UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

FIRST SOLAR, INC.

Petitioner,

v.

ROVSHAN SADE,

Patent Owner.

Case IPR2023-00881, 00827
U.S. Patent Nos. 9,057,546 and 9,917,546

EXPERT DECLARATION OF EDWARD C. KERN, JR. IN SUPPORT OF PETITION FOR *INTER PARTES* REVIEW

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I. Introduction

1. I have been retained by First Solar, Inc. ("First Solar" or "Petitioner"), as an independent expert in this proceeding before the Patent Trial and Appeal Board ("PTAB" or "Board"). I understand that First Solar is requesting that the Board institute an *Inter Partes Review* ("IPR") proceeding of U.S. Patent No. 9,057,546 (the "'57546 Patent") (EX1001) and U.S. Patent No. 9,917,546 (the "'17546 Patent") (EX1002), currently assigned to Rovshan Sade ("Sade," "Patent Owner," or "PO").

2. I am not and have never been an employee of First Solar. I am being compensated at my usual and customary rate of $400 per hour. No part of my compensation depends on the outcome of this proceeding, and I have no other interest in this proceeding.

3. I have been asked to provide my independent analysis of the '57546 Patent and the '17546 Patent in light of the prior art publications cited below. I have also been asked to consider the state of the art and prior art available as of July 5, 2010. Based on the prior art discussed in this declaration, it is my opinion that Claims 5-6 of the '57546 Patent and Claim 1 of the '17546 Patent are unpatentable for the reasons provided below.

4. I am over 18 years of age and, if I am called upon to do so, I would be competent to testify as to the matters set forth herein. I understand that a copy of my

current curriculum vitae, which details my education and professional and academic experience, is being submitted by Petitioner attached to this declaration as **Appendix A**. The following provides an overview of some of my experience that is relevant to the matters set forth in this declaration.

5. All of my opinions stated in this declaration are based on my own personal knowledge and professional judgment. In forming my opinions, I have relied on my over 40 years of research, academic, industry, and consulting engineering experience in design, development, manufacturing and construction of solar energy conversion devices and systems, including support and mounting structures.

A. Qualifications

6. I have over four decades experience designing and building solar photovoltaic power systems. I am a director of Irradiance, Inc. a firm designing and manufacturing instruments for solar resource measurement. Routinely, I consult on renewable energy technology development, infrastructure, and utility power system integration through KRNLPWR LLC and consult and, occasionally, serve as an expert witness in areas pertaining to photovoltaic panel and array structural products and system design concepts.

7. I am a founder, past president and director of the Solar Energy Business Association of New England. From 2002 through 2004, I lectured in wind and solar

energy technology as part of MIT's subject 10.319j "Sustainable Energy". Previously, I was the Director of Engineering for Schott Applied Power Corporation until 2002 when I formed Irradiance, Inc. and focused my activities on technology consulting and instrumentation design and manufacturing. Since 2015, I have devoted pro bono efforts within my community of Lincoln, Massachusetts, and my alma mater Dartmouth College advocating for and providing design guidance toward their initial investments in solar power generation.

8. In addition, I have participated in solar power system research, development, and engineering projects across the United States and internationally since the mid-1970s. After leaving Schott, I worked with an electric utility in the Philippines and the International Finance Corporation to design and build the first megawatt-scale solar photovoltaic system to support clean electric power development in developing countries. I have worked with the United Nations Environment Program and electric utilities in Mexico, El Salvador, Costa Rica, Peru, India, Thailand, and the Philippines on planning megawatt-scale PV installations. I also worked with the Tata Power Company in Mumbai developing a megawatt-scale PV installation in collaboration with the U.S. Department of State's Asian-Pacific Partnership on Clean Development and Climate. Additionally, I have served as a consultant to the International Finance Corporation, World Bank Group, in the area of renewable energy and infrastructure.

9. I have been active in the field of solar energy resources assessment, solar power system design, and power system performance modeling throughout my renewable energy career which began in 1977. Irradiance manufactures a rotating shadowband radiometer (RSR), a field survey instrument for measuring and recording global, direct and diffuse solar irradiance that I invented in the early 1990s. Since 2005, over one thousand RSR instruments have been installed in the United States, Australia, Bahrain, Brazil, Canada, China, Chile, Costa Rica, Ethiopia, Ghana, Greece, India, Indonesia, Israel, Italy, Jordan, Libya, Mexico, Morocco, Pakistan, Peru, the Philippines, Qatar, Russia, Saudi Arabia, South Africa, Spain, Switzerland, Tunisia, Turkey, and Uruguay. Irradiance and the National Renewable Energy Laboratory's Solar Radiation Research Laboratory worked collaboratively for many years to characterize and improve rotating shadowband radiometers. A third generation of RSR instruments has been developed by Irradiance, Inc. under my son Chris Kern's leadership.

10. As founder and president of Ascension Technology (1987-1999) I oversaw the design and installation of over 200 grid-connected photovoltaic systems, in over 20 U.S. states from Hawaii to Massachusetts and internationally, totaling over two megawatts. These seminal grid-tie projects ranged in size from a 300-watt "AC-Module" to 100-kW systems installed within a wind farm in Tamil Nadu State, India and at the Pentagon in Washington, DC. The earliest of these

projects were co-funded by the EPA, EPRI (Electric Power Research Institute) and electric utilities across the United States to demonstrate the feasibility of grid-connected solar photovoltaic systems and to determine the air emission offsets derived from clean PV power displacing fossil fuel fired generation. In these and many subsequent projects, system performance-monitoring and solar energy resource measurement equipment was developed under my supervision and used in these projects.

