

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

RAVIN CROSSBOWS, LLC
Petitioner

v.

MCP IP, LLC
Patent Owner

Inter Partes Review Case No. IPR2024-00522

U.S. Patent No. 8,683,989

DECLARATION OF JOSHUA LANGE, P.E.

TABLE OF CONTENTS

I.	INTRODUCTION	13
A.	BACKGROUND AND QUALIFICATIONS	14
B.	MATERIALS CONSIDERED	16
II.	LEGAL FRAMEWORK.....	17
A.	ANALOGOUS ART	17
B.	OBVIOUSNESS	17
C.	SECONDARY CONSIDERATIONS OF NON-OBVIOUSNESS	23
III.	CLAIM CONSTRUCTION.....	24
IV.	OPINIONS REGARDING LEVEL OF SKILL OF A PERSON HAVING ORDINARY SKILL IN THE ART	24
V.	BACKGROUND OF TECHNOLOGY	26
A.	COMPOUND BOWS	26
VI.	OPINIONS REGARDING THE '989 PATENT AND PRIOR ART 30	
A.	DESCRIPTION OF THE ALLEGED INVENTION OF THE '989 PATENT	31
B.	OPINIONS REGARDING <i>DARLINGTON</i>	32
C.	OPINIONS REGARDING <i>ISLAS</i>	33
VII.	GROUND 1: OPINIONS REGARDING THE COMBINATION OF <i>DARLINGTON</i> AND <i>ISLAS</i>	34
A.	CLAIM 1	34
1.	<i>Claim 1(Pre): "An archery bow having a brace condition and a drawn condition, the archery bow comprising:"</i>	<i>34</i>
2.	<i>Claim 1(a): "a riser; a first limb and second limb supported by the riser;" 35</i>	
3.	<i>Claim 1(b)(i): "a first rotatable member supported by the first limb on a first axle, a second rotatable member supported by the second limb on a second axle,"</i>	<i>36</i>

4. Claim 1(b)(ii): “the first rotatable member comprising a drawstring track, 39
5. Claim 1(b)(iii): “[the first rotatable member comprising] a cam track” 41
6. Claim 1(b)(iv): “[the first rotatable member comprising] a capstan and a terminal” 46
7. Claim 1(b)(v): “wherein said drawstring track is oriented in a first cam plane and said cam track is oriented in a second cam plane offset from said first cam plane;” 47
8. Claim 1(c): “a drawstring extending between the first rotatable member and the second rotatable member;” 49
9. Claim 1(d)(i): “a power cable attached to said terminal and extending toward the second limb,” 50
10. Claim 1(d)(ii): “said power cable comprising an elongate straight portion located near said first rotatable member, a capstan portion in contact with said capstan and a terminal portion in contact with said terminal;” 51
11. Claim 1(e): “wherein, in the brace condition, the power cable wraps around the capstan in a first rotational direction as the power cable is traversed from the elongate straight portion to the terminal portion; and” ..53

12. Claim 1(f): “when the bow is drawn from the brace condition, the first rotatable member rotates in a second rotational direction that is opposite the first rotational direction and” 55
13. Claim 1(g): “wherein, in the brace condition, the elongate straight portion defines a plane, wherein said first axle and said terminal are located on opposite sides of said plane.” 69
14. Claim 2: “The archery bow of claim 1, wherein, in the brace condition, the power cable is not oriented in said cam track.” 71
15. Claim 3: “The archery bow of claim 1, wherein a distance between the first axle and the terminal is greater than a distance between the first axle and the cam track.” 71
16. Claim 4: “The archery bow of claim 1, wherein at least a portion of said cam track comprises a module that is attached to said first rotatable member.” 74
- Claim 7: “The archery bow of claim 4, wherein said module is interchangeable with a second module having a different shape.” 74
17. Claim 8: “The archery bow of claim 1, further comprising a second power cable, said second rotatable member comprising a second cam track, a second capstan and a second terminal, the second power cable attached to said second terminal and extending toward the first limb, said second power

cable comprising a second elongate straight portion located near said second rotatable member, a second capstan portion in contact with said second capstan and a second terminal portion in contact with said second terminal; wherein, in the brace condition, the second power cable wraps around the second capstan in the second rotational direction as the second power cable is traversed from the second elongate straight portion to the second terminal portion; and when the bow is drawn from the brace condition, the second rotatable member rotates in the first rotational direction.” 76

18. *Claim 10: “The archery bow of claim 1, wherein said first rotatable member comprises an outer peripheral structure, said terminal located on said outer peripheral structure.” 81*

19. *Claim 11(Pre): “An archery bow having a brace condition and a drawn condition, the archery bow comprising:” 85*

20. *Claim 11(a): “a riser; a first limb and second limb supported by the riser;” 85*

21. *Claim 11(b)(i): “a first rotatable member supported by the first limb on a first axle, a second rotatable member supported by the second limb on a second axle,” 85*

22. *Claim 11(b)(ii): “the first rotatable member comprising a drawstring track, a cam track, a capstan and a terminal,” 85*

23. *Claim 11(b)(iii): “wherein said drawstring track is oriented in a first cam plane and said cam track is oriented in a second cam plane offset from said first cam plane;” 86*
24. *Claim 11(c): “a drawstring extending between the first rotatable member and the second rotatable member;” 86*
25. *Claim 11(d)(i): “a power cable attached to said terminal and extending toward the second limb,” 86*
26. *Claim 11(d)(ii): “said power cable comprising an elongate straight portion located near said first rotatable member, a capstan portion in contact with said capstan and a terminal portion in contact with said terminal;” 86*
27. *Claim 11(e): “wherein, in the brace condition, the power cable wraps around the capstan in a first rotational direction as the power cable is traversed from the elongate straight portion to the terminal portion; and” ..86*
28. *Claim 11(f): “when the bow is drawn from the brace condition, the first rotatable member rotates in a second rotational direction that is opposite the first rotational direction and” 86*
29. *Claim 11(g): “wherein, in the drawn condition, the capstan is located closer to the elongate straight portion than the terminal.” 86*
30. *Claim Claim 12(Pre): “An archery bow having a brace condition and a drawn condition, the bow comprising:” 89*

31. Claim 12(a): “a riser; a first limb and second limb supported by the riser;” 89
32. Claim 12(b)(i): “a first rotatable member supported by the first limb on a first axle, a second rotatable member supported by the second limb on a second axle,” 89
33. Claim 12(b)(ii): “the first axle and the second axle defining an axle plane,” 89
34. Claim 12(b)(iii): “the first rotatable member comprising a drawstring track, a cam track, a capstan and a terminal,” 92
35. Claim 12(b)(iv): “wherein said drawstring track is oriented in a first cam plane and said cam track is oriented in a second cam plane offset from said first cam plane;” 92
36. Claim 12(c)(i): “a drawstring extending between the first rotatable member and the second rotatable member, ...92
37. Claim 12(c)(ii): “the drawstring extending from the first rotatable member at an exit location;” 92
38. Claim 12(d)(i): “a power cable attached to said terminal and extending toward the second limb,” 94

39. *Claim 12(d)(ii): “said power cable comprising a capstan portion in contact with said capstan and a terminal portion in contact with said terminal;” 94*
40. *Claim 12(e)(i): “wherein, in the brace condition, the axle plane divides the first rotatable member to a first part and a second part, the capstan and the terminal located in the first part, the drawstring exit location located in the second part, and” 94*
41. *Claim 12(e)(ii): “a distance between the terminal and the axle plane is greater than a distance between the capstan and the axle plane and” 96*
42. *Claim 12(f)(i): “wherein, in the brace condition, said power cable comprises an elongate straight portion located near said first rotatable member,” 97*
43. *Claim 12(f)(ii): “the elongate straight portion defines a cable portion plane, said first axle and said terminal are located on opposite sides of said cable portion plane.....99*
44. *Claim 13 “The archery bow of claim 12, wherein said distance between the terminal and the axle plane is measured orthogonal to said axle plane, and said distance between the capstan and the axle plane is measured orthogonal to said axle plane.” 99*

45. Claim 14 *“The archery bow of claim 12, wherein a distance between the first axle and the terminal is greater than a distance between the first axle and the cam track.”* 100
46. Claim 15: *“The archery bow of claim 12, wherein, in the brace condition, the power cable is not oriented in said cam track.”* 100
47. Claim 16: *“The archery bow of claim 12, wherein at least a portion of said cam track comprises a module that is attached to said first rotatable member, the module being removable or repositionable.”* 100
48. Claim 17 (a): *“The archery bow of claim 12, further comprising: a second power cable, said second rotatable member comprising a second cam track, a second capstan and a second terminal,”* 100
49. Claim 17(b): *“the second power cable attached to said second terminal and extending toward the first limb,”* 101
50. Claim 17(c)(i): *“said second power cable comprising a second capstan portion in contact with said second capstan and a second terminal portion in contact with said second terminal,”* 101
51. Claim 17(c)(ii): *“the drawstring extending from the second rotatable member at a second exit location;”* 101
52. Claim 17(d): *“wherein, in the brace condition, the axle plane divides the second rotatable member to a first part and a second part, the second*

capstan and the second terminal located in the first part, the second drawstring exit location located in the econd part, and a distance between the second terminal and the axle plane is greater than a distance between the second capstan and the axle plane.” 102

53. *Claim 18: “The archery bow of claim 17, wherein said second rotatable member comprises a mirror image of said first rotatable member.”*
102

54. *Claim 19 (Pre): “An archery bow having a brace condition and a drawn condition, the bow comprising:” 102*

55. *Claim 19(a): “a riser; a first limb and second limb supported by the riser;” 102*

56. *Claim 19(b)(i): “a first rotatable member supported by the first limb on a first axle, a second rotatable member supported by the second limb on a second axle,” 103*

57. *Claim 19(b)(ii): “the first axle and the second axle defining an axle plane,” 103*

58. *Claim 19(b)(iii): “the first rotatable member comprising a drawstring track, a cam track, a capstan and a terminal,” 103*

59. *Claim 19(b)(iv): “wherein said drawstring track is oriented in a first cam plane and said cam track is oriented in a second cam plane offset from said first cam plane;” 103*
60. *Claim 19(c): “a drawstring extending between the first rotatable member and the second rotatable member, the drawstring extending from the first rotatable member at an exit location;” 103*
61. *Claim 19(d): “a power cable attached to said terminal and extending toward the second limb, said power cable comprising a capstan portion in contact with said capstan and a terminal portion in contact with said terminal;” 103*
62. *Claim 19(e): “wherein, in the brace condition, the axle plane divides the first rotatable member to a first part and a second part, the capstan and the terminal located in the first part, the drawstring exit location located in the second part, and a distance between the terminal and the axle plane is greater than a distance between the capstan and the axle plane and” 103*
63. *Claim 19(f)(i): “wherein, in the drawn condition, said power cable comprises an elongate straight portion located near said first rotatable member,” 104*
64. *Claim 19(f)(ii): “[wherein, in the drawn condition,] the capstan is located closer to the elongate straight portion than the terminal.” 106*

VIII.	CONCLUSION	107
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I, Joshua D. Lange, hereby declare the following:

I. INTRODUCTION

1. My name is Joshua Lange, and I am over 21 years of age and otherwise competent to make this Declaration. I make this Declaration based on facts and matters within my own knowledge and on information provided to me by others, and, if called as a witness, I could and would competently testify to the matters set forth herein.

2. I have been retained as a technical expert witness in this matter by Counsel for the Petitioner, Ravin Crossbows, LLC (“Petitioner”) to provide my independent opinions on certain issues requested by Counsel for Petitioner relating to the accompanying Petition for Inter Partes Review of U.S. Patent No. 8,683,989 (“the ’989 Patent”). I am being compensated at an hourly rate of \$400.00. My compensation in this matter is not based on the substance of my opinions or on the outcome of this matter. I have been informed that MCP IP, LLC is the purported owner of the ’989 Patent. I note that I have no financial interest in MCP IP, LLC or Petitioner, and I have no other interest in the outcome of this matter.

3. I have been informed by counsel that the claims being challenged in the accompanying Petition for the ’989 Patent are Claims 1-4 and 7-19 (“the Challenged Claims of the ’989 Patent”).

A. Background and Qualifications

4. I have summarized in this section my educational background, career history, and other qualifications relevant to this matter. I have also included a current version of my curriculum vitae, attached as Appendix B.

5. I am currently a Principal Engineer at EIS Forensic where I perform forensic analysis of mechanical systems, including the evaluation of mechanical component failures as related to product liability, industrial equipment accidents/failures and shooting sports accident reconstructions.

6. I earned a Bachelor of Science Degree in Mechanical Engineering at the University of Utah (2005) with an emphasis of study in the area of solid mechanics followed by a Master of Science in Engineering with an emphasis in thermodynamics from the University of Arkansas in 2019. I obtained a professional engineering license in Utah in 2012. I am currently licensed as a professional engineer ("P.E.") in 20 states.

7. In 2005, I began working as a Product Development Engineer for Hoyt Archery in Salt Lake City, Utah. Hoyt manufactures recurve and compound archery bows and related accessories. During my time at Hoyt, I designed a variety of products including: recurve and compound bow handles made of cast magnesium and machined aluminum, limb pockets systems, cam systems, and various accessories. The majority of my time with Hoyt was spent studying and developing

compound bow cam systems. While at Hoyt, I spent time at various archery trade shows and field venues investigating and evaluating competitor products. I performed laboratory-tests on competitor products to understand new developments and evaluate performance. I studied the teachings of various archery related patents to understand prior art and to avoid potential infringement when developing new product designs. I was engaged in all aspects of cam system product development and developed system innovations. I worked on cosmetic designs, created computer-aided design (CAD) drawings and solid models, and performed finite element analyses to model the structural performance of cams. Additionally, I programmed and operated computer numeric control (CNC) milling machines to create prototype cams, built test bow/cam assembly platforms, and performed laboratory testing for durability, arrow speed, vibration, sound, energy storage and efficiency.

8. I personally designed two hybrid cam system product lines: the 2007 Reflex FX Cam and the 2008 Hoyt Cam & ½ Plus. The Reflex FX cam was designed for a parallel limb hunting compound bow platform. The Cam & ½ Plus was available on various compound target bows.

9. I am being compensated for my time spent in connection with this case. I have no financial interest in the outcome of this case. The opinions provided in this report are my own and my compensation does not depend in any way on the substance of my opinions.

10. Based on my experiences described above, and as indicated in my Curriculum Vitae, I am qualified to provide the following opinions with respect to the patents in this case. Additionally, I was at least a person having ordinary skill in the art as of the priority date of the '989 Patent.

B. Materials Considered

11. As part of my work and in forming my opinions in connection with this proceeding, I have reviewed the following materials. For any prior art listed below, it is my opinion persons of ordinary skill in my field would reasonably rely upon such prior art in forming opinions regarding the subject matter of this proceeding:

- Petition for *Inter Partes* Review of U.S. Patent No. 8,683,989 (the "Petition");
- U.S. Patent No. 8,683,989 B1 to McPherson ("McPherson") (Ex.1001)
- File History of U.S. Patent No. 8,683,989 ("989 File History") (Ex. 1002)
- U.S. Patent No. 8,205,607 B1 to Darlington ("Darlington") (Ex. 1004)
- U.S. Patent Application Publication No. 2008/0135032 A1 to Islas ("Islas") (Ex. 1005)
- U.S. Patent No. 6,470,870 B1 to Schaar ("Schaar") (Ex. 1006)
- Browning Compound Bow User Guide ("Browning Manual") (Ex. 1007)
- Bear Archery Owner's Manual ("Bear Manual") (Ex. 1008)
- U.S. Patent Application Publication No. 2010/0154769 A1 to Grace, Jr. ("Grace") (Ex. 1009)
- U.S. Patent No. 7,997,259 B2 to Wilson ("Wilson") (Ex. 1010)
- U.S. Patent Application Publication No. 2009/0288650 A1 to Batdorf ("Batdorf") (Ex. 1011)
- Diamond Archery Nuclear Ice Instructions ("Diamond Manual") (Ex. 1012)

II. LEGAL FRAMEWORK

12. I am a technical expert and do not offer any legal opinions. However, I have been informed about certain legal principles regarding patentability and related matters under United States patent law, which I have applied in performing my analysis and arriving at my technical opinions in this matter.

A. Analogous Art

13. I have been informed by counsel that for prior art to be used to establish the unpatentability of a patent based on obviousness, the prior art must be “analogous art” to the claimed invention. I have also been informed by counsel that a prior art reference is analogous art to the claimed invention if: (1) the reference is from the same field of endeavor as the claimed invention, even if it addresses a different problem; or (2) the reference is reasonably pertinent to the problem faced by the invention, even if it is not in the same field of endeavor as the claimed invention.

B. Obviousness

14. I have been informed that a person cannot obtain a patent on an invention if the differences between the invention and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art (“PHOSITA”). I have been informed that a conclusion of obviousness may be founded upon more than a single item of prior art. I have been further informed that obviousness is determined by evaluating the following factors: (1) the scope and content of the prior art, (2) the differences

between the prior art and the claim at issue, (3) the level of ordinary skill in the pertinent art, and (4) secondary considerations of non-obviousness. In addition, the obviousness inquiry should not be done in hindsight. Instead, the obviousness inquiry should be done through the eyes of a PHOSITA at the time of the alleged invention.

15. In considering whether certain prior art renders a particular patent claim obvious, I have been informed that I can consider the scope and content of the prior art, including the fact that one of skill in the art would regularly look to the disclosures in patents, trade publications, journal articles, conference papers, industry standards, product literature and documentation, texts describing competitive technologies, requests for comment published by standard setting organizations, and materials from industry conferences, as examples. I have been informed that for a prior art reference to be proper for use in an obviousness analysis, the reference must be “analogous art” to the claimed invention. In order for a reference to be “reasonably pertinent” to the problem, it must logically have commended itself to an inventor's attention in considering his problem. In determining whether a reference is reasonably pertinent, one should consider the problem faced by the inventor, as reflected either explicitly or implicitly, in the specification. I believe that all of the references I considered in forming my opinions

in this IPR are well within the range of references a PHOSITA would have consulted to address the type of problems described in the Challenged Claims.

16. I have been informed that, in order to establish that a claimed invention was obvious based on a combination of prior art elements, a clear articulation of the reason(s) why a claimed invention would have been obvious must be provided. Specifically, I am informed that, under the U.S. Supreme Court's KSR decision, a combination of multiple items of prior art renders a patent claim obvious when there was an apparent reason for one of ordinary skill in the art, at the time of the invention, to combine the prior art, which can include, but is not limited to, any of the following rationales: (A) combining prior art methods according to known methods to yield predictable results; (B) substituting one known element for another to obtain predictable results; (C) using a known technique to improve a similar device in the same way; (D) applying a known technique to a known device ready for improvement to yield predictable results; (E) trying a finite number of identified, predictable potential solutions, with a reasonable expectation of success; (F) identifying that known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations are predictable to one of ordinary skill in the art; or (G) identifying an explicit teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine

the prior art references to arrive at the claimed invention. I am also informed that where there is a motivation to combine, claims may be rejected as prima facie obvious provided a PHOSITA would have had a reasonable expectation of success regarding the proposed combination.

17. I am informed that the existence of an explicit teaching, suggestion, or motivation to combine known elements of the prior art is a sufficient, but not a necessary, condition to a finding of obviousness. This so-called “teaching-suggestion-motivation” test is not the exclusive test and is not to be applied rigidly in an obviousness analysis. In determining whether the subject matter of a patent claim is obvious, neither the particular motivation nor the avowed purpose of the patentee controls. Instead, the important consideration is the objective reach of the claim. In other words, if the claim extends to what is obvious, then the claim is invalid. I am further informed that the obviousness analysis often necessitates consideration of the interrelated teachings of multiple patents, the effects of demands known to the technological community or present in the marketplace, and the background knowledge possessed by a person having ordinary skill in the art. All of these issues may be considered to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent.

18. I also am informed that in conducting an obviousness analysis, a precise teaching directed to the specific subject matter of the challenged claim need not be

sought out because it is appropriate to take account of the inferences and creative steps that a PHOSITA would employ. The prior art considered can be directed to any need or problem known in the field of endeavor at the time of invention and can provide a reason for combining the elements of the prior art in the manner claimed. In other words, the prior art need not be directed towards solving the same specific problem as the problem addressed by the patent. Further, the individual prior art references themselves need not all be directed towards solving the same problem. I am informed that, under the KSR obviousness standard, common sense is important and should be considered. Common sense teaches that familiar items may have obvious uses beyond their primary purposes.

19. I also am informed that the fact that a particular combination of prior art elements was “obvious to try” may indicate that the combination was obvious even if no one attempted the combination. If the combination was obvious to try (regardless of whether it was actually tried) or leads to anticipated success, then it is likely the result of ordinary skill and common sense rather than innovation. I am further informed that in many fields it may be that there is little discussion of obvious techniques or combinations, and it often may be the case that market demand, rather than scientific literature or knowledge, will drive the design of an invention. I am informed that an invention that is a combination of prior art must do more than yield predictable results to be non-obvious.

20. I am informed that for a patent claim to be obvious, the claim must be obvious to a PHOSITA at the time of the alleged invention. I am informed that the factors to consider in determining the level of ordinary skill in the art include (1) the educational level and experience of people working in the field at the time the invention was made, (2) the types of problems faced in the art and the solutions found to those problems, and (3) the sophistication of the technology in the field.

21. I am informed that it is improper to combine references where the references teach away from their combination. I am informed that a reference may be said to teach away when a PHOSITA, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the patent applicant. In general, a reference will teach away if it suggests that the line of development flowing from the reference's disclosure is unlikely to be productive of the result sought by the patentee. I am informed that a reference teaches away, for example, if (1) the combination would produce a seemingly inoperative device, or (2) the references leave the impression that the product would not have the property sought by the patentee. I also am informed, however, that a reference does not teach away if it merely expresses a general preference for an alternative invention but does not criticize, discredit, or otherwise discourage investigation into the invention claimed.

C. Secondary Considerations of Non-Obviousness

22. I am informed that even if a prima facie case of obviousness is established, the final determination of obviousness must also consider “secondary considerations” if presented. In most instances, the patentee raises these secondary considerations of non-obviousness. In that context, the patentee argues an invention would not have been obvious in view of these considerations, which include: (a) commercial success of a product due to the merits of the claimed invention; (b) a long-felt, but unsatisfied need for the invention; (c) failure of others to find the solution provided by the claimed invention; (d) deliberate copying of the invention by others; (e) unexpected results achieved by the invention; (f) praise of the invention by others skilled in the art; (g) lack of independent simultaneous invention within a comparatively short space of time; (h) teaching away from the invention in the prior art.

23. I am further informed that secondary-considerations evidence is only relevant if the offering party establishes a connection, or nexus, between the evidence and the claimed invention. The nexus cannot be based on prior art features. The establishment of a nexus is a question of fact. While I understand that the Patent Owner here has not offered any secondary considerations at this time, I will supplement my opinions in the event that the Patent Owner raises secondary considerations during the course of this proceeding.

III. CLAIM CONSTRUCTION

24. I have been informed by counsel that the first step in an unpatentability analysis involves construing the claims, as necessary, to determine their scope. Second, the construed claim language is then compared to the disclosures of the prior art. I am informed that claims are generally given their ordinary and custom meaning as understood by one of ordinary skill in the art at the time of the invention, in light of the patent specification.

IV. OPINIONS REGARDING LEVEL OF SKILL OF A PERSON HAVING ORDINARY SKILL IN THE ART

25. I was asked to provide my opinion as to the level of skill of a person having ordinary skill in the art (“PHOSITA”) of the ’989 Patent at the time of the claimed invention, which I have been instructed to assume is September 30, 2009. In determining the characteristics of a hypothetical person of ordinary skill in the art of the ’989 Patent at the time of the claimed invention, I was told to consider several factors, including the type of problems encountered in the art, the solutions to those problems, the rapidity with which innovations are made in the field, the sophistication of the technology, and the education level of active workers in the field. I also placed myself back in the time frame of the claimed invention and considered the colleagues with whom I had worked at that time.

26. In my opinion, a person having ordinary skill in the art of the ’989 Patent at the time of its filing would have had (i) a Bachelor of Science degree in

mechanical engineering, materials science, or a similar technical field; (ii) a working knowledge of and/or experience with projectile weapon (e.g., archery bow) operation and performance; and (iii) two to four years of experience with designing and manufacturing of consumer products. Additional industrial experience or technical training may offset less formal education, while advanced degrees or additional formal education may offset lesser levels of industry experience. Such a person of ordinary skill in the art would have been capable of understanding the '989 Patent and the prior art references discussed herein.

27. Based on my education, training, and professional experience in the field of the claimed invention, I am familiar with the level and abilities of a person of ordinary skill in the art at the time of the claimed invention. Additionally, I met at least these minimum qualifications to be a person having ordinary skill in the art at least as of September 30, 2009. Further, although my qualifications may exceed those of the hypothetical person having ordinary skill in the art defined above, my analysis and opinions regarding the '989 Patent have been rendered from the perspective of a person having ordinary skill in the art at the time of the invention.

28. My opinions provided in this Declaration are made as of the priority date of the '989 Patent, unless expressly stated otherwise. To the extent that any verb tense used in this Declaration or any deposition or testimony provided in this matter is a present tense, e.g., "would understand," such verb tense should be understood to

be my opinion as of the '989 Patent's priority date (again, unless expressly stated otherwise).

