

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

NORTH SAILS GROUP, LLC
Petitioner

v.

TEAM NEW ZEALAND LIMITED
Patent Owner

Case No. PGR2025-00062
Patent No. 12,110,089

PETITION FOR POST-GRANT REVIEW OF U.S. PATENT NO. 12,110,089

REDACTED PURSUANT TO PROPOSED PROTECTIVE ORDER
FOR THE REASONS SPECIFIED IN THE CONCURRENTLY FILED
MOTION TO SEAL

Mail Stop "PATENT BOARD"

Patent Trial and Appeal Board
U.S. Patent & Trademark Office

P.O. Box 1450
Alexandria, VA 22313-1450

TABLE OF CONTENTS

LIST OF EXHIBITS	iii
I. Introduction	1
II. Identification of Challenge (37 C.F.R. §42.204(b))	1
A. Grounds for Unpatentability	1
III. Background of the Collie'089	3
A. Background of Sail Design.....	3
B. Overview of the Claimed Invention	4
C. Collie'089 Prosecution History	5
D. Level of Ordinary Skill in the Art	6
E. Background of the Art.....	6
F. Background of Inventor Stephen Collie	8
IV. Claim Construction.....	9
A. Higher Degree of Elasticity	10
B. Average Stiffness and Average Elasticity	10
C. Luff Region	11
D. Remainder of the Sail.....	12
E. First and Second Materials.....	12
F. Third Region	12
V. Indefiniteness	13
VI. Enablement.....	17
VII. Written Description.....	17
VIII. Invalidity Based on Prior Sales to Team New Zealand.....	18
Claim Chart for Sails Sold by North Sails in 2019:.....	23
IX. Invalidity Based on Written Prior Art.....	41
A. Invalidity Based on Maximum Sail Power (EX1017) as the Primary Reference	41

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

i.	Claims 1-12, 19-23 Are Anticipated by <i>Maximum Sail Power</i>	41
ii.	Claims 4-6, 9, 12, 16-18, 21, and 22 are Rendered Obvious by MSP in View of Secondary References.....	55
a)	Obviousness of Claims 4-5 over MSP in view of Cali, and Claim 6, 9 and 12 over MSP in view of Cali and/or DKG.....	55
b)	Obviousness of Claims 16-18 over MSP in view of Linville.	56
c)	Obviousness of Claim 21 over MSP.....	58
d)	Obviousness of Claim 22 over MSP in view of Twin-Skin Prior Art.....	58
B.	Invalidity Based on U.S. Patent No. 5,097,783 to Linville as the Primary Reference	59
i.	Claims 1-3, 7, 10, 11, 16-20, 22, and 23 Are Anticipated by Linville	59
ii.	Claims 4-6, 9, 12-15, 17, 18, 21 and 22 Are Obvious Over Linville in View of Various Secondary References.....	69
a)	Obviousness of Claims 4-5 over Linville in view of Cali.....	69
b)	Obviousness of Claims 6, 9 and 12 over Linville in view of Keire and DKG.	70
c)	Obviousness of Claim 17 over Linville in view of Keire.	72
d)	Obviousness of Claim 18 and 21 over Linville in view of MSP.....	74
e)	Obviousness of Claim 22 over Linville in view of Twin-Skin Prior Art.	75
C.	The “Third Region Prior Art”	76
i.	Anticipation of Claims 1-3, 10, 11, 13-14 and 23 of Collie’089 by Stars and Stipes ’88 Sails.	83
ii.	Anticipation of Claims 1, 3, 13-16, and 23 of Collie’089 by Alinghi 2009-2010 Sails.....	84
iii.	Alternative Obviousness of claims 13-15 over MSP or Linville in view of Third Region Prior Art.....	89
X.	Grounds for Standing (37 C.F.R. §42.204(a)).....	97
XI.	Mandatory Notices (37 C.F.R. §42.8(a)(1)).....	97
XII.	Conclusion.....	99
	CERTIFICATE OF COMPLIANCE	100

LIST OF EXHIBITS

Exhibit No.	Description
1001	U.S. Patent No. 12,110,089 to Collie (October 8, 2024) ("Collie'089")
1002	Certified Copy of Prosecution History of Collie'089
1003	Declaration of Daniel Neri in Support of Petition for Post-Grant Review of U.S. Patent No. 12,110,089
1004	<i>Curriculum Vitae</i> of Daniel Neri
1005	Declaration of Per Andersson in Support of Petition for Post-Grant Review of U.S. Patent No. 12,110,089
1006	<i>Curriculum Vitae</i> of Per Andersson
1007	Declaration of Thomas Whidden in Support of Petition for Post-Grant Review of U.S. Patent No. 12,110,089
1008	Wikipedia Page of Thomas Whidden
1009	Digitized Version of New York Times Article from The Times' Print Archive regarding America's Cup (September 27, 1983) (www.nytimes.com/1983/09/27/sports/america-s-cup-to-australia-ii-as-132-year-us-reign-ends.html)
1010	Excerpt from the first edition of the book <i>The Art and Science of Sails</i> by Tom Whidden and Michael Levitt, St. Martin's Press, New York, NY (1990), including pages 131-133, and 225
1011	1974 advertisement in <i>Offshore</i> magazine for a brand of sail called the "Compensator"
1012	A History of Sails for the America's Cup (https://www.northsails.com/en-us/blogs/north-sails-blog/a-

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

	winning-combination-for-four-decades)
1013	2018 America's Cup Rules (https://www.sailingscuttlebutt.com/wp-content/uploads/2018/03/AC75_Class_Rule.pdf) ("ACR")
1014	Sail World Publication regarding Team New Zealand (February 27, 2019) (https://www.sail-world.com/news/214971/Americas-Cup-AC75-Learning-the-foiling-dance) ("TNZ")
1015	U.S. Patent No. 2,561,253 to Wells-Coates (July 17, 1951) ("Wells-Coates")
1016	US Patent No. 2,569,318 to Kersten (September 25, 1951) ("Kersten")
1017	<i>Maximum Sail Power: the Complete Guide to Sails, Sail Technology, and Performance</i> , by Brian Hancock, Nomad Press (2003) ("MSP")
1018	U.S. Patent No. 5,097,783 to Linville (March 24, 1992) ("Linville")
1019	U.S. Patent No. 6,260,497 to Keire (July 17, 2001) ("Keire")
1020	New York Times Article about team Alinghi America's Cup entry (February 8, 2010) (https://www.nytimes.com/2010/02/09/science/09sail.html)
1021	U.S. Patent No. 4,064,821 to Roberts (December 27, 1977) ("Roberts")
1022	Michele Cali <i>et al.</i> , "Comparison of Commonly Used Sail Cloths through Photogrammetric Acquisitions, Experimental Tests and Numerical Aerodynamic Simulations" <i>Procedia Manufacturing</i> , Volume 11, 2017 , pages 1651-1658 ("Cali")
1023	U.S. Patent No. 5,038,700 to Conrad (August 13, 1991) ("Conrad")

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

1024	U.S. Patent No. 1,613,890 to Herreshoff (January 11, 1927) ("Herreshoff")
1025	Sketch of Stars & Stripes '88 Sail Design (March 1988)
1026	Purchase Order for sails sold by North Sails Group to Alinghi (2009)
1027	Sales Invoice for sails sold by North Sails Group to Alinghi (2009)
1028	Images of Alinghi 2010 America's Cup catamaran sail
1029	Images of sail sold by North Sails Group to Alinghi in 2009
1030	Excerpts from Sail Designer file for Alinghi Sails sold in 2009
1031	European Patent Application Publication No. EP0271215 to Smale (June 15, 1988) ("Smale")
1032	Kevlar Aramid Fiber Technical Guide; DuPont Corp, 2017 ("DKG")
1033	Excerpt from EX1011 - a 1974 advertisement in <i>Offshore</i> magazine for a brand of sail called the "Compensator"
1034	North Sails' [REDACTED] taping report
1035	North Sails' [REDACTED] taping report
1036	Listing sails sold to Team New Zealand by North Sails
1037	Higher resolution image of Figure 7.2 from page 132 of EX1010, the first edition of the book <i>The Art and Science of Sails</i> by Tom Whidden and Michael Levitt, St. Martin's Press, New York, NY (1990)
1038	May 23, 2023 email to Burns Fallow from Team New Zealand

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

I. Introduction

North Sails Group, LLC ("North Sails" or "Petitioner") respectfully requests post-grant review of claims 1-23 of U.S. Patent No. 12,110,089 to Steven James Collie ("Collie'089") (EX1001), in accordance with 35 U.S.C. §§321-329 and 37 C.F.R. §42.200 et seq.

The claims of Collie'089 fail to meet the requirements of 35 U.S.C. §§112(a), 112(b), 102, and 103(a), as demonstrated below and supported by the declarations of Per Andersson (EX1005), Daniel G. Neri (EX1003) and Thomas A. Whidden (EX1007).

II. Identification of Challenge (37 C.F.R. §42.204(b))

A. Grounds for Unpatentability

Ground	References	Basis	Claims Challenged
1.	N/A	35 U.S.C. §112(b)	1-23
2.	N/A	35 U.S.C. §112(a)	1-23
3.	Prior Sales to Team New Zealand (2019)	35 U.S.C. §102(a)(1)	1-7, 9-23
4.	Prior Sales to Stars & Stripes (1988)	35 U.S.C. §102(a)(1)	1-3, 10, 11, 13, 14, 23
5.	Prior Sales to Alinghi (2009)	35 U.S.C. §102(a)(1)	1-3, 10, 11, 13, 14, 23

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

6.	MSP	35 U.S.C. §102(a)(1)	1-12, 19-23
7.	Linville	35 U.S.C. §102(a)(1)	1-3, 7, 10, 11, 16-20, 22, 23
8.	MSP in view of Cali	35 U.S.C. §103	4-5
9.	MSP in view of Cali and/or DKG	35 U.S.C. §103	6, 9, 12
10.	MSP or Linville in view of Third Region Prior Art	35 U.S.C. §103	13, 14, 15
11.	MSP in view of Linville	35 U.S.C. §103	16-18
12.	MSP in view of any of Twin Skin Prior Art	35 U.S.C. §103	22
13.	Linville in view of Cali	35 U.S.C. §103	4, 5
14.	Linville in view of Keire and DKG	35 U.S.C. §103	6, 9, 12
15.	Linville in view of Keire	35 U.S.C. §103	17
16.	Linville in view of MSP	35 U.S.C. §103	18
17.	Linville in view of Twin-Skin Prior Art	35 U.S.C. §103	22

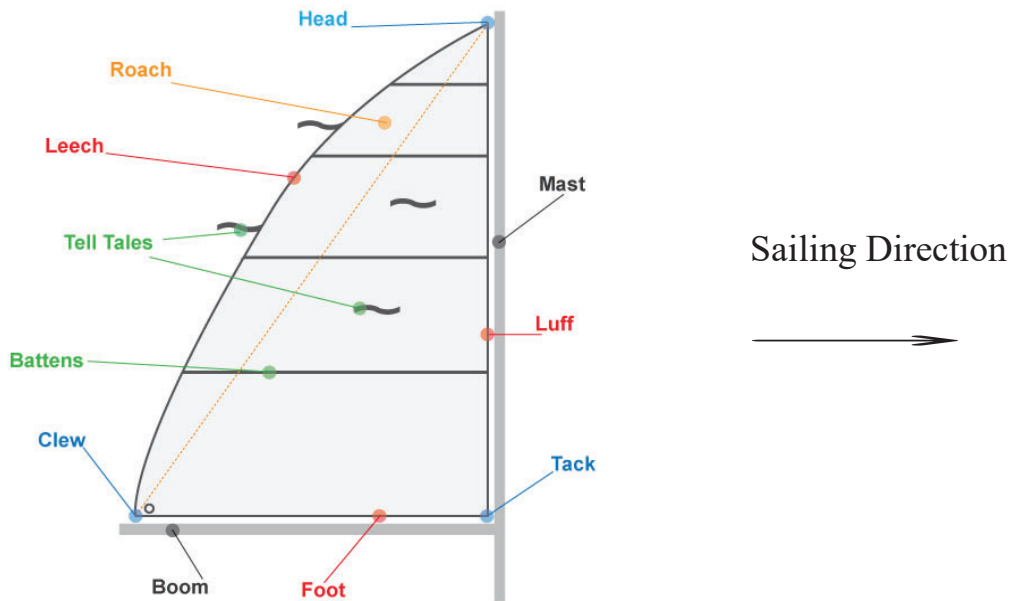
Petition for Post-Grant Review of U.S. Patent No. 12,110,089

18.	Third Region Prior Art	35 U.S.C. §102	1-3, 13-16, 23
19.	Stars and Stripes Sails	35 U.S.C. §102	1-3, 10, 11, 13-14, 23
20.	Alinghi 2009- 2010 Sails	35 U.S.C. §102	1, 3, 13-16, 23
21.	Third Region Prior Art including Conrad and Smale	35 U.S.C. §103	13-15

III. Background of the Collie'089

A. Background of Sail Design

A typical sail is defined by three vertices: the "tack," and the "clew" at the bottom of the sail, and the "head" at the top of the sail. The front part of the sail, in the direction of sailing is called the "luff." The back part is called the "leech." (EX1003, ¶20).



The sail shape can be altered by applying tension on the leech, luff or foot using controls at each corner. The control at the head is the halyard. The control at the tack is the cunningham, or in larger boats the tack ram, and the control at the clew is the outhaul.

B. Overview of the Claimed Invention

Collie'089 at Col. 1, l. 25, describes the invention to be used on “sailing yachts” and the applicant is Team New Zealand Limited, which purchases sails from North Sails to compete in the America’s Cup races. These are high-performance sails. Independent claim 1 of Collie'089 is directed to a sail comprising a luff region having a higher degree of elasticity compared to the remainder of the sail. The luff region includes a first material, and the remainder

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

of the sail includes at least a second different material. The average stiffness of the second material is 2-20 times higher than the average stiffness of the first material.

Independent claim 23 is similar to claim 1 and requires "... in a luff direction ... a stiffness...in the range of 2-25 times greater."

The basic point of Collie'089 is that the "more elastic" luff region allows the sailor to apply tension to the luff, stretching the material in the vertical axis (parallel to the luff) while shortening the material in the horizontal axis (EX1003, ¶¶21-22). This commonly used action results in a reduction in the depth or camber of the sail which is desirable as the apparent wind strength increases (EX1003, ¶¶22, 28). Sometimes Collie'089 refers to the remainder of the sail as being "stiffer" than the luff region (EX1003, ¶22; e.g., EX1001, claim 23). According to Collie'089, the more elastic luff can be achieved by using different types of sailcloth (EX1003, ¶22; EX1001, Col. 9, l. 49, Col. 10, l. 50). The use of more elastic material in the luff region compared to the rest of the sail is an old concept. It is in fact over 50 years old (EX1003, ¶¶23-33).

C. Collie'089 Prosecution History

The prosecution history of U.S. Patent No. 12,110,089 is included as EX1002. U.S. 12,110,089, filed on June 16, 2023 (U.S. Serial No. 18/21,036) is a continuation of PCT/IB2021/061985, filed on December 17, 2021, which claims

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

priority to provisional application Serial No. 63/127,127, filed on December 17, 2020.

D. Level of Ordinary Skill in the Art

A person of ordinary skill in the art (POSITA) of sailmaking and design of high-performance sails (e.g., for yacht and racing sails such as the America's Cup) would have a bachelor's degree, preferably in an engineering field, followed with at least 3 years of fulltime employment working under the tutelage of a senior sail design expert in high-performance yacht and racing sails (EX1003, ¶16).