11. Before founding Ascension Technology in 1987, I was a member of the Massachusetts Institute of Technology faculty and research staff. I joined the MIT Lincoln Laboratory Photovoltaic Field-Test and Applications Project in 1977 and was promoted to Assistant Group Leader in 1980. In 1979, I planned and then managed the U.S. Department of Energy's Residential Rooftop Photovoltaic Systems Project. From 1982 until 1987, I continued this photovoltaic systems development activity at the MIT Energy Laboratory.

12. Before entering the solar photovoltaic power field in 1977, my professional activities were in the field of hydrodynamics, particularly studying the dynamics of floating ocean structures for the control of oil spills. During the mid-1970s, I was an Assistant Professor at MIT's Department of Ocean Engineering.

13. A Senior Member of the IEEE, I served as a member of the IEEE Standards Coordinating Committee on Dispersed Storage and Generation. During

the early 1980s, this committee developed the IEEE Guide for Interfacing Dispersed Storage and Generation with Utility Systems. I have consulted to EPRI on photovoltaic applications, have served on the Science and Technology Review Committee for the National Renewable Energy Laboratory's Solar Radiation Resource Assessment Project and have served as a Peer Reviewer for the U.S. Department of Energy's Solar Program for Evaluation, Validation and Analysis.

14. I earned an A.B. in Engineering Sciences from Dartmouth College, a B.Eng. from Dartmouth's Thayer School of Engineering and a Ph.D. in the field of hydrodynamics from the Massachusetts Institute of Technology. I am a life member and Fellow of the American Solar Energy Society and an emeritus Senior Member of the IEEE.

15. Based on my experience and education, I believe that I am qualified to opine as to the knowledge and level of skill of one of ordinary skill in the art at the time of the alleged invention underlying the '57546 Patent and the '17546 Patent, as well as the state of the art at that time.

B. Materials Considered

16. In forming my opinions, I have reviewed the following documents:

Exhibit	Description
EX1001	U.S. Patent No. 9,057,546 to Sade ("the '57546 Patent")

Exhibit	Description
EX1002	U.S. Patent No. 9,917,546 to Sade ("the '17546 Patent")
EX1004	Content retrieved from the Wayback Machine in association with the Wayback URL: https://web.archive.org/web/20051202075211/http://www.wattsun.com/PDF/Wattsun_AZ-125_Instructions.pdf (Array Technologies, Inc. Wattsun Solar Trackers AZ-125 Installation Guide. "*Wattsun*")
EX1005	Content retrieved from the Wayback Machine in association with the Wayback URL: https://web.archive.org/web/20081016035440/http://www.raytracker.com/products/ (http://www.raytracker.com/products/ on or before October 16, 2008. "*RayTracker Webpage*")
EX1006	"It's time to get tracking…" Brochure, published on http://www.raytracker.com/products/ on or before October 16, 2008. "*RayTracker*"
EX1007	"RayTracker™ GC200 & GC100 Series Product Specifications," published on http://www.raytracker.com/products/ on or before October 16, 2008. "*RayTracker Specification*"
EX1009	Standard Wayback Affidavit in completed form authenticating various URLs including: https://web.archive.org/web/20100701155447/http:/www.wattsun.com:80/residential_trackers.html https://web.archive.org/web/20051201071458/http://www.wattsun.com:80/manuals.html https://web.archive.org/web/20051202075211/http://www.wattsun.com/PDF/Wattsun_AZ-125_Instructions.pdf ("*Wattsun*")

Exhibit	Description
EX1010	Standard Wayback Affidavit in completed form authenticating various URLs including: https://web.archive.org/web/20090605173603/http://www.raytracker.com/products https://web.archive.org/web/20090312062555/http://www.raytracker.com/products/ https://web.archive.org/web/20081016035440/http://www.raytracker.com/products/ ("*RayTracker Webpage*") https://web.archive.org/web/20100923030431/http://www.raytracker.com/documents/raytracker_brochure.pdf
EX1011	Prosecution History of the '57546 Patent (U.S. Application Serial No. 12/830,907)
EX1012	Prosecution History of the '17546 Patent (U.S. Application Serial No. 14/700,436)

II. Legal Standards

17. In forming my opinions and considering the subject matter of the '57546 Patent and the '17546 Patent and their claim in light of the prior art, I am relying on certain legal principles that counsel in this case explained to me. My understanding of these concepts is summarized below.

18. I understand that, in this proceeding, Petitioner has the burden of proving that the challenged claims of the '57546 Patent and the '17546 Patent are unpatentable by a preponderance of the evidence. I understand that "a preponderance of the evidence" means that a fact or conclusion is more likely true than not true.

19. I understand that earlier publications and patents may act to render a patent unpatentable for one of two reasons: (1) anticipation, and (2) obviousness.

A. Anticipation

20. It is my understanding that the claims of a patent are anticipated by a prior art reference if each and every element of the claim is found either explicitly or inherently in the reference. I understand that inherency requires a showing that an element of a claim not explicitly found in the reference is inherent in the reference when it is necessarily present in the anticipating reference, and that it would have been so recognized by a person of ordinary skill in the art ("POSITA").