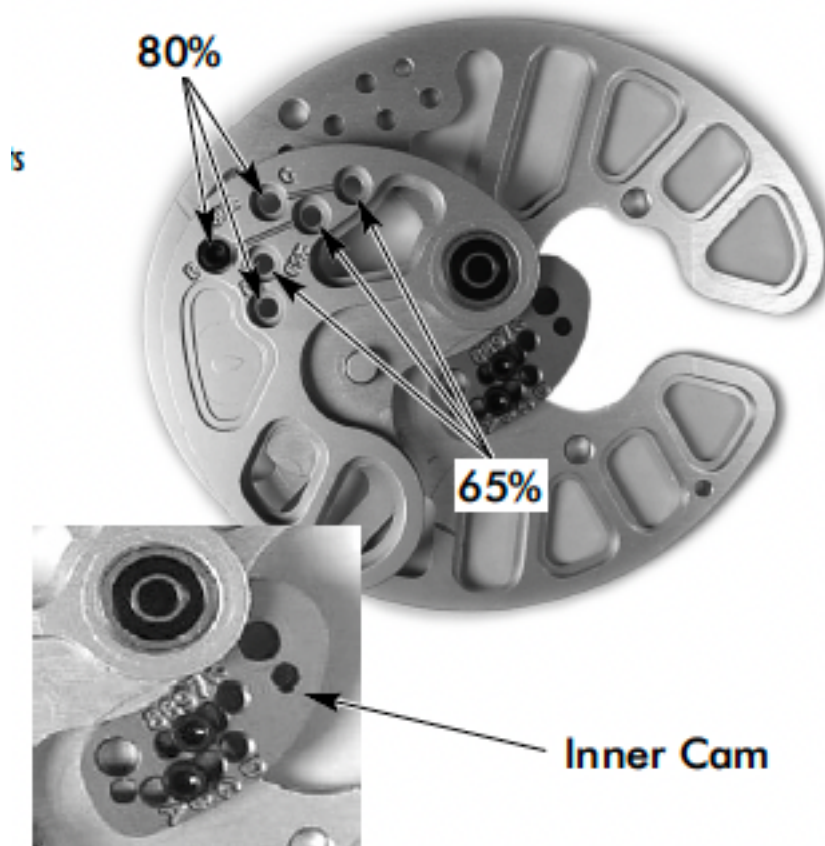
V. BACKGROUND OF TECHNOLOGY

29. I was asked to briefly summarize the background of the technology from the standpoint of a PHOSITA prior to September 30, 2009.

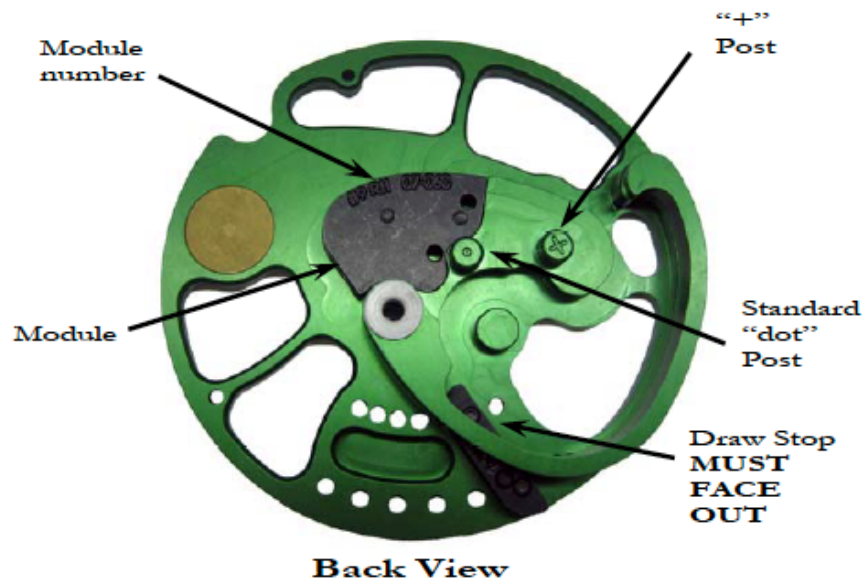
A. Compound Bows

30. Compound bows provide mechanical advantage through use of pulleys (or "rotatable members," as described and claimed by the '989 Patent) mounted at the ends of one or both limbs. *See, e.g. Schaar* (Ex. 1006), 1:40-60; *Wilson* (Ex. 1010), 1:17-27. Often, compound bows employ cables wrapped within grooves to provide energy storage. *Schaar*, 2:2-19. A primary motivation amongst designers and manufacturers of compound bows is ensuring the safety of the archer, as serious injury could occur if the bow components (cables, pulleys, etc.) fail. *See, e.g. Schaar*, 18:45-52, 54:48-52; *Browning Manual* (Ex. 1007), 4; *Bear Manual* (Ex. 1008), 11. Another well-known motivation amongst PHOSITAs in the field of compound bows at the time of the '989 Patent was increasing the speed at which an arrow is fired, contributing to its accuracy and lethality. *Schaar*, 16:10-53; *Grace*, [0004], [0012]; *Wilson*, 1:28-32. Often, power cables at the time of the '989 Patent were managed by employing grooves or tracks on the pulley in which the power cables would be located. *Schaar*, 6:28-36 (describing undesirable noise caused by

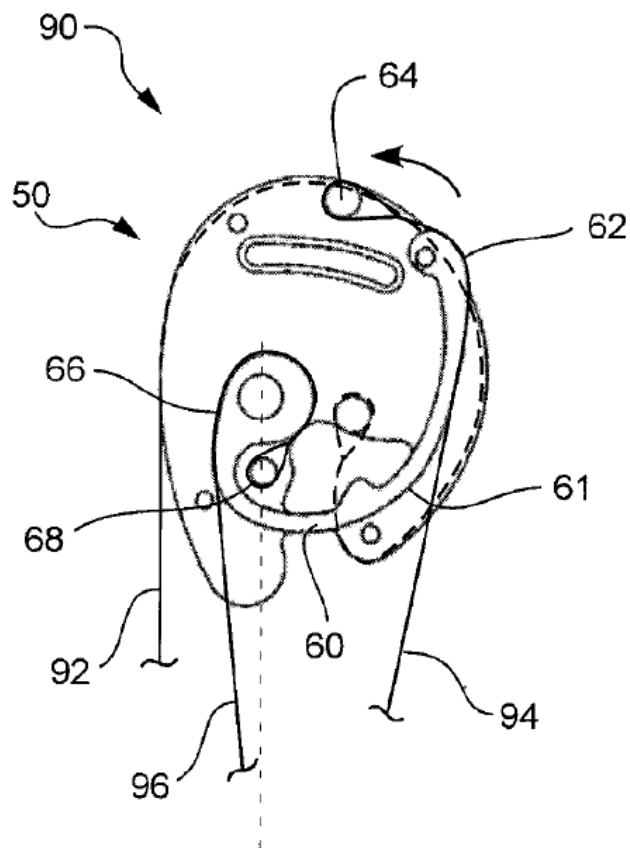
cable contact), 7:4-15 (further describing “deplorable” accuracy caused by cable contact), 29:65-67. Examples of such “cam tracks,” as they are named in the ’989’s claims, can be seen below in figures taken from the Browning Manual, Bear Manual, and *Batdorf* (Ex. 1011), respectively.



Browning Manual, p. 8.



Bear Manual, p. 15.



Batdorf, Fig. 3 (excerpt), [0047].

31. Power cables are anchored to pulleys by an “anchor” or “terminal.” *See, e.g. Batdorf*, Fig. 3, [0047] (describing and illustrating “anchor point 64”); *Wilson*, 2:60-3:23 (describing and illustrating “anchors” of Figs 1, 2, and 6); *Nuclear Ice Manual*, 2 (describing and illustrating an anchoring “cable post”). Some bows opt to wrap power cables around static posts near their anchors, serving to both redirect the power cables and to manage the stresses transmitted to the anchor. *See, e.g. Nuclear Ice Manual*, 3 (describing and illustrating a “directional post”); *Darlington*, Fig. 4D, 3:65-4:6, Figs. 4B-4C, 5A-C.

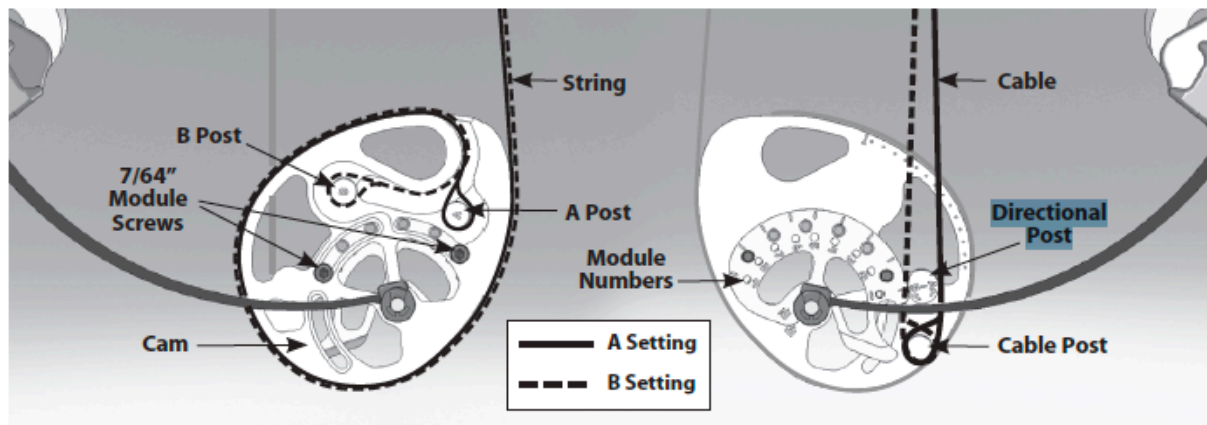
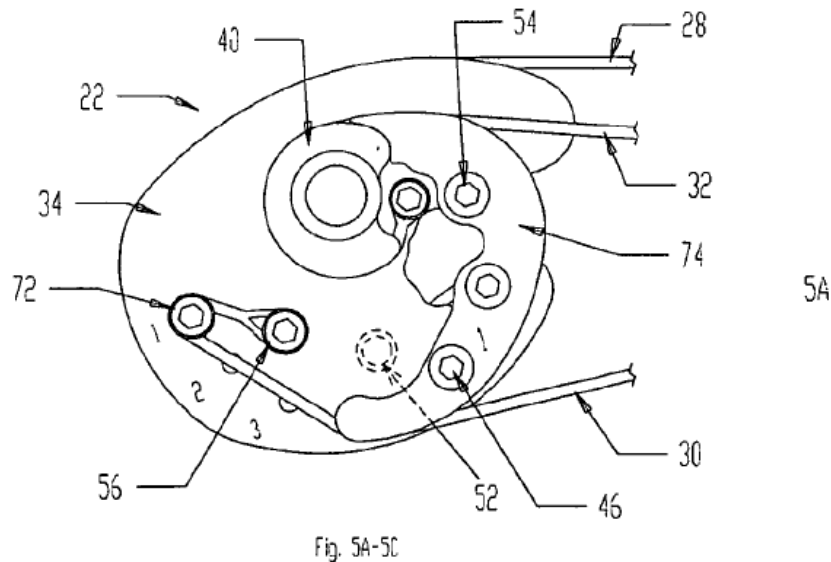


Figure 2. The Nuclear Ice bottom cam, (both sides).

Nuclear Ice Manual, Fig. 2 (annotated).



Darlington, Fig. 5A (illustrating intermediate post 72, a capstan). The '989 Patent refers to such a post for redirecting a power cable as a “capstan[,]” a term often used in nautical applications for similar structures that wind ropes or chains around a shaft.

32. Accordingly, a PHOSITA would have been well aware of the above-described state of the art as of September 30, 2009.

VI. OPINIONS REGARDING THE '989 PATENT AND PRIOR ART

33. I have been asked to review and provide my opinion as to unpatentability of at least some of the Challenged Claims of the '989 Patent. In my opinion, the below-discussed combinations of references teach or at least render obvious each of the Challenged Claims of the '989 Patent. A summary of the

mappings from each of these references to the claim language of the '989 Patent is provided below for reference as Appendix A.

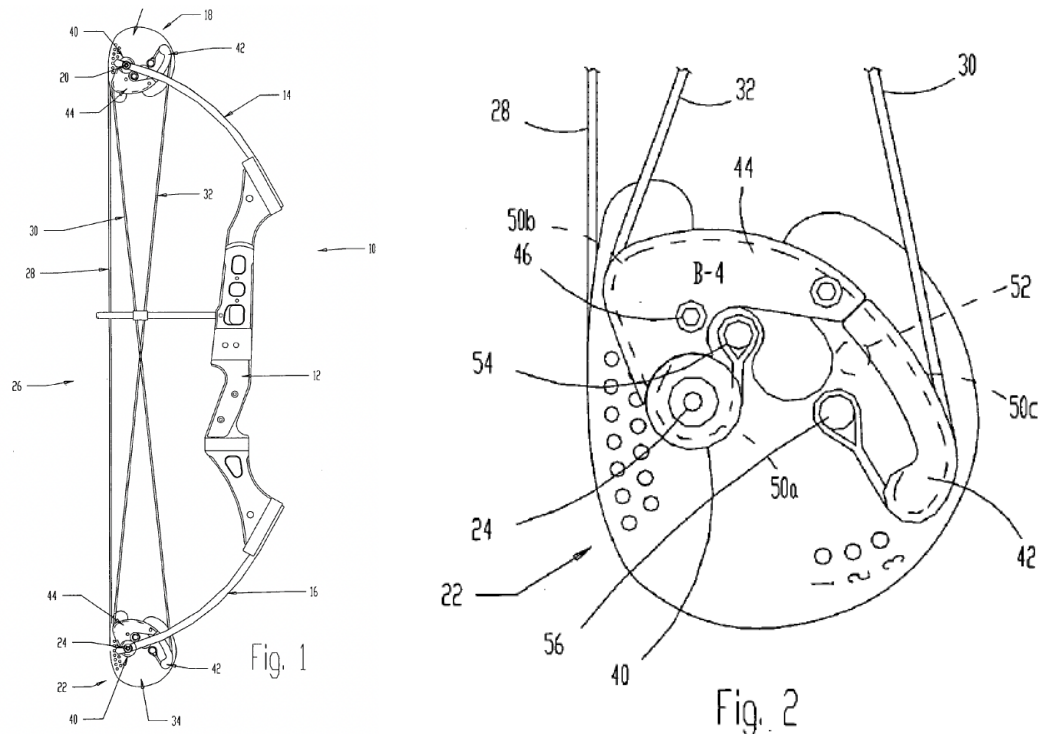
A. Description of the Alleged Invention of the '989 Patent

34. The independent claims of the '989 Patent generally claim physical components of a compound bow including cams, power cables, capstans, terminals, and cam tracks. These hardware components were well-known, commercially-available, and documented prior to the priority date of the '989 Patent, as discussed above in my Background of the Technology Section.

35. Additionally, the '989 claims particular arrangements of these known hardware components. Specifically, claim 1 of the '989 Patent specifies that the power cable wraps around the capstan in a rotational direction opposite to the rotational direction the cam rotates when the bow is drawn. *Infra*, Claim 1. This dynamic behavior of the power cables as a bow is drawn is a consequence of the underlying construction of the bow's cams and power cables, which are arranged such that the power cable rotates around the capstan outward, away from the center of the cam and towards its periphery. Each of the other independent claims similarly recite consequences of this particular arrangement of the bow's cams, power cables, capstans, cam tracks, and terminals. As will be discussed below, this arrangement, as well as each of the particular hardware components recited, were known in the art prior to the '989 Patent.

B. Opinions Regarding *Darlington*

36. *Darlington* describes a compound archery bow with “first and second pulleys mounted on the limbs for rotation around respective axes.”



Darlington, Figs. 1-2, Abstract, 1:3-9, 2:32-42, Claim 1. Like the '989 Patent, *Darlington* provides rotatable members that contact a bowstring and rotate when the bow is drawn having power cables that wrap around cam structures and are anchored at a terminal. *See Infra*, Claim 1(b)(i)-1(b)(iv). Thus, each of the '989 Patent and *Darlington* are in the field of compound archery bows.

37. Further, *Darlington* is reasonably pertinent to problems that the '989 Patent addresses, such as a desire to provide a more adjustable bow for differing users and applications. *Compare '989 Patent*, 1:23-25, with *Darlington*, 3:52-59

(describing the interchangeable draw length modules of Figures 2-4, noting “that modules 48 can be replaced by an associated pair of modules 60 or 62 or 64 to adjust the draw length of the bow without having to disassemble the cam or the bow.”), 4:1-6 (discussing adjusting the effective length of power cable 30 moving intermediate post 72). A PHOSITA would have recognized that each of the ’989 Patent and *Darlington* sought to efficiently and safely manage the complicated power cables under high tension at the rotating cams of compound archery bows in a manner that afforded adjustability.

C. Opinions Regarding *Islas*

38. *Islas* teaches a compound bow cam structure, like the ’989 Patent, that may have configurable draw characteristics. *Compare Islas*, Abstract, [0002], [0006-0008], *with ’989 Patent*, 1:12-14, (stating the “invention relates generally to archery bows and more specifically to a cam configuration suitable for use in bows, such as a compound bow”), 3:18-25, (“FIG. 7 shows an embodiment of a compound archery bow 50” having two cams), 3:26-39. Thus, the ’989 Patent and *Islas* are in the same field.

39. *Islas* is applicable to problems the ’989 Patent addresses, such as allowing users to adjust aspects of the bow “such as draw weight and draw length” that may be programmed to the size, strength, and/or preferences of the user. *Compare ’989 Patent*, 1:16-22, *with Islas*, [0002] (stating *Islas* is “directed to the

field of archery, and more specifically to compound bows of the type employing cams and control cables to achieve a programmed draw weight, and the latter being variable with draw length” and “particularly concerned with improvements to such compound bows which make the bows more compact and streamlined, and which permit the archer to select the bow’s draw characteristic, and which increases the bow’s shooting performance.”), [0006]-[0008]. Thus, a PHOSITA would have recognized that each of the ’989 Patent and *Islas* sought to efficiently and safely manage the complicated power cables under high tension at the rotating cams of compound archery bows in a manner that afforded adjustability.

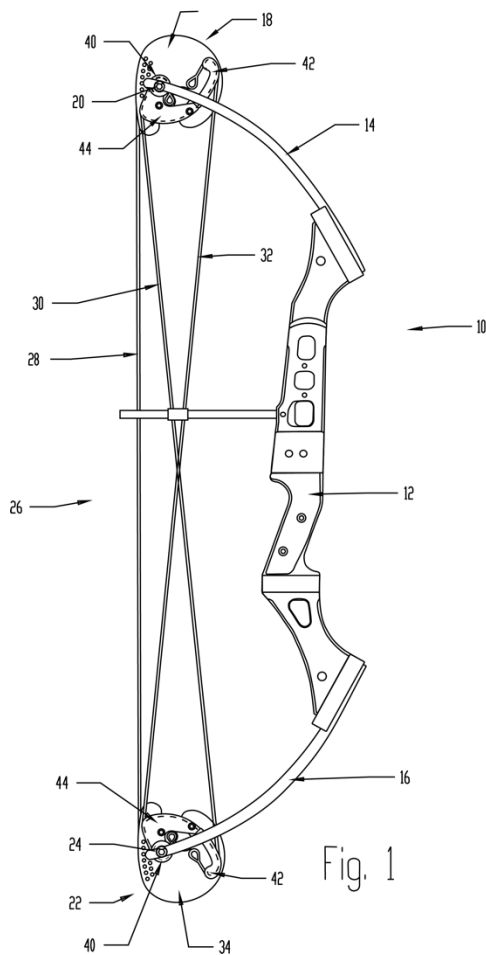
VII. GROUND 1: OPINIONS REGARDING THE COMBINATION OF DARLINGTON AND ISLAS

A. Claim 1

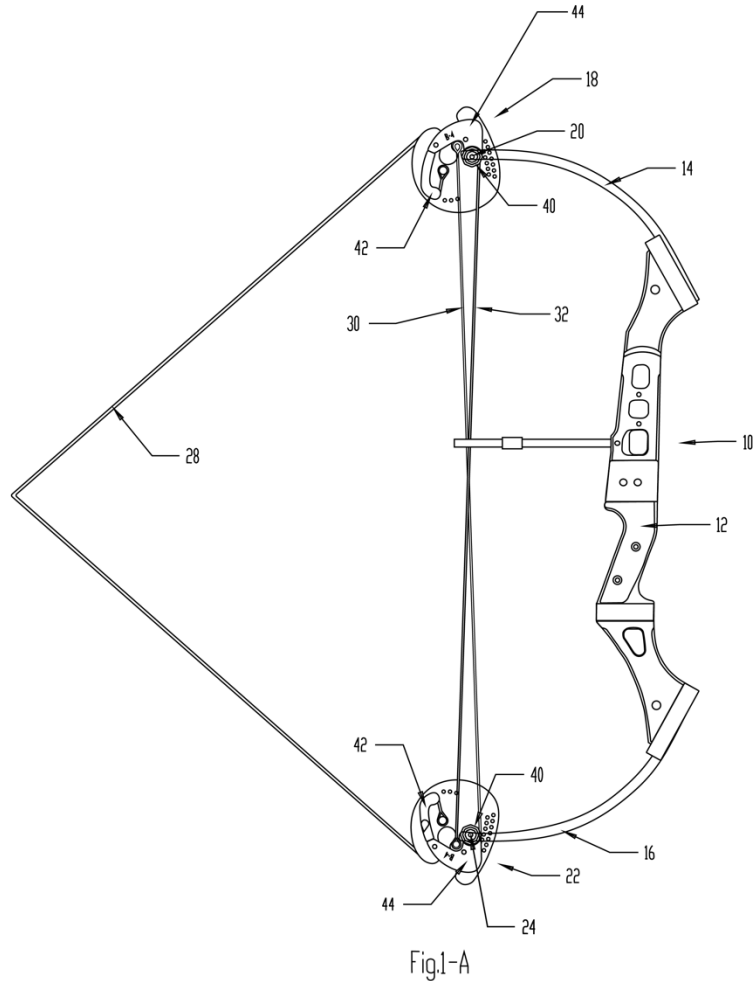
1. Claim 1(Pre): “An archery bow having a brace condition and a drawn condition, the archery bow comprising:”

40. As seen below in Figures 1 and 1-A, *Darlington* teaches an archery bow having a brace condition and a drawn condition.

“Brace Condition”



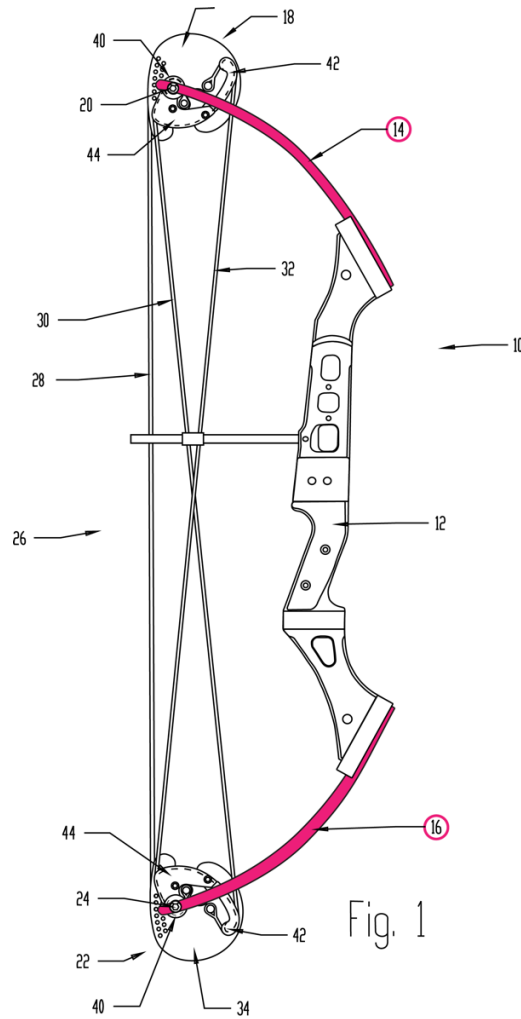
“Drawn Condition”



Darlington, Figs. 1, 1A, 3:14-19, Abstract. *Darlington* expressly characterizes its bow as a “compound archery bow[.]” *Darlington*, Abstract, 1:42-45, 2:32-36.

2. Claim 1(a): “a riser; a first limb and second limb supported by the riser;”

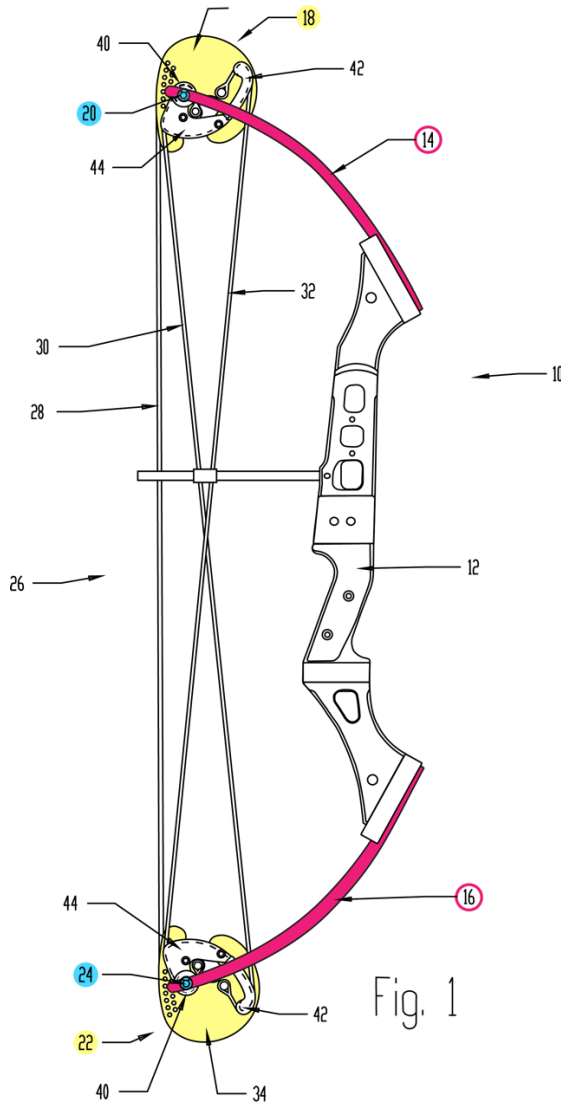
41. *Darlington* expressly teaches two limbs 14, 16 (highlighted pink in Figure 1 below) attached to a handle 12 “having spaced risers with bow-limb mounting surfaces at each end.



Darlington, Fig. 1 (annotated), 2:32-39, 1:42-55, Abstract.

