UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

RAVIN CROSSBOWS, LLC
Petitioner

v.

MCP IP, LLC,
Patent Owner

Case No. IPR2024-00522
Patent No. 8,683,989

Case No. IPR2024-00523
Patent No. 9,354,017

Case No. IPR2024-00524
Patent No. 9,909,831

DECLARATION OF CHARLES F. REINHOLTZ, Ph.D.

MCP 2007
RAVIN v. MCP
IPR2024-00523

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I, Charles F. Reinholtz, Ph.D., of New Smyrna Beach, Florida, declare that:

I. INTRODUCTION AND SCOPE OF WORK

1. I have been retained by Fish & Richardson P.C. as an expert witness on behalf of MCP IP, LLC ("MCP" or "Patent Owner"). I understand that Ravin Crossbows, LLC ("Ravin" or "Petitioner") is requesting that the Patent Trial and Appeal Board ("PTAB" or "Board") institute an *inter partes* review ("IPR") proceeding of U.S. Patent No. 8,683,989 ("the '989 patent"), U.S. Patent No. 9,354,017 ("the '017 patent"), and U.S. Patent No. 9,909,831 ("the '831 patent").

2. I have been asked to provide my independent analysis of the '989 patent, the '017 patent, and the '831 patent in light of the prior art publications cited below.

3. I am not, and never have been, an employee of Petitioner. I received no compensation for this declaration beyond my normally hourly compensation based on my time actually spent analyzing the '989 patent, the '017 patent, the '831 patent, the prior art publications and other materials cited below, and the issues related thereto. My compensation is not in any way contingent on the content of my analysis or the outcome of any IPR or other proceeding involving the '989 patent, the '017 patent, and the '831 patent.

II. QUALIFICATIONS

4. A summary of my background and qualifications as a technical expert for this case is provided below. A more detailed listing of my qualifications and background are provided in my curriculum vitae ("CV"), which is attached hereto as Appendix A. Among other things, my CV includes a list of works that I have published in at least the last 10 years. I am also attaching Appendix B, which provides information about my expert witness experience, with case numbers where available.

5. I am currently Emeritus Professor of Mechanical Engineering at Embry-Riddle Aeronautical University, Daytona Beach, Florida. In that role I continue to teach classes, serve on committees and advise students in a voluntary capacity. I served as Professor and Chair of the Department from 2007 until 2017. In 2017 I stepped down as Department Chair, but I continued to serve as a professor until 2022.

6. From 1983 to 2007, I was a faculty member in the Department of Mechanical Engineering at Virginia Polytechnic Institute and State University (Virginia Tech) in Blacksburg, Virginia, most recently serving as Alumni Distinguished Professor from 2002 to 2007. In my time at Virginia Tech, I also served as the Assistant Department Head, W.S. White Chair for Innovation in Engineering Education and ABET Review Chair, among other appointments.

7. I received a Bachelor of Science degree in Mechanical Engineering from the University of Florida in 1976, a Master of Engineering from the University of Florida in 1980, and a Doctor of Philosophy in Mechanical Engineering from the University of Florida in 1983.

8. I have received numerous awards for accomplishments in these roles, including being named a Fellow to the American Society of Mechanical Engineers, being awarded the Outstanding Faculty Member Award, receiving the Dean's Award for Excellence in Teaching, and being inducted into the Virginia Tech Academy of Teaching Excellence. My work in the classroom consists of both teaching and mentoring. I teach or have taught classes relating to the following subjects: cams and cam design, mechanisms, robotics, unmanned and autonomous vehicle systems, and various engineering design courses. I have also been primary advisor to seventy-six master's degree and thirteen Ph.D. students over the course of my teaching career.

9. In 1978, I worked for Burroughs Corporation as a Design Engineer in Orlando, Florida. My job responsibilities included designing consumer products for the printing industry. I also have significant experience working in industry part time during summers and course breaks while I was a Professor.

10. I have significant experience in the design, fabrication, modification and implementation of mechanisms and mechanical devices like those involved in

this litigation. My publications include a popular textbook, “Mechanisms and Dynamics of Machinery,” published in 1987 focused on the analysis, design and application of cams, gears, linkages and similar devices. These mechanisms are the basis for the design of the devices in the art related to the Asserted Patents. A number of my industrial research projects, conference papers and journal articles also directly address these topics.

11. In particular, I have extensive experience in the design of cam-based mechanism, including both conventional cam and follower systems such as those used in internal combustion engines, and in the design of “wrapping” cams such as those used in compound bow. I have published extensively on these topics. In a wrapping cam, a cable, belt or chain partially wraps the cam, and the shape of the cam is used to control forces and mechanical advantage.

12. In 1992 I published what I believe to be a seminal paper providing the first analytical tools for synthesizing wrapping cams to control forces, torques and mechanical advantage. This paper, entitled "Synthesis of Wrapping Cams," was first published in the Proceedings of the 22nd ASME Mechanisms Conference, DE-VOL 46, September 1992, pp. 337-343. It received the Procter and Gamble Best Paper Award at that conference. The paper was later republished in the

Journal of Mechanical Design, Transactions of the ASME, Vol.116, No. 2, June 1994[1].

13. I have also supervised multiple master's theses and PhD dissertations on the design of wrapping cams, including a master's thesis on design of compound bows (Palmer, Matthew, Kinematics of Beam-Flexure Four-Bar Linkages with Applications in a Compound Bow, Virginia Tech, 12/96).

14. Additionally, I am a named inventor on two U.S. patents (one on a type of capstan called a Snubber Profile). I have authored or co-authored numerous publications in the field of mechanical engineering, machines, and/or mechanisms, and have worked, consulted, and testified in numerous patent cases. All my publications are listed in my attached CV.

15. Based on my experience and education, and the acceptance of my publications and professional recognition by societies in my field, I believe that I am qualified to opine as to the knowledge and level of skill of one of ordinary skill

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[1] Tidwell, P. H., Bandukwala, N., Dhande, S. G., Reinholtz, C. F. and Webb, G, "Synthesis of Wrapping Cams," Journal of Mechanical Design, Transactions of the ASME, Vol.116, No. 2, June 1994 (revised version of 1992 ASME conference publication.)

in the art at the time of the alleged invention of the ’989 patent, the ’017 patent, and the ’831 patent (which I further describe below).

III. MATERIALS CONSIDERED

16. In preparing this declaration, I have considered the specification, including the claims, and prosecution history of the ’989 patent, the ’017 patent, and the ’831 patent. I have also considered my own knowledge and experience, including my experiences in the field of the ’989 patent, the ’017 patent, and the ’831 patent (*see* paragraphs 10-15 above). The following list identifies relevant documents that I have reviewed and considered in the course of preparing this declaration:

- Petition for *Inter Partes* Review of U.S. Patent No. 8,683,989 Case No. IPR2024-00522 (the “’989 Pet.”)
    - **EX1001 (IPR2024-00522)**: U.S. Patent No. 8,683,989 B1 to McPherson (“the ’989 patent”)
    - **EX1002 (IPR2024-00522)**: Prosecution History of the ’989 Patent
    - **EX1003 (IPR2024-00522)**: Declaration of Joshua Lange, P.E.
- Petition for *Inter Partes* Review of U.S. Patent No. 9,354,017 (the “’017 Pet.”)
    - **EX1001 (IPR2024-00522)**: U.S. Patent No. 9,354,017 B1 to McPherson (“the ’017 patent”)
    - **EX1002 (IPR2024-00522)**: File History of the ’017 Patent
    - **EX1003 (IPR2024-00522)**: Declaration of Joshua Lange, P.E.

- Petition for *Inter Partes* Review of U.S. Patent No. 9,909,831 (the "'831 Pet.")
    - **EX1001 (IPR2024-00524)**: U.S. Patent No. 9,909,831 B1 to McPherson ("the '831 patent")
    - **EX1002 (IPR2024-00524)**: Prosecution History of the '831 Patent
    - **EX1003 (IPR2024-00524)**: Declaration of Joshua Lange, P.E.
- **EX1004**: U.S. Patent No. 8,205,607 B1 ("Darlington")
- **EX1005**: U.S. Patent Application Publication No. 2008/0135032 A1 to Islas ("Islas")
- **EX2001**: U.S. Provisional Patent Application No. 61/247,473 ("'473 Provisional")
- **EX2002**: *Inside Archery* Bow Report – 2009 Mission Menace ("*Menace"*)
- **EX2003**: *Inside Archery* Bow Report – Mathews McPherson Series Monster ("*Monster*")
- **EX2004**: U.S. Patent Application No. 12/248,467 as filed ("*'467 Application*")
- **EX2005**: U.S. Patent Application Publication No. 2010/0089375 ("'*375 Pub*.")
- **EX2006**: Declaration of Mathew McPherson ("McPherson Decl.")

17. I understand that the teaching of the prior art is viewed through the eyes of a person of ordinary skill in the relevant art ("POSITA"). My analysis in this declaration is thus based on the perspective of a POSITA having the level of knowledge and skill described below (¶21) at the relevant time of the inventions of the '989 patent, the '017 patent, and the '831 patent.

18. In particular, I understand that the ’989 patent was filed September 20, 2010, the ’017 patent was filed Mar, 31, 2014, ’831 patent was filed May 26, 2016. All three patents claim priority to the ’473 Provisional (EX2001) filed on September 30, 2009. For purposes of my analysis in this declaration, I have applied the timeframe around this date (September 30, 2009) as the relevant timeframe of the inventions of the ’989 patent, the ’017 patent, and the ’831 patent (and the relevant timeframe from which I considered the perspective of a POSITA).

IV. LEGAL STANDARDS

19. In preparing my analysis, I have applied the legal standards described below, which were provided by counsel for MCP.

20. It is my understanding that assessing the validity of a U.S. patent based on a prior art analysis requires two essential steps. First, one must construe the terms of the patent claims to understand what meaning one of ordinary skill in the art would give the terms. Second, after the claim terms have been construed, one may then assess validity by comparing a patent claim to the “prior art.” I understand that the teaching of the prior art is viewed through the eyes of a POSITA. For the limited purpose of this declaration, I have applied Mr. Lange’s opinion of the definition of a POSITA. EX1003 (IPR2024-00522, IPR2024-

00523, IPR2024-00524) para. 25-28. However, I may reconsider the definition at a later point.

A. Interpretation of Claim Terms

21. For purposes of my analysis in this IPR proceeding, I have interpreted the terms appearing in the patent claims according to their plain and ordinary meaning. I understand that the case that explains how to interpret patent claims is *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312-13 (Fed. Cir. 2005) (*en banc*). I understand, according to *Phillips*, that the structure of the claims, the specification, and the patent prosecution history are used to construe a claim, and the "ordinary meaning" of a claim term is its meaning that would have been recognized by a POSITA after reading the entire patent. Moreover, *Phillips* provides that even treatises and dictionaries may be used, albeit under limited circumstances, to determine the meaning attributed by a POSITA to a claim term at the time of filing. For example, *Phillips* cautions against heavy reliance on the dictionary divorced from the intrinsic record of the patent, such as the patent's specification. I have followed this approach in my analysis.

22. I also understand that the words of the claims should be interpreted as they would have been interpreted by a POSITA at the time the invention was made.

B. Obviousness

23. I understand that a patent claim is invalid as obvious if the subject matter of the claimed invention "as a whole" would have been obvious to a POSITA. In determining the differences between a prior art reference (or a proposed combination of prior art references) and the claims, the question of obviousness is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious. I also understand that an assertion of obviousness should be supported by articulated reasoning with rational underpinning to support the legal conclusion of obviousness. I further understand that there must be a motivation to combine the prior art references to achieve the invention.

24. It is my understanding that an assessment that an alleged invention is obviousness may be based on various factors including (1) whether a combination of teachings was merely the predictable result of using prior art elements according to their known functions, or whether it was the result of true inventiveness; (2) whether there is some teaching or suggestion in the prior art to make a modification or combination of elements recited in the claim at issue; (3) whether the alleged invention applies a known technique that had been used to improve a similar device or method in a similar way; and (4) whether the alleged invention would have been obvious to try, meaning that the alleged invention was one of a

relatively small number of possible approaches to a problem with a reasonable expectation of success by those skilled in the art.

25. I understand that in assessing obviousness, one must be careful to avoid hindsight-based reasoning since true inventions might seem obvious after the fact. I understand that obviousness is to be assessed from the perspective of a POSITA and that the decision-maker should not consider what is known today or what is learned from the teaching of the patent.

26. I understand that assessments of obviousness are supported by certain factual findings regarding the allegedly claimed invention and the prior art. These factual findings include: (1) the scope and content of the prior art; (2) the difference or differences, if any, between the claim of the patent and the prior art; (3) the level of ordinary skill in the art at the time the claimed invention was made; and (4) the objective indicia of non-obviousness (if available), also known as "secondary considerations."

27. I understand that the secondary considerations include:

- commercial success of a product due to the merits of the claimed invention;
- a long felt need for the solution provided by the claimed invention;
- unsuccessful attempts by others to find the solution provided by the claimed invention;
- copying of the claimed invention by others;

- unexpected and superior results from the claimed invention;
- acceptance by others of the claimed invention as shown by praise from others in the field or from the licensing of the claimed invention;
- teaching away from the conventional wisdom in the art at the time of the invention;
- independent invention of the claimed invention by others before or at about the same time as the named inventor thought of it; and
- other evidence tending to show obviousness.

28. It is my understanding that, in order to establish a secondary consideration, the evidence must demonstrate a nexus between that secondary consideration and the alleged invention.

V. OVERVIEW OF THE '989 PATENT, THE '017 PATENT, AND THE '831 PATENT

29. The '989 Patent, the '017 patent, and the '831 patent share a common written description and figures. For convenience, in the below paragraphs, the '989 Patent is referenced, and the reference figures and quotations are also found in the '017 patent and the '831 patent.

30. The '989 Patent describes a unique design for a compound bow cam. The cams of the '989 Patent have a terminal post where the take up end of a power cable terminates at the periphery of the cam, see e.g., '989 Patent, FIG. 1 (element 32). A traditional archery bow cam design positions a corresponding terminal near

the center of the cam. *See e.g.*, EX1004, FIG. 4D (element 56); '989 Pet., 20-21; '017 Pet., 18-19; '831 Pet., 17-19.

> [T]he location of the terminal post 32 and the shape of the capstan 30 result in the power cable 24 wrapping around the capstan 30 in a direction away from the axle 18 before terminating on the post 32. In some embodiments, the cable wraps around the capstan 30 in a direction opposite the direction of cam 10 rotation as the bowstring 20 is drawn. As shown in FIG. 1, the cam 10 will rotate in a first rotational direction 76 (e.g. clockwise) when drawn, and the power cable 24 wraps around the capstan 30 and extends toward the terminal post 32 in a second rotational direction 78 (e.g. counter-clockwise) that is opposite the first rotational direction as the power cable 24 is traversed from the elongate straight portion 28 toward the terminal portion 36. '989 Patent, 4:33-45.

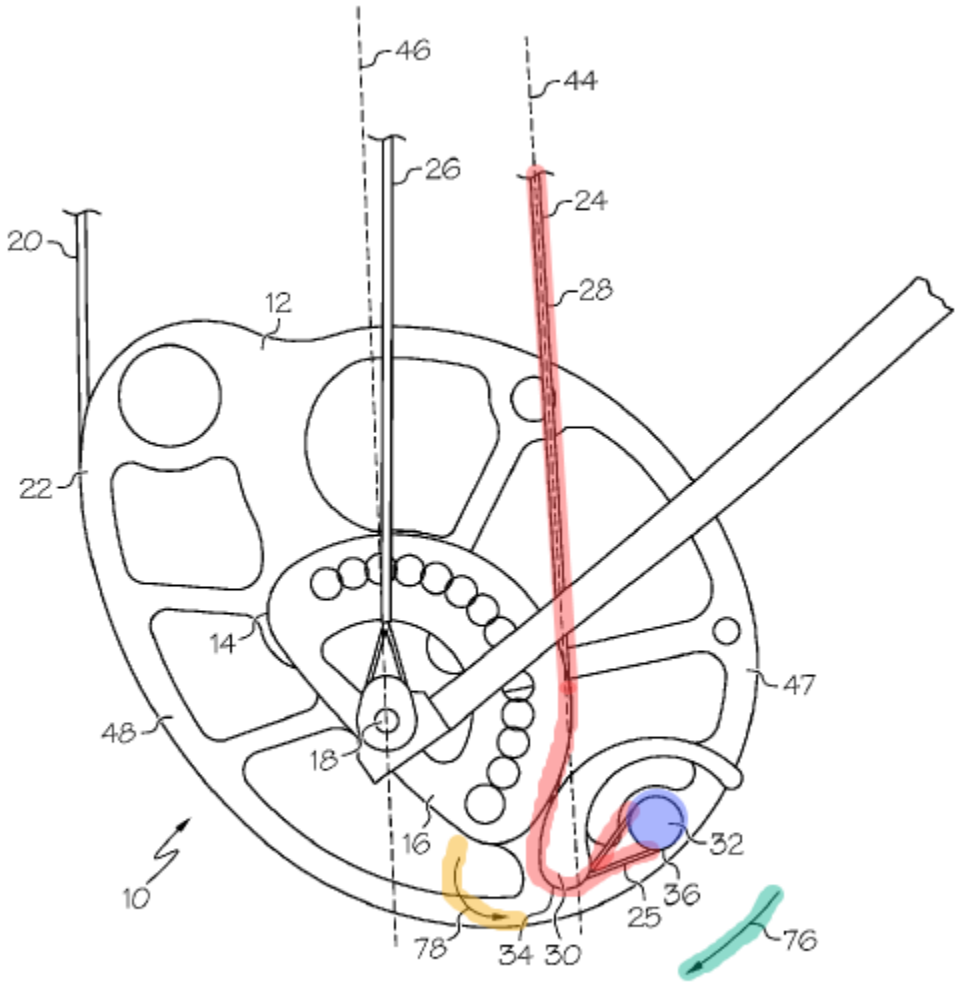


FIG. 1

’989 Patent, FIG. 1 (annotated).

31. As illustrated in the annotated ’989 Patent FIG. 1 above, the power cable take-up-end wraps around the capstan (30) to be affixed to the terminal in a direction 78 that is reverse (opposite) to the direction 76 that the cam rotates when the bow is drawn. This wrap direction can be called a “reverse wrap” because the power cable is wrapped in the direction that is the reverse of the cam draw rotation

direction. It is my opinion that several features recited in the independent claims resulting from the "reverse wrap" were unique among the prior art of the time. In particular:

- In the brace position, the "reverse wrap" positions the terminal post 32 and the cam's axle 18 on opposite sides of a plane formed by the straight portion 28 of the power cable 24 that extends toward the opposite bow cam. *See e.g.,* '989 Patent, col. 4:46-48, FIG. 1, claim 1.
- The "reverse wrap" positions the cam's capstan 30 closer to power cable 24 than the terminal post 32 when the bow is drawn, thus, providing "added draw capability." *See e.g.,* '989 Patent, col. 5:15-21, FIGS. 2, 5, claims 11, 19.
- In the brace position, the power cable wraps around the capstan in a counter-clockwise direction, and when the bow is drawn, the cam rotates in a clockwise direction. *See, e.g.,* '017 Patent, col. 4:41-47, FIG. 1, claim 1.
- In the brace position, the "reverse wrap" positions the terminal post and the cam track on opposite sides of the capstan. *See, e.g.,* '831 Patent, FIG. 1, claim 1.
- The "reverse wrap" positions the terminal 32 further from the bow's axle plane 46 than the capstan 30. *See e.g.,* '989 Patent, col. 4:57-59, claim

12; ’017 Patent, col. 4:59-61, claim 12; ’831 Patent col. 4:66 – 5:2, claim 11.

VI. OPINIONS REGARDING THE MISSION MENACE BOW AND THE MCPHERSON SERIES MONSTER BOW.

32. It is my opinion that the 2009 model year Mission Menace bow and the 2009 Mathews McPherson Series Monster bow embodied the claim limitations of the ’989 patent, the ’017 Patent, and the ’831 Patent. I reached this conclusion after analyzing the Menace bow review by Bill Krenz in the December 2008 issue of Inside Archery and the Monster bow review by Bill Krenz in the June 2009 issue of Inside Archery. EX2002; EX2003. I compared the disclosures in these articles to the claims of the ’989 patent, the ’017 Patent, and the ’831 Patent from the perspective of a POSITA.

33. In the Menace review article, Mr. Krenz praised the Mission Menace’s performance. Based on this, it is clear that Mr. Krenz believed the bow worked and performed well. EX2002, 42-43. For example, Mr. Krenz says “The 2009 Mission Menace is a remarkable bow system that offers new, and particularly young and growing, bowhunters an inviting and versatile bow that can indeed grow with them from their very first days afield well into their adult bowhunting.” EX2002, 42. Mr. Krenz positively reviewed the bow’s adjustability, and its performance at its different adjustments. *Id.*

How It Shoots

I had an archery dealer recently tell me that he was tired of so-called youth compounds that were nothing more than cut-down adult bows. "Such bows are often too heavy, noisy, full of handshock and very poor performers," he explained.

The 2009 Mission Menace is none of those things. To begin with, the new Menace weighs just 2.9 pounds. That's light. And it's just 31 inches from axle to axle so it's also compact.

Maybe never before has such a sweet-shooting, affordable, performance-minded bow been offered specifically for new bowhunters. The 2009 Mission Menace is astoundingly pleasant to shoot. There's little or no hand shock and the bow is quiet as a whisper. For a beginner bow, that's spectacular.

EX2002, 42-43.