21. I understand that when a challenged claim covers several structures, either generically or as alternatives, the claim is deemed anticipated if any of the structures within the scope of the claim is found in the prior art reference.

22. Although anticipation typically involves the analysis of a single prior art reference, I understand that additional references may be used to show that the prior art reference has enabling disclosure that enables a POSITA to make the invention without undue experimentation, explains the meaning of a term used in the prior art reference, and/or shows that an element is inherent in the prior art reference.

B. Obviousness

23. I understand that a claim is invalid as obvious if it would have been obvious to a POSITA at the time the alleged invention was made. This means that even if all the elements of the claim cannot be found in a single prior art reference that would anticipate the claim, a POSITA who was aware of the prior art would have been able to envision the claimed invention. This may be the case, for example, where the missing element represents only a trivial or insubstantial difference over the prior art or a reconfiguration of a known system. I understand that in an obviousness determination, the POSITA is presumed to have knowledge of all material prior art.

24. I understand that an obviousness analysis requires an understanding of the scope and content of the prior art, any differences between the alleged invention and the prior art, and the level of ordinary skill in evaluating the pertinent art.

25. I understand that when a product is available, design incentives and market forces can prompt variations of it, either in the same field of use or a different one. If a POSITA can implement a predictable variation, obviousness likely bars its patentability. For the same reason, if a technique has been used to improve one device and a POSITA would recognize that it would improve similar devices in the same way, using the technique would have been obvious.

26. I understand that whether a prior art reference renders a patent claim unpatentable as obvious is determined from the perspective of a POSITA at the time of the alleged invention. I have been told that there is no requirement that the prior art contain an express suggestion to combine known elements to achieve the claimed invention, but a suggestion to combine known elements to achieve the claimed invention may come from the prior art, as filtered through the knowledge of one skilled in the art. In addition, I have been told that the inferences and creative steps a POSITA would employ are relevant to the determination of obviousness.

27. For example, when determining if a patent claim is obvious, I understand that one may consider whether: (1) the alleged invention (and change to the prior art) was merely the predictable result of using prior art elements according to their known functions, or whether it was the result of true inventiveness; (2) there is some teaching or suggestion in the prior art to motivate the modification or combination of elements claimed in the patent; (3) the claimed innovation applies a known technique that had been used to improve a similar device or method in a similar way; (4) the alleged invention would have been obvious to try, meaning that the claimed innovation was one of a relatively small number of possible approaches to the problem with a reasonable expectation of success by those skilled in the art; (5) the alleged invention merely substituted one known element for another known element in order to obtain predictable results; (6) the alleged invention merely

applies a known technique to a known device, method, or product to yield predictable results; or (7) known work in one field of endeavor may have prompted variations of it for use in either the same field or a different one based on design incentives or other market forces that would have been predictable to a POSITA.

28. I further understand that certain factors may support or rebut the obviousness of a claim. I understand that such secondary considerations include, among other things, commercial success of the patented invention, skepticism of those having ordinary skill in the art at the time of the invention, unexpected results of the invention, any long-felt but unsolved need in the art that was satisfied by the alleged invention, the failure of others to make the alleged invention, praise of the alleged invention by those having ordinary skill in the art, and copying of the alleged invention by others in the field. I understand that there must be a nexus—that is, a connection—between any such secondary considerations and the alleged invention. I also understand that contemporaneous and independent invention by others is a secondary consideration tending to show obviousness.

29. I am not aware of any allegations by the named inventor, or any assignee, of the ’57546 Patent or the ’17546 Patent that any secondary considerations tend to rebut the obviousness of the ’57546 Patent or the ’17546 Patent.

30. Additionally, I understand that in considering obviousness, it is important not to use the benefit of hindsight derived from the patent under consideration.

C. Level of Ordinary Skill in the Art

31. When interpreting a patent, I understand that it is important to identify the relevant art pertaining to that patent, as well as the level of ordinary skill in that art at the time of the claimed invention. The "art" is the field of technology to which the patent is related.

32. I am informed and understand that the POSITA is a hypothetical person who is presumed to know the relevant prior art. I understand that the actual inventor's skill is not determinative of the level of ordinary skill. I further understand that factors that may be considered in determining level of skill include: (i) the types of problems encountered in the art; (ii) prior art solutions to those problems; (iii) the rapidity with which innovations are made; (iv) the sophistication of the technology; and (v) the educational level of active workers in the field. I understand that not all such factors may be present in every case, and one or more of them may predominate.

33. I understand that a POSITA is presumed to be aware of all pertinent art, thinks in concert with conventional wisdom in the art, and is a person of ordinary creativity. A POSITA would have had knowledge of solar energy conversion

systems, mounting structures, including components thereof, and related technologies as of July 5, 2010.

34. A person of ordinary skill in the art at the relevant time ("POSITA") would have had a bachelor's degree in mechanical engineering, or equivalent with 2-3 years of experience involving design, development, and manufacturing of support and mounting structures for solar trackers, with additional education substituting for experience and vice versa.

35. Based on my education and experience, I would have, at least, met the criteria for a POSITA in July 5, 2010, and I exceed it in 2023 at the time of this declaration.

D. Claim Construction

36. I understand that the United States Patent and Trademark Office interprets claim terms in an *Inter Partes Review* proceeding under the same claim construction standard that is used in a United States federal court. I understand that under this standard, the meaning of claim terms is considered from the viewpoint of a POSITA at the time of the alleged invention.