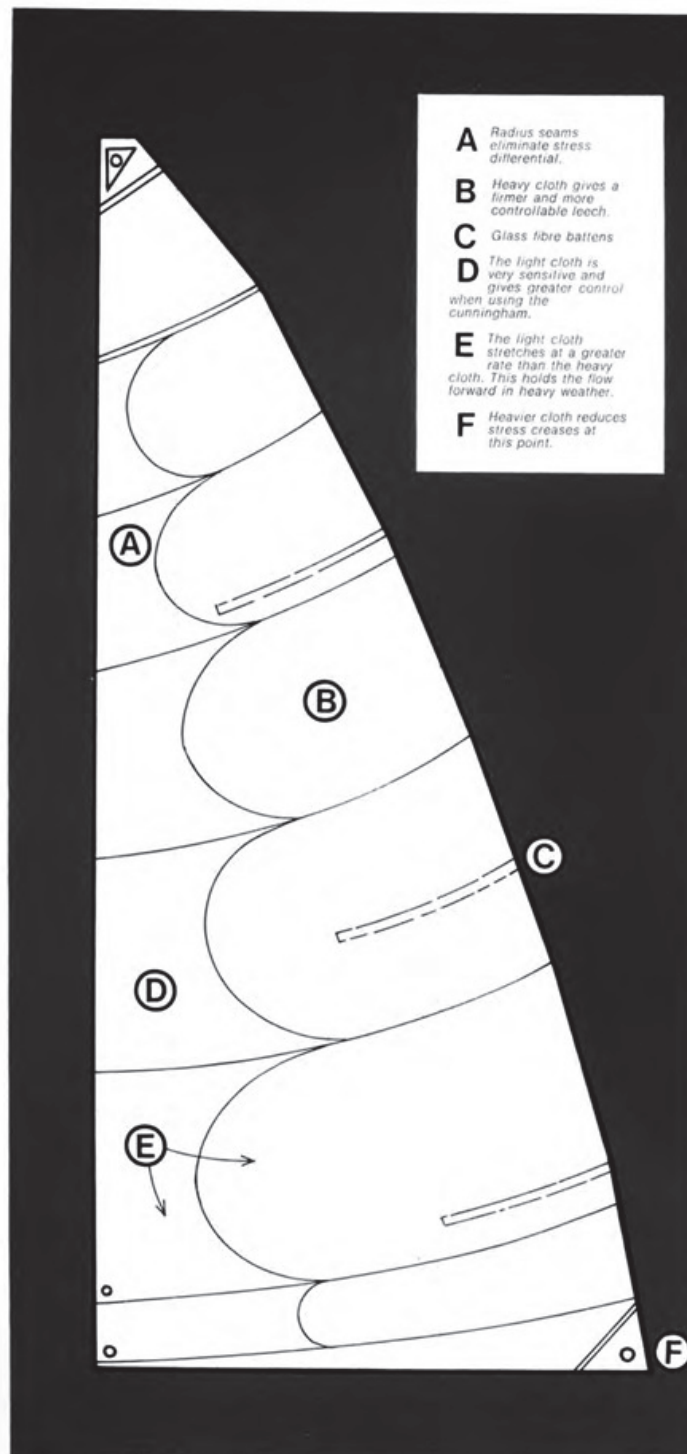
Alternatively, such a person could have progressed through a longer apprenticeship in the field of sailmaking for high-performance sails. This longer path would normally require up to five years of apprenticeship and two years of design office training. A POSITA would have access to, and functional expertise with, sail design software such as that developed by North Sails. Such a person typically will also have a keen interest in racing sailboats and have spent hundreds of hours in boats tuning and adjusting sails (EX1003, ¶16).

E. Background of the Art

EX1011 is a 1974 advertisement in *Offshore* magazine for a brand of sail called "The Compensator" which states: "The secret of the 'Compensator' sails...is that they use a combination of cloths of varying weights." (EX1011). The

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

advertisement illustration (EX1033) shows the luff on the left:



Petition for Post-Grant Review of U.S. Patent No. 12,110,089

As described in the inset box above, the circled letters in the illustration identify the types of sailcloth:

B. “Heavy cloth gives a firmer and more controllable leech.”

D. “The light cloth is very sensitive and gives greater control.”

E. “The light cloth stretches at a greater rate than the heavy cloth. This holds the flow forward in heavy weather.”

The light cloth of "D" above is precisely the "more elastic luff" which Collie'089 broadly claims to be its invention.

The Compensator is not being applied as prior art *per se*, but it shows that such “elastic luff” sails were widely known for use in racing sails for over 50 years (EX1003, ¶¶23-26).

F. Background of Inventor Stephen Collie

The inventor, Stephen Collie, learned about sail design from North Sails, the company that makes the sails for all of the teams in the America’s Cup (EX1003, ¶18). Some of the history of the development of such sails is set out in the Declaration of Thomas A. Whidden (EX1007) of North Technology Group, LLC, owner of Petitioner North Sails. Mr. Collie spent months working for North Sails New Zealand as an apprentice sailmaker and most of his sailmaking knowledge

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

was acquired from North Sails (EX1003, ¶18).

Collie was granted access to the North Sails sail design software by a confidentiality agreement signed in 2006 (EX1003, ¶18). North Sails has been a sail equipment supplier to Team New Zealand throughout all of their race campaigns (EX1003, ¶18). In January 2018, Collie attended an exclusive working party of North Sails designers to develop the sail modeling software and sail designs for the America's Cup (EX1003, ¶18). Collie signed an additional North Sails Confidentiality Agreement effective August 18, 2017 (EX1003, ¶18). As discussed below, the sails developed and covered by Collie'089 are a natural application of the prior North Sails designs, and these sails were made and sold by North Sails to Team New Zealand beginning in 2019, more than one year before the priority date.

IV. Claim Construction

Because many of the claim terms have little to no support in the specification or drawings, we propose, where possible, to construe certain claim terms as would be done by a POSITA. Some claim terms cannot be construed and, accordingly, are indefinite.

Generally, the claim construction standard of *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005), applies. 83 Fed. Reg. 51,341 (Oct. 11, 2018); 37

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

C.F.R. §42.200. Words in a claim are given their plain meaning, which is the meaning understood by a POSITA at the time of the alleged invention after reading the entire patent. *Phillips*, 415 F.3d at 1312-13.

A. Higher Degree of Elasticity

Collie'089 construes the term “higher degree of elasticity” as: “...includes the meaning of ‘lower stiffness’ and/or the meaning of ‘higher failure strain’, and/or generally ‘higher deformability’.” Since these terms are used interchangeably in Collie'089, these terms should be construed as if they mean the same thing (EX1003, ¶¶42-47).

B. Average Stiffness and Average Elasticity

The terms "average stiffness" and "average elasticity" cannot be construed directly because there is no art recognized way of how the "average" is to be determined (EX1003, ¶¶48-50). For purposes of applying the prior art, "average stiffness" and "average elasticity" should be given their broadest reasonable interpretations and any prior art reference that discloses stiffness or elasticity ratios within the 2-20 or 2-25 range of claims 1 and 23 satisfies this limitation.

The choices of directionality, where the elasticity or stiffness is measured, and how to measure an "average" on a sail would all lead to different results when measured by different persons of ordinary skill in the art (EX1003, ¶49). Different

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

fabrics have different elasticity or stiffness depending on the direction of measurement. The warp elasticity (i.e., in the direction of the warp fibers of the fabric) is different from the weft elasticity (i.e., in the direction of the weft fibers, also known as the “fill” fibers, of the fabric), which is generally perpendicular to the warp (EX1003, ¶50). Table 2 of the Cali reference (EX1022), discussed in detail below, shows the weft and warp modulus values in the last two columns. There is no guidance given how to select the data samples, or how many samples from which to calculate the “average” (EX1003, ¶¶50-53).

C. Luff Region

The term “luff region” should be construed as a homogenous panel of the first material extending from the luff, to a defined margin spaced from the luff. Because no means to measure “average” stiffness or elasticity is enabled for non-homogenous materials, the claim construction needs to be limited to homogenous panels, i.e., made of a single material (EX1003, ¶¶54-55).

The fact that the luff region has a defined margin comes from claim 13 which describes “a portion of a margin of the luff region between the luff region and the remainder of the sail.” Also, as stated at col. 9, ll. 19-20, “at the margin between the elastic region and the rest of the sail...” This further shows that the luff region is a panel.

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

D. Remainder of the Sail

The term “remainder of the sail” should be construed as a panel of a second homogenous material that is different from the first material. The construction is consistent with col. 9, ll. 19-20, which refers to “the margin between the elastic region and the rest of the sail...” (EX1003, ¶57).

E. First and Second Materials

The “first and second materials” of claims 1-23 should be construed as separate panels of different materials with a defined margin between them. As stated in the Abstract and at col. 4, l. 20, the panels are connected by “curing or sewing the sail to form a cohesive structure.” Also at col. 8, ll. 16-31, the two materials are clearly described as being different fabrics (EX1003, ¶58).

F. Third Region

The “third region” referred to in claims 13-15 should be construed, if at all possible, as a band of third material between the first material and second material. See col. 3, ll. 49-52 and claims 13-15.

Claims 13-15 call for a third region along a portion of a margin of the luff region, but the phrase “third region” appears nowhere in the Collie’089 description, nor is it shown in any drawing as required by 37 C.F.R. §1.83 (EX1003, ¶¶59-62). The closest is the use of the term “third material” which is only described by

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

functional language as having a higher stiffness. Col. 3, ll. 49-52. As such, it is only identified by functional language as used in 35 U.S.C. §112(f) and its construction is a question of law.

The element 16 in Figure 2 is not the “third region” but is “the edge of the stiffer region 16 [of the remainder of the sail]” (Col. 10, ll. 61-64). Thus, element 16 is the border between the luff region and the remainder of the sail. No “third region” is shown in the figures.

Because no structure or element is either shown or described, there is no support, and therefore the term “third region” and claims 13-15 are invalid under 35 U.S.C. §112 (EX1003, ¶62).

V. Indefiniteness

Claims 1-23 are indefinite. The threshold test for indefiniteness under §112(b) is set forth in *Nautilus, Inc. v. Biosig Instruments, Inc.*, 134 S. Ct. 2120, 2130 (2014). Under the *Nautilus* standard, a patent claim is invalid for indefiniteness if the claims, "read in light of the specification delineating the patent, and the prosecution history, fail to inform, *with reasonable certainty*, those skilled in the art about the scope of the invention." *Nautilus*, 134 S. Ct. at 2124.

Independent claims 1 and 23, utilize the terms “elasticity” and “stiffness”, and equates these terms with Young's modulus ("modulus") and failure strain.

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

However, a POSITA would find that these modulus and failure strain measurements lead to different conclusions as to whether or not there is infringement (EX1003, ¶52). *Interval Licensing LLC v. AOL Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014) states "If the claim language might mean several different things and no informed and confident choice is available among the contending definitions, the claim is indefinite."

There is also a clear lack of precision for these claims. For example, how and which way is elasticity of the sail measured – up, down, bending, or the surface flexibility? Where is it measured? How do you measure an “average stiffness” or “average elasticity” (claim 7)? There are no standardized measurement techniques known or used by a POSITA and Collie’089 does not teach any measurement techniques (EX1003, ¶¶48-50). Therefore, claims 1-23 are indefinite.

Independent claim 1 refers to the “average stiffness”, while claim 7 refers to “average elasticity.” Collie’089 conflates elasticity/modulus/stiffness/failure strain/higher deformability and treats these terms as being interchangeable. Claim 1 calls for the average stiffness of the second material to be 2-20 times that of the first material (the luff region). Claim 7 refers to the “average elasticity” of the first material being 100% to 2400% (i.e., 2 to 25 times) higher than that of the second

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

material. That means that the failure strain of the first material is 2-20 (or 2-25) times that of the second material or the modulus of the second material is 2-20 (or 2-25) times that of the first material. Looking at Table 2 of Cali (EX1022), DIAX 60p is a polyester and Kevlar Flex and Kevlar CZ15 are both aramids (EX1003, ¶52). The values below are taken from Table 2 of EX1022 and are consistent with Collie'089, col. 8, ll. 43-54. Using the values given, the ratio of "stiffness" of the second material to the first material can be calculated (EX1003, ¶52). The varying conclusion on infringement is also listed. All references to "modulus" used herein refer to "Young's modulus".

	<u>Failure Strain</u>	<u>Modulus</u>
DIAX 60P	6.4	2600
Kevlar Flex	2.7	3800
Ratio	2.3	1.46
Conclusion	Infringement	No infringement

	<u>Failure Strain</u>	<u>Modulus</u>
DIAX 60P	6.4	2600
Kevlar CZ15	2.3	2600
Ratio	2.78	1.00
Conclusion	Infringement	No infringement

	<u>Failure Strain</u>	<u>Modulus</u>
Pentex Flex	7.8	3700
Kevlar Flex	2.7	3800
Ratio	2.89	1.03
Conclusion	Infringement	No infringement

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

	<u>Failure Strain</u>	<u>Modulus</u>
Pentex Flex	7.8	3700
Kevlar CZ15	2.3	2600
Ratio	3.39	1.42
Conclusion	Infringement	No infringement

Determination of infringement varies depending on which property is being measured. The use of the same materials can be infringement (right column) or no infringement (left column). Thus, all the claims fail to inform those skilled in the art about the scope of the invention. See *Nautilus* 134 S.Ct. 2124 (2014) (EX1003, ¶¶52-53).

A POSITA would not use “average stiffness” or “average elasticity” or understand exactly how such an average would be measured, absent a specified test protocol for the measurement (EX1003, ¶¶48-50). Therefore, the claims are indefinite under 35 U.S.C. §112(b) and there is no enablement under 35 U.S.C. §112(a). (See below).

The limitation “luff region” in claims 1 to 23 fails to define the extent, shape, and location of where the luff region ends and the “remainder of the sail” begins (EX1003, ¶¶54-56). Claims 13-15 also talk about the “luff region” and “remainder of the sail” and a “third region” between the luff region and the remainder of the sail. The plain meaning of “the remainder” to a POSITA is *everything except the*

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

luff region, yet somehow there is a "third region" which is not part of the "remainder." (EX1003, ¶¶59-62) This adds even further confusion to how one would determine where one region ends and another region begins. Accordingly, independent claims 1 and 23, and all the dependent claims should be found indefinite.

VI. Enablement

While the disclosure of Collie'089 appears to describe panel sails in some detail, Collie'089 does not teach how to construct a composite sail in accordance with the claims. There are only passing references to processes for making composite sails (e.g., EX1001, col. 2, l. 64-67; col. 7, l. 9-10), but no guidance is provided for a POSITA to make a composite sail with the characteristics of the claims. Similarly, Collie'089 does not teach how to measure an "average stiffness", especially for composite sails (EX1003, ¶¶48-50). Accordingly, claims 1-23 do not comply with the enablement requirement of 25 U.S.C. 112(a).

VII. Written Description

Claims 13-15 require the presence of a "third region" between the luff region and the remainder of the sail; however, the drawings do not provide any illustration of this "third region." Thus, there is insufficient support for the "third region" and claims 13-15 are invalid under 35 U.S.C. §112 (EX1003, ¶¶59-62).

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

VIII. Invalidity Based on Prior Sales to Team New Zealand

The earliest priority date for Collie'089 is December 17, 2020. North Sails was selling sails to patent owner Team New Zealand which embody the Collie'089 sails as far back as 2019, more than a year before the earliest claimed priority date for Collie'089, for the America's Cup race.¹ These sails were the basis for the Collie'089 application (EX1005, ¶13).

Per Andersson is the general manager of North Sails' 3Di manufacturing facility in Minden, Nevada, where the sails for all of America's Cup racing boats were made and sold (EX1005, ¶8). His Declaration discusses these sails.

More than one year before the December 17, 2020 provisional application to which Collie'089 claims priority, the first such sail was sold on [REDACTED] (EX1005, ¶15; EX1036). EX1036 provides a list of sails using substantially the same design that were sold to Team New Zealand in 2019 (EX1005, ¶19). This same design continued to be used even in the 2024 America's Cup race in Barcelona (EX1005, ¶12).

As shown in EX1036, Petitioner produced and sold [REDACTED] that embodied the same concepts described above [REDACTED] with invoice or

¹ These prior art sales were not disclosed to the USPTO. North Sails reserves its rights to raise inequitable conduct as a defense should there be litigation.

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

shipping dates between [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Because these 2019 sails were publicly used and sold, there is no novelty for any of the claims under 35 U.S.C. §102(a) and the exceptions under §102(b) do not apply. Accordingly, all Collie'089 claims except claim 8 are fully anticipated by the sails sold by North Sails [REDACTED].

