

UNITED STATES PATENT AND TRADEMARK OFFICE

---

BEFORE THE PATENT TRIAL AND APPEAL BOARD

---

**HUNTER'S MANUFACTURING COMPANY, INC.**  
**d/b/a TENPOINT CROSSBOW TECHNOLOGIES,**  
Petitioner,

v.

**RAVIN CROSSBOWS, LLC,**  
Patent Owner.

---

Case No. **IPR2023-**  
Patent No. **9,354,015**

---

**DECLARATION OF STEPHEN A. BATZER, PH.D., P.E.**

Mail Stop PATENT BOARD  
Patent Trial and Appeal Board  
U.S. Patent and Trademark Office  
P.O. Box 1450  
Alexandria, VA 22313-1450

## **TABLE OF CONTENTS**

|                                                               | <b><u>Page</u></b> |
|---------------------------------------------------------------|--------------------|
| I. <u>INTRODUCTION</u> .....                                  | 5                  |
| II. <u>BACKGROUND</u> .....                                   | 6                  |
| III. <u>LEVEL OF ORDINARY SKILL IN THE ART</u> .....          | 7                  |
| IV. <u>LEGAL STANDARDS</u> .....                              | 8                  |
| A.    Claim Construction .....                                | 8                  |
| B.    Anticipation .....                                      | 11                 |
| C.    Obviousness .....                                       | 12                 |
| V. <u>TECHNOLOGY OVERVIEW</u> .....                           | 14                 |
| VI. <u>'015 PATENT OVERVIEW AND PROSECUTION HISTORY</u> ..... | 18                 |
| A.    Overview of the '015 Patent .....                       | 18                 |
| B.    Prosecution History of the '015 Patent .....            | 24                 |
| VII. <u>OVERVIEW OF THE PRIOR ART</u> .....                   | 29                 |
| A.    Stanziale '302 .....                                    | 29                 |
| B.    Stanziale '062 .....                                    | 32                 |
| C.    Stanziale '771 .....                                    | 35                 |
| D.    Darlington .....                                        | 38                 |
| E.    Norkus .....                                            | 40                 |

|                                                                  | <b><u>Page</u></b> |
|------------------------------------------------------------------|--------------------|
| F. Park .....                                                    | 42                 |
| G. Kempf ‘871 .....                                              | 46                 |
| H. Islas .....                                                   | 47                 |
| I. Despart .....                                                 | 49                 |
| J. Lester.....                                                   | 51                 |
| VIII. <u>CLAIM CONSTRUCTION</u> .....                            | 52                 |
| A. “helical power cable take-up journal” .....                   | 52                 |
| B. “mounted to” .....                                            | 53                 |
| IX. <u>UNPATENTABILITY ANALYSIS</u> .....                        | 56                 |
| A. Ground 1: Claim 1 is Anticipated by Stanziale ‘302. ....      | 57                 |
| B. Ground 2: Claim 1 is Rendered Obvious by Stanziale ‘302. .... | 62                 |
| C. Ground 3: Claim 1 is Anticipated by Stanziale ‘062. ....      | 63                 |
| D. Ground 4: Claim 1 is Rendered Obvious by Stanziale ‘062. .... | 66                 |
| E. Ground 5: Claim 1 is Anticipated by Stanziale ‘771. ....      | 68                 |
| F. Ground 6: Claim 1 is Rendered Obvious by Stanziale ‘771. .... | 72                 |
| G. Ground 7: Claim 1 is Obvious over Darlington and Norkus. .... | 73                 |
| H. Ground 8: Claim 1 is Obvious over Darlington and Park. ....   | 79                 |
| I. Ground 9: Claim 1 is Obvious over Kempf ‘871 and Norkus. .... | 82                 |

|                                                                              | <b><u>Page</u></b> |
|------------------------------------------------------------------------------|--------------------|
| J. Ground 10: Claim 1 is Obvious over Kempf ‘871 and Park.....               | 86                 |
| K. Ground 11: Claim 1 is Obvious over Kempf ‘871 and Stanziale<br>‘302. .... | 87                 |
| L. Ground 12: Claim 1 is Obvious over Islas, Darlington, and Park.....       | 89                 |
| M. Secondary Considerations.....                                             | 93                 |

I, Stephen A. Batzer, declare as follows:

**I. INTRODUCTION**

1. I have personal knowledge of the matters set forth herein.

2. I have been retained to provide expert opinions on behalf of Petitioner Hunter's Manufacturing Company, Inc. d/b/a TenPoint Crossbow Technologies ("TenPoint") in support of its petition for *inter partes* review ("IPR") of U.S. Patent 9,354,015 (the "'015 Patent") owned by Patent Owner Ravin Crossbows, LLC ("Ravin").

3. I have been asked to provide my opinion whether claim 1 of the '015 Patent is unpatentable as being anticipated by, or obvious in light of, the prior art to a person of ordinary skill in the art ("POSA") before the effective filing date of the '015 Patent (December 16, 2013, "Effective Filing Date").

4. In preparing this declaration, I have reviewed the following materials:

| <b><u>Description</u></b>                                               | <b><u>Ex. #</u></b> |
|-------------------------------------------------------------------------|---------------------|
| U.S. Patent No. 9,354,015 ("’015 Patent")                               | 1001                |
| Prosecution history of the '015 Patent                                  | 1002                |
| LPR 1-15 Joint Claim Construction and Prehearing Statement              | 1003                |
| Defendant's LPR 1-14 Proposed Constructions                             | 1004                |
| Plaintiff's LPR 1-14 Prelim. Claim Constructions and Extrinsic Evidence | 1005                |

| <b><u>Description</u></b>                                 | <b><u>Ex. #</u></b> |
|-----------------------------------------------------------|---------------------|
| U.S. Patent No. 9,494,379 (“’379 Patent”)                 | 1006                |
| U.S. Patent App. Pub. No. 2012/0125302 (“Stanziale ‘302”) | 1007                |
| U.S. Patent No. 7,708,001 (“Kempf ‘001”)                  | 1008                |
| U.S. Patent App. Pub. No. 2012/0312287 (“Park”)           | 1009                |
| U.S. Patent No. 7,578,289 (“Norkus”)                      | 1010                |
| WIPO Int’l Pub. No. WO 2011/158062 (“Stanziale ‘062”)     | 1011                |
| WIPO Int’l Pub. No. WO 2011/141771 (“Stanziale ‘771”)     | 1012                |
| U.S. Patent App. Pub. No. 2011/0030666 (“Darlington”)     | 1013                |
| U.S. Patent No. 7,836,871 (“Kempf ‘871”)                  | 1014                |
| U.S. Patent App. Pub. No. 2011/0308508 (“Islas”)          | 1015                |
| U.S. Patent No. 6,474,324 (“Despart”)                     | 1018                |
| U.S. Patent No. 5,024,206 (“Lester”)                      | 1019                |

5. In forming the opinions expressed in this declaration, I have considered the materials listed above, the relevant legal standards (including for claim construction, anticipation, and obviousness), and my own knowledge and experience in the field of archery and bows and crossbows in particular.

## II. **BACKGROUND**

6. My *curriculum vitae* is attached as Ex. 1003. What follows is a short summary of my professional qualifications.

7. I hold a B.S. degree in mechanical engineering from the Michigan Technological University, an M.S. degree in manufacturing systems engineering from the GMI Engineering and Management Institute (the former General Motors Institute, now Kettering), and a Ph.D. in mechanical engineering from the Michigan Technological University.

8. I am a licensed engineer in Michigan meeting the requirements of education, experience, two written examinations, and the recommendation of my peers. I am regularly engaged in professional development, which is a requirement of engineering licensure.

9. I hold three US Patents regarding mechanical designs, U.S. Patent No. 9,352,714, U.S. Patent No. 9,487,171, and U.S. Patent No. 11,305,713. As is shown in the prosecution history, my co-inventor and I submitted these patents through issue *pro se*.

10. I am a retired U.S. Army Lieutenant Colonel of Ordnance (i.e., munitions). I served over twenty years in uniform.

11. I have been a mechanical engineer for thirty-five years, specializing in forensic engineering and failure analysis for the past twenty years. I have served as an expert witness in numerous weapons patent / intellectual property cases, to include:

- *Adcor Defense v. Beretta USA*, No. 03C15006837 (Maryland, Baltimore County Circuit Court);
- *Evolution v. Juggernaut*, No. 8:18-CV-1378-JLS-DFM (C.D. Cal.);
- *Kyntec v. ITT Enidine*, No. 14-cv-271 A (W.D.N.Y.);
- *TTC Performance v. Mossberg*, No. 3:18-cv-01270-KAD (D. Conn.);
- *RTG Parts, LLC v. Schmeisser GmbH*, No. IPR2022-00083 (P.T.A.B.).

I have performed innumerable archery forensic analyses in which I have investigated inadvertent discharge or other product failure. These cases include vertical bows and crossbows manufactured by Barnett, Bowtech, Horton Archery, Hoyt, Matthews, PSE, and Ravin.

12. I am a member of various professional organizations, including the American Society of Mechanical Engineers, the National Academy of Forensic Engineers, the Society of Automotive Engineers, and the National Society of Professional Engineers. I regularly review technical manuscripts at the request of the editor prior to their publication. I have authored over seventy peer-reviewed

publications. These manuscripts are based upon my research, analysis, and testing. I have taught engineering coursework at five universities. Upon invitation, I have given lectures at universities nationally and internationally on a variety of topics, principally dealing with insights derived from my career as a mechanical forensic engineer.

13. I regularly teach continuing education to other licensed engineers at the request of private organizations.

14. I am being compensated for my work in this matter at the hourly rate of \$380 and am also being reimbursed for reasonable and customary associated expenses. My compensation is not contingent on the outcome of this matter or the specifics of my opinions.

### **III. LEVEL OF ORDINARY SKILL IN THE ART**

15. I understand that a POSA is a hypothetical person who is presumed to have the skill and experience of an ordinary worker in the field at the time of the effective filing date of the relevant patent claiming the invention at issue, and who is presumed to know the relevant prior art.

16. I understand that various factors may guide the determination of the ordinary level of skill in the art, including the educational level of the inventor and active workers in the field, the type of problems encountered in the art, prior art

solutions to those problems, the rapidity with which innovations are made, the sophistication of the technology, and the patent's purpose.

17. Based on my knowledge and experience in this field and review of the '015 Patent and its prosecution history, I believe that a hypothetical POSA in the field of the '015 Patent (archery and particularly bows and crossbows) as of December 16, 2013, would have been a technical person who has had at least some experience working in the field of archery, reviewing crossbows or engineering related to bows and/or crossbows and is generally familiar with prior art crossbows. Such a person would likely have at least a bachelor's degree in mechanical engineering or, alternatively, would have several years of experience in the field of archery or engineering related to bows and/or crossbows. Lack of work experience can be remedied by additional education, and vice versa.

18. Based on my education and experience, I believe that I am qualified and able to opine and testify regarding a POSA's knowledge and perspective on various technical issues, including claim construction, anticipation, and obviousness, and the opinions in this declaration are made from that perspective.

#### **IV. LEGAL STANDARDS**

19. I am not an attorney, so I have been advised by counsel about the following legal standards applicable in this IPR. I have applied these standards in this declaration.

**A. Claim Construction**

20. I understand that claim construction must begin with the words of the claims themselves. I understand that the same claim term cannot be interpreted differently in different claims of the same patent (i.e., have one meaning in certain claims and a different meaning in other claims), but must be interpreted consistently. I understand that in contrast, different phrases used in separate claims are presumed to indicate that the claims have different meanings and scope. I understand that an independent claim presumptively should not be construed as requiring a limitation added by a dependent claim and that an independent claim should be given broader scope than a dependent claim.

21. I understand that the claim terms are not considered in isolation but in light of the specification and prosecution history (i.e., the intrinsic evidence). I understand that the specification is always highly relevant to the analysis and usually is the single best guide to the meaning of a disputed term. Yet I also understand that importing a limitation from the specification into the claims is improper. Thus, I understand that there is a fine line between reading a claim in

light of the specification (which is proper) and reading a limitation from the specification into the claim (which is improper).

22. I understand that the prosecution history is the entire record of the proceedings in the U.S. Patent and Trademark Office (“USPTO”) from the first application papers to the issued patent, and includes the prior art cited during the examination of the patent. I understand that because the prosecution history represents an ongoing negotiation between the USPTO and the applicant, it often lacks the clarity of the specification and thus is less useful for claim construction. I understand that the intrinsic evidence also includes related patent applications in the same patent family and their prosecution histories, especially if the applications involve common subject matter. I understand that unless otherwise compelled, the same claim term in the same or related patents carries the same construed meaning.

23. I understand that claim construction may also rely on extrinsic evidence, which consists of all evidence external to the patent and prosecution history (e.g., expert and inventor testimony, dictionaries, and learned treatises). However, I understand that extrinsic evidence is usually less reliable, and thus less significant, than intrinsic evidence. I understand that if the meaning of a claim term is clear from the intrinsic evidence, there is no need to resort to extrinsic

evidence, and similarly, extrinsic evidence may not be used to contradict the construction mandated by the intrinsic evidence.

24. I understand that there is a heavy presumption that a claim term carries its ordinary and customary meaning as of the patent's effective filing date, as understood by a POSA in light of the intrinsic evidence. I understand that there are only two exceptions to this rule: 1) when the patentee acts as a lexicographer and sets out a definition, or 2) when the patentee disclaims or disavows the full scope of a claim term either in the specification or during prosecution. I understand that the standards for finding either exception are exacting.

#### **B. Anticipation**

25. I understand that a patent claim is anticipated (and thus unpatentable) under 35 U.S.C. §102 if each and every limitation of the claim is found, arranged as recited in the claim, expressly or inherently, in a single prior art reference.

26. I understand that prior art includes patents, printed publications, public use activity, on-sale activity, or other availability to the public before a claimed invention's effective filing date. I understand that the effective filing date of a claimed invention is the earliest filing date of the patent application to which the claimed invention can properly claim priority (which is December 16, 2013, for the '015 Patent).

27. I understand that to establish that a claim limitation is inherently disclosed in a reference, that limitation must be necessarily (rather than merely probably or possibly) present in the reference.

28. I also understand that a reference can anticipate a claim, even if it does not expressly spell out all the limitations arranged or combined as in the claim, if a POSA, reading the reference, would at once envisage the claimed arrangement or combination.

### **C. Obviousness**

29. I understand that a patent claim is obvious (and thus unpatentable) under 35 U.S.C. §103 if the differences between the claimed invention and the prior art are such that the claimed invention, as a whole, would have been obvious before the invention's effective filing date to a POSA.

30. I understand that obviousness is determined by considering the following factors: a) scope and content of the prior art; b) differences between the claimed subject matter and the prior art; c) level of ordinary skill in the art; and d) any available secondary considerations. I understand that secondary considerations can include evidence of a long-felt but unsolved need that was satisfied by the claimed invention, industry praise of a claimed invention, industry skepticism, copying of the claimed invention by others, commercial success of the

claimed invention, failure of others to make the claimed invention, unexpected results, and contemporaneous and independent invention by others.

31. I understand that a finding of obviousness requires a showing that a POSA would have been motivated to combine or modify the teachings in the prior art to achieve the claimed invention, and that the POSA would have had a reasonable expectation of success in doing so.

32. I understand that the Supreme Court has recognized several rationales for combining or modifying references to show obviousness of a claimed invention, including: combining prior art elements according to known methods to yield predictable results; simple substitution of one known element for another to obtain predictable results; use of a known technique to improve a similar device in the same way; applying a known technique to a known device ready for improvement to yield predictable results; choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success; and some teaching, suggestion, or motivation in the prior art that would have led a POSA to modify the prior art reference or to combine prior art teachings to arrive at the claimed invention.

33. I understand that a prior art reference qualifies for an obviousness determination when it is analogous to the claimed invention, i.e., if the reference is

either from the same field of endeavor as the claimed invention or reasonably pertinent to the particular problem with which the inventor of the claimed invention is involved. I understand that a reference is reasonably pertinent if it is one that, because of its disclosed matter, logically would have commended itself to an inventor's attention in considering his problem, when viewed from a POSA's perspective.

34. I understand that the burden to prove unpatentability in an IPR (whether by anticipation or obviousness) is by a preponderance of the evidence (i.e., more likely than not).

## **V. TECHNOLOGY OVERVIEW**

35. The two most common products in the archery field are vertical bows (so called because a user holds it with the limbs oriented vertically) and crossbows. Each has been used for hunting and fishing, and for target shooting.

36. The simplest vertical bow is a bent or curved elongated narrow object with a bowstring attached to both ends. Pulling back, or drawing, the bowstring flexes the bow further, which acts as a spring and stores energy that is released when the string is released and the bow returns to its starting position. If an arrow is placed in front of the bowstring when it is in the drawn position, the stored energy is transferred into the arrow when the string is released, causing the arrow

to accelerate. Instead of the bow being one integral object, it may consist of a central handle or riser to which the extending bow limbs are secured.