37. I have been informed that claim terms are generally given their ordinary and customary meaning as understood by one of ordinary skill in the art in light of the specification and the prosecution history pertaining to the patent. I understand,

however, that claims terms are generally not limited by the embodiments described in the specification.

38. I understand that in addition to the claims, specification, and prosecution history, other evidence may be considered to ascertain the meaning of claim terms, including textbooks, encyclopedias, articles, and dictionaries. I have been informed that this other evidence is often less significant and less reliable than the claims, specification, and prosecution history.

III. Summary of Grounds

39. I understand that Petitioner challenges the validity of Claims 5 and 6 of the '57546 Patent and Claim 1 of the '17546 Patent.

Ground	References	Basis	Claims
1A	*Wattsun*	§ 102	U.S. Patent No. 9,057,546: claims 5 and 6 are anticipated by *Wattsun* (EX1004)
1B	*Wattsun*	§ 102	U.S. Patent No. 9,917,546: claim 1 is anticipated by *Wattsun* (EX1004)
2A	*RayTracker*	§ 102	U.S. Patent No. 9,057,546: claims 5 and 6 are anticipated by *RayTracker* (EX1006)
2B	*RayTracker*	§ 102	U.S. Patent No. 9,917,546: claim 1 is anticipated by *RayTracker* (EX1006)
3A	*Wattsun* in view of *RayTracker*	§ 103	U.S. Patent No. 9,057,546: claims 5 and 6 are obvious based on *Wattsun* in view of *RayTracker*

Ground	References	Basis	Claims
3B	*Wattsun* in view of *RayTracker*	§ 103	U.S. Patent No. 9,917,546: claim 1 is obvious based on *Wattsun* in view of *RayTracker*

IV. The US 9,057,546 and 9,917,546 Patents

A. Relation of the Patents

40. The '17546 Patent is a continuation of the '57546 Patent, and the two patents share a common specification that is, in all material aspects, the same. Unless explicitly stated, citations to one of the specifications shall also apply to the other. For clarity convenience, the common specifications the '17546 Patent and the '57546 Patent are referred to herein as "the Sade Patent(s)" with corresponding citations to each patent, where applicable. So while I have provided citations below to the '57546 Patent, my opinions regarding the '17546 Patent are based upon the '17546 Patent having common specifications.

B. The Specification

41. The Sade Patents disclose "a free-standing solar tracker with a rotating panel assembly to track the movement of the sun during the day." EX1001, 1:6-8. The Sade Patents explains that "[i]n most [prior] installations, the solar panels are mounted in a fixed position to maximize the exposure when the sun is at its peak." EX1001, 1:19-21. As was well known in the art, the Sade Patents provide that "the

ability to track the movement of the sun significantly increases the output of the solar panel assembly, thus increasing the user's return on the investment in the solar system." EX1001, 1:53-56. In this regard, the Sade Patents are consistent with the prior art in describing the known benefits of solar tracking – solar panels that track the sun's position provide increased output. For example, the first large scale solar farm with tracking solar panels was built by ARCO Solar at Hesperia California in the early 1980s.



https://ui.adsabs.harvard.edu/abs/1984pvse.conf..314A/abstract

42. While unrelated to the challenged claims, the Sade Patents describe a primary feature of the systems therein to be "easily moved to a site with adequate exposure to the sun." EX1001, 1:50-51. For example, the Sade Patents describe a solar tracker that is "designed to be free-standing and requires no foundation." EX1001, 1:46-47. To achieve this, the Sade Patents describes the alleged inventive features as having a "base [that] forms a pan to contain a ballast material for holding the base in place." EX1001, 1:48-50.

43. It should be noted that such ballasted, ground mounted (non-tracking) PV systems were also deployed by my company at several highly visible locations in the 1990s. For example, they were deployed at the Pentagon and on the Ellipse near the White House Visitor center (powering the National Christmas Tree in Washington DC) and as the second grid-tied PV system installed in India, at a wind farm near Coimbatore, Tamil Nadu State.



Photo: Ballasted ground mounted solar panels at the White House Visitor Center, December 1997. Source: Edward Kern's personal image archives.



Photo: Ballast ground mounted solar panels at the 14th Street Bridge offramp to the Pentagon, Washington, DC May 1999. Source: Edward Kern's personal image archives.



Photo: Ground ballast mounted solar panels, Coimbatore, Tamil Nadu State, India May 1996. Source: Edward Kern's personal image archives.

44. However, in any event, the challenged claims do not require this alleged inventive feature.

45. For example, the Sade Patents describe a "solar tracker 10 generally comprises a base 20, support frame 40, panel assembly 60, and actuator assembly 90 for rotating the panel assembly 60 to follow the azimuth of the sun as it moves across the sky." EX1001, 2:23-26; Fig. 2; Fig. 4.