34. The Menace article also includes a chart listing draw weight and arrow speeds for several of the Menace bow's adjustable draw lengths (reproduced below) further demonstrating that the bow operated across each of its adjustments. In the Menace article, Mr. Krenz stated "The new Menace is also packed with performance, the type of performance that can bring big smiles in the backyard or down a trophy buck in the field. See accompanying Arrow Speed chart." EX2002, 43. Based on this, it is clear that Mr. Krenz felt that the bow performed well at

each of the adjustment settings, and that the arrow speeds listed in the chart were acceptable.

Arrow Speed

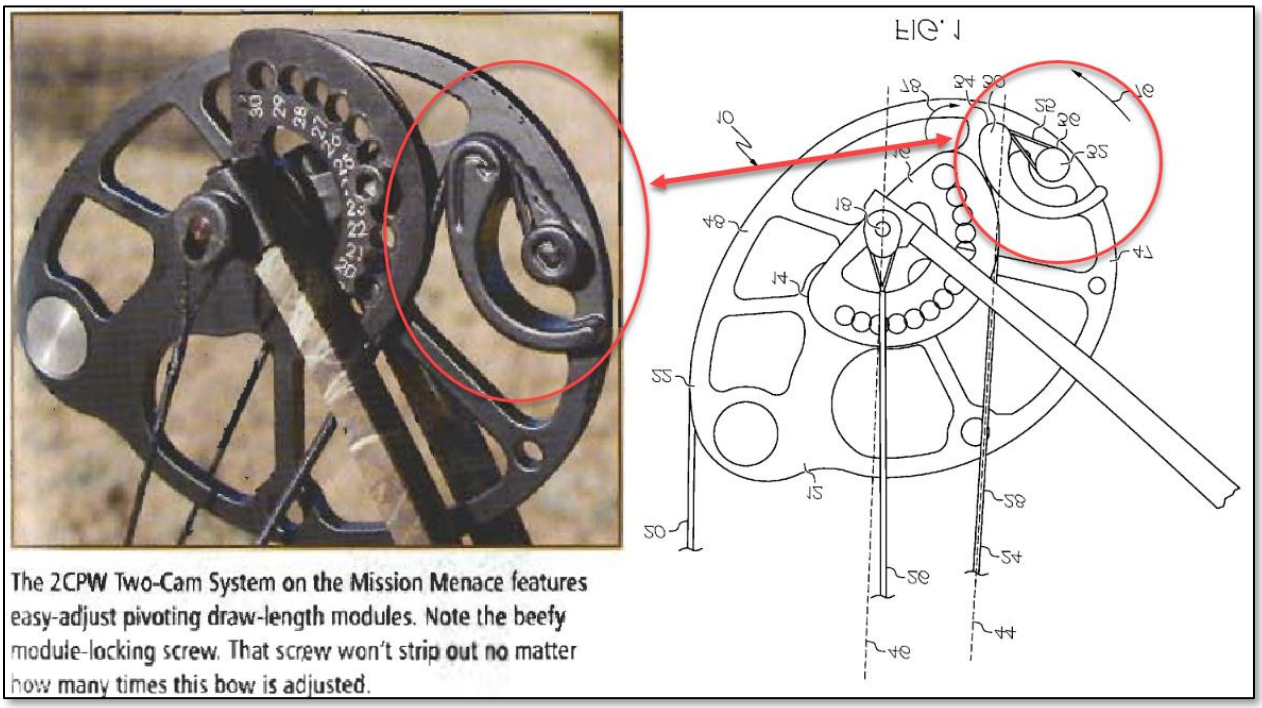
2009 Mission Menace

Draw Length	Draw Weight	Arrow	Arrow Weight	Arrow Speed
20 inches	38 pounds	19" 1816 Aluminum	326 grains	145 fps
		21" 1714 Aluminum	264 grains	155 fps
25 inches	48 pounds	24" 1916 Aluminum	396 grains	191 fps
		24" 1816 Aluminum	376 grains	196 fps
30 inches	52 pounds	28" 400 Carbon	391 grains	248 fps
		28" 400 Carbon	366 grains	255 fps

EX2002, Arrow Speed Chart.

35. It is my opinion that the cams of the Menace bow pictured in the Menace article are substantively the same as the cams illustrated in FIGS. 1-3 of the '989 Patent because the cams pictured in the Menace article have substantively the same shape and features as the cam illustrated in FIGS. 1-3 of the '989 Patent. The image below shows the cam photograph from the Menace article side by side with FIG. 1 from the '989 Patent. FIG. 1 from the '989 Patent has been rotated to approximately match the orientation of the cam in the photograph. As shown by the photograph, the Menace bow had the same "reverse wrap" power cable

configuration (circled in red in both images) as described in the ’989 Patent. This is because the power cable of the cam in the Menace article photograph wraps outward toward the periphery of the cam, which is the same direction that the power cable is wrapped in FIG. 1 of the ’989 Patent.



EX2002, 43; ‘989 PATENT, FIG. 1.

36. Mr. Krenz also praised the Mathews McPherson Series Monster bow in the Monster review article. EX2003, 30-31. For example, Mr. Krenz states, “The McPherson Series Monster is one of the fastest, most efficient dual-cam compound bows ever produced.” EX2003, 30. Mr. Krenz continues: “At the shot, the Mathews Monster is surprisingly quiet and shock-free.” Id. “Arrow speed with the Mathews Monster is simply astonishing. Just a few years ago archery

engineers would have told you that it wasn't possible to build a bow this fast while being this shootable." EX2003, 30-31. Based on this review, it is clear that Mr. Krenz felt that the Monster bow worked and performed well. The Monster article included a chart (reproduced below) comparing arrow speed for various arrows. This chart demonstrates the high arrow speeds of the Monster bow touted by Mr. Krenz.

Arrow Speed

2009 Mathews Monster set at 29 inches (by factory) and adjusted to 70 pounds

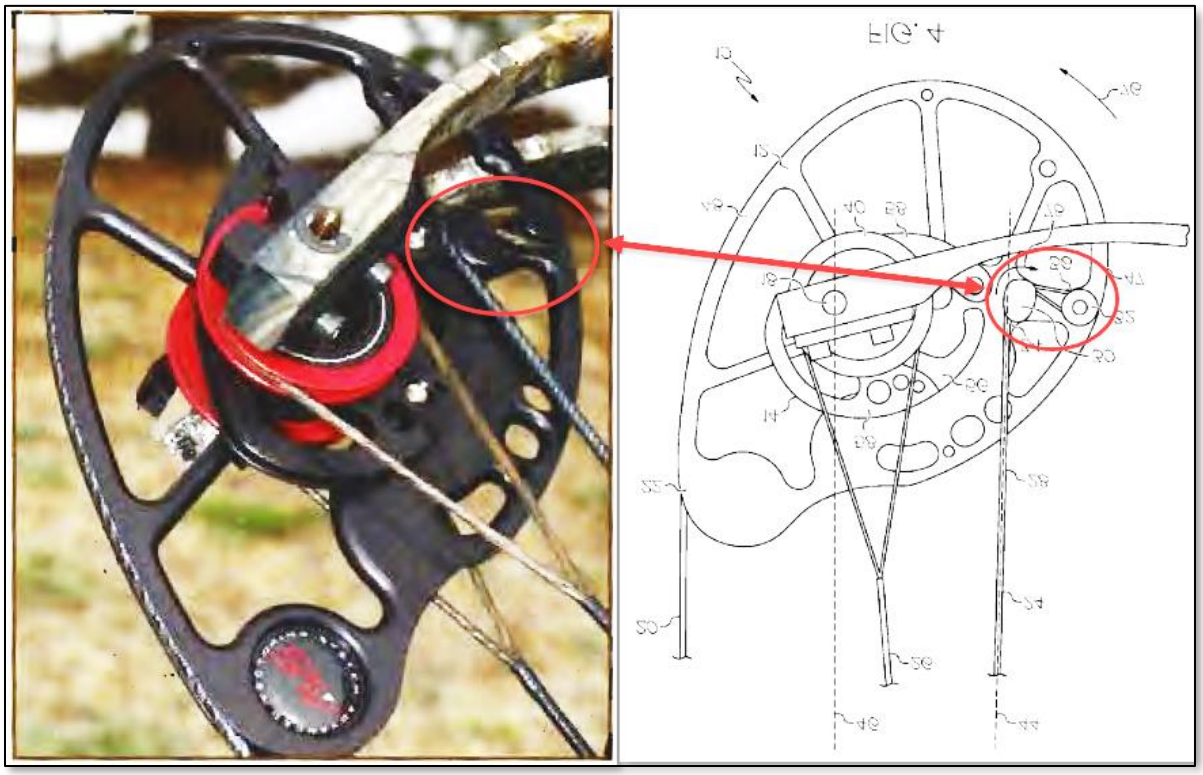
28-inch Arrows	Shaft: Grains/In	Arrow: Total Weight	Kinetic Energy	Arrow Speed
Easton XX78 Alloy 2512	10.3	448 gr.	92.0	304 fps
Easton Full Metal Jacket 400	10.2	426 gr.	91.5	311 fps
Carbon Express Aramid KV 350	9.8	415 gr.	90.9	314 fps
Carbon Tech Whitetail 65/80	9.5	411 gr.	91.1	316 fps
Carbon Express Maxima Hunter 350	8.9	398 gr.	90.5	320 fps
Easton ST Axis N-Fused 400	9.0	392 gr.	90.3	322 fps
Beman ICS Hunter Elite 400	8.4	390 gr.	90.3	323 fps
Gold Tip XT Hunter 55/75	8.2	385 gr.	89.8	324 fps
PSE Radial X Weave Hunter 300	8.1	376 gr.	89.8	328 fps
Easton LightSpeed 400	7.4	363 gr.	89.4	333 fps
Gold Tip Ultralight Pro 400	7.4	361 gr.	89.4	334 fps
Carbon Tech Cheetah 400	6.4	346 gr.	88.8	340 fps
High Country Speed Pro Max	5.5	303 gr.	88.2	362 fps

Bow weighed with an Easton Bow Force Digital Scale. All tests conducted with a Spot-Hogg Hooter Shooter Portable Shooting Machine and a Competition Electronics Pro Chronograph.

EX2003, Arrow Speed Chart.

37. It is my opinion that the cams of the Monster bow pictured in Mr. Krenz's review article are substantively the same as the cams illustrated in FIGS. 4-6 of the '989 Patent. The cams pictured in the Monster article have substantively

the same shape and features as the cam illustrated in FIGS. 4-6 of the ’989 Patent. The image below shows the photograph of the cam from the Monster article side-by-side with FIG. 4 of the ’989 Patent. FIG. 4 of the ’989 Patent is rotated to match the orientation of the cam in the photograph. It is clear from these images that the Monster bow had the same “reverse wrap” power cable configuration (circled in red) as described in the ’989 Patent because in both the photograph and FIG. 4 of the ’989 Patent the power cable wraps outward toward the periphery of the cam.



EX2003, 30; ’989 Patent, FIG. 4.

’989 Patent Independent Claims with Reference Numbers in Annotated Photographs
Claim 1: An archery bow having a brace condition and a drawn condition, the archery bow comprising: a riser (1); a first limb (2) and second limb (3) supported by the riser; a first rotatable member (4) supported by the first limb (2) on a first axle (5), a second rotatable member (6) supported by the second limb (3) on a second axle (7), the first rotatable member (4) comprising a drawstring track (9), a cam track (10), a capstan (11) and a terminal (12), wherein said drawstring track (9) is oriented in a first cam plane and said cam track (10) is oriented in a second cam plane offset from said first cam plane, a drawstring (8) extending between the first rotatable member (4) and the second rotatable member (6); a power cable (13) attached to said terminal (12) and extending toward the second limb (6), said power cable (13) comprising an elongate straight portion located near said first rotatable member (4), a capstan portion in contact with said capstan (11) and a terminal portion in contact with said terminal (12); wherein, in the brace condition, the power cable (13) wraps around the capstan (11) in a first rotational direction as the power cable (13) is traversed from the elongate straight portion to the terminal portion; and when the bow is drawn from the brace condition, the first rotatable member (4) rotates in a second rotational direction that is opposite the first rotational direction, wherein, in the brace condition, the elongate straight portion defines a plane, wherein said first axle (5) and said terminal (12) are located on opposite sides of said plane.”
Claim 11: An archery bow having a brace condition and a drawn condition, the archery bow comprising: a riser (1); a first limb (2) and a second limb (3) supported by the riser (1); a first rotatable member (4) supported by the first limb (2) on a first axle (5), a second rotatable member (6) supported by the second limb (3) on a second axle (7), the first rotatable member (4) comprising a drawstring track (9), a cam

track (10), a capstan (11) and a terminal (12), wherein said drawstring track (9) is oriented in a first cam plane and said cam track (10) is oriented in a second cam plane offset from said first cam plane;

a drawstring (8) extending between the first rotatable member (4) and the second rotatable member (6);

a power cable (13) attached to said terminal (12) and extending toward the second limb (3), said power cable (13) comprising an elongate straight portion located near said first rotatable member (4), a capstan portion in contact with said capstan (11) and a terminal portion in contact with said terminal (12);

wherein, in the brace condition, the power cable (13) wraps around the capstan (11) in a first rotational direction as the power cable (13) is traversed from the elongate straight portion to the terminal portion; and when the bow is drawn from the brace condition, the first rotatable member (4) rotates in a second rotational direction that is opposite the first rotational direction and wherein, in the drawn condition, the capstan (11) is located closer to the elongate straight portion than the terminal (12).

Claim 12: An archery bow having a brace condition and a drawn condition, the bow comprising:

a riser (1);

a first limb (2) and a second limb (3) supported by the riser (1);

a first rotatable member (4) supported by the first limb (2) on a first axle (5), a second rotatable member (6) supported by the second limb (3) on a second axle (7), the first axle (5) and the second axle (7) defining an axle plane, the first rotatable member (4) comprising a drawstring track (9), a cam track (10), a capstan (11) and a terminal (12), wherein said drawstring track (9) is oriented in a first cam plane and said cam track (10) is oriented in a second cam plane offset from said first cam plane;

a drawstring (8) extending between the first rotatable member (4) and the second rotatable member (5), the drawstring (8) extending from the first rotatable member (4) at an exit location;

a power cable (13) attached to said terminal (12) and extending toward the second limb (3), said power cable (13) comprising a capstan portion in contact with said capstan (11) and a terminal portion in contact with said terminal (12);

wherein, in the brace condition, the axle plane divides the first rotatable

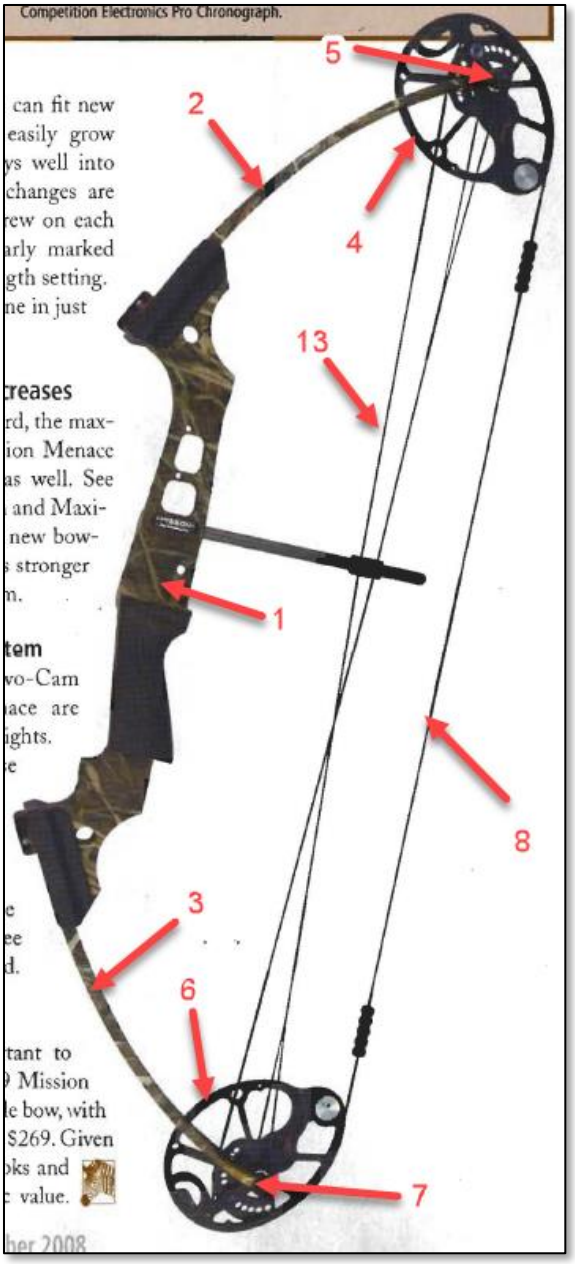
member (4) to a first part and a second part, the capstan (11) and the terminal (12) located in the first part, the drawstring exit location located in the second part, and a distance between the terminal (12) and the axle plane is greater than a distance between the capstan (11) and the axle plane and wherein, in the brace condition, said power cable (13) comprises an elongate straight portion located near said first rotatable member (4), the elongate straight portion defines a cable portion plane, said first axle (5) and said terminal (12) are located on opposite sides of said cable portion plane.
Claim 19: An archery bow having a brace condition and a drawn condition, the bow comprising: a riser (1); a first limb (2) and a second limb (3) supported by the riser (1); a first rotatable member (4) supported by the first limb (2) on a first axle (5), a second rotatable member (6) supported by the second limb (3) on a second axle (7), the first axle (5) and the second axle (7) defining an axle plane, the first rotatable member (4) comprising a drawstring track (9), a cam track (10), a capstan (11) and a terminal (12), wherein said drawstring track (9) is oriented in a first cam plane and said cam track (10) is oriented in a second cam plane offset from said first cam plane; a drawstring (8) extending between the first rotatable member (4) and the second rotatable member (6), the drawstring (8) extending from the first rotatable member (4) at an exit location; a power cable (13) attached to said terminal (12) and extending toward the second limb (3), said power cable (13) comprising a capstan portion in contact with said capstan (11) and a terminal portion in contact with said terminal (12); wherein, in the brace condition, the axle plane divides the first rotatable member (4) to a first part and a second part, the capstan (11) and the terminal (12) located in the first part, the drawstring exit location located in the second part, and a distance between the terminal (12) and the axle plane is greater than a distance between the capstan (11) and the axle plane and wherein, in the drawn condition, said power cable (13) comprises an elongate straight portion located near said first rotatable member (4), the capstan (11) located closer to the elongate straight portion than the terminal (12).

A. The Menace bow embodies all the limitations of claims 1, 3-4, 8-14, and 16-19 of the ’989 patent.

38. It is my opinion that the Menace article demonstrates that the Mission Menace bow embodied all of the limitations of claims 1, 3-4, 8-14, and 16-19 of the ’989 Patent.

39. The Menace article included photographs of the full Mission Menace bow (shown in a brace condition) and a close up photograph of one of the cams of the Mission Menace bow.

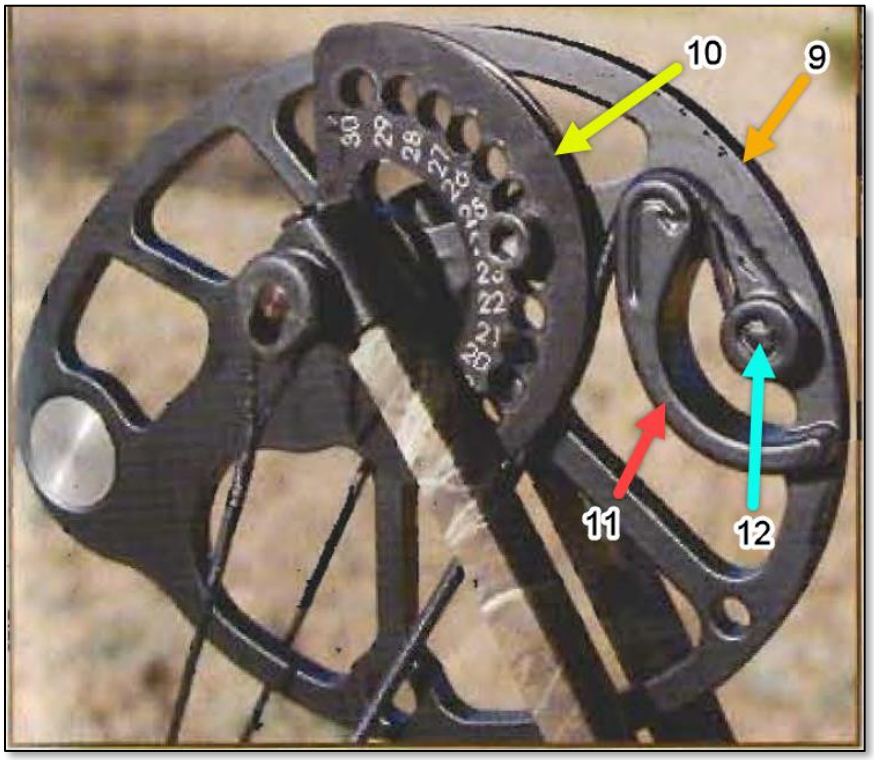
40. It is clear from the photograph of the full Mission Menace bow (reproduced and annotated below) that the Mission Menace bow included a riser (1) supporting both a first (2) and a second limb (3). EX2002, 43. Each limb supports a rotating cam (4, 6) on a respective axle (5, 7), with a drawstring (8) extending between the two cams.



EX2002, 43 (annotated).