37. A compound bow modifies the above design by adding cams (also called eccentrics) at the ends of the limbs where the bowstring is attached, and having the bowstring be secured to the cams such that it unwinds off the cams while the bow is being drawn and winds back onto the cams while the bow is released and fired.

38. A compound bow often includes power cables (sometimes called buss cables or control cables) in addition to the bowstring. These can extend from the cam on each limb to the tip of the other limb (e.g., around an axle located at the limb tip), or from the cam on each limb to the cam on the other limb. When the bow is drawn, the power cable end(s) secured to the cam(s) wrap on to the cam(s) and unwrap when the bowstring is released.

39. Some bows include just one cam, secured to one of the limbs, where the other limb secures a round pulley called an idler wheel.

40. The simplest crossbow takes a vertical bow and secures it horizontally onto a main beam (also called center rail, stock, or barrel), with a trigger mechanism to hold the bowstring in a drawn or cocked configuration until ready

for firing. Crossbows include those without cams (sometimes called recurve crossbows) or those with cams (sometimes called compound crossbows).

41. For compound crossbows, in addition to the power cable configurations discussed above (regarding vertical bows), another configuration has the power cables extend from each cam, directly or indirectly, to the main beam without crossing over it.

42. One known design incentive in the archery field is to decrease the size of the bow (whether vertical or crossbow), including the distance between the cam axles (axle-to-axle distance) on compound bows. This is because smaller or narrower bows are easier to maneuver, e.g., around trees, branches, bushes, and other objects when hunting.

43. Another known design incentive in the archery field is to increase the arrow speed, which is directly related to the energy stored by the bow while drawn. The energy stored by the bow depends on the power stroke distance (also known as the draw length), which is the distance the bowstring travels (along the arrow's path) between the drawn and the released configuration, and the draw weight, which is the amount of force required to draw the bowstring along the power stroke distance. The bow's stored energy is the area under the draw-weight-v-

draw-length curve for that bow. The power stroke distance is affected by the axle-to-axle distance and the length of the bowstring.

44. Cams play an important role in a bow's energy storage. Some cams (sometimes known as step-down cams) have grooves of different diameter or circumference for the bowstring compared to the power cable, which in effect provides the equivalent of a gear ratio between the forces applied to the string and cable.

45. By their design, cams can affect the draw weight along the power stroke distance. For example, many vertical bows are designed to decrease the draw weight at full draw to make it easier for the shooter to hold the string (and arrow) while aiming; this is called let-off or drop-off. Such a feature is not as important for crossbows, which have a trigger mechanism holding the bowstring, and therefore most crossbows do not feature draw force let-off.

46. Cams also affect the length of the bowstring available for drawing, by the design of their grooves or channels that receive the bowstring. For example, the circumference of the cams (and their grooves) affects how much string is available to be unwound and thus the power stroke distance.

47. If the axle-to-axle distance were reduced to make the bow more compact (as discussed above), then to maintain the same string payout and power

stroke distance, the circumference and size of the cams would need to increase.

But increasing the size of the cams renders them more susceptible to damage and makes the bow somewhat less compact, both of which are undesirable. So another option is to design the cams to be able to rotate a greater angular magnitude (e.g., more than one complete turn), which allows keeping the cam size small and the axle-to-axle distance short. The actual amount of cam rotation can be designed to achieve a desired power stroke distance, and thus energy storage.

48. If a cam were to rotate more than a certain amount, the bowstring or power cable will overlap. In some cases, such overlap is acceptable. In such cases, the cam groove or channel can simply be designed deep enough to accommodate the overlapping string or cable.

49. In other cases, it is undesirable because the overlap results in friction, which can affect the durability of the string or cable. One way of avoiding such overlap (if rotation greater than 360 degrees is desired) is by designing the cam grooves in a helical or spiral configuration for string or cable displacement out of the central plane of cam rotation. Cams can have as many grooves as necessary for the correct rotation amount.

## **VI. '015 PATENT OVERVIEW AND PROSECUTION HISTORY**

### **A. Overview of the '015 Patent**

50. The '015 Patent is entitled "String Guide System for a Bow." The Field of the Invention section states that the disclosure is "directed to a string guide system for a bow that permits greater rotation of the cams and pulleys, permitting a longer power stroke." Ex. 1001 at 1:5-7.<sup>1</sup>

51. The '015 Patent includes the following Abstract:

A string guide for a bow having a reverse draw configuration with a draw string located adjacent a down-range side of the bow in a released configuration. First and second string guides rotate around first and second axes, respectively, as the draw string is displaced from the released configuration to the drawn configuration. A first power cable take-up journal on the first string guide rotates around the first axis to take up a power cable. The first power cable take-up journal includes a width measured along the first axis at least twice a width of the first power cable. The first power cable is biased away from at least the draw string. The first power cable is translated along the first power cable take-up journal as the bow is drawn from the released configuration to the drawn configuration.

---

<sup>1</sup> The citation format used in this declaration for U.S. patent specifications is column:line(s).

52. The '015 Patent explains, in the Background of the Invention section, that bows with cams and power cables (i.e., compound bows) are known, as are bows configured in the reverse-draw configuration, where the draw string in the released condition is positioned on the down-range side of the cams or pulleys (called string guides in the '015 Patent, 4:10-12). *Id.* at 1:11-27. The '015 Patent states that cams of existing bows have their rotation limited to about 270 degrees because of the interference of the power cables with the power cable anchors, which limits the power stroke distance. *Id.* at 1:28-58. So to increase the power stroke distance, the diameter of the pulleys would need to be increased, which results in a larger and less usable bow. *Id.* at 1:29-32.

53. Thus, to solve this problem, the '015 Patent desires to have the power cables wrap more than 270 degrees onto the grooves or channels (called journals in the '015 Patent, 4:6-10) of the string guides while extending helically away from the power cable anchors, avoiding the above-mentioned interference. This greater rotation of the string guides would result in a longer power stroke. *Id.* at 1:63-65.

54. The principal way of accomplishing this objective, in the '015 Patent, is by using helical power cable journals. *Id.* at 4:18-5:3, Figs. 4-9A. The patent first discusses the string guides and their associated parts. *Id.* at 3:46-4:21. For example, the draw string journal 130A, 130B receives the draw string 114 and is

shown as having a larger diameter and circumference. *Id.* at 4:1-5, Figs. 7-8. The patent then discusses the helical power cable journals 122A, 122B. *Id.* at 4:18-5:3. Each string guide 104A, 104B is disclosed as having a helical power cable journal 122A, 122B (to receive the power cable 102A, 102B) on one side of the draw string journal 130A, 130B, where the power cable journal has a smaller diameter. *Id.* at Figs. 7-8. By configuring the power cables 102A, 102B on the helical journals 122A, 122B such that the cables 102A, 102B wind upwards and away from the draw string journals 130A, 130B, the cables 102A, 102B can pass over and avoid interference from their anchors 106A, 106B, thus allowing the string guides 104A, 104B to keep rotating. *Id.* at 4:25-37, 45-59, 4:62-5:3, Figs. 6-9A.

55. The '015 Patent also briefly notes that the draw string journals can likewise be helical to allow greater wrapping of the draw string on the string guides. *Id.* at 4:30-32, 5:4-9, Fig. 9B.

56. The '015 Patent discloses that another way of accomplishing its objective (of having the power cables wrap more than 270 degrees onto their journals while extending vertically to avoid the anchors) is by using wide power cable journals that allow more than one turn of the power cable to be wound within the journal. *Id.* at 5:10-19, Fig. 9C. In contrast to Figs. 7-9B, which show the power cable journal widths being wide enough to receive only one wrap of the

power cable each (and thus configuring multiple adjacent wraps of the power cable within the multiple adjacent journals), Fig. 9C shows the power cable journal width 276<sup>2</sup> being wide enough to receive perhaps three or more wraps of the power cable without the cable wrapping upon itself.

57. The '015 Patent then discusses its string guide system (specifically, the embodiment with helical power cable journals) installed on a vertical bow. *Id.* at 5:20-51, Fig. 10.

58. The '015 Patent then discusses its string guide system installed on a crossbow. *Id.* at 5:52-6:23, Fig. 11. In this disclosed embodiment, the limbs 312A, 312B extend forward (downrange) from the riser 310. *Id.* at Fig. 11. Also, one string guide 316A includes a power cable journal 322A that has a width at least twice a width of the power cable 324 (like in Fig. 9C), while the other string guide 316B is a simple pulley (idler wheel) that does not include a power cable journal. *Id.* at 5:60-6:9, Fig. 11.

59. The '015 Patent then discusses another embodiment of its string guide system installed on a crossbow. *Id.* at 6:24-56, Fig. 12. In this disclosed embodiment, the limbs 362A, 362B extend forward from the riser 360. *Id.* at Fig.

---

<sup>2</sup> There is some inconsistency in terminology. *Compare id.* at 2:6-8 and 6:2-4 (“width”) with *id.* at 5:12-16 (“height”). I use “width” here.

12. Also, the string guides 366A, 366B include power cable journals 372A, 372B that each have a width at least twice a width of the power cable 374A, 374B received therein (like in Fig. 9C). *Id.* at 6:40-42. In this embodiment, one end of each power cable 374A, 374B is secured to a string guide 366A, 366B while the other end is secured to the center portion 354 (on opposite sides). *Id.* at 6:46-51, Fig. 12.

60. The '015 Patent has 20 claims, with claims 1, 11, and 17 being independent. Claim 1, the claim challenged in this IPR, states as follows:

1. A crossbow, comprising:  
a central portion comprising a down-range side and an up-range side;  
first and second flexible limbs attached to the central portion;  
a first string guide mounted to the first bow limb and rotatable around a first axis, the first string guide comprising a first draw string journal having a first plane of rotation perpendicular to the first axis, and a first helical power cable take-up journal extending in a direction perpendicular to the first plane of rotation of the first draw string journal;  
a second string guide mounted to the second bow limb and rotatable around a second axis, the second string guide comprising a second draw string journal having a second plane of rotation perpendicular to the second axis, and a second helical power cable take-up journal extending in a direction perpendicular to the second plane of rotation of the second draw string journal;

a draw string received in the first and second draw string journals and secured to the crossbow in a reverse draw configuration with the draw string adjacent the down-range side of the string guides in a released configuration, wherein the draw string translates from the down-range side toward the up-range side and unwinds between the first and second string, *[sic]* guides to a drawn configuration;

a first power cable received in the first helical power cable take-up journal; and

a second power cable received in the second helical power cable take-up journal,

wherein as the bow is drawn from the released configuration to the drawn configuration the first and second power cables wrap onto the first and second helical, power cable take-up journals and are displaced along the first and second axes away from the first and second planes of rotation of the first and second draw string journals, respectively.

61. Claim 1 describes a crossbow and the embodiment of the string guide system with helical power cable journals. Claims 2-10 depend from claim 1 and recite additional limitations.

62. Claim 11 also describes a crossbow. In contrast to claim 1, it does not recite that the power cable journals are helical, but that they “comprise lengths that accommodates *[sic]* more than 360 degrees of rotation of the first string guide.” Thus claim 11 appears to be broader than claim 1, encompassing any journals that

accommodate more than 360 degrees of rotation of the string guide (e.g., helical journals, or journals having a width at least twice the width of the power cables).

Claims 12-16 depend from claim 11 and recite additional limitations.

63. Claim 17 describes a method of operating a crossbow with certain design specifications. The claimed crossbow is drawn to the embodiment of the string guide system with helical power cable journals, like claim 1. Claims 18-20 depend from claim 17 and recite additional limitations.

#### **B. Prosecution History of the ‘015 Patent**

64. The ‘015 Patent was applied for on application no. 14/107,058, filed December 16, 2013, listing Craig Thomas Yehle as the inventor. Mr. Yehle appears to have assigned the application to Field Logic, Inc., which was the original applicant, and Field Logic, Inc. appears to have subsequently assigned it to Ravin, which took over as the applicant. This application was published on June 18, 2015, as U.S. Patent App. Pub. 2015/0168093.

65. During prosecution, the applicant submitted two Information Disclosure Statements (“IDS”), listing various references. The IDS submitted February 6, 2014, listed 80 U.S. Patent Documents. Ex. 1002 at 164-69. The IDS submitted January 29, 2015, listed two more U.S. Patent Documents. *Id.* at 156-59.

66. The USPTO issued a non-final Office Action on December 11, 2015. *Id.* at 102. In this Office Action, the Examiner objected to the drawings, requiring Figs. 1-3 to be designated as prior art. *Id.* at 104. The Examiner rejected original claims 2 and 4 under 35 U.S.C. §112(b) as being indefinite and unclear (claim 2 regarding the biasing force, and claim 4 regarding the take up journal's width). *Id.* at 104-05. The Examiner rejected original claims 1-6, 9, 11-13, 17-19, and 22 under 35 U.S.C. §102(a) as being anticipated by Kempf '001. *Id.* at 105-09. The Examiner rejected original claims 7, 8, 14-16, 20, and 21 under 35 U.S.C. §103 as being obvious over Kempf '001. *Id.* at 109-12. And lastly, the Examiner rejected original claims 10 and 23 under §103 as being obvious over Kempf '001 and Applicant Admitted Prior Art ("AAPA"). *Id.* at 112-13. With this Office Action, the Examiner cited four additional references, but he did not discuss them. *Id.* at 115.

67. Ravin then held a telephonic interview with the Examiner on December 29, 2015, where Ravin apparently argued that the helical power cable journals allow the power cable anchors to not interfere with the cables during winding (by having the cables extend away from the planes of rotation) and thus allow the string guides to rotate more than 270 degrees. *Id.* at 64, 73. The

Examiner indicated that the claims did not recite such structure and suggested that Ravin amend the claims accordingly. *Id.* at 64.

68. Ravin responded in writing to the non-final Office Action on January 4, 2016. *Id.* at 66. In the response, Ravin submitted replacement drawings for Figs. 1-3, labeling each as “prior art.” *Id.* at 76-77. Ravin also cancelled all original claims (1-23) and added new claims (24-43). *Id.* at 68-72. In the remarks, Ravin repeated the arguments that it made during the telephone interview and also argued that the helical journals increase the available length of the power cables (e.g., wrapping about 720 degrees on the journals) and thus allow the power stroke distance to be increased. *Id.* at 73-74. Ravin argued that Kempf ‘001 (the reference applied by the Examiner in the rejections) “does not disclose any structure that corresponds to the claimed power cable take-up journals.” *Id.* Notably, Ravin did not distinguish any other claim limitations or crossbow elements from the cited prior art.

69. The USPTO issued a final Office Action on March 25, 2016. *Id.* at 55. In this Office Action, the Examiner rejected the added claims 24-43 under 35 U.S.C. §112(b) as being indefinite because it was unclear what Ravin meant by the helical power cable take-up journals being wrapped in a direction perpendicular to the first plane of rotation and due to insufficient antecedent basis for “first and

second cables” and “first and second helical power cable take-up journals.” *Id.* at 57. The Examiner suggested that the power cable journal structure be defined using clearer language. *Id.* at 58.

70. Ravin then apparently held another telephonic interview with the Examiner on March 30, 2016, discussing the location of the power cable take-up journals with respect to the string guides and placement of the power cables onto the power cable take-up journals. *Id.* at 51.

71. Ravin responded in writing to the final Office Action on March 30, 2016. *Id.* at 45. In the response, Ravin amended claims 24 and 34 to recite that the power cable journals extend (rather than wrap) in directions perpendicular with respect to the planes of rotation of the first and second draw string journals, and reiterated in claim 24 that those journals are helical. *Id.* at 46, 48. Ravin also amended claim 40 to add that the first and second string guides include first and second helical power cable take-up journals configured to receive first and second power cables, respectively, and added “the” before the claim terms that lacked antecedent basis. *Id.* at 50. Ravin argued that these amendments overcame the §112(b) rejections. *Id.* at 51.

72. The USPTO then issued a Notice of Allowance on April 25, 2016. *Id.* at 30. The Notice memorialized an Examiner’s amendment (which Ravin appears

to have authorized in another telephonic interview held April 6, 2016) to claim 40, adding that the power cable take-up journals extend in a direction perpendicular to a rotation of the draw string journals. *Id.* at 35. The Notice also provided the Examiner's reasons for allowance. The Examiner was persuaded by Ravin's arguments (made January 4, 2016) that the "first and second helical power cable take-up journals extending in a direction perpendicular to a rotation of the first and second draw string guides, benefits the pulley mechanism in the manner of displacing the power cables (in relation to the string/main guide) as well as increasing the power of the drawn power cable/s (which inherently increases/adds more 'draw strength/energy/power' to the bow)" [*sic*]. *Id.*

73. After Ravin paid the issue fee on April 28, 2016, the '015 Patent issued on May 31, 2016, with pending claims 24-43 renumbered as issued claims 1-20, respectively. *Id.* at 22, 25, 42.