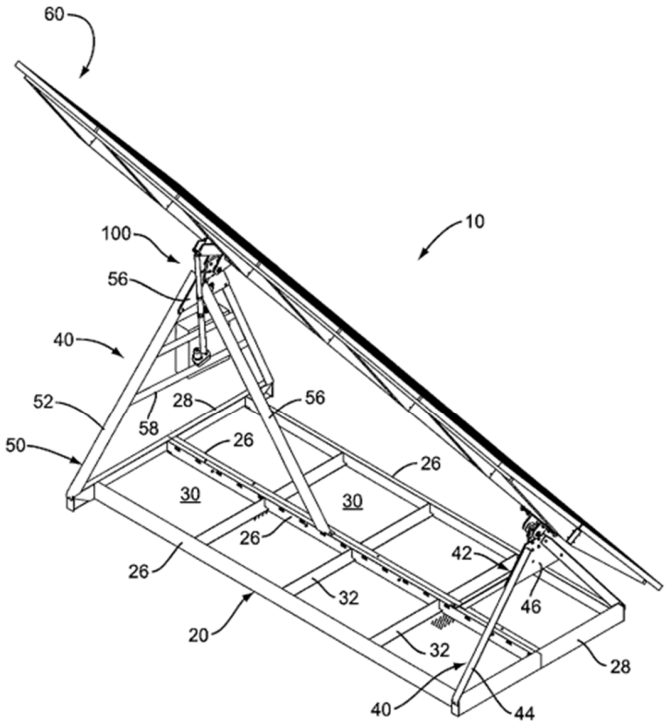

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FIG. 2

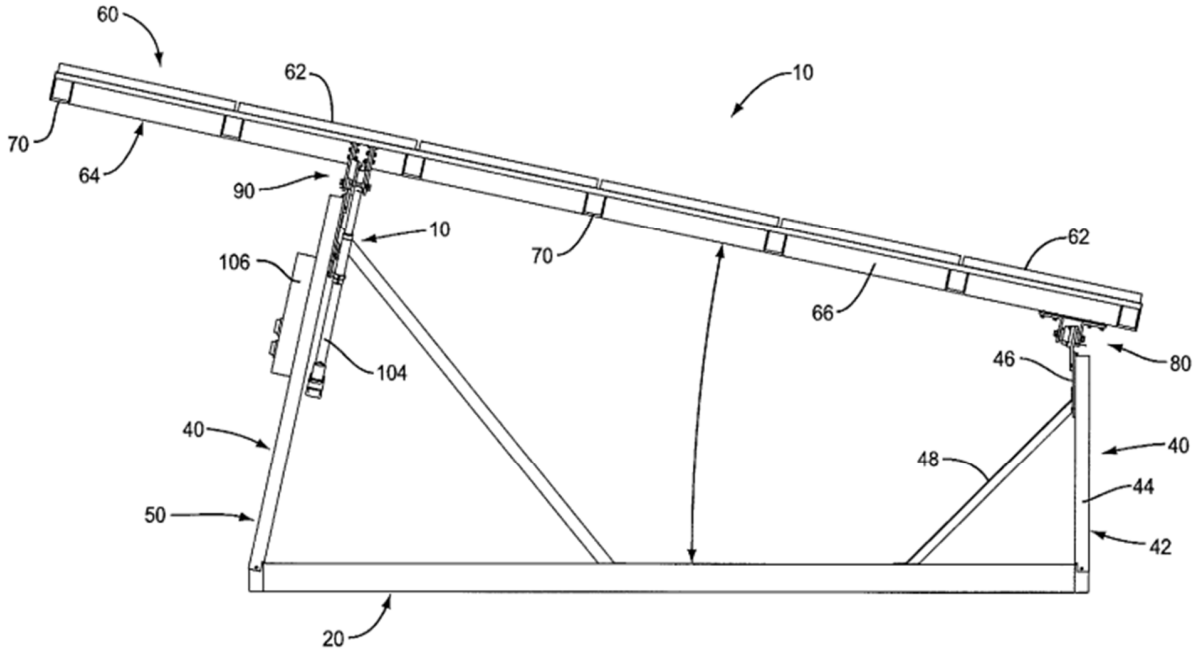

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FIG. 4

46. "The support frame 40 mounts to the base 20." EX1001, 2:57. "The support frame 40 comprises front frame 42 and a rear frame 52." EX1001, 2:57-58.

47. "The panel assembly 60 comprises a plurality of solar panels 62 and a panel support frame 64 to support the solar panels." EX1001, 3:24-26. "The panel support frame 64 comprises a central spine 66, a pair of laterally-spaced side members 68, and a plurality of longitudinally-spaced panel carriers 70, which can be removably connected by bolts and nuts, or other fasteners." EX1001, 3:26-29. "The spine 66 in the exemplary embodiment is made from a metal tube, while the side members 68 and panel carriers are made of a metal channel." EX1001, 3:33-35. "The panel carriers 70 taper from the inner end to the outer end." EX1001, 3:35-36.

48. "The panel assembly 60 is rotatably mounted to the support frame 40 so as to rotate about a single, inclined axis." EX1001, 3:45-46. The system includes "a first mounting assembly 80 for securing the lower end of the panel assembly 60 to the front support frame 42." EX1001, 3:47-48. "Mounting brackets 84 are bolted or welded to the spine 66 of the panel support frame 64." EX1001, 3:55-56.

49. "FIGS. 6 and 7 shows a second mounting assembly 90 for mounting the upper end of the panel support frame 64 to the rear support frame 50." EX1001, 3:62-64. "The second mounting assembly 90 comprises a connecting plate 92, a pair of mounting forks 94, a bearing 96, and a pivot member 98." EX1001, 3:64-66. "Connecting plate 92 is secured by bolts or other mechanical fasteners to the gusset

plate 56 of the rear support frame 50." EX1001, 3:66-4:1. "The mounting forks 94 include a slot 95 to receive the spine 66 of the panel support frame 64." EX1001, 4:1-3. "The mounting forks 94 may be permanently fixed to the spine 66 by welding." EX1001, 4:3-4.

