a POSITA would have understood that claim 26 is unclear because there are multiple possible meanings of the claim language and the '854 patent specification does not provide clarity that would have allowed the POSITA to confidently choose the appropriate meaning of the claim. Thus, the scope of claim 26 is unclear and the claim is unpatentable because it is indefinite.

IX. CONCLUSION

302. 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	
[10]	The recreational slide system of claim 9, wherein the resin comprises a silicon-based epoxy resin.
Claim 11	
[11]	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.

APPENDIX A

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Employment:

2002 - present	Professor, Georgia Institute of Technology
1995 - 2002	Associate Professor, Georgia Institute of Technology
1989 - 1995	Assistant Professor, Georgia Institute of Technology

Interests:

Fiber and polymer processing. Manufacturing and characterization of textile structural composites.
Polymer recycling. Fiber reinforced concrete. Mechanics of fibers and textiles. Textile processes.

Awards:

Junior Faculty Research Enhancement Award, Oak Ridge Associated Universities, 1991
National Textile Center (“NTC”) Director's Partnership Awards, 1993, 1995
Class '69 Teaching Fellow, Georgia Tech, 1995-1996
NTC TAC Award for “Best 1998 Proposal in Fabrication” (as team leader), 1998
NTC Director's Award, 2006, 2010.

Professional Societies & Activities:

Professional Engineer, Registered in the State of Georgia, 1996 - present
Member, Editorial Boards, *Textile Research Journal*, *Journal of Industrial Textiles*, *Journal of Fiber Bioengineering and Informatics*, *Textiles and Clothing Sustainability*
Fellow, American Society of Mechanical Engineers, 2000 - present
Fellow, The Textile Institute, 1998-2007
Member, The Fiber Society, 1988 - 2018
Chair, Textile Engineering Division, American Society of Mechanical Engineers, 2001-2002

Courses Taught:

Introduction to Textile Engineering, Fiber Science, Structure & Properties of Polymers, Yarn & Fabric Formation Processes, Mechanics of Textile Structures, Carpet Technology, Textile Testing, Advanced Fiber Science, Fiber Mechanics, Composite Materials & Processing, Principles and Applications of Engineering Materials, Engineering Mechanics – Statics, Polymer/Fiber Enterprises.

US Patents

Automated Yarn Creeling Device, US Patent 6260783, July 2001, M.L. Realff et al.
Method of Forming Integrated Multilayer Fabrics, US Patent 8082761, Dec. 2011, Y. Wang et al.
Integrated Hollow Fabric Structure”, US Patent 8161775, April 2012, Z. Mi et al.
Integrated Multiaxial Articles: Method, Apparatus And Fabrics, US Patent 8341980, January 2013, Z. Mi et al.
Quasi-Melt Processes For Single Polymer Composites And Products Thereof, US Patent 8,653,194. February 2014, D. Yao et al.

Selected Publications & Presentations

Q. Mao, Y. Hong, T.P. Wyatt, J. Chen, Y. Wang, J. Wang, and D. Yao, "Insert injection molding of polypropylene single-polymer composites," *Composites Science & Technology*, Vol. 106, pp. 47-54 (2015).

G Rajesha Shetty, S Asha, Lakshmeesha Rao B, Youjiang Wang, Y. Sangappa, Preparation and Characterization of Silk Fibroin/Hydrylpropyl Methyl Cellulose blend films, *Fibers and Polymers*, ISSN: 1229-9197, Vol. 16 Iss. 08 pp 1734-1741, DOI:10.1007/s12221-015-5223-z (2015).

R Madhukumar, S Asha, B Lakshmeesha Rao, B Narayana, K Byrappa, Donggang Yao, Youjiang Wang, Y. Sangappa, Gamma radiation assisted synthesis of Silver nanoparticles and their characterization, *Advanced Materials Letters*, Vol. 6 Iss. 12 pp. 1088-1093 (2015).

Fangbing Lv, Donggang Yao, Youjiang Wang, Chaoxia Wang, Ping Zhu, Yifeng Hong, Recycling of waste nylon 6/spandex blended fabrics by melt processing, *Composites Part B: Engineering*, doi:10.1016/j.compositesb.2015.03.038, Volume 77, Pages 232–237 (2015)

Haiyan Mao, Chaoxia Wang and Youjiang Wang, Synthesis of polymeric dyes based on waterborne polyurethane for improved color stability, *New J. Chem.*, DOI: 10.1039/C4NJ02222J, vol. 39, 3543-3550 (2015).