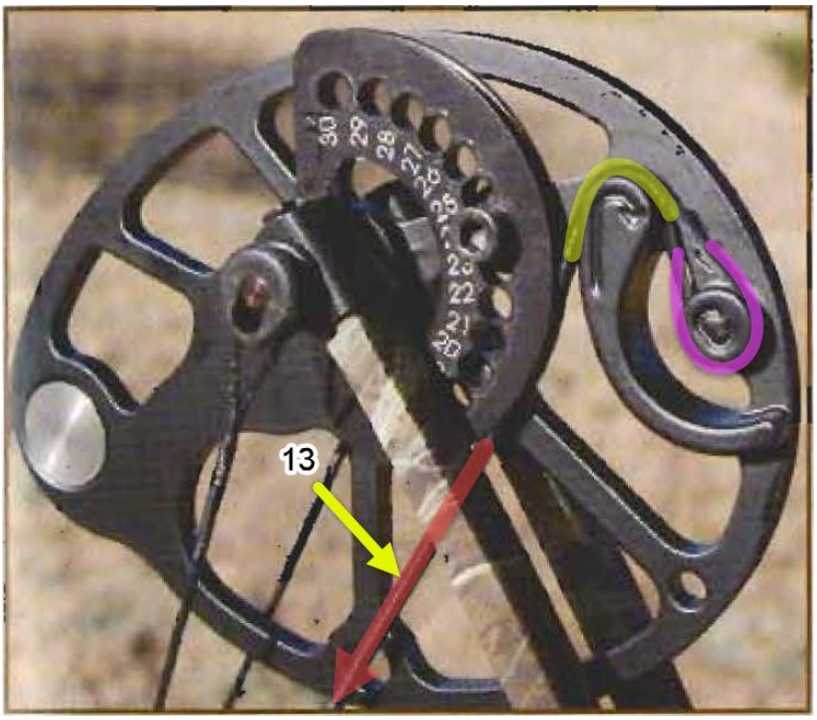
41. It is clear from the photograph of the cam (reproduced and annotated below) that the Menace bow included a drawstring track (9), cam track (10), capstan (11), and terminal (12). A POSITA would recognize from the photograph that the cam track (10) is offset in a separate plane from the drawstring track (9)

because the drawstring track (9) is a part of the cam, and the cam track (10) is located on a component attached to a surface of the cam.



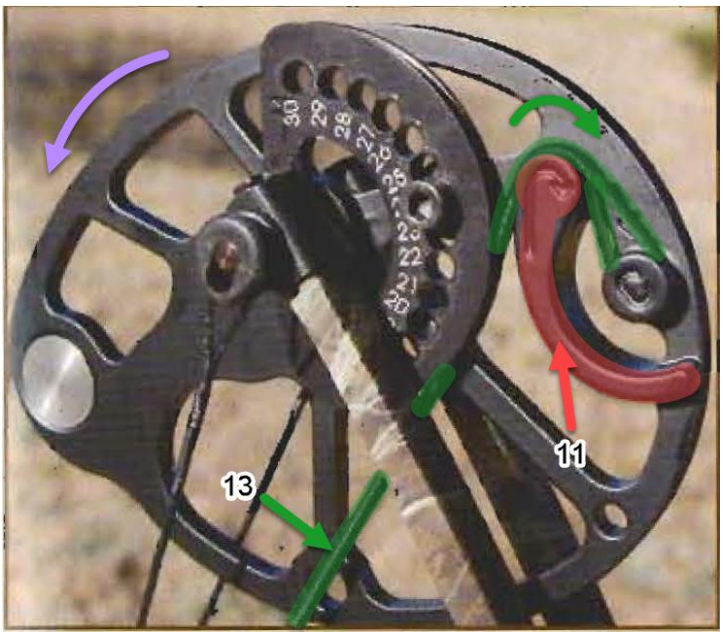
EX2002, 43 (annotated).

42. From the annotated photograph below, it is clear that the Mission Menace bow had a power cable (13) with a straight portion (red highlighted portion) extending between the first cam and the second cam. A portion of the Mission Menace bow's power cable wraps around the capstan (yellow highlighted portion) and a portion is looped around the terminal (purple highlighted portion).



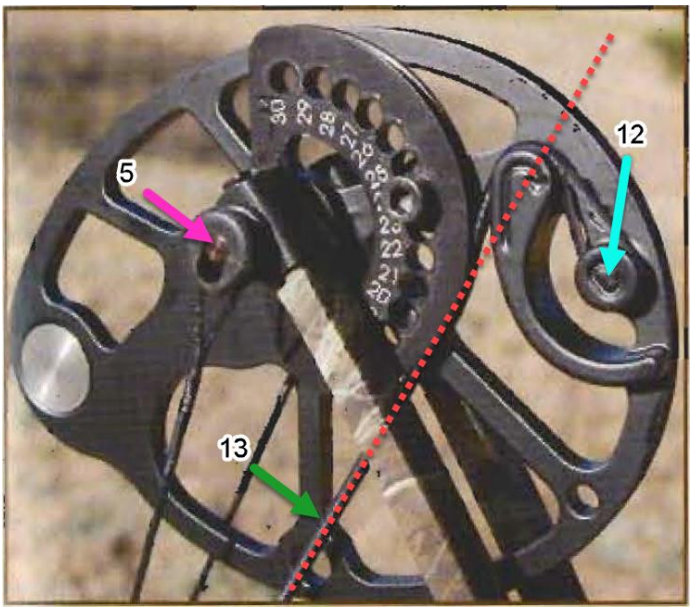
EX2002, 43 (annotated).

43. As shown below, the Mission Menace bow power cable (13) wraps from left to right around the capstan (11), as indicated by the green arrow. A POSITA would have understood that when the bow is drawn from the brace condition, that the cam would rotate in the opposite direction because the force exerted by the drawstring on the cam when the bow is drawn would be directed along the drawstring, tangential to the cam, in a counterclockwise direction for the cam orientation shown in the image below causing rotation as indicated by the purple arrow.



EX2002, 43 (annotated).

44. The photograph of the cam of the Mission Menace bow below shows the cam in the brace condition. The photograph has been annotated with a dashed red line aligned with the straight elongate portion of the power cable (13). A POSITA would have understood that the dashed red line along the elongate straight portion of the power cable defines a plane parallel to the viewing axis (*e.g.*, extending into and out of the page). The axle (5) and the terminal (12) are on opposite sides of the dashed line and thus are on opposite sides of a plane defined by the straight portion of the power cable (13). A POSITA would have understood that the plane would be perpendicular to the cam (e.g., extending into/out of the photograph) because the plane is used to define locations of features on the cam.



EX2002, 43 (annotated).

45. A POSITA would have understood that when the bow is drawn, the cam would rotate, but the relative position of the capstan and the terminal with respect to the cam would remain the same because the capstan and the terminal are affixed to the cam and are thus undergo the same solid body rotation as the cam. As noted above, the Mission Menace cams were substantively the same as the cams depicted in FIGS 1-3 of the ’989 Patent. While the Menace article does not show the cam of the Menace bow in a drawn configuration, a POSITA would have understood that when the bow is in the drawn condition the power cable rests in the flat portion of the cam module. FIG. 2 from the ’989 Patent confirms this. It depicts a cam with substantively the same geometry in the drawn position (‘989 Patent, col. 5:8). The bow is in the drawn condition with the power cable resting in the flat portion of the cam module is shown in orange in FIG. 2 of the ’989 Patent.

The flat portion of the cam module will dramatically increase the draw weight required to rotate the cam further.

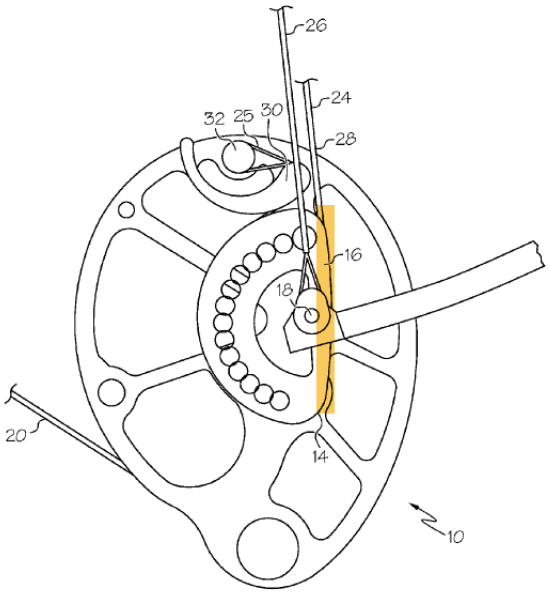
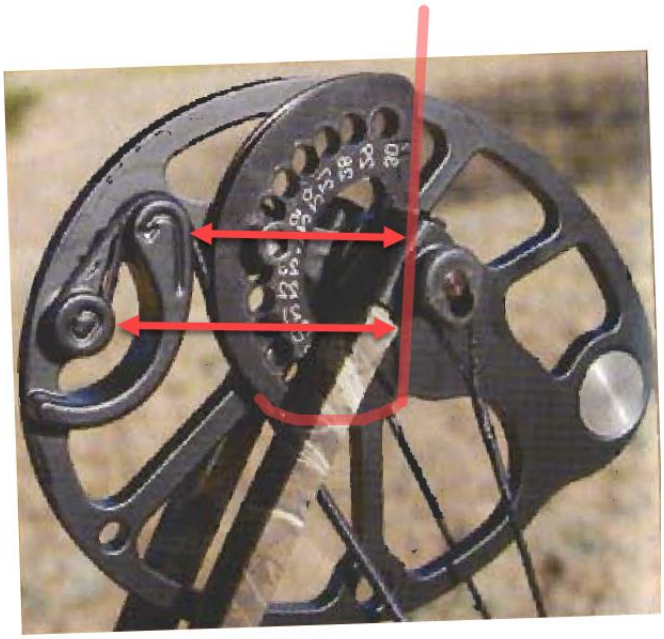


FIG. 2

’989 Patent, FIG. 2 (annotated).

46. A rotated version of the cam photograph from the Menace article is shown below. When in the drawn condition, the power cable of the Menace bow would rest in the flat portion of the cam module, as shown in annotated red lines. As shown below, the terminal in the photograph is farther from the flat portion of the cam module and consequently farther from the straight portion of the power cable in the drawn condition than the capstan, similar to that depicted in FIG. 2 of the ’989 Patent.



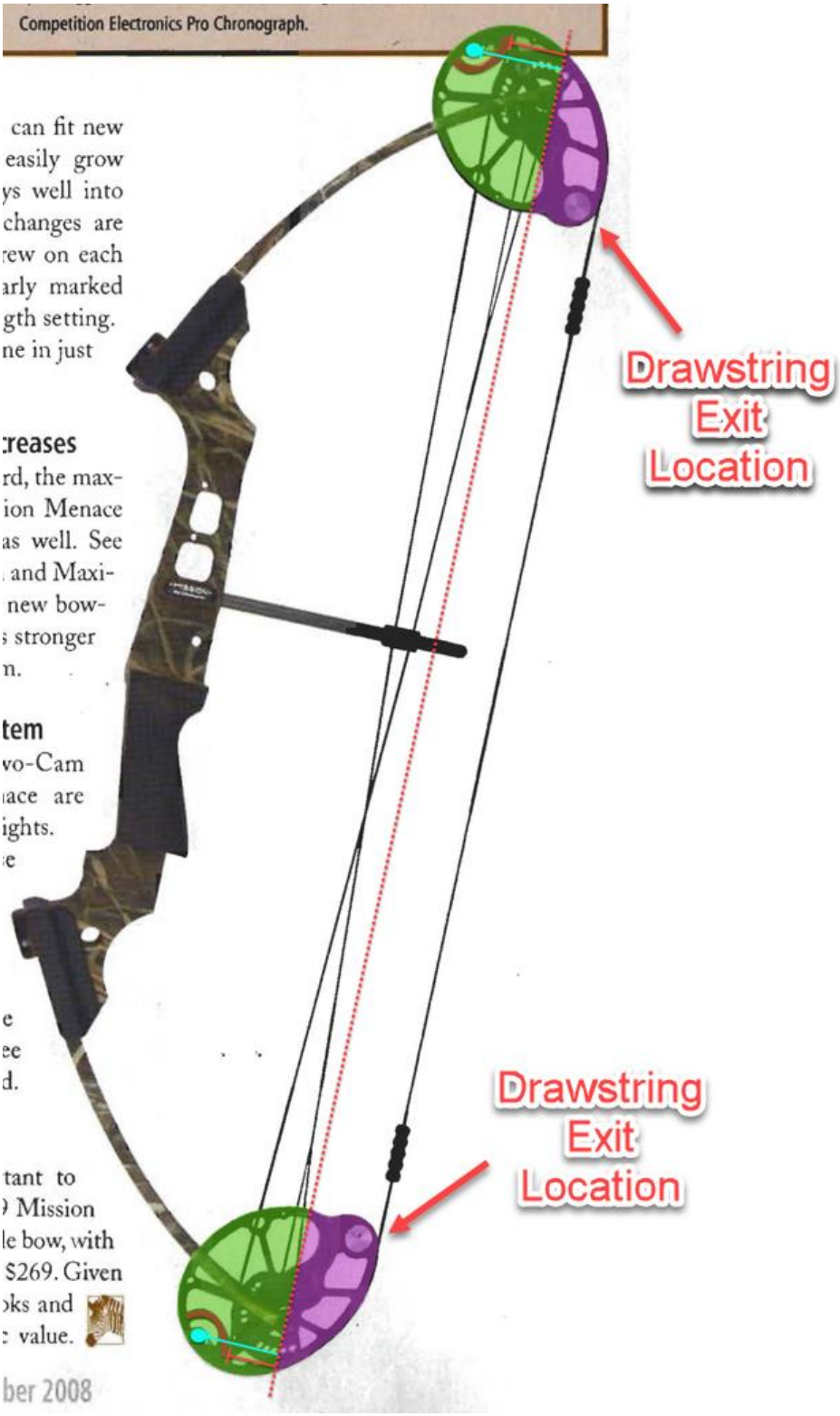
EX2002, 43 (annotated).

47. A POSITA would have understood that the two axles on a compound bow are parallel to each other and therefore define a plane.

48. The full bow photograph from the Menace article is annotated below to show the axle plane (the red dashed line represents an edge view of the plane) defined by the two axles and the drawstring exit location on each cam. As illustrated, the axle plane of the Mission Menace bow divides each cam into a first part (green) and a second part (purple). It is clear that the capstan and terminal are located in the green first part, and the drawstring exit is located on the purple second part.

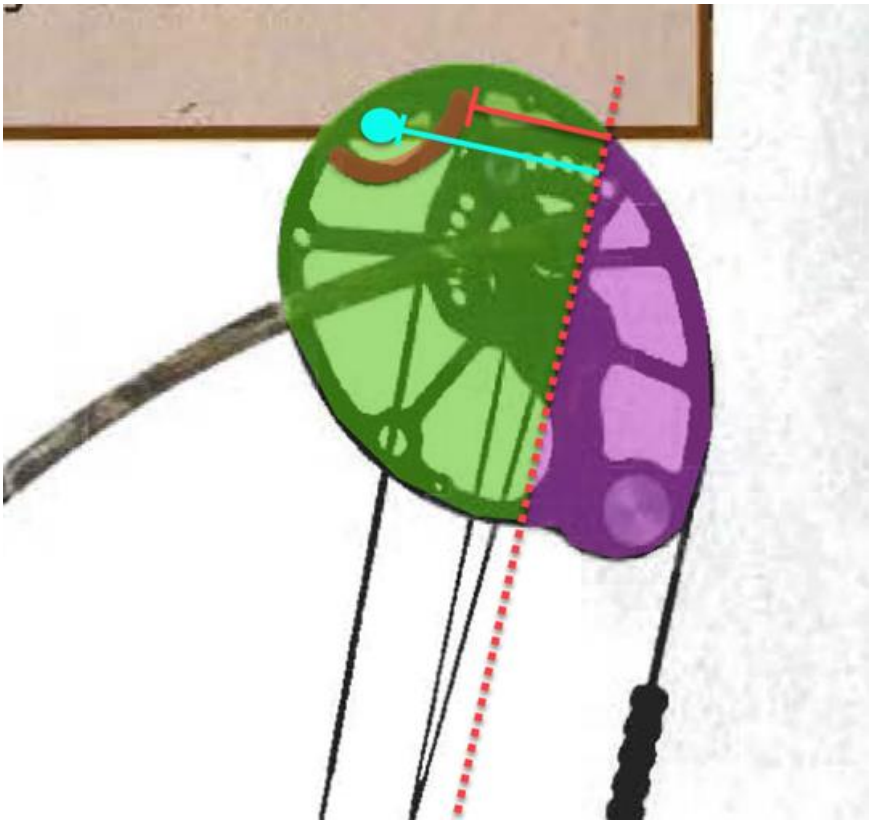
49. The full bow photograph depicts the opposite side of the cam as compared with the cam photograph; however, a POSITA would have easily

identified the location of the capstan and terminal because the shape and location of these features is distinctive and still clearly visible. In the image below, the locations of the capstan and terminal are highlighted in red and blue, respectively, for clarity.



EX2002, 43 (annotated).

50. The image below shows the full bow photograph cropped around the upper cam to enlarge the detail of the upper cam. The relative distances between the axle plane (dashed red line) of the Mission Menace bow and the terminal (blue) and the capstan (red) have been annotated on the photograph. It is clear that the distance between the terminal and the axle plane is greater than the distance between the capstan and the axle plane on the Mission Menace bow.

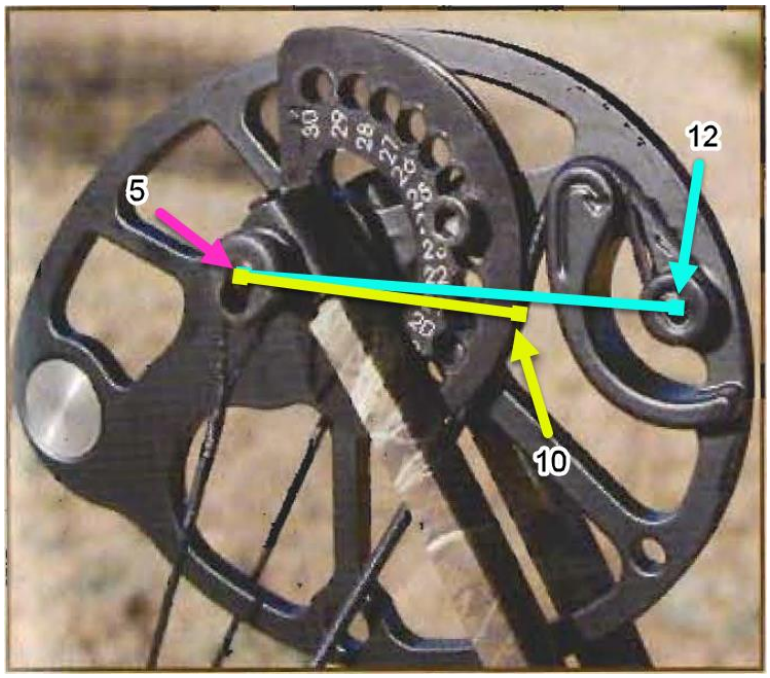


EX2002, 43 (annotated).

51. While the distances are shown approximately orthogonal to the axle plane in the image above, it is my opinion that a POSITA would have understood that the distance between the axle plane and the capstan would be shorter than the

distance between the axle plane and the terminal if taken from other locations along the axle plane, such as from the axle.

52. It is clear from the cam photograph below that on the Mission Menace bow, the distance (blue) between the terminal (12) and the axle (5) is greater than the distance (yellow) between the cam track (10) and the axle (5).



EX2002, 43 (annotated).

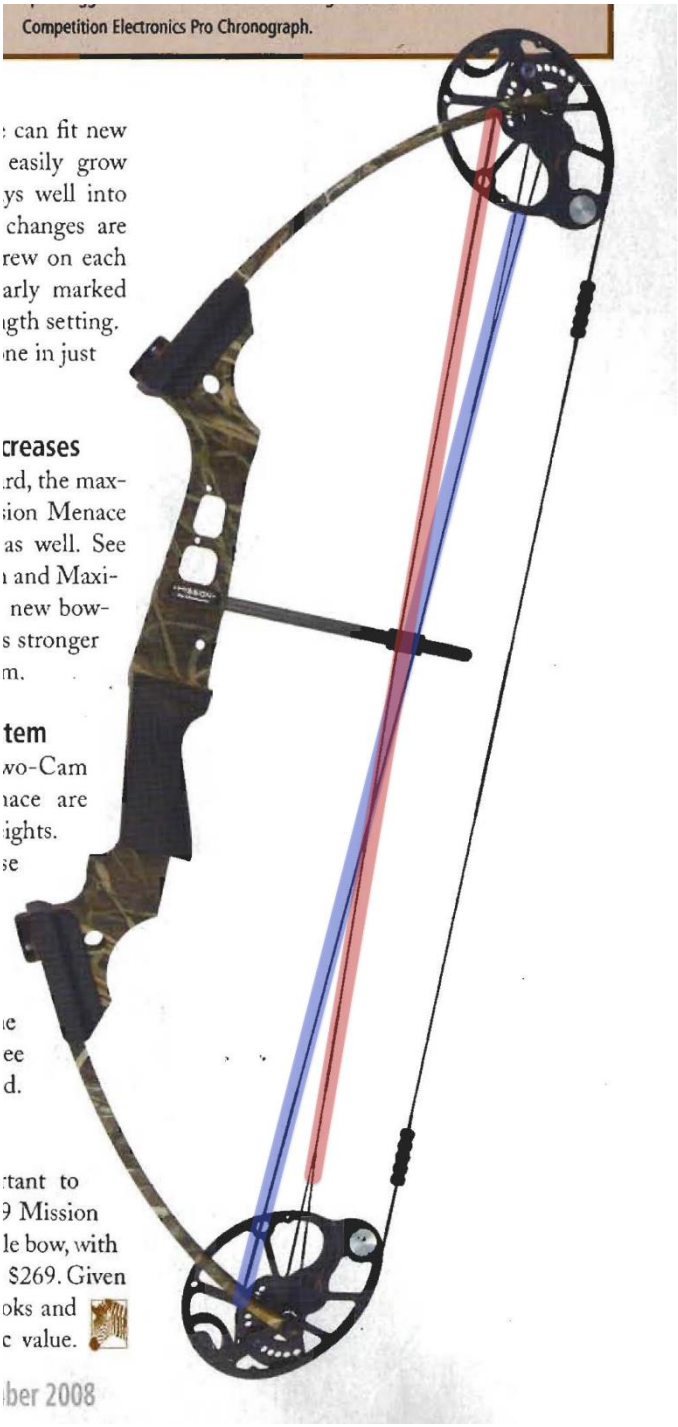
53. In the Menace article, Mr. Krenz stated, "Draw-length changes are a snap. Remove one locking screw on each cam and simply pivot the clearly marked modules to the desired draw-length setting." EX2002, 43. Based on this, it is clear that the Mission Menace bow included an adjustable/rotatable cam module for changing draw-length. The cam photograph below highlights this adjustable/ rotatable module. Additionally, it is my opinion that a POSITA would have

understood that the cam module is adjustable/rotatable because the markings and associated holes in the cam module indicate that the module is adjustable.