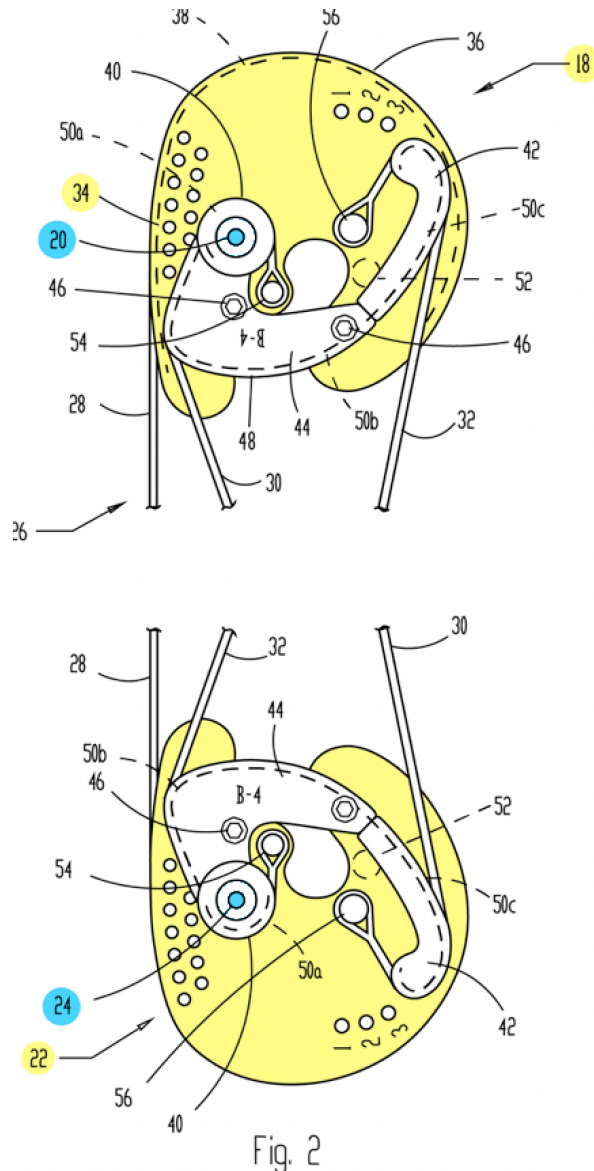
3. *Claim 1(b)(i): “a first rotatable member supported by the first limb on a first axle, a second rotatable member supported by the second limb on a second axle,”*

42. As further illustrated and highlighted in Figure 1 below, *Darlington's* bow includes a pair of pulleys 18, 22 (highlighted yellow) which teach rotatable members supported by the limbs.



Darlington, Fig. 1 (annotated), 2:39-42, 1:42-47, Abstract. Specifically, for the ensuing discussion, the upper pulley 18 will be discussed as the “second rotatable member[.]” while lower pulley 22 will be referred to as the “first rotatable member[.]” This is done merely for convenience because some of *Darlington*’s figures focus on lower pulley 22, while independent claim 1 focuses on claimed details of the “first rotatable member[.]” However, *Darlington* is very clear that its upper and lower pulleys are “similar in function” and may be “near mirror images

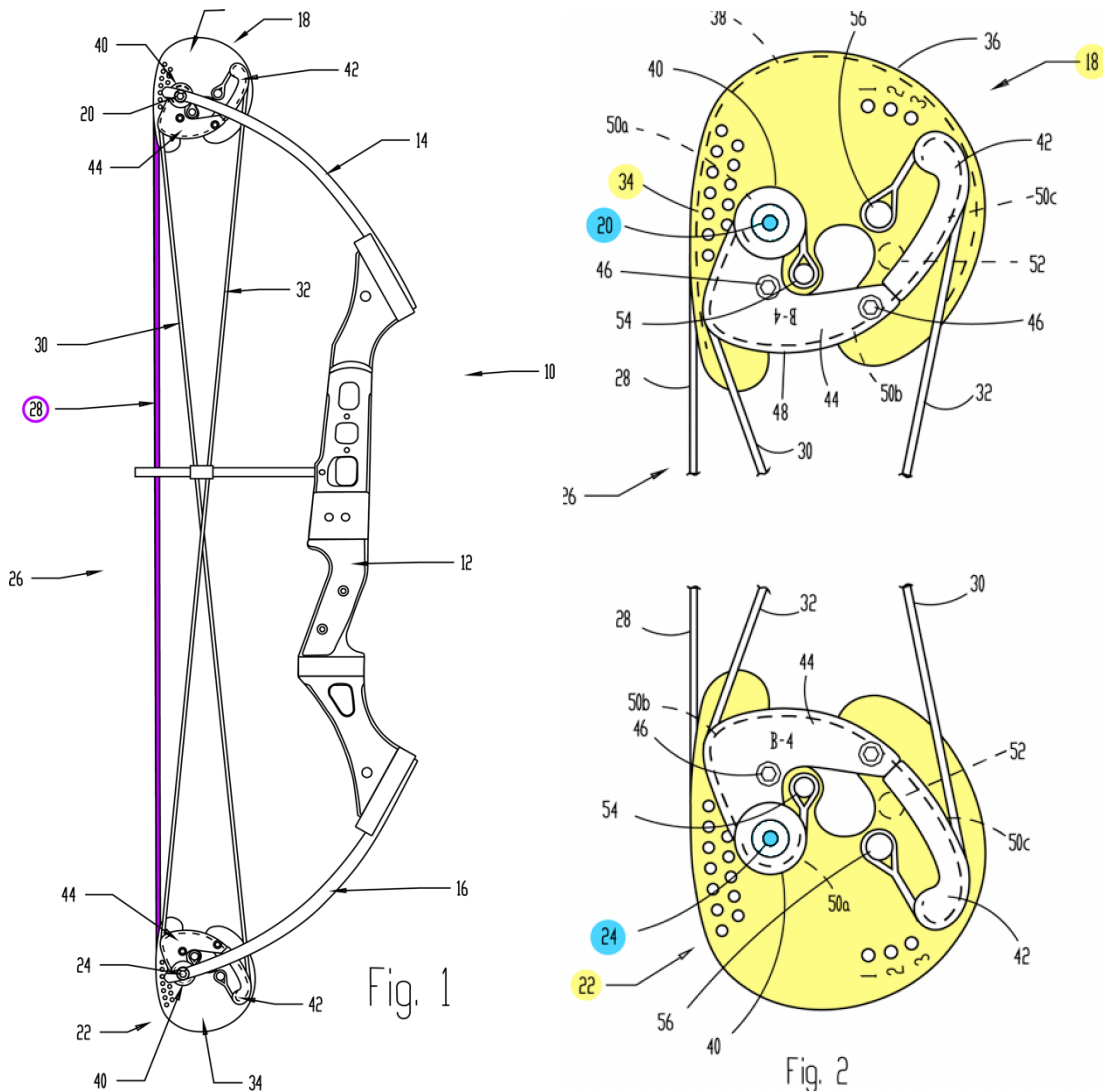
of each other.” *Darlington*, 2:42-47. Specifically, *Darlington* states “lower pulley 22 is essentially a mirror image of [upper] pulley 18” and notes that “it will be will be [sic] appreciated that the terms ‘upper’ and ‘lower’ are employed for descriptive purposes only with respect to the orientation of FIGS. 1-2.” *Darlington*, 3:8-13. Thus, a PHOSITA would have appreciated that any descriptions or illustrations provided by *Darlington* specifically describing its lower pulley would have been equally appreciated as being envisioned in embodiments as describing its upper pulley, and vice versa. Additionally, because *Darlington* mentions that its “pulleys also can be made **non-identical** in areas that are non-functional to create a desired difference in appearance” or may otherwise be non-identical for functional purposes (e.g. “to compensate for the arrow rest not being at the true center of the bow”), a PHOSITA would *not* have taken *Darlington*’s description of its upper and lower pulleys to be limiting (i.e., that they *must* be “mirror-images” of one another), but rather a known possibility. *Darlington*, 2:42-47 (emphasis added), 3:8-13. Further, as seen in Fig. 1 above and Fig. 2 below, each of *Darlington*’s rotatable members are supported on its respective limb (first limb 16, second limb 14) by a respective axle (first axle 24, second axle 20), highlighted light blue.



Darlington, Fig. 2, 2:39-43; see also Figs. 4A-C, 5A-C, 3:65-4:6.

4. Claim 1(b)(ii): “the first rotatable member comprising a drawstring track,

43. As with all compound archery bows, *Darlington* includes a drawstring along its outer peripheral edge, which *Darlington* identifies as “bowstring cable 28” (highlighted purple in Figs. 1 and 2 below) extending between the first and second rotatable members.



Darlington, Figs. 1 (left, annotated) and 2 (right, annotated), 2:50-52, 1:59-61, Abstract. *Darlington* states “bowstring cable 28 extends around bowstring let-out groove 38 to a bowstring cable anchor 52 adjacent to the end of the bowstring let-out groove.” *Darlington*, Fig. 2, 2:66-3:2. This bowstring let-out groove 38 is illustrated above in Figure 2 only on the upper pulley, but a PHOSITA would have recognized, especially given *Darlington*’s discussion that the upper and lower pulleys may be nearly identical, that such a groove would have been present or at

least obvious on the lower pulley as well. A PHOSITA would have recognized that rotatable members would have been long-expected, at the time of the '989 Patent, to include such a groove (drawstring track) for holding a drawstring during the draw cycle, preventing it from slipping off the cam. A PHOSITA would have recognized that *Darlington's* bowstring would necessarily have been connected to each pulley to make the bow operational, and that each pulley would have included the drawstring track to facilitate the bow's operation.

5. *Claim 1(b)(iii): "[the first rotatable member comprising] a cam track,"*

44. As seen below in Figure 1 from the '989 Patent, adjustable module 16 (highlighted dark blue) comprises cam track 14, which provides a contour that "can impact and/or control various characteristics of the bow, such as the draw force profile, the draw length, the amount of force let-off provided by the compounding action, etc." via its contact with a power cable.

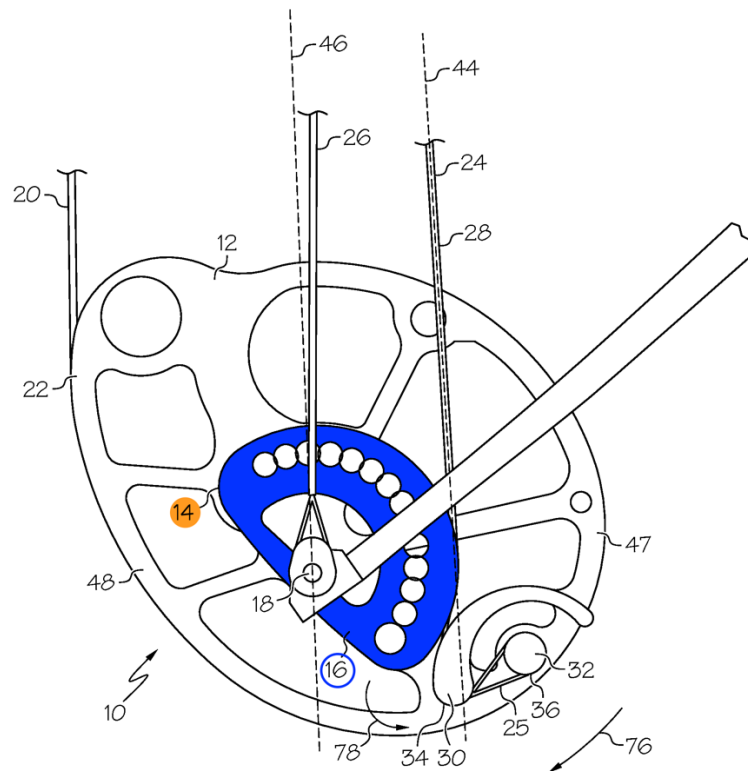
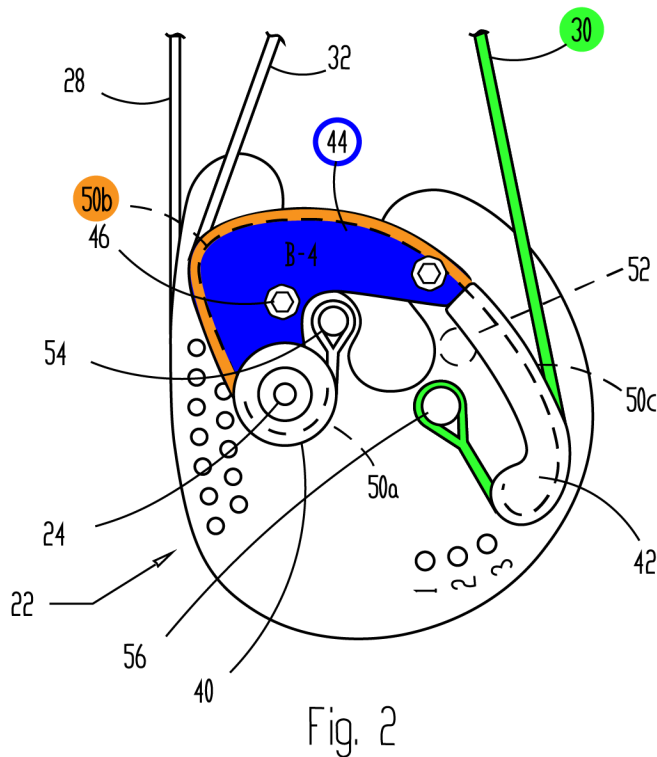


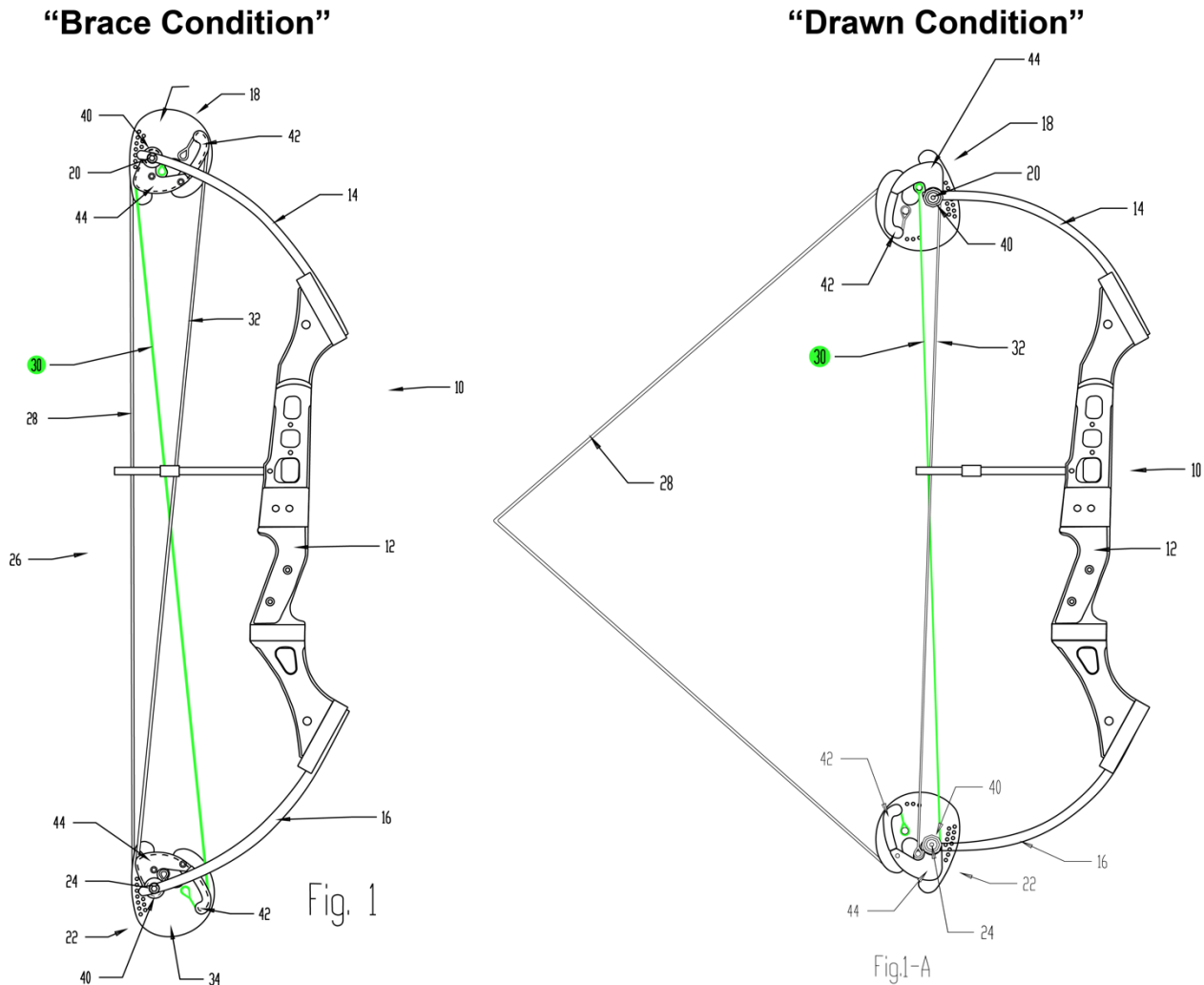
FIG. 1

'989 Patent, Fig. 1 (annotated), 3:58-4:8. In the figure provided, the illustrated cam 10 rotates a first rotational direction 76 as the bow is drawn, and the power cable is taken up by the cam track 14. '989 Patent, 4:39-45.

45. In the same manner, *Darlington's* bow includes a cable groove 50b (annotated orange in Fig. 2 below) provided along the edge 48 of a draw length module 44 (dark blue) that takes up a power cable 30 (green) as the bow is drawn.



Darlington, Fig. 2 (excerpt, annotated), 2:57-65. *Darlington* teaches that its “first cable extends from the first anchor on the first pulley through a portion of the cable groove on the first pulley and then toward the second pulley” and that the “second cable extends from the second anchor toward the second pulley.” *Darlington*, 1:55-65. Drawing *Darlington*’s bow “lets out the first cable from the cable groove on the first pulley and takes up the second cable into the cable groove on the first pulley including a portion of such groove previously occupied by the first cable[,]” as seen by comparison of Figs. 1 and 1A:



Darlington, Figs. 1(left, annotated), 1A (right, annotated), 1:59-65. Like the '989's cam track, a PHOSITA would have recognized this groove 50b can impact various characteristics of the bow, such as its draw force profile, **draw length**, and/or the amount of force let-off provided by the compounding action" via its contact with power cable 30 at least because it is provided as part of a "draw length module." Also, like the '989's cam track 14, *Darlington's* cable groove 50b serves to take up the power cables as the bow is drawn from the brace orientation to the fully drawn orientation. *Darlington*, 1:55-2:2, 2:57-3:13, Abstract, Figs. 1-5C. Again, as above,

due to the drawings of Figs 1, 1A, and 2, the descriptions thereof, and *Darlington*'s description of the upper and lower pulleys being "near mirror images[,]” a PHOSITA would have recognized that *Darlington* teaches or at least renders obvious that the mapped cam track (groove 50b) would have been present on both the upper and lower pulleys (second and first rotatable members, respectively). An annotated excerpt from Fig. 1A is provided below, showing power cable 30 (green) oriented in groove 50b of draw length module 44 in the drawn condition.

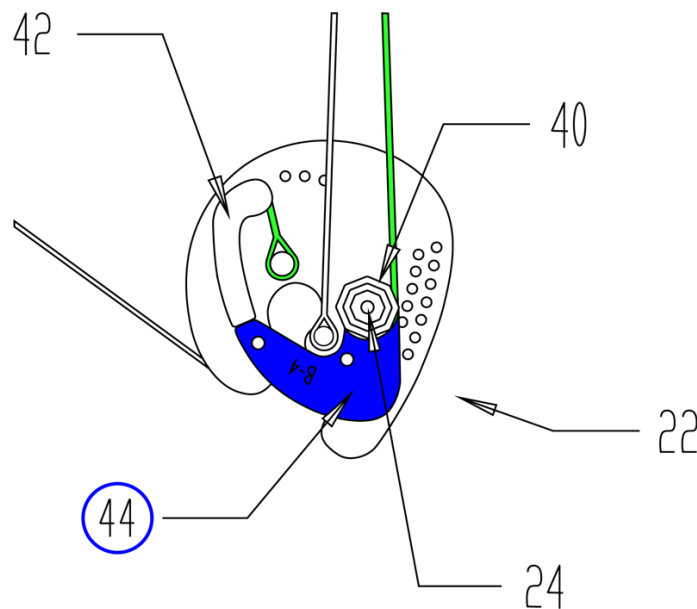


Fig.1-A

Darlington, Fig. 1A (excerpt, annotated).

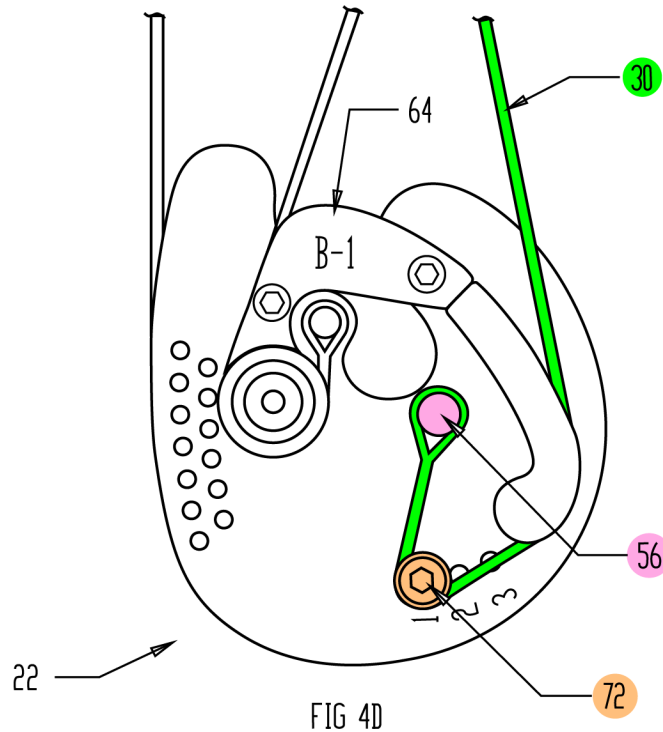
46. As will be further discussed below, *Darlington* envisions that draw length module may be replaceable with alternatively-shaped components "determined by the draw cycle desired." *Infra*, limitation 1(f) citing *Darlington*,

1:23-26, 1:65-2:2, 3:60-64, 4:7-20. In these embodiments, the cable groove 50b disposed along the edge of the modified draw length module 44 still is mapped to the claimed “cam track,” which is still taught and/or at least rendered obvious by *Darlington*.

6. Claim 1(b)(iv): “[the first rotatable member comprising] a capstan and a terminal,”

47. A capstan, as described and illustrated in the ’989 Patent, provides a fixed rotation point around which a power cable wraps as the cable extends from its anchoring terminal on a first rotatable member towards the opposite rotatable member. ’989 Patent, 5:26-39, 1:53-59, 4:18-32, Figs. 1-2. The ’989 Patent teaches that a capstan is desirable because it prevents high vibrational forces during firing from being transmitted to the portion of the power cable that splits to form a loop about the terminal post, a portion which is relatively weaker. *Darlington*, 5:26-39. *Darlington* teaches both the claimed capstan and terminal.

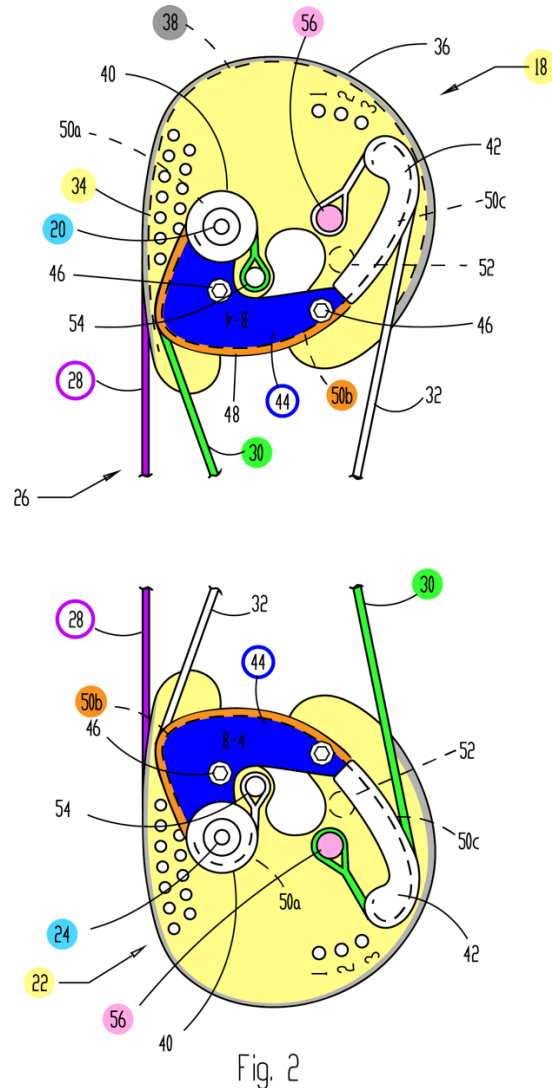
48. *Darlington*’s rotatable members include a terminal (anchor 56, highlighted pink below) anchoring a power cable 30 (green) that wraps around a capstan (intermediate post 72, orange) as the power cable extends towards the opposite rotatable member.



Darlington, Fig. 4D (annotated), 3:65-4:6, 1:42-50. As I will discuss in further detail below regarding limitation 1(f), *Darlington* teaches that its intermediate post 72 may be adjusted between a plurality of locations (labeled 1,2,3 in Fig. 4D, *see also* Figs. 2-5C). *Darlington*, 4:1-6, 4:11-18. This adjustability desirably allows a user to control the effective length of the power cable, impacting the stresses in the bow as it is drawn and fired. *Id.* A PHOSITA would have recognized *Darlington*'s intermediate post serves to redirect the power cable towards the terminal, reducing the vibrations being transmitted to the terminal, thus satisfying the claimed "capstan" of the '989 Patent.