The first sail order embodying Collie'089 submitted by Team New Zealand that featured all of the characteristics described in the Collie'089 claims was received by the North Sails [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

[REDACTED]

[REDACTED]

[REDACTED]

Today's high-performance sails are composite structures made of wide tapes connected to form the sail (EX1005, ¶16). A 3Di sail is typically made up of [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]. The tapes are deposited in a

variety of angles on each ply of the structure to address loads calculated by North Sails' design software. The layout of tapes for a given sail is described in a document referred to as a taping report, which shows how each layer of tapes is laid out on the sail mold, and which tape types are used (EX1005, ¶17). More details on the manufacturing processes for 3Di sails are described by Per Andersson in his declaration (EX1005, ¶¶16-26).

All of the sails sold to Team New Zealand used substantially the same design (EX1005, ¶19). [REDACTED]

[REDACTED]

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] The images below relate to the portions of the taping reports that relate to claim elements, while other parts of the taping reports do not affect claim issues. The tapes used in the taping reports are

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

The images above show three pages of the taping report for North Sails



 These layers contribute to the overall strength and ruggedness of the sail (EX1005, ¶20).

The Claim Chart below provides a concise explanation of where each element of the claims is found in the sails sold by North Sails. All of the statements are supported by the declaration of Per Andersson (EX1005).

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

Claim Chart for Sails Sold by North Sails in 2019:

Claim of Collie U.S. Pat. No. 12,110,089	Citations to Sails Sold by North Sails More than One Year Before the Earliest Claimed Priority Date of Collie'089
	Discussions of stiffness and elasticity, below, refers to stiffness or elasticity in the direction of the luff.
Claim 1	
A sail comprising a head, a tack, a luff extending between the head and the tack; and a luff region extending along the luff; wherein the luff region has a higher degree of elasticity compared to a remainder of the sail,	 

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

	[REDACTED] [REDACTED] [REDACTED] [REDACTED]
--	--

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

wherein the luff region of the sail includes a first material	The luff region includes [REDACTED]
and a remainder of the sail includes at least a second material,	[REDACTED] [REDACTED]
wherein the first material and the second material are different, and	[REDACTED]
wherein an average stiffness of the second material is in a range of 2-20 times higher	[REDACTED]

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

than an average stiffness of the first material.	Therefore, claim 1 is anticipated.
Claim 2	
The sail of claim 1, wherein the sail is a mainsail.	Order number [REDACTED] is a mainsail. Therefore, claim 2 is anticipated.
Claim 3	
The sail of claim 1, wherein the sail is a headsail.	[REDACTED]

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

	Therefore, claim 3 is anticipated  
Claim 4 The sail of claim 1, wherein the first material has a failure strain of at least about 2.5% to about 30%.	Therefore, claim 4 is anticipated  

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

Claim 5	
The sail of claim 1, wherein the first material has a failure strain of at least about 2 to about 10 times the failure strain of the second material.	[REDACTED] [REDACTED] therefore, claim 5 is anticipated [REDACTED]
Claim 6	
The sail of claim 1, wherein the first material has an average Young's Modulus of about 1 to about 60 GPa.	[REDACTED] Therefore, claim 6 is anticipated [REDACTED]
Claim 7	
The sail of claim 1, wherein the first material has an average elasticity that is at least about 100% to about 2400% higher than an average elasticity of the second material.	[REDACTED] Therefore, claim 7 is anticipated [REDACTED]
Claim 8	
The sail of claim 1, wherein there	

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

is an absence of sail fibres, or sailcloth fibres, that extend in a direction parallel, or at least substantially parallel, to the luff in the luff region of the sail.	It is believed that the sails listed in EX1036 are not covered by this claim.
Claim 9	
The sail of claim 6, wherein there are sail fibres, or sailcloth fibres, in the luff region of the sail, the sail fibres, or sailcloth fibres, extending in a line that leaves an angle of greater or equal than about 15 degrees free from fibres relative to a direction parallel to the luff of the sail.	

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

	Therefore, claim 9 is anticipated
Claim 10	
The sail of claim 1, wherein the first material extends at least 50% to about	

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

95% of a distance between the head and tack of the sail.	Therefore, claim 10 is anticipated [REDACTED] [REDACTED]
Claim 11	
The sail of claim 1, wherein the first material extends up to about 10% to about 50% of a width of the sail towards a leech of the sail.	[REDACTED] Therefore, claim 11 is anticipated [REDACTED] [REDACTED]
Claim 12	
The sail of claim 9, wherein the first material extends towards a leech of the sail to a greater extent in the middle of the sail relative to a height of the sail compared to the luff regions towards the head and tack of the sail.	[REDACTED] Therefore, claim 12 is anticipated by [REDACTED] [REDACTED]

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

Claim 13	
The sail of claim 1, wherein the sail includes a third region having an elasticity less than other regions of the sail, this third region extending along at least a portion of a margin of the luff region between the luff region and the remainder of the sail.	 Therefore, claim 13 is anticipated  
Claim 14	
The sail of claim 13, wherein the third region	

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

extends from the head to the tack of the sail.	Therefore, claim 14 is anticipated
Claim 15	
The sail of claim 13, wherein the third region comprises carbon.	Therefore, claim 15 is anticipated
Claim 16	
The sail of claim 1, wherein the first material comprises a gradient of reducing elasticity in a direction from luff to leech, as defined by its: (i) failure strain, or (ii) average Young's Modulus, or (iii) both (i) and (ii).	

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

	Therefore, claim 16 is anticipated [REDACTED] [REDACTED]
Claim 17	
The sail of claim 16, wherein the first material comprises polyester.	[REDACTED] Therefore, claim 17 is anticipated [REDACTED] [REDACTED]

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

Claim 18	
The sail of claim 16, wherein the first material comprises polyester in combination with one or more of aramid and UHMWPE.	  Therefore, claim 18 is anticipated  
Claim 19	
The sail of claim 1, wherein a difference in elasticity is achieved by a lesser material thickness in the luff region compared with the remainder of the sail.	 

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

	[REDACTED] [REDACTED] Therefore, claim 19 is anticipated [REDACTED]
Claim 20	
The sail of claim 1, wherein an orientation of a material in the luff region is different from an orientation of a material in the remainder of the sail, such that the luff region has a higher degree of elasticity compared to the remainder of the sail.	Claim 20 is anticipated [REDACTED] [REDACTED]

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

--	--

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

	[REDACTED] [REDACTED] [REDACTED] Therefore, claim 20 is anticipated [REDACTED]
Claim 21	
The sail of claim 1, wherein the luff region does not comprise any carbon fibres oriented within 15 degrees of parallel to the luff, and wherein the remainder of the sail does comprise carbon fibres oriented within 15 degrees of parallel to the luff.	[REDACTED] [REDACTED] Therefore, claim 21 is anticipated [REDACTED]
Claim 22	
The sail of claim 1, wherein the	

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

sail is a twin skin mainsail having two skins defining the sail, wherein each skin has a luff region extending along the luff, and wherein each luff region has a higher degree of elasticity compared to a remainder of the respective skin.	Therefore, claim 22 is anticipated.
Claim 23 A sail comprising a head, a tack, a luff extending between the head and the tack; and a luff region extending along the luff; wherein the luff region has a higher degree of elasticity compared to a remainder of the sail, wherein in a luff direction, a ratio of a stiffness of regions outside	For the reasons claim 1 is anticipated above, claim 23 is anticipated.

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

the luff region and the stiffness of the luff region is in a range of 2-25 times greater.	
--	--

As can be seen from the discussion and Claim Chart above, Collie'089, which is owned by Team New Zealand, was written to cover sails that were sold more than a year before the Collie'089 priority date (EX1005, ¶54). Even Team New Zealand believes that Collie'089 covers the sails sold by North Sails.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] Thus, Team New Zealand

has admitted that the sails made and sold by North Sails to Team New Zealand are covered by Collie'089. Because these sails are prior art, Collie'089 is invalid.

Also previously sold by North Sails were sails that had the “third region” of claims 13-15, as discussed in detail below in the section relating to what we have termed "The Third Region Prior Art" which anticipate claims 1-3, 10, 11, 13-16, and 23 (see also EX1007, ¶26).

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

and 23 (see also EX1007, ¶26).

Thus, at least claims 1-7 and 9-23 are anticipated by these sails which were sold by North Sails.

IX. Invalidity Based on Written Prior Art

The teachings of the two primary references, *Maximum Sail Power* (“MSP”) (EX1017) and Linville (EX1018) anticipate most of the claims of Collie’089, either alone, or as evidenced by evidentiary references about what is generally known in the field. The primary references can also be combined with other references in the field of sail design to render the remaining claims obvious, as discussed below.

The secondary references for claims 13, 14, and 15, discussed below, are collectively referred to herein as the “Third Region Prior Art”, some of which also anticipates claims 1-3, 10, 11, 13-16, and 23 (see EX1007, ¶26; EX1010; EX1020; EX1025-EX1030).

A. Invalidity Based on Maximum Sail Power (EX1017) as the Primary Reference

i. Claims 1-12, 19-23 Are Anticipated by *Maximum Sail Power*

As supported by the Declaration of Daniel G. Neri (EX1003), and as discussed in detail below, the 2003 textbook *Maximum Sail Power: the Complete Guide to Sails, Sail Technology, and Performance* (2003) (“MSP” EX1018),

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

discloses all of the limitations of claims 1-12, and 19-23, either alone or in view of common knowledge of a POSITA, as evidenced by various evidentiary references (EX1003, ¶¶64). One such particularly useful evidence reference about sailcloth materials is Michele Calì et al., "Comparison of Commonly Used Sail Cloths through Photogrammetric Acquisitions, Experimental Tests and Numerical Aerodynamic Simulations" *Procedia Manufacturing*, Volume 11, 2017, pages 1651-1658 ("Calì") (EX1022).

Regarding claim 1, page 60 of MSP shows a tri-radial headsail in Fig. 4.10, where the luff is on the left and the leech is on the right (EX1003, ¶¶65-66).

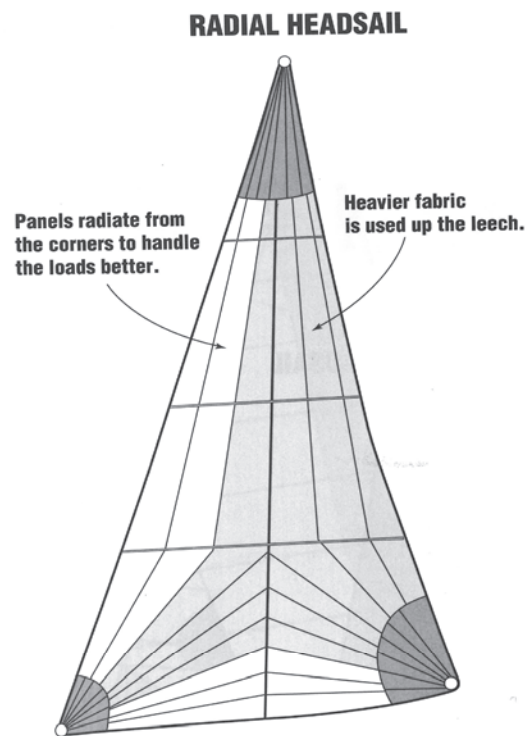


Fig. 4.10

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

The luff region in Fig. 4.10 is made up of the light-colored panels. A POSITA would understand that it is common to illustrate sails using different shading to differentiate heavier, more stretch-resistant materials (darker shades) from lighter, stretchier materials (lighter shades) (EX1003, ¶66).

MSP page 60 states: “the sail designer can engineer different fabrics in different areas of the sail to address specific loads. In other words, heavier fabrics can be used along the leech..., while lighter fabrics can be used in the lower load areas like along the luff....[T]he sailmaker can design the sail with low stretch Kevlar yarns in the high load areas and a regular polyester in the rest of sail.” This meets the limitation of claim 1 of Collie’089 that “the luff region has a higher degree of elasticity compared to a remainder of the sail” because in MSP, the luff region of the sail is formed of stretchy polyester. This also meets the limitation of claim 1 that “...the luff region of the sail includes a first material [regular polyester] and a remainder of the sail includes at least a second material [Kevlar]”, and that “...the first material and the second material are different...” (EX1003, ¶67).

MSP page 20 says Kevlar “is stronger than steel for its weight and has a modulus five times greater than polyester.” Modulus is defined on page 276 of MSP to be “a measure of a material's ability to resist stretch. The higher the

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

modulus, the less the fiber will stretch." This is also consistent with the 2018 Wikipedia article on sailcloth properties (EX1021) and DKG (EX1032), as discussed in detail in EX1003, ¶68). A POSITA would understand that Kevlar having a modulus that is five times greater than polyester meets the limitation "wherein an average stiffness of the second material [Kevlar] is in a range of 2-20 times higher than an average stiffness of the first material [regular polyester]." Thus, MSP discloses all of the limitations of claim 1 of Collie'089.

Regarding claim 2, page 60 of MSP refers to a mainsail in the section discussing Figure 4.10. Thus, MSP anticipates claim 2 (EX1003, ¶69).

Regarding claim 3, Figure 4.10 on page 60 of MSP refers to the illustrated sail as a headsail and on page 275 gives the definition of headsail. Various headsails are discussed throughout MSP. Thus, MSP anticipates claim 3 (EX1003, ¶70).

Claim 4 specifies that the first material has a failure strain of at least about 2.5% to about 30%. MSP discloses that a luff area can be polyester. Cali teaches that Dacron is a polyester on page 1652; and Table 2 on page 1654, indicates that Dacron TNF 240 has a Max strain (failure strain) of 12.2% which is within the range of claim 4 (EX1003, ¶¶71-73). Thus MSP, as evidenced by Cali anticipates claim 4 (EX1003, ¶¶72-73).

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

Claim 5 specifies that failure strain of the “first material” is about “2 to about 10 times the failure strain of the second material.” MSP teaches using polyester in the luff region (the first material) and Kevlar in the remainder of the sail (the second material) (EX1003, ¶74). Table 2 of Cali, on page 1654, provides failure strain values for Dacron TNF 240 polyester (12.2%) and Kevlar CZ 15 (2.3%) (EX1003, ¶74). Based on these numbers Dacron TNF 240 has a failure strain that is 5.3 times greater than Kevlar CZ 15, which is within the range of claim 5. Thus, MSP as evidenced by Cali anticipates claim 5 (EX1003, ¶74).

Claim 6 specifies an average Young's Modulus of about 1 to about 60GPa for the first material. MSP teaches using a polyester as the first material. Table 2 of Cali reports the modulus of common polyester sailcloth materials Dacron TNF 240 polyester (1.050GPa in the weft) and Pentex FLEX 15 (3.4GPa in the warp and 3.56GPa in the weft), both of which are within the range of claim 6 (EX1003, ¶77). In addition, the 2017 Dupont Kevlar Guide (“DKG”, EX1032, p. 7, Table II-2) reports that of polyester yarn has a modulus of 2.0×10^6 psi, which is equivalent to 13.7GPa, which is also in the range of claim 6 (EX1003, ¶77). Both of these polyesters are recommended for sailcloth and meet the claim limitation. DKG (EX1032, p. 7, Table II-2) reports that the modulus of polyester is yarn is 2.0×10^6 psi, which is equivalent to 13.7GPa, which is also in the range of claim 6 (EX1003,

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

¶77). Thus, MSP as evidenced by Cali or DKG anticipates claim 6 (EX1003, ¶77).

Claim 7 specifies that the first material has an average elasticity that is at least about 100% to about 2400% higher (i.e., 2 to 25 times greater) than an average elasticity of the second material. MSP teaches that the first material can be polyester and the second material can be Kevlar. MSP teaches that Kevlar is 5 times stiffer than polyester (see EX1003, ¶79). Since elasticity and stiffness are complimentary terms, a second material that is five times stiffer than the first material means that the first material is five times more elastic than the second material (see EX1003, ¶79). Thus, MSP anticipates claim 7.