Haiyan Mao, Fan Yang, Chaoxia Wang, Youjiang Wang, Donggang Yao and Yunjie Yin, Anthraquinone chromophore covalently bonded blocked waterborne polyurethanes: synthesis and application, *RSC Advances*, DOI: 10.1039/C5RA01425E, No. 5, 30631-30639 (2015).

X. Fang, C. Bi, Y. Hong, K.H. Cho, M.S. Park, Y. Wang, and D. Yao, "Rapid resin infusion of epoxy matrix composites," *Polym. Plast. Technol. Eng.*, DOI: 10.1080/03602559.2015.1132453, Vol. 55, No. 10 (2016) 1030-1038.

Bandu Madhukar Kale, Jakub Wienera, Jiri Militkya, Samson Rwawiire, Rajesh Mishraa, Karl I. Jacob, Youjiang Wang, "Coating of cellulose-TiO₂ nanoparticles on cotton fabric for durable photocatalytic self-cleaning and stiffness", *Carbohydrate Polymers*, DOI:10.1016/j.carbpol.2016.05.006, Vol. 150, pp. 107–113 (2016).

C S Shivananda, S Asha, R Madhukumar, S Satish, B Narayana, K Byrappa, Youjiang Wang and Y Sangappa, "Biosynthesis of colloidal silver nanoparticles: their characterization and antibacterial activity," *Biomedical Physics & Engineering Express*, doi:10.1088/2057-1976/2/3/035004, Volume 2, Number 3 (2016)

C S Shivananda, R Madhukumar, S Asha, B Lakshmeesha Rao, B Narayana, K Byrappa, S Satish, Youjiang Wang and Y. Sangappa, "Biosynthesis of Silver nanoparticles: Characterization and their antibacterial properties," *Macromolecular Research*, DOI 10.1007/s13233-016-4086-5, Vol. 24, No. 8 (2016) 684-690.

Tieshi He, Qunyan Su, Zehra Yildiz, Kedi Cai, Youjiang Wang, "Ultrafine Carbon Fibers with Hollow-Porous Multilayered Structure for Supercapacitors," *Electrochimica Acta*, DOI:10.1016/j.electacta.2016.11.083, Vol. 222 (2016) 1120-1127.

Haiyan Mao, Youjiang Wang, Donggang Yao, Chaoxia Wang, Shiguo Sun, "Synthesis of Blocked Waterborne Polyurethane Polymeric Dyes with Tailored Molecular Weight: Thermal, Rheological and Printing Properties", *RSC Advances*, DOI: 10.1039/c6ra14344j, Vol. 6 (2016) 56831–56838.

Dildar Ali Lakho, Donggang Yao, Kyonghoon Cho, Muhammad Ishaq, and Youjiang Wang, Study of the Curing Kinetics towards Development of Fast Curing Epoxy Resins, *Polym. Plast. Technol. Eng.* DOI: 10.1080/03602559.2016.1185623; Vol. 56 No. 2 (2017) 161-170.

C S Shivananda, R Madhukumar, P Renu, B Narayana, K Byrappa, Youjiang Wang, Y Sangappa, "Preparation and Characterization of Silk Fibroin/Silver Nano Composite Films," *Materials Science and Innovations*, DOI: 10.1080/14328917.2016.1200844, vol. 21, No. 4 (2017) 210-214.

Zehra Yildiz, H. Ayşen Önen, Atilla Güngör, Youjiang Wang, Karl Jacob, “Synthesis and application of dual-curable PVB based adhesive formulations for cord/rubber applications,” *Journal of Adhesion Science and Technology*, 31:17, 1900-1911, DOI: 10.1080/01694243.2017.1289828 (2017).

B. Lakshmeesha Rao, Mahadev Gowda, S. Asha, K. Byrappa, B. Narayana, R. Somashekar, Y. Wang, L. N. Madhu, and Y. Sangappa, “Rapid Synthesis of Gold Nanoparticles Using Silk Fibroin: Characterization, Antibacterial Activity, and Anticancer Properties,” *Gold Bulletin*, DOI 10.1007/s13404-017-0218-8, Vol 50 (2017) 289–297.