74. I understand that various subsequent patent applications claimed the benefit of the '015 Patent.

## **VII. OVERVIEW OF THE PRIOR ART**

### **A. Stanziale '302**

75. Stanziale '302 (U.S. Patent App. Pub. No. 2012/0125302) states on its cover page that it was published on May 24, 2012, which is earlier than the

Effective Filing Date (indeed, it is more than a year before the Effective Filing Date). Stanziale '302 states that it is the publication of application no. 12/949,705, which was filed November 18, 2010. Stanziale '302 lists Pasquale Stanziale as the inventor. I understand that Stanziale '302 is prior art to the '015 Patent under §102(a)(1) and (2).

76. Stanziale '302, entitled "Device for Firing a Projectile or Another Object to be Fired," states that its field relates to a device for firing or launching a projectile, an arrow, a bolt, or another object to be fired or launched, particularly an archery crossbow. Ex. 1007 at [0002]. It includes the following Abstract:

The present disclosure relates to a device for firing a projectile. The device comprises a stock, at least two elastic members, two levers symmetrically arranged on opposite sides of the stock, a first flexible element connecting the two levers with each other and intended for pushing the projectile during the firing, and a loading arrangement for shifting the device from a rest condition to a loaded condition. The two levers are movable with respect to the stock between a first position when the device is in the rest condition and a second position when the device is in the loaded condition; the two levers are operatively connected with the at least two elastic members for correlating a movement of the two levers between said first and second positions to a variation of deformation of the at least two elastic members. and vice versa. The loading arrangement includes a

first loading member configured to receive a foot of a user, and a second loading member protruding from the device and configured to rest against a support surface for supporting the device during the loading phase. One between said first and second loading members is associated with the stock and the other between said first and second loading members is movable together with the two levers. A distance between the first loading member and the second loading member is lower in the loaded condition than in the rest condition.

77. Stanziale ‘302 explains the basic mechanics of operation of existing crossbows and discusses the desire to achieve a crossbow with an improved force/draw-length curve that stores sufficient energy and yet is easier to load or draw, as well as one that reduces the stresses acting on the crossbow as it is fired and reaches the end of the power stroke distance. *Id.* at [0003]-[0011], [0019], [0029].

78. Stanziale ‘302 then discloses a crossbow 1 with two limbs (called elastic members) 10 fastened to the stock 2 through wings 25. *Id.* at [0049]-[0054], [0059]-[0072], Figs. 1-6. A foot stirrup 24 is secured to the stock 2 to facilitate cocking or drawing the bow 1. *Id.* at [0055]-[0058]. A pulley assembly 50 is secured to each limb 10 through a triangular lever assembly 40. *Id.* at [0073]-[0097], Figs. 1-6. The assembly 50 has a first pulley 51, which has a track or groove 511 for a bowstring (called flexible element) 31, that is “sandwiched”

between two pulleys 52, each of which has a track or groove 521 for a power cable 32. *Id.* at [0097]-[0107], [0120]-[0130], [0132], Figs. 1-6, 9, 11. Stanziale teaches that these grooves for the crossbow bowstring and the power cables, 511 and 521 respectively, may be annular or may be spiral or helical so as to wind a plurality of turns of the respective bowstring or power cable 31, 32. *Id.* at [0106]. This crossbow 1 has a rest condition (shown in Figs. 1-2) with the bowstring 31 released and at rest, a loaded or drawn condition (shown in Figs. 3-4), and a fully unloaded condition (shown in Figs. 5-6), which occurs after the crossbow 1 is fired and the pulley assemblies 50 are at their maximum forward position. *Id.* at [0134]-[0194].

79. Stanziale ‘302 discloses a second embodiment of a crossbow 11 that is similar to the first embodiment with the addition of a guide 280 and slide 479 that, in conjunction with the bar 47, mechanically constrain and synchronize the movement of parts on both sides of the stock 2. *Id.* at [0196]-[0203], Fig. 12.

#### **B. Stanziale ‘062**

80. Stanziale ‘062 (WIPO Int’l Pub. No. WO 2011/158062) states on its cover page that it was published by the World Intellectual Property Organization (“WIPO”) on December 22, 2011, which is earlier than the Effective Filing Date (indeed, it is more than a year before the Effective Filing Date). Stanziale ‘062 states that it is the publication of international application no. PCT/IB2010/052685,

which was filed June 15, 2010, and designates the U.S. Stanziale ‘062 lists Pasquale Stanziale as the inventor and NEC Plus Ultra S.R.L as the applicant. I understand that Stanziale ‘062 is prior art to the ‘015 Patent under §102(a)(1) and (2).

81. Stanziale ‘062, entitled “Device for Launching a Projectile or a Launch Object in General,” states that it refers to a device for launching a projectile, an arrow, a bolt, or a launch object in general, particularly an archery crossbow. Ex. 1011 at 1:4-5.<sup>3</sup> It includes the following Abstract:

A device (1, 401, 601) for launching a projectile or a launch object in general, comprising a stock (2) having a longitudinal development direction (201) between a rear or proximal end (205) and a front or distal end (206); the stock (2) has a top side (221) for supporting the projectile and two opposite lateral sides (223, 224). Two elastic members (10; 610), which are elastically deformable in order to accumulate elastic energy, are associated with the stock (2). Two first pulleys (145), each of them being rotatably associated with a respective pushing arm (32; 662), are interposed between the respective pushing arm (32; 662) and the flexible pushing element (31). Each of said first pulleys (145) is pivotably mounted on a

---

<sup>3</sup> The citation format used in this declaration for WIPO publication specifications is page:line(s).

respective supporting member (120; 420; 620), which is movably associated with a respective pushing arm (32; 662). The supporting member (120; 420; 620) is movable relatively to the pushing arm (32; 662) between a first or outer position and a second or inner position: in said second position a pivot (147) of the first pulley (145) is spaced from the respective lateral side (223,224) of the stock (2) at a lower distance (D2) than in said first position.

82. Stanziale '062 discusses the desire to achieve a favorable force-draw curve, reduce the stresses acting on the bow at the end of the power stroke distance after the bow is fired (called end-of-stroke arrest), reduce the lateral dimension (i.e., width) of the bow, and increase the power of the bow. *Id.* at 1:13-2:23, 4:1-20, 30-34.

83. Stanziale '062 then discloses several crossbow embodiments. In one embodiment (shown in Figs. 1-8), the crossbow 1 has limbs (called elastic or bending members) 10 positioned substantially adjacent and parallel to the stock 2 and secured to it, and pulleys 145 secured to pushing arms 32 that cooperate with the limbs 10 to store and release energy. *Id.* at 6:30-10:8. Each pulley 145 has a pivot 147 to which a second pulley 146 is fastened. *Id.* at 15:20-16:19, Figs. 2-4. Each pulley 145, 146 has a track or groove 1451, 1461 that has a spiral or helical shape so as to wind a plurality of turns of either a bowstring (called flexible pushing member) 31 or power cable (called flexible force member) 37. *Id.* at

16:20-17:21, Figs. 2, 4. The crossbow 1 has a rest position (shown in Figs. 1-2) with the bowstring 31 released and at rest, a loaded or drawn condition (shown in Figs. 3, 5), and a maximum discharge condition (shown in Fig. 4), which occurs after the crossbow 1 is fired and the arms 32 move the pulleys 145, 146 to the maximum forward position, after which the crossbow 1 returns to the rest position. *Id.* at 7:12-14, 12:27-13:31, 17:25-22:6.

84. In a second embodiment (shown in Figs. 9-16), the crossbow 401 is similar to the first embodiment, with the primary differences being that the pulleys 145, 146 are pivoted on a sliding member 420 rather than an auxiliary arm 120, and that there is only one power cable 37 instead of two (though Stanziale '062 expressly notes that either embodiment can utilize one or two such cables 37). *Id.* at 22:22-30, 24:11-25.

85. In a third embodiment (shown in Figs. 17-23), the crossbow 601 is similar to the first embodiment, with the notable difference being that limbs 610 generally extend away from the stock 2 at the point where they connect to it, and that the power cables 37 are secured to the stock 2 (though alternative configurations may be utilized). *Id.* at 26:18-27:5, 28:10-16.

### **C. Stanziale ‘771**

86. Stanziale ‘771 (WIPO Int’l Pub. No. WO 2011/141771) states on its cover page that it was published by WIPO on November 17, 2011, which is earlier than the Effective Filing Date (indeed, it is more than a year before the Effective Filing Date). Stanziale ‘771 states that it is the publication of international application no. PCT/IB2010/052105, which was filed May 12, 2010, and designates the U.S. Stanziale ‘771 lists Pasquale Stanziale as the inventor and NEC Plus Ultra S.R.L as the applicant. I understand that Stanziale ‘771 is prior art to the ‘015 Patent under §102(a)(1) and (2).

87. Stanziale ‘771, entitled “Device for Launching a Projectile or a Launch Object in General,” states that it refers to a device for launching a projectile, an arrow, a bolt, or a launch object in general, particularly an archery crossbow. Ex. 1012 at 1:4-5. It includes the following Abstract:

A device (1, 401, 501) for launching a projectile or a launch object in general, comprising a stock (2) having a longitudinal development direction (201) between a rear or proximal end (205) and a front or distal end (206), said stock (2) having a top face (221) for supporting said projectile. The device comprises also elastic members (10) which are elastically deformable in order to accumulate elastic energy, and pushing means for the projectile, said pushing means being able to cooperate with the elastic members (10) to transfer elastic energy

to/from the elastic member (10). Moreover, the pushing arms (32, 32a, 32b) are hinged on said respective connecting element (27) and are rotatably movable, about respective second rotation axes (93), between a down position and an up position, the pushing arm (32, 32a, 32b) in up position being angularly displaced towards the top face (221) of the stock (2) more than in down position. The pushing arms (32, 32a, 32b) are apt to carry out combined angular displacements about respective [sic] first and second rotation axis (33, 93).

88. Stanziale '771 discusses the desire to achieve a favorable force-draw curve, reduce the stresses acting on the bow at the end of the power stroke distance after the bow is fired (called end-of-stroke arrest), reduce the lateral dimension (i.e., width) of the bow, and increase the power of the bow. *Id.* at 1:13-2:27, 4:15-19, 5:5-9.

89. Stanziale '771 then discloses several crossbow embodiments. In one embodiment (shown in Figs. 1-10D), the crossbow 1 has limbs (called elastic or bending members) 10 secured to the stock 2, and pulleys 145 secured to pushing arms 32 that cooperate with the limbs 10 to store and release energy. *Id.* at 7:3-8:13, 9:32-10:13. Each pulley 145 has a pivot 147 to which a second pulley 146 is fastened. *Id.* at 15:24-16:5, Figs. 1-10A. Each pulley 145, 146 has a track or groove 1451, 1461 that has a spiral or helical shape so as to wind a plurality of

turns of either a bowstring (called flexible pushing member) 31 or power cable (called flexible force member) 37. *Id.* at 16:18-17:26. This crossbow 1 has a rest position (Figs. 1, 4) when the bowstring 31 is released and at rest. *Id.* at 17:30-33. The crossbow 1 also has a loaded or charge position (Figs. 2, 5) when the bowstring 31 is fully drawn and unwound from the grooves 1451 of the pulleys 145. *Id.* at 17:34-19:7. The crossbow 1 lastly has a maximum discharge position, which occurs after the crossbow 1 is fired and the arms 32 move the pulleys 145, 146 to the maximum forward position. *Id.* at 19:8-21:26. Afterwards, the crossbow 1 again returns to the rest position. *Id.* at 21:27-30. Because of this design, the “end-of-stroke shock is substantially eliminated” and a desired force-draw curve can be obtained. *Id.* at 22:1-24.

90. In a second embodiment, the crossbow 401 is very similar to the first embodiment, with the primary difference being the addition of rails 450 for guiding the pushing arms 32. *Id.* at 22:30-23:29, Figs. 11-17.

91. In a third embodiment, the crossbow 501 is similar to the first embodiment, with the primary difference being the addition of rods 60, 66, which limit the movement of connecting elements 27. *Id.* at 23:30-25:10, Figs. 18-21B. This embodiment also has annular (i.e., non-helical) pulley grooves 1451, 1461, but Stanziale ‘771 teaches that the different pulley embodiments (annular, helical

or spiral grooves; with or without radial extensions 1465) are interchangeable. *Id.* at 25:11-23.

**D.     Darlington**

92.     Darlington (U.S. Patent App. Pub. No. 2011/0030666) states on its cover page that it was published on February 10, 2011, which is earlier than the Effective Filing Date (indeed, it is more than a year before the Effective Filing Date). Darlington states that it is the publication of application no. 12/535,290, which was filed August 4, 2009. Darlington lists Rex Franklin Darlington as the inventor. I understand that Darlington is prior art to the ‘015 Patent under §102(a)(1) and (2).

93.     Darlington, entitled “Compound Archery Crossbow,” states that the field of invention relates to an improved compound archery crossbow. Ex. 1013 at [0001]. It includes the following Abstract:

The invention is directed to a compound archery crossbow wherein the power cables and the bowstring remain substantially parallel allowing the bowstring to be positioned for increased power and accuracy of an arrow and/or wherein the power stroke has been extended by positioning the bowstring farther from the string catch.

94.     Darlington discusses existing crossbows and potential synchronization and balancing problems associated with the cams, as well as solutions to those

problems. *Id.* at [0002]-[0006]. It also discusses the desire to increase the stored energy in the bow. *Id.* at [0003].

95. Darlington then discloses several crossbow embodiments. One embodiment (shown in Figs. 1-3) of a crossbow 10 includes three-groove cams 24, 26, each of which has two let-out grooves 24A, 24B, 26A, 26B and one take-up groove 24C, 26C. *Id.* at [0038]-[0041], [0044]-[0046]. Because of the securement of the bowstring 32 and power cables 28, 30 on the cams 24, 26, this crossbow 10 is a shoot-through configuration. *Id.* at [0041]. Darlington also discloses a reverse-draw version of this embodiment, which increases the power stroke distance and thus improves the crossbow's performance. *Id.* at [0042], Fig. 4.

96. Another embodiment (shown in Figs. 9-11) of a crossbow 60, also in a shoot-through configuration, uses two-groove cams 70, 72, where one end of each power cable 28, 30 is secured to an anchor 74, 76 located on the cam axles 34A, 34B. *Id.* at [0051]-[0055]. Darlington also discloses a reverse-draw version of this embodiment. *Id.* at [0054], Fig. 12.

97. Yet another embodiment (shown in Figs. 13-15) of a crossbow 100 uses hybrid two-groove cams 102, 104, each of which has a let-out groove 102A, 104A and a hybrid groove 102B, 104B that includes a let-out portion 102B1, 104B1 and a take-up portion 102B2, 104B2. *Id.* at [0056]-[0060]. This

embodiment does not use the shoot-through configuration. *Id.* at [0056]-[0057].

Darlington also discloses a reverse-draw version of this embodiment. *Id.* at [0059], Fig. 16.

98. Darlington lastly explains that each preceding embodiment can be configured such that the limbs extend in a forward direction from the riser. *Id.* at [0061]. It discloses an example embodiment of a crossbow 140 that has its limbs 16A&B, 18A&B configured to extend in a forward direction from the riser 142 and uses the hybrid two-groove cams 102, 104 from the preceding embodiment. *Id.* at [0061], Fig. 17. Darlington also discloses a reverse-draw version of this embodiment. *Id.* at [0061], Fig. 18.

99. The Examiner cited Darlington among several other references in the December 11, 2015 Office Action, but he did not discuss it at all. Ex. 1002 at 115. Neither did Ravin in its response.

#### **E. Norkus**

100. Norkus (U.S. Patent No. 7,578,289) states on its cover page that it was issued on August 25, 2009, which is earlier than the Effective Filing Date (indeed, it is more than a year before the Effective Filing Date). Norkus states that it issued on application no. 11/467,965, which was filed August 29, 2006, and claimed the benefit of application no. 60/713,186, which was filed August 30, 2005. Norkus

lists Gregory Norkus as the inventor. I understand that Norkus is prior art to the '015 Patent under §102(a)(1) and (2).

101. Norkus, entitled “Compound Archery Bow with Extended Inverted Stroke,” states that the field of invention relates to archery bows, particularly inverted compound archery bows. Ex. 1010 at 1:12-13. It includes the following Abstract:

An inverted compound archery bow including an extended-capacity cam system having two cams, each cam engaging the bowstring and separate cables extending to limbs of the bow. The bowstring and cables are counter-wound on the cams, producing tension opposite and proportional to the inverse ratio of windings. Drawing the bowstring winds the cables onto the cams, producing limb tension that propels an arrow when the bowstring is released. An arrow rest located between full-draw and rest excursions of the bowstring accommodates the extended draw length of the bow. A bowstring arrestor engages the bowstring at an intermediate-draw position. A slide stabilizes and supports a rear portion of the bow, and a receptacle on the slide engages an adapter for a bowstring release mechanism.

102. Norkus explains that the energy capacity of a bow depends on its draw weight and its power stroke distance, and explains the desire for a greater power stroke distance and stored energy. *Id.* at 1:17-34, 46-49, 55-62, Fig. 2. It also

discusses the limitations of existing inverted bows and compound bows. *Id.* at 1:35-49.