7. ***Claim 1(b)(v): "wherein said drawstring track is oriented in a first cam plane and said cam track is oriented in a second cam plane offset from said first cam plane;"***

49. As discussed above and reproduced in annotated Figure 2 below, each of *Darlington's* pulleys include a drawstring track (bowstring let-out groove 38, highlighted gray) and a cam track (cable groove 50b, highlighted orange):

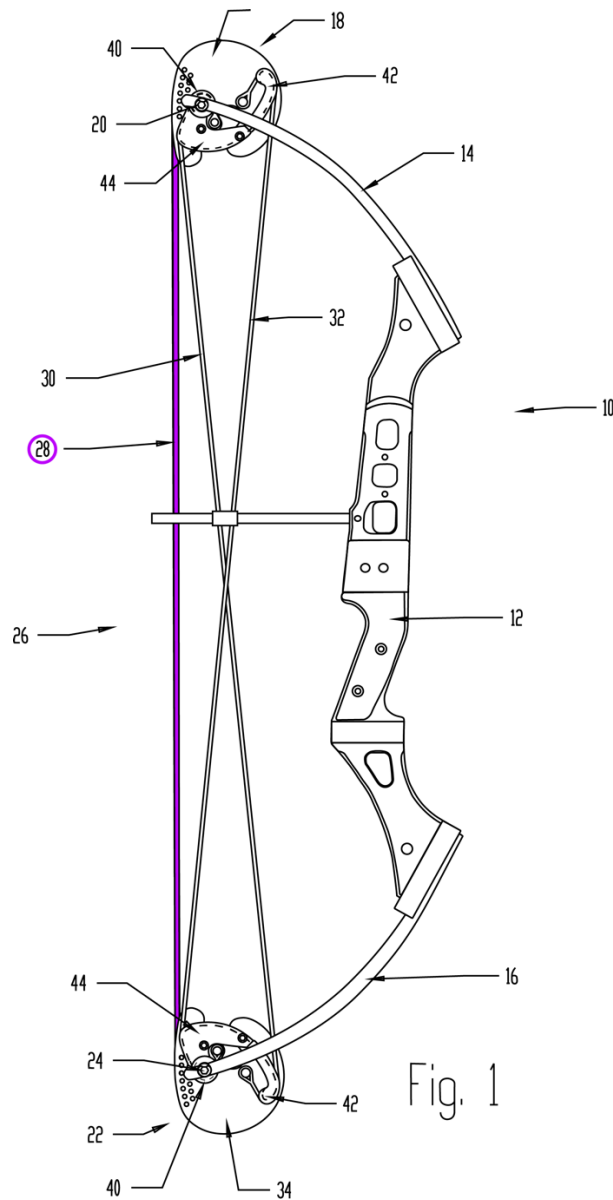


Darlington, Fig. 2 (excerpt, annotated). A PHOSITA, looking at Figure 2 and reading the description of Figure 2, would have immediately appreciated that *Darlington's* drawstring tracks and cam tracks are in offset cam planes relative to the body of the cam (highlighted yellow in Fig. 2 above), as claimed, while the

mapped drawstring track runs along the outer edge of the yellow cam body. The cam track (cable groove 50b) runs along the edge of the draw length module 44, which is expressly described as being “mounted on” the “flat base 34” portion of *Darlington*’s pulleys “having an outer peripheral edge 36 in which a bowstring let-out groove 38 is disposed.” *Darlington*, 2:50-61, Fig. 2. Thus, *Darlington*’s drawstring track is oriented in a first cam plane that is further from the viewer than the second cam plane in which its cam track lies because, as seen from the perspective of Fig. 2, draw length module 44 is on top of the flat base 34 of the cam body. *Id.* Again, though some of the reference numbers only appear on the upper pulley, a PHOSITA would have recognized that these components are present on *Darlington*’s lower pulley as well, or would have at least been obvious to a PHOSITA to include on the lower pulley.

8. *Claim 1(c): “a drawstring extending between the first rotatable member and the second rotatable member;”*

50. As previously discussed regarding limitation 1(b)(ii), *Darlington*’s bow includes a drawstring (bowstring cable 28, purple in Fig. 1 below) anchored to and “extending between” its first and second pulleys (rotatable members) 18, 22, contacting each of them:

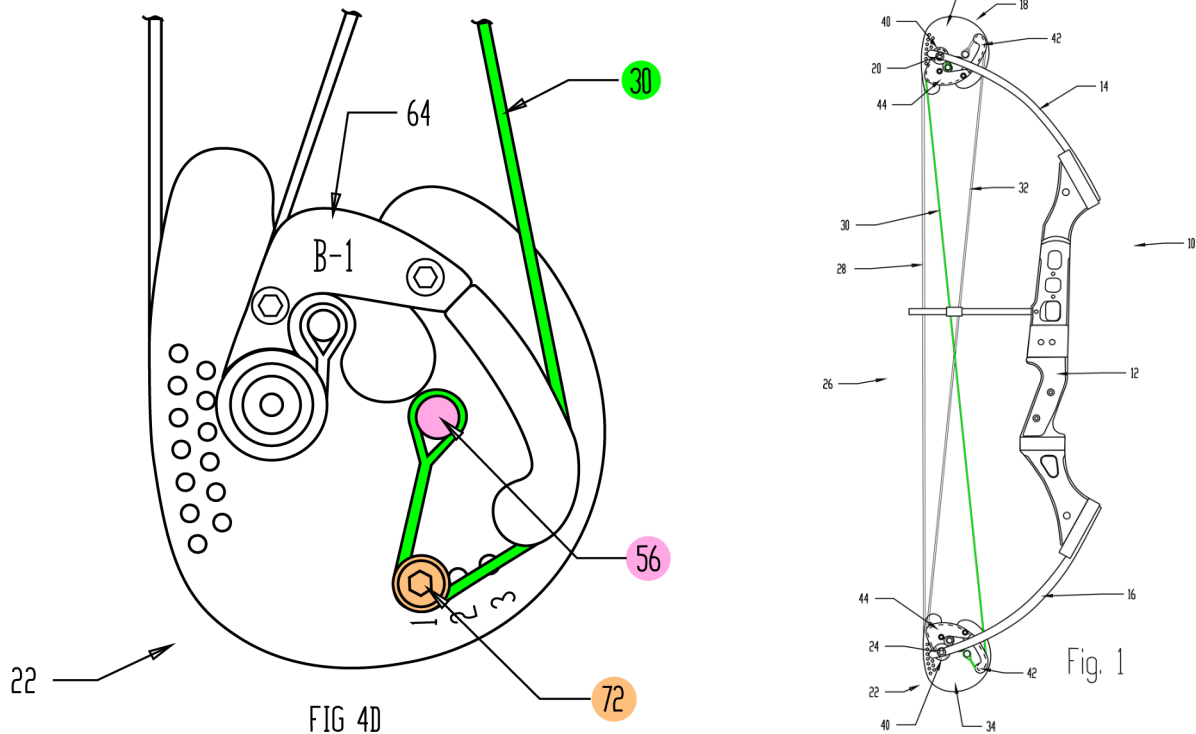


Darlington, Fig. 1 (annotated), 2:47-49.

9. Claim 1(d)(i): “a power cable attached to said terminal and extending toward the second limb,”

51. As previously discussed regarding limitation 1(b)(iii), *Darlington*’s bow includes a power cable 30 (green below) attached at one end to *Darlington*’s

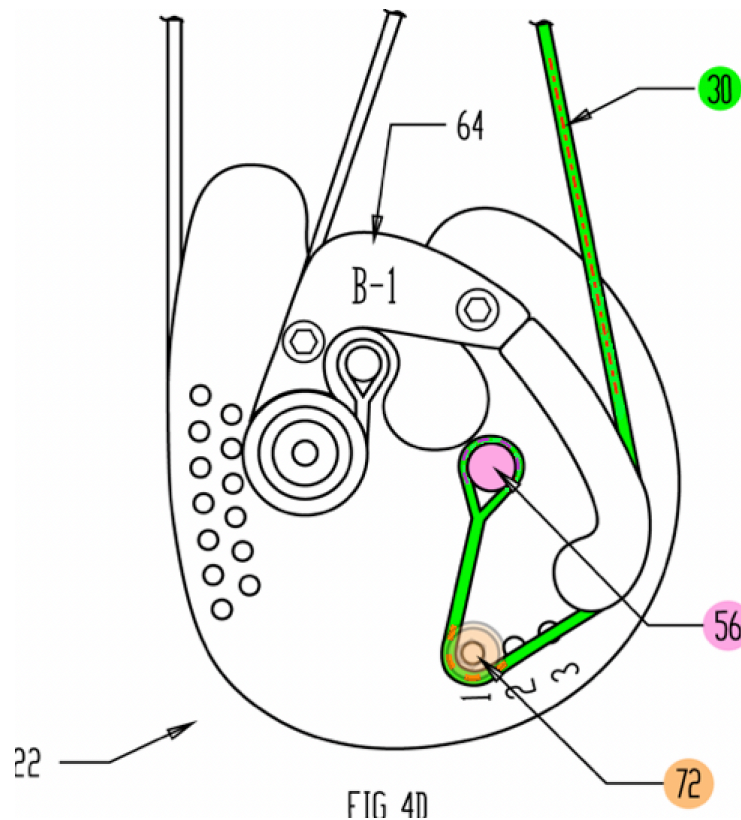
terminal (anchor 56, pink below) and extending toward the second rotatable member supported by the second limb via the second axle:



Darlington, Figs. 4D (left, annotated), 1A (right, annotated). A PHOSITA would have recognized that the direction of the power cable extends is “toward” the second limb because the power cable attaches to a component attached to and supported by the second limb (the second pulley). Particularly in Fig. 1, the line annotating the power cable is clearly extending from one limb to the other, traversing the space between them to render the bow operable for firing an arrow.

10. ***Claim 1(d)(ii): “said power cable comprising an elongate straight portion located near said first rotatable member, a capstan portion in contact with said capstan and a terminal portion in contact with said terminal;”***

52. Limitation 1(d)(ii) merely names portions of the power cable that are present in the '989's power cable architecture as well as *Darlington's*. These portions (the “elongate straight portion[,]” “capstan portion[,]” and “terminal portion”) are present merely because the power cable is anchored at a terminal, wraps around a capstan, and then extends toward the second limb as described for the preceding limitations. To be precise, elements of the power cable 30 that are at least included within the claimed “portions” have been indicated below using dashed lines in annotated Fig. 4D:



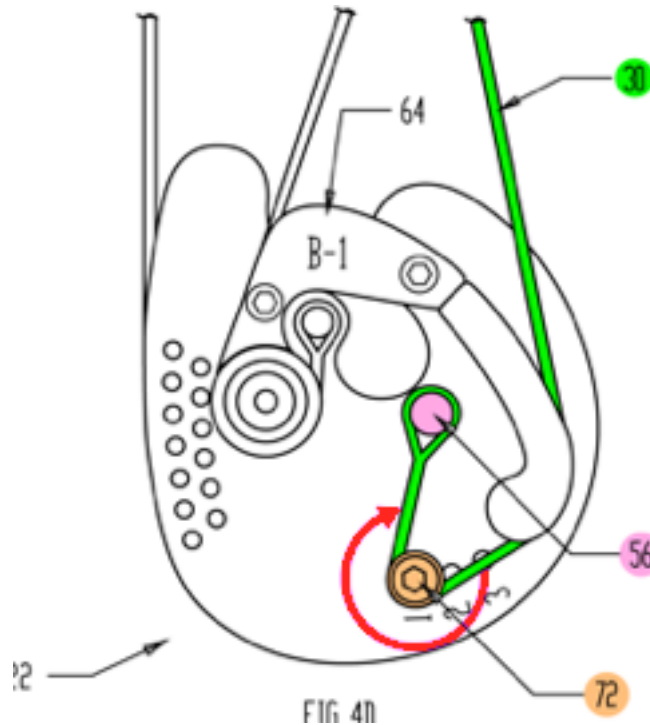
Darlington, Fig. 4D (annotated), 3:65-4:6, *see also* 1:55-2:2, 3:20-37, Figs. 4A-C, 5A-C. The portion of *Darlington's* power cable 30 that contacts *Darlington's*

terminal 56 teaches the recited “terminal portion.” *Darlington*, 3:6-8, 1:55-2:2, 3:20-37, Figs. 4A-4D, 5A-C. At least a part of this portion satisfying the “terminal portion” is marked above with a dashed purple line. Similarly, the portion of the power cable that wraps around and contacts the capstan (intermediate post 72, orange) teaches the recited “capstan portion[.]” *Id.* At least a part of this portion satisfying the “capstan portion” is marked above with a dashed orange line. Finally, the portion at the right of the figure that extends in a straight line toward the second limb at least includes an “elongate straight portion located near said first rotatable member[.]” *Id.* At least a part of this portion satisfying the “elongate straight portion” is marked above with a dashed red line. As previously discussed, each of these claimed portions are present or would have at least been obvious to a PHOSITA as being present on power cable 32, which is attached in a mirror-imaged manner to the upper pulley (second rotatable member) including its own capstan and terminal.

11. Claim 1(e): “wherein, in the brace condition, the power cable wraps around the capstan in a first rotational direction as the power cable is traversed from the elongate straight portion to the terminal portion; and”

53. Notably, limitation 1(e) does not specify *which* direction the power cable wraps around the capstan as the power cable is traversed from the elongate straight portion to the terminal portion. Thus, because *Darlington*’s power cable has an elongate straight portion, wraps around a capstan, and then anchors at a terminal portion, *Darlington* teaches limitation 1(e). In the embodiments expressly described

by *Darlington*, this first rotational direction happens to be clockwise (from above), as indicated by the red arrow in annotated Fig. 4D below:



Darlington, Figs. 4D (annotated). Clearly, the illustration of Fig. 4D is in the brace condition because the bowstring is oriented vertically along the left edge of the pulley; it is not drawn back.

54. As will be discussed regarding limitation 1(f) below, a PHOSITA would have modified *Darlington*'s bow pursuant to *Islas* to reverse the first rotational direction, such that the power cable wraps outward (counter-clockwise as seen in the image above, from the near-axle side of the capstan towards the far-axle side of the capstan) as the power cable is traversed from the elongate straight portion to the terminal portion. When modified, the resultant *Darlington+Islas* bow also

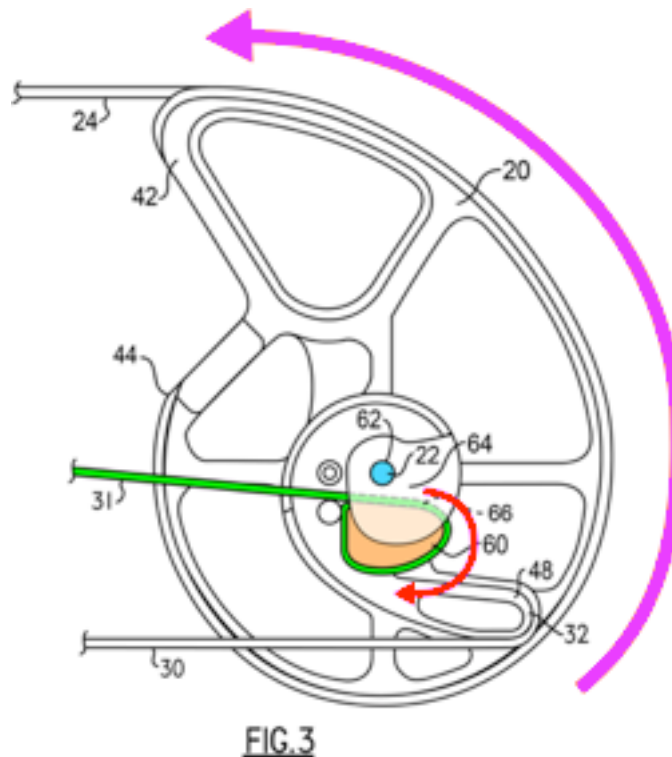
teaches limitation 1(e) because it still provides a power cable having an elongate straight portion, which then wraps around a capstan (now, when modified, in the opposite direction as in *Darlington* alone) to anchor at a terminal. The motivations to combine *Darlington* and *Islas* provided below regarding limitation 1(f) are intended for inclusion by reference for this limitation as well.

12. Claim 1(f): “when the bow is drawn from the brace condition, the first rotatable member rotates in a second rotational direction that is opposite the first rotational direction and”

55. As previously noted, *Darlington*’s bow teaches a first rotational direction. Because *Darlington*’s pulleys rotate when the bow is drawn, *Darlington* also teaches a second rotational direction. However, *Darlington*’s pulleys rotate in a clockwise direction from the perspective of Fig. 2, which is the *same* as the first rotational direction that the power cable wraps around the capstan. Thus, *Darlington* does not teach that its second rotational direction is opposite its first rotational direction. As I will explain in detail below, it was known prior to the ’989 Patent to wrap a power cable outwards, away from the center of the rotatable member (or, equivalently, away from the axis of rotation of the pulley), such as in the compound archery bow taught by *Islas*. Further, a PHOSITA would have found it obvious and would have been motivated to modify the *Darlington* bow, rearranging, resizing, and/or relocating any particular physical elements necessary to wrap outward as in *Islas* for a wide array of desirable advantages including (1) improving safety and

maintainability, (2) simplifying the overall design, resulting in reduced manufacturing cost and (3) increasing the maximum angular sweep the rotatable member could rotate without obstruction from brace to full-draw. Each of these motivations will be discussed in detail, after a discussion of what *Islas* teaches and how the *Darlington* bow would have been modified pursuant to *Islas*.

56. *Islas* teaches a bow having a power cable 31 (shown in light green in annotated Fig. 3 below) that wraps around an element of *Islas*'s rotatable member (60, shown in orange) in a first rotational direction, as indicated by the small red arrow to anchor at a terminal (or "anchor point[,]" described but not illustrated, *see* ¶ [0024]).



Islas, Fig. 3 (annotated), [0024]. The large magenta arrow annotated above in Fig. 3 indicates the second rotational direction, which cam 20 (a “first rotational member”) rotates as the bow is drawn. *Islas*, ¶¶ [0018], [0020], [0032-0034]. As seen from the perspective of Fig. 3, the first rotational direction is **clockwise**. As *Islas*’s bow is drawn, the cam 20 rotates in a second rotational direction, indicated by the large magenta arrow, which is **counter-clockwise** as seen from the perspective of Fig. 3. *Id.* (expressly stating that Fig. 3 depicts the bow at brace (released) position). Thus, because the first rotational direction (red) is opposite the second rotational direction (magenta), *Islas* teaches limitation 1(f).

57. Regarding *Islas*’s element 60 (orange), *Islas* teaches that its “power cable 31 rides in a peripheral groove in the second power cam member 60, passing over one or more lobes, and being attached at an anchor point.” *Islas*, [0024]. When comparing illustration of Fig. 3 to that of Fig. 4, it becomes clear that the “second power cam member 60” lies in a plane beneath the surface of “crank portion 64[.]” explaining why there is a curved line drawn through the center of the annotated orange element of Fig. 3.

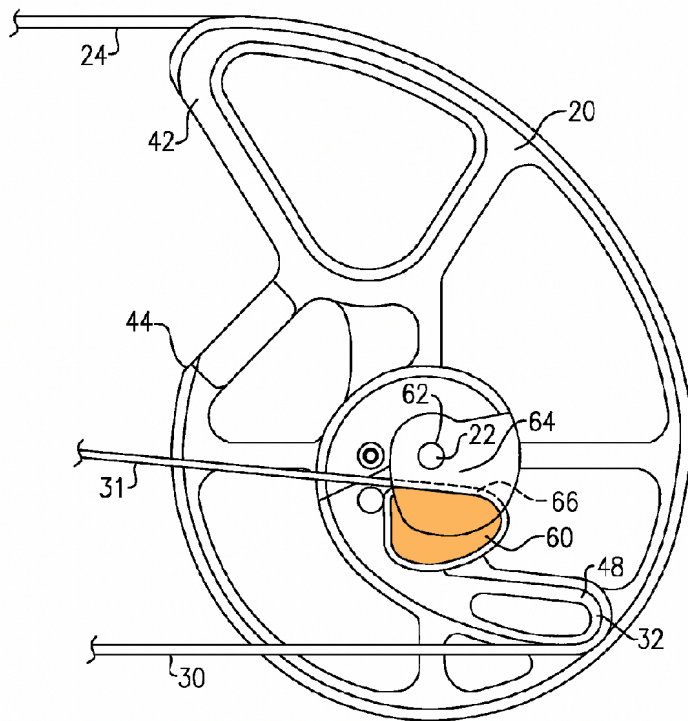


FIG. 3

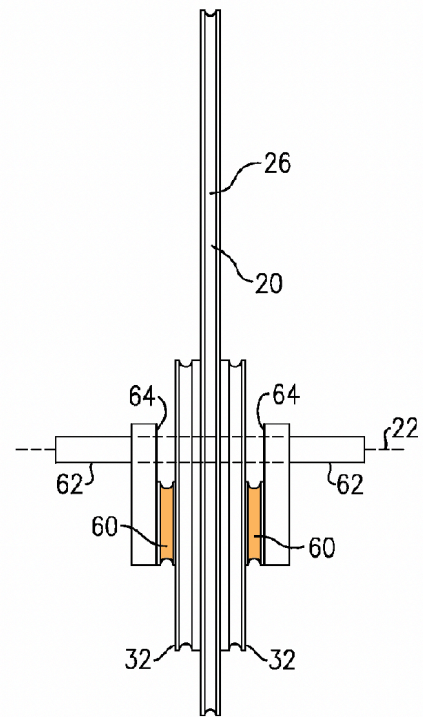
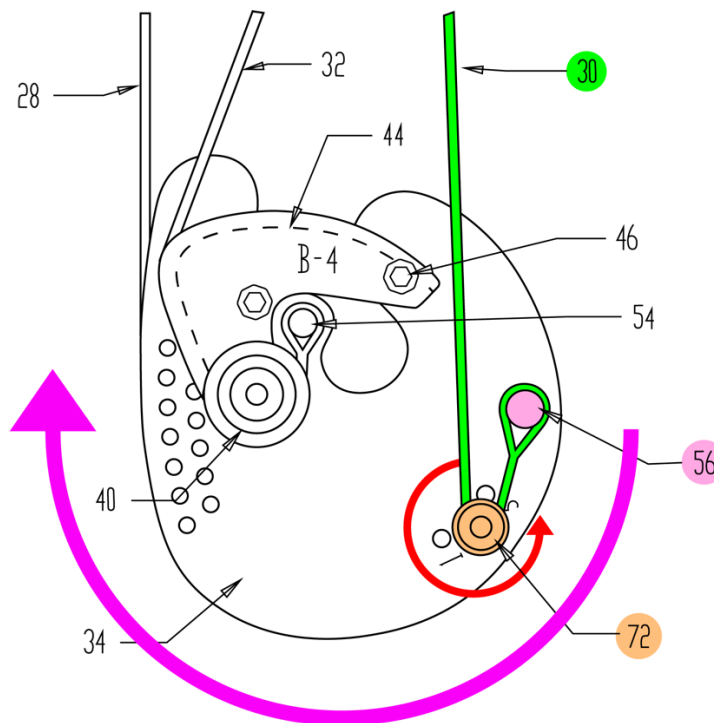


FIG. 4

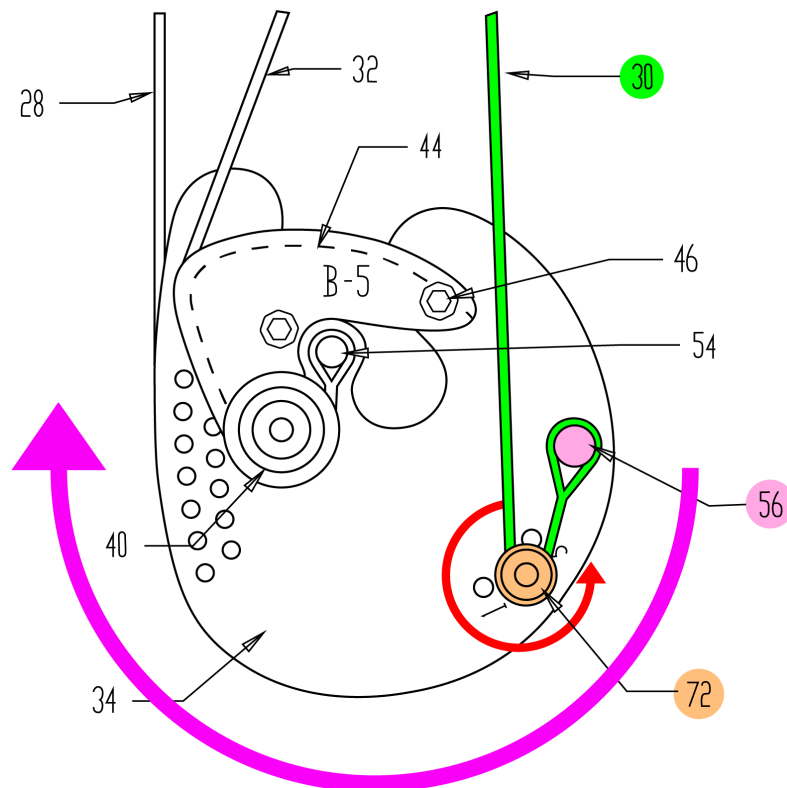
Islas, Figs. 3-4 (annotated), [0024], [0030], [0032]. While I understand this concept of *Islas*'s power cable wrapping about an element within a void interior to its cam is **not** being combined into the *Darlington* bow (rather, **only** the rotational direction of the power cable around the orange element is being combined), this context is important to understand where element 60 is located in Figure 1. A PHOSITA would have recognized that second power cam member 60 provides a fixed point around which a power cable wraps as it extends from a terminal on a first rotatable member to the opposite rotatable member, similar to the capstan of the '989 Patent. '989 Patent, 5:26-39, 1:53-59, 4:18-32, Figs. 1-2; *Islas*, Figs. 3-4 (annotated), [0024],

[0030]. Though the purposes of the second power cam member 60 and the '989's capstan are not identical, *Islas* is not being used to teach a capstan – *Darlington's* intermediate post 72 already teaches the required capstan. Rather, the concept of *Islas's* power cable wrapping around a fixed point as it extends towards an opposite rotatable member in a direction opposite the direction its pulleys rotate when drawn is being combined into *Darlington's* bow for advantages that will be articulated below.