Claim 8 specifies that there is an absence of sail fibers, or sailcloth fibers, that extend in a direction parallel, or at least substantially parallel, to the luff in the luff region of the sail. MSP, on page 61 and in Fig. 4.11, as noted in the figure caption, shows a bi-radial sail in which load-bearing gores (panels) radiate out of the head and the clew only. Page 59 of MSP states: "...warp-oriented laminates were used to build radial sails." A POSITA would understand that orienting panels of the first material at an angle as in the lower right side of the sail as shown in Fig. 4.11 of MSP places the more elastic bias of the fabric parallel to the luff resulting in greater elasticity along the luff. This technique is common knowledge in the sailmaking industry (EX1003, ¶80).

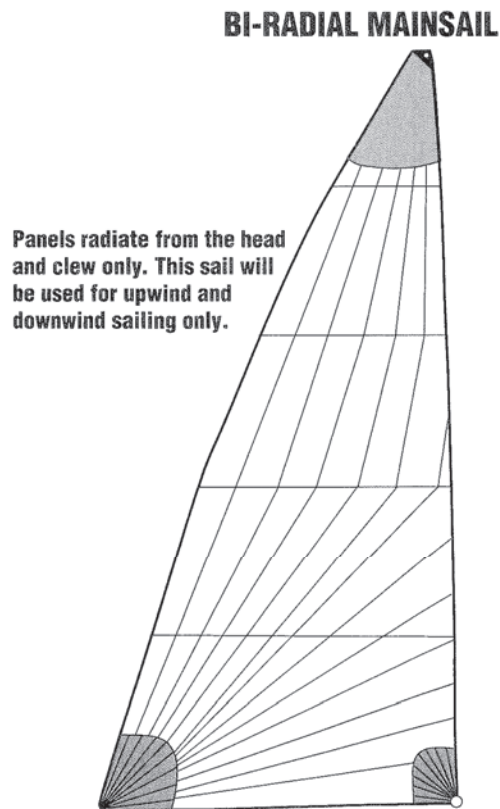


Fig. 4.11

Thus, the load-bearing warp fibers and the perpendicular fill fibers of the panels in the lower luff area of Fig. 4.11 on the right side of the figure are at an angle such that there is an absence of sail fibers, or sailcloth fibers, that extend in a direction parallel, or at least substantially parallel, to the luff in the luff (EX1003, ¶¶81-82). Thus, MSP anticipates claim 8.

Claim 9 depends on claim 6 and requires sailcloth fibers in the luff region of the sail which extend in an angle “greater than or equal to about 15 degrees free from fibers” parallel to the luff of the sail. As shown for claim 6, above, and in EX1003, ¶83, MSP teaches warp-oriented fabric panels in the radial sails

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

illustrated in Fig. 4.11, which are arranged at an angle significantly greater than 15 degrees free relative to the direction parallel to the luff. Thus, MSP, as evidenced Calli or DKG (as applied to parent claim 6) anticipates claim 9 (EX1003, ¶84).

Claim 10 specifies that the first material extends at least 50% to about 95% of a distance between the head and tack of the sail. MSP, Fig. 4.10, shows stretchier polyester luff panels on the left extend between dark reinforced areas near the head and the tack, which appears to be approximately 70% of the distance between the head and the tack (EX1003, ¶86). Thus, MSP anticipates claim 10.

See Fig. 4.10 below:

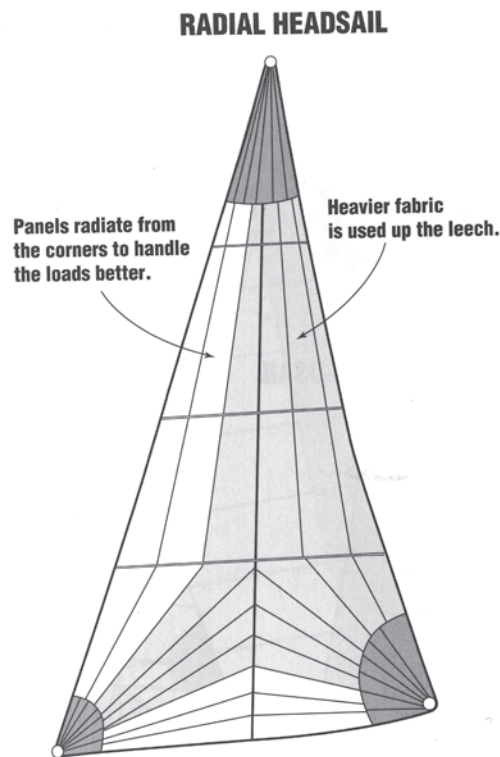


Fig. 4.10

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

Regarding claim 11, page 60 and Fig. 4.10 of MSP show the lighter-colored luff panels on the left extend about 1/3 of the way from the luff to the leech near the middle of the sail which is within the 10% to 50% range of claim 11. Thus, MSP anticipates claim 11 (EX1003, ¶87).

Claim 12 depends on claim 9 and specifies that “first material extends towards a leech of the sail to a greater extent in the middle of the sail relative to a height of the sail compared to the luff regions towards the head and tack of the sail.” See MSP, p. 60, Fig. 4.10 wherein the panels (light shading) have a wider width in the middle of the sail compared to near the tack and head. Thus, MSP, as evidenced by Cali (EX1022) or DKG (EX1032) as applied to parent claim 6, anticipates claim 12 (EX1003, ¶¶88-89).

Claim 19 specifies that a difference in elasticity is achieved by a lesser material thickness in the luff region compared with the remainder of the sail. Pages 56-59 and Figure 4.8 of MSP discuss known sail configurations in which two plies of fabric are used in the leech where loads are heaviest, and a single ply in the luff. A POSITA would understand that two plies of the same material would be twice as stretch resistant (or stiffer) as one ply (EX1003, ¶91).

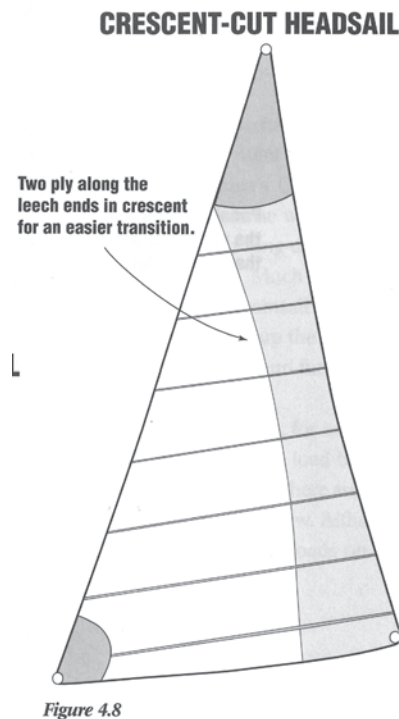


Fig. 4.8

See also MSP, page. 38: "...there is little need to have heavy fabric along the luff or in the body of the sail since these areas are subjected to very little loading. The leech, on the other hand, is an area in which a sail designer needs to be sure to place a fabric with both high modulus and tensile strength." (EX1003, ¶92). Thus, MSP also anticipates claim 19.

Claim 20 specifies that an orientation of a material in the luff region is different from an orientation of a material in the remainder of the sail, such that the luff region has a higher degree of elasticity compared to the remainder of the sail. MSP, at page 59, states: "...warp-oriented laminates were used to build radial sails." MSP: p. 61 notes in the caption for Fig. 4.11, that this figure shows a "bi-

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

radial main with load-bearing gores radiating out of the head and clew only..."

The term "gore" means a panel (EX1003, ¶93).

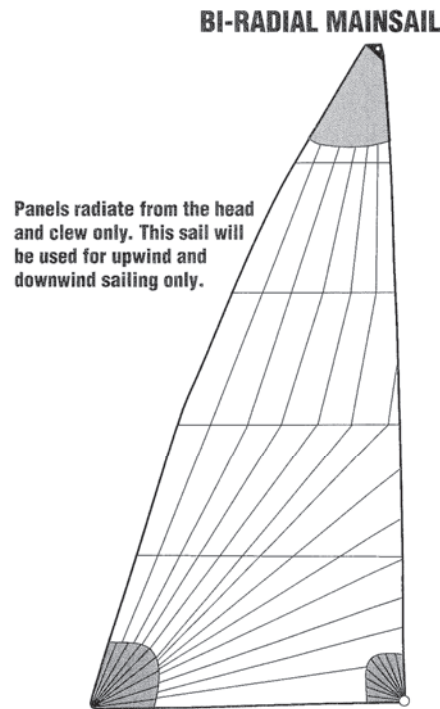


Fig. 4.11

MSP states on page 60: "One of the principal benefits of radial sails is that the sail designer can engineer sails with different fabrics in different areas of the sail to address specific loads. In other words, heavier fabrics can be used along the leech of the sail or at the head and clew where loads are highest, while lighter fabrics can be used in lower load areas like along the luff..." A POSITA would understand the teaching of the panels along the leech at the left side of Fig. 4.11 are oriented generally in a different direction from the orientation of the panels in the lower half of the luff on the right side of the sail (EX1003, ¶94). The different orientations of

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

the warp fibers in the lower luff area would make this area stretchier in the direction from tack to clew, than the leech in the same direction (EX1003, ¶94).

Thus, MSP anticipates claim 20.

Claim 21 specifies that there are no carbon fibers oriented within 15 degrees of parallel to the luff in the luff region, whereas “the remainder of the sail” does have carbon fibers oriented within 15 degrees of parallel to the luff. According to MSP page 60 and Fig. 4.10, the benefit of radial sails is that “the sailmaker can design the sail with low-stretch Kevlar yarns in the high-load areas and a regular polyester in the rest of the sail.” There is no mention of carbon fibers in the polyester luff region. See page 23 of MSP: “When used in sails carbon fibers are combined with more durable fibers like Kevlar....The result is a measure of durability, without a sacrifice in modulus.” Also in MSP, p. 20 photo caption: “Some fabrics are made from a blend of fibers such as Kevlar and carbon in order to maximize benefits of each.” The orientation of such carbon fibers would generally be in the direction of the warp fibers, which is the same as the orientation of the panels making up the sail shown above in Fig. 4.10 of MSP. The orientation of the panels in the lower right side of the sale (the luff region) is different from the orientation of the panels in the remainder of the sail (EX1003, ¶95). Thus, claim 21 is anticipated by MSP.

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

Claim 22 specifies a twin-skin mainsail wherein each skin has a luff region extending along the luff. A twin-skin mainsail for racing boats was common knowledge to a POSITA, as evidenced by U.S. Patent No. 1,613,890, the nearly 100 year old patent to Herreshoff ("Herreshoff" (EX1024) and in later patents such as U.S. Patent No. 2,561,253 (1951) to Wells-Coates ("Wells-Coates" EX1015), Patent No. 2,569,318 (1951) to Kersten ("Kirsten" EX1016), and Patent No. 4,064,821 (1977) to Roberts ("Roberts" EX1021) (EX1003, ¶¶97-98). The use of twin-skin sails was well known to patent owner Team New Zealand. The 2018 America's Cup rules for the AC75 were written primarily by Team New Zealand to include twin-skin sails (AC75, EX1013), and a 2019 *Sail World* article about Team New Zealand discusses the advantages of the twin-skin sail design and even quotes the inventor, Collie (EX1014).² The foregoing references of EX1024, EX1015, EX1016, EX1021, EX1013 and EX1014 are collectively referred to herein as the "Twin-Skin Prior Art." See also EX1003, ¶97.

Fig. 2 of Herreshoff shows the twin-skin mainsail configuration on both illustrated mainsails. See also Herreshoff page 1, ll. 56-64, which teaches that "By dividing the sail ... and joining the forward edges of the two sections or wings

² This prior art was not disclosed to the USPTO.

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

thereof to the mast so that they are substantially flush with the opposite sides of the mast, a substantially smooth stream line surface is presented to the action of the wind, the eddying of the wind around the mast is eliminated, and a more efficient arrangement is provided.” A POSITA would have understood that both sail skins would be constructed in the same way since both sides must operate in the same way in response to those wind forces (EX1003, ¶98). Thus, claim 22 is anticipated by MSP and common knowledge in the art, as evidenced by the Twin-Skin Prior Art.

Claim 23 is very similar to claim 1. Thus, the discussion above, regarding the teachings of MSP for claim 1, applies equally to the corresponding limitations of claim 23.

The last limitation of claim 23 "wherein in a luff direction, a ratio of a stiffness of regions outside the luff region and the stiffness of the luff region is in the range of 2-25 times greater" is very similar to the last limitation of claim 1. MSP at page 20 teaches that Kevlar “is stronger than steel for its weight and has a modulus five times greater than polyester.” A POSITA would understand that Kevlar having a modulus that is five times greater than polyester meets the limitation of claim 23. A POSITA would know that the luff of MSP Fig. 4.10 would be elastic in all directions including in the luff direction (EX1003, ¶99).

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

Thus, MSP discloses all of the limitations of claim 23 of Collie'089.

ii. Claims 4-6, 9, 12, 16-18, 21, and 22 are Rendered Obvious by MSP in View of Secondary References.

a) Obviousness of Claims 4-5 over MSP in view of Cali, and Claim 6, 9 and 12 over MSP in view of Cali and/or DKG.

Claims 4-5 are anticipated by MSP, as evidenced by Cali, and claims 6, 9, and 12 are anticipated by MSP as evidenced by Cali or DKG. In the alternative, claims 4-5 are obvious over MSP in view of Cali, and claims 6, 9, and 12 are obvious over MSP in view of Cali (EX1022) and/or DKG (EX1032) (EX1003, ¶¶74, 78, 90, 95). A POSITA would be motivated to combine the teachings of MSP with Cali (EX1022), because MSP discusses common fabrics used in sails and a qualitative discussion of the elastic properties, while Cali provides quantitative data on common sailcloth materials of relevance, including those discussed in MSP (EX1003, ¶¶71); and to combine the teachings of MSP with DKG, because DKG provides quantitative data, such as modulus, for common sailcloth fibers such as polyester and Kevlar (EX1003, ¶¶77). Arriving at the full range of values in claims 4, 5, and 6 would have been a matter of routine optimization that is well within the level of skill of a POSITA (EX1003, ¶¶68).

With specific regard to claim 12 (which depends on claim 9), a POSITA would be motivated to orient the panels according to the load as discussed in MSP

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

to increase the elasticity of the luff region toward the middle to better flatten the sail when under strong wind conditions (EX1003, ¶90).

b) Obviousness of Claims 16-18 over MSP in view of Linville.

Claim 16 specifies that the first material comprises a gradient of reducing elasticity in a direction from luff to leech, defined by its failure strain or average Young's Modulus, or a combination. Claim 16 is obvious over MSP in view of U.S. Patent No. 5,097,783 to Linville ("Linville") (EX1018). See col. 8, ll. 13-35 which discloses a gradient of fabric denier from 5000 to 10,000 to 18,000 denier/g in direction from luff to leech. See also Linville Claim 2: "wherein the denier density of strands of stretch resistant polymer in layer (ii) varies between the segments in each panel, the high density [1800] being located nearest the leech of said sail and the lower density [5000] being located in segments nearest the luff of the sail." It is well known that denier density is directly proportional to stretch resistance and inversely proportional to how much reversible stretch a fiber can undergo (EX1003, ¶103). A POSITA would be motivated to utilize a range of materials that were more elastic in the luff and progressively less elastic towards the leech for greater control of sail shape (EX1003, ¶103). The gradient approach to the transition between the luff (first region) and leech (remainder of the sail) has

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

the added benefits of smoothing the transition to eliminate transition ridges and reducing the overall weight of the sail by allowing the lightest possible materials to be used (EX1003, ¶103). These concerns, techniques and benefits are well known to a POSITA (EX1003, ¶103).

Claim 17 depends on claim 16 and specifies that the first material comprises polyester. As noted above for claim 1, page 60 of MSP states: “.... the sailmaker can design the sail with low-stretch Kevlar yarns in the high-load areas and a regular polyester in the rest of the sail.” The rest of the sail referred to in this passage includes the luff (EX1003, ¶104). Thus, claim 17 is obvious over MSP in view of Linville for the same reasons and motivations discussed for claim 16.