The 2CPW Two-Cam System on the Mission Menace features easy-adjust pivoting draw-length modules. Note the beefy module-locking screw. That screw won't strip out no matter how many times this bow is adjusted.

EX2002, 43 (annotated).

54. It is clear from the full bow photograph and the Menace article that the Mission Menace bow includes two operating cams. EX2002, 43 ("The 2CPW Two-Cam System on the Mission Menace features easy-adjust pivoting draw-length modules."). The full bow photograph from the Menace article is annotated below to highlight the two power cables in red and blue.

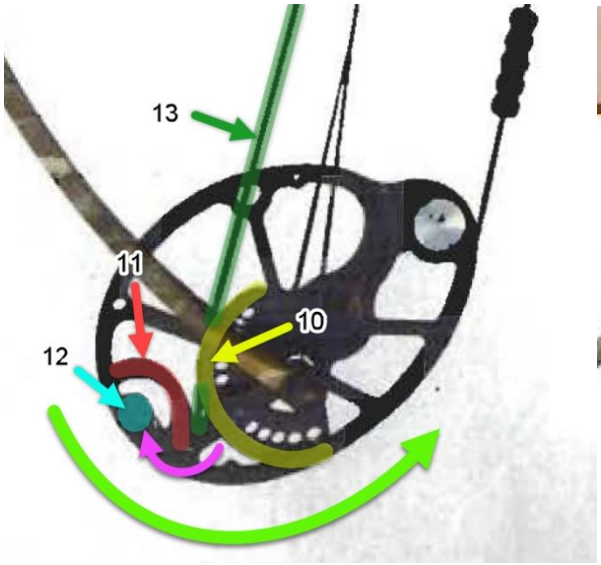


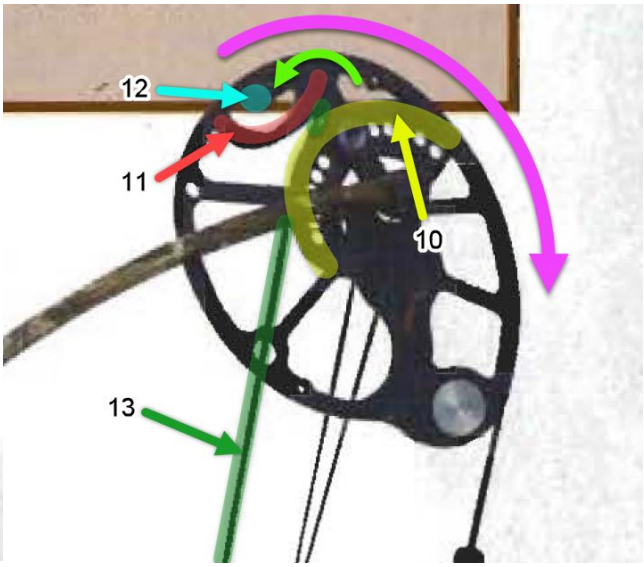
EX2002, 43 (annotated).

55. The below images show the upper and lower cams cropped from the full bow photograph from the Menace article. The two cams are shown side-by-

side and have been enlarged and annotated to show the components of each cam. As noted above, the full bow photograph shows the opposite side of the cam as compared with the cam photograph; however, a POSITA would have easily identified the structures from the side shown in the full bow photograph.

56. It is clear from the below photographs that both cams of the Mission Menace bow have a cam track (10), a capstan (11), and a terminal (12). On both cams a respective power cable (13) was attached to the terminal (12) and each power cable (13) had an elongate straight portion that extends towards the opposite limb. Based on the cam photograph and the full bow photograph, a POSITA would have understood that a portion of each power cable (13) wrapped around the capstan (11) and a portion looped around the terminal (12). The green arrows indicate a first rotational direction, and the purple arrows indicate a second rotational direction opposite the first rotational direction .





EX2002, 43 (annotated).

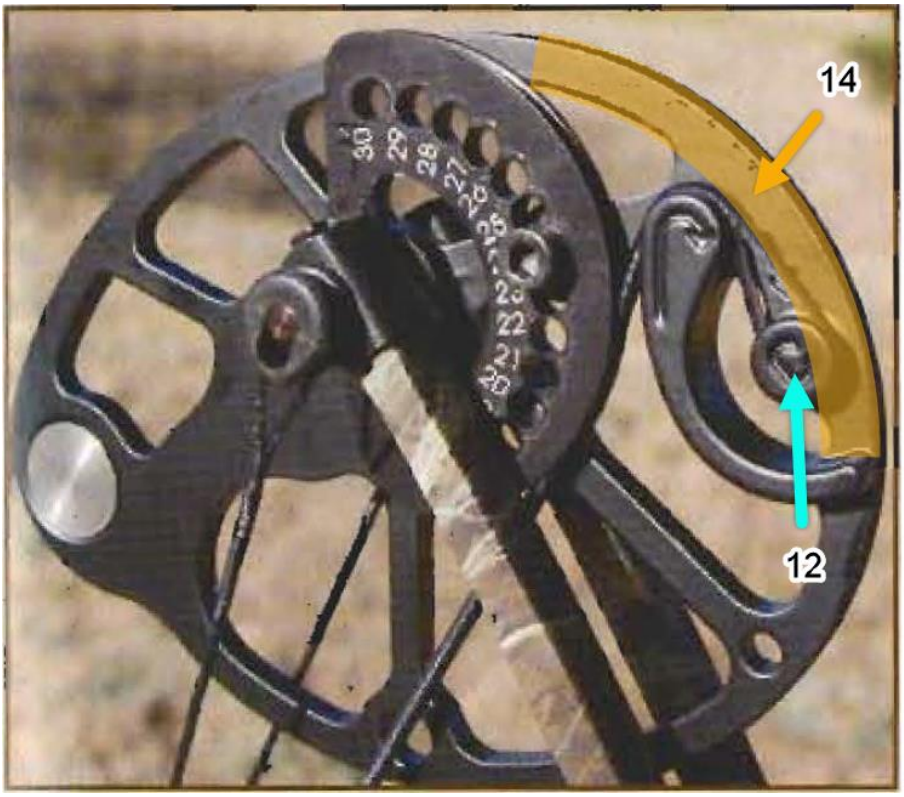
57. It is clear based on the above photographs that, on the Mission Menace bow, the power cables on each cam wrap around the respective capstan in an opposite direction to the rotational direction of the cam when the bow is drawn. The lower cam (shown on the left) rotates, when drawn, in a first rotational direction (green) which is counter-clockwise in this view, and its power cable wraps in a second rotational direction (purple), which is clockwise in this view. The upper cam (shown on the right) rotates, when drawn, in the second rotational direction (purple, clockwise in this view) and its power cable wraps in the first rotational direction (green, counter-clockwise in this view).

58. The cams of the Mission Menace are mirror images of each other. To illustrate the mirrored cams, the image below depicts overlaid images of the cams cropped from the full bow photograph. The image of the bottom cam has been given a blue hue to differentiate it from the overlaid top cam, and the image of the top cam has been given transparency to allow the image of the bottom cam to be seen. The image of the top cam has also been flipped vertically (i.e., mirrored across a horizontal axis) and rotated to align with the image of the bottom cam. It is clear from this image that the cams of the Menace bow are mirror images of each other. Further, as noted in Mr. McPherson's declaration, the cams are

configured as mirror images to accommodate the power cables being attached to the cams on the same side of the bow. EX2006, 13.

EX2002, 43 annotated

59. It is clear from the annotated photograph below, that the terminal (12) of the Mission Menace bow is located on an outer peripheral structure (14) of the cam.



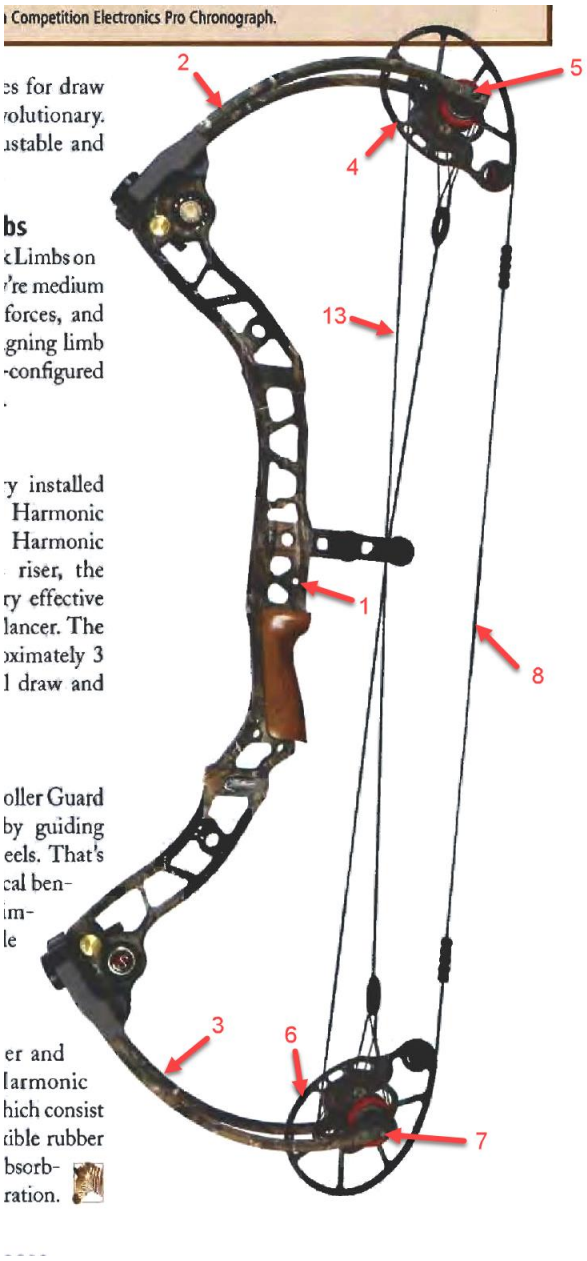
EX2002, 43 (annotated).

B. The Monster bow embodies all the limitations of claims 1, 2, 4, 7, 12, and 15 of the ’989 patent.

60. It is my opinion that the Monster article demonstrates that the Mathews McPherson Series Monster bow embodied all of the limitations of at least claims 1, 2, 4, 7, 12, and 15 of the ’989 Patent.

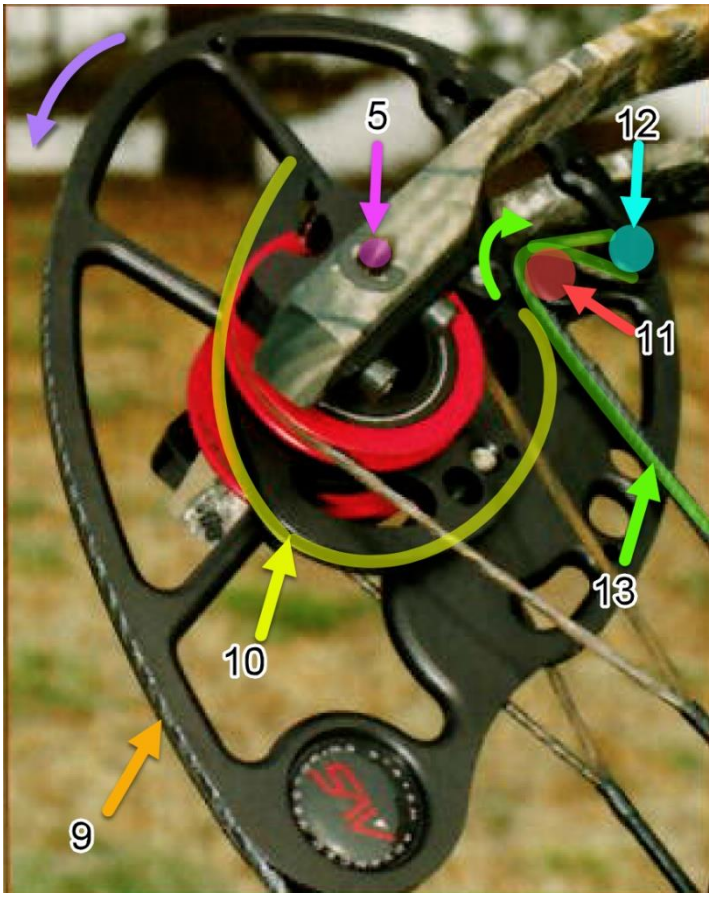
61. The Monster article included photographs of the full Monster bow (shown in a brace condition) and a close-up photograph of one of the cams of the Monster bow. I have reproduced and annotated these photographs below to highlight features of the Monster bow.

62. It is clear from the photograph of the full Monster bow that the Monster bow includes a riser (1) supporting both a first (2) and a second limb (3). EX2003, 31. Each limb of the Monster bow supports a rotating cam (4, 6) on an axle (5, 7), with a drawstring (8) extending between the two cams.



EX2003, 31 (annotated).

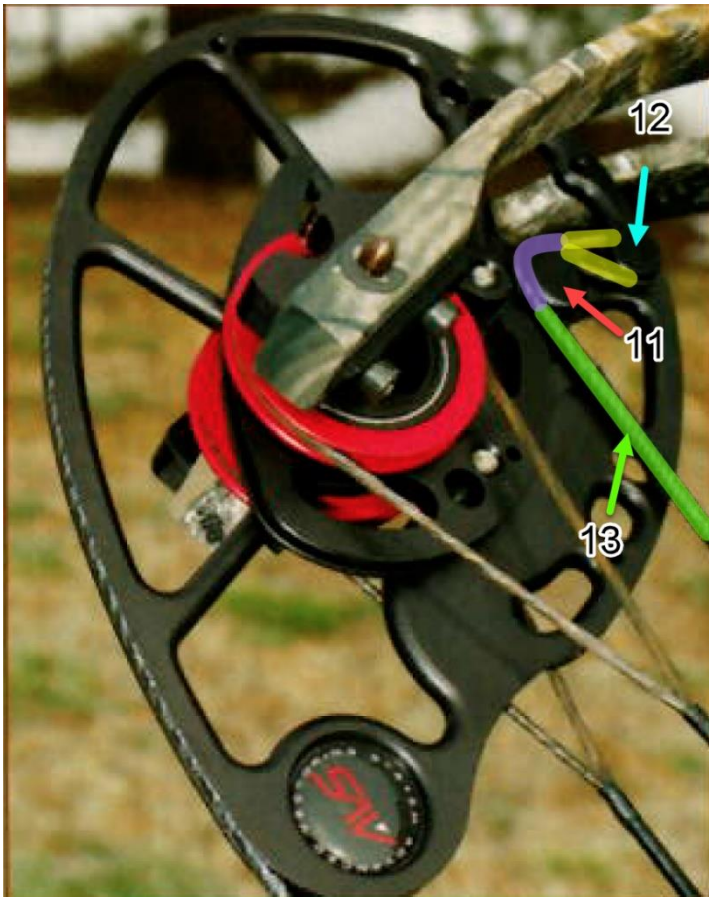
63. It is clear from the photograph of the cam of the Monster bow that the Monster bow includes a drawstring track (9), a cam track (10), a capstan (11), and a terminal (12). It is also clear from the photograph, and a POSITA would have understood, that the cam track is offset in a separate plane from the drawstring track because the cam track (10) is part of a module affixed to a face of the cam and the drawstring track (9) is in line with the cam.



EX2003, 30 (annotated).

64. It is clear from the annotated cam photograph below that the Monster bow had a power cable (13) with a straight portion (green) extending from one cam

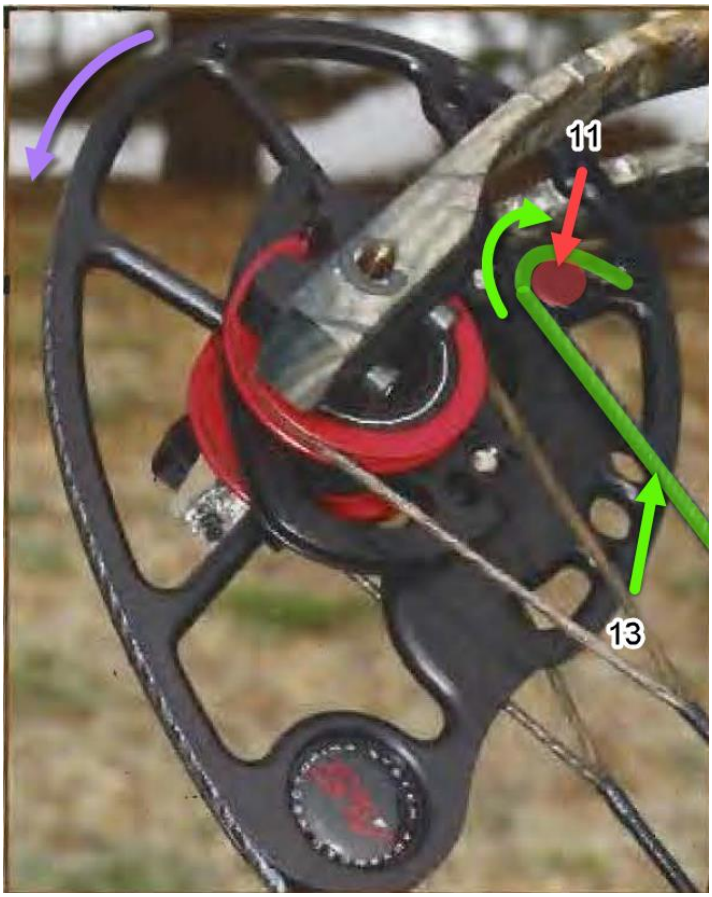
towards the other cam. It is clear that the power cable (13) also has a portion (purple) wrapped around the capstan (11) and a portion (yellow) that loops around the terminal (12).



EX2003, 30 (annotated).

65. The Monster bow power cable (13) wraps from left to right around the capstan (11), as indicated by the green arrow in the image below. A POSITA would have understood that the cam would rotate in the opposite direction when the bow is drawn from the brace condition because the force exerted by the drawstring on the cam when the bow is drawn would be directed along the

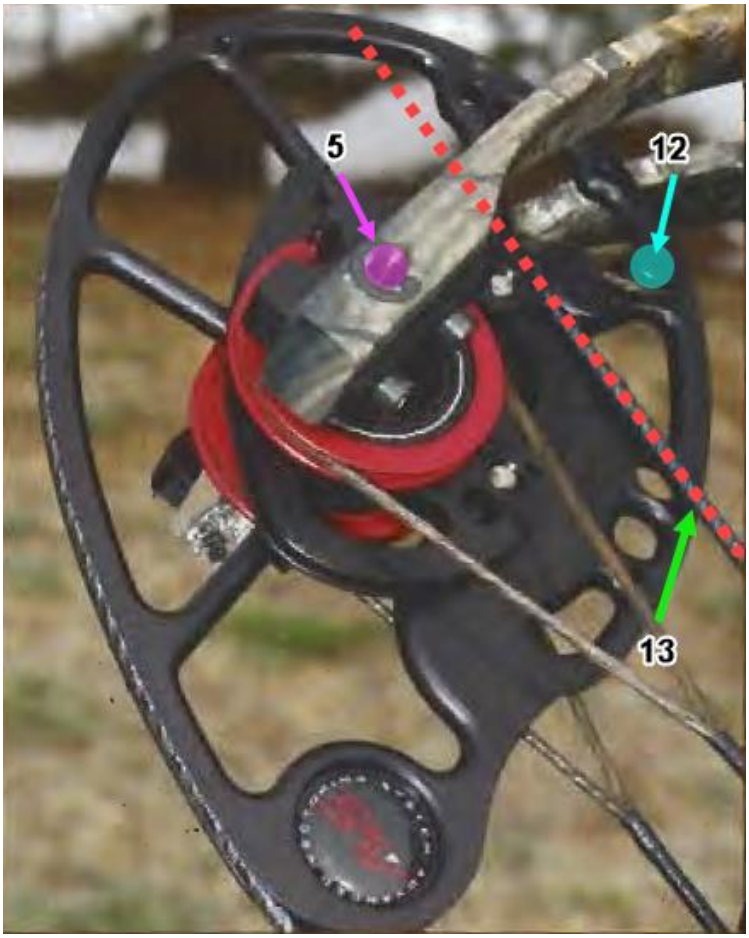
drawstring, tangential to the cam, in a counterclockwise direction for the cam orientation shown in the image below causing rotation as indicated by the purple arrow.