58. Presented below is a first example of how a PHOSITA may have modified the *Darlington* bow to wrap its power cable in the opposite direction (red arrow) from that which the rotatable member rotates when drawn (magenta arrow).



The above figure has been generated using the expressly-provided figures of *Darlington* but this modified figure itself **is not present in *Darlington***. This modified figure is presented for discussion purposes only as an example of one form that a *Darlington*+*Islas* bow as combined by a PHOSITA may have looked, but the example from the above figure is not intended as limiting. A second example is presented below, which again is not limiting but is presented merely to provide an example of how a PHOSITA would have been motivated to modify the *Darlington* bow pursuant to *Islas*. In this embodiment, the draw length module 44 has been reshaped to round-off its end, ensuring that there is no potentially sharp edge for the take-up of power cable 30.



Again, this design is also not present in either reference, nor intended as limiting. It is merely presented as a second example embodiment of the bow that would have resulted from the modification of *Darlington* pursuant to *Islas*. To produce such a modified bow, a PHOSITA would have utilized any necessary ordinary skills of a PHOSITA, such as changing the relative distances between the capstan and terminal, the sizes of any of the elements illustrated, the angle of the power cable, and/or the shape of draw length module 44 such that the bow was both operable and provided the desired improvements detailed below in safety, simplicity, maintenance, and draw length. Notably, *Darlington* is specifically intended to be modified, stating portions of its removable draw length module (e.g. draw length module 44 and section 42) are intended to be removable (e.g., via screws) and “replaceable” with components of alternative shapes corresponding to any desired draw cycle, while the capstan (intermediate post 72) is “adjustably positionable” to configure stresses in the limbs during the draw cycle. *Darlington*, 3:35-4:20 (*pinpoint* at 3:60-64 describing elements 60,62,64 of Figs. 3A-D corresponding to element 44 of Fig. 2), 1:32-38, 2:50-65, 4:7-20, Figs. 2-5C. Thus, a PHOSITA would have been capable and motivated to produce alternative draw length modules for facilitating the modification of *Darlington*’s design based on *Islas* and would have merely needed to unscrew the original module and attach the new module to modify the design. Similarly, removing the section 42 would have desirably reduced the weight of the

cam, decreasing its manufacturing cost, the effort needed to carry the bow and hold it away from the archer's body, and increasing the fraction of rotational energy being imparted to a fired arrow. To the extent it would have been necessary to modify the design further, such as by changing the number, type, or location of the fasteners (and corresponding holes into which the fasteners enter), a PHOSITA would have had the skills necessary to do so, without undue experimentation, leading to a reasonable expectation of success for the combination.

59. A PHOSITA would have been motivated to modify *Darlington's* bow such that its power cable wrapped the opposite direction that its pulley rotated when drawn for several reasons including (1) improving safety and maintainability, (2) simplifying the overall design, resulting in reduced manufacturing cost and (3) increasing the maximum angular sweep the rotatable member could rotate without obstruction from brace to full-draw. As seen throughout the prior art, it was well-known prior to the '989 Patent that contact between power cables and other portions of the bow (such as other power cables, posts, edges, cam edges, etc.) had a deleterious effect over time on the integrity of the power cables. For instance, as seen in the *Browning Manual* (Ex. 1007), worn cables must be immediately replaced because "[a] worn cable or string can suddenly break, causing **serious injury** to the archer and damage to the bow." *Browning Manual*, 4. Further, PHOSITAs would have been aware that contact with other bow portions shortens the lifespan of strings

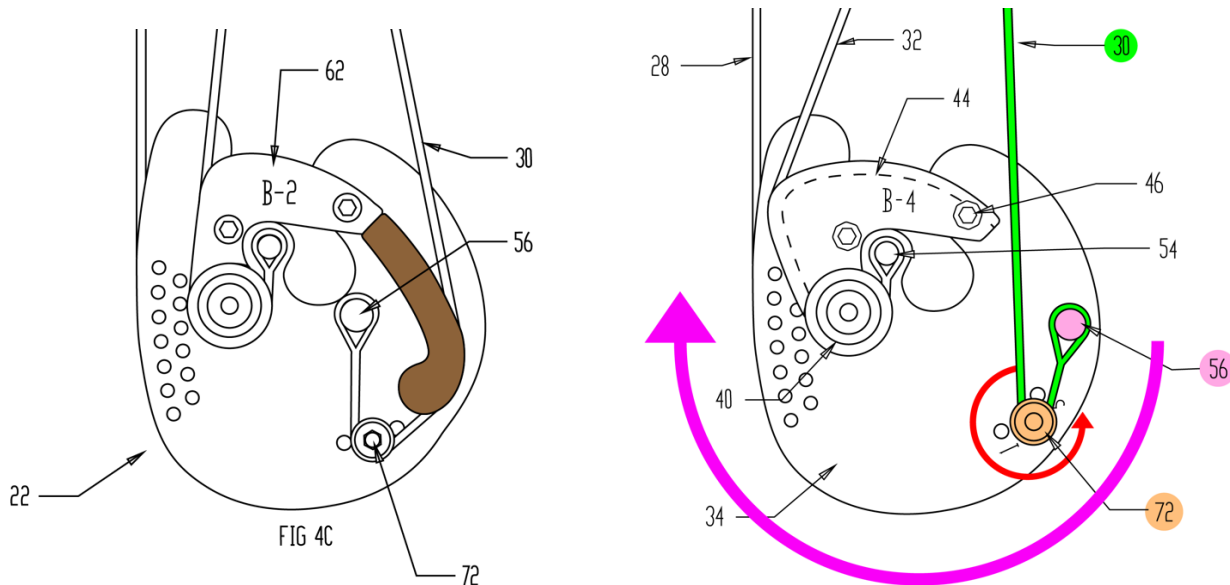
and cables, which increases the ongoing expense of owning the bow. *See, e.g., Grace* (Ex. 1009), [0008], *Bear Manual* (Ex. 1008), 6 (“Bear Archery strongly recommends replacing the bowstring and cable annually...Replace frayed or worn bowstrings and cables immediately.”). Thus, any modification to a bow which reduced the likelihood of contact between a power cable and anything else on the bow would have reduced the frequency at which the power cables had to be replaced, and thus would have improved the maintainability of the bow by reducing the cost of such maintenance. Specifically, a PHOSITA would have recognized that the natural wear that occurs as a cable rides in and out of a track as the bow is drawn would have been reduced by the modification of *Darlington* mapped in the Petition. Thus, as a further motivation to modify *Darlington*’s design, the power cable’s lifespan would have been desirably lengthened.

60. In short, power cables rubbing against anything would have reduced the integrity of the cables, decreasing the safety and increasing the expense of owning and using the bow. US Patent No. 6,470,870 to Schaar (Ex. 1006) directly describes the unfavorable consequences of power cables rubbing together, which creates friction enough to eventually wear through the cables. *Schaar*, 6:28-36 (further describing undesirable noise caused by the cable contact), 7:4-15 (further describing “deplorable” accuracy caused by cable contact), 29:65-67. Additionally, a PHOSITA would have recognized that any contact between the power cable and

other bow components during firing would have undesirably reduced the maximum force of the bow (and thus speed of the arrow). PHOSITAs were aware of the importance of arrow speed, as it determines the range, accuracy (due to gravitational arrow drop), and lethality of the arrow to a game target, and thus would have been highly motivated to avoid any potential reductions to the arrow's speed. Since arrow speed is a major determining factor in the price a customer is willing to pay for a particular bow, a PHOSITA would have further recognized the financial motivation behind maximizing the arrow speed of the bow. *See, e.g., Schaar*, 16:10-53.

61. Thus, PHOSITAs were well aware as of the '989 Patent that any design modification that would have lowered the likelihood of the power cables contacting any other portion of the bow would have been a desirable modification. In removing portions of the structure (section 42, described further below), wrapping the power cable further **away** from the other components of the pulleys, and positioning the terminal anchor towards the periphery of the cam, a PHOSITA would have recognized motivations of reduced cost and of increased safety due to decreased likelihood of power cable contact; motivations which would have been furthered by modifying *Darlington's* bow based on *Islas's* design. A PHOSITA would have been directly motivated by the prior art's warnings about the dangers of cable wear leading to failure and potential injury, as well as the decrease in accuracy and increase in cost of operating the bow.

62. As an added benefit of the modification, the section 42 highlighted in brown in annotated Fig. 4C below would have been rendered superfluous and would have been desirably eliminated from the combined *Darlington*+*Islas* bow, simplifying the overall design.



Darlington, Fig. 4C (annotated, left), *Darlington*'s lower pulley, modified as proposed in one example (annotated, right). As mentioned above, eliminating section 42 would have decreased the wear, friction, and potential for unwanted contact between power cable 30 and other portions of the bow, but its elimination also would have resulted in reduced manufacturing cost for the design, further motivating the combination. Equivalently, in the case that the pulleys (including portions such as section 42) were formed from a single piece of material and then material is removed, a PHOSITA would have recognized that the removed material (e.g. aluminum) from section 42 being no longer necessary would have been

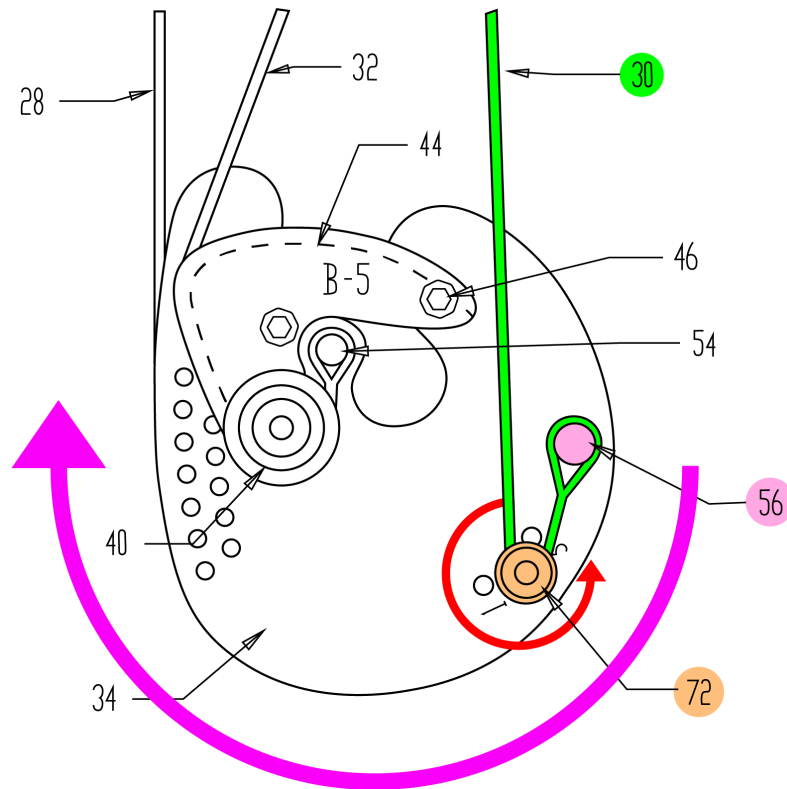
recyclable for further future manufacturing, and thus the *Darlington+Islas* bow would have reduced the manufacturing cost of the bow (and subsequent cost of the bow to a consumer) in such a manner. A PHOSITA would have further recognized that eliminating section 42 would reduce the overall weight of the cam, resulting in greater arrow speed produced by the bow because more of the rotational energy of the cam would have been imparted to the arrow. As another benefit, the space between the anchored end of the power cable from other bow components would have been desirably increased, reducing the likelihood of unwanted contact. Additionally, the overall weight reduction of the bow would have made the bow easier to hold steady at draw and to carry at brace.

63. A PHOSITA would have also recognized the elimination of section 42 in the modified *Darlington+Islas* design would have increased the maximum rotation allowable for the pulleys to sweep from brace to full-draw without the power cable contacting other portions of the cam assembly, again desirably increasing arrow velocity without increasing the size of the cams. The rotational limit of the original *Darlington* design would have been overcome by wrapping the power cable the opposite direction, towards the edge of the pulley, getting the end of the power cable and the terminal out of the way of the rotation of the pulley. For a given cam size, this would have resulted in a larger amount of force being imparted to a fired arrow, which was highly desirable in the market for both consumers and bow

manufacturers. Thus, a PHOSITA would have recognized increasing the maximum angular draw sweep of the bow's rotatable members (pulleys) as an additional motivation to combine *Darlington* and *Islas*. A PHOSITA would have had all of the skills necessary for the modifications to *Darlington* using hardware components already present, requiring only modifications to the orientations, sizes, and/or relative placements of components already present, leading to a reasonable expectation of success without undue experimentation.

64. I note that *Darlington* says that cable groove 50a-c "preferably is substantially continuous...meaning that there are no more than small gaps between the cable groove sections that do not affect smooth drawing of the bow" and that "section 50b preferably is smooth and arcuate, without any abrupt steps or discontinuations that would affect the 'feel' of the bow as it is drawn." *Darlington*, 2:61-65, 3:61-64. I agree that a PHOSITA would have desired the bow to have a smooth cam track without discontinuations or gaps, which would impact its firing profile as well. In my opinion, the combination of *Darlington* in view of *Islas* as mapped in the Petition would not have abrupt discontinuations or gaps that would introduce problematic unwanted disruptions in the smoothness of the cam track of the modified bow. The redesigned bow would potentially have had a shortened draw length module 44 (also numbered 62 in other drawings), but it would have been no

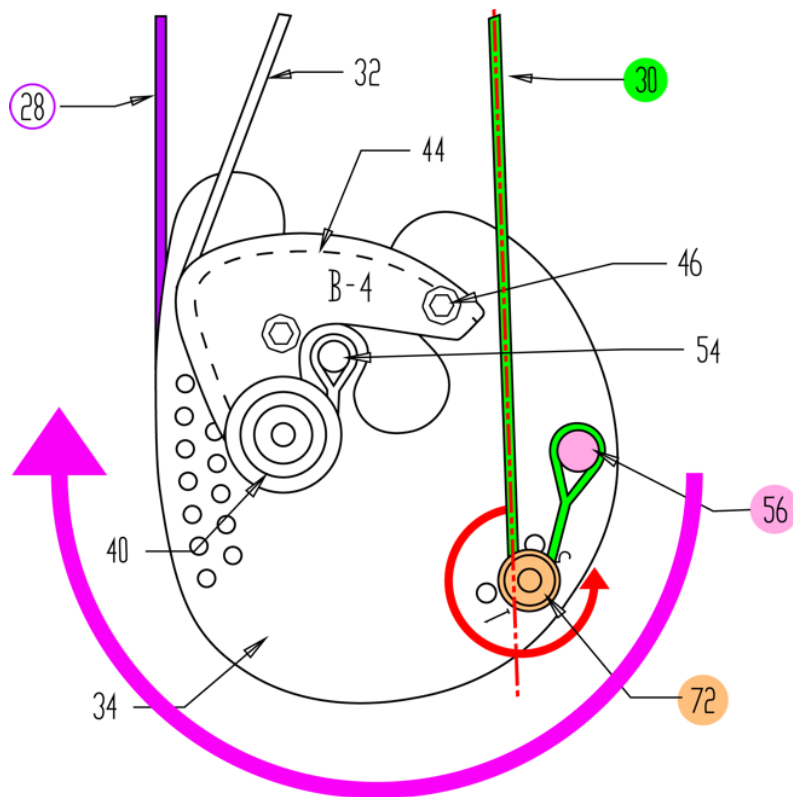
more discontinuous than in its unmodified form, especially in the discussed example combination in which the corner of the draw length module has been rounded off.

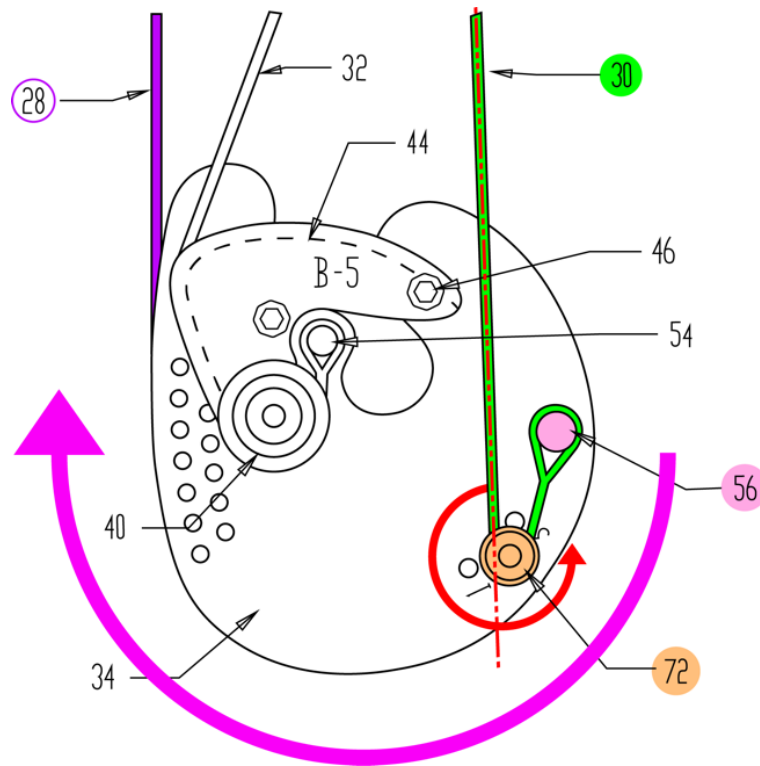


A PHOSITA would have recognized that the modified bow would have appropriately been redesigned to operate smoothly in the new configuration, resulting in the benefits previously discussed of improving safety, reducing maintenance cost, simplifying the design, and increasing the maximum angular sweep of the pulley as the bow is drawn. Omitting section 42, as proposed, would have addressed any concerns for a PHOSITA regarding discontinuous cam track due to gaps between the cable groove sections. Specifically, a potential “gap” arising between elements 44 and 42 would have been avoided due to the elimination of section 42, improving *Darlington’s* design.

13. ***Claim 1(g): “wherein, in the brace condition, the elongate straight portion defines a plane, wherein said first axle and said terminal are located on opposite sides of said plane.”***

65. The previously presented example combination of what the *Darlington+Islas* bow would have looked like are reproduced below, illustrated in the brace condition (the bowstring 28 is not pulled away from the pulley).

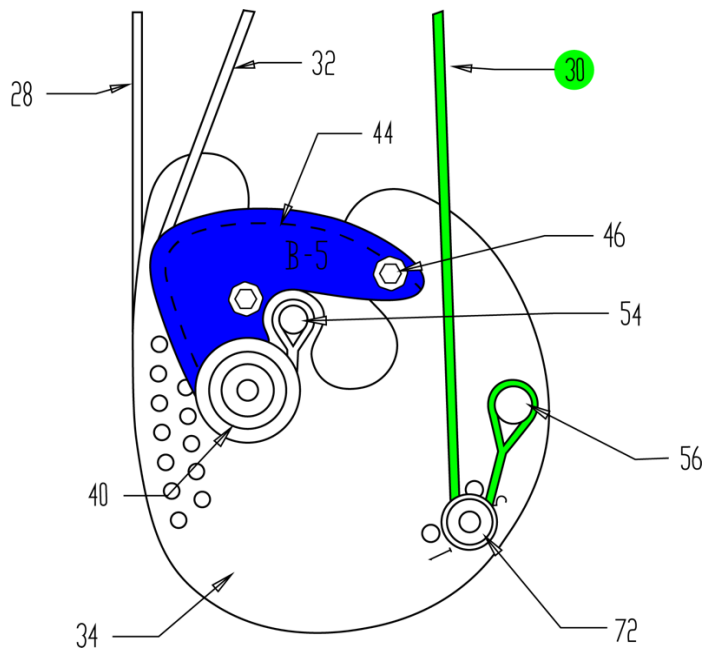




In the above mock-ups, the power cable is highlighted green and the plane defined by the power cable is illustrated by a dashed red line superimposed upon the green cable. This plane is seen side-on, stretching infinitely up and down along the power cable and both into and out of the image. As can be seen, the power cable's elongate straight portion defines a plane with the terminal 56 on one side and the axle (within hub 40) on the other side. I note that the elongate straight portion defining a plane was already present in the unmodified *Darlington* bow, but it is only upon modification pursuant to *Islas* for the motivations provided above (and intended for inclusion for limitation 1(g) as well) that the axle and terminal are located on opposite sides of this plane.

14. Claim 2: “The archery bow of claim 1, wherein, in the brace condition, the power cable is not oriented in said cam track.”

66. As seen in the below figure, the example combination of a modified *Darlington+Islas* bow described above regarding limitation 1(f) meets this limitation.

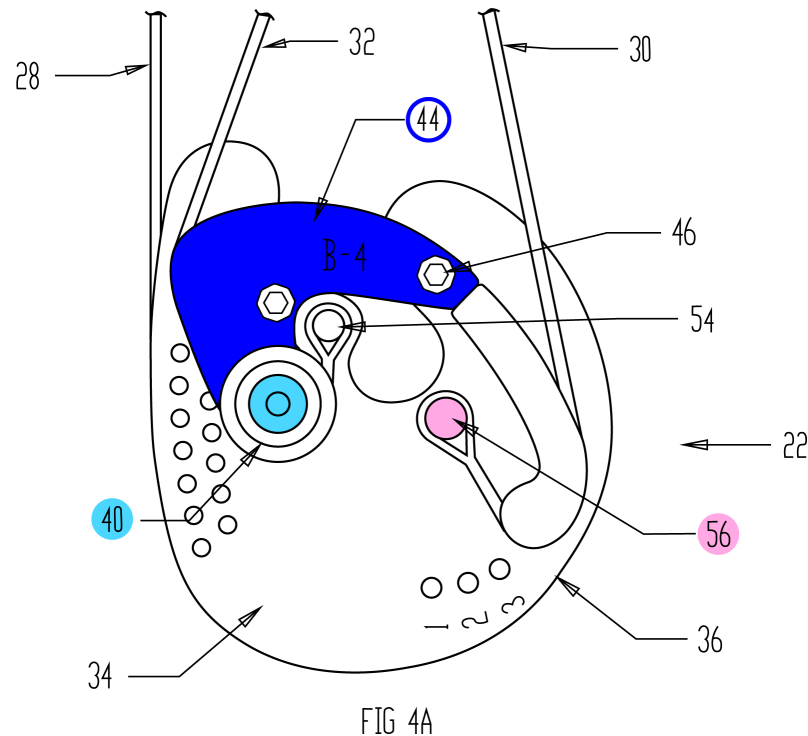


Power cable 30 is spaced apart from cam track 44, not oriented in it. The bow is at brace, as evidenced by its drawstring 28 resting against the pulley and running straight up toward the opposite pulley.

15. Claim 3: “The archery bow of claim 1, wherein a distance between the first axle and the terminal is greater than a distance between the first axle and the cam track.”

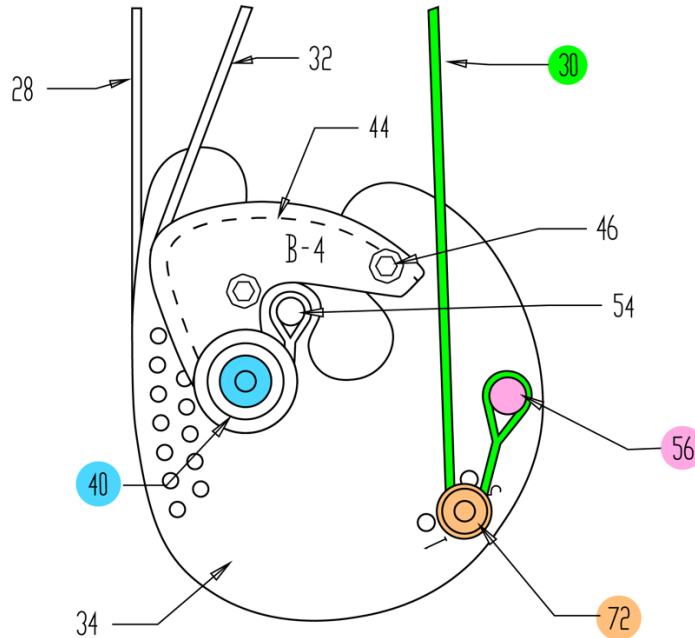
67. As seen in the below figure from the unmodified *Darlington* bow, the distance between the first axle 20 (at the center of hub 40, light blue) and the terminal

(56, pink) is greater than the distance between the first axle and the cam track (44, dark blue).



Darlington, Fig. 4A (annotated), 4:50-65. Though axle 20 is not expressly enumerated in this figure, *Darlington* states that hub 40 “surround[s] an opening for receiving axle 20[,]” leading to a conclusion that the center of hub 40 highlighted light blue above represents the location of first axle 20. *Darlington*, 2:50-54. I understand this figure is not necessarily to scale, but a PHOSITA would have recognized that the hub surrounding the first axle and cam track are touching, while the hub surrounding the first axle does not touch the terminal, meaning the distance between the axle and terminal is the greater distance. Thus, *Darlington* alone teaches

this limitation. When modified pursuant to *Islas*, the terminal is moved even further from the first axle, as seen in the example combination below.