103. Norkus then discloses a compound bow 16 with the limbs 19, 21 extending in a forward direction from the riser 23. *Id.* at 2:60-65, Fig. 5. The bow 16 has two cams 18, 20 secured to the riser 23 and four pulleys 22a, 22b, 24a, 26a secured to the limbs 19, 21. *Id.* Each cam 18, 20 includes an annular groove 28 to receive the bowstring 22 and a helical groove 30 to receive two full wraps of a power cable 24, 26. *Id.* at 2:66-3:48, Fig. 7. The cams rotate approximately 720 degrees, but this amount can be increased or decreased as desired. *Id.* at 3:16-19. The bow 16 also has an arrow rest 40, a bowstring arrestor mechanism 50 to hold the bowstring 22 in place, a slide mechanism (shown in Fig. 11) to stabilize the bow on firing, and a release mechanism 70. *Id.* at 3:49-4:50, Figs. 8-14.

#### **F. Park**

104. Park (U.S. Patent App. Pub. No. 2012/0312287) states on its cover page that it was published on December 13, 2012, which is earlier than the Effective Filing Date (indeed, it is more than a year before the Effective Filing Date). Park states that it is the publication of application no. 13/578,076, which I understand is the §371 entry of international application no. PCT/KR11/00882,

which was filed February 10, 2011. Park lists Kyung Sin Park as the inventor. I understand that Park is prior art to the '015 Patent under §102(a)(1) and (2).

105. Park, entitled “Small-Scale Compound Bow,” states that the technical field relates to archery, particularly a small scale compound bow that is equipped with a differential motion pulley and a differential motion cam. Ex. 1009 at [0001]. It includes the following Abstract:

The present invention relates to archery, and more specifically relates to a compound bow of reduced size and weight comprising short limbs (Li), small pulleys and small cams while maintaining the performance of the prior art by linking a differential motion cam and a differential motion pulley of a novel design. The present invention has devised a method for dispensing with large cams and decreasing the scale of compound bows by using three different stratagems. The compound bow is decreased in scale through 1. the use of an idler pulley (IP) and a differential motion cam which rotates by a large extent as shown in FIG. 3, 2. the use of both a Y-cam (YC) which rotates by a large extent and a differential motion cam as shown in FIG. 11, and 3. the use of a combination of Y-cams (YC) which rotate by a large extent as shown in FIG. 16; and this compound bow can be used, by way of example, for hunting and sports and for shooting ropes for life saving purposes.

106. Park gives a brief overview of existing bows and their components. *Id.* at [0002]-[0016]. It also discusses the design incentives in this field, including

increasing arrow speed, reducing axle-to-axle distance, avoiding string overlap, and increasing draw length. *Id.* at [0002], [0006], [0016], [0018], [0026]-[0027]. Park explains that the draw length is affected by the distance between the axles and the length of the string wound on the cams. *Id.* at [0009], [0018]. One way of increasing the length of the wound string is to make the cam circumference larger, but the increased cam size renders the cam more susceptible to damage and the bow heavier, neither of which is desirable. *Id.* at [0018]-[0019].

107. Park thus discloses three methods of increasing the length of the wound string while keeping the bow compact, all of which use cams with a large rotational amount due to use of helical journals. *Id.* at [0020]-[0027]. One of the methods, exemplified in the bow shown in Fig. 3, uses large-rotation cams DC and pulleys IP. *Id.* at [0021], [0030], [0077]-[0086]. Each cam has a large lobe DCLL and a small lobe DCSL, both of which use helical journals that wind around the lobes in a direction perpendicular to the axle Ax, as shown in Figs. 4B, 7, and can rotate about 360 degrees. *Id.* at [0031], [0079]-[0080], [0085]-[0086]. This bow also includes a synchronizing pulley SP that also has helical journals (for buss cables BC1, BC2 (sometimes also noted as BS1, BS2)) that wind in a direction perpendicular to the axle Ax, as shown in Figs. 4B, 7, 9A-B. *Id.* at [0031], [0034],

[0036], [0079], [0087]. Park discloses an alternative embodiment of the cam and synchronizing pulley that can rotate 540 degrees. *Id.* at [0093], Fig. 8A-C.

108. Another of the methods, exemplified in the bow shown in Fig. 11, uses a differential motion cam DC with a large-rotation Y-cam YC (also sometimes referred to as the Y-pulley YP, depending on the shape, *id.* at [0011], [0101]). *Id.* at [0022], [0038], [0095]. The differential motion cam has planar (i.e., non-helical) journals and can rotate about 270 degrees. *Id.* at [0097], Fig. 13. However the Y-cam (or Y-pulley YP) has “a lot of rotational amount” and can rotate 900 degrees without any overlap in the string. *Id.* at [0095], [0098]. This large rotation amount is due to the wraps of the helical journals shown in Fig. 14. *Id.* at [0098]. Next to the Y-pulley YP is the lateral pulley LP, as shown in Fig. 14, which has only one groove; Park explains that if overlap of the string is not desired, the overlap can be avoided simply by using the design of a synchronizing pulley SP, which has helical journals, as shown in Fig. 9A-B. *Id.* at [0099].

109. The third of the methods, exemplified in the bow shown in Fig. 16, uses large-rotation cams (that can rotate 650 degrees) each of which has a Y-cam large lobe YCLL (for the string) and a differential-cam small lobe DCSL (for the buss cable), both of which use helical journals. *Id.* at [0023], [0043], [0111], [0112]-[0115], Figs. 17A-19. Alternatively, the large-rotation cam can have a Y-

pulley YP (instead of the Y-cam large lobe) and a Y-cam small lobe YCSL (sometimes also noted as YCLL; instead of the differential-cam small lobe). *Id.* at [0116]-[0118], Figs. 20A-22.

110. Park notes that its invention applies to crossbows. *Id.* at [0124].

### **G. Kempf ‘871**

111. Kempf ‘871 (U.S. Patent No. 7,836,871) states on its cover page that it was issued on November 23, 2010, which is earlier than the Effective Filing Date (indeed, it is more than a year before the Effective Filing Date). Kempf ‘871 states that it issued on application no. 11/654,418, which was filed January 17, 2007.

Kempf ‘871 lists James J. Kempf as the inventor. I understand that Kempf ‘871 is prior art to the ‘015 Patent under §102(a)(1) and (2).

112. Kempf ‘871, entitled “Powerstroke Crossbow,” states that the field of invention relates to an improved crossbow, namely, one having improved speed and reduced noise characteristics. Ex. 1014 at 1:5-8. It includes the following Abstract:

A crossbow having an increased powerstroke and reduced noise. The powerstroke is increased by inverting the limb orientation from the standard crossbow arrangement and locating string guides at least partially forward and rearward of the ends of the limbs. The bowstring is drawn from the tops of the string guides to maximize the

powerstroke, reducing noise and increasing the retained and delivered energy over existing crossbows.

113. Kempf '871 provides a brief overview of crossbow development. *Id.* at 1:9-2:3. It also discusses the design incentives in this field, including increasing the draw length and thus bow power and arrow speed, while also reducing the axle-to-axle distance, cost, weight, and manufacturing complexity of the bow. *Id.* at 1:28-2:55.

114. Kempf '871 then discloses a crossbow 10 having limbs 24, 26 extending forward (i.e., in the direction of shooting) from the riser 20, 22 and a reverse-draw configuration (i.e., with the bowstring 48 resting on the downstream side of the string guides 28, 36 when in a released position). *Id.* at 3:40-4:23, Fig. 1. Kempf '871 then discusses a cocker mechanism 56 and a locking assembly 62 and accompanying details. *Id.* at 4:24-6:40, Figs. 4-9.

115. Ravin cited Kempf '871 among 79 other references in the February 6, 2016 IDS, but neither Ravin nor the Examiner discussed it at all. Ex. 1002 at 168.

## **H. Islas**

116. Islas (U.S. Patent App. Pub. No. 2011/0308508) states on its cover page that it was published on December 22, 2011, which is earlier than the Effective Filing Date (indeed, it is more than a year before the Effective Filing Date). Islas states that it is the publication of application no. 13/116,731, which

was filed May 26, 2011, and claimed the benefit of application no. 61/356,109, which was filed June 18, 2010. Islas lists John J. Islas as the inventor. I understand that Islas is prior art to the '015 Patent under §102(a)(1) and (2).

117. Islas, entitled “Bowstring Cam Arrangement for Compound Long Bow or Crossbow,” states that the field of invention is archery, namely, compound bows employing cams and control cables to achieve a programmed draw weight, the latter being variable with draw length. Ex. 1015 at [0002]. It includes the following Abstract:

A compound bow or crossbow employs bowstring cams with bowstring cam grooves and power cord cam grooves. Preferably a pair of generally identical power cord cam grooves are positioned axially above and below the bowstring cam groove. The power cords are anchored to a fixed anchor point, e.g., a pylon, on the near end of the riser or on the near side of the crossbow bar or stock. The power cords do not cross over to the other limb. The reduction in the number of cam wheels and pulleys and in the number of strings or cords results in greater efficiency and higher transfer of energy from the bow to the arrow or bolt. There is no drop-off in pull weight at full draw. The bolt or arrow accelerates throughout the travel of the bowstring, resulting in significantly higher velocity.

118. Islas discusses the design incentives in this field, including increasing the energy stored in a bow and the speed of the shot arrow. *Id.* at [0004], [0006].

It discusses existing bows, which have let-off at the power stroke distance and also use crossover strings or cables, which introduces small mechanical losses and does not maximize the energy that can be stored in the bow. *Id.* at [0003]-[0006].

119. Thus, Islas discloses a crossbow 10 with cams 20 that are designed to not have let-off, where the cams 20 have grooves 28a, 28b for power cables on each side of the bowstring groove 24 and where the other end of the power cables 26 are secured to the axial beam 12 and do not cross over to the other limb 16. *Id.* at [0005]-[0006], [0011]-[0013], Figs. 1, 4.

120. Ravin cited Islas among 79 other references in the February 6, 2016 IDS, but neither Ravin nor the Examiner discussed it at all. Ex. 1002 at 168.

## **I. Despart**

121. Despart (U.S. Patent No. 6,474,324) states on its cover page that it was issued on November 5, 2002, which is earlier than the Effective Filing Date (indeed, it is more than a year before the Effective Filing Date). Despart states that it issued on application no. 09/716,027, which was filed November 17, 2000.

Despart lists James Robert Despart and Terry G. Martin as the inventors and Martin Archery, Inc. as the assignee. I understand that Despart is prior art to the '015 Patent under §102(a)(1) and (2).

122. Despart, entitled “Archery Bows, Archery Bow Cam Assemblies, and Archery Bow Anchors,” states that its technical field relates to archery bows, archery bow cam assemblies, and archery bow anchors. Ex. 1018 at 1:6-7. It includes the following Abstract:

In one aspect, the invention includes an archery bow having a first limb and a second limb, and a handle between the limbs. A rotating member includes at least two cams rotatably joined to the first limb with a first of the at least two cams having an eccentric profile to provide a first camming surface and a second of the at least two cams having an eccentric profile to provide a second camming surface. The eccentric profile of the first cam is substantially symmetrical relative to the eccentric profile of the second cam. A string extends between the rotating member and second limb.

123. Despart discusses basic archery components and operation and design incentives in this field, including increasing the energy storage and resulting speed as well as the efficiency of the energy transfer. *Id.* at 1:9-2:3.

124. It then discusses several bow and cam/wheel embodiments. *Id.* at Figs. 1-23. One embodiment of a wheel 102a utilizes helical grooves 114, 116 that can receive multiple wraps of string 22 (e.g., 720 degrees). *Id.* at 8:39-9:5, Figs. 22-23. When the wheel 102a rotates, the grooves displace the string 22 in a direction along the axis 46. *Id.*

## **J. Lester**

125. Lester (U.S. Patent No. 5,024,206) states on its cover page that it was issued on June 18, 1991, which is earlier than the Effective Filing Date (indeed, it is more than a year before the Effective Filing Date). Lester states that it issued on application no. 285,652, which was filed December 16, 1988. Lester lists Wayne L. Lester as the inventor. I understand that Lester is prior art to the '015 Patent under §102(a)(1) and (2).

126. Lester, entitled "Compound Archery Bow," states that the field of invention relates in general to archery bows, and particularly to improved compound archery bows. Ex. 1019 at 1:6-9. It includes the following Abstract:

A compound bow having a handle, upper and lower limbs, and a bowstring. Upper and lower pulleys are mounted on the bow. Each pulley has a helical groove of three turns, one turn having a different diameter from the other two. Tension cables travel around two of the three turns of the pulleys. As the bowstring is drawn, the pulleys rotate 360 degrees, and the cables unwind from one turn and wind onto a different turn.

127. Lester discusses certain disadvantages of existing bows and discloses two bow embodiments that address those disadvantages. *Id.* at 1:10-67, Figs. 1-10. One of these embodiments includes a pulley 43, 47 that rotates 360 degrees and has helical grooves for receiving a tension cable 45, 49. *Id.* at 2:47-3:27, Figs. 4-5.

Another embodiment includes a cam 75, 77 that has three turns 85, 87, 89 of a helical groove for a tension cable 81, 83 and also rotates 360 degrees. *Id.* at 3:42-4:37, Figs. 9-10. Lester explains that this greater rotation produces increased efficiency in the bow, which stores a greater amount of energy. *Id.* at 4:29-37.

## **VIII. CLAIM CONSTRUCTION**

128. I have been asked to opine regarding the construction of two claim terms.

### **A. “helical power cable take-up journal”**

129. Claim 1 of the ‘015 patent states that the first and second string guides each have a “helical power cable take-up journal” extending in a direction perpendicular to the plane of rotation of the string guide’s draw string journal.

130. I understand that in a related district court case between Ravin and TenPoint, both parties agreed that a “power cable take-up journal” means “a structure that accepts at least one power cable.” I believe that this construction is consistent with the plain and ordinary meaning of this term to a POSA in light of the intrinsic evidence.

131. Adding the prefix “helical” results in the following construction: “a helical structure that accepts at least one power cable.” This is because “helical” would simply be given its plain and ordinary meaning by a POSA in light of the

intrinsic evidence. For example, the ‘015 Patent refers to Figs. 4-8 as disclosing a string guide system “with a helical take-up journal,” and Figs. 6-8 show the helically winding journals 122A, 122B that accept a power cable 102A, 102B. Ex. 1001 at 3:13-23, 4:18-28, 43-61. Fig. 9A shows another example of “helical journals 204 that permit the power cables 102 to wrap around about two full turns . . . .” *Id.* at 4:62-66.

**B. “mounted to”**

132. Claim 1 of the ‘015 patent states that the first and second string guides are each “mounted to” the respective bow limb.

133. In my opinion, this term’s plain and ordinary meaning to a POSA would be “connected to, either directly or indirectly.”

134. Starting from the claim itself, one component (e.g., a first string guide) is “mounted to” another component (e.g., the first bow limb). Fig. 10 shows the string guides 158A, 158B connected to the limbs 154A, 154B through the axles 160A, 160B. The same is shown in Fig. 11 (string guides 316A, 316B connected to limbs 312A, 312B) and Fig. 12 (string guides 366A, 366B connected to limbs 362A, 362B).

135. Ravin’s U.S. Patent No. 9,494,379 (the “379 Patent”) claims the benefit of the ‘015 Patent. Claim 1 of the ‘379 Patent likewise uses the “mounted

to” claim term (e.g., “a first cam mounted to the first flexible limb”). And the specification of the ‘379 Patent explains that “[c]ams 440A, 440B (‘440’) are attached to the limbs 420 by axle mounts 442A, 442B (‘442’).” Ex. 1006 at 8:30-31. Fig. 14A shows that the cams 440 each have their axle secured inside a mounting bracket 442, which is then secured to the limb 420. Thus, a reference to one component being “mounted to” another clearly includes mounting directly or indirectly through another component. And no reason is provided to treat this claim term differently between the ‘015 Patent and its child ‘379 Patent.

136. I understand that Ravin argued in the related district court case that this term should mean “mounted to allow only rotation about a fixed axis.” Ravin’s proposal seems to include a requirement (that the mounted component must allow rotation) and a prohibition (that any movement other than rotation about a fixed axis is not permitted). I do not believe a POSA would find Ravin’s proposed construction for this claim term to be correct.

137. The claim term “mounted to” says nothing about rotation at all, much less rotation about only one fixed axis. This claim term appears in a limitation that refers to the string guide also being “rotatable around a first axis,” and it is this subsequent claim term (rather than “mounted to”) that has a bearing on rotation. If

“mounted to” itself included a rotation aspect, then the subsequent term “rotatable around a first axis” would be superfluous.