Tieshi He, Rui Jia, Xiaoshi Lang, Xianyan Wu, Youjiang Wang, “Preparation and electrochemical performance of PVdF ultrafine porous fiber separator-cum-electrolyte for supercapacitor”, *Journal of The Electrochemical Society* (Electrochemical Engineering section), DOI 10.1149/2.0631713jes Vol. 164, No. 13 (2017) E379-E384.

R. Madhukumar, K. Byrappa, Youjiang Wang & Y. Sangappa, Effect of gamma irradiation on synthesis and characterization of bio-nanocomposite SF/Ag nanoparticles, *Radiation Effects and Defects in Solids*, DOI: 10.1080/10420150.2017.1418873 (2018).

Zehra Yildiz, H. Ayşen Önen, Atilla Güngör, Youjiang Wang, Karl Jacob, Effects of NCO/OH Ratio and Reactive Diluent Type on the Adhesion Strength of Polyurethane Methacrylates for Cord/Rubber Composites, *Polymer-Plastics Technology and Engineering*, DOI: 10.1080/03602559.2017.1364382 2018, VOL. 57, NO. 10 (2018) 935–944.

B. Lakshmeesha Rao, R. Madhukumara, K. Sharath Chandra, R. Neelakandan, Youjiang Wang, Y. Sangappa, “Physicochemical and Antimicrobial Properties of Gamma Irradiated HPMC-ZnO BNC Films”, *Materials Today* (Elsevier) Vol 5 (2018) 21398–21405.

Caiyun Zhao, Chaoxia Wang, Youjiang Wang and Donggang Yao, “Super stretchable chromatic polyurethane driven by anthraquinone chromogen as a chain extender”, *RSC Advances*, DOI: 10.1039/c8ra06744a, Vol. 9 (2019) 2332-2342.

Na Zhang, Qian Zhao, Zhongxing Mi, Youjiang Wang, Bohong Gu, “Axial impact compressive behaviors of a novel 3-D integrated multilayer fabric reinforced composite tubular structures”, *Thin-Walled Structures*, doi.org/10.1016/j.tws.2018.10.037 Vol. 134 (2019) 363-372.

Na Zhang, Qian Zhao, Zhongxing Mi, Youjiang Wang, Bohong Gu, “Unit cell modeling on torsion damage behavior of a novel 3-D integrated multilayer fabric reinforced composite tubular structures”, *Textile Research Journal*, Vol. 89 (2019) 4253–4264.

Zehra Yildiz, Ismail Usta, Bandu Madhukar Kale, Graham B. Mellen, Youjiang Wang “Alkali Treatment to Maximize Adhesion of Polypyrrole Coatings for Electro-Conductive Textile Materials”, *Organic Polymer Material Research*, Volume 1 Issue 1 (2019) 3-9.

Jishu Zhang, Yonggui Li, Youjiang Wang, Yanan Zhu, “Microstructure and spectral characteristics of spectrum-fingerprint fiber with double luminous centers for anti-counterfeiting application”, *Applied Optics*, Vol. 59, Issue 7, pp. 2004-2010 (2020) <https://doi.org/10.1364/AO.383997>.

Lingling Meng, Youjiang Wang, Qufu Wei, Xinmin Huang, Jiayu Shen & Hongwei Chen (2020) Study on the structure and properties of Ag/Cu nanocomposite film deposited on the surface of polyester substrates, *The Journal of The Textile Institute*, DOI: 10.1080/00405000.2020.1838129.

Y. Wang, “Challenges to Mechanical and Chemical Recycling of Textiles”, NIST Workshop: Facilitating a Circular Economy for Textiles, 21-23 September 2021.

Y. Wang, “The role and challenges of textile recycling in a circular economy”, International Conference on Eco-Textiles (ICET2021), Jiangnan University, Wuxi, China, 20-21 November 2021.

Honglin Liu, Karl I. Jacob, Youjiang Wang, “Scaling in membrane distillation (MD): Current state of art insight on mechanisms and Membrane design”, *Desalination*, Volume 581, 20 July 2024, DOI: doi.org/10.1016/j.desal.2024.117539.

Vibhor Jain, Xin Li, Karl I. Jacob, and Youjiang Wang, “Effect of strain rate and temperature on the crystallization behavior of amorphous poly(ethylene terephthalate) fibers during superdrawing”, The Journal of The Textile Institute, DOI: doi.org/10.1080/00405000.2024.2346667 (2024).