Claim 18 depends on claim 16 and requires that the first material comprises polyester in combination with one or more of aramid and UHMWPE. Linville (EX1018), at col. 7, l. 41-45 also teaches panels in the area of the luff that comprise a Mylar film in combination with Kevlar fibers. Linville also acknowledges the well known facts that Mylar is a polyester (col. 1, ll. 34-35), and Kevlar is an aramid (col. 5, l. 1). A POSITA would have been motivated to apply the teachings of Linville regarding the use of a combination of a polyester and an aramid to the teachings of MSP, because Linville teaches (col. 2, ll. 59-66) that panels constructed in this manner provide improved resistance to stretch and

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

deformation, and that this sail construction provides a high degree of versatility in locating reinforcing members in predetermined directions (EX1003, ¶105).

Consequently, claim 18 is obvious over MSP in view of Linville (EX1003, ¶105).

c) Obviousness of Claim 21 over MSP.

As discussed above, claim 21 is anticipated by MSP. In the alternative, claim 21 is obvious over MSP and the obvious design choice to use a blend of Kevlar and carbon fibers in the remainder of the sail for improved durability and strength noted in MSP on pages 20 and 23 (EX1003, ¶96).

d) Obviousness of Claim 22 over MSP in view of Twin-Skin Prior Art.

As discussed above, Claim 22 is anticipated by MSP in view of common knowledge of a POSITA as evidenced by the Twin-Skin Prior Art. In the alternative, claim 22 is obvious over MSP (EX1017) in view of the Twin-Skin Prior Art. A POSITA would have been motivated to construct a twin-skin sail because that sail construction eliminates wing eddies near the mast and would also have understood that both sail skins would be constructed in the same way since both sides are subjected to the same wind forces during use and must operate in the same way in response to those wind forces (EX1003, ¶98).

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

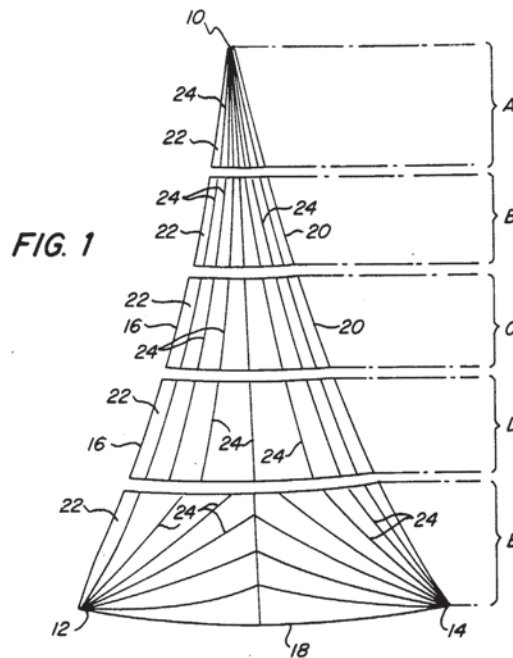
B. Invalidity Based on U.S. Patent No. 5,097,783 to Linville as the Primary Reference

U.S. Patent No. 5,097,783 to Linville ("Linville") (EX1018) anticipates most of the claims and can also be supplemented with the teachings of the additional references discussed above.

i. Claims 1-3, 7, 10, 11, 16-20, 22, and 23 Are Anticipated by Linville

As demonstrated by the Declaration of Daniel G. Neri (EX1003), and as discussed in detail below, U.S. Patent No. 5,097,783 to Linville ("Linville") (EX1018) discloses all the limitations of claims 1-3, 7, 10, 11, 16-20, 22, and 23, which are thus anticipated.

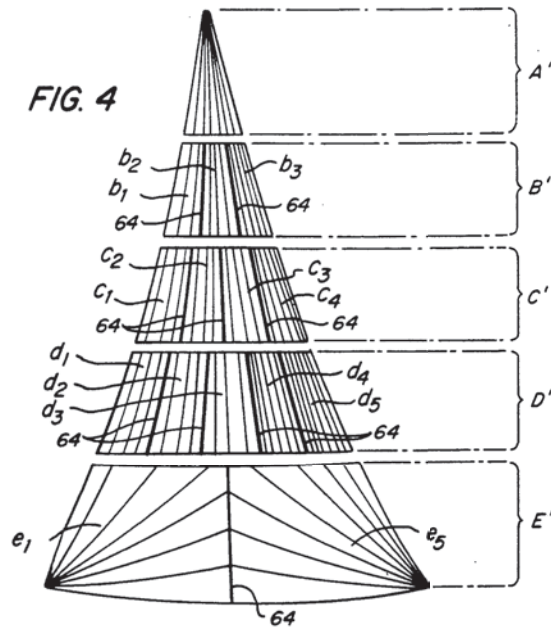
Linville shows a conventional sail panel assembly in Fig. 1.



Linville Fig. 1

Linville states, Fig. 1; col 4, ll. 49-51; "...the sail when assembled from the five panels would have a head (10), a tack (12), a clew (14), a luff (16), a foot (18) and a leech (20)." The luff region in Fig. 1 is on the left side of the sail. The remainder of the sail is made up of the panels along the leech and in the middle of the sail (EX1003, ¶108).

The luff region of Linville has a higher elasticity than the remainder of the sail because the denier density increases from the luff to the leech as described at col. 8, ll. 19-32 with reference to Fig. 4 and Fig. 8 as evident from the specific denier density values given for the different materials of the sail panels (EX1003, ¶109).



Linville Fig. 4

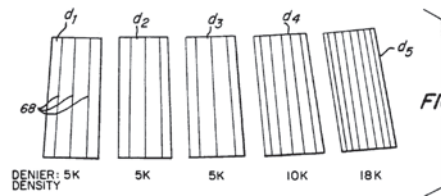


FIG. 8

Linville Fig. 8

Specifically, the lower denier density makes the luff region (5000 denier/g) more elastic than the higher denier density of the remainder of the sail because the leech region has a higher denier density (18000 denier/g) (EX1003, ¶109). See also col. 3, ll. 42-50 of EX1018. Thus, this limitation of claim 1 is met by Linville (EX1003, ¶109).

The materials used in the luff and leech regions of Linville Figs. 4 and 8 are different materials because they have different denier densities (EX1003, ¶110).

Claim 1 also calls for “an average stiffness of the second material is in a

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

range of 2-20 times higher than an average stiffness of the first material.” It is well known to a POSITA that fabric denier density is proportional to stiffness in the direction of the fibers, and is inversely proportional to elasticity (EX1003, ¶111). The terms “denier density” or “denier per inch” (DPI) are commonly used in the art to describe different levels of stiffness (EX1003, ¶111). Linville describes a leech panel with a denier density of 18000 denier/g (the “second material”) which is 3.6 times higher than the denier density of the luff panels which have a denier density of 5000 denier/g (the “first material”) (EX1003, ¶111). See Col. 8, ll. 19-32, Fig 4, and Fig. 8 of EX1018. Thus, claim 1 is anticipated by Linville (EX1003, ¶111).

Regarding claim 2, the Linville Abstract begins with: “A composite sail (mainsail ...)”: Thus, Linville anticipates claim 2 (EX1003, ¶112).

Regarding claim 3, the Linville Abstract also refers to a jib and spinnaker which are known in the art as headsails. Thus, Linville anticipates claim 3 (EX1003, ¶113).

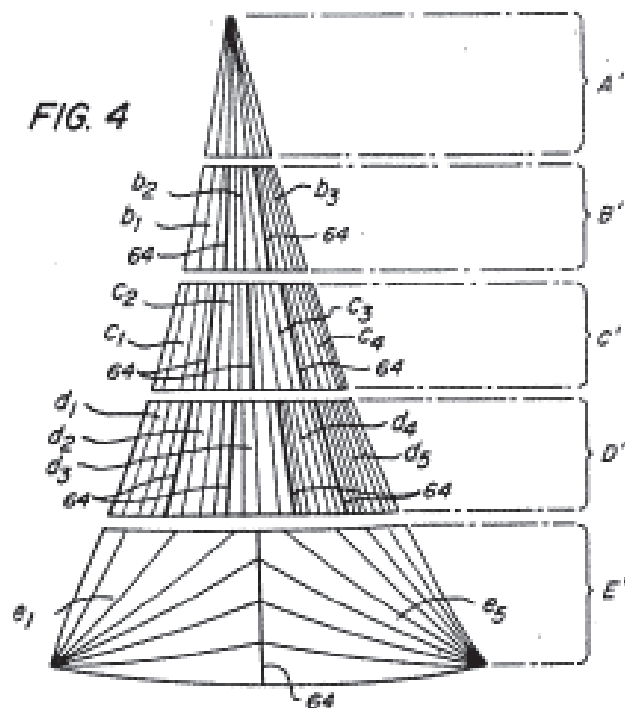
Regarding claim 7, Col. 8, ll. 19-32 of Linville discusses the different denier densities of the leech and luff materials which also allows a calculation of the different elasticities (EX1003, ¶114).

In Linville, the first material (luff) has a denier density of 5000 denier/g,

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

which is about 3.6 times more elastic than the second material (leech) which has a denier density of 18000 denier/g. This equates to about 260% higher elasticity for the first material relative to the second material (EX1003, ¶132), which is between the 100% and 2400% range of claim 7. Thus, Linville anticipates claim 7 (EX1003, ¶132).

Regarding claim 10, Linville Fig. 4, shows the luff panels (b1, c1, and d1) on the left-hand side of the sail extend about 70 to 75 percent of the distance between the tack 12 and the head 10, which is between the 50% to 95% range of claim 10 (EX1003, ¶134).



Petition for Post-Grant Review of U.S. Patent No. 12,110,089

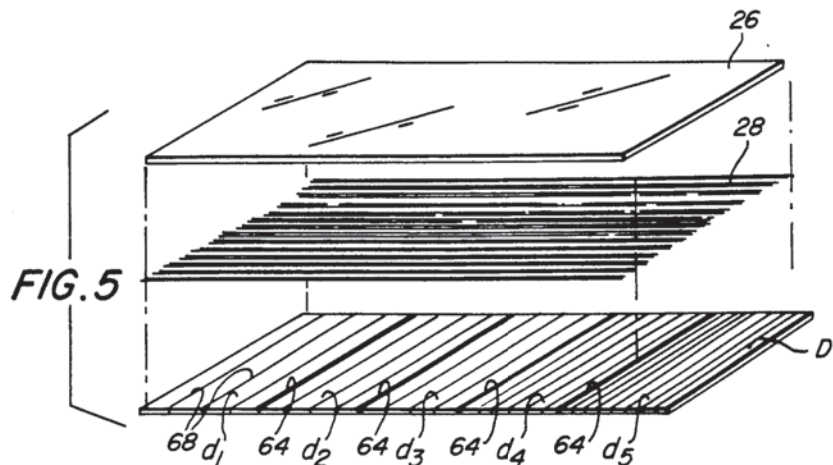
Thus, Linville anticipates claim 10.

Regarding claim 11, Fig. 4 of Linville (above) shows that the luff panels (b₁, c₁, and d₁) extend about 20% to about 33 % of the way from the luff to the leech, which is between the 10% and 50% range of claim 11(EX1003, ¶135). Thus, Linville anticipates claim 11.

Regarding claim 16, while Linville does not explicitly disclose a gradient based on failure strain or modulus values, col. 8, ll. 13-35 of Linville discloses using a gradient of fabric denier density increasing from 5,000 to 10,000 to 18,000 denier/g in direction from luff to leech. See also Linville Claim 2: "wherein the denier density of strands of stretch resistant polymer in layer (ii) varies between the segments in each panel, the high density [18,000] being located nearest the leech of said sail and the lower density [5000] being located in segments nearest the luff of the sail." It is well known to a POSITA that failure strain and modulus are just alternative ways of quantitatively characterizing elasticity or stiffness (EX1003, ¶117). A POSITA would understand that denier density is directly proportional to stretch resistance (modulus) and inversely proportional to how much reversible stretch a fiber can undergo before breaking (failure strain) (EX1003, ¶117). Therefore, Linville in view of common knowledge of a POSITA anticipates claim 16, by disclosing the gradient required by the claim (EX1003, ¶117).

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

Regarding claim 17, Linville Fig. 5 and col. 5, lines 21-23, show “Layer (26) is a dimensionally stable polymeric film such as an oriented polyester film of which Mylar is typical.”



The d_1 side of Fig. 5 is the luff region (see Fig. 4), and is the first material according to the language of Collie’089. Thus, Linville anticipates claim 17, since this passage discloses using polyester in the luff of the sail, which is the first material in Collie’089 claim 1.

Regarding claim 18, Col. 7, ll. 41-45 of Linville discloses that luff material comprises Mylar polyester film in combination with Kevlar fibers: “The material illustrated in FIG. 7 comprises a web (66) of film such as Mylar to which has been bonded by adhesive a warp of individual substantially

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

parallel strands (68) of Kevlar fiber or like stretch resistant synthetic polymer.” Linville discloses that Mylar is a polyester and Kevlar is an aramid; see e.g., col. 4, l. 55-57 “Illustrative are the drawn, oriented polyester films such as available under the trademark Mylar”; and col. 5, l. 1: “...an aramid such as Kevlar.” Thus, Linville anticipates claim 18 by disclosing the combination of a polyester with an aramid in the luff region.

Regarding claim 19, it is common knowledge to a POSITA that one way to achieve a more elastic portion of a sail is to include fewer yarns in a given area where higher elasticity is desired, compared to a greater number of yarns in other areas, assuming the yarns are made from the same material. FIG. 4 of Linville, discussed above, shows just such a sail, in which the greater number of Kevlar yarns is used in the leech area of the sail (on the right hand side) and fewer Kevlar yarns in the luff area (on the left). A POSITA would understand that a sailcloth fabric with a higher yarn density would also be thicker than a sailcloth panel with a lower yarn density, as more yarns generally equates with thicker fabric. Thus, Linville also anticipates claim 19, since it teaches the use of a thinner material in the luff region relative to the remainder of the sail.

Regarding claim 20, Fig. 12 of Linville shows the panels I'-V' “cut substantially parallel to the leech” as stated in column 8, ll. 48-50.

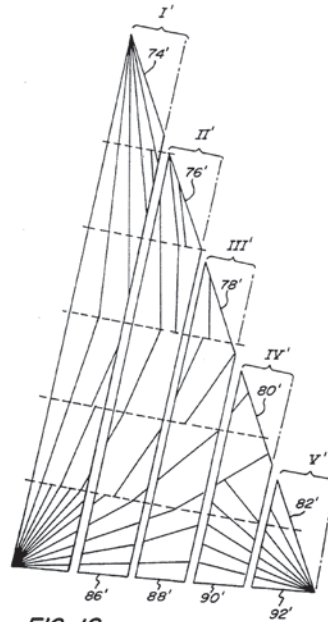


Fig. 12 has the leech to the left and the luff to the right (EX1003, ¶121). The panels in the luff region of II', III', and IV' are all oriented with the warp strands at angles relative to the luff, which would align the stretchier bias of the panels generally in the direction of the luff (EX1003, ¶121). In contrast, the panels along the leech are oriented with the warp fibers running roughly parallel to the leech, making the leech stiffer than the luff region (EX1003, ¶121). Thus, Linville anticipates claim 20, by disclosing the fiber orientation requirements of the claim.

Regarding claim 22, the twin-skin sail configuration is an old concept that is common knowledge to a POSITA, as evidenced by the Twin-Skin Prior art discussed above. A POSITA would be familiar with this sail design, and would know that a twin-skin mainsail has the advantage of less drag because it better

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

diverts the wind flow around the mast. Thus, claim 22 is anticipated by Linville in view of common knowledge, as evidenced by the Twin-Skin Prior Art (EX1003, ¶123).

Claim 23 is very similar to claim 1 with regard to the initial limitations. The discussion above applies equally to the corresponding limitations of claim 23.

With respect to the last limitation of "wherein in a luff direction, a ratio of a stiffness of regions outside the luff region and the stiffness of the luff region is in the range of 2-25 times greater," it is very similar to the last limitation of claim 1, except that it specifies stiffness in "a luff direction" and increases the range of stiffness to 2-25 times greater in claim 23. As can be seen by Fig. 7A, the Linville panels are cut in the direction of strands 68 and the specification discusses the denier density of the strands that are aligned from the foot 18 upward toward the head 10, so the luff direction is what Linville uses when disclosing the stiffness discussed above for claim 1. Thus, Linville anticipates claim 23 (EX1003, ¶126).