138. Additionally, the specification of the related ‘379 Patent discloses “a riser 404 mounted at the distal end 406” and an “arrow rest 750 mounted to distal end 776 of the center rail 402 by fasteners 762.” Ex. 1006 at 7:67-8:1, 15:8-9. But there is no indication that such mounting necessarily allows these components to rotate about a fixed axis; indeed such movement would severely compromise the operation and accuracy of the crossbow.

139. Furthermore, even if the entire claim limitation (“a first string guide mounted to the first bow limb and rotatable around a first axis”) were considered, a POSA would understand merely that rotation of the string guide around a first axis were required, not that the *only* permitted motion be rotation, and *only* around a first axis. In other words, so long as the string guide is connected to the limb and can be rotated around a first axis, this claim limitation is met, regardless of what additional movement is allowed.

## **IX. UNPATENTABILITY ANALYSIS**

140. I understand that TenPoint has asserted that claim 1 of the ‘015 Patent is unpatentable over the following references, and I have been asked to provide my opinion regarding same:

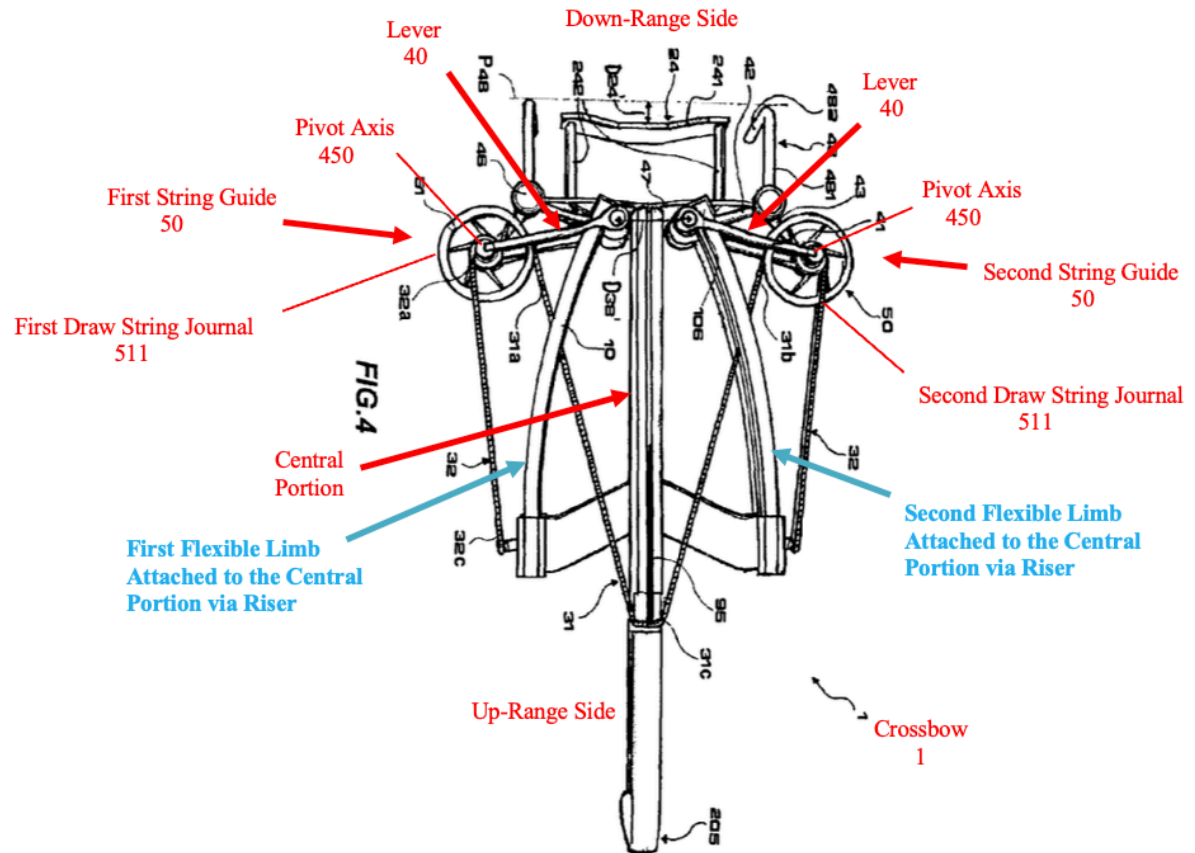
| <u><b>Ground</b></u> | <u><b>Basis</b></u> | <u><b>Reference(s)</b></u>    |
|----------------------|---------------------|-------------------------------|
| 1                    | §102(a)             | Stanziale ‘302                |
| 2                    | §103                | Stanziale ‘302                |
| 3                    | §102(a)             | Stanziale ‘062                |
| 4                    | §103                | Stanziale ‘062                |
| 5                    | §102(a)             | Stanziale ‘771                |
| 6                    | §103                | Stanziale ‘771                |
| 7                    | §103                | Darlington and Norkus         |
| 8                    | §103                | Darlington and Park           |
| 9                    | §103                | Kempf ‘871 and Norkus         |
| 10                   | §103                | Kempf ‘871 and Park           |
| 11                   | §103                | Kempf ‘871 and Stanziale ‘302 |
| 12                   | §103                | Islas, Darlington, and Park   |

**A. Ground 1: Claim 1 is Anticipated by Stanziale ‘302.**

141. It is my opinion that Stanziale ‘302 anticipates claim 1 of the ‘015 Patent as follows by at least a preponderance of the evidence.

142. Stanziale ‘302 discloses a crossbow. “In particular, the present disclosure relates to an archery crossbow . . . .” Ex. 1007 at [0002]. Fig. 4

(annotated version shown below) shows a crossbow with reference 1. *See also id.* at [0049], [0052], Figs. 1-8, 12.



143. Stanziale ‘302 discloses a central portion (called stock) 2 comprising a down-range side 206 and an up-range side 205 as shown in the above figure. *Id.* at [0052]-[0055], Figs. 1-4.

144. Stanziale ‘302 discloses first and second flexible limbs 10 attached to the central portion 2 via riser 25 (shown in blue above). “In the embodiment shown, each pair of elastic members [limbs] 10a, 10b at a same side of the stock [central portion] 2 is associated with the stock [central portion] 2 through a

respective wing [riser] 25 projecting from the lateral side 223, 224 of the stock [central portion] 2. A first end 25a of each wing [riser] 25 is fastened to the stock [central portion] 2 . . . .” *Id.* at [0065]-[0066].

145. Stanziale ‘302 discloses first and second string guides (called pulley assemblies) 50, each mounted through a lever 40 to a limb 10 on each side of the crossbow. *Id.* at [0095]-[0097], Figs. 1-6. Each string guide 50 is rotatable about a pivot 45 having a pivot axis 450 [first and second axes, respectively]. *Id.* at [0097]-[0099], Figs. 1, 9, 11.

146. Each string guide 50 has a draw string journal (called perimetral track or groove) 511, and each draw string journal 511 has a plane of rotation perpendicular to the corresponding first and second axes 450. “Each pulley 51 ... has a respective perimetral track or groove 511 ... configured to wind a flexible element.” *Id.* at [0105], Figs. 9 (annotated version shown below), 11.

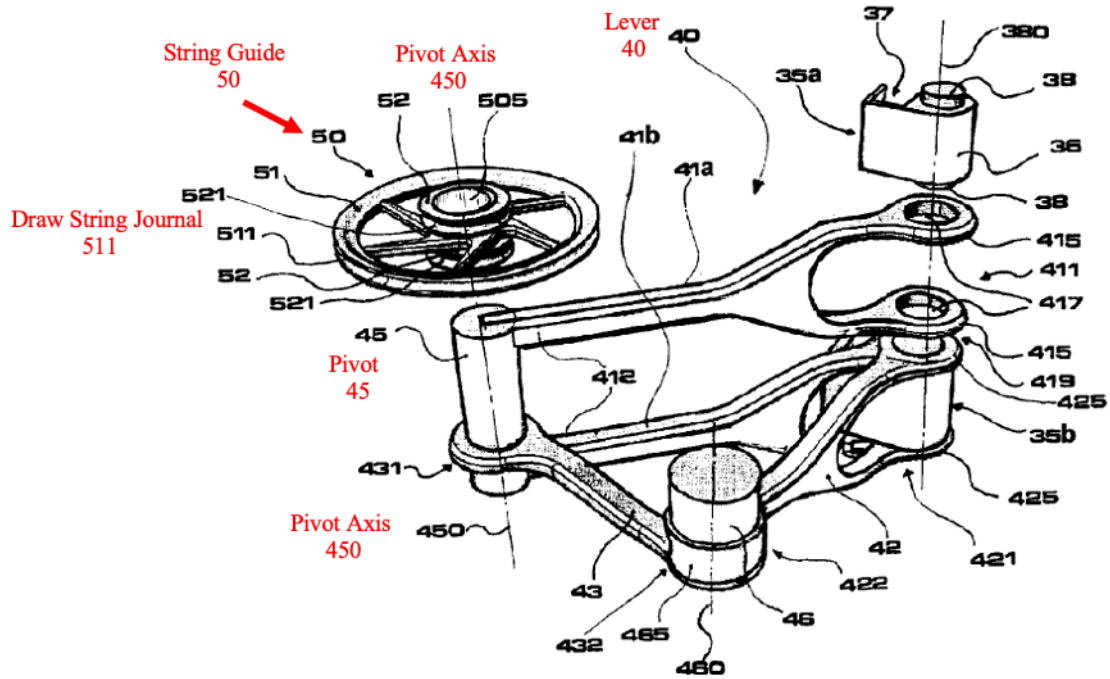
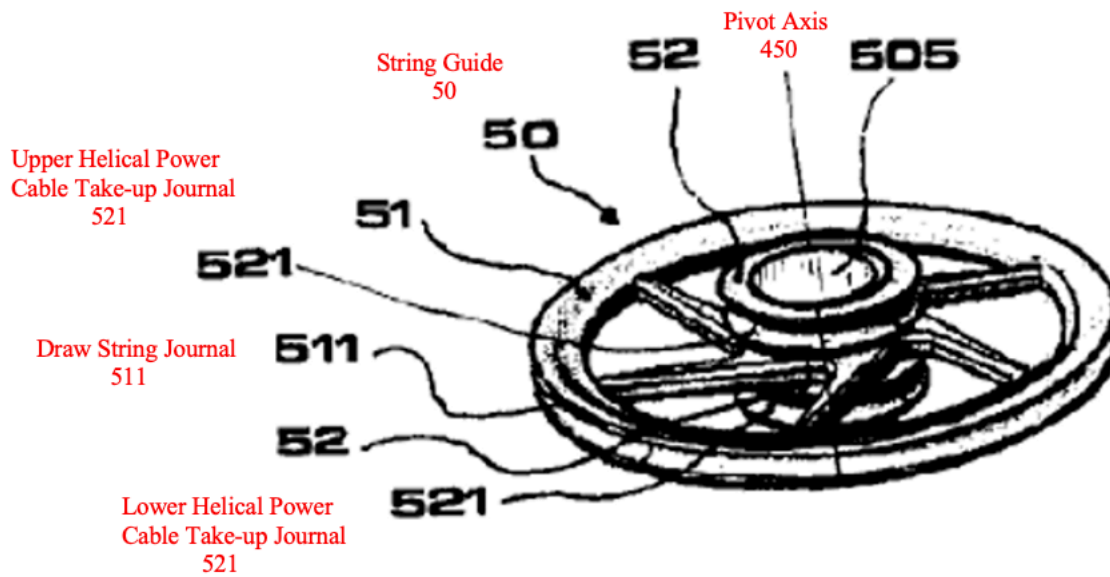


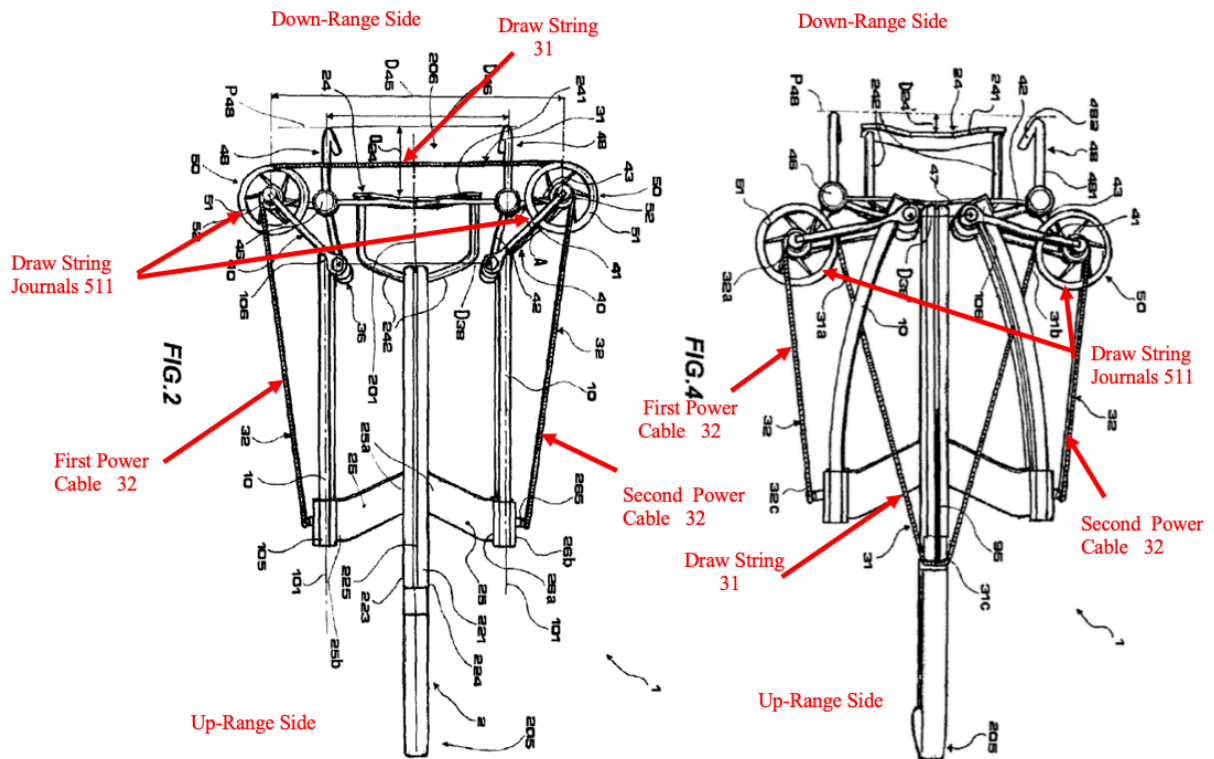
**FIG.9**

147. Stanziale ‘302 discloses that each of the two string guides 50 has upper and lower pulleys 52 having helical power cable take-up journals 521 extending in a direction perpendicular to the plane of rotation of the draw string journal 511. “[T]he perimetral track . . . 521 may . . . have a spiral or helical shape, so as to wind a plurality of turns of a flexible element.” *Id.* at [0106], Fig. 9 (annotated portion shown below). Because the power cable take-up journals 521 are helical in nature, are positioned above and below the draw string journals 511, and have a common rotation axis 450, they extend perpendicular to the plane of rotation of the draw string journal 511.



148. The '015 Patent discloses that the helical power cable take-up journals allow the string guide to rotate more than 360 degrees. Ex. 1001 at 4:63-5:3. Stanziale '302 discloses the same result. Ex. 1007 at [0106].

149. Stanziale '302 discloses that draw string 31 is received in the first and second draw string journals 511 and is secured to the crossbow in a reverse draw configuration with draw string 31 adjacent the down-range side 206 in a released configuration. *Id.* at [0120]-[0121], Fig. 2. The draw string 31 translates from the down-range side (Fig. 2) toward the up-range side (Fig. 4) and unwinds between the first and second string guides 50 to a drawn configuration. *Id.* at [01021] (annotated Figs. 2 and 4 shown below).



150. First and second power cables (called flexible elements) 32 are received respectively in the first and second helical power cable take-up journals 521. *Id.* at [0124]-[0129], Figs. 1-6, 11.

151. Stanziale ‘302 discloses that when the crossbow 1 is drawn from the released configuration (Figs. 1-2, 7) to the drawn configuration (Figs. 3-4, 8), the first and second power cables 32 wrap onto the first and second helical power cable take-up journals 521 and are displaced along the first and second axes away from the first and second planes of rotation of the first and second draw string journals 511. *Id.* at [0126]-[0129], Figs. 3, 11. Stanziale ‘302 notes that helical grooves result in turns of the cable being progressively coiled adjacent to each

other, with respect to the axis of rotation 450. *Id.* at [0106]. And with the helical power cable journals 521 being on opposite sides of the draw string journal 511, a POSA would immediately envisage that the helical configuration of the power cable journals 521 would need to be such that the power cables 32 extend away from (rather than towards) the draw string journal 511 to avoid interference with the draw string 31.