50. "Actuator assembly 100, shown in FIG. 7, comprises a pivot arm 102, fluid cylinder 102, and control unit 106." EX1001, 4:18-19. "Pivot arm 102 is connected at one end to the spine 66 of the panel support frame 64." EX1001, 4:19-21. "Pivot arm 102 extends outward from the spine 66." EX1001, 4:21-22.

51. To determine a desired direction of the panels, "[t]he control unit 106 preferably includes a processor and associated memory for controlling the rotation of the panel assembly 60." EX1001, 4:28-30. "The control unit 106 may store ephemeras data in memory that gives the position of the sun in the sky at different times of the day." EX1001, 4:30-32. "Alternatively, the position of the sun in the sky at different times of day may be calculated based on formulas that model the sun's movement." EX1001, 4:33-35. "As the azimuth of the sun changes, the control unit 106 rotates the panel assembly 60 to minimize as much as possible the angle of incidence of the sun rays on the solar panels 62." EX1001, 4:35-38. "It is noted that the panel assembly 60 rotates about a single axis that follows the azimuth of the sun." EX1001, 4:38-39. "Those skilled in the art will appreciate that it is also

possible to change the angle of inclination of the solar panels to track changes in the altitude of the sun." EX1001, 4:39-42.

52. With regard to the asserted claims, the Sade Patents disclosed nothing more than an example implementation of systems, techniques, and approaches that were well known in the art and specifically disclosed by *RayTracker Collection* (i.e., and in each of *RayTracker*, *RayTracker Specification*, and *RayTracker Webpage*) and by *Wattsun*.

C. Prosecution History

53. I understand that the '17546 Patent is a continuation of the '57546 Patent. I also understand that the '57546 Patent claims a solar tracker assembly that, in all material aspects, is the same (*e.g.*, nearly identical) to the claimed support structure for solar tracker in the '17546 Patent.

1. Prosecution of '57546 Patent

54. The '57546 Patent states that US Patent Application Serial No. 12/380,907 (the application that led to the '57546 Patent) was filed on July 6, 2010. I understand that the application underwent several rounds of prosecution, with claim amendments and remarks in attempts to traverse the Examiner's prior art rejections.

55. I understand that the Notice of Allowance issued by the Patent Office includes a "Reasons for Allowance," providing the Examiner's view of the

patentable elements of the claims. Specifically, the Examiner stated the following Reasons of Allowance:

REASONS FOR ALLOWANCE

2. The following is an examiner's statement of reasons for allowance: The invention, Solar tracker, is in the field of solar tracking supports for a plurality of solar panels. Prior art in a similar field of endeavor belong to Strahm [8492645] and Bottger et al [6105316]. Strahm teaches a support 43 for a motor 38, which differs from the claimed invention in that the application has a mounting fork which is rotatable and has a slot for the support spine. For these reasons, the invention is unique and therefore allowable.

(EX1011, Notice of Allowance dated April 17, 2015)

56. The Examiner specifically references the "mounting fork which is rotatable and has a slot for the support spine" as being the unique features of the claimed invention. However, these deemed-patentable features (i.e., "mounting fork which is rotatable and has a slot for the support spine") do not appear to be included in any of the claims at-issue.

2. Prosecution of '17546 Patent

57. The '17546 Patent states that US Patent Application Serial No. 14/700,436 (the application that led to the '17546 Patent) was filed on April 30, 2015 and claimed priority as a continuation application to US Patent Application Serial No. 12/380,907 (the application that led to the '57546 Patent). I understand that the application underwent one full round of prosecution (with one non-final rejection

and one final rejection), with claim amendments and remarks in attempt to overcome rejections that the claims were unpatentable in view of prior art.

58. In this application, I understand that the Examiner did not provide any Reasons of Allowance in the Notice of Allowance.

V. Technology Background

A. Solar Tracking

59. As early as the 1970's, the use of solar trackers to capture more incident solar radiation, improve efficiency of some types of solar collectors, and increase power output throughout the day was well known and was used in early instances of solar thermal and solar photovoltaic system designs to enhance their performance. One of the earliest "trackers" I recall was a very low tech manual tracker, with a structure and scale similar to that of a common wheel barrow. It was designed by a colleague at MIT for farmers in India to use single solar panels for agricultural water pumping. The panel could be simply "wheeled" to a field and periodically repositioned to follow the sun during the daylight hours. It is also informative to recall that solar photovoltaic power was first used as the electric system of choice by NASA and the US Airforce in the 1960s to power earth orbiting satellites. NASA's Jet Propulsion Laboratory at CalTech, MIT's Lincoln Laboratory (where I first worked on solar power), and the NASA Lewis Research Labs were chosen by the Energy Research and Development Agency (ERDA), the predecessor of the US

Department of Energy, to develop the first "terrestrial" applications. These Labs operated earth base station tracking antennas to communicate with earth orbiting satellites. The point is that many early solar photovoltaic system innovators were not only aware of, but also experienced with the tracking structures.

60. A solar tracker is a device that orients a payload, here solar collectors, such as panels, toward the sun. For systems flat photovoltaic solar panels, solar trackers are used to reduce or minimize the angle of incidence between incoming direct beam sunlight and the photovoltaic panel. That is, the trackers can reduce or minimize the incidence angle between direct beam sunlight vector and the surface normal vector of the panels.