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

ii. Claims 4-6, 9, 12-15, 17, 18, 21 and 22 Are Obvious Over Linville in View of Various Secondary References

a) Obviousness of Claims 4-5 over Linville in view of Cali.

Regarding claim 4, Linville teaches that the first material can comprise a polyester (see col. 5, ll. 21-23). It is common knowledge of a POSITA that failure strain is just another way of characterizing elasticity or stiffness of a material (EX1003, ¶129). Cali (EX1022), in Table 2 on p. 1654, lists the failure strain (referred to as “Strain max” in Cali) of a number of common sailcloth materials comprising various yarns sandwiched between sheets of polyester (e.g., Mylar) as in Linville. All of the sailcloth materials in Table 2 of Cali have failure strains within the range specified in claim 4 (about 2.5% to about 30%). A POSITA would have been motivated to combine the teachings of Cali with Linville because Cali provides elasticity property information on common sailcloth materials of similar design as the materials of Linville. Thus, claim 4 is obvious over Linville in view of Cali (EX1003, ¶129).

Regarding claim 5, a POSITA would understand that denier density is just another way of characterizing stiffness or elasticity, as is failure strain, and that denier density is roughly directly proportional to stiffness and inversely proportional to elasticity (EX1003, ¶103). As discussed above, Linville teaches a

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

sail with a second material that is about 2 to 3.6 times stiffer than the first material in the luff region. Since denier density and failure strain are just alternative characterizations of stiffness, a POSITA would recognize that the failure strain of the luff region of Linville will also have a failure strain that is within the range of 2 to 10 times greater than the failure strain of the second material. Thus, claim 5 is obvious over Linville in view of Cali (EX1003, ¶129).

Arriving at the full range of values in claims 4-5 would just involve routine optimization well within the level of skill of a POSITA in the field of high-performance sail design. (EX1003, ¶129-131)

b) Obviousness of Claims 6, 9 and 12 over Linville in view of Keire and DKG.

Regarding claim 6, U.S. Patent No. 6,260,497 (2001) to Keire ("Keire") (EX1019), teaches the use of polyester fibers in the luff region of a sail similar in design to that of Linville (claim 10 of Keire states: "...the yarns of the third panel are continuous filament polyester yarns.") The "third panel" referred in Keire is in the luff region of the sail (see Keire claim 8). The 2017 Kevlar Fiber Technical Guide (DKG) from DuPont (EX1032) discloses on p. 7, Table II-2, that of polyester yarn has a modulus of 2.0×10^6 psi, which is equivalent to 13.7 GPa, which is also within the range of claim 6. A POSITA would have been motivated

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

to utilize the polyester yarns of Keire in the luff region of the Linville sails, because the sail designs of Linville and Keire are similar, and polyester is a known alternative to the aramid yarns for achieving a more elastic luff, as taught by Keire. A POSITA would look to DKG for properties of yarns used in composite sails such as those of Linville and Keire because Kevlar is one of the yarns specified in both Linville and Keire. Arriving at the full 1 to 60 GPa range of modulus values in claim 6 would just involve routine optimization well within the level of skill of a POSITA in the field of high-performance sail design. (EX1003, ¶129-131). Thus, claim 6 is obvious over Linville in view of Keire, and further in view of DKG (EX1003, ¶130-131).

Regarding claim 9, Linville Fig. 12 shows the panels I'-V' "cut substantially parallel to the leech" as stated in column 8, lines 48-50. This indicates that the sail in Fig 12 is illustrated below with the leech to the left and the luff to the right. The panels in the luff region of II', III' and IV' are all oriented with the warp strands at angles more than 15 degrees relative to the luff. for the luff on the left side being angled about 15 degrees relative to the luff. Thus, claim 9 is obvious over Linville in view of Keire (EX1019), and further in view of DKG (EX1032), for the same reasons as for parent claim 6 (EX1003, ¶134).

Regarding claim 12, Linville in Fig 4 (below) shows the first material of the

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

luff region on the left side of C¹ and D¹ extending further toward the middle of the sail than it does in B¹.

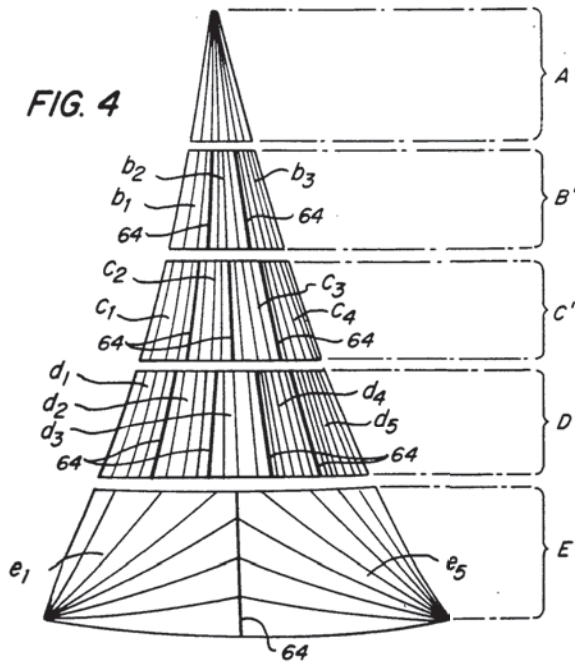


FIG. 4, panels b₁, c₁, and d₁ constitute a first material in the luff region that extends to a greater extent in the middle of the sail than toward the head or the tack.

Therefore, Linville anticipates claim 12. (EX1003, ¶134).

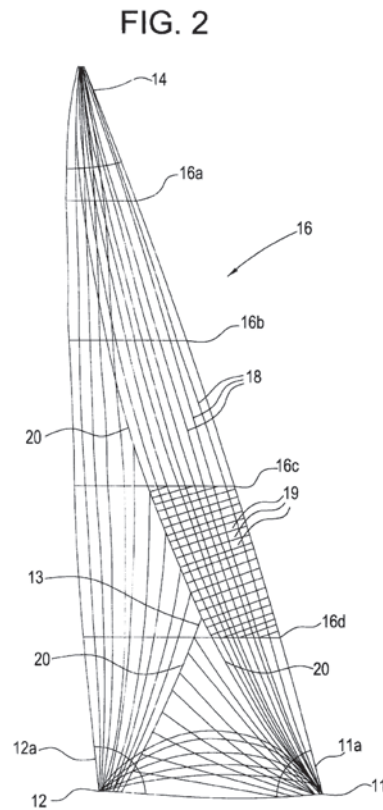
The obviousness of claims 13-15 is dealt with separately below in the section on “Third Region Prior Art”. One of these pieces of prior art is U.S. Patent No. 5,038,700 to Conrad ("Conrad") (EX1023). Linville often cites Conrad.

c) Obviousness of Claim 17 over Linville in view of Keire.

As noted above, claims 16-18 are anticipated by Linville in view of common

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

knowledge of a POSITA. In the alternative claims 16-18 would have been obvious to a POSITA in view of the common knowledge that failure strain and Young's modulus are just alternative ways of quantitatively characterizing elasticity (EX1003, ¶¶137-139). Keire Fig. 2, below, shows warp threads 18 running from clew to head (on the right), from tack to head (on the left), and from tack to clew (at the bottom) forming three distinct panels, one in the luff region (on the left), one from the leech to the luff region (on the right), and one at the foot of the sail (at the bottom). Claim 8 of Keire describes the luff region panel running from tack to head as "a third Panel." Claim 10 of Keire specifies that the "third panel" comprises polyester yarns. Linville discloses a lower denier density in the luff region compared to the remainder of the sail, which a POSITA would recognize results in a luff region that is more elastic than the remainder of the sail as discussed above regarding claim 1. Thus, claim 17 is obvious over Linville in view of Keire (EX1003, ¶136).



d) Obviousness of Claim 18 and 21 over Linville in view of MSP.

Regarding claim 18, Linville teaches the use of aramid fibers in the luff region, as noted above. MSP (EX1017) states, on page 24, that “Fabric makers are not the type to let the bad properties of a particular yarn stand in the way of progress, and they are constantly working to combine fibers. These hybrid fabrics exploit the strengths of individual yarns while minimizing the weaknesses.” Absent a showing of criticality, it is an obvious design choice to use a combination of the aramid of Linville with a polyester to exploit the strengths and minimize the

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

weaknesses of the fibers, as taught by MSP. Thus, claim 18 is obvious over Linville in view of MSP (EX1003, ¶¶137)

Regarding claim 21, Linville discloses using Kevlar aramid fibers as the load-bearing threads in the sail. According to MSP, page 23: "When used in sails carbon fibers are combined with more durable fibers like Kevlar ... The result is a measure of durability, without a sacrifice in modulus." Also in MSP (EX1017), p. 20 photo caption: "Some fabrics are made from a blend of fibers such as Kevlar and carbon in order to maximize benefits of each." A POSITA would consider it an obvious design choice to blend Kevlar and carbon fibers (per claim 21) to provide the desired high modulus of carbon with improved durability of Kevlar, as taught by MSP (EX1003, ¶138). Thus, claim 21 is obvious over Linville in view of MSP.

e) Obviousness of Claim 22 over Linville in view of Twin-Skin Prior Art.

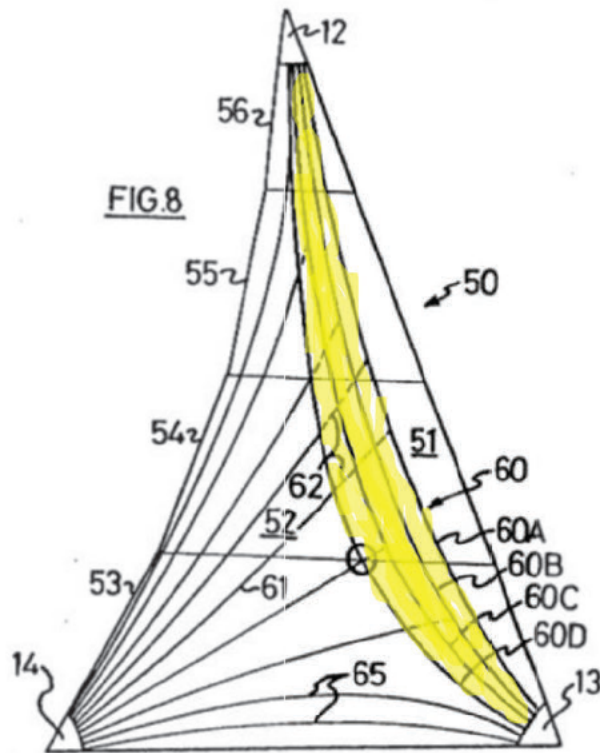
As discussed above, claim 22 is anticipated by Linville (EX1018) in view of common knowledge or a POSITA as evidenced by the Twin-Skin Prior Art. In the alternative, claim 22 is obvious over Linville in view of The Twin-Skin Prior Art. A POSITA would have been motivated to construct a twin-skin sail based on one or more of these references, because that sail has less drag, and a POSITA would

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

also have understood that both sail skins would be constructed in the same way since both sides are subjected to the same wind forces during use and must operate in the same way in response to those wind forces (EX1003, ¶¶139).

C. The “Third Region Prior Art”

Claims 13-15 require a “third region” in the sail of claim 1, which is less elastic than other regions of the sail. The idea of a stiff “third region” in the middle of the sail goes back to at least the 1980’s when Thomas Whidden and Peter Conrad were owners of Sobstad Sails. They developed a “third region” for use on racing sails to transmit the load between the luff region and the leech region so the leech could react dynamically to changing wind conditions (EX1007, ¶29). This design was incorporated by Tom Whidden for a proposed boat for the America’s Cup in 1988 named *Stars and Stripes* '88 and the sail was built and sold at that time and thus is prior art (EX1007, ¶31). This design feature was also included by Peter Conrad in his U.S. Patent No. 5,028,700 (EX1023), and in EP 0 271 215 A1 to Geoffrey Smale (EX1031). The “third region” is shown at 60, 60A, 60B, 60C and 60D (colored) of Figure 8 of Smale.



The drawings of Collie'089 do not show the “third region,” but the prior art clearly does show the “third region.”

Use of a “third region” continued with America’s Cup racing sails, and the example of the Swiss team Alinghi from 2010 is included as prior art (EX1020; EX1026-EX1030; EX1007, ¶¶48-50).

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

Claims 1-3, 13-16 and 23 are invalid as anticipated by and/or obvious over a group of prior art identified as “Third Region Prior Art”. Claim 13-15 are also obvious in view of the primary references cited above, MSP (EX1017) or Linville (EX1018) combined with any of the “Third Region Prior Art”, either individually or collectively.

The “Third Region Prior Art” relates to high-end racing sails from the 1980’s to the 2000’s and is represented by U.S. Patent No. 5,038,770 (EX1023) to Peter Conrad, the 1988 sails made and sold by North Sails for the America’s Cup boat *Stars and Stripes* ’88 (EX1025; EX1010, p. 225; EX1007, ¶¶36-47), the 2009-2010 sails made and sold by Petitioner for the America’s Cup boat of team Alinghi (EX1007, ¶¶48-65; EX1026-EX1030), and 1988 European Patent Publication No. EP 0271215A1 to Smale (EX1031).

Claim 13 of Collie’089 specifies that the sail of claim 1 includes a third region having an elasticity less than other regions of the sail, and that this third region extends along at least a portion of a margin of the luff region between the luff region and the remainder of the sail. This concept has been known since at least the 1980’s and is nothing more than applying a known technique to improve a known device to yield predictable results (EX1007, ¶28).

Tom Whidden worked with Peter Conrad during the 1980’s to develop sails

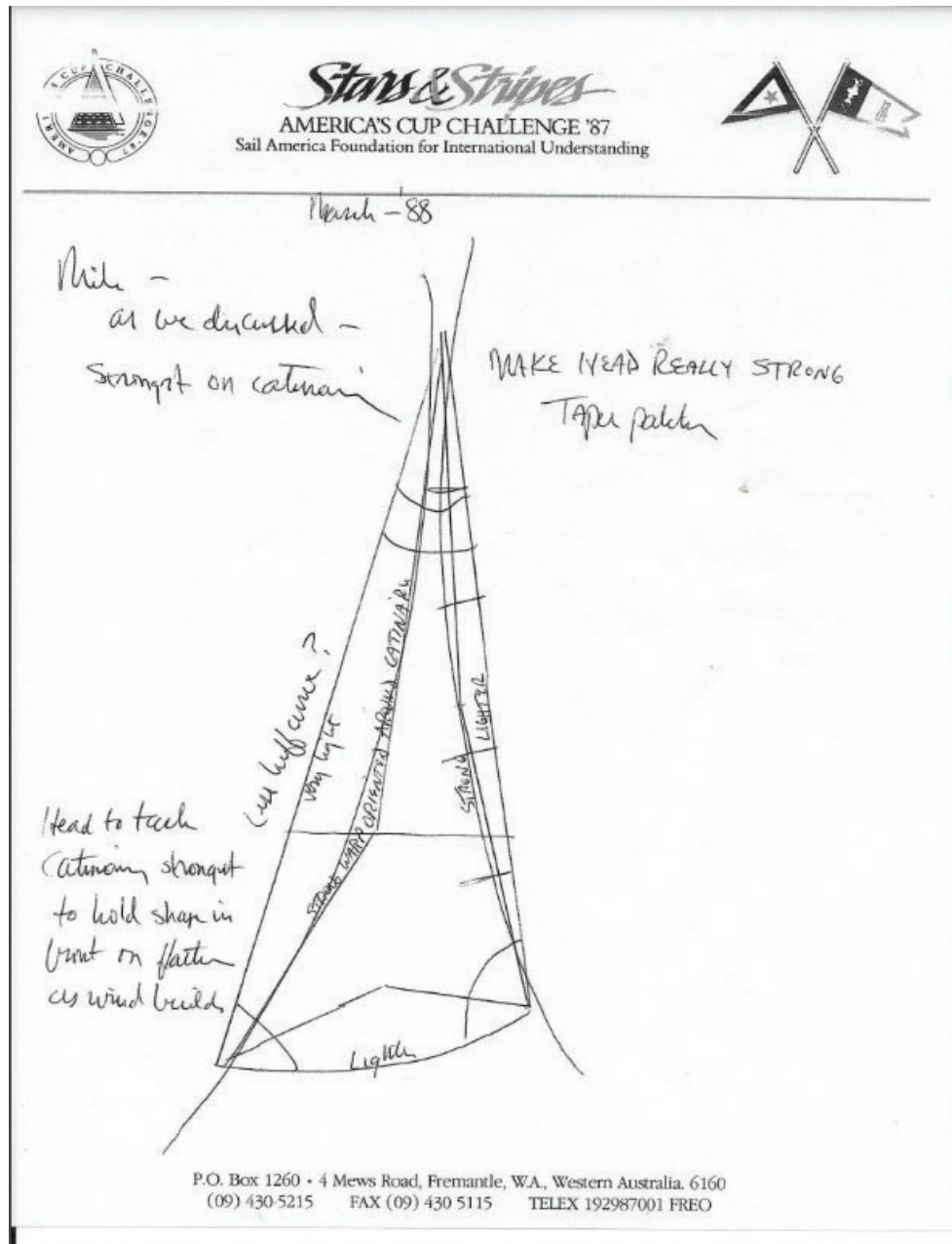
Petition for Post-Grant Review of U.S. Patent No. 12,110,089

that had a stiffer region between the luff and the leech, such that the sail could flatten in higher winds for improved up-wind performance (EX1007, ¶29). This idea is often called a “catenary band.” This catenary band is what Collie’089 refers to as a “third region that has an elasticity that is less than other regions of the sail.” (EX1007, ¶29).