EX2003, 30 (annotated).

66. A POSITA would have understood that the dashed line in the image below represented the edge of a plane defined by the elongate straight portion of the power cable and parallel to the axle direction. That plane extends perpendicularly from the face and is used in the patent description to identify the relative locations of key features on the cam. It is clear that the axle (5) and the

terminal (12) are on opposite sides of the plane defined by the straight portion of the power cable (13).

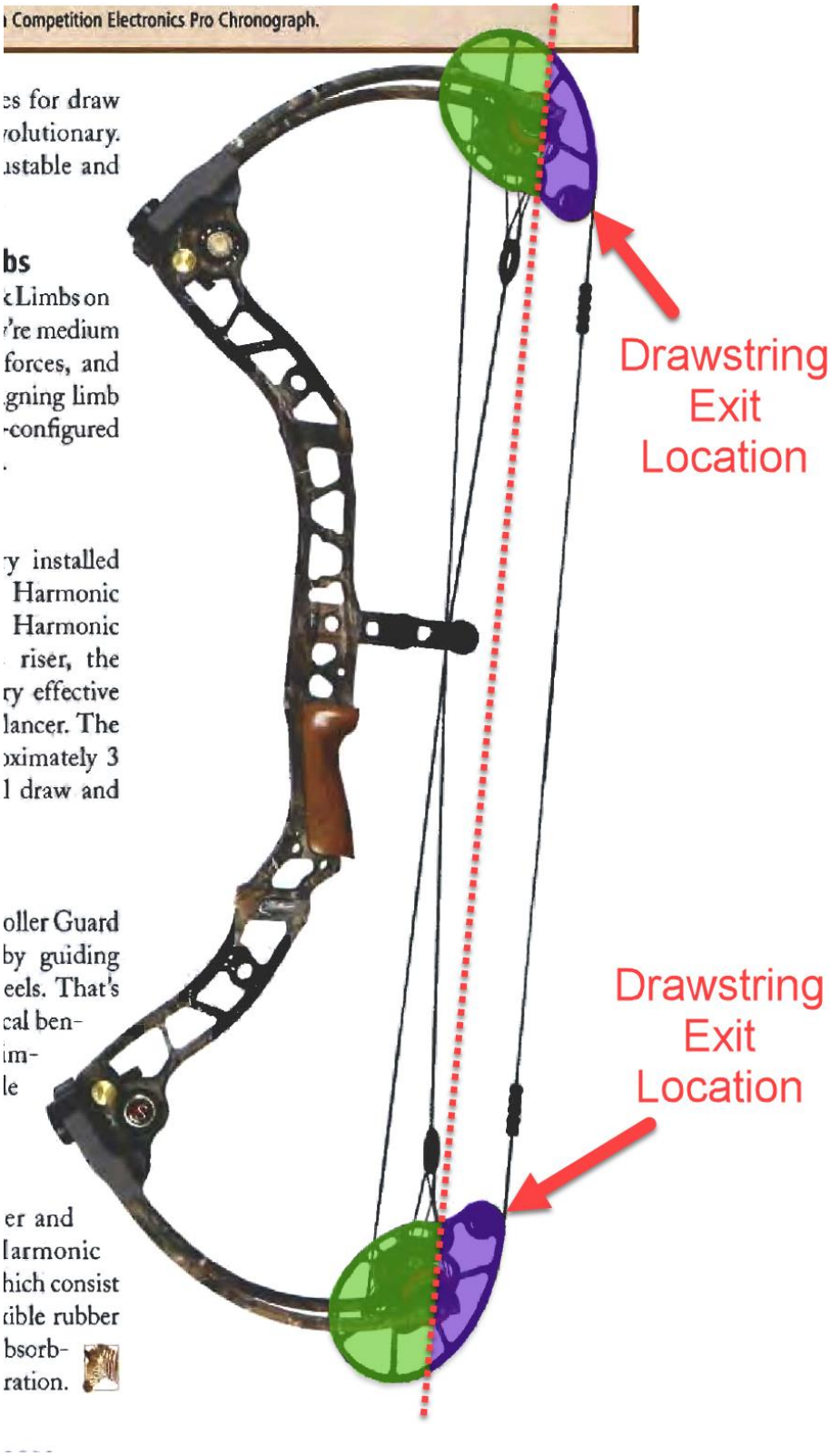


EX2003, 30 (annotated).

67. The full bow photograph from the Monster article is annotated below to show the axle plane (dashed red line) defined by the two axles and to indicate the drawstring exit location on each cam. As noted above, a POSITA would understand that a compound bow would have a plane defined between the two axles of the bow and that the plane is parallel to the axis of rotation of the axles. A POSITA would also have understood that the axle plane would divide the cam into

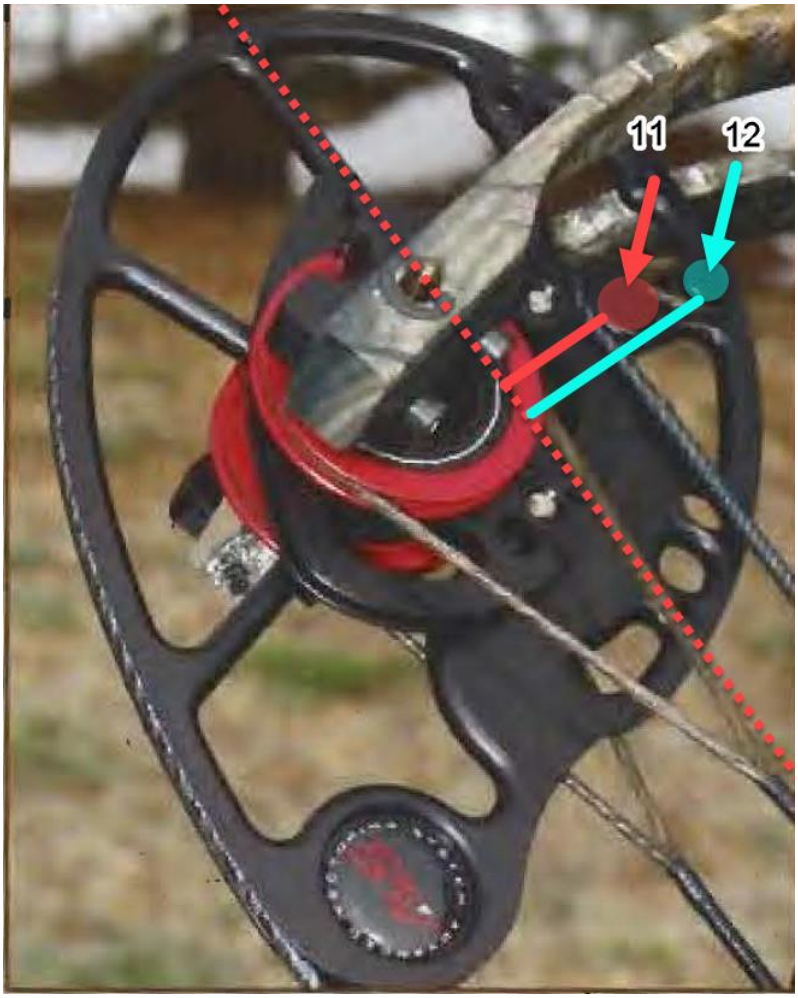
a first part and a second part. It is clear that the axle plane of the Monster bow divides each cam into a first part (green) and a second part (purple). The capstan and terminal were located in the green first part drawstring exit was located on the purple second part.

68. The full bow photograph of the Monster bow shows the opposite side of the cam as compared with the cam photograph; however, a POSITA would have easily identified the location of the capstan and terminal because of the distinctive shape of the cam, the location of the power cables, and the location of the capstan and terminal relative to the shape of the cam.



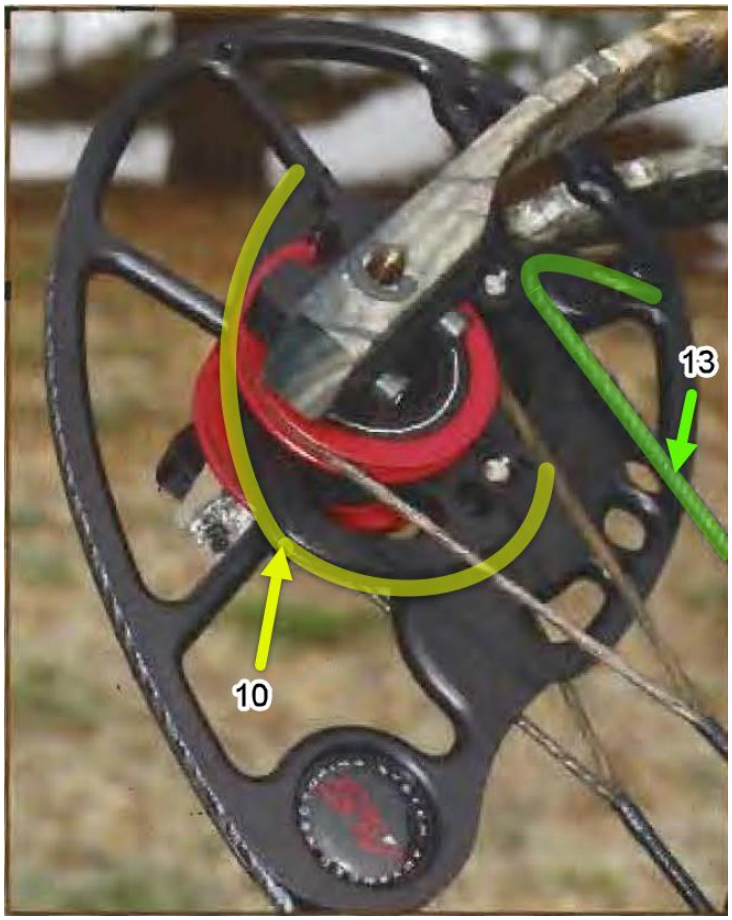
EX2003, 31 (annotated).

69. The cam photograph from the Monster article is annotated below illustrating the relative distances between the axle plane (dashed red line) of the Monster bow and the terminal (12, blue) and the capstan (11, red). It is clear from this photograph that on the Monster bow, the distance (blue) between the terminal (12) and the axle plane is greater than the distance (red) between the capstan (11) and the axle plane.



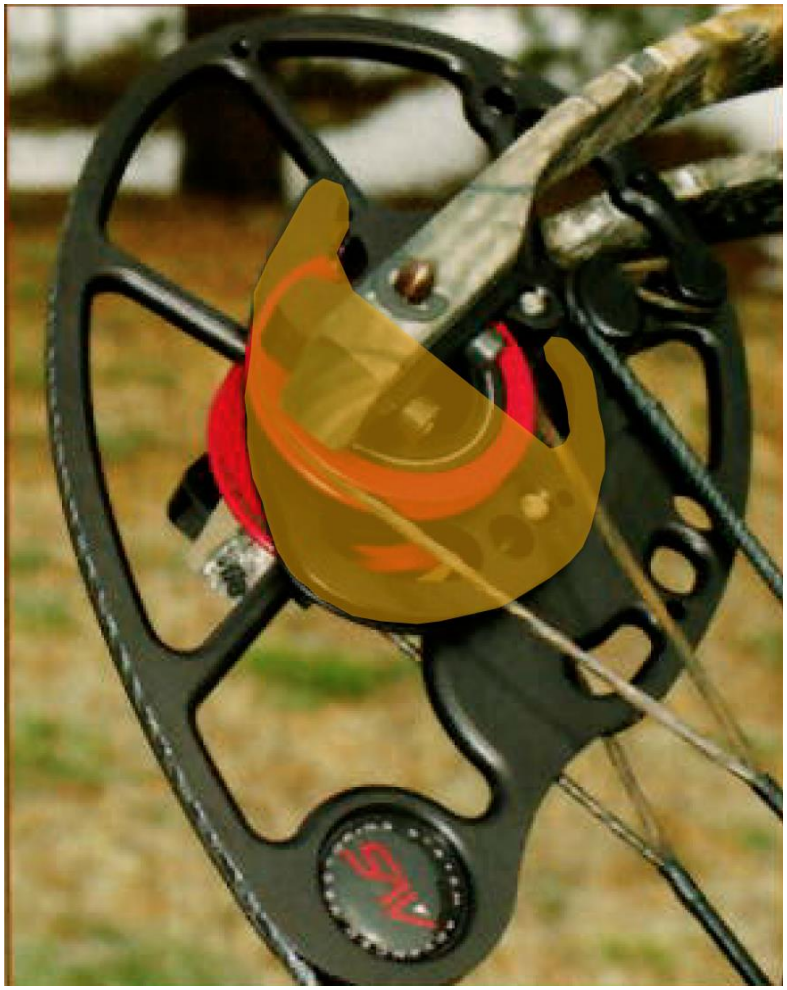
EX2003, 30 (annotated).

70. It is clear from the cam photograph below that the power cable (13) of the Monster bow did not rest in the cam track (10) while in the brace condition. A POSITA would have understood that because the elongate straight portion of the power cable (13) is fully visible and does not deflect or bend after being looped around the capstan when traversing the power cable from the terminal toward the opposite limb of the bow. This shows that the power cable does not rest in the cam track (10) in the brace position.



EX2003, 30 (annotated).

71. Mr. Krenz's review article of the Monster bow stated "[The Monster] utilizes interchangeable modules for draw length adjustment." EX2003, 31. The cam photograph below highlights the interchangeable cam module.



EX200, 30 (annotated).

C. The Menace and Monster bows embodied the claims of the '017 Patent

72. It is my opinion that the Menace article demonstrates that the Mission Menace bow embodied all of the limitations of claims 1-3, 5-6, 10-16, and 18-20 of the '017 patent. *See* Sec VI.A.

73. It is my opinion that the Monster article demonstrates that the Mathews McPherson Series Monster bow embodied all of the limitations of, at least, claims 1, 4, 6, 9, 12, and 17 of the ’017 patent. *See* Sec VI.B.

’017 Patent Independent Claims with Reference Numbers in Annotated Photographs
Claim 1: An archery bow having a brace condition and a drawn condition, the archery bow comprising: a riser (1); a first limb (2) and second limb (3) supported by the riser; a first rotatable member (4) supported by the first limb (2) on a first axis (5), a second rotatable member (6) supported by the second limb (3) on a second axis (7), the first rotatable member (4) comprising a cam track (10), a capstan (11) and a terminal (12); a drawstring (8) extending between the first rotatable member (4) and the second rotatable member (6); a power cable (13) attached to said terminal (12) and extending toward the second limb (6), said power cable (13) comprising an elongate straight portion located near said first rotatable member (4), a capstan portion in contact with said capstan (11) and a terminal portion in contact with said terminal (12); wherein, in the brace condition, the power cable (13) wraps around the capstan (11) in a counter-clockwise direction as the power cable (13) is traversed from the elongate straight portion to the terminal portion; and when the bow is drawn from the brace condition, the first rotatable member (4) rotates in a clockwise direction.
Claim 12: An archery bow having a brace condition and a drawn condition, the bow comprising: a riser (1); a first limb (2) and a second limb (3) supported by the riser (1); a first rotatable member (4) supported by the first limb (2) on a first axle (5), a second rotatable member (6) supported by the second limb (3) on a second axle (7), the first axle (5) and the second axle (7) defining an axle plane, the first

rotatable member (4) comprising a cam track (10), a capstan (11) and a terminal (12); a drawstring (8) extending between the first rotatable member (4) and the second rotatable member (5), the drawstring (8) extending from the first rotatable member (4) at an exit location; a power cable (13) attached to said terminal (12) and extending toward the second limb (3), said power cable (13) comprising a capstan portion in contact with said capstan (11) and a terminal portion in contact with said terminal (12); wherein, in the brace condition, the axle plane divides the first rotatable member (4) to a first part and a second part, the capstan (11) and the terminal (12) located in the first part, the drawstring exit location located in the second part, and a distance between the terminal (12) and the axle plane is greater than a distance between the capstan (11) and the axle.

D. The Menace and Monster bows embodied the claims of the '831 Patent

74. It is my opinion that the Menace article demonstrates that the Mission Menace bow embodied all of the limitations of claims 1-2, 4-5, 9-15, and 17-19 of the '831 patent. *See* Sec VI.A.

75. It is my opinion that the Monster article demonstrates that the Mathews McPherson Series Monster bow embodied all of the limitations of, at least, claims 1, 3, 5, 8, 11, and 16, of the '831 patent. *See* Sec VI.B.

'017 Patent Independent Claims with Reference Numbers in Annotated Photographs
Claim 1: An archery bow having a brace condition and a drawn condition, the archery bow comprising: a riser (1); a first limb (2) and second limb (3) supported by the riser;

a first rotatable member (4) supported by the first limb (2) on a first axle (5), a second rotatable member (6) supported by the second limb (3) on a second axle (7), the first rotatable member (4) comprising a cam track (10), a capstan (11) and a terminal (12); a drawstring (8) extending between the first rotatable member (4) and the second rotatable member (6); a power cable (13) attached to said terminal (12) and extending toward the second limb (6); wherein the capstan (11) is located between the cam track (10) and the terminal (12), and in the brace condition, the power cable (13) wraps around the capstan (11) in a first rotational direction as the power cable (13) is traversed toward the terminal (12); and when the bow is drawn from the brace condition, the first rotatable member (4) rotates in a second rotational direction that is opposite the first rotational direction.
Claim 12: An archery bow having a brace condition and a drawn condition, the bow comprising: a riser (1); a first limb (2) and a second limb (3) supported by the riser (1); a first rotatable member (4) supported by the first limb (2) on a first axle (5), a second rotatable member (6) supported by the second limb (3) on a second axle (7), the first axle (5) and the second axle (7) defining an axle plane, the first rotatable member (4) comprising a cam track (10), a capstan (11) and a terminal (12); a drawstring (8) extending between the first rotatable member (4) and the second rotatable member (5), the drawstring (8) extending from the first rotatable member (4) at an exit location; a power cable (13) attached to said terminal (12) and away from said terminal (12), wrapping around said capstan (11) and extending toward the second limb (3); wherein, in the brace condition, the axle plane divides the first rotatable member (4) to a first part and a second part, the capstan (11) and the terminal (12) located in the first part, the drawstring exit location located in the second part, and

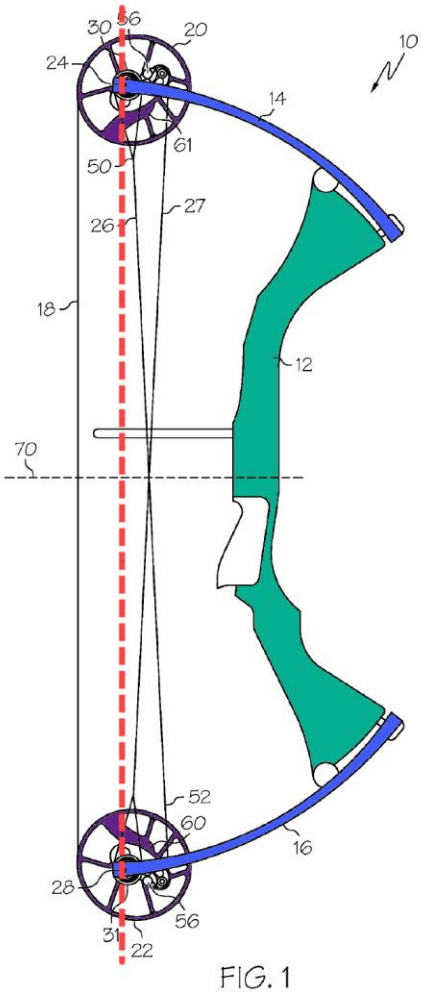
a distance between the terminal (12) and the axle plane is greater than a distance between the capstan (11) and the axle.

VII. OPINIONS REGARDING THE ’473 PROVISIONAL

76. It is clear that FIGS. 1-6 of the ’473 Provisional and FIGS. 1-6 of the ’989 Patent are substantially the same. It is my opinion that the ‘473 Provisional discloses all of the features of the claims of the ’989 Patent because the cam design and cam features are the same. Further, due to the mechanical nature of this invention, even if not explicitly stated or shown in the ’473 Provisional, a POSITA would have understood that a compound bow using the cams illustrated in FIGS. 1-6 of the ’473 Provisional would have the same general features as a compound bow using the cams illustrated in FIGS. 1-6 of the ’989 Patent because, for the bow to function properly, the bow would have to have the same general features.