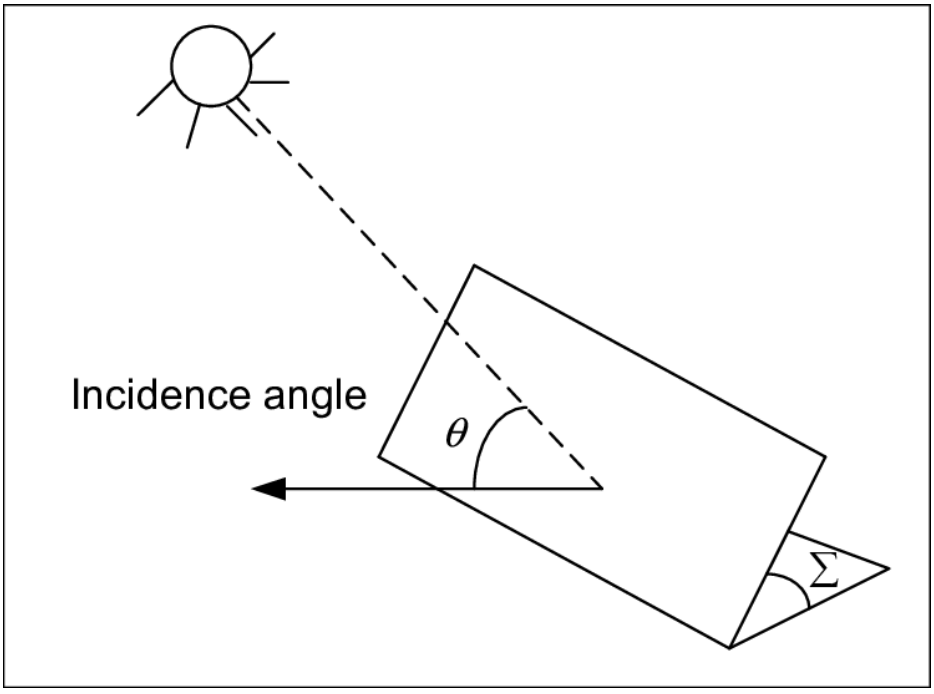


Image taken from: https://www.researchgate.net/figure/The-incidence-angle-th-between-a-normal-to-the-PV-module-face-and-the-incoming-solar-beam_fig3_252018864

61. Reducing (or minimizing, to the extent possible) this angle increases the amount of energy produced from a solar panel that has a fixed rated capacity. That is, reducing the angle of incidence can increase the captured sunlight, and for a fixed area panel, its area multiplied by its conversion efficiency determines its output.

62. The term single axis tracker refers to trackers that have only one degree of freedom that acts as an axis of rotation. The axis of rotation of single axis trackers is most often (and ideally) aligned with a meridian line (i.e., a north/south line of constant longitude on the Earth). This is often colloquially referred to by layman and industry professionals as being toward true North. There are several common types of single axis trackers, which can include horizontal single axis trackers (HSAT), horizontal single axis tracker with tilted modules (HTSAT), vertical single axis trackers (VSAT), tilted single axis trackers (TSAT) and polar aligned single axis trackers (PSAT). The orientation of the module with respect to the tracker axis is a tracker design option that affects the angle of incidence as the tracker rotates and is important when modeling performance. In most tracker designs, however, the axis of rotation is in the plane of the modules, or somewhat offset in a parallel plane.

63. In horizontal single axis trackers (HSAT), the axis of rotation for horizontal single axis tracker is approximately horizontal with respect to the ground. One or more posts along the axis of rotation of a horizontal single axis tracker can be used and shared between multiple tracker segments (spans) to lower the installation cost. Field layouts with horizontal single axis trackers are very flexible. The simple geometry and design means that keeping all the axes of rotation generally parallel to one another on a flat parcel of land serving as an array field is all that is required for appropriately positioning the trackers with respect to one another. Appropriate spacing can maximize the ratio of energy production to cost. For example, "cost" as used here can refer to both the equipment and the land; self-shading can be a problem and it's the issue of forgoing capturing low levels of early morning and late afternoon direct beam sunlight to bring the parallel axes closer together and use less land per tracker row.

64. Horizontal trackers typically have the face of the module or modules assembled into a panel oriented parallel to the axis of rotation. As a module or panel tracks, it sweeps a cylinder (*e.g.*, right circular cylinder) that is typically rotationally symmetric around the axis of rotation. In many single axis horizontal trackers, a horizontal torque tube (sometimes referred to as a "spline") is supported on bearings mounted upon pylons, posts, or other frames. The axis of the torque tube is ideally aligned with a meridian line. Panels are mounted to frames extending laterally from

and affixed to the torque tube, and the torque tube will rotate on its axis to track the apparent motion of the sun through the day.