High-performance racing sails need to operate over a range of wind conditions and directions, and the shape of the sail must be adjustable in response to the wind conditions, because racing is not just a question of speed, but the speed in the direction of the next marker in the racecourse. Sail shape is used to optimize speed in a given direction and in given wind conditions (EX1007, ¶32).

A drawing (EX1025) that was the genesis for the sails built at North Sails for the *Stars and Stripes* '88 Catamaran is dated March, 1988 (EX1007, ¶33).

Petition for Post-Grant Review of U.S. Patent No. 12,110,089



EX1025

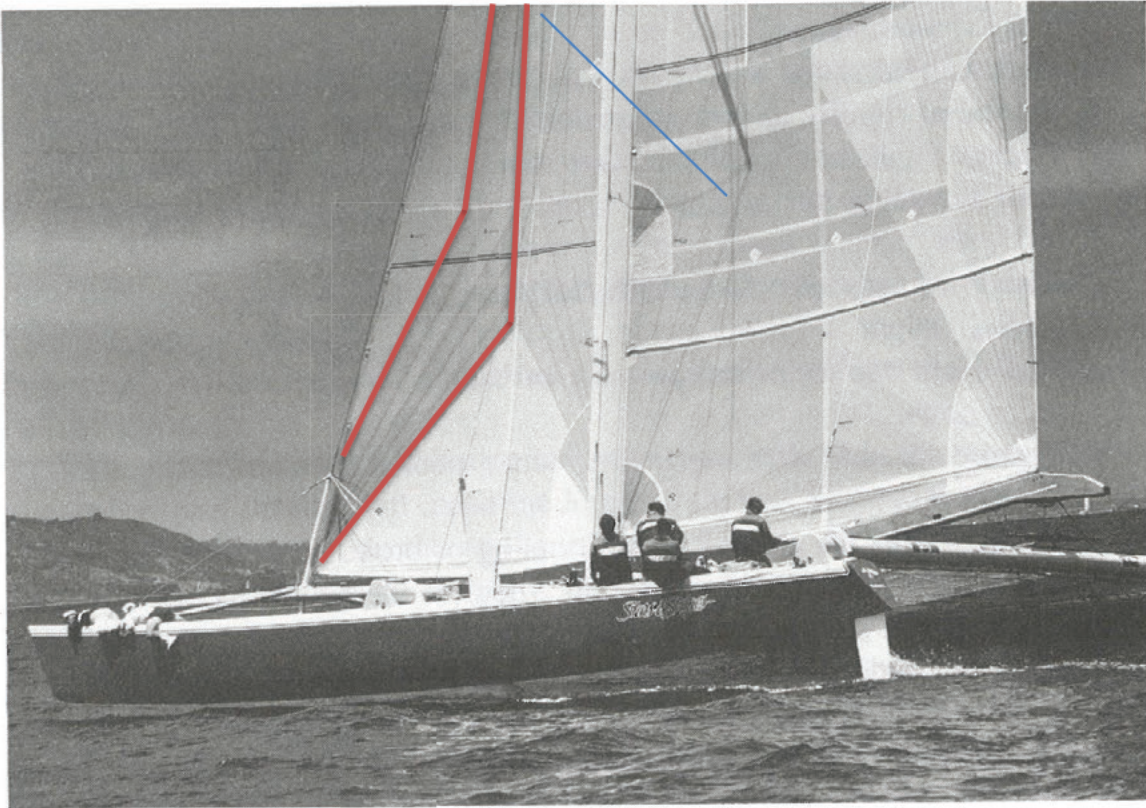
This sail was made and sold by North Sails in 1988 to demonstrate a catenary band (a/k/a “third region”) running from the tack toward the head between the luff region and the remainder of the sail to hold the shape of the sail in

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

front or flatten as the wind builds (EX1007, ¶34).

As can be seen in EX1025, the catenary band is labeled “STRONG WARP ORIENTED AROUND CATENARY“, while the leech on the right side of the sail is labeled “lighter“, and the luff region on the left side of the sail is labeled “very light.” Thus, the catenary band is the least elastic (strongest) area of the sail, while the leech region is more elastic (lighter) than the catenary band, and the luff region is the most elastic (lightest) area of the sail. This sail design is the same as set out in Collie’089 and claimed in claims 13-15. The purpose for the catenary band is stated on the lower left side of the drawing in EX1025: “Head to tack Catenary strongest to hold shape in front or flatten as wind builds.” This is the same logic expressed in Collie’089 (see e.g., EX1001, col. 5, ll. 44-47): “This provides for a sail that is effective to power up or power down the sail in response to the wind speed or heading of the yacht relative to the wind direction.” or col. 5, l. 48 through 59, and col. 11, ll. 46-50) (EX1007, ¶35).

The sail that North Sails built and sold based on this concept is also shown on page 225 of Thomas Whidden’s 1990 book *Art and Science of Sails* (EX1010), shown below (EX1007, ¶36), annotated in red to highlight the position of the "third region."



A full-battened main is seen on the catamaran Stars & Stripes '88—the one with the soft rig rather than the wing (see photograph on page 124). While go-fast catamaran sailors and then boardsailors were the first recreational sailors to use full-battened mainsails, Chinese junks have had them for at least a century. They are now popular on cruising boats and some racers. (Courtesy of North Sails, Inc.)

In the jib shown on the left in the photo from page 225 of EX1010, the luff is along the left (forward) side, the leech is to the right and the stronger “catenary band” (outlined in red) is the darkest region aft of the luff, running from the tack (lower left of the sail), consistent with the sketch in EX1025, shown above. A POSITA looking at this photograph would recognize these light and dark regions

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

as having the elasticity characteristics described above (EX1007, ¶37).

North Sails also built and sold another jib (a headsail of claim 3) in this fashion, and at least one mainsail (claim 2) of similar concept for *Stars and Stripes* '88 (EX1007, ¶38). The luff region was the lightest Kevlar (200 denier yarns and 1 mil of polyester film); the middle section was strong Kevlar, 1000 denier, and the leech area was 400 denier Kevlar yarns with 2 mil of polyester film (*Id.*). Because denier can also relate to the stiffness of the material, the leech region (what Collie'089 generally calls the “remainder of the sail”) is about two times as stiff as the luff region, meeting the requirements of claims 1 and 23 (*Id.*). The middle section (what Collie'089 calls the “third region”) was the stiffest material (claims 13 and 14). This particular sail worked just as expected, as the harder a sailor pulled on the halyard and cunningham, and the harder the sailor sheeted the sail, the flatter it got (*Id.*).

i. Anticipation of Claims 1-3, 10, 11, 13-14 and 23 of Collie'089 by Stars and Stipes '88 Sails.

Thus, the *Stars and Stripes* '88 jib and mainsails anticipate at least claims 1-3, 10-14, and 23 of Collie'089 as the sail includes all of the elements of these claims. As noted above, these sails include the requirements that the luff region is more elastic than the remainder of the sail (claims 1 and 23), that the second

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

material is 2-20 (or 25) times stiffer than the first material (claims 1 and 23), that the sail is a mainsail (claim 2), that the sail is a headsail (claim 3), that the first material extends at least 50-90% of the distance between the head and the tack as shown (claim 10), that the first material extends about 10-50% the width of the sail as shown (claim 11), that the first material extends more to the leech in the middle of the sail as shown (claim 12), and that the third material (catenary) at a boundary of the luff region and the remainder of the sail is stiffer than the luff region and the remainder of the sail) (claims 13 and 14) (EX1007, ¶¶39-47).

ii. Anticipation of Claims 1, 3, 13-16, and 23 of Collie'089 by Alinghi 2009-2010 Sails.

For the 2010 America's Cup, Alinghi designed a 100' catamaran boat that needed deep sails to get the windward hull to lift clear of the water and then much flatter sails to reduce drag once accelerated. North Sails designed composite headsails for Alinghi's catamaran, and sold them to Alinghi in 2009 and 2010 (EX1007, ¶48). These sails were made with Kevlar and carbon yarns deposited onto Mylar film. As discussed below, these Alinghi sails anticipate the Collie'089 claims 1, 3, 13-16, and 23 (EX1007, ¶49).

A photo of the Alinghi boat was published by the New York Times in a 2010 in the article entitled "Thirty Knots, with The Wind at Your Wings"

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

(EX1020), and shows the relative density of material in the third region (central portion) of the sail (with red lines outlining the densest catenary band) (EX1007, ¶50, 51).



EX1028 provides images of another jib sail of the same general design as EX1027 for the same Alinghi catamaran. This much larger jib sail was intended to be used in lighter wind ranges than the sail in EX1027 (EX1007, ¶53). The photo is sourced from the designer's testing records and was sold by North Sails on December 13, 2009 (see EX1027 and EX1007, ¶53). Below is an image from EX1028 showing this sail, annotated to include red lines around the densest "third region" area of the sail: (EX1007, ¶53).

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

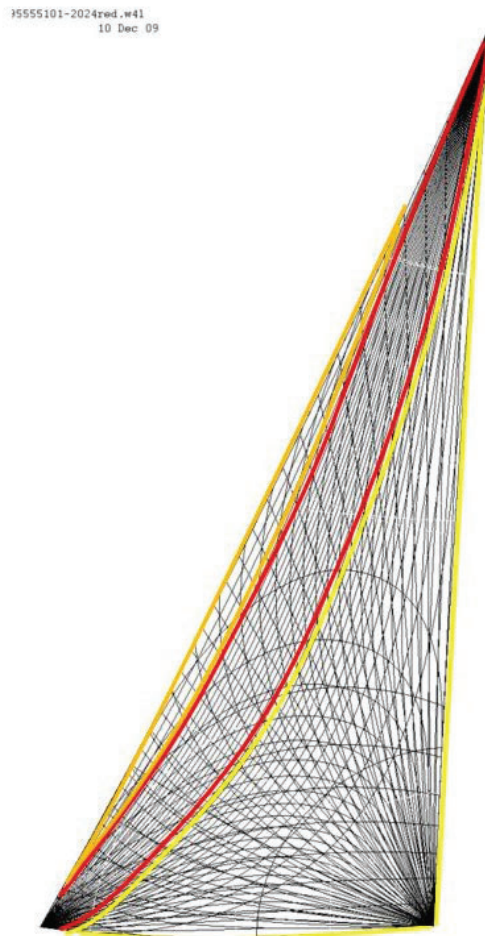


The next image, from EX1030, is taken from the sail design file used to create the headsail of EX1026 through EX1029. It shows all of the yarn passes that make up the complete structure for the sail as curved lines. Note that each line in the image represents 4 passes of a comb containing 13 yarns (52 yarns represented by each line) with some combination of carbon and aramid yarns intermixed among the 13 positions. The image has been annotated to add outlines of the different regions of the sale. The area bounded by the orange lines corresponds to the “first material” or “luff region” of Collie’089 (on the left side of the image), which runs about 80% to 90% of the distance from tack to head.

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

The area bounded by the yellow lines corresponds to the “second material of the “remainder of the sail” of Collie’089. The area bounded by the red lines corresponds to the “third material” or “third region” of Collie’089 claims 13-15.

Although the average stiffness of a given region of such as sail cannot be determined (see above claim construction for "average stiffness"), the number of yarns per inch can be calculated for regions spanning a girth of the sail from the design records, and knowing the number of yarns and the denier size of the yarns, an average denier density in denier per inch (DPI) for those regions can be



Petition for Post-Grant Review of U.S. Patent No. 12,110,089

calculated (EX1007, ¶¶58-59). DPI is directly proportional to stiffness for yarns of the same type (EX1007, ¶66). In this case, the yarns are Kevlar. The table below included in EX1030 provides the average values for the so called "first material" (luff region) and "second material" from the remainder of the sail of claims 1 and 23, as well as the so-called "third region" or "third material" in the middle of the sail between the luff region and the remainder of the sail of claim 13.

Region of sail	First Material		Third Material				Second Material					
Distance from Luff edge (mtrs)	0.6	1.2	3	4	5	6	7	8	9	10	11	12
Luff group	11000	13,500	19,700	21,500	21,600	20,500	19,000	17,500	16,250	15,000	11,500	9,000
Leech groups	0	0	7,300	7700	8250	8600	8850	9200	9650	10100	11500	12900
total DPI	11000	13500	27000	29200	29850	29100	27850	26700	25900	25100	23000	21900
Average	12250		28787.5				25075					

Based on the above table, this sail comprises a luff region that is more elastic than the remainder of the sail, and the remainder of the sail is at least 2 to 2.3 times stiffer than the luff region (or the luff region is at least 2 to 2.3 times more elastic than the remainder of the sail) in the direction of the luff based on comparison of the average DPI values.

The sail is a headsail (as in claim 3), and there also is a gradient from 11000 DPI to 13500 DPI in the luff region (first material) (EX1007, ¶59), as in claim 16 of Collie'089. The "second material", which extends to the leech of the sail, has a DPI along the same girth of the sail which include sections that have twice the

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

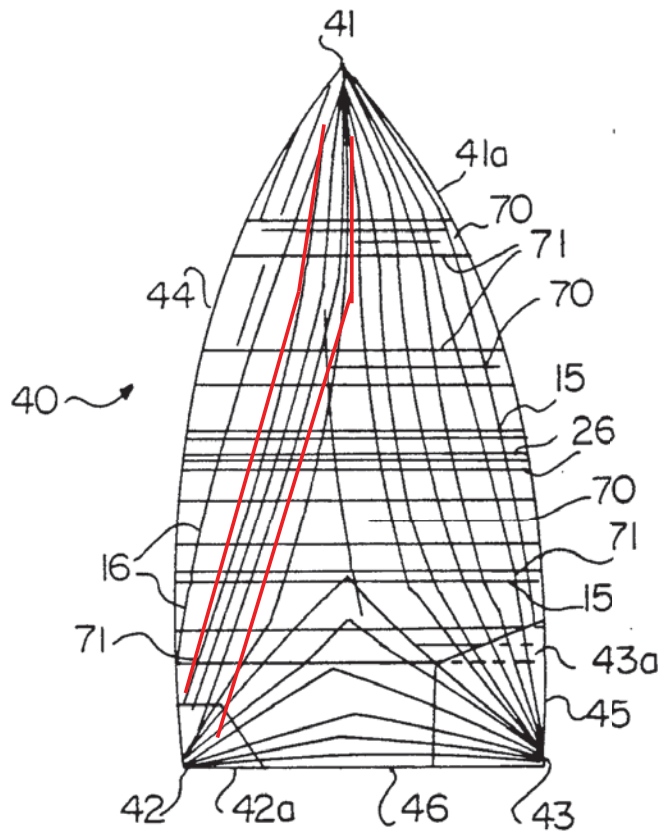
stiffness (DPI) of the first material as in claim 1 (or a first material that is at least twice as elastic and the remainder of the sail as in claim 23), while the “third material” in the middle of the sail has the highest stiffness (DPI) along this same girth, as required by claims 13-15 of Collie’089 (EX1007, ¶59).