77. FIG. 1 of the ’467 Application (shown below with annotations), which is incorporated by reference in the ‘473 Provisional, depicts a full bow (10) with a riser (12, green), two limbs (14, 16, blue), two rotatable cams (20, 22, purple) supported by the limbs, two power cables (26, 27), and a drawstring (18). The two axles (24, 28) of the compound bow define an axle plane (red dashed line). A POSITA would have understood from FIG. 1 of the ‘467 Application, and general

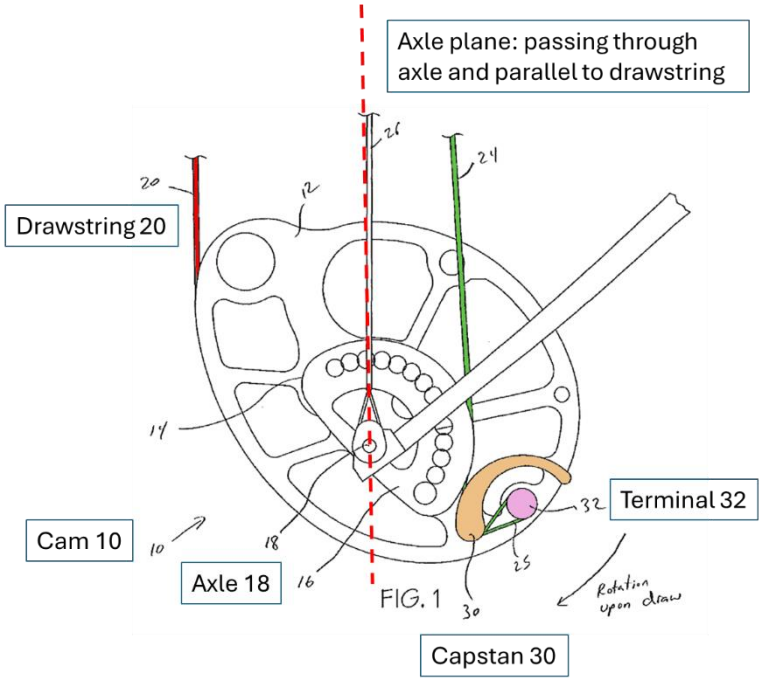
knowledge of compound bows, that the axle plane that extends between the axles of the cams would be substantially parallel to the drawstring in the brace condition.



EX2004, FIG. 1 (annotated)

78. FIG. 1 of the ’473 Provisional, annotated below, shows the lower cam of a compound bow in the brace condition. Although only cam (10) and axle (18) are shown in the figure, a POSITA would understand that the axle plane of the compound bow is substantially parallel to the drawstring (20) in the brace condition, and the axle plane would go through the axle (18) because the

drawstring extends from one cam to the other cam, and in order for the drawstring to impart a force normal to the arrow when shooting the bow, the drawstring would need to be substantially parallel to the axle plane. The red dashed line in the annotated figure below represents the axle plane defined in this manner. A POSITA would have understood from this image that the drawstring exit and the capstan (30) and terminal (32) are on opposite sides of the axle plane. Further, a POSITA would have understood that the distance between the axle plane and the terminal is greater than the distance between the axle plane and the capstan.



EX2001, FIG. 1 (annotated)

79. Further, since the axle plane goes through the axle, a POSITA would understand that the distance between the axle plane and the terminal is greater than the distance between the axle plane and the capstan because the distance between

the axle and the terminal is greater than the distance between the axle and the capstan.

VIII. OVERVIEW OF THE PRIOR ART

A. Darlington (EX1004)

80. Darlington describes a compound archery bow with two pulleys, one pulley is attached to an upper limb and one pulley is attached to a lower limb of the bow. The bow has a bowstring and two power cables. The power cables are attached at each end to one of the pulleys. When the bowstring is drawn, the pulleys rotate, and each pulley lets out one power cable while taking up the other power cable.

B. Islas (EX1005)

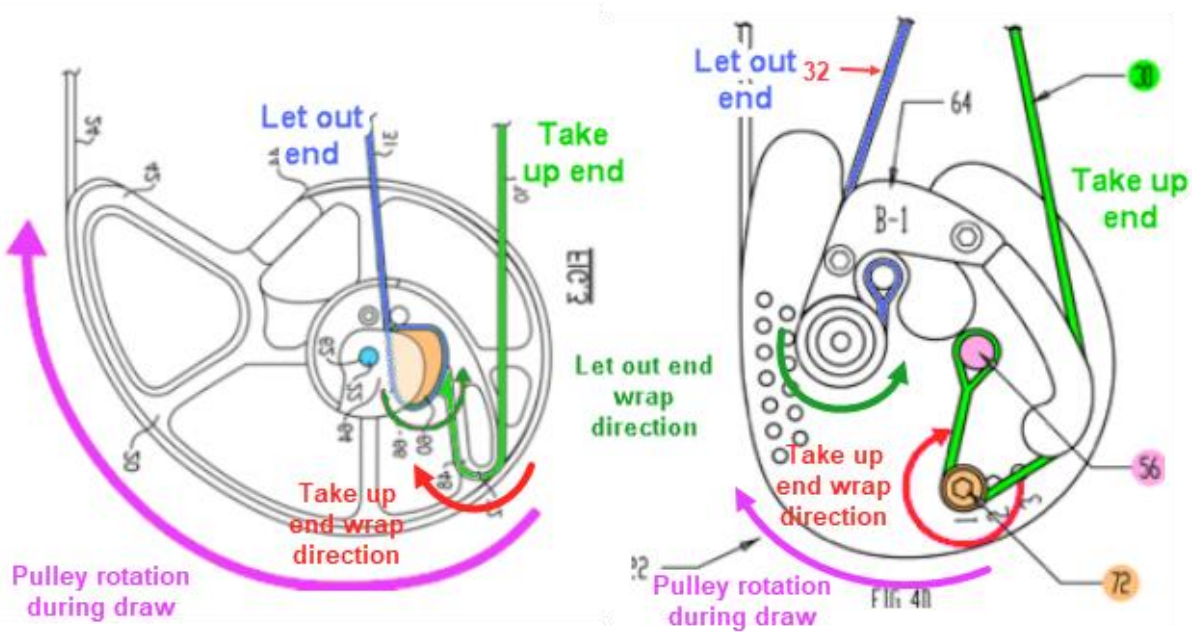
81. Islas describes a bowstring cam assembly for a compound archery bow. The bowstring cam is attached at the end of a bow power limb. Two power cams are attached to the bowstring cam and rotate with the bowstring cam. A cam cable extends over the periphery of each power cam. One of the power cams is situated to one side of the axis of the bowstring cam such that at full release, both of the power cables are pulling on the bowstring cam in a common rotational direction and at full draw the power cables are pulling in opposed directions.

IX. A POSITA WOULD NOT HAVE COMBINED ISLAS AND DARLINGTON TO YIELD THE "REVERSE WRAP"

82. It is my opinion that a POSITA would have known that power cables for compound bows have two ends. One end, often referred to as the "take up" end, wraps around a portion of the cam (e.g., a cam module) when the bow is drawn to pull the limbs of the bow together to store potential energy that is imparted to the arrow when the drawstring is released. The other end of the power cable is attached to the opposite limb and can either be what is often called a "control" end or a "let out" end. A "control" end is attached to an anchor point at or near the bow axle. A "let out" end is wrapped around a portion of the cam when in the brace condition and the "let out" end is "let out" or unwrapped from the cam when the bow is drawn. In short, the "take up" end takes up the power cable when drawing the bow to flex the limbs of the bow, and the "let out" end lets out the power cable when the bow is drawn.

83. It is clear that the pulleys of Darlington and the cams of Islas have the same configuration. As shown in the annotated image below comparing FIG. 4D of Darlington with FIG. 3 of Islas (both reproduced below from '989 Pet., 31, 29 with additional annotations, EX1005, FIG 3 is also flipped and rotated to show the same orientation as EX1004, FIG. 4D), the power cables of both Darlington and Islas have a "take up" end and a "let out" end. At the "take up" end, the power cable is wrapped or "taken up" in cable grooves when the bow is drawn. In both

Darlington and Islas, the "take up" end of the power cable is wrapped inward toward the cam/pulley center, which is in the same direction that the cam rotates when the bow is drawn. At the "let out" end, the power cable is unwrapped or "let out" of cable grooves. In both Darlington and Islas, the "let out" end is wrapped in a direction opposite of the direction that the cam/pulley rotates when the bow is drawn enabling the power cable to be "let out" from the cable grooves.



EX1005, FIG. 3 EX1004, FIG. 4D

84. A POSITA would have recognized the distinction between the "take up" and "let out" ends of the power cables because the power cable is "taken up" at the "take up" end when the bow is drawn, and the power cable is "let out" from the "let out" end when the bow is drawn. A POSITA would not have incorporated features from the "let out" end of a power cable to the "take up" end of a power

cable because the “let out” end and the “take up” end perform different functions, namely, to “let out” or “take up” the power cable, respectively.

X. OVERVIEW OF CONCLUSIONS FORMED

85. A POSITA would have understood that the 2009 model year Mission Menace bow and the 2009 model year Mathews McPherson Series Monster bow embodied the claim limitations of the ’989 Patent, the ’017 Patent, and the ’831 Patent.

86. A POSITA would have understood that the ’473 Provisional describes each of the claim limitations of the ’989 patent, the ’017 Patent, and the ’831 Patent.

87. A POSITA would not have combined Darlington and Islas to yield a bow cam with the “reverse wrap” described and claimed in the ’989 Patent, the ’017 Patent, and the ’831 Patent because neither Darlington nor Islas describe a “reverse wrap” of the “take up” end of a power cable. A POSITA would not have incorporated features from the “let out” end of the power cable into the “take up” end of the power cable because the “let out” end and the “take up” end perform different functions.

XI. ADDITIONAL REMARKS

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

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

Date: 6/14/24 By: _____

Charles F. Reinholtz, Ph.D.
New Smyrna Beach, Florida

APPENDIX A

Charles F. Reinholtz

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236 Quay Assisi
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Education

Doctor of Philosophy, University of Florida, Mechanical Engineering, 1983
Master of Engineering, University of Florida, 1980
Bachelor of Science, University of Florida, 1976

Full-time Industrial Experience

1978, Burroughs Corporation, Orlando, Florida, Design Engineer, Non-impact Printing Group
1989-1996 Milliken and Company, Spartanburg, South Carolina, summer employment and consulting involving textile equipment design

Academic Employment Experience

Virginia Polytechnic Institute and State University, Blacksburg, Virginia
Assistant Professor, September 1983 to August 1988, Tenure Granted
Associate Professor, August 1988 to August 1993
Professor, August 1993 to 2007
W. S. White Chair for Innovation in Engineering Education, Aug. 1996 to Aug. 1999
Assistant Department Head and ABET Review Chair, 1996-2002
Alumni Distinguished Professor, 2002-2007
Embry-Riddle Aeronautical University, Daytona Beach, Florida
Professor and Chair, Department of Mechanical Engineering, 2007-2017
Professor, Department of Mechanical Engineering, 2017-2022
Emeritus Professor and Chair, 2022-

Membership in Professional Organizations and Honor Societies

Society	Membership Grade
ASME	Fellow
SAE	Member
American Nuclear Society	Member 1995-1997
Tau Beta Pi	Member
Pi Tau Sigma	Member
Sigma Xi	Member
Epsilon Lambda Chi	Member
ASEE	Member, 1984-1987, 1998-99
AUVSI	Member

Professional Honors and Awards

Benton Engineering Council Service Key, University of Florida, 1976-1977.
Procter and Gamble Best Paper Award, 9th Applied Mechanisms Conference, October 1985.
Presidential Young Investigator Award, 1987-1992, National Science Foundation
Certificate of Teaching Excellence, Virginia Polytechnic Institute and State University, 1987-88, 1997-98 and 2001-02.

ASME Outstanding Faculty Advisor Award, 1989-1990 and 1991-92
Procter and Gamble Best Paper Award of Merit, 2nd National Applied Mechanisms and Robotics Conference, November 1991.
George Wood Best Applied Mechanism Design Paper Award, 2nd National Applied Mechanisms and Robotics Conference, November 1991.
Wine Award for Excellence in Teaching, Virginia Polytechnic Institute and State University, 1992.
Virginia Tech Academy of Teaching Excellence, Inducted 1992
Procter and Gamble Best Paper Award of Merit, 22nd ASME Mechanisms Conference, Scottsdale, Arizona, September 1992
ASME National Faculty Advisor Award, 1995.
Applied Mechanism Conference "Beyond the Call of Duty" Award for prodigious contributions to mechanism science, 1995.
W. S. White Chair for Innovation in Engineering Education, Aug. 1996 to Aug. 1998
Dean's Award for Excellence in Teaching, Virginia Tech College of Engineering, 1998
South-Pointing Chariot Award, 1999 Applied Mechanisms and Robotics Conference, for lifetime contributions to the mechanism's community
Ingersoll-Rand Faculty Award for Outstanding Contributions to the Mechanical Engineering Department, 2000
National Instruments Award for Best Application of Measurement and Automation for the Development of a Tele-Operated CASE CX-160 Excavator Using FieldPoint, National Instruments Week 2002, Austin Texas, Aug 12-15, 2002.
Virginia Tech Alumni Distinguished Professor, 2002-
Outstanding Faculty Member Award selected and awarded by the students in Mechanical Engineering, April 2003.
Fellow, American Society of Mechanical Engineers, 2003
Alumni Teaching Award, Virginia Polytechnic Institute and State University, 2004
National Instruments Virtual Instrumentation Applications Best Control Paper Award, Developing a Fully Autonomous Vehicle for Virginia Tech's Entry in the DARPA Grand Challenge," National Instruments NI Week 2006, Austin Texas.

ASME Distinguished Service Award, 2005
College of Engineering Certificate of Teaching Excellence, 2006-2007
Volusia Manufacture's Association "Friend of Industry" Award, 2013
Emeritus Professor and Emeritus Chair, Embry Riddle Aeronautical University, 2022

Funded Research

1. "Design Optimization of Spatial Mechanisms Subject to Real-World Constraints," National Science Foundation Grant MEA-8404313, June 15, 1984 through November 30, 1986, $47,979, 100% Responsibility.

2. "Presidential Young Investigator Award: Interactive Spatial Mechanism Synthesis," National Science Foundation, Grant No. DMC 8657828, June 15, 1987 through January 31, 1993, $312,000, 100% Responsibility.

3. "High-Speed Bearing Research," supported by the Industrial Drives Division of Inland Motor Corporation, Jan. 1, 1987 through Dec. 31, 1987, $15,000, 100% Responsibility.

4. "Analysis of Warhead Structures," Department of the Navy, July 24, 1987 to November 15, 1987, $99,348, Project Director with J. B. Kosmatka, R. H. Fries, A. L. Wicks, and L. D. Mitchell, Responsible for $19,535.

5. "Analysis of Warhead Structures, Year 2," Department of the Navy, October 30, 1987 to March 31, 1988, $174,000, Project Director with J. B. Kosmatka, R. H. Fries, A. L. Wicks, and L. D. Mitchell, Responsible for $12,908.

6. "Hull Joint Model Test," Georgia Institute of Technology, May 16, 1988 to Aug. 16, 1988, $10,141, Principal Investigator with R. H. Fries, Responsible for $5,071.

7. "Design of Variable-Geometry Truss Manipulators," Virginia Center for Innovative Technology (CIT), 10/1/88 to 9/31/89, $30,000, 100% Responsibility.

8. "Active Structures for Space Applications," 1/1/89 to 12/31/90, $200,000, Principal Investigator with H. H. Robertshaw, Responsible for $80,000.

9. "Computer-Aided Design of Fully-Wiped, Co-rotating Extruder Screws," Windward International and CIT, January 1, 1989 through December 31, 1989, $44,029, Principal Investigator with Sanjay Dhande, Responsible for $22,015.

10. "Construction of a NASP Mock-up," NASA Langley Research Center, February 1, 1989 to July 15, 1989, $51,692, Principal Investigator with W. F. O'Brien, A. L. Wicks, and J. Marchman.

11. "Design of Advanced Manipulators for Steam Generator Maintenance," Babcock & Wilcox Co., November 1, 1989 to August 15, 1990, $20,000, Principal Investigator with Sanjay Dhande, Responsible for $15,000.

12. "Calibration, Control and Menu Design for an Advanced Steam-Generator Maintenance Manipulator," Babcock and Wilcox Co., February 1, 1991 through January 31, 1992, $41,408, Principal Investigator with Sanjay Dhande, Responsible for $31,056.

13. "Calibration, Control and Menu Design for an Advanced Steam-Generator Maintenance Manipulator," Virginia Center for Innovative Technology, February 1, 1991 through January 31, 1992, $29,663, Principal Investigator with Sanjay Dhande, Responsible for $22,247.

14. "Computer-Aided Design and Manufacture of Extruder Screw Elements," Windward International and CIT, July 1, 1990 through June 30, 1991, $30,984, Principal Investigator with Sanjay Dhande, Responsible for $15,492.

15. "Design of a Cellulose Acetate Preconditioning Heat Exchanger," Tennessee Eastman Co., October 1990 through July 1991, $25,560, Principal Investigator with D. J. Nelson, Responsible for $9,876.

16. "Continued Steam Generator Manipulator Support Based on Kinematic Control and Investigation of Vision Based Approach," Babcock and Wilcox Co., October 1, 1991 through September 31, 1992, $40,000, Principal Investigator with A. L. Abbott, Responsible for $32,000.

17. "Cellulose Acetate Packaging Study," Tennessee Eastman Co., October 1991 through July 1992, $51,120, Principal Investigator with D. J. Nelson, Responsible for $19,752.

18. "Continued Steam Generator Manipulator Support Based on Kinematic Control and Investigation of Vision Based Approach," Virginia CIT, January 1, 1992 through December 31, 1992, $35,570, Principal Investigator with A. L. Abbott, Responsible for $28,456.

19. "Preliminary Design of a Medical Waste Processing Machine," Virginia Center for Innovative Technology, June 1, 1992 through August 31, 1992, $14,386, 100% Responsibility.

20. "Preliminary Design of a Medical Waste Processing Machine," Bioconversions Technologies, May 1, 1992 through January 31, 1993, $16,377, 100% Responsibility.

21. "Conceptual Design of an Advanced Reactor Vessel Inspection Manipulator," B&W Nuclear Services Company, March 1, 1992 through February 28, 1993, $30,000, 100% Responsibility.

22. "Engineering Development of a Medical Waste Processing Machine," Bioconversions Technologies, Aug. 15, 1992 to May 15, 1994, Principal Investigator with A. A. Kornhauser, $93,088, responsible for $46,544.

23. "Engineering Development of a Medical Waste Processing Machine," CIT, Aug. 15, 1992 to Aug. 14, 1993, Principal Investigator with A. A. Kornhauser, $90,988, responsible for $45,494.

24. "Enhancing the Capability and Performance of Nuclear Service Robots with Kinematic Analysis and Computer Vision," B&W Nuclear Services Co., Dec.1, 1992 to Nov. 30, 1993, with A. L. Abbott, $50,000, responsible for $40,000.

25. "Design of a Reactor Vessel Inspection Manipulator," B&W Nuclear Services, June 16, 1992 through June 15, 1993, $100,146, 100% responsibility.

26. "Design of an Automated Needle/Armature Tray Loader," Siemens Automotive, Sept. 1, 1993 to Aug. 31, 1994, $24,925, 100% Responsibility.

27. "Enhancing the Design and Performance of Nuclear Service Robots with Flexure Analysis, Computer Vision, and Optimization Techniques," B&W Nuclear Technologies, Dec.1, 1993 to Nov. 30, 1994, with A. L. Abbott, $40,000, responsible for $30,000.

28. "Enhancing the Design and Performance of Nuclear Service Robots with Flexure Analysis, Computer Vision, and Optimization Techniques," Center for Innovative Technology, Feb. 1, 1994 to Jan. 31, 1995, with A. L. Abbott, $47,023, responsible for $35,000.

29. "Design Studies for Nautilus," Nautilus, Inc, Jan.1, 1994 to Oct. 15, 1994, $7,723, 100% responsibility.

30. "Design Studies for Nautilus," Center for Innovative Technology, Jan.1, 1994 to Dec. 31, 1994, $13,795, 100% Responsibility.

31. "Rod Formation Dynamics," R. J. Reynolds Co., Jan. 1, 1994 to Dec. 31, 1994, with D. J. Nelson, 116,557, 50% Responsibility.

32. "A Short-term Proposal to Develop Cam-Design Software for Cadkey, Inc.," June 16, 1994 to Sept 15, 1994, $9,981, 100% Responsibility.

33. "Design of an Automated Injector Body Tray Loader," Siemens Automotive, Sept. 1, 1994 to Aug. 31, 1995, $20,744, 100% Responsibility.

34. "Design Studies for Nautilus," Nautilus, Inc, Dec 1, 1994 to Nov. 30, 1995, $23,731, 100% Responsibility.

35. "Design Studies for Nautilus," Center for Innovative Technology, Dec.1, 1994 to Dec. 31, 1995, $25,924, 100% Responsibility.

36. "Preliminary design and Equipment Selection for a Mulch-Making Machine," Fred Whitaker Co., June 1, 1995 to Dec. 31, 1995, $10,920, %100 Responsibility.

37. "Improving the Kinematic Control of Robots with Computer Vision," NSF, July 15, 1995 to June 30, 1996, $22,026, %100 Responsibility.

38. "Proposal to Increase Funding in Siemens Valve-Body Loader Project, "Siemens Automotive, $7,018, 100% Responsibility.

39. "Preliminary Design and Equipment Selection for a Mulch-Making Machine," CIT, June 1, 1995 to August 31, 1995, $8,185, %100 Responsibility.

40. "Design of a Personal Smith Machine," Nautilus, Inc, July 1, 1995 to Oct. 31, 1995, $12,273, 100% Responsibility.

41. "Development of Advanced Control Strategies for Variable Geometry Truss Manipulators," Batelle -Pacific Northwest Laboratory, Jan. 1, 1995 to June 31, 1995, $10,000, with R. J. Salerno, 10% Responsibility.

42. "Curriculum Renewal in Mechanical Engineering at Virginia Tech," NSF SUCCEED, Sept. 15, 1995 to Dec. 15, 1995, with Paul Tidwell, $4,500 (NSF), $4,677 (Cost Sharing), 50% Responsibility.

43. "Development of a Parallel Architecture Robotic Wrist," Triad Investors, Jan. 1, 1996 to May 31, 1997, $51,707, 100% Responsibility.

44. "Development of Advanced Control Algorithms for Variable Geometry Truss Manipulators," Batelle-Pacific Northwest Laboratory, Jan. 1, 1996 to June 31, 1996, $10,000, 100% Responsibility.