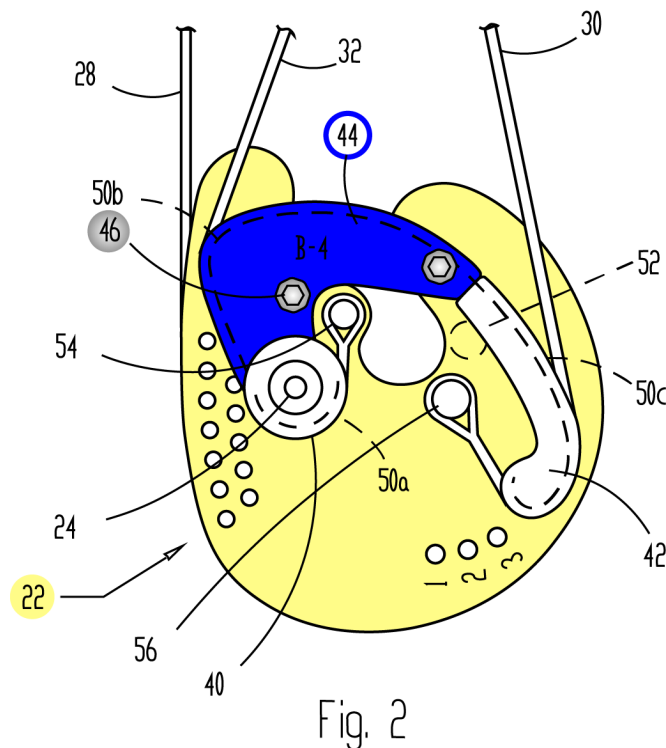


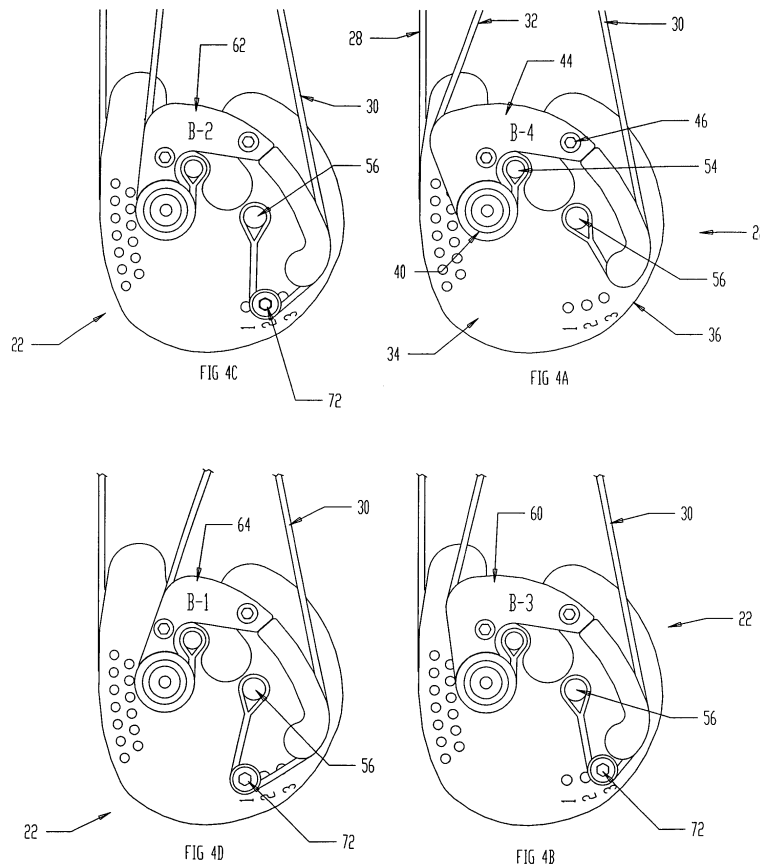
Thus, the modified *Darlington+Islas* bow must also render obvious this limitation. A PHOSITA would have also recognized that the axle, terminal, and cam track would have been resizable, repositionable, and configurable into any particular orientation, shape, size, and relative spacing desired as a design choice dictated by the particular draw profile desired by the PHOSITA for the particular bow. For instance, a PHOSITA may have desired a longer draw profile for a bow that was configured for a taller person, but a shorter draw profile for a bow intended for a shorter person, such as for women or children. Thus, a PHOSITA would have had the skill without undue experimentation and found it obvious to shape the *Darlington+Islas* bow such that it rendered claim 3 obvious.

16. **Claim 4:** “The archery bow of claim 1, wherein at least a portion of said cam track comprises a module that is attached to said first rotatable member.”

Claim 7: “The archery bow of claim 4, wherein said module is interchangeable with a second module having a different shape.”

68. *Darlington's* removable draw length module 44 (the mapped cam track) is mounted on a flat base 34 of each of the upper and lower pulleys 18, 22. *Darlington*, 2:50-65; Figs. 1-2. Specifically, *Darlington* states “draw length module 44 is removably mounted on base 34, such as by screws 46[.]” *Darlington*, 2:54-56. In annotated Fig. 2 below, draw length module 44 (blue) is attached to the base of pulley 22 (yellow) by screws 46 (grey):





Darlington, Fig. 2 (annotated), Figs. 4A-4D (illustrating the bow interchanged with modules of different shapes B-1 through B-4), *see also* 3:38-43, 4:18-20; Figs. 3A-3D. The shapes of *Darlington*'s replacement draw length modules 60, 62, and 64 determine the draw cycle of the bow. *Darlington*, 3:60-61. Each of the draw length modules 60, 62, and 64 impart "progressively decreasing draw length to the bow" by progressively decreasing the lengths of each module's peripheral edges 48 "so that cable groove sections 50b likewise are of progressively decreasing length." *Darlington*, 3:38-52; Figs. 3A-4D. *Darlington* touts advantages of providing

interchangeable draw length modules, such as allowing users to customize the bow to the desired draw length. *Darlington*, 3:55-59.

17. ***Claim 8: “The archery bow of claim 1, further comprising a second power cable, said second rotatable member comprising a second cam track, a second capstan and a second terminal, the second power cable attached to said second terminal and extending toward the first limb, said second power cable comprising a second elongate straight portion located near said second rotatable member, a second capstan portion in contact with said second capstan and a second terminal portion in contact with said second terminal; wherein, in the brace condition, the second power cable wraps around the second capstan in the second rotational direction as the second power cable is traversed from the second elongate straight portion to the second terminal portion; and when the bow is drawn from the brace condition, the second rotatable member rotates in the first rotational direction.”***

69. *Darlington*’s upper (second) pulley 18 includes a draw length module 44 (dark blue) with groove section 50b (orange) and anchor 56 (pink). The upper draw length module 44 with groove section 50b teaches the second cam track and the upper anchor 56 teaches the second terminal. *Darlington*, 2:50-3:13; Figs. 1-2.

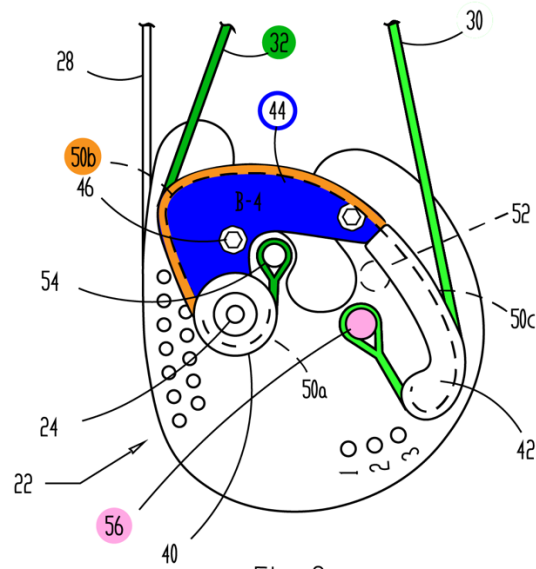
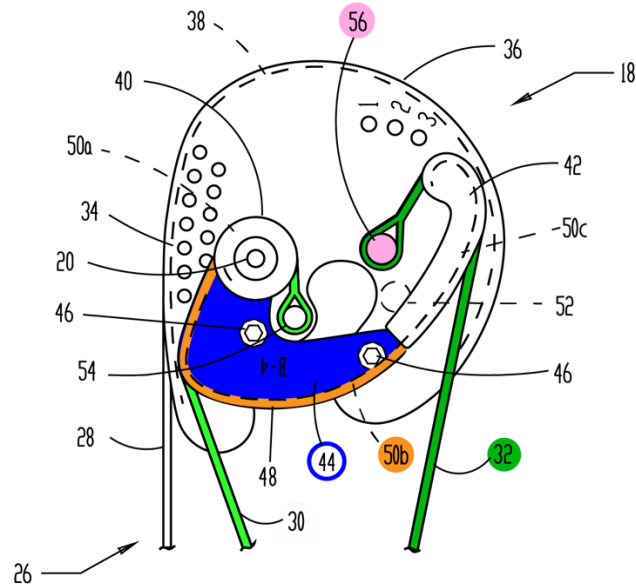
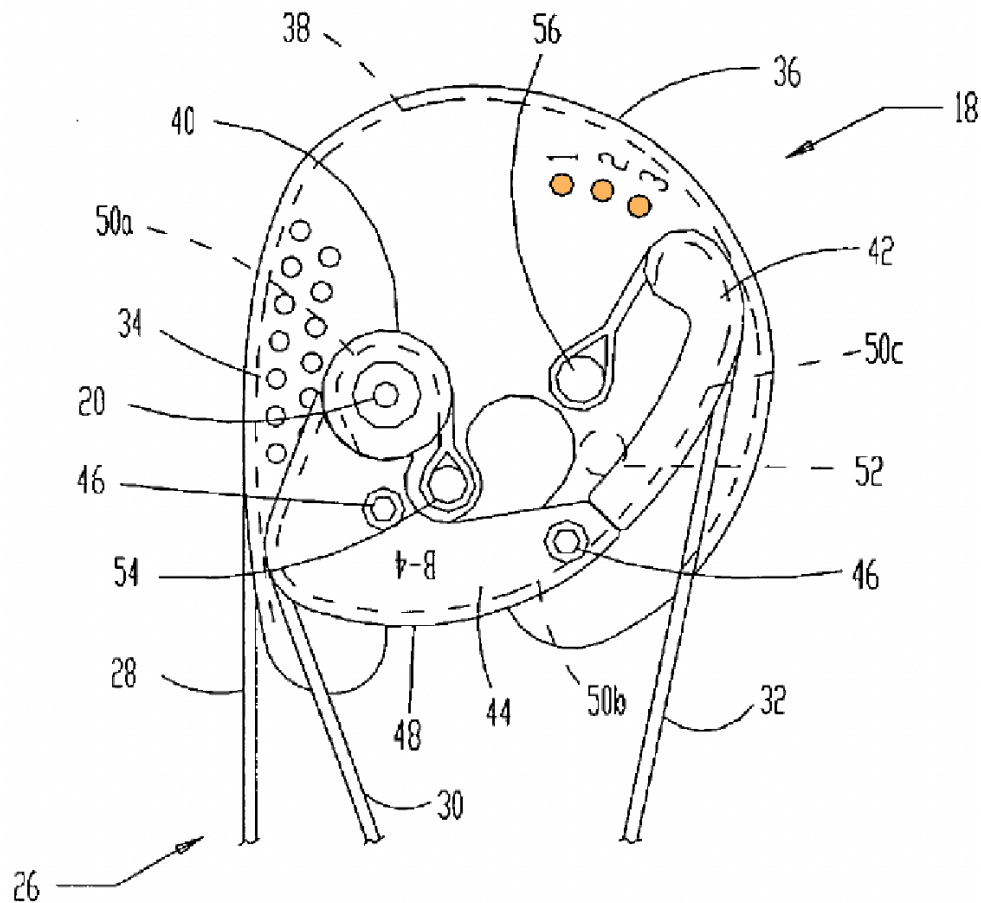


Fig. 2

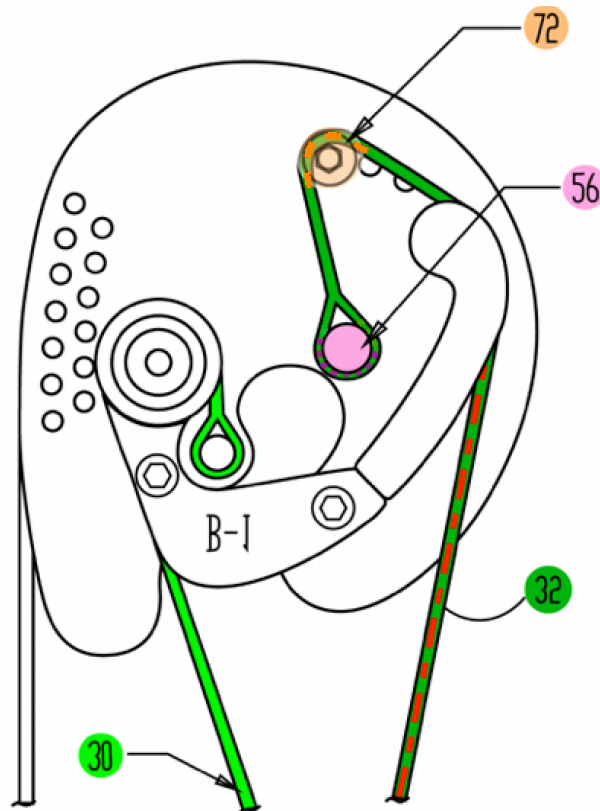
Darlington, Fig. 2 (annotated), 3:6-8. *Darlington's* intermediate post 72 (capstan) is not illustrated in Fig. 2, though the positions 1,2,3 at which the upper capstan may be located *are* shown.



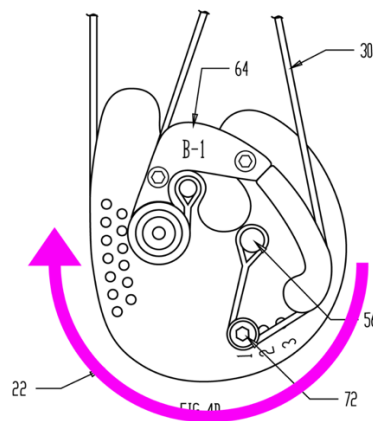
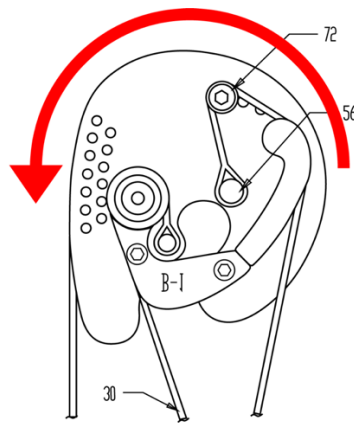
Darlington, Fig. 2 (annotated), 3:65-4:6, 1:42-50. A PHOSITA would have recognized that the intermediate post described by *Darlington* and illustrated in other figures, such as 4A-D would have been intended as being positionable at any of the 3 locations 1,2,3 marked in orange in the above figure. Though these figures only illustrate the post (capstan) on the lower pulley, *Darlington* states that “lower pulley 22 is essentially a mirror image of [upper] pulley 18.” *Darlington*, 3:8-13. Thus, a PHOSITA would have understood embodiments of *Darlington* teach a post 72 on upper pulley 18, teaching or at least rendering obvious the claimed “second capstan[.]” A PHOSITA would have expected the upper pulley to mirror the lower

pulley for balance and parallel operation of the bow, leading the PHOSITA to expect that embodiments in which the lower pulley has an intermediate post, the upper pulley would also have an intermediate post in the corresponding appropriate location.

70. *Darlington's* power cable 32 then “extends from an anchor 56 on base 34 through at least a portion of cable groove section 50c and thence toward pulley 22.” *Darlington*, 3:6-8. As a result, the configuration of the upper pulley in the modified *Darlington+Islas* bow would have mirrored the configuration of the lower pulley in the same bow, teaching the details of claim 8 in the same manner as in claim 1.



Specifically, the second power cable of the *Darlington+Islas* bow wraps around a capstan on the upper pulley in a second rotational direction (opposite the lower pulley, because they are mirror images) as the power cable is traversed from the elongate straight portion to the terminal portion when the bow is in a brace condition, and the second rotatable member rotates in a first rotational direction that is opposite the second rotational direction as the bow is drawn.



The resulting *Darlington+Islas* bow would have provided a capstan on of the *upper* pulley, around which the power cable wraps around the capstan from the side closer

to the axle of the pulley towards the periphery of the upper pulley, onward to its second terminal, now relocated on the periphery of the upper pulley, with any of the structures resized and/or relocated as necessary according to the PHOSITA's desired draw profile such that the bow would have been operable using skills available to a PHOSITA without undue experimentation. My motivation to modify the *Darlington* bow pursuant to *Islas* for this limitation is identical to that described above regarding limitation 1(f), only now applicable to the upper pulley and the *second* power cable, capstan, and terminal. Thus, my motivations described above regarding claim 1(f) are herein incorporated by reference.

18. Claim 10: "The archery bow of claim 1, wherein said first rotatable member comprises an outer peripheral structure, said terminal located on said outer peripheral structure."

71. I note that the '989 Patent describes rotatable members, such as those illustrated in Figs. 1 and 2 below, that have inner voids with a number of spokes branching out to support an outer peripheral structure.

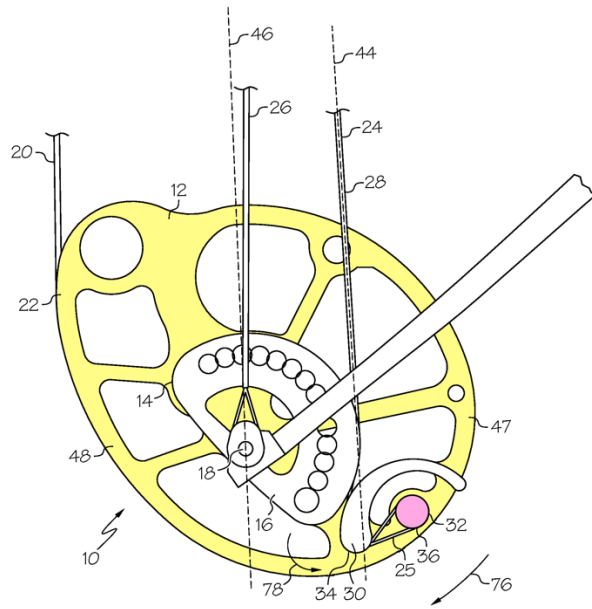


FIG. 1

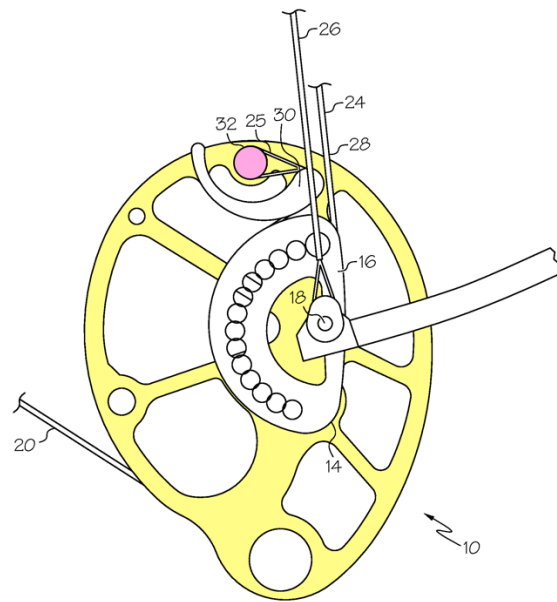
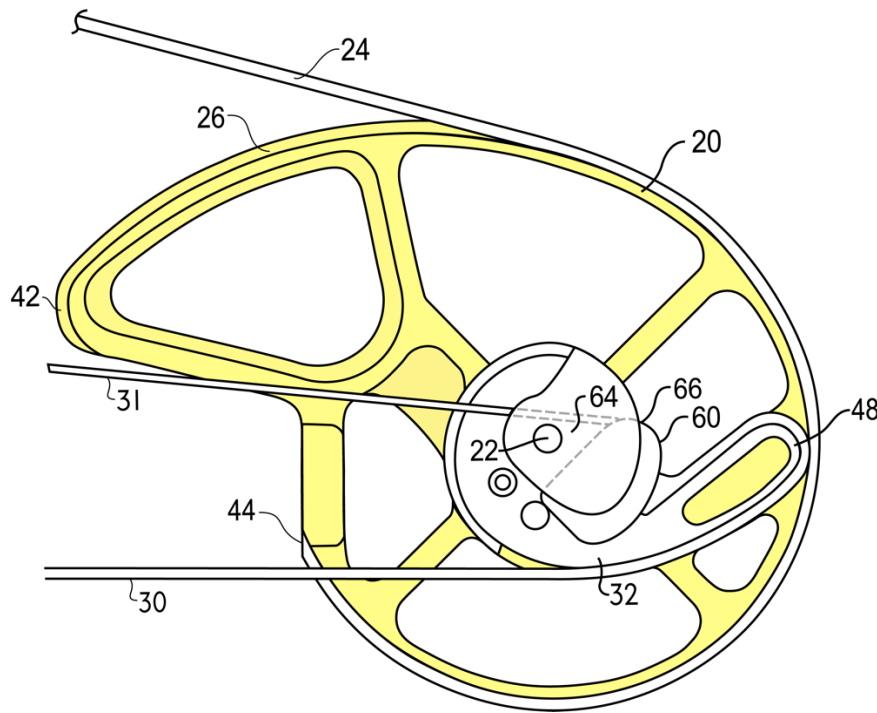


FIG. 2

'989 Patent, Figs. 1, 2 (annotated). A PHOSITA would have recognized the pink terminal in Figs. 1 and 2 is oriented on the “outer peripheral structure” of the rotatable members.

72. *Islas* teaches a very similar structure, in which a bowstring cam member 20 that has “cutouts and spokes to make it light in weight,” as shown in Fig. 1 below:



Islas, Fig. 1 (annotated), [0029]. The cutouts result in an outer peripheral structure left behind, as recited in Claim 10. A PHOSITA would have been motivated to combine *Islas*'s "cutouts and spokes" design into the pulleys of the *Darlington+Islas* bow for the well-known advantages resulting from providing a lower mass design. *Islas* expressly states that its "cutouts serve to relieve some of the mass of the cam member, reducing the rotational inertia without any sacrifice of rigidity," which a PHOSITA would have recognized as a desirable improvement to the Moment of Inertia of the bow's cams, allowing the bow to transfer more of the stored energy into a fired arrow. *Islas*, [0029]. The bow would have also ultimately conserved the amount of material required to manufacture the bow (either directly or via recycling of "cutout" material), and thus would have rendered the bow less expensive for both

the manufacturer and the consumer. Equivalently, in the case that the pulleys were formed from a single piece of material and then material is removed, a PHOSITA would have recognized that the removed material (e.g. aluminum) would have been recyclable for further future manufacturing, and thus the *Darlington+Islas* bow would have reduced the manufacturing cost of the bow (and subsequent cost of the bow to a consumer) in such a manner. Additionally, a PHOSTIA would have recognized that the lighter cam would have resulted in a bow that is easier to carry and hold, especially when drawn and held out away from the archer's body. A PHOSITA would have had the skill to combine the designs without undue experimentation because it would have only required selection of a sufficiently strong material and removal of unnecessary portions, resulting in a reasonable expectation of success because only techniques well-known to a PHOSITA would have been required. A PHOSITA would have further had the skill and found it obvious to place the anchor (terminal) of the *Darlington+Islas* bow on the outer peripheral structure because it could not have been placed in the void, leaving only three other options that are obvious to try: the center of the cam, the spokes, and the outer peripheral structure. A PHOSITA would have recognized that the expected, most successful location for the terminal would have been on the outer peripheral structure, especially given that the original *Darlington* bow already had the terminal located at the periphery of the pulley. The location of the terminal would have been

a mere design choice and placing it on the outer peripheral structure (as opposed to placing the terminal at a location on a thin interior structure) would have been desirable in many embodiments for strength and resistance to fatigue. A PHOSITA would have had the skill and found it obvious to place the other elements of the bow that I discussed above for claim 1, as well as any other elements necessary for the bow to operate, between the holes of the *Darlington+Islas* bow such that they would have been well-supported. A PHOSITA would have found it nonsensical to try to locate one of the bow elements in a cutout hole, and instead would have found it obvious to modify the design, relocating, resizing, reshaping, and/or reorienting portions as necessary to make the bow operable while incorporating the desirable advantages of *Islas*'s cutouts, again resulting in a reasonable expectation of success.