152. Thus, because Stanziale ‘302 discloses each limitation of claim 1, arranged as claimed, it anticipates claim 1.

**B. Ground 2: Claim 1 is Rendered Obvious by Stanziale ‘302.**

153. As explained above, the ‘015 Patent’s field of invention relates to a string guide system for a bow, and the patent shows both vertical bows (Fig. 10) and crossbows (Figs. 11-12). Stanziale ‘302 likewise is in the crossbow field and discloses string guide systems. Thus, Stanziale ‘302 is analogous art to the ‘015 Patent.

154. It is my opinion that Stanziale ‘302 renders claim 1 of the ‘015 Patent obvious as follows by at least a preponderance of the evidence.

155. The preceding section explains how Stanziale ‘302 meets each limitation of claim 1 and is not repeated here to avoid redundancy. If there were any doubt regarding the direction of displacement of the power cables 32, the

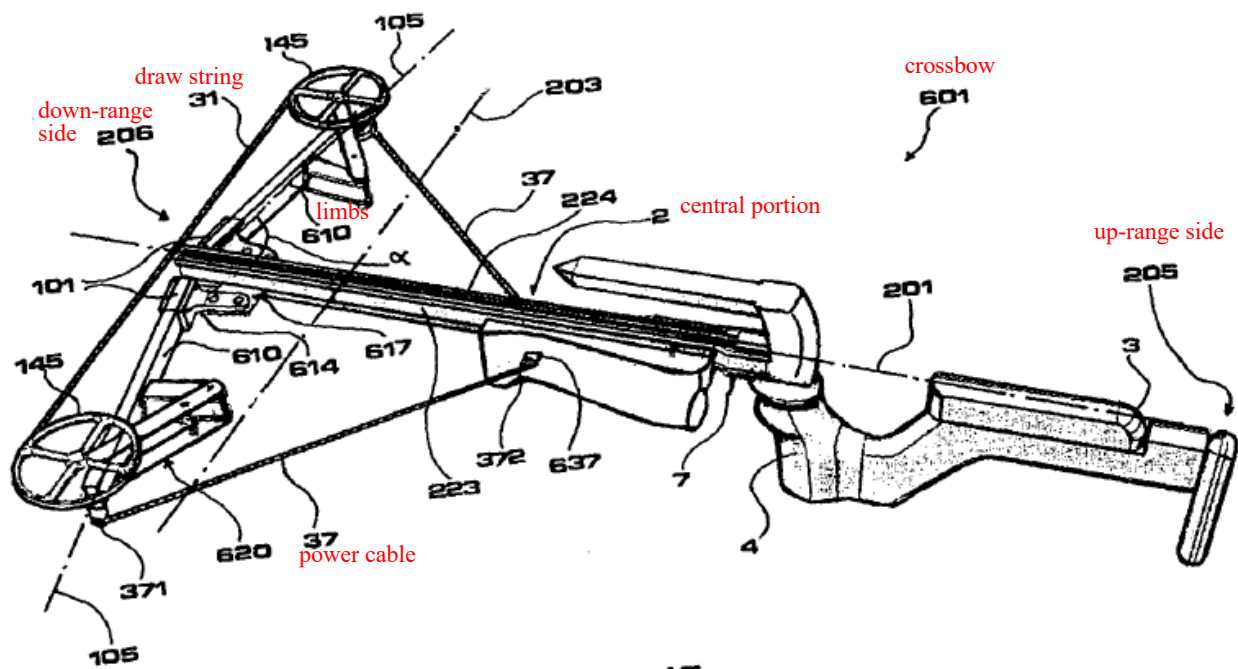
helical nature of the power cable take-up journals 521 means that the cable 32 wraps on those journals 521 in one of two directions: toward the draw string planes of rotation or away. With only two options, it would be obvious to try each.

156. All of the other claim limitations are met as discussed in the preceding section. Thus, Stanziale '302 renders obvious claim 1.

**C. Ground 3: Claim 1 is Anticipated by Stanziale '062.**

157. It is my opinion that Stanziale '062 anticipates claim 1 of the '015 Patent as follows by at least a preponderance of the evidence.

158. Stanziale '062 discloses a crossbow 601, as shown in the below annotated figure. Ex. 1011 at 1:4-5, 26:18-21, Fig. 17.



159. This crossbow comprises a central portion (called a stock) 2 that has a down-range side (called a front end) 206 and an up-range side (called a rear end) 205. *Id.* at 6:33-7:6, 26:24-26, 34:2-5, Fig. 17.

160. First and second flexible limbs (called elastic or bending members) 610 are attached to the central portion. *Id.* at 26:24-27:3, Figs. 17-18.

161. Two pulleys 145 are mounted to the first and second limbs, respectively, through brackets or arms 620 and are rotatable around respective axes 150. *Id.* at 27:27-28:7, Figs. 17-20. Stanziale '062 discloses that a pivot 147 of the first pulley 145 is fastened to the second pulley 146, 15:25-29, 16:2-5, Fig. 22, thus rendering each combination 145, 146, 147 as the claimed first and second string guides.

162. Each string guide has a draw string journal (called track or groove) 1451 having a plane of rotation (e.g., formed by the wound string 31) perpendicular to the respective axis of rotation 150, as shown in the below annotated figure. *Id.* at 16:20-25, 28:8-9, Figs. 17, 22.

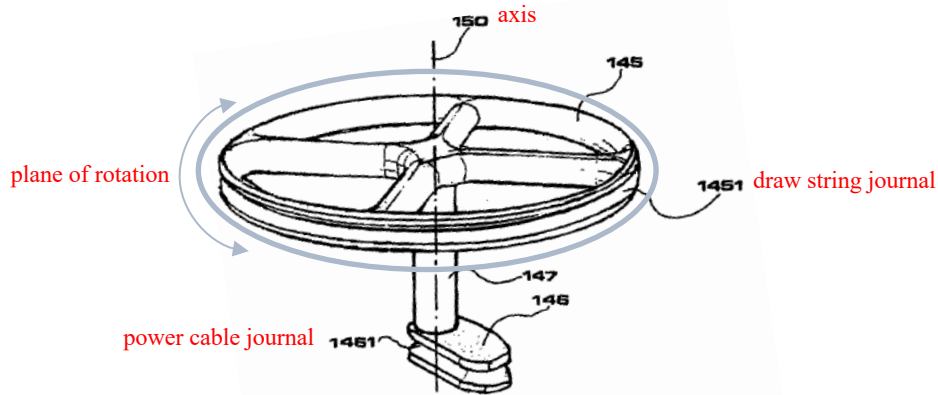


**FIG. 22**

163. Each string guide also has a helical power cable take-up journal (called track or groove) 1461 that, due to its helical nature, wraps in a direction perpendicular to the draw string journal's plane of rotation. *Id.* at 17:4-9, 28:10-13, Figs. 17, 22.

164. Stanziale '062 discloses several configurations of pulley grooves (annular, helical or spiral). *Id.* at 16:24-25, 17:8-9. Thus, Stanziale '062 discloses having annular grooves 1451 for the string 31 and helical grooves 1461 for the cable 37.

165. Stanziale '062 discloses a draw string (called flexible pushing member) 31 received in the draw string journals 1451. *Id.* at 9:32, 16:20-25, 28-32, 28:8-9, 30:4-6, Figs. 17-19. The string 31 is secured to the crossbow in a reverse draw configuration, because the string is adjacent the down-range or front side 206 of the string guides 145 when in a released configuration (*see* Figs. 17,

19). *Id.* at 30:3-6. The string 31 translates from the down-range side 206 toward the up-range or rear side 205 to a drawn configuration (*see* Fig. 18) while unwinding off the string guides 145. *Id.* at 30:10-16, 30:34-31:6.

166. Each of the two helical journals 1461 also receives a cable (called flexible force member) 37. *Id.* at 16:33-17:9, 28:10-16, Figs. 17-20, 22.

167. As the bow is drawn from the released configuration (*see* Figs. 17, 19) to the drawn configuration (*see* Fig. 18), the cables 37 wrap onto the helical journals 1461. *Id.* at 28:17-21, 30:10-16, 31:1-6. The helical nature of journals 1461 means that a POSA would at once envisage that the cable 37 wraps on those journals in one of two directions along the axis 150: toward the string planes of rotation or away.

168. Thus, because Stanziale ‘062 discloses each limitation of claim 1, arranged as claimed, it anticipates claim 1.

**D. Ground 4: Claim 1 is Rendered Obvious by Stanziale ‘062.**

169. As explained above, the ‘015 Patent’s field of invention relates to a string guide system for a bow, and the patent shows both vertical bows (Fig. 10) and crossbows (Figs. 11-12). Stanziale ‘062 likewise is in the archery field and discloses crossbows and string guide systems. Thus, Stanziale ‘062 is analogous art to the ‘015 Patent.

170. It is my opinion that Stanziale '062 renders claim 1 of the '015 Patent obvious as follows by at least a preponderance of the evidence.

171. The preceding section explains how Stanziale '062 meets each limitation of claim 1 and is not repeated here to avoid redundancy. If the combination of pulleys 145, 146 and pivot 147 is determined to not constitute the claimed string guide, it would nevertheless be obvious to simply make these components integral as one piece (which would be the claimed string guide), as it has long been known to make separate components integral to, e.g., reduce assembly complexity, cost, and potential points of failure.

172. The preceding section also explains how Stanziale '062 discloses having annular draw string journals 1451 and helical power cable journals 1461. But if there is disagreement regarding such disclosure, that journal configuration would nevertheless be obvious to try from the very small number of disclosed options (since Stanziale '062 discloses annular, helical or spiral pulley grooves, 16:24-25, 17:8-9).

173. Similarly, the preceding section explains how Stanziale '062 discloses the power cables 37 wrapping on the journals 1461 away from the string planes of rotation. But if this is disputed, such wrapping direction would nevertheless be

obvious to try, since there can only be two options (toward the string planes of rotation or away).

174. All of the other claim limitations are met as discussed in the preceding section. Thus, Stanziale '062 renders obvious claim 1.

**E. Ground 5: Claim 1 is Anticipated by Stanziale '771.**

175. It is my opinion that Stanziale '771 anticipates claim 1 of the '015 Patent as follows by at least a preponderance of the evidence.

176. Stanziale '771 discloses a crossbow 1, as shown in the below annotated figure. Ex. 1012 at 1:4-5, 7:6-11, Fig. 1.

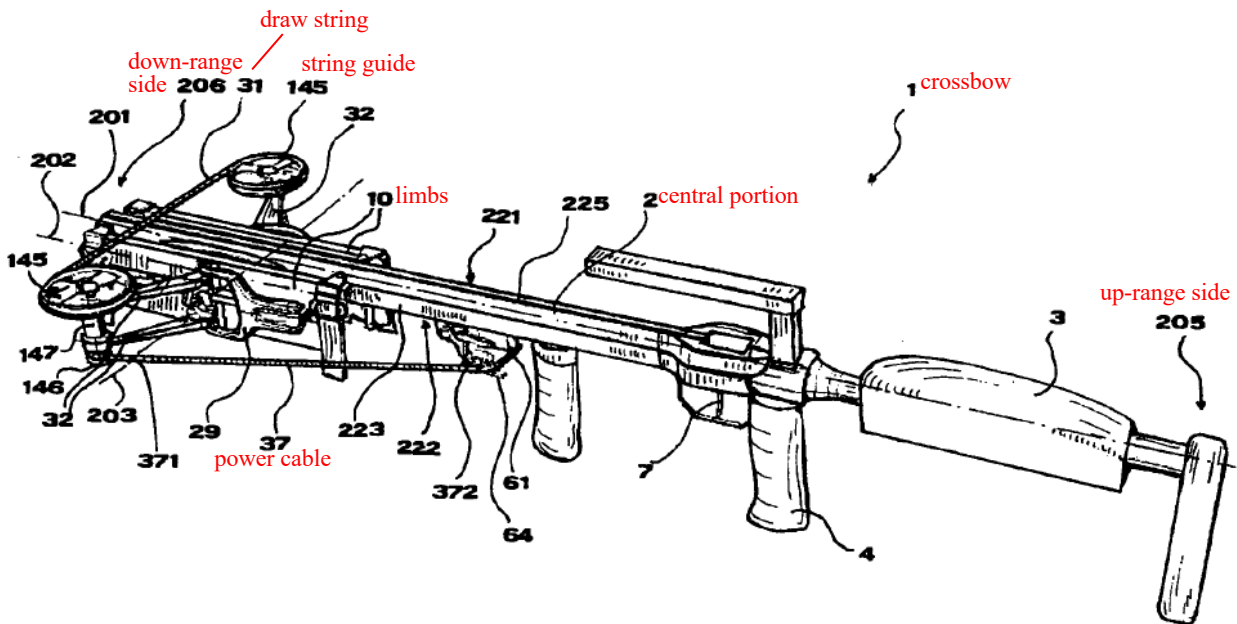


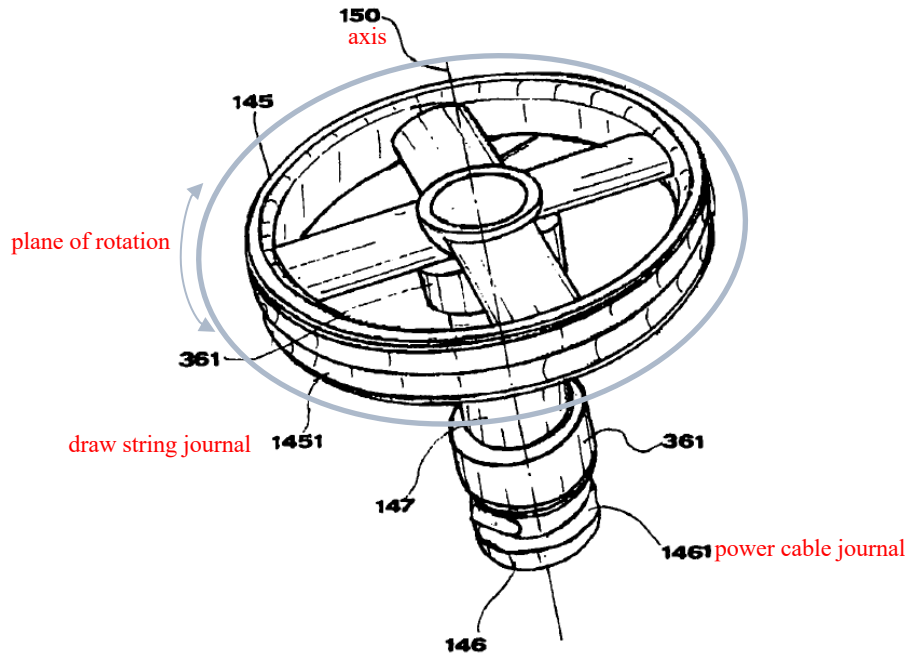
**FIG.1**

177. This crossbow comprises a central portion (called a stock) 2 that has a down-range side (called a front end) 206 and an up-range side (called a rear end) 205. *Id.* at 7:9-17, Fig. 1.

178. First and second flexible limbs (called elastic or bending members) 10 are attached to the central portion. *Id.* at 7:26-8:13, Figs. 1-2; *see also id.* at 1:6-12.

179. Two pulleys 145 are mounted to the first and second limbs, respectively, through brackets or arms 32 and rotatable around respective axes 150. *Id.* at 10:8-9, 16:2, 15-17, 24-27, Figs. 1-7; *see also id.* at 13:18-14:22, 18:12-30, 19:32-20:16. Stanziale '771 discloses that a pivot 147 of the first pulley 145 is fastened to the second pulley 146, 15:24-25, 29, thus rendering each combination 145, 146, 147 as the claimed first and second string guides.

180. Each string guide has a draw string journal (called groove) 1451 having a plane of rotation (e.g., formed by the wound string 31) perpendicular to the respective axis of rotation 150, as shown in the below annotated figure extracted from Fig. 9 of Stanziale '771. *Id.* at 25:11-23, Figs. 1-2, 18-19.



181. Each string guide also has a helical power cable take-up journal (called track or groove) 1461 that, due to its helical nature, wraps in an axial direction perpendicular to the draw string journal's plane of rotation. *Id.* at 16:34-17:5, Figs. 1, 5, 8-10A; *see also id.* at Fig. 12.

182. Stanziale '771 discloses several configurations of pulley grooves (annular, helical or spiral; with or without cable-enclosing radial extensions 1455, 1465). *Id.* at 16:22-23, 17:4-5, 25:11-21. And Stanziale '771 also discloses that the disclosed pulleys are interchangeable among the various disclosed embodiments. *Id.* at 25:22-23. Thus, Stanziale '771 discloses having annular grooves 1451 for the string 31 and helical grooves 1461 for the cable 37.

183. Stanziale ‘771 discloses a draw string (called flexible pushing member) 31 received in the draw string journals 1451. *Id.* at 10:6-7, Figs. 1-8. The string 31 is secured to the crossbow in a reverse draw configuration, because the string is adjacent the down-range or front side 206 of the string guides 145 when in a released configuration (*see* Figs. 1, 4, 7-8). *Id.* at 17:30-34. The string 31 translates from the down-range side 206 toward the up-range or rear side 205 to a drawn configuration (*see* Figs. 2, 5) while unwinding off the string guides 145. *Id.* at 16:18-23, 30-31, 17:22-26, 17:34-18:6, 19:3-6.