65. There are many additional similar single axis solar trackers deployed back to the 1990s and earlier that employ multiple support frames (or columns, or pipe providing the same vertical support) with multiple panels (or collectors, not only flat panel photovoltaic, but also parabolic solar thermal concentrators) rotationally supported between the frames. The SEGS plants in the Mohave Desert was an early example. Solar Millennium developed similar technology and deployed in the US and Spain.



https://web.archive.org/web/20090205235753/http://www.nrel.gov/csp/troughnet/pdfs/2007/martin_andasol_pictures_storage.pdf

66. There are also examples of tilted single axis trackers with solar photovoltaic panels that have been tested at the U.S. Department of Energy's National Renewable Energy Laboratory in Golden Colorado in the 1990s. https://www.nrel.gov/docs/fy05osti/37024.pdf

67. Another similar system (and widely publicized, President Obama visited) was installed by SunPower Corp at the Nellis Air Force Base in Nevada in 2005.



https://www.wikiwand.com/en/Nellis_Solar_Power_Plant

VI. The Prior Art in the Applied Invalidity Grounds

A. Wattsun

68. Non-patent literature document *Wattsun* published on the Internet by third party entity, Array Technologies, Inc. of Alburquerque, NM describes certain features, functionality, and technical details of another solar tracker, the AZ-125

Dual-Axis, Azimuth Drive Solar Tracker. I understand that *Wattsun* was published in 2005 and constitutes prior art under at least pre-AIA 35 U.S.C. § 102(b) or 35 U.S.C. § 102(a)(1). I understand that *Wattsun's* prior art public accessibility is evidenced at least by its reference on a webpage verified by the Internet Archive as being publically available at as early as December 2, 2005.

69. *Wattsun* is an assembly, installation, and set up guide for the AZ-125 solar tracker. *Wattsun* includes technical specifications and assembly instructions for the construction of base support frames for solar trackers, rotatable mounting assemblies to move a panel assembly supporting one or more solar panels. *Wattsun* further describes a panel assembly having a central spine (torque tube) and panel carriers (frames extending from torque tubes) to support the solar panels, as well as an actuator assembly to rotate the torque tube and panel carriers. *Wattsun* also includes substantially the same fundamental structure and characteristics as the systems depicted in the '57546 Patent and the '17546 Patent and in the *RayTracker Collection*.

70. As I detail below, it is my opinion that the thorough technical designs and specifications detailed in *Wattsun* disclose every element and limitation (and thus anticipate) claims 5 and 6 of the '57546 Patent and claim 1 of the '17546 Patent.

71. And it is my opinion that *Wattsun* is analogous art to the '57546 Patent and the '17546 Patent. The technical designs, approaches, and solutions to construct,

use, and improve solar panel tracking systems are in the same technical field of endeavor. And the designs and solutions in *Wattsun* are applicable and pertinent to the particular problems dealt with by the inventor of the '57546 Patent and the '17546 Patent —increasing solar panel yield. And while *Wattsun* may describe a solar tracker that can be implemented as a two-axis tracker and the claims of the '57546 Patent and the '17546 Patent do not necessarily require a two-axis tracker (though they do not explicitly exclude a two-axis tracker), the cited portions of *Wattsun* provided herein adequately describe one axis of a tracker that sufficiently satisfy the claims of the '57546 Patent and the '17546 Patent. However, to the extent that it is argued or construed that the claims of the '57546 Patent and the '17546 Patent are limited to a single-axis tracker, such a structure could be achieved by "locking" one of the axes of *Wattsun* and operating the tracker as a single-axis tracker.

72. I understand that *Wattsun* was neither cited nor considered during prosecution of the '57546 Patent or the '17546 Patent, so I understand that there is no enhanced burden to show that *Wattsun* invalidates the claims of the '57546 Patent or the '17546 Patent.

B. RayTracker Collection

73. A collection of additional non-patent literature documents published on the Internet by a third-party entity, RayTracker, Inc., also describe certain features,

functionality, and technical details of the RayTracker GC single axis solar tracker system. (collectively "*RayTracker Collection*") (EX1005-EX1007). *RayTracker Collection* was available from a single source substantially before the respective critical dates of the '57546 Patent (EX1001) and the '17546 Patent (EX1002).

74. Each document in the collection adequately describes the RayTracker GC system to a POSITA. Nevertheless, I understand and believe that the *RayTracker Collection* constitutes a single website with multiple webpages describing the RayTracker GC single axis solar tracker system. That is, the *RayTracker Collection* describes a single product from a single source, the raytracker.com/products website, and I understand that, due to its availability, constitutes a printed publication. I believe that, skilled artisans interested in the RayTracker GC system (or other solar trackers) would have read or have been interested in reading the *RayTracker Collection* pages in their entirety, all collected at a single location, to obtain an understanding of a single coherent system – the RayTracker GC system. And as discussed below, the various webpages of *RayTracker Collection* describe inherent aspects of a single product, the RayTracker GC system.

75. I understand that the *RayTracker Collection,* and each of the specific documents forming the *RayTracker Collection* are prior art under 35 U.S.C. § 102(b) publication. It is my opinion that the *RayTracker Collection* (and each of the specific

documents forming the *RayTracker Collection*) are analogous art to the '57546 Patent and the '17546 Patent. The technical designs, approaches, and solutions to construct, use, and improve solar panel tracking systems are in the same technical field of endeavor. And the designs and solutions in documents forming the *RayTracker Collection* are applicable and pertinent to the particular problems dealt with by the inventor of the '57546 Patent and the '17546 Patent —improving solar panel yield.

76. I understand that the *RayTracker Collection* was neither cited nor considered during prosecution of the '57546 Patent or the '17546 Patent, though one of the constituent documents of the *RayTracker Collection*, *RayTracker*, was cited in the prosecution of the '17546 Patent.

77. Specifically, *RayTracker Collection* includes at least the following documents available as a collection.

1. RayTracker

78. I understand that the "It's time to get tracking…" brochure (EX1006, "*RayTracker*") was published in 2008 and constitutes prior art under at least under pre-AIA 35 U.S.C. § 102(b