Thus, the Alinghi sails from EX1028 through EX1030, discussed above, anticipate at least claims 1, 3, 13-16, and 23 of Collie’089, as the sails include all of the elements of these claims either alone or in combination with common knowledge of a POSITA (EX1007, ¶65).

iii. Alternative Obviousness of claims 13-15 over MSP or Linville in view of Third Region Prior Art.

Thomas Whidden's former partner, Peter Conrad has U.S. Patent No. 5,038,700, which discloses a stronger catenary band between a relatively elastic luff and a stiffer leech area. Figure 4 of Conrad (EX1023) shows a sail design with threads 16 aligned from tack to head and from clew to head, which provide strength to the sail along the catenary lines of force experienced by the sail in use. The density of threads is directly proportional to the stiffness of the sail in a given region (EX1005, ¶66). An annotated version of FIG. 4 of Conrad in which the stiffer catenary band or “third material” is the region between the two red lines (EX1007, ¶66).

FIG. 4



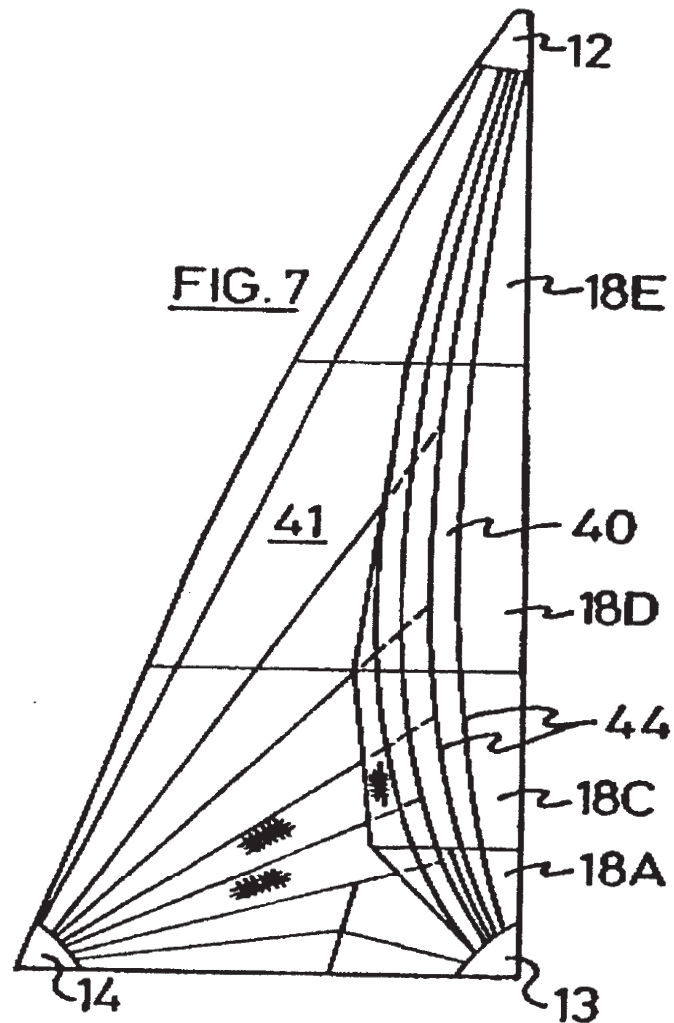
The dense group of catenary threads 16 is evident in the middle of the sail between the luff 44 and leech 45. The luff region to the left includes a single illustrated thread line, while the remainder of the sail, to the right has thread lines 16 that are spaced further apart than the threads in the region between the red lines. A POSITA would understand that thread density is directly proportional to stiffness, thus, the sail in FIG. 4 of Conrad is stiffest in the red circled region

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

(EX1007, ¶67). Thus, Conrad teaches the same “third material” region as in claims 13-15 of Collie’089. A POSITA would have been motivated to include the stiffer third region of the Conrad patent for the same reasons as described above for the *Stars and Stripes* ‘88, Alinghi, and related sails discussed above, namely, a recognized improvement of control over a range of wind conditions (EX1007, ¶67).

Yet another example of a sail design with a strong catenary band or “third region” between the luff and the remainder of the sail is found in European Patent Publication No. 0271215 A1 to Smale, which was published in 1988 (EX1031). Smale, at col. 1, ll. 51-55: “It is an object of this invention to provide improved fore and aft sails, capable of varying their cross-sectional shape in response to varying wind conditions, or which will at least provide sail makers with a useful choice.” (EX1007, ¶68).

Col. 6, ll. 16-20 of Smale states: “Figure 7 shows a similar mainsail with the addition of strips of reinforcing material 44 superimposed on the surface of the fore portion 40 of the sail which is itself make up of substantially triangular panels 18A-18E.” FIG. 7 of Smale is shown below (EX1007, ¶70).



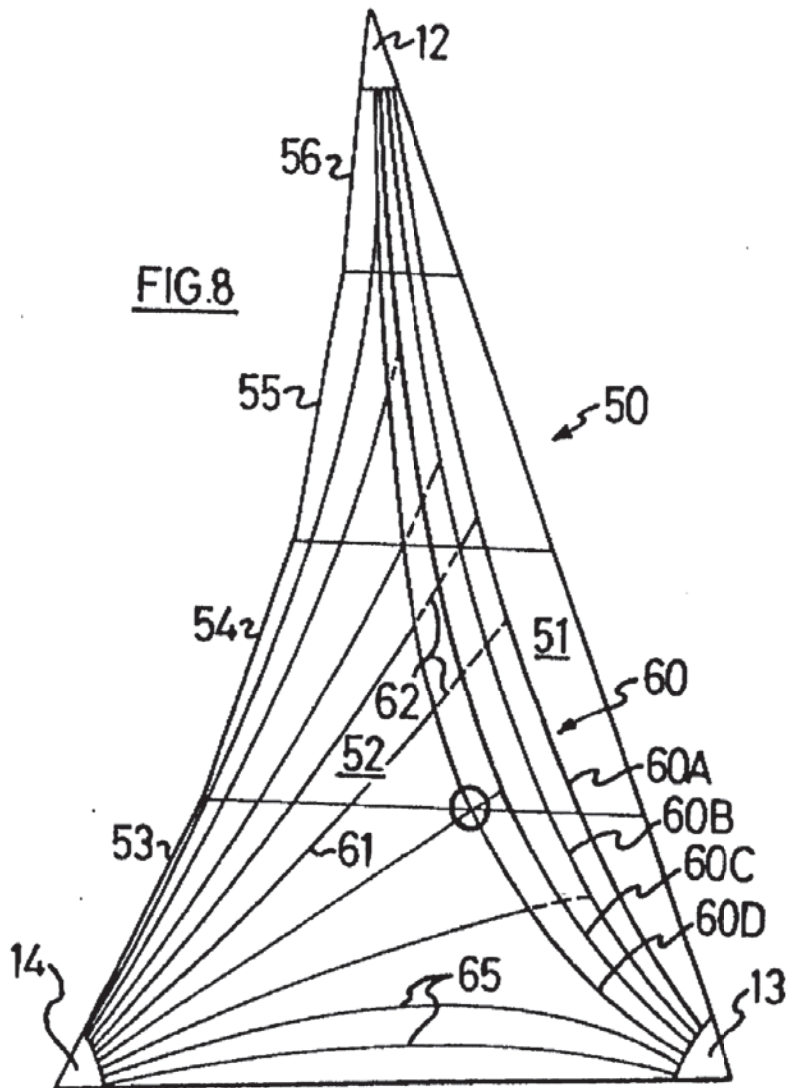
The tapes 44 in FIG. 7 are reinforcements for that region of the sail adjacent to the luff region formed from panels 18A-E. A POSITA would recognize that this reinforced region would be stiffer than both the luff region and the remainder of the sail (41 in FIG. 7). The purpose of the tapes 44 is to help control the shape of the sail in varying wind conditions (e.g., per col. 1, ll. 51-55 referred to above) and

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

is just another variant on the catenary band in the Whidden design for the *Stars and Stripes* '88 jib discussed above (EX1007, ¶71).

Col. 3, ll. 50-57 of Smale states: “Any length of sail material will have a certain elongation at a specific loading. Thus the objective becomes one of transmitting the loads at the clew to the aft edge of the fore portion consistent with maintaining the ability of the leech of the sail to react dynamically to changing wind conditions and thus varying its cross-sectional shape in the chosen manner.” A POSITA would recognize that this is exactly what Collie'089 does with the stiff, so-called “third material.” (EX1007, ¶69).

Col. 6, ll. 27-36 of Smale states: “Figure 8 shows a headsail 50 having a fore portion 51 and an aft portion 52. This sail can be formed from a single large panel, or more conveniently a series of panels 53 54 55 56, in which the orientation of the thread lines of the panels is not as important as the orientation of the lines of directional stability of a series of strips of material, e.g., tapes 60, 61, superimposed on the surface of the material.” (EX1007, ¶72).



Just as in FIG. 7, the tapes 60A-D in FIG. 8 of Smale reinforce and stiffen the region of the sail just aft of the luff region, making the taped region the stiffest part of the sail excluding reinforcements at the head, tack and clew (EX1007, ¶73).

Claim 13 of Collie'089 requires a third region having an elasticity less than

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

other regions of the sail, where the third region extends along at least a portion of a margin of the luff region between the luff region and the remainder of the sail. As discussed above, claim 1 is anticipated by MSP (EX1017) and Linville (EX1018). Claim 13 is obvious over either of these references in view of any of the “third region” catenary band prior art including the *Stars and Stripes* (EX1025), Alinghi (EX1028), Conrad (EX1023), and Smale (EX1031), all of which disclose this stiffer band of a “third material” between the luff region and the remainder of the sail. A POSITA would have been motivated to combine the anticipating references of EX1017 and/or EX1018 with any or all of the “third region” catenary band prior art in order to control the shape of the sail in varying wind conditions for the reasons discussed by Smale (EX1007, ¶¶74-75). This concept has been used in the America’s Cup for over 35 years to win.

Claim 14 depends on claim 13, and specifies that the third region extends from the tack to the head of the sail. The catenary “third regions” of the *Stars and Stripes* design (EX1025), of the Alinghi sails (EX1028), of Conrad (EX1023), and of Smale (EX1031) all extend from the tack to the head of their respective sails. Thus claim 14 is obvious over either of the MSP (EX1017) or Linville (EX1018) in view of at least EX1025, Alinghi (EX1028), Conrad (EX1023) or Smale (EX1031). As with claim 13, a POSITA would be motivated to use such a winning

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

design because it increases the size of the catenary and provides greater control (EX1007, ¶76).

Claim 15 depends on claim 13 and specifies that the third region comprises carbon. As discussed above, the Alinghi and related sails of EX1026 through EX1030, were composite sails comprising Kevlar and carbon fibers between sheets of polyester film. In addition, MSP discloses that carbon fibers are commonly mixed with aramids such as Kevlar (EX1017, p. 20 and 23). Thus claim 15 is obvious over either of the MSP (EX1017) or Linville (EX1018) in view of EX1026 through EX1030, Conrad (EX1023) or Smale (EX1031). A POSITA would have been motivated to combine the teachings of the primary references with EX1026 through EX1030, Conrad (EX1023) or Smale (EX1031) for the teachings set forth in MSP (EX1017), p. 23, i.e., that carbon has a high modulus , and when combined with Kevlar or other aramids, provides “a measure of durability, without a sacrifice in modulus.” (EX1007, ¶77).

Page 60 of MSP states: “.... the sailmaker can design the sail with low-stretch Kevlar yarns in the high-load areas and a regular polyester in the rest of the sail.” And on page 20, MSP states that "Some fabrics are made from a blend of fibers such as Kevlar and carbon in order to maximize benefits of each." Thus, it would have been an obvious design choice to use a combination of high modulus

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

carbon fibers with high modulus Kevlar (as in Conrad) at the time of the alleged invention, in order to maximize the benefits of each type of fiber. Thus, MSP discloses the added limitation of claim 15, since this passage discloses using carbon in the sailcloth fabric (EX1007, ¶77).

In addition, the combination of this “Third Region Prior Art” a/k/a/ catenaries with *Maximum Sail Power* is quite evident because *Maximum Sail Power*, on pages 52, 63, 66, 67, 68, 87, 88, and 201 discusses how loads are directed along catenaries in sails and how North Sails, Peter Conrad, and Sobstad Sails developed such sails. *Maximum Sail Power* itself connects the prior art.

X. Grounds for Standing (37 C.F.R. §42.204(a))

Pursuant to 37 C.F.R. §42.204(a), Petitioner hereby certifies that Collie’089 is available for post-grant review in accordance with 37 C.F.R. §42.202(a), and that Petitioner is not barred or estopped from requesting post-grant review challenging the claims of the Collie’089 on the grounds identified in this Petition.

This Petition is filed within nine months from the date of the grant of Collie’089.

XI. Mandatory Notices (37 C.F.R. §42.8(a)(1))

REAL PARTY IN INTEREST: The real parties-in-interest are Petitioner North Sails Group, LLC and its owner North Technology Group, LLC, as well as Oakley

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

Capital Investments, owner of North Technology Group, LLC.

RELATED MATTERS: There are no matters or proceedings related to U.S. Patent No. 12,110,089.

LEAD AND BACKUP COUNSEL: Under 37 C.F.R. §§42.8(b)(3) and 42.10(a), Petitioner appoints **Arne M. Olson** (Reg. No. 30,203) as lead counsel and **Robert J. Ross** (Reg. No. 45,058) as back-up counsel, both at the address: Olson & Cepuritis, Ltd, 20 N. Wacker Drive, 36th Floor, Chicago, IL 60606; phone (312) 580-1180, facsimile: (312) 580-1189.

SERVICE INFORMATION: Petitioner consents to electronic service by email at: aolson@olsonip.com with a copy to rross@olsonip.com.

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

XII. Conclusion

For the reasons above, post-grant review of claims 1-23 of U.S. Patent No. 12,110,089 is requested.

Respectfully submitted,

OLSON & CEPURITIS, LTD.

/Arne M. Olson/

Arne M. Olson (Reg. No. 30,203)

Robert J. Ross (Reg. No. 45,058)

Attorneys for Petitioner
North Sails Group, LLC

Date: July 2, 2025
20 North Wacker Drive, 36th Floor
Chicago, Illinois 60606
(312) 580-1180

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

**CERTIFICATE OF COMPLIANCE WITH TYPE-VOLUME LIMITATION,
TYPEFACE REQUIREMENTS, AND TYPE STYLE REQUIREMENTS**

1. This Petition complies with the type-volume limitation of 18,700 words, comprising 17,876 words, excluding the parts exempted by 37 C.F.R. § 42.24(a).

2. This Petition complies with the general format requirements of 37 C.F.R. § 42.6(a) and has been prepared using Microsoft® Word 365 in 14 point Times New Roman font.

Respectfully submitted,

OLSON & CEPURITIS, LTD

/Arne M. Olson/

Arne M. Olson (Reg. No. 30,203)

Robert J. Ross(Reg. No. 45,058)

Attorneys for Petitioner
North Sails Group, LLC

Date: July 2, 2025
20 North Wacker Drive, 36th Floor
Chicago, Illinois 60606
(312) 580-1180

Petition for Post-Grant Review of U.S. Patent No. 12,110,089

CERTIFICATION OF SERVICE (37 C.F.R. §§42.6(e), 42.105)

The undersigned hereby certifies that on July 3, 2025, a copy of the foregoing document, including any public redacted exhibits or appendices is being served via FedEx® at the following correspondence address of record for the patent:

Bryan Cave Leighton Paisner LLP
1155 F Street NW, Suite 700
Washington, DC 20004-1357

Date: July 2, 2025

/Raisha Y. Gibson/
Raisha Y. Gibson
Office Administrator
Olson & Cepuritis, Ltd.
20 North Wacker Drive, 36th Floor
Chicago, Illinois 60606
(312) 580-1180