184. Each of the helical journals 1461 also receives a cable (called flexible force member) 37. *Id.* at 16:32-17:5, Figs. 1-7. Stanziale ‘771 discloses that either the same cable 37 can be received in both string guide (i.e., one end in each groove 1461), or two cables may be used, *id.* at 17:13-16, thus disclosing the claimed first and second power cables.

185. As the bow is drawn from the released configuration (*see* Figs. 1, 4, 7-8) to the drawn configuration (*see* Figs. 2, 5), the cables 37 wrap onto the helical journals 1461. *Id.* at 16:34-17:5, 17:22-26, 17:34-18:6, 19:3-6. The cables 37 are displaced along the axes 150 away from the draw string planes of rotation as the bow is drawn. *Compare id.* Figs. 4 and 5 (showing cable 37 wrap around journal

1461 and away from string 31 as the bow is drawn); *also compare id.* Figs. 11 and 12 (same), 22:30-23:1; *see also id.* at 18:2-6.

186. Thus, because Stanziale '771 discloses each limitation of claim 1, arranged as claimed, it anticipates claim 1.

**F. Ground 6: Claim 1 is Rendered Obvious by Stanziale '771.**

187. As explained above, the '015 Patent's field of invention relates to a string guide system for a bow, and the patent shows both vertical bows (Fig. 10) and crossbows (Figs. 11-12). Stanziale '771 likewise is in the archery field and discloses crossbows and string guide systems. Thus, Stanziale '771 is analogous art to the '015 Patent.

188. It is my opinion that Stanziale '771 renders claim 1 of the '015 Patent obvious as follows by at least a preponderance of the evidence.

189. The preceding section explains how Stanziale '771 meets each limitation of claim 1 and is not repeated here to avoid redundancy. If the combination of pulleys 145, 146 and pivot 147 is determined to not constitute the claimed string guide, it would nevertheless be obvious to simply make these components integral as one piece (which would be the claimed string guide), as it has long been known to make separate components integral to, e.g., reduce assembly complexity, cost, and potential points of failure.

190. The preceding section also explains how Stanziale ‘771 discloses having annular draw string journals 1451 and helical power cable journals 1461. But if there is disagreement regarding such disclosure, that journal configuration would nevertheless be obvious to try from the very small number of disclosed options (since Stanziale ‘771 discloses annular, helical or spiral grooves, with or without cable-enclosing radial extensions, 16:22-23, 17:4-5, 25:11-21).

191. Similarly, the preceding section explains how Stanziale ‘771 discloses the power cables 37 wrapping on the journals 1461 away from the string planes of rotation. If there were any doubt regarding the direction of displacement, the helical nature of the journals 1461 means that the cable 37 wraps on those journals in one of two directions: toward the string planes of rotation or away. With only two options, it would be obvious to try each.

192. All of the other claim limitations are met as discussed in the preceding section. Thus, Stanziale ‘771 renders obvious claim 1.

**G. Ground 7: Claim 1 is Obvious over Darlington and Norkus.**

193. As explained above, the ‘015 Patent’s field of invention relates to a string guide system for a bow, and the patent shows both vertical bows (Fig. 10) and crossbows (Figs. 11-12). Darlington likewise is in the archery field and discloses crossbows and string guide systems. Norkus also is in the archery field

and discloses bows and string guide systems. Thus, Darlington and Norkus are analogous art to the '015 Patent.

194. I understand that Ravin argued in the related district court case that the claimed string guides of the '015 Patent allow only rotation about a fixed axis. Even if that were true, it is my opinion that Darlington renders claim 1 of the '015 Patent obvious in light of Norkus as follows by at least a preponderance of the evidence.

195. Darlington discloses various crossbow configurations, the features of which can be modified and combined. Ex. 1013 at [0061], Figs. 1-18. For simplicity, crossbow 140' shown in Figure 18 (annotated version shown below) will form the basis here. Darlington explains that this crossbow 140' uses the cam configuration shown in Figs. 13-16, so those figures and accompanying description provide additional details about this crossbow 140'.

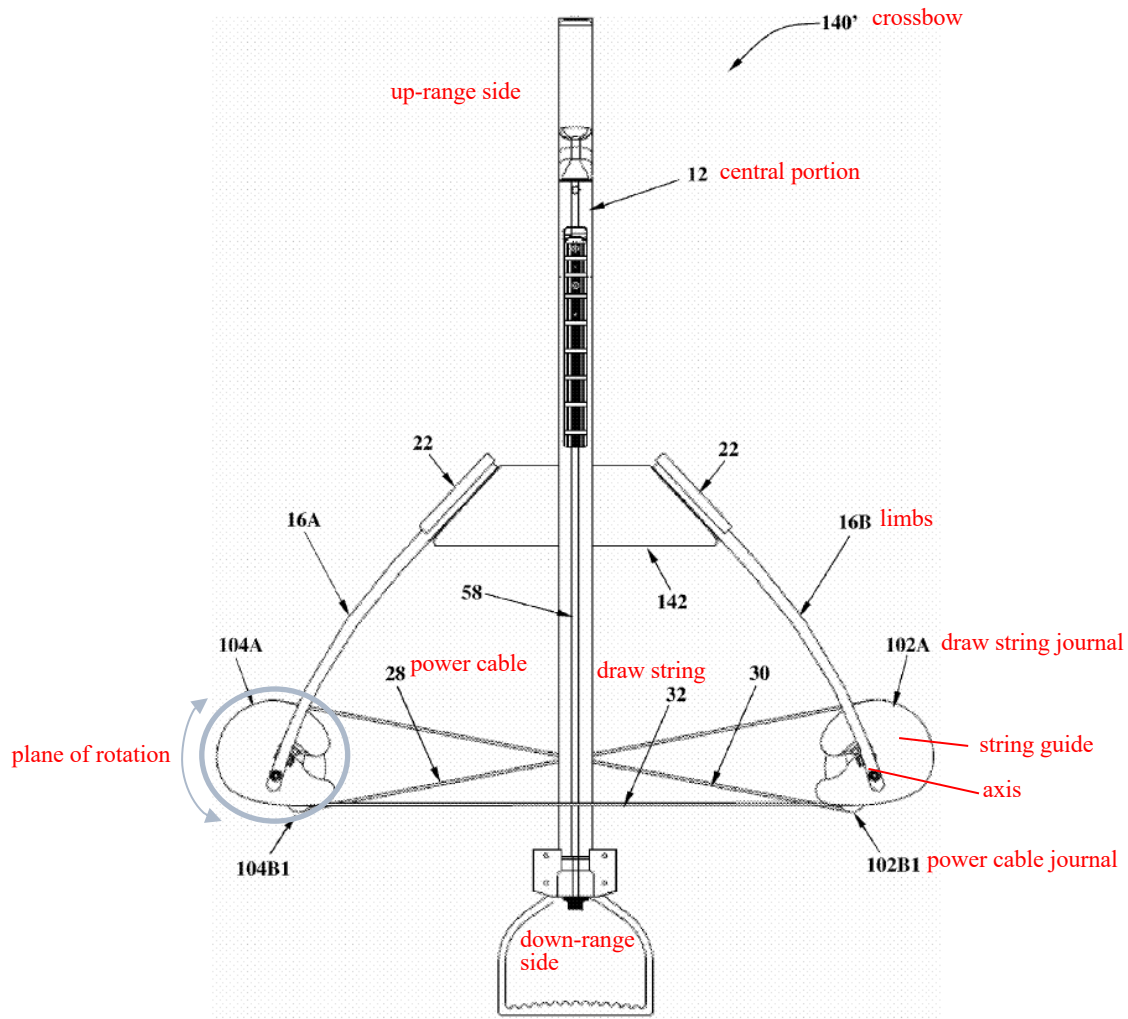


**FIG. 18**

196. This crossbow 140' comprises a central portion (called a barrel) 12 with a down-range side (closer to the foot stirrup) and an up-range side (closer to the stock). *Id.* at [0038], Fig. 18.

197. First and second flexible limbs 16A&B, 18A&B are attached to the central portion. *Id.* at [0002], [0038], Fig. 18.

198. First and second string guides (called cams) 102, 104 are mounted to the first and second limbs, respectively, and are rotatable around respective axes going through axles 34A and 34B. *Id.* at [0045], [0056], [0060], Figs. 16, 18.

199. Each string guide has a draw string journal (called groove) 102A, 104A having a plane of rotation (e.g., formed by the wound string 32) perpendicular to the respective axis of rotation 34A, 34B. *Id.* at [0057], Figs. 14-15, 18.

200. Each string guide also has a power cable take-up journal (called groove) 102B, 104B, though perhaps not helical. *Id.* at [0056]-[0057], Figs. 14, 18.

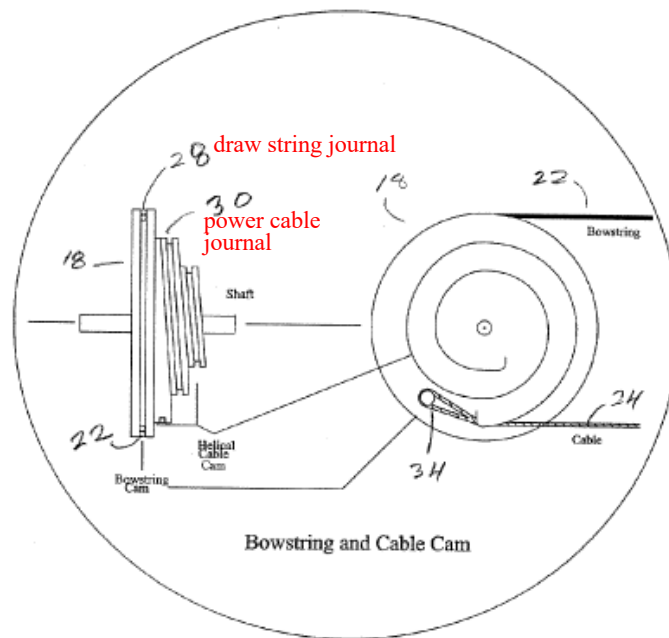
201. Darlington discloses a draw string (called bowstring) 32 received in the draw string journals 102A, 104A. *Id.* at [0003], [0010], [0056], Figs. 14, 18. The string 32 is secured to the crossbow in a reverse draw configuration, because the string is adjacent to the down-range side of the string guides 102, 104 when in a released configuration. *Id.* at [0021] [0029], [0033], [0035], [0042], [0054], [0059], [0061], Figs. 4, 12, 16, 18. The string 32 translates from the down-range side toward the up-range side to a drawn configuration while unwinding off the string guides 102, 104. *Id.* at [0010], [0042], claim 1.

202. Each of the power cable journals 102B, 104B also receives a power cable 28, 30. *Id.* at [0003]-[0004], [0010], [0056]-[0057], Figs. 14, 18.

203. As the bow is drawn from the released configuration to the drawn configuration, the cables 28, 30 wrap onto the power cable journals 102B, 104B. *Id.* at [0057], claim 1.

204. Thus, Darlington discloses each limitation of claim 1 except that the power cable journals are helical (extending in a direction perpendicular to the draw string planes of rotation), and thus that the power cables are displaced along the respective axes away from the planes of rotation as the cables wrap onto the helical journals.

205. However, Norkus discloses these related limitations. Norkus discloses a bow cam 18 that includes a planar journal 28 for the bowstring 22 and a helical journal 30 for the power cable 24, as shown in the annotated figure below. Ex. 1010 at 2:60-3:7, 3:42-48, Fig. 7.



206. Darlington teaches the desirability of “a higher level of stored energy” and increased power stroke (i.e., the distance of travel of the bowstring between the drawn and released configurations), which “results in better performance.” Ex. 1013 at [0003], [0015], [0042]. Norkus likewise teaches the desirability of more energy storage, which is directly impacted by increased power stroke. Ex. 1010 at 1:24-49, 55-62. Norkus discloses that the longer power stroke is accomplished by allowing the cams (which receive the bowstring) to rotate more than once (e.g., approximately 720 degrees), which is accomplished by using helical cable journals. *Id.* at 3:2-7. Thus a POSA would be motivated to further increase Darlington’s power stroke (and energy storage) and would utilize the design of

Norkus's helical cable journals to facilitate the increased power stroke, which result would be reasonably expected from this combination.

207. Thus, Darlington and Norkus render obvious claim 1.

**H. Ground 8: Claim 1 is Obvious over Darlington and Park.**

208. As explained above, the '015 Patent's field of invention relates to a string guide system for a bow, and the patent shows both vertical bows (Fig. 10) and crossbows (Figs. 11-12). Darlington likewise is in the archery field and discloses crossbows and string guide systems. Park also is in the archery field and discloses bows and string guide systems. Thus, Darlington and Park are analogous art to the '015 Patent.

209. It is my opinion that Darlington renders claim 1 of the '015 Patent obvious in light of Park as follows by at least a preponderance of the evidence.

210. The preceding section explains how Darlington discloses each limitation of claim 1 (and is not repeated here to avoid redundancy), except that the power cable journals are helical (extending in a direction perpendicular to the draw string planes of rotation), and thus that the power cables are displaced along the respective axes away from the planes of rotation as the cables wrap onto the helical journals. However, Park discloses these related limitations. And unlike Norkus

(discussed in the preceding section), which shows the details of such journals in one figure, Park's figures disclose multiple embodiments of such journals.

211. Park discloses multiple archery string guides (cams or pulleys) having helical power cable take-up journals extending perpendicular to axes Ax. Ex. 1009 at Figs. 4B, 7-9B, 14, 15, 17A-23C.

212. Park explains that a bow's draw length (also known as power stroke) is affected by the distance between the cam axles as well as the length of the string wound on such cams. *Id.* at [0009], [0018]. So if a bow has a reduced axle-to-axle distance (which is desired to make the bow easier to shoot when around obstacles), then the amount of string wound on the cams should increase to maintain the same draw length. *Id.* at [0009], [0018], [0027]. But prior art cams can only accommodate 270 degrees of rotation without string overlap. *Id.* at [0013], [0018]. Thus to increase the amount of cable wound on the cams without overlapping, Park discloses helical journals, which allow rotation of 360 degrees, 540 degrees, 650 degrees, and even up to 900 degrees. *Id.* at [0025], [0031], [0035], [0098], [0112]. The length of the helical grooves determines the amount of cam rotation without cable overlap. *Id.* at [0087]. Park confirms that such helical journals can be applied to crossbows. *Id.* at [0124]. Thus a POSA wishing to increase a crossbow's power stroke (per Ex. 1013 [0003], [0015], [0042]) would be

motivated to use helical power cable journals (per Park), which allow more cable to be wound and unwound, as would be reasonably expected from such a combination.

213. Indeed, a POSA wishing to increase the power stroke of Darlington's (or any other) crossbow, and understanding the impact of wound cable on the power stroke, would be motivated to apply the helical-journal teachings of any of various additional references, including Stanziale '062 (Ex. 1011 at 17:4-9), Stanziale '771 (Ex. 1012 at 16:34-17:5), Stanziale '302 (Ex. 1007 at [0106]), Despart (Ex. 1018 at 8:50-9:5, Figs. 22-23), and Lester (Ex. 1019 at 3:59-63, Fig. 10), which would permit more cable to be wound, as would be reasonably expected from such combinations. Not only are all of these references from the same archery field, they also would have logically commended themselves to an inventor's attention in considering the problem of increasing greater rotation of string guides and permitting a longer power stroke distance, thus being reasonably pertinent to this problem. These multiple analogous references further reinforce the obviousness of using helical journals on archery cams.