19. Claim 11(Pre): “An archery bow having a brace condition and a drawn condition, the archery bow comprising:”

73. *Supra*, Section VII.A.1(Pre)

20. Claim 11(a): “a riser; a first limb and second limb supported by the riser;”

74. *Supra*, Section VII.A.1(a)

21. Claim 11(b)(i): “a first rotatable member supported by the first limb on a first axle, a second rotatable member supported by the second limb on a second axle,”

75. *Supra*, Section VII.A.1(b)(i)

22. Claim 11(b)(ii): “the first rotatable member comprising a drawstring track, a cam track, a capstan and a terminal,”

76. *Supra*, Section VII.A.1(b)(i)-(iv)

23. Claim 11(b)(iii): “wherein said drawstring track is oriented in a first cam plane and said cam track is oriented in a second cam plane offset from said first cam plane;”

77. *Supra*, Section VII.A.1(b)(v)

24. Claim 11(c): “a drawstring extending between the first rotatable member and the second rotatable member;”

78. *Supra*, Section VII.A.1(c)

25. Claim 11(d)(i): “a power cable attached to said terminal and extending toward the second limb,”

79. *Supra*, Section VII.A.1(d)(i)

26. Claim 11(d)(ii): “said power cable comprising an elongate straight portion located near said first rotatable member, a capstan portion in contact with said capstan and a terminal portion in contact with said terminal;”

80. *Supra*, Section VII.A.1(d)(ii)

27. Claim 11(e): “wherein, in the brace condition, the power cable wraps around the capstan in a first rotational direction as the power cable is traversed from the elongate straight portion to the terminal portion; and”

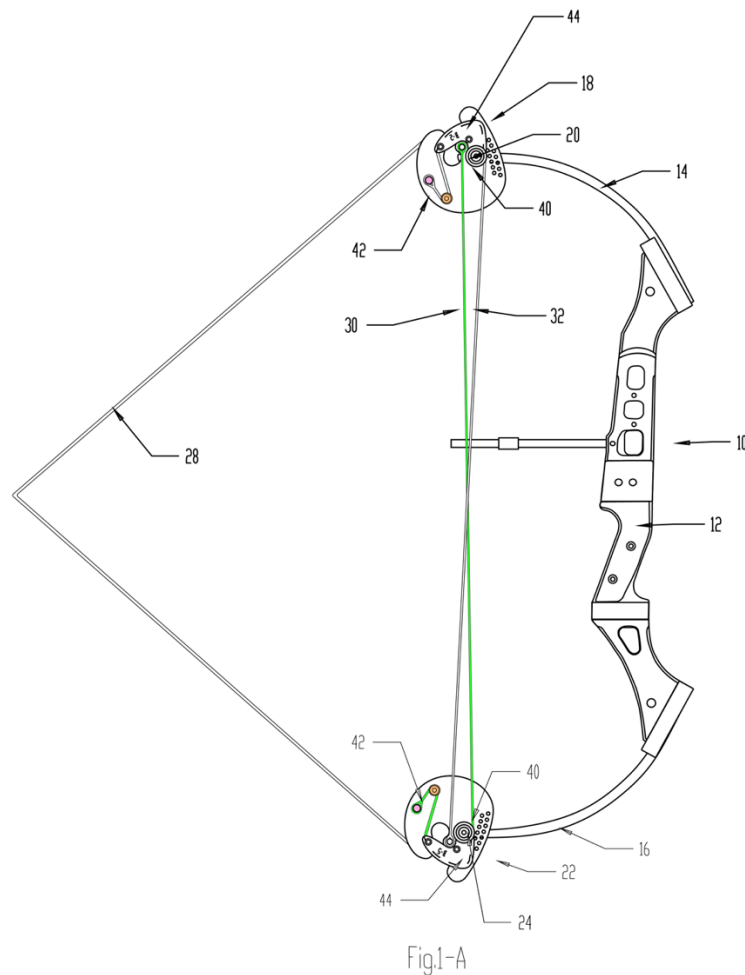
81. *Supra*, Section VII.A.1(e)

28. Claim 11(f): “when the bow is drawn from the brace condition, the first rotatable member rotates in a second rotational direction that is opposite the first rotational direction and”

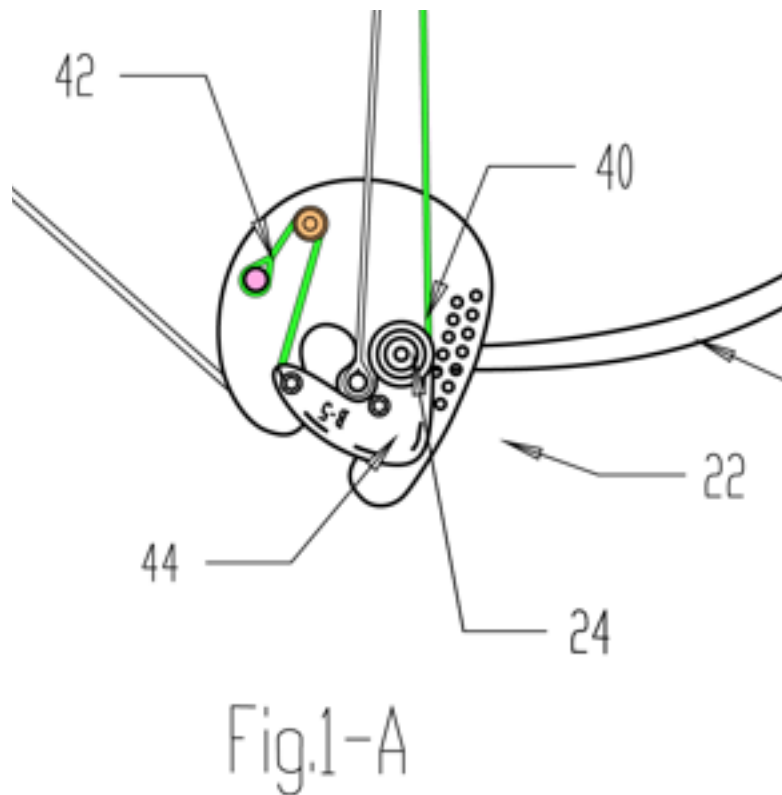
82. *Supra*, Section VII.A.1(f)

29. Claim 11(g): “wherein, in the drawn condition, the capstan is located closer to the elongate straight portion than the terminal.”

83. The *Darlington+Islas* bow described above regarding claim 1 was discussed in the brace condition. The same embodiments of *Darlington+Islas* bows discussed in limitation 1(f) render obvious limitation 11(g) when in the drawn position. Below, Fig. 1A from *Darlington* has been modified to illustrate an example combination of a *Darlington+Islas* bow, in which the power cable wraps from the center (or axis) of the pulley outwards towards the edge (periphery) of the pulley, now in a drawn orientation.



As above, a PHOSITA would have been motivated to modify *Darlington's* bow to wrap the power cable the opposite direction of the direction the rotatable member rotates as the bow is drawn for advantages relating to safety, maintenance, design simplification, weight reduction, and maximum draw length increase. *Supra*, claim 1(f), the discussion and motivations of which are herein incorporated by reference. A zoomed-in view of the above figure is reproduced below for convenience, showing how the *Darlington+Islas* bow teaches claim 11(g) as well.



Here, the *Darlington+Islas* bow is in a drawn condition, and the capstan (intermediate post, orange) is located closer to the elongate straight portion of the power cable stretching vertically at the right of the pulley than is the terminal

(anchor, pink) at the far left of the pulley. A PHOSITA would have immediately recognized that the *Darlington+Islas* bow described above would satisfy limitation 11(g) because the mapped axle is closer to the capstan than the terminal in the brace condition, and because clockwise rotation ensures that the terminal is strictly farther from the elongate straight portion in the drawn orientation than in the brace orientation.

30. Claim 12(Pre): “An archery bow having a brace condition and a drawn condition, the bow comprising:”

84. *Supra*, Section VII.A.1(Pre)

31. Claim 12(a): “a riser; a first limb and second limb supported by the riser;”

85. *Supra*, Section VII.A.1(a)

32. Claim 12(b)(i): “a first rotatable member supported by the first limb on a first axle, a second rotatable member supported by the second limb on a second axle,”

86. *Supra*, Section VII.A.1(b)(i)

33. Claim 12(b)(ii): “the first axle and the second axle defining an axle plane,”

87. Figure 7 from the '989 Patent is reproduced below, illustrating in red the axle plane extending side-on into and out of the page and containing each of the upper and lower axles.

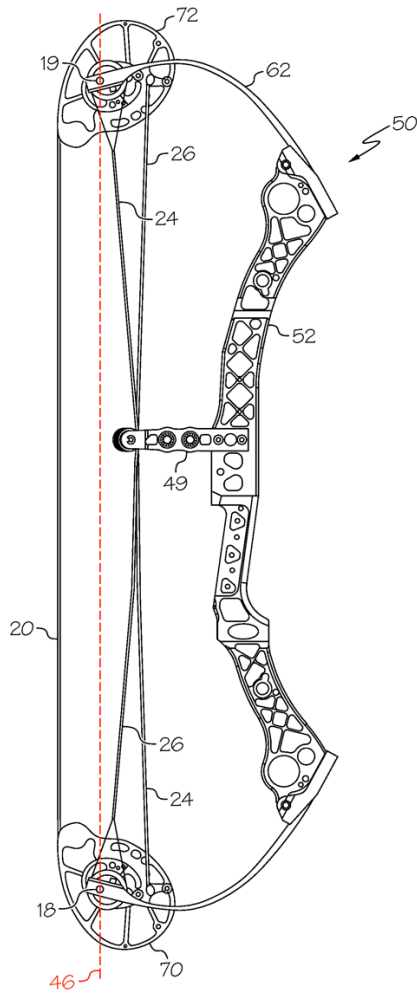


FIG. 7

'989 Patent, Fig. 7 (annotated). Similarly, a plane extending side-on into and out of the page and containing each of *Darlington's* upper and lower axles is illustrated below in annotated figure 1 of *Darlington*.



91

axle plane identical to that of the '989 Patent would have been present in the embodiments disclosed by *Darlington*.

34. Claim 12(b)(iii): “the first rotatable member comprising a drawstring track, a cam track, a capstan and a terminal,”

88. *Supra*, Section VII.A.1(b)(i)-(iv)

35. Claim 12(b)(iv): “wherein said drawstring track is oriented in a first cam plane and said cam track is oriented in a second cam plane offset from said first cam plane;”

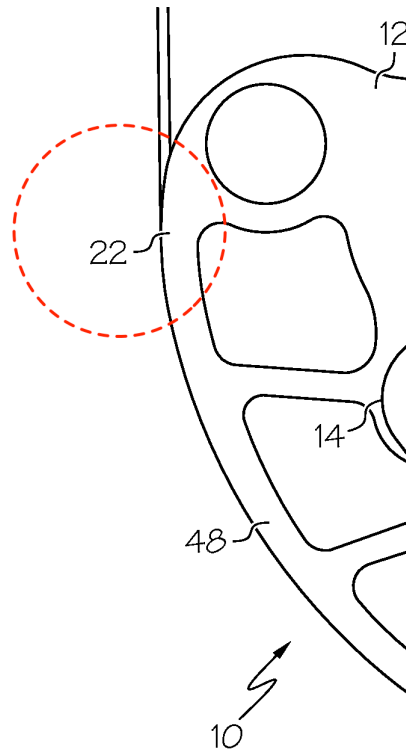
89. *Supra*, Section VII.A.1(b)(v)

36. Claim 12(c)(i): “a drawstring extending between the first rotatable member and the second rotatable member,

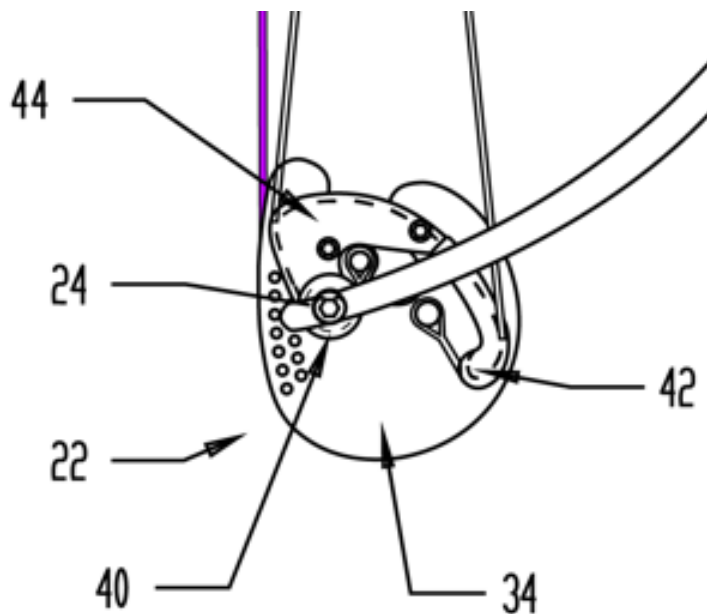
90. *Supra*, Section VII.A.1(c)

37. Claim 12(c)(ii): “the drawstring extending from the first rotatable member at an exit location;”

91. The '989 illustrates the exit location of a drawstring in Fig. 1, describing it by stating, “The drawstring 20 leaves the cam 10 at an exit location 22.” *Id.*, 3:51-57, 4:52.



Id., Fig. 1 (excerpt, annotated). Similarly, *Darlington's* bowstring leaves its cam (pulley) at an exit location, as seen in annotated Fig. 1.



Darlington, Fig. 1 (excerpt, annotated). Thus, *Darlington* alone and the modified *Darlington+Islas* bow each teach the claimed “exit location.” To the extent it is argued that the *Darlington* exit location isn’t expressly disclosed by the bow string ceasing contact with the pulley and extending upward, a PHOSITA would have at least found it obvious that an exit location identical to that of the ’989 Patent would have been present in the embodiments disclosed by *Darlington*.

38. Claim 12(d)(i): “a power cable attached to said terminal and extending toward the second limb,”

92. *Supra*, Section VII.A.1(d)(i)

39. Claim 12(d)(ii): “said power cable comprising a capstan portion in contact with said capstan and a terminal portion in contact with said terminal;”

93. *Supra*, Section VII.A.1(d)(ii)

40. Claim 12(e)(i): “wherein, in the brace condition, the axle plane divides the first rotatable member to a first part and a second part, the capstan and the terminal located in the first part, the drawstring exit location located in the second part, and”

94. *Darlington*’s axle plane is shown below on an annotated Fig 2, in which it would have been clear to a PHOSITA that the terminal (pink) and drawstring (purple) are on opposite sides of the axle plane (red).

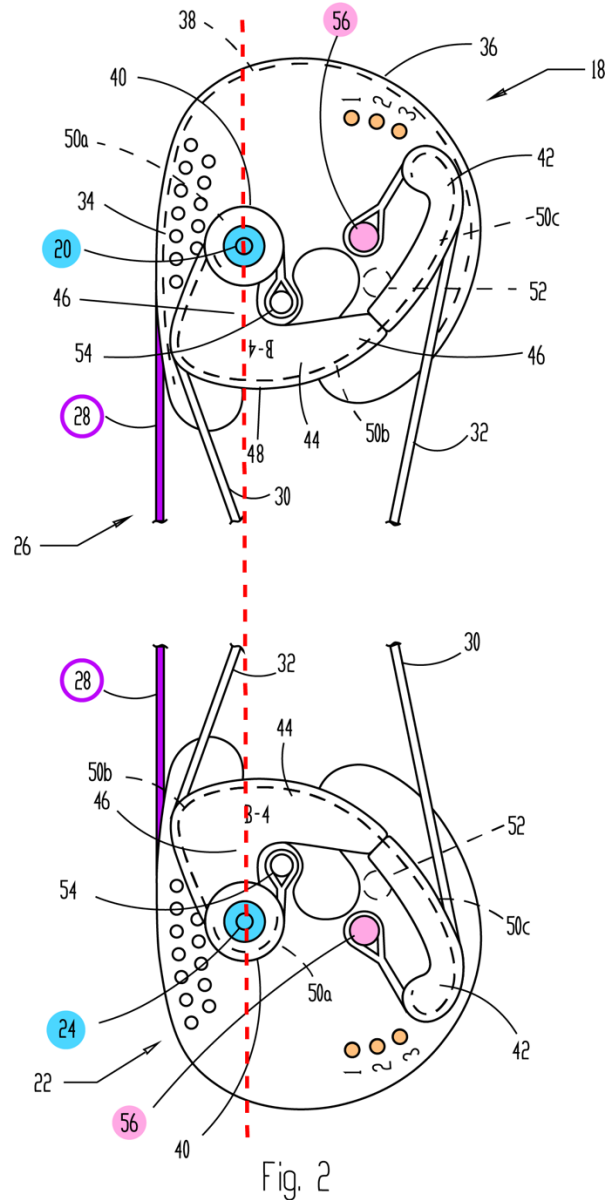
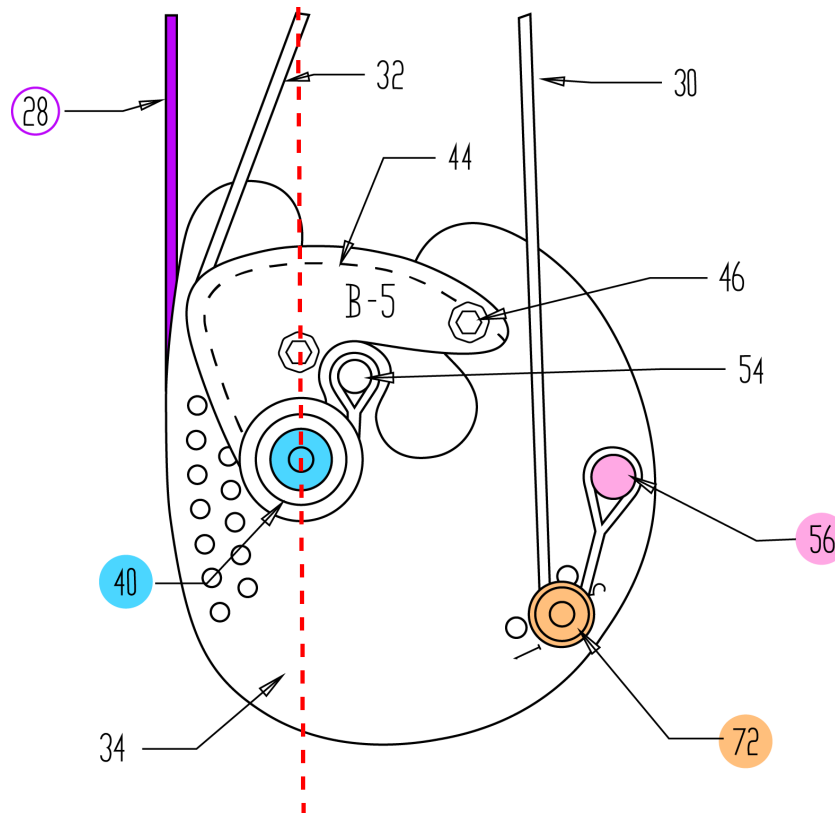


Fig. 2

Darlington, Fig. 2 (annotated). Additionally, though the intermediate post (capstan) is not illustrated in Fig. 2, *Darlington* is clear that the intermediate post is intended to be inserted optionally into any of holes 1,2,3, each of which are on the same side of the red axle plane as the pink terminal, opposite that of the purple bowstring. For instance, *Darlington* shows the intermediate posts 72 inserted into each of the three holes and also removed from the pulley in Figs. 4B-4D. Thus, mapping the right-

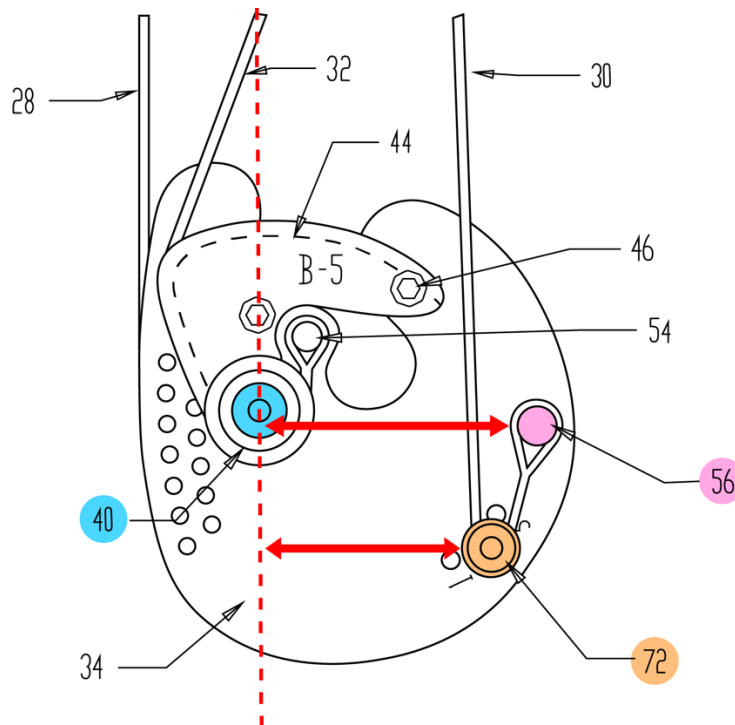
hand side of *Darlington*'s pulley as the “first part” and the left-hand side as the “second part” results in *Darlington* teaching limitation 12(e)(i). Further, the modification of *Darlington* pursuant to *Islas* moves the terminal but **does not** move it across the axle plane – the modified relocated terminal is still on the right-hand side (first part) of the modified *Darlington+Islas* bow, and as such the modified bow teaches limitation 12(e)(i) in the same manner.



41. Claim 12(e)(ii): “a distance between the terminal and the axle plane is greater than a distance between the capstan and the axle plane and”

95. As seen in the annotated figure below, the example combinations of the *Darlington+Islas* bow provide a rotatable member in which the distance between

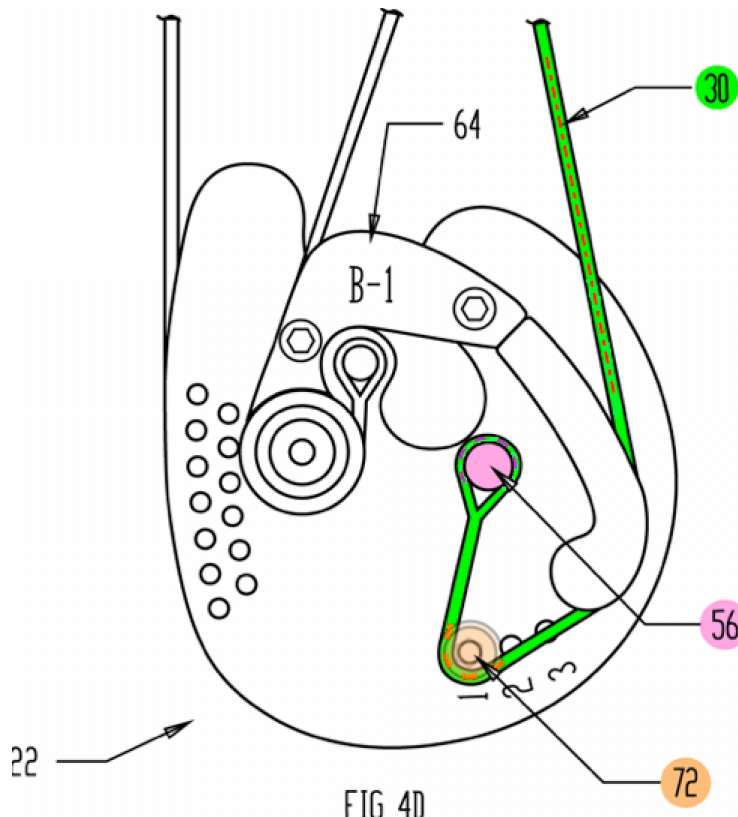
the terminal and axle plane (upper red arrow) is greater than the distance between the capstan and axle plane (lower red arrow) as a consequence of the power cable wrapping outwards around the capstan, from the near-axle side of the capstan toward the periphery of the pulley.



The terminal is further from the axle plane because the power cable drops down substantially vertically, wraps around the capstan, and then continues away from the axle plane at an angle. My motivations to combine *Darlington* and *Islas* discussed above regarding limitation 1(f), are intended for incorporation by reference herein.

42. ***Claim 12(f)(i): “wherein, in the brace condition, said power cable comprises an elongate straight portion located near said first rotatable member,”***

96. As discussed above regarding limitation 1(d)(ii), *Darlington* (as well as *Darlington+Islas*) include an elongate straight portion where the power cable 30 straightens out to extend toward the opposite pulley, as indicated by the red dash-dotted line below.



Supra, V.A.1(d)(ii); *Darlington*, Fig. 4D (annotated). *Darlington* expressly identifies the bows of Figs. 1 and 2 as being in the “undrawn condition” or the “rest position[.]” *Darlington*, 2:66-3:19; Figs. 1 and 2. Comparing pulley 22 in annotated Fig. 4D above to pulley 22 in Fig. 2, which is expressly identified as being in the undrawn (e.g., brace) condition, reveals that pulley 22 is in the same orientation in

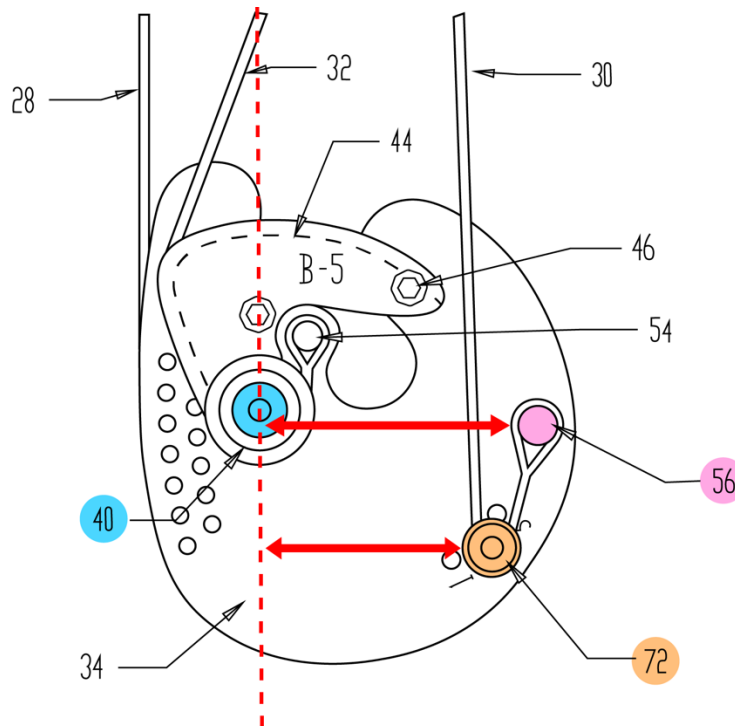
both figures. Thus, a PHOSITA would have readily identified the bow in annotated Fig. 4D above as being in the “brace condition.”

43. Claim 12(f)(ii): “the elongate straight portion defines a cable portion plane, said first axle and said terminal are located on opposite sides of said cable portion plane.”

97. *Supra*, Section VII.A.1(g).

44. Claim 13 “The archery bow of claim 12, wherein said distance between the terminal and the axle plane is measured orthogonal to said axle plane, and said distance between the capstan and the axle plane is measured orthogonal to said axle plane.”

98. In the figure reproduced below, which was previously discussed regarding claim 12(e)(ii), the red arrows below representing the distances between the terminal and axle plane (upper red arrow) and the distance between the capstan and axle plane (lower red arrow) are each measured orthogonal (perpendicular) to the axle plane.



45. Claim 14 *“The archery bow of claim 12, wherein a distance between the first axle and the terminal is greater than a distance between the first axle and the cam track.”*

Supra, Section VII.A.15 (Claim 3).

46. Claim 15: *“The archery bow of claim 12, wherein, in the brace condition, the power cable is not oriented in said cam track.”*

Supra, Section VII.A.14 (Claim 2).

47. Claim 16: *“The archery bow of claim 12, wherein at least a portion of said cam track comprises a module that is attached to said first rotatable member, the module being removable or repositionable.”*

99. *Supra*, Section VII.A.16 (Claim 4).

48. Claim 17 (a): *“The archery bow of claim 12, further comprising: a second power cable, said second rotatable member comprising a second cam track, a second capstan and a second terminal,”*

100. *Supra*, Section VII.A.18 (Claim 10).