45. "Curriculum Renewal in Mechanical Engineering at Virginia Tech – Year 5," NSF SUCCEED, June 16, 1996 to June 15, 1997, $10,000 (NSF), $10,000 (Cost Sharing), 100% Responsibility.

46. "Technology Assessment for a Robotic Vacuum Cleaner," Servus Robots Incorporated, Sept.1, 1998 to Feb. 28, 1999 with John Bay, Bob Sturges, and Mike Deisenroth, $8,333, 25% Responsibility.

47. "Technology Assessment for a Robotic Vacuum Cleaner," Virginia CIT, Oct.1, 1998 to March 31, 1999 with John Bay, Bob Sturges, and Mike Deisenroth, $25,000, 25% Responsibility.

48. "MBC Guidance Project," Long-Airdox Company, August 1998 to July 1999, P.I.: R.H. Sturges, Co-P.I.'s: M. P. Deisenroth, C.F. Reinholtz. $100,000.

49. "MBC Guidance Project," Virginia Center for Innovative Technology (matching), August 1998 to July 1999, P.I.: R.H. Sturges, Co-P.I.'s: M. P. Deisenroth, C.F. Reinholtz. $100,000.

50. "Vertical Integration of Mechatronics at Virginia Tech," NSF SUCCEEED, Aug 1999 to July 2002, P.I.: W. R. Saunders, Co-P.I.'s: J. S. Bay, D. J. Leo, C.F. Reinholtz, $18,000/year for three years.

51. Development of a Remote-Controlled CASE CX-160 Excavator, Naval Surface Warfare Center, Dahlgren G-64 Division, February 2003 to September 2003, Co-PI with A. L. Wicks, $17,000

52. Investigation of Adaptive Structures for Morphing Aircraft, NASA Langley Research Center, $65,078, July 1,2002 to June 30, 2003, 25% (with H. Robertshaw and D. Inman).

53. Increased Scope for Delivery Orders 0019, Remote Control Excavator, Naval Surface Warfare Center, with Al Wicks, PI, $21,223.

54. Develop the Joint Unmanned Systems Experimentation and Research (JOUSTER) Site, U.S Army RDECOM STTC, Orlando, FL, June 10, 2004 to June 9, 2007, $12,200,000, C. Reinholtz, PI (55% Responsibility), A. Wicks, Co-PI (43% Responsibility), Carstensen Co-PI (2% Responsibility).

55. Virginia First Lego League 2004 Pilot High School Robotics Program, NASA Langley Research Center, Education Grant NNL04AA65G, $20,000, July 9, 2004 to July 8, 2005, 100% Responsibility

56. Virginia First Lego League NIA Outreach Program, National Institute of Aerospace, Grant No. VT-03-1, $8,000, February 1, 2005 to August 31, 2005, 100% Responsibility.

57. Heterogeneous Teams Of Autonomous Vehicles: Advanced Sensing And Control, Office of Naval Research, Dennis W. Hong, Naira V. Hovakimyan, Marty E. Johnson, Charles F. Reinholtz, Daniel J. Stilwell, A. L. Wicks, Craig A. Woolsey, Christopher L. Wyatt, 07/01/05 – 6/30/06, Total Funding: $1,050,000, C. F. Reinholtz share: $52,752.

58. Coordinated Sensing and Control for Surveillance and Tracking by Heterogeneous Autonomous Vehicle Teams, Daniel J. Stilwell, Christopher L. Wyatt, Craig A. Woolsey, Naira V. Hovakimyan, A. L. Wicks, Andy Kurdila, Charles Reinholtz and Michael Roan, Office of Naval Research 5/15/06 – 9/14/07, $1,417,500, Reinholtz share: $184,275.

59. Development Of An Autonomous Vehicle For The DARPA Urban Challenge, with Al Wicks and Dennis Hong, the Defense Advanced Research Projects Agency, 10/1/06 to 12/31/07, $999,274.

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64. Canfield, S. L. and Reinholtz, C. F., "Development of and All-Revolute-Jointed Constant-Velocity Coupling, Proceedings of the 3rd National Applied Mechanisms and Robotics Conference, November 7-10, 1993, Cincinnati, Ohio, Paper AMR 93-081.

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68. Shooter, S. B., Reinholtz, C. F. and Dhande, S. G., "On the Kinematic Design of Manipulators for Limited Access Workspaces (LAWS)," Proceedings of the 22nd ASME Mechanisms Conference, DE-VOL 45, September 1992, pp. 485-491.

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73. Stulce, J. R., and Reinholtz, C. F., "Observations on Caterpillar Locomotion and Their Application to a Crawling Robot," Proceedings of the 2nd National Applied Mechanisms and Robotics Conference, November 3-6, 1991, Cincinnati, Ohio.

74. Stulce, J. R., W. D. Burgos, S. G. Dhande, and C. F. Reinholtz, "Conceptual Design of a Multibody Passive-Legged Crawling Vehicle," Proceedings of the 1990 ASME Mechanisms Conference, DE-Vol. 26, Cams, Gears Robot and Mechanism Design, Sept. 16-19, 1990, pp. 199-205.

75. Arun, V., and C. F. Reinholtz, L. T. Watson, "Enumeration and Analysis of Variable Geometry Truss Manipulators," Proceedings of the 1990 ASME Mechanisms Conference, DE-Vol. 26, Cams, Gears Robot and Mechanism Design, Chicago, IL, Sept. 16-19, 1990, pp. 93-98.

76. Dhande, S. G., B. Padmanabhan, C. F. Reinholtz, and R. S. Voruganti, "Computer-Aided Design and Manufacture of Approximate Ruled Surfaces," Proceedings of the Second International Conference on Computer Integrated Manufacturing, IEEE Computer Society Press, Troy, NY, May 21-23, 1990, pp. 137-142.

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78. Padmanabhan, B., and C. F. Reinholtz, "Design of Robotic Manipulators Using Variable-Geometry Trusses as Joints," paper 89 AMR-8C-7, Proceedings of the First National Applied Mechanisms and Robotics Conference, Vol. II, 1989.

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82. Robertshaw, H. H., and C. F. Reinholtz, "Variable Geometry Trusses," Proceedings of the US Army Research Office Workshop on Smart Materials, Structures and Mathematical Issues, Sept. 15-16, 1988.

83. Salerno, R. J., C. F. Reinholtz, and H. H. Robertshaw, "Shape Control of High Degree of Freedom Variable Geometry Trusses," presented at the NASA Workshop on Controls/Structures Integration, Williamsburg, VA, July 11-13, 1988.

84. Williams, R. L., II, C. F. Reinholtz, "Closed-Loop Planar Manipulators: Part I - Forward and Inverse Kinematics; Part 2 - Workspace Optimization," Proceedings of the 10th Applied Mechanisms Conference, Dec. 6-9, 1987, New Orleans, Louisiana.

85. Rogers, C. A., H. H. Mabie, and C. F. Reinholtz, "Numerical Determination of Accuracy Points Using Chebyshev Polynomials for Displacement and Velocity Synthesis," Proceedings of the 10th Applied Mechanisms Conference, Dec. 6-9, 1987, New Orleans, Louisiana.

86. Mabie, H. H., C. F. Reinholtz, and C. A. Rogers, "Determination of Hob Offsets to Maximize the Ratio of Recess to Approach Action and Balance Tooth Strengths for Nonstandard Spur Gears by Limit Analysis," Proceedings of the 10th Applied Mechanisms Conference, Dec. 6-9, 1987, New Orleans, Louisiana.

87. Mabie, H. H., C. F. Reinholtz, and C. A. Rogers, "Determination of Pinion Cutter Offsets to Maximize Recess to Approach Action or to Equalize Tooth Strengths of Nonstandard Spur Gears with Backlash," Proceedings of the l0th Applied Mechanisms Conference, Dec. 6-9, 1987, New Orleans, Louisiana.

88. Reinholtz, C. F., and D. Gokhale, "Design and Analysis of Variable Geometry Truss Robots," Proceedings of the 10th Applied Mechanisms Conference, Dec. 6-9, 1987, New Orleans, Louisiana.

89. Reinholtz, C. F., V. Arun, and R. L. Williams, A Reassessment of the Tasks of Kinematic Synthesis," Proceedings of the 10th Applied Mechanisms Conference, Dec. 6-9, 1987, New Orleans, Louisiana.

90. Arun, V., and C. F. Reinholtz, "Design of the RCCC Spatial Mechanism," Proceedings of the 10th Applied Mechanisms Conference, Dec. 6-9, 1987, New Orleans, Louisiana.

91. Klatt, M. A., and C. F. Reinholtz, "Mechanism Optimization Using Zero-Order Methods and Penalty Functions: A Comparison of Incremented Versus Nonincremented Penalty Parameter," DE-VOL. 10-1, Advances in Design Automation, Vol. 1, Proceedings of the 1987 Design Automation Conference, Boston, MA, Sept. 27-30, 1987, pp. 205-213.

92. Rogers, C. A., R. E. Cobb, and C. F. Reinholtz, "Incorporating Computer Programming Projects Into the Mechanical Engineering Curriculum," Proceedings of the Fifth National Conference on University Programs in Computer-Aided Engineering, Design, and Manufacturing (UPCAEDM '87), pp. 176-180.

93. Williams, II, R. L., C. F. Reinholtz, and A. Myklebust, "Complete Function-Generation Synthesis and Design of RSSR Spatial Mechanisms," ASME Paper 86-DET-151, presented at the 19th ASME Mechanisms Conference, Columbus, Ohio, October 1986.

94. Reinholtz, C. F., "Integrating Computers into Kinematics Courses at VPI&SU," Proceedings of the Fourth National Conference on University Programs in Computer-Aided Engineering, Design and Manufacture, August 1986, pp. 127-130.

95. Mabie, H. H., C. F. Reinholtz, D. Puzio, and G. M. Irwin, "Optimum Design of Spur Gear Teeth Cut with a Hob," Proceedings of the Ninth Applied Mechanisms Conference, Kansas City, MO, 1985, Vol. 2, Session VIII.B, Paper VI.

96. Keil, M. J., A. Myklebust, and C. F. Reinholtz, "Prediction of Link Interference in Planar Mechanisms," Proceedings of the Ninth Applied Mechanisms Conference, Kansas City, MO, 1985, Vol. 1, Session III.B, Paper V, (Winner of Proctor and Gamble Best Paper Award).

97. Myklebust, A., C. F. Reinholtz, W. H. Francis, and M. J. Keil, "Design of a Radar Guidance Mechanism Using MECSYN-ANIMEC," ASME Paper 84-DET-139, presented at the 18th ASME Mechanisms Conference, Cambridge, Massachusetts, October 10, 1984.

98. Sandor, G. N., A. G. Erdman, E. Raghavacharyulu, and C. F. Reinholtz, "On the Equivalence of Higher and Lower Pair Planar Mechanisms," Proceedings of the Sixth World Congress of the International Federation for the Theory of Machines and Mechanisms, New Delhi, India, 1983.

99. Sandor, G. N., D. Kohli, X. Zhuang, and C. F. Reinholtz," Synthesis of a Five-Link Spatial Motion Generator," ASME paper 82-DET-130, 1982.

100. Sandor, G. N., D. Kohli, A. Ghosal, and C. F. Reinholtz," Closed-Form Analytic Synthesis of a Five-Link Spatial Motion Generator," Proceedings of the Seventh Applied Mechanisms Conference, Kansas City, MO, 1981, pp. XXVI-1 to XXVI-7

Patents

1. "Spatial, Parallel-Architecture, Robotic Carpal Wrist," U. S. Patent 5,699,695, Inventors: Canfield, S. L., Reinholtz, C. F., Salerno, R. J., and Ganino, Anthony J., Assignee: Virginia Tech Intellectual Properties, Inc., Awarded December 23, 1997.

2. "Snubber Profile," U. S. Patent 4,998,942, Inventor: Reinholtz, Charles F. Assignee: Milliken Research Corporation, Spartanburg, S.C., Awarded March 12, 1991.

Invited Presentations at National Meetings

1. "Test Drive an Autonomous Vehicle: Experiences from the 2007 DARPA Urban Challenge," Presentation to USAA, 19 January 2009, San Antonio, TX
2. "Challenges and Opportunities Offered by the DARPA Grand Challenge," Invited Presentation and Panel Discussion at the 2004 AIAA Unmanned Aerial Vehicle Conference, Chicago, IL, September 2004.
3. "Product Safety and Product Liability," Invited Lecture at the 2001 ASME World Congress, New York, NY, Nov.13, 2001
4. "Life after Tenure"' Invited Speaker and Panelist at the ASEE Annual Conference and Exposition, Charlotte NC, June 20-23, 1999.
5. "Reduced Complexity Robotics," Invited presentation at the 1998 ASME Design Technical Conferences, 25th Biennial Mechanisms Conference, Atlanta, GA, September 1998.
6. "Trends and Opportunities in Mechanisms Research," Plenary Panel Session Speaker at the 4th National Applied Mechanisms and Robotics Conference, Cincinnati, Ohio, December 10-14, 1995.
7. "Trends and Opportunities in Robotics," Opening Plenary Session Lecture at the 10th Applied Mechanisms Conference, Dec. 6-9, 1987, New Orleans, Louisiana.
8. "Observations on Robotics and Mechanisms Research," Opening Plenary Panel Session Speaker at the 2nd National Applied Mechanisms and Robotics Conference, November 3-6, 1991, Cincinnati, Ohio, November 3-6, 1991.

University Service

Invited Speaker at the following University Events and Alumni Association Chapter Meetings:
June 23, 2005, Research Triangle Park Alumni Chapter, Raleigh, NC
March 18, 2004, Greensboro, NC Triad Alumni Chapter
March 31, 2004, Atlanta Alumni Chapter
November 1, 2004, Committee of 100 - Hotel Roanoke
November 21, 2004, Class of 1968, Donaldson Brown

Advisor to the following Embry Riddle Autonomous Vehicle Teams:
Unmanned Aerial Systems Competition, 2007-Present
International Aerial Robotics Competition, 2007-Present
Intelligent Ground Vehicle Competition, 2007-Present
RoboBoat, 2007-Present
RoboSub, 2007-Present
Maritime RobotX Competition,2013-Present
EcoCAR (CAVs Advisor), 2016-Present
Member, College Promotion and Tenure Committee 2018-21
Fulbright Scholarship Advisory Committee 2005
Advisor to the Virginia Tech Autonomous Aerial Vehicle Competition Team, 2004-
Advisor to the Virginia Tech DARPA Grand Challenge Team, 2003-
Virginia FIRST Lego League Coordinator, 2002-
Advisor to the Virginia Tech Intelligent Ground Vehicle Competition Team, 1995-
Advisor to Entering Honors Students 2003-
Horton Honors Scholarship Selection Committee 2003-
Member, University Strategic Planning Committee, 2001
Chair, Virginia Tech Academy of Teaching Excellence 2000-2001
Vice Chair, Virginia Tech Academy of Teaching Excellence 1999-2000

Member, University Promotion and Tenure Committee 2000-2001
Member, College Promotion and Tenure Committee 2000-2001
Chair, Mechanical Engineering Curriculum Committee 1997-2002
Chair, Mechanical Engineering ABET Review, 1998-2002
Member, College of Engineering Curriculum Committee 1997-2002
Member, 1st Year Special Curriculum Review Committee 1997
Member, Engineering Dean Search Committee, 1993-4
Chairman, Mechanical Engineering Honors and Awards and Publicity Committee, 1993-99
Member, Mechanical Engineering Honors and Awards and Publicity Committee, 1993-99
Chairman, College Wine Teaching Award Committee, 1992-95
Chairman, University Wine Teaching Award Committee, 1995-96
Member, Mechanical Engineering Department Head Search Committee, 1992-93
Member, Mechanical Engineering Curriculum Committee, 1984-87, 1992-2004
Member, Mechanical Engineering Tenure and Promotion Committee, 1989-2004
Member, Mechanical Engineering Graduate Committee, 1987-89
Member, Mechanical Engineering Recruiting Committee, 1992-93
Member, Sigma Xi High School Teaching Award Committee 1987-88, Chairman 1989
Member, College of Engineering Commencement Committee, 1988-
Faculty Advisor to the Virginia Tech Student Section of ANS, 1993-
Faculty Advisor to the Virginia Tech Student Section of ASME, 1988-
Faculty Advisor to the Virginia Tech Chapter of Tau Beta Pi, 1984-88
Host for the Virginia Tech Academic Challenge, 1991

Professional Service

Society	Positions Held
ASME	Secretary of the Virginia Section 1987-92
	Chairman of the National Student Mechanism Competition 1987-88
	Chairman of the Joint Regional Conference 1989 and 2000
	Virginia Tech Student Section Advisor, 1988-2007
	Member of the ASME Mechanisms Committee, 1990-1993
	Associate Technical Editor, *ASME Journal of Mechanical Design*, 1991-93
	Paper Review Chairman, 22nd ASME Mechanisms Conference, Sept. 1992
	Conference Arrangements Chairman, 23rd ASME Mechanisms Conference, Sept. 1994
	Member, ASME National Design Contest Committee, 1996-2002
	Virginia Section Newsletter Editor, 1994-2000
	Region IV Senior Representative to the National Student Sections Committee, 1995-2000
Sigma Xi	High School Teaching Award Committee, Member 1987-88, Chair 1989
ANS	Student Section Advisor, Virginia Tech, 1993-95
NAE	Invited review Board member, National Academies' National Research Council (NRC) Army Research Laboratory Technical Assessment Board (ARLTAB), May 2004

Graduate Advising

Master's Degree Students Completed				
	Degree	**Name**	**Completion Date**	**Title**
1	MS	Robert L Williams, II	8/85	Synthesis and Design of the RSSR Spatial Mechanism for Function Generation
2	MS	Arun Veeraraghavan	3/86	Computer Aided Design of the RCCC Spatial Mechanism
3	MS	Michael A. Klatt	10/86	Design Optimization of Planar Mechanisms
4	MS	Kevin K. Moyers	11/87	A Microcomputer-Based Data Acquisition System for Diagnostic Monitoring of High-Speed Electric Motors
5	MS	Christodoulos S. Demetriou	12/87	A PC Implemented Kinematic Synthesis System for Planar Mechanisms
6	MS	Dipen P. Gokhale	12/87	Kinematic Analysis and Animation of a Variable-Geometry Truss Robot
7	MS	William R. Seith	5/88	Design of a Flying Cutter
8	MS	George M. Clessas	5/88	Direct Calculation of Cable Tension in a Store Separation Program Which Models the Launch of an Aerial Tow Target
9	MS	Mark W. Biegler	8/88	Determination of Stress Concentration Factors Using Experimental Methods
10	MS	Nandan Joshi	2/88	Mobility Analysis of Variable-Geometry Trusses
11	MS	Vasant Marathe	12/88	Design of a Hot Melt Book Binding Machine
12	MS	Babu Padmanabhan	12/88	Design of a Robotic Manipulator Using Variable-Geometry Trusses as Joints
13	MS	Robert J. Salerno	6/89	Shape Control of High Degree-of-Freedom Variable-Geometry Truss Manipulators
14	MS	Ravinder S. Voruganti	8/90	Symbolic and Computational Conjugate Geometry for Design and Manufacturing Applications
15	MS	Steven B. Shooter	12/90	Conceptual Manipulator Design for Limited Access Workspaces
16	MS	Paul Mele	5/91	Mechanical Design of a Stewart Platform-Based Crawling Vehicle
17	M.S.	William K. Carpenter	12/92	Design of Medical Waste Treatment Systems Employing Bioremediation
18	MS	Allen Maples	5/93	Design of a Robust Acoustic Positioning System for an Underwater Nuclear Reactor Vessel Inspection Robot
19	MS	William Cordle	5/93	Numerical Inverse Kinematics for a Six Degree-of-Freedom Manipulator
20	MS	Glenn Melnyk	6/93	Mechanisms for Automated Toolhead Changing in Nuclear Steam Generator Robotics
21	MS	Steve Payne	5/94	A CAD-Interactive Software Package for the Synthesis of Planar Disk Cams
22	MS	Anil K. Garg	8/94	Design, Installation and Testing of a Bioremediation-Based System for Treating Regulated Medical Waste
23	MS	Todd Denkins	12/94	Design Methodology to reduce the Number of Actuators in Complex Mechanisms