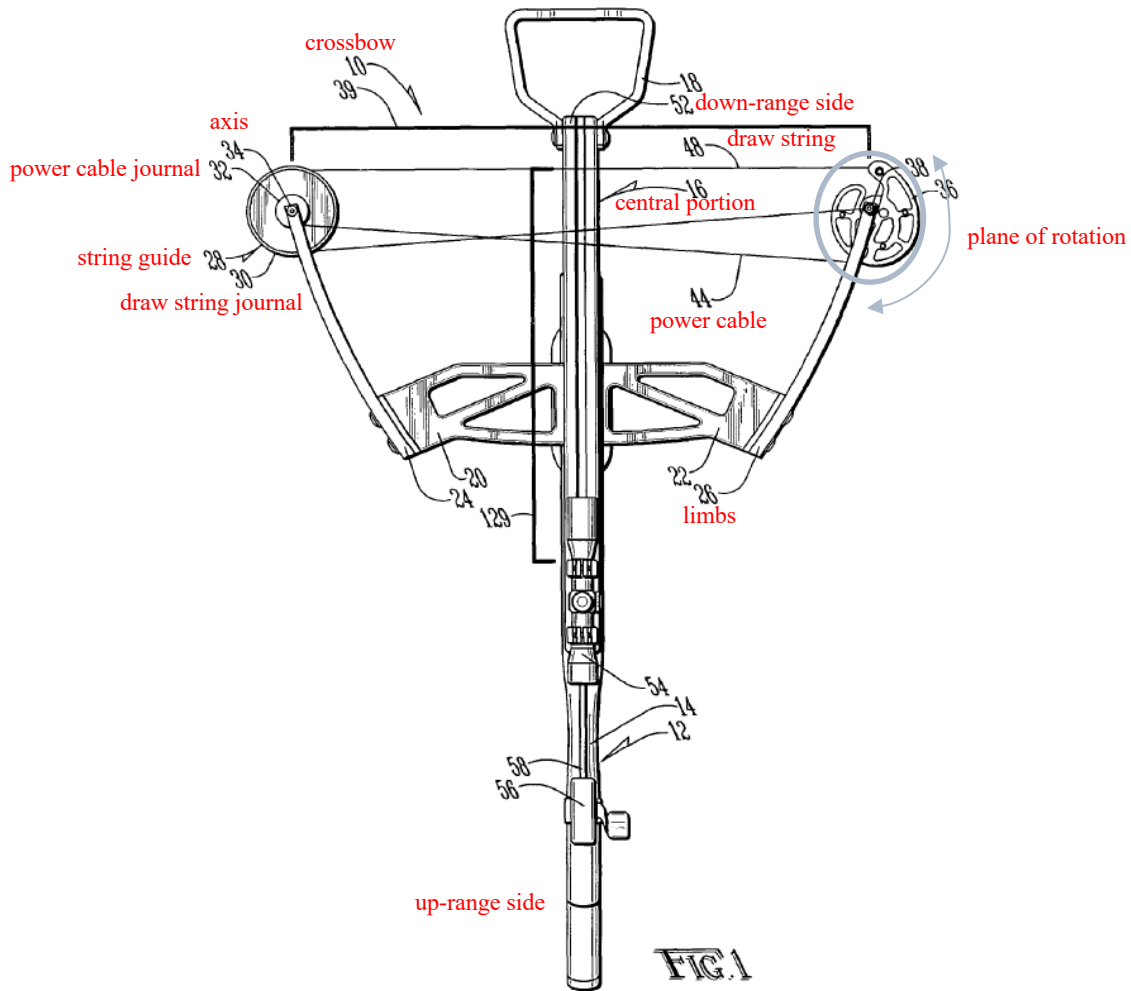
214. Thus, Darlington and Park render obvious claim 1.

**I. Ground 9: Claim 1 is Obvious over Kempf ‘871 and Norkus.**

215. As explained above, the ‘015 Patent’s field of invention relates to a string guide system for a bow, and the patent shows both vertical bows (Fig. 10) and crossbows (Figs. 11-12). Kempf ‘871 likewise is in the crossbow field and discloses string guide systems. Norkus also is in the archery field and discloses bows and string guide systems. Thus, Kempf ‘871 and Norkus are analogous art to the ‘015 Patent.

216. It is my opinion that Kempf ‘871 renders claim 1 of the ‘015 Patent obvious in light of Norkus as follows by at least a preponderance of the evidence.

217. Kempf ‘871 discloses a crossbow 10 that comprises a central portion (called a rail) 16 with a down-range side (called forward end) 52 and an up-range side (closer to the stock 14). Ex. 1014 at 3:40-43, Fig. 1. In fact, Fig. 1 of Kempf ‘871 (annotated version shown below) looks remarkably similar to Fig. 11 of the ‘015 Patent.



218. First and second flexible limbs 24, 26 are attached to the central portion through the riser 20, 22. Ex. 1014 at 3:50-56, Fig. 1.

219. First and second string guides 28, 36 are mounted to the first and second limbs, respectively, and are rotatable around respective axes going through axles 34, 38. *Id.* at 3:57-66, Fig. 1. Figure 1 shows a pulley 28 and a cam 36 as the string guides, but two cams may also be used. *Id.* at 4:12-13.

220. Each string guide has a draw string journal (called outer track) 30 having a plane of rotation (e.g., formed by the wound string 48) perpendicular to the respective axis of rotation 34, 38. *Id.* at 3:57-59, 4:13-19, Fig. 1.

221. Each string guide also has a power cable take-up journal (called inner track) 32, though perhaps not helical. *Id.* at 3:57-59, 4:13-23, Fig. 1.

222. Kempf '871 discloses a draw string (called bowstring) 48 received in the draw string journals 30. *Id.* at 4:13-23, Figs. 1, 10. The bowstring 48 is secured to the crossbow in a reverse draw configuration, because the string is adjacent the down-range side 52 of the string guides 28, 36 when in a released configuration. *Id.* at 4:16-23, Fig. 1. The string 48 translates from the down-range side (*see* Fig. 1) toward the up-range side (*see* Fig. 10) to a drawn configuration while unwinding off the string guides 28, 36.

223. Each of the power cable journals 32 also receives a power cable 44. *Id.* at 4:13-23, Figs. 1, 10.

224. As the bow is drawn from the released configuration (*see* Fig. 1) to the drawn configuration (*see* Fig. 10), the cables 44 wrap onto the rotating power cable journals 32 as the limbs bend closer together and reduce the distance between the string guides 28, 36.

225. Thus, Kempf ‘871 discloses each limitation of claim 1 except that the power cable journals are helical (extending in a direction perpendicular to the draw string planes of rotation), and thus that the power cables are displaced along the respective axes away from the planes of rotation as the cables wrap onto the helical journals.

226. However, Norkus discloses these related limitations and their benefits, as discussed above in §IX.G (not repeated here to avoid redundancy).

227. Similar to the previously discussed Darlington reference, Kempf ‘871 discloses the desirability of increasing a crossbow’s draw length or power stroke, which increases its potential power and thus speed, while minimizing its axle-to-axle distance. Ex. 1014 at 1:31-40, 1:62-2:18, 2:41-55. So in light of these desired features, a POSA would have been motivated to apply helical power cable journals from Norkus to Kempf’s crossbow to obtain a longer power stroke (and thus crossbow speed) while maintaining the axle-to-axle distance (or even reducing it). And a POSA would have reasonably expected to achieve success from such combinations.

228. Thus, Kempf ‘871 and Norkus render obvious claim 1.

**J. Ground 10: Claim 1 is Obvious over Kempf ‘871 and Park.**

229. As previously explained, Kempf ‘871 and Park are analogous art to the ‘015 Patent.

230. It is my opinion that Kempf ‘871 renders claim 1 of the ‘015 Patent obvious in light of Park as follows by at least a preponderance of the evidence.

231. The preceding section explained how Kempf ‘871 discloses each limitation of claim 1 (and is not repeated here to avoid redundancy), except that the power cable journals are helical (extending in a direction perpendicular to the draw string planes of rotation), and thus that the power cables are displaced along the respective axes away from the planes of rotation as the cables wrap onto the helical journals. However, Park discloses these related limitations and their benefits, as discussed above in §IX.H (not repeated here to avoid redundancy).

232. As discussed in the preceding section, Kempf ‘871 discloses the desirability of increasing a crossbow’s draw length or power stroke, which increases its potential power and thus speed, while minimizing its axle-to-axle distance. Ex. 1014 at 1:31-40, 1:62-2:18, 2:41-55. So in light of these desired features, a POSA would have been motivated to apply helical power cable journals from Park (in light of its teachings discussed in §IX.H) to Kempf’s crossbow to obtain a longer power stroke (and thus crossbow speed) while maintaining the

axle-to-axle distance (or even reducing it), with a reasonable expectation of success.

233. Thus, Kempf ‘871 and Park render obvious claim 1.

**K. Ground 11: Claim 1 is Obvious over Kempf ‘871 and Stanziale ‘302.**

234. As previously explained, Kempf ‘871 and Stanziale ‘302 are analogous art to the ‘015 Patent.

235. It is my opinion that Kempf ‘871 renders claim 1 of the ‘015 Patent obvious in light of Stanziale ‘302 as follows by at least a preponderance of the evidence.

236. Section IX.I explained how Kempf ‘871 discloses each limitation of claim 1 (and is not repeated here to avoid redundancy), except that the power cable journals are helical (extending in a direction perpendicular to the draw string planes of rotation), and thus that the power cables are displaced along the respective axes away from the planes of rotation as the cables wrap onto the helical journals.

237. However, Stanziale ‘302 discloses these related limitations. Stanziale ‘302 discloses the use of helical grooves 511, 521 on string guides 50 that permit multiple turns of the string 31 or cable 32 on the pulleys/string guides 50:

“Moreover, the perimetral track 511, 521 . . . may have a spiral or helical shape, so

as to wind a plurality of turns of a flexible element. To be more detailed: a spiral has a two-dimensional development and then winds a plurality of turns which progressively crown or overlap each other; a helix has a three-dimensional development and then winds a plurality of turns which are progressively coiled adjacent to each other.” Ex. 1007 at [0106], Figs. 5, 9.

238. As explained above, Kempf ‘871 discloses the desirability of increasing a crossbow’s draw length or power stroke, which increases its potential power and thus speed, while minimizing its axle-to-axle distance, and the undesirability of increasing the draw weight. Ex. 1014 at 1:31-40, 1:62-2:18, 2:41-55.

239. Stanziale ‘302 also notes the benefits of decreased draw weight as follows: “The inventor has recognized that the force exerted by the user during a loading phase of the device should be as constant as possible along most of the draw length (or stroke or displacement) of said middle portion of the propulsive wire, *so as to minimize the* maximum force (commonly referred to as *draw weight*) that the user has to put in loading the device by hand.” Ex. 1007 at [0006] (emphasis added).

240. A POSA beginning with the bow of Kempf ‘871 and the desire to increase the power stroke distance and reduce draw weight, as disclosed in Kempf

‘871, would be motivated to consider Stanziale ‘302 because it also concerns crossbows and the desire to reduce draw weight. A POSA would also readily understand that the benefit of increased power stroke distance could be accomplished using the helical grooves disclosed in Stanziale ‘302. Therefore, a POSA would be motivated to replace the power cable take-up journals of Kempf ‘871 with the helical power cable take-up journals disclosed in Stanziale ‘302 to increase the power stroke distance, with a reasonable expectation of success.

241. Thus, Kempf ‘871 and Stanziale ‘302 render obvious claim 1.

**L. Ground 12: Claim 1 is Obvious over Islas, Darlington, and Park.**

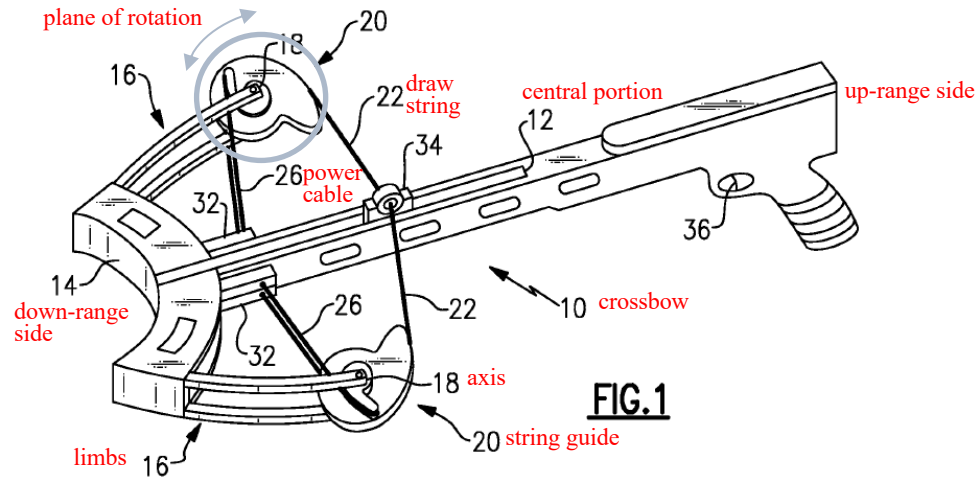
242. As explained above, the ‘015 Patent’s field of invention relates to a string guide system for a bow, and the patent shows both vertical bows (Fig. 10) and crossbows (Figs. 11-12). Islas likewise is in the archery field and discloses vertical bows, crossbows, and string guide systems. Thus, Islas is analogous art to the ‘015 Patent, along with Darlington and Park as discussed previously.

243. It is my opinion that Islas renders claim 1 of the ‘015 Patent obvious in light of Darlington and Park as follows by at least a preponderance of the evidence.

244. Islas discloses a crossbow 10 that comprises a central portion (called an axial beam or stock) 12 with a down-range side (closer to the riser 14) and an

up-range side (closer to the trigger 36), as shown in the annotated figure below.

Ex. 1015 at [0011], Fig. 1.



245. First and second flexible limbs 16 are attached to the central portion through the riser 14. *Id.*

246. First and second string guides (called cams) 20 are mounted to the first and second limbs, respectively, and are rotatable around respective axes going through pivots 18 or axles 30. *Id.* at [0011], [0013], Figs. 1, 4.

247. Each string guide 20 has a draw string journal (called groove or channel) 24 having a plane of rotation (e.g., formed by the wound string 22) perpendicular to the respective axis of rotation 18, 30, as shown in the below annotated figure. *Id.* at [0013], Figs. 1, 4.

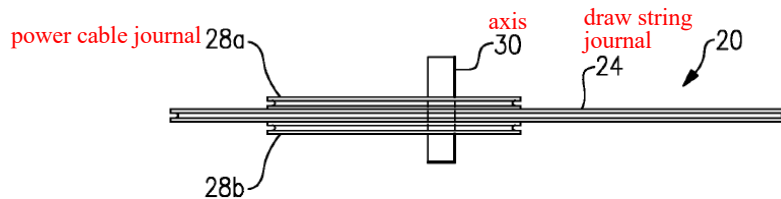


**FIG. 4**

248. Each string guide 20 also has a power cable take-up journal (called groove) 28a or 28b, though perhaps not helical. *Id.* at [0006], [0013], Figs. 1, 4.

249. Islas discloses a draw string (called bowstring) 22 received in the draw string journals 24 and that unwinds between the string guides 20 to a drawn configuration. *Id.* at [0006], [0013], Figs. 1, 4, claim 2.

250. Islas's bowstring is not secured in a reverse draw configuration (with the string 22 adjacent the down-range side of the string guides 20 in a released configuration, such that the string 22 translates from the down-range side toward the up-range side while being drawn). But it would be obvious to do so in light of Darlington, which teaches that a reverse-draw configuration provides a bow with a longer power stroke and thus increased speed and better performance. Ex. 1013 at [0042]. This teaching is supported by Kempf '871. Ex. 1014 at 1:40-43, 2:62-67, Fig. 1. Islas likewise teaches the desirability of increasing crossbow speeds, Ex. 1015 at [0004], [0006], and thus a POSA would be motivated to modify Islas's crossbow to implement the reverse-draw configuration of Darlington to increase the power stroke and resulting speed, with the results being as expected.

Darlington shows various embodiments in forward-draw and reverse-draw configurations, indicating the simplicity of making such a modification. Ex. 1013 at [0021] (compare Figs. 1 and 4), [0029] (compare Figs. 9 and 12), [0033] (compare Figs. 13 and 16), [0035] (compare Figs. 17 and 18).

251. Each of the Islas power cable journals 28a or 28b also receives a power cable 26. Ex. 1015 at [0006], [0013], Figs. 1, 4.

252. As the bow is drawn from the released configuration to the drawn configuration, the cables 26 wrap onto the rotating power cable journals 28a or 28b. *Id.* at [0013], Figs. 1-3, claim 2.

253. Thus, the missing limitation is that the power cable journals are helical (extending in a direction perpendicular to the draw string planes of rotation), and thus that the power cables are displaced along the respective axes away from the planes of rotation as the cables wrap onto the helical journals. However, Park discloses these related limitations and their benefits, as discussed above in §IX.H (not repeated here to avoid redundancy).

254. Similar to the previously discussed base references (Darlington and Kempf '871), Islas discloses the desirability of increasing a crossbow's potential power and speed. Ex. 1015 at [0004], [0006]. So in light of these desired characteristics, a POSA would have been motivated to apply helical power cable

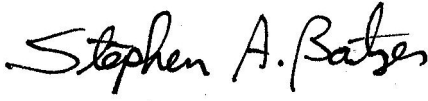
journals from Park to the Islas-Darlington crossbow to increase the bow's stored energy and speed by obtaining a longer power stroke through wrapping more cable length on the helical journals. And a POSA would have reasonably expected to achieve success from such combinations.

**M. Secondary Considerations**

255. I have seen no evidence of, and am not aware of any, secondary considerations (listed above in §IV.C) that would support the non-obviousness of claim 1 of the '015 Patent. However, should Ravin assert any such considerations, I reserve the right to respond.

I, Stephen Batzer, having been warned that willful false statements and the like are punishable by fine or imprisonment or both (18 U.S.C. § 1001), do hereby declare under penalty of perjury that all foregoing statements made of my own knowledge are true and that all foregoing statements made on information and belief are believed to be true.

Date: December 20, 2022

  
\_\_\_\_\_  
Stephen A. Batzer, Ph.D., P.E.