49. Claim 17(b): “the second power cable attached to said second terminal and extending toward the first limb,”

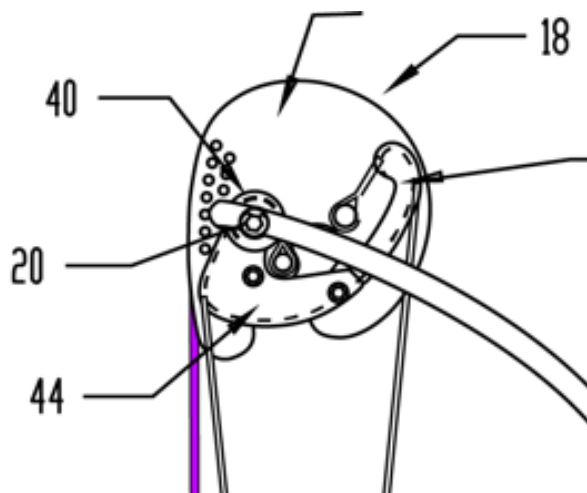
101. *Supra*, Section VII.A.18 (Claim 10).

50. Claim 17(c)(i): “said second power cable comprising a second capstan portion in contact with said second capstan and a second terminal portion in contact with said second terminal,”

102. *Supra*, Section VII.A.18 (Claim 10).

51. Claim 17(c)(ii): “the drawstring extending from the second rotatable member at a second exit location;”

103. As discussed regarding limitation 12(c)(ii) above, *Darlington’s* bowstring 28 ceases contact with each of the pulleys 18, 22 teaching a drawstring exit location on each. *Supra*, Section VII.A.10(c)(ii). Specifically, the excerpt below from *Darlington’s* Fig. 1 shows bowstring 28 exiting from upper pulley 18 (mapped second rotatable member) and extending towards lower pulley 22 at a second exit location where the purple drawstring ceases contact with the upper pulley:



Darlington, Fig. 1 (annotated). Thus, *Darlington* teaches or at least renders obvious the drawstring extending from the second rotatable member at a second exit location, as claimed.

52. Claim 17(d): “wherein, in the brace condition, the axle plane divides the second rotatable member to a first part and a second part, the second capstan and the second terminal located in the first part, the second drawstring exit location located in the second part, and a distance between the second terminal and the axle plane is greater than a distance between the second capstan and the axle plane.”

104. For the reasons discussed above regarding the first rotatable member, the second rotatable member of the *Darlington+Islas* bow renders obvious this limitation. *Supra*, Section VII.A.40-41 Claim 12(e)(i)-(ii).

53. Claim 18: “The archery bow of claim 17, wherein said second rotatable member comprises a mirror image of said first rotatable member.”

105. *Darlington* explains that its upper and lower pulleys are “similar in function” and may be “near mirror images of each other.” *Darlington*, 2:42-47, 3:8-13.

54. Claim 19 (Pre): “An archery bow having a brace condition and a drawn condition, the bow comprising:”

106. *Supra*, Section VII.A.1(Pre).

55. Claim 19(a): “a riser; a first limb and second limb supported by the riser;”

107. *Supra*, Section VII.A.1(a).

56. Claim 19(b)(i): “a first rotatable member supported by the first limb on a first axle, a second rotatable member supported by the second limb on a second axle,”

108. *Supra*, Section VII.A.1(b)(i).

57. Claim 19(b)(ii): “the first axle and the second axle defining an axle plane,”

109. *Supra*, Section VII.A.10(b)(ii).

58. Claim 19(b)(iii): “the first rotatable member comprising a drawstring track, a cam track, a capstan and a terminal,”

110. *Supra*, Section VII.A.1(b)(iii)-(iv).

59. Claim 19(b)(iv): “wherein said drawstring track is oriented in a first cam plane and said cam track is oriented in a second cam plane offset from said first cam plane;”

111. *Supra*, Section V.A.1(b)(v).

60. Claim 19(c): “a drawstring extending between the first rotatable member and the second rotatable member, the drawstring extending from the first rotatable member at an exit location;”

112. *Supra*, Section V.A.10(c)(i)-(ii).

61. Claim 19(d): “a power cable attached to said terminal and extending toward the second limb, said power cable comprising a capstan portion in contact with said capstan and a terminal portion in contact with said terminal;”

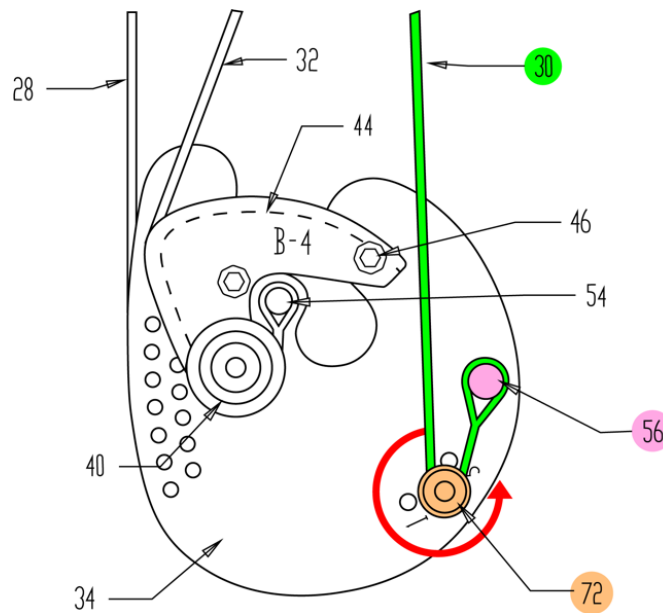
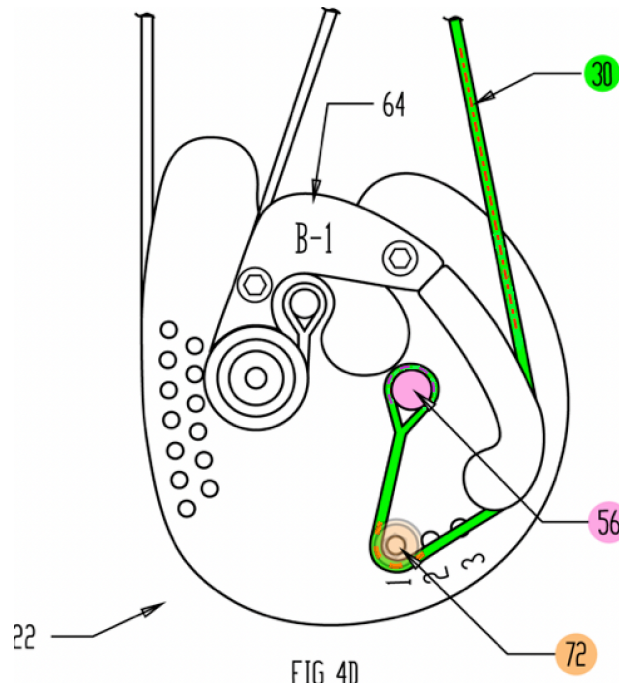
113. *Supra*, Section V.A.10(d)(i)-(ii).

62. Claim 19(e): “wherein, in the brace condition, the axle plane divides the first rotatable member to a first part and a second part, the capstan and the terminal located in the first part, the drawstring exit location located in the second part, and a distance between the terminal and the axle plane is greater than a distance between the capstan and the axle plane and”

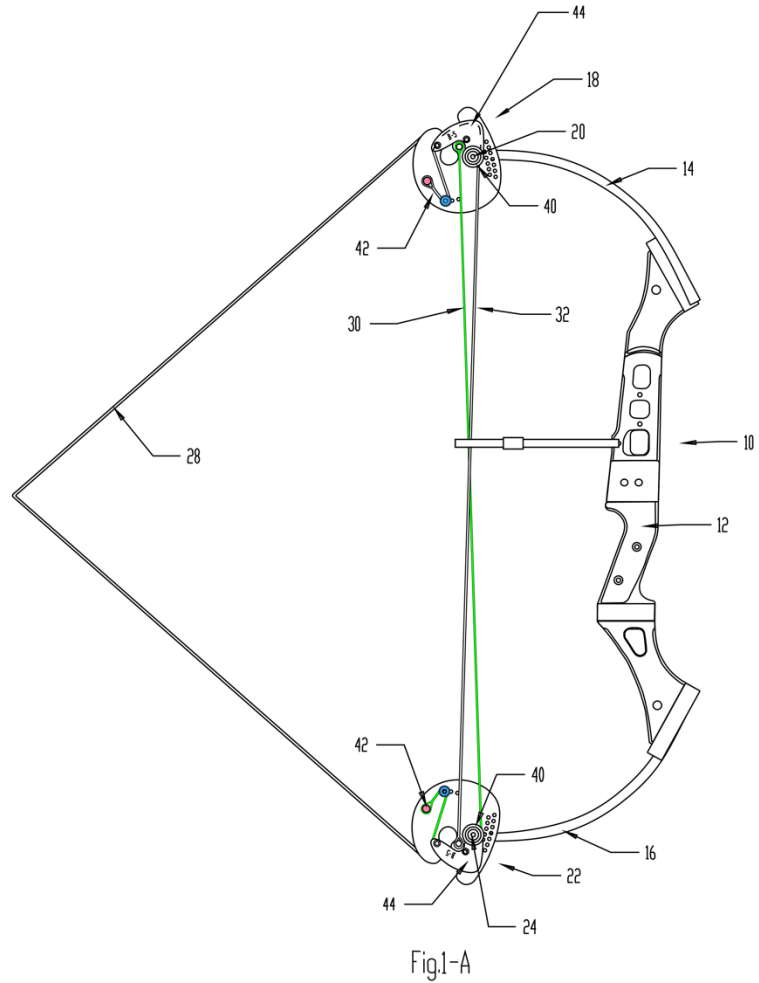
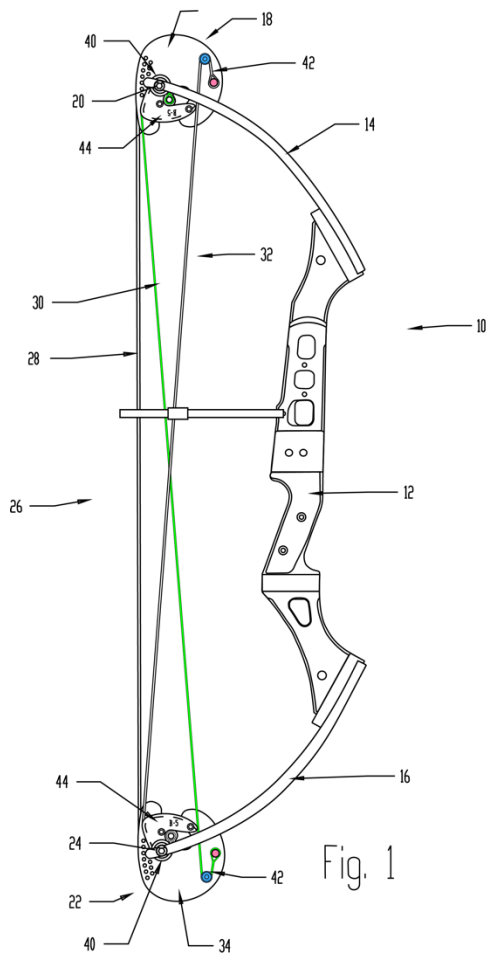
114. *Supra*, Section V.A.10(e)(i)-(ii).

63. Claim 19(f)(i): “wherein, in the drawn condition, said power cable comprises an elongate straight portion located near said first rotatable member,”

115. As discussed above regarding limitation 1(d)(ii), the *Darlington* and *Darlington+Islas* bows teach or at least render obvious an elongate straight portion in the brace condition. *Supra*, claim 1(d)(ii), the discussion of which is incorporated herein by reference.



Darlington, Fig. 4D (above) and an example combinations of *Darlington+Islas* (below). Further, each of *Darlington* and *Darlington+Islas* include such an elongate straight portion in the drawn condition as well, illustrated below for the *Darlington+Islas* bow.



As illustrated, in **both** the brace and drawn conditions, power cable 30 (green) includes a straight portion near lower pulley 22 (first rotatable member) that extends towards upper pulley 18 (second rotatable member).

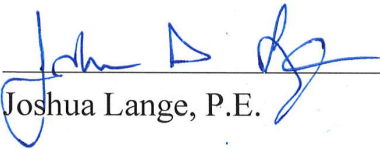
64. Claim 19(f)(ii): “[wherein, in the drawn condition,] the capstan [is] located closer to the elongate straight portion than the terminal.”

116. *Supra*, Section VII.A.29 (Claim 11(g)).

VIII. CONCLUSION

I declare that all statements made herein of my knowledge are true, and that all statements made on information and belief are believed to be true, and 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 Title 18 of the United States Code.

Date: 2/28/24

By: 
Joshua Lange, P.E.

Joshua D. Lange, P.E.
jlange@eisforensic.com

Education

University of Arkansas
Master of Science
Engineering with an Emphasis in Thermodynamics

University of Utah
Bachelor of Science
Mechanical Engineering

Work Experience

Principal Engineer 2016 to Present

Engineering & Investigation Services – Centerville, Utah

Responsible for performing forensic analysis of mechanical systems including HVAC, building controls, plumbing, fire suppression, solar thermal, and industrial piping. System evaluations include moisture source assessments, performance assessments, verification of design calculations, code analysis, and root cause of failures. Performs construction defect investigations, including review of specifications, field modifications, equipment selections, and system design and installation. Other duties include the evaluation of mechanical component failures as related to product liability, industrial equipment accidents/failures and shooting sports accident reconstructions.

Performs calculations, creates designs and produces construction drawings for commercial HVAC, plumbing and piping projects. Works with technical staff and contractors to ensure that mechanical system projects are executed per the construction documents and in accordance with the design intent. Performs analysis of various building codes and energy codes to ensure that facilities are in compliance.

Technical Manager - Mechanical Engineering 2022 to Present

Michael Baker International - Midvale, Utah

Leads engineering teams in the design of HVAC and plumbing system projects. Schedules and coordinates project tasks with support staff, other engineering disciplines, and construction contractors. Responsible for managing mechanical design team project budgets. Oversees and reviews engineering calculations, system designs, building plans, specifications, and written documents. Serves as a technical advisor to the mechanical engineering team and trains junior-level engineering staff in HVAC and plumbing design.

Mechanical Engineer 2020 to 2022

Michael Baker International - Midvale, Utah

Designs HVAC and plumbing systems for government facilities including military/defense buildings, healthcare facilities, municipal buildings, testing facilities and dormitories. Performs mechanical calculations, sizes equipment and fluid conduits, prepares mechanical system layouts, performs code reviews, and performs government standards reviews. Prepares written sequences of operation for controls systems of common and non-standard mechanical systems and equipment. Coordinates with multi-disciplinary teams of engineers, architects and contractors in design-build, design-assist, and plan & specification project types.

APPENDIX A

Facilities Engineer 2016 to 2019

L-3 Technologies, Salt Lake City, Utah

Worked with internal government defense contract program managers to define space design requirements and accommodate specialized manufacturing equipment. Accordingly, designed HVAC, plumbing, and mechanical process piping infrastructure throughout one million square feet of electronics manufacturing operations and office space spread across a 17-building campus. Worked with in-house technicians and tradesmen to ensure that projects were executed according to the design and per customer requirements. Worked with outside design consultants to define the scope on new-construction and retrofit projects. Reviewed and evaluated consultants' designs. Coordinated with environmental health and safety engineering staff to meet audit requirements. Evaluated the condition of mechanical equipment and made recommendations for maintenance and replacement.

Project Engineer 2016

Easton Technical Products – Salt Lake City, Utah

Designed and engineered new archery arrow shafts and components. Performed related project management duties including overseeing development, directing technicians in fabrication and testing, maintaining project schedules, conducting project meetings, and advising executive staff. Met with vendors and OEM manufacturers to coordinate business objectives. Developed and implemented manufacturing process improvements.

Project Engineer - Forensics 2013 to 2016

S-E-A, Ltd. - Charlotte, North Carolina

Performed failure analyses of building automation systems, HVAC systems, fire suppression systems, plumbing systems and industrial process equipment. Performed investigations and evaluations related to construction defect litigation including site inspections, design reviews, code analysis, specifications, equipment installation and post-installation maintenance. Also performed forensic analyses of mechanical component failures related to product liability, work-place accidents, and shooting sports injuries. Assisted in automobile accident reconstructions.

Project Engineer 2008 to 2013

David L. Jensen & Associates - Bountiful, Utah

Directed and coordinated cross-functional teams in the production of HVAC and Plumbing construction documents for a variety of building types such as: healthcare facilities, laboratories, manufacturing facilities, schools, and government facilities. Performed engineering calculations related to building heating and cooling loads, heat transfer, and fluid delivery. Verified design compliance with applicable codes and standard. Performed construction administrations duties including cost estimates, progress inspections, progress reports and conducting project meetings.

Product Development Engineer 2005 to 2008

Hoyt Archery - Salt Lake City, Utah

Designed and engineered various product components with a focus on compound bow cam systems to enhance performance in the areas of energy storage, noise reduction, vibration reduction, and system efficiency. Generated solid models and performed finite element analyses. Prototyped new parts through CNC programming and machining. Tested new products to verify performance standards using data acquisition hardware and software. Supported manufacturing engineering in the implementation of production processes.

APPENDIX A

Professional Registrations

Professional Engineer, State of Alabama, License No. 34626
Professional Engineer, State of Arizona, License No. 72176
Professional Engineer, State of California, License No. 38643
Professional Engineer, State of Colorado, License No. PE.0057293
Professional Engineer, State of Florida, License No. 77167
Professional Engineer, State of Georgia, License No. PE039060
Professional Engineer, State of Idaho, License No. 19798
Professional Engineer, State of Illinois, License No. 062.067302
Professional Engineer, State of Louisiana, License No. PE.0045906
Professional Engineer, State of Maryland, License No. 45625
Professional Engineer, State of Nevada, License No. 24615
Professional Engineer, State of North Carolina, License No. 040647
Professional Engineer, State of Ohio, License No. PE.80035
Professional Engineer, State of South Carolina, License No. 30995
Professional Engineer, State of Texas, License No. 115710
Professional Engineer, State of Utah, License No. 8268013-2202
Professional Engineer, State of Virginia, License No. 402023531
Professional Engineer, State of Washington, License No. 52504
Professional Engineer, State of Wisconsin, License No. 44330-6

Select Forensic Investigation & Expert Witness Experience

Edgewater at Barefoot Resort Condominiums, North Myrtle Beach, SC

Performed an inspection and evaluation of reported HVAC and fire suppression system construction defects. Reviewed construction related documentation including contracts, emails, change orders, etc. Produced an engineering report detailing the existing conditions, interpretation of related code requirements and parties responsible for work performed on the project. Provided expert testimony in deposition.

Food and Drug Administration – Central Utility Plant II, Silver Spring, Maryland

Investigated the reported failure of two inlet air cooling coils which led to water ingestion by a 50 MW natural gas turbine generator. Reviewed and evaluated various construction related documents and historical controls data. Produced an engineering report of the findings and provided expert testimony in deposition.

American City Building – The Howard Hughes Corporation, Columbia, Maryland

Investigation of a sprinkler pipe freeze which resulted in water damage to the building. Prepared an engineering report containing an evaluation of the existing building HVAC system and the standard of care exhibited by the building engineering technicians at the time of the incident. Provided expert testimony in deposition and trial.

Hoke Health Pavilion, Raeford, North Carolina

Performed an investigation of one of the hospital's air handling units that sustained freeze related damage to a heating water coil resulting in water damage to the building. Performed an evaluation of the building controls sequence of operations and coil piping configuration. Submitted a report rendering opinion as to the root cause of the failure.

Gwinnett Hospital, Lawrenceville, Georgia

Performed an investigation of a plumbing fitting failure within a pipe chase at the 8th floor of the building which resulted in water damage to the building.

APPENDIX A

St. Louis County Health and Wellness Center, Berkeley, Missouri

Performed an inspection of the freeze related failure of a 3” diameter sprinkler pipe that resulted in water damage to the building. Performed an evaluation of the HVAC system functionality and resultant building internal pressure as related to the sprinkler pipe failure. Prepared an engineering report describing the opinions resulting from the inspection and evaluation.

Ashton Heights Apartments, Suitland, Maryland

Evaluation of a heating water boiler failure which resulted in a fire. Provided an engineering report characterizing the boiler condition and rendering opinion as to the cause of the failure.

Denton Water Treatment Plant, Denton, North Carolina

Performed an inspection and evaluation of a failed pipe connection that resulted in a chemical spill. An engineering report containing the results of the evaluation was produced.

Southeast Frozen Foods, Gaston, South Carolina

Performed an inspection and evaluation of a fire sprinkler pipe joint failure which resulted in flooding and property loss. The inspection also included an examination of the associated fire alarm system’s failure to provide notification of system conditions through the fire alarm control panel. Performed a review of construction documents associated with the installation and testing of the fire alarm system. An engineering report containing opinions as to the cause of the failures was produced.

Solar Thermal Pool Heating Systems, Various, North Carolina

Investigated freeze related damage to solar thermal pool heating systems at the Alleghany Wellness Center, Sparta, North Carolina, and the W.G. White, Jr. Family YMCA, Winston-Salem, North Carolina. Performed a review of the system design considerations as related the local climatic design conditions and submitted a report containing the findings.

Green Chiropractic Clinic, Barnwell, South Carolina

Performed an inspection and evaluation of reported HVAC system construction defects. Produced an engineering report providing interpretation of the applicable sections of the IMC and opinion as to the industry best practices.

Greif, Inc, Chicago, Illinois

Examined and evaluated the HVAC and fire sprinkler systems of an existing building. Submitted an engineer report giving opinion as to the condition and normal expected service life of the facility’s mechanical systems and equipment. Provided expert testimony in deposition.

Nascar Center, Charlotte, North Carolina

Investigation of a diesel generator fuel reserve tank and pump system that caused a fuel leak which resulted in contamination of the storm drain systems and a local stream. Produced an engineering report describing the findings of the investigation and related opinions.

Morinaga America Food, Inc., Mebane, North Carolina

Investigation of the food manufacturing process equipment and DDC system which endured a malfunction resulting in the implosion of a stainless-steel storage tank. An engineering report detailing the results of the investigation was produced.

APPENDIX A

Select Design Experience

Wasatch Mental Health Center, Provo, Utah

Project Engineer for the HVAC systems of the new construction project consisting of a wellness center, classroom space, office areas, and a commercial kitchen with cafeteria. Responsible for performing heating and cooling load calculations, IMC Compliance, equipment selections and system layouts.

Timpanogos Regional Hospital – Cystoscopy and Endoscopy Procedure Rooms, Orem, Utah

Project Engineer for the HVAC systems and plumbing system remodels. Designed for the specific needs of the cystoscopy and endoscopy procedure rooms per the Guidelines for Design and Construction of Health Care Facilities and the International Mechanical Code (IMC). Integrated the new HVAC and plumbing equipment into the existing mechanical systems. Produced contract documents/drawings.

Ogden Regional Medical Center – Post-Anesthesia Care Unit (PACU), Ogden, Utah

Project Engineer for the medical gas plumbing and HVAC systems in the conversion of an office and reception area to a PACU within the existing building. Performed an evaluation of the existing HVAC systems and integrated changes to accommodate the requirements of the new space. Designed the new HVAC system in accordance with the Guidelines for Design and Construction of Health Care Facilities and the International Mechanical Code.

Utah Neuropsychological Institute (UNI), Salt Lake City, Utah

Project Engineer and construction administrator for the remodel and upgrade of a two-story psychiatric hospital. Coordinated cross-functional design and construction teams to remodel the existing building per the owner's requirements. Designed the replacement of the existing fan coil units with respective heating and chilled water piping. Integrated the new HVAC equipment with the existing dedicated ventilation air handling units, chilled water system and heating water system. Designed the replacement of all above-ground waste piping. Produced drawings depicting the aforementioned designs.

Lyman Library, Lyman, Wyoming

Project Engineer for the HVAC systems in the new construction project. Performed building heating and cooling load calculations, sized equipment, worked with architects to design an aesthetically pleasing duct design and layout, and produced contract documents/drawings.

Camp Williams Building 2500, Riverton, Utah

Project Engineer for the remodel of the HVAC systems. Performed heating and cooling load calculations and selected new equipment per the load requirements and the IMC. Designed a vehicle tailpipe exhaust collection system for the automotive shop space.

Ogden Regional Medical Center – Wing 1 Pediatric Unit Remodel, Ogden, Utah

Project Engineer for HVAC system alterations to accommodate the remodel of the Pediatric Unit. Performed load calculations, sized variable air volume (VAV) boxes and integrated the new HVAC equipment into the existing system. Designs were in accordance with the Guidelines for Design and Construction of Health Care Facilities.

Deseret Care Center, South Salt Lake, Utah

Project Engineer for the HVAC systems retrofit and domestic water piping replacement of an assisted living facility. Performed building heating and cooling load calculations, sized replacement equipment, and produced contract documents/drawings.

APPENDIX A

Ogden Regional Medical Center – Wing 4 C-Section Operating Room, Ogden, Utah

Project Engineer for HVAC system remodel. Designed the operating room system per the Guidelines for Design and Construction of Health Care Facilities and the IMC to provide the required airflow characteristics and room pressure requirements.

Central City Community Center, Salt Lake City, Utah

Project Engineer for the replacement of the HVAC and plumbing systems in conjunction with a complete remodel of the existing building. Performed building heating and cooling load calculations, air handling unit and VAV box equipment selections, duct sizing and layout, and heating water pipe sizing.

Viewmont High School, Bountiful, Utah

Project Engineer for the demolition of all existing low-pressure steam piping and equipment, and replacement with heating water piping and equipment. The project included the replacement of air handling unit coils, the addition of heat exchangers, new piping configurations and new direct digital control (DDC) equipment and devices.

Schiff Nutrition – Phase 1 Building B, Salt Lake City, Utah

Project Engineer for the demolition and remodel of the HVAC and plumbing systems of a nutritional supplements laboratory. Performed site inspection of existing building conditions, performed related design calculations, and produced HVAC and plumbing plans.

University of Utah – James Fletcher Physics Building, Salt Lake City, Utah

Project Engineer for the replacement of the building's fume hood exhaust system. Performed an evaluation of the existing building occupancy and chemical storage characteristics according to the International Building Code. Calculated system airflow requirements, sized and selected new exhaust fans, and integrated a venturi valve system into the ductwork to provide exhaust airflow velocities in accordance with the university standards and industry best practices.

Professional Affiliations

American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE)

Languages

Fluent in French: 9 years formal study, two years living in France.