24	MS	Joseph Calkins	12/94	Real-Time Compensation of Static Deflections in Robotic Manipulators
25	MS	Randy Soper	8/95	Synthesis of Planar Four-Link Mechanisms for Force Generation
26	MS	Keith Garguilo	8/95	Design and Testing of a Nonlinear Mechanical Advantage Demonstration Mechanism
27	MS	Ganino, A. J.	5/96	Mechanical Design of the Carpal Wrist: A Parallel-Actuated, Singularity-Free Robotic Wrist
28	MS	Larkin, Susan	6/96	Wheeled Autonomous Mobile Robots for use in Harsh Environments: A Survey of Recent Publications
29	MS	Iskandar, Kurnia	6/96	Computer Assisted Synthesis of Wrapping Cam Mechanisms
30	MS	Riutort, Kevin	7/96	Applied Design and Implementation of Straight-Line Mechanisms
31	MS	Saccoccio, Greg	8/96	Error Modeling of the Carpal Wrist
32	MS	Scardina, Mike	10/96	Optimal Synthesis of Force-Generating Planar Four-Link Mechanisms
33	MS	Palmer, Matthew	12/96	Kinematics of Beam-Flexure Four-Bar Linkages with Applications in a Compound Bow
34	MS	Coombs, Dana	2/97	Design of User-Weight-Based Exercise Machines
35	MS	Doyle, Matthew	12/97	The Foundation for CADSPAM
36	MS	Hayes, Thomas J.	12/97	The Creative Entrepreneurs Organization
37	MS	Adler, Alex	5/98	Testing and Understanding Screwdriver Bit Wear
38	MS	Haynie, C. Dean	8/98	Mechanical Design and Navigation Strategies for a Zero-Turn-Radius Autonomous Vehicle
39	MS	Holland, Michael	12/98	Assembly Optimization for Double-Row Ball Bearings
40	MS	Abbott, Michael	6/00	Dynamics and Control of the Biplanar Bicycle
41	MS	Conner, David	8/00	Sensor Fusion, Navigation, and Control of Autonomous Vehicles
42	MS	Jillcha Wakjira	1/01	Design of a SMA Heat Engine
43	MS	Carr, Angela	5/01	Position Control Comparison of Equilibrated and Mass Counterweight Systems
44	MS	Kedrowski, Philip	5/01	Development and Implementation of a Self-Building Global Map for Autonomous Navigation
45	MS	Blackett, Ricardo	5/01	Optimization of Multi-Degree-of-Freedom Force Generating Mechanisms
46	MS	Matthew Thompson	7/01	Design of a Cyclic Sliding, Dynamically Loaded Wear Testing Device for the Evaluation of Total Knee Replacement Materials
47	MS	Rundgren, Brian	12/01	Design and Optimization of Force Generation Linkages to Include Dynamic Effects
48	MS	Schiller, Ean	9/02	Heat Engine Driven by Shape Memory Alloys: Prototyping and Design

49	MS	Gopinath, Sudir	12/02	Using Color and Shape Analysis for Boundary Line Extraction in Autonomous Vehicle Applications
50	MS	Whittier, Will	12/02	Kinematic Analysis of Tensegrity Structures
51	MS	Terwelp, Chris	5/03	Remote Control of Hydraulic Equipment for Unexploded Ordnance Remediation
52	MS	Henshaw, Graham	5/03	Single-Session Design: Design Methodology in Compressed Timeframes Derived from the Robot Rivals Television Series
53	MS	Corey, Chris	12/03	Epicyclic Gear Train Solution Techniques with Application to Tandem Bicycling
54	MS	Fleming, Michael	12/03	Teleoperated Control of Hydraulic Equipment for Hazardous Material Handling
55	MS	Stubbs, Matthew	12/03	Kinematic Design and Analysis of a Morphing Wing
56	MS	Bacha, Andrew	5/05	Line Detection and Lane Following for an Autonomous Robot
57	MS	Frentzel, John	5/05	A Wireless Instrumented Payload for Testing Unmanned Vehicles
58	MS	Naik, Ankur	12/05	Arc Path Collision Avoidance Algorithm for Autonomous Ground Vehicles
59	MS	Barnett, Shane	12/05	Development of a Tow Capacity Test Device for Small Unmanned Vehicles
60	MS	Cooper, Jared	12/05	Modeling of a Small-Scale Remote Controllable Helicopter for Simulation and Control Development
61	MS	Baity, Sean	5/06	Development of a Next-generation Experimental Robotic Vehicle (NERV) that Supports Intelligent and Autonomous Systems Research
62	MS	Leedy, Brett	5/06	Two Minds for One Vehicle: A Case Study in Deliberative and Reactive Navigation
63	MS	Gombar, Brett	5/06	Design and Evaluation of a Mobile Instrumentation Platform for Unmanned Vehicle Testing
64	MS	Putney, Joseph	5/06	Reactive Navigation of an Autonomous Ground Vehicle Using Dynamic Expanding Zones
65	MS	Willis, Christopher Ryan	5/06	A Kinematic Analysis and Design of a Continuously Variable Transmission
66	MS	James Hayward Bittorf	6/06	Mechanical Device to Assist the Landing of Unmanned Aerial Vehicles
67	MS	Ramirez, Rachael	8/06	Computer Vision Based Analysis of Broccoli for Application in a Selective Autonomous Harvester
68	MS	Grant Edward Gothing	7/07	Development of the “Discretized Dynamic Expanding Zones with Memory” Autonomous Mobility Algorithm for the Nemesis Tracked Vehicle Platform
69	MS	David Burns Van Covern	7/07	Collaborative Target Localization and Inspection Using a Heterogeneous Team of Autonomous Vehicles
70	MS	Thomas James Alberi	4/08	A Proposed Standardized Testing Procedure for Autonomous Ground Vehicles

71	MS	Patrick Norman Currier	4/08	Development of an Automotive Ground Vehicle Platform for Autonomous Urban Operations
72	MS	Jesse Lee Farmer	2/08	Kinematic Analysis of a Two Body Articulated Robotic Vehicle
73	MS	Chris Hockley	12/10	Development of an Autonomous Monocopter
74	MS	Katrina Corley	4/11	Supervisory Autonomous Control of Homogeneous Teams of Unmanned Ground Vehicles: Application to The Multi-Autonomous Ground-Robotic International Challenge
75	MS	Robert Andrew Lister	5/11	Classification of Marine Vessels in a Littoral Environment Using a Novel Training Database
76	MS	Kevin Rigby	8/11	Localization of Aircraft Using Wide-Baseline Stereopsis
77	MS	Lafe Zabowski	8/11	A Low Cost, Computer Vision Based, Target Tracking Hexapod
78	MS	Christine Dailey	5/12	A Novel Resistance Exercise Machine for Use in a Lower Body Negative Pressure Box to Counteract the Effects of Weightlessness

Ph.D. Students Completed				
1	PhD	Robert L. Williams II	5/88	Planar Robotic Mechanisms: Analysis and Configuration Comparison
2	PhD	Arun Veeraraghavan	9/90	The Solution of Variable-Geometry Truss Problems Using New Homotopy Continuation Methods
3	PhD	Shahriar Tavakkoli	6/91	Shape Design Using Intrinsic Geometry
4	PhD	Babu Padmanabhan	12/92	A Study of Isostatic Framework with Application to Manipulator Design
5	PhD	Robert J. Salerno	12/93	Positional Control Strategies for a Modular, Long-Reach, Truss-Type Manipulator
6	PhD	Paul Tidwell	8/95	Wrapping Cam Mechanisms
7	PhD	J. Barry Fallon	8/95	Improving the Kinematic Control of Robots by Estimating the End-Effector Pose Directly with Computer Vision
8	PhD	Steven B. Shooter	12/95	Information Modeling in Mechanical Design: With Application to Cam Mechanism Design
9	PhD	Ravi S. Voruganti	12/95	Robot System Characterization: Error Modeling, Identification, Analysis and Calibration
10	PhD	Canfield, Steve	5/98	Development of the Carpal Wrist
11	PhD	Stulce, John	1/02	Conceptual Design of a Multibody Passive-Legged Crawling Vehicle
12	PhD	Calkins, Joseph	8/02	Quantifying Coordinate Uncertainty Fields in Coupled Spatial Measurement Systems
13	PhD	Snorri Gudmundsson	12/16	A Biomimetic, Energy-Harvesting, Obstacle-Avoiding, Path-Planning Algorithm for UAVs

APPENDIX B

Charles F. Reinholtz, Ph.D.

Deposition and Court Testimony, 2018 - Present

Year	Counsel	Opposing Counsel	Case Information (Client Shown in Boldface)	Plaintiff/ Defendant	Deposition/ Court Appearance
2018	Calfee, Halter & Griswold LLP	Quinn Emanuel Urquhart & Sullivan, LLP	**Lincoln Electric Company**, et al. Plaintiffs, v. Harbor Freight Tools USA Inc., Defendants, Case No. 1:17-CV-02329	Plaintiff	Deposition, February 22, 2018, Cleveland, OH
2018	Finnegan, Henderson, Farabow, Garrett & Dunner, LLP	Sterne, Kessler, Goldstein & Fox, P.L.L.C.	**Caterpillar** v. Wirtgen GmbH, et. al., In the Matter of Certain Road Construction Machines and Components Thereof, ITC Investigation No. 337-TA-1088	Complainant	Deposition, May 10, 2018, Washington, DC
2018	Fish & Richardson P.C	Quinn Emanuel Urquhart & Sullivan, LLP	**Sanofi-Aventis U.S. LLC** et al, Plaintiffs, v. Merck Sharp & Dohme Corp., Defendant., 1:16-cv-00812	Plaintiff	Deposition, April 13, 2018, New York, NY
2018	Fish & Richardson P.C	Quinn Emanuel Urquhart & Sullivan, LLP	**Sanofi-Aventis U.S. LLC** et al, Plaintiffs, v. Merck Sharp & Dohme Corp., Defendant., 1:16-cv-00812	Plaintiff	Court Testimony, U. S. District Court, District of Delaware, May 29-31, 2018, Wilmington, DE
2018	Finnegan, Henderson, Farabow, Garrett & Dunner, LLP	Sterne, Kessler, Goldstein & Fox, P.L.L.C	**Caterpillar** v. Wirtgen GmbH, et. al., In the Matter of Certain Road Construction Machines and Components Thereof, ITC Investigation No. 337-TA-1088	Complainant	Deposition, July 24, 2018, Washington, DC
2018	Finnegan, Henderson, Farabow, Garrett & Dunner, LLP	Sterne, Kessler, Goldstein & Fox, P.L.L.C	**Caterpillar** v. Wirtgen GmbH, et. al., In the Matter of Certain Road Construction Machines and Components Thereof, ITC Investigation No. 337-TA-1088	Complainant	ITC Court Testimony, September 25 and 26, 2018, Washington, DC, ALJ: Dee Lord
2019	Weil, Gotshal & Manges LLP	Wilson, Sonsini, Goodrich & Rosati	**Sanofi-Aventis**, Plaintiffs v. Mylan GmbH, Biocon Ltd., Defendant, C.A. No. 17-cv-09105-SRC-CLW	Plaintiff	Markman Hearing Court Testimony, April 12, 2019, Newark, New Jersey

2019	Steptoe & Johnson LLP	Finnegan, Henderson, Farabow, Garrett & Dunner, LLP	**Autel Robotics** v SZ DJI Technology, et. al., In the Matter of Certain Unmanned Aerial Vehicles and Components Thereof, ITC Investigation No. 337-TA-1133	Complainant	Deposition, July 19 and 12, 2019, Washington, DC
2019	Weil, Gotshal & Manges LLP	Wilson, Sonsini, Goodrich & Rosati	**Sanofi-Aventis**, Plaintiffs v. Mylan GmbH, Biocon Ltd., Defendant, C.A. No. 17-cv-09105-SRC-CLW	Plaintiff	Deposition, October 15, 2019, Washington, DC
2019	Steptoe & Johnson LLP	Finnegan, Henderson, Farabow, Garrett & Dunner, LLP	**Autel Robotics** v SZ DJI Technology, et. al., In the Matter of Certain Unmanned Aerial Vehicles and Components Thereof, ITC Investigation No. 337-TA-1133	Complainant	ITC Court Testimony, Oct 21 to 23, 2019, Washington, DC ALJ: Charles Bullock
2019	Kirkland & Ellis, LLP	Gibson Dunn and Finnegan, Henderson, Farabow, Garrett & Dunner, LLP	**iRobot Corp.** v. SharkNinja, Civil Action No. 1:19-cv-12125	Plaintiff	Deposition, October 28, 2019, Washington, DC
2019	Steptoe & Johnson LLP	Finnegan, Henderson, Farabow, Garrett & Dunner, LLP	**Autel Robotics** v SZ DJI Technology, Inter Partes Review, Case IPR2019-00249 and Case IPR2019-00250, Patent 7,979,174 B2	Patent Owner	Deposition, October 31, 2019, Chicago, IL
2019	Steptoe & Johnson LLP	Finnegan, Henderson, Farabow, Garrett & Dunner, LLP	**Autel Robotics** v SZ DJI Technology, Inter Partes Review, Case PGR2019-00016, Patent 10,044,013B2, PGR 2019-00014, Patent 9,979,000, Case IPR2019-00343, Patent 9,260,184 B2	Patent Owner	Deposition, November 15, 2019, Orlando, FL
2019	Weil, Gotshal & Manges LLP	Wilson, Sonsini, Goodrich & Rosati	**Sanofi-Aventis** v. Mylan GmbH, Biocon Ltd., Defendant, C.A. No. 17-cv-09105-SRC-CLW	Plaintiff	Court Testimony, December 2-4, 2019, Newark, NJ
2019	Fish & Richardson P.C	Pepper Hamilton LLP	2019, **Floodbreak, LLC,** Plaintiff, v. Art Metal Industries, LLC, et al., Defendants, No. 3:18-cv-503, United States District Court District of Connecticut, 2019.	Plaintiff	Deposition, December 13, 2019, Bridgeport, CT

2020	Steptoe & Johnson LLP	Finnegan, Henderson, Farabow, Garrett & Dunner, LLP	**Autel Robotics** v SZ DJI Technology, Inter Partes Review, Case IPR2019-00846, Patent 9,260,184 B2	Patent Owner	Deposition, April 3, 2020 (appearing by videoconference from New Smyrna Beach, FL)
2020	Finnegan, Henderson, Farabow, Garrett & Dunner, LLP	Sterne, Kessler, Goldstein & Fox, P.L.L.C	**Caterpillar** v. Wirtgen GmbH, et. al., Modification Proceeding in the Matter of Certain Road Construction Machines and Components Thereof, ITC Investigation No. 337-TA-1088	Complainant	Deposition, May 12, 2020 (appearing by videoconference from New Smyrna Beach, FL)
2020	Steptoe & Johnson LLP	Finnegan, Henderson, Farabow, Garrett & Dunner, LLP	**Autel Robotics** v SZ DJI Technology, Inter Partes Review, Case IPR2019-00846, Patent 9,260,184 B2	Patent Owner	Deposition, June 16, 2020 (appearing by videoconference from New Smyrna Beach, FL)
2020	Fish & Richardson P.C	Davis & Kuelthau, s.c.	Wash World Inc., Plaintiff, v. **Belanger Inc., et al.**, Defendants, Case No.: 19-Cv-1562, United States District Court Eastern District of Wisconsin	Patent Owner	Deposition, December 3, 2020, (appearing by videoconference from Eugene, OR)
2020	Fish & Richardson P.C	Troutman Pepper Hamilton Sanders LLP	**Floodbreak, LLC,** Plaintiff v. A rt Metal Industries, LLC, et al., Defendants, No. 3:18-cv-503, United States District Court District of Connecticut.	Patent Owner	Court Testimony, December 9 & 10, Bridgeport, CT (appearing by videoconference from Florence, OR)
2020	Sterne, Kessler, Goldstein & Fox, P.L.L.C	Willkie Farr & Gallagher LLP	Civil Action No. 5:19-cv-6021	Defendant	Deposition, December 21, 2020, (appearing by videoconference from Moab, UT)
2021	Faegre Drinker Biddle & Reath LLP	RuyakCherian LLP	Team Worldwide Corporation, Plaintiff, v. **Academy, Ltd. D/B/A Academy ports + Outdoors, et al.,** Defendants, Lead Case No. 2:19-cv-00092-JRG-RSP	Defendant	Deposition, January 5 & 6, 2021, (appearing by videoconference from Colorado Springs, CO)

2021	Durie Tangri LLP	Kramer Levin Naftalis & Frankel LLP	Midwest Athletics and Sports Alliance, LLC v. **Xerox Corporation** (represented by Durie Tangri LLP) v Case No. 6:19-CV-06036-EAW-MJP.	Defendant	Deposition, September 20, 2021 (appearing by videoconference from New Smyrna Beach, FL)
2021	Kirkland & Ellis, LLP	Finnegan, Henderson, Farabow, Garrett & Dunner, LLP	**iRobot Corp.** v. SharkNinja, In The Matter of Certain Robotic Floor Cleaning Devices And Components Thereof, ITC Investigation No. 337-TA-1252	Complainant	Deposition, October 6, 2021 (appearing by videoconference from New Smyrna Beach, FL)
2021	Fish & Richardson P.C	Latham & Watkins LLP and Finnegan, Henderson, Farabow, Garrett & Dunner, LLP	AbbVie Inc. and AbbVie Biotechnology Ltd, Plaintiff, v **Alvotech Hf**., Civil Action No. 1:21-cv-2258, United States District Court for the Northern District of Illinois Eastern Division.	Defendant	Deposition, December 6, 2021, (appearing by videoconference from Boulder, CO)
2022	Kirkland & Ellis, LLP	Finnegan, Henderson, Farabow, Garrett & Dunner, LLP	**iRobot Corp.** v. SharkNinja, In The Matter of Certain Robotic Floor Cleaning Devices And Components Thereof, ITC Investigation No. 337-TA-1252	Complainant	ITC Court Testimony, January 6, 7 and 12 (appearing by videoconference from the offices of Kirkland & Ellis, Washington, DC), ALJ: MaryJoan McNamara
2022	Faegre Drinker Biddle & Reath LLP	Crowell & Moring	Wonderland Nurserygoods Co., Ltd., Plaintiff, v. **Baby Trend, Inc**., Denny Tsai and Betty Tsai, Defendants, Case No. 5:14-cv-01153-JWH-SPx	Defendant	Deposition, April 12, 2022, Daytona Beach, FL
2022	Sterne, Kessler, Goldstein & Fox, P.L.L.C	Willkie Farr & Gallagher LLP	Provisur Technologies, Inc., Plaintiff, v. **Weber, Inc., Textor, Inc., et. al.,** United States District Court, Western District of Missouri, St. Joseph Division, Case No. 5:19-CV-06021.	Defendant	Deposition, May 5, 2023, Washington, DC
2022	Fish & Richardson P.C	Davis & Kuelthau, s.c.	Wash World Inc., Plaintiff, v. **Belanger Inc., et al.**, Defendants, Case No.: 19-Cv-1562, United States District Court Eastern District of Wisconsin	Patent Owner and Defendant	Court Testimony, August 2 &3, United States District Court Eastern District of Wisconsin, Green Bay, WI

2022	Faegre Drinker Biddle & Reath LLP	Crowell & Moring	Graco Children's Products Inc. and Wonderland Nurserygoods Co., Ltd. v. **Baby Trend, Inc. et. al**, "In the Matter of Certain Playards and Strollers," ITC Investigation No. 337-TA-1288	Defendant	Deposition, September 27-28, 2022, Indianapolis, Indiana
2022	Sterne, Kessler, Goldstein & Fox, P.L.L.C	Willkie Farr & Gallagher LLP	Provisur Technologies, Inc., Plaintiff, v. **Weber, Inc., Textor, Inc., et. al.,** United States District Court, Western District of Missouri, St. Joseph Division, Case No. 5:19-CV-06021.	Defendant	Court Testimony, October 25 &26, United States District Court, Western District of Missouri, Kansas City
2022	Faegre Drinker Biddle & Reath LLP	Crowell & Moring	Graco Children's Products Inc. and Wonderland Nurserygoods Co., Ltd. v. **Baby Trend, Inc. et. al**., "In the Matter of Certain Playards and Strollers," ITC Investigation No. 337-TA-1288	Respondent	ITC Court Testimony, Washington, DC, December 13-15, 2022, ALJ: Bryan F. Moore
2023	Fish and Richardson	K&L Gates LLP	**Kidde** v. First Alert & BRK, USDC WDTX (CA No. 6:22-00566) Civil Action No. 6:22-cv-411-ADA	Plaintiff	Deposition Testimony, Atlanta, GA, January 4, 2023
2023	Fish and Richardson	Husch Blackwell LLP	MGI Digital Technology S.A v **Duplo U.S.A.**, Case No. 8:22-cv-00979-DOC-KES, District Court for the Central District of California	Defendant	Deposition, March 7, 2023 (appearing by videoconference from New Smyrna Beach, FL)
2023	Fish and Richardson	Morgan, Lewis & Bockius LLP	Persawvere, Inc**., v. Milwaukee Electric** Tool Corporation, C.A. No. 21-cv-00400-GBW	Plaintiff	Deposition Testimony, Wilmington, DE, July 11, 2023
2023	Fish and Richardson	K&L Gates LLP	**Kidde** v. First Alert & BRK, USDC WDTX (CA No. 6:22-00566) Civil Action No. 6:22-cv-411-ADA	Plaintiff	Deposition Testimony, Atlanta, GA, October 28-29, 2023
2023	Fish and Richardson	Husch Blackwell LLP	MGI Digital Technology, v **DUPLO U.S.A. Corp**., Case No. 8:22-CV-00979-DOC-KES	Defendant	Deposition Testimony, November 3, 2023 (appearing by videoconference from New Smyrna Beach, FL)

2023	Fish and Richardson	Morgan, Lewis & Bockius LLP	Persawvere, Inc**., v. Milwaukee Electric** Tool Corporation, C.A. No. 21-cv-00400-GBW	Plaintiff	Court Testimony, Wilmington, DE, December 5-8, 2023
2024	Fish and Richardson	Husch Blackwell LLP	MGI Digital Technology, v **DUPLO U.S.A. Corp**., Case No. 8:22-CV-00979-DOC-KES	Defendant	Court testimony, February 6-9, 2024, US District S. District of Central California, Judge David O. Carter
2024	Knobbe, Martens, Olson & Bear, LLP and Katten Muchin Rosenman LLP	Fenwick and West, LLP	Novo Nordisk Inc. v **Orbicular Pharmaceutical and Biocon**, C.A. No.: 22-856 (Cfc)	Defendant	Deposition, Charlotte, North Carolina, February 27, 2024
2024	Fish and Richardson	Morgan, Lewis & Bockius LLP	Persawvere, Inc**., v. Milwaukee Electric** Tool Corporation, C.A. No. 21-cv-00400-GBW	Plaintiff	Court Testimony, Wilmington, DE, March 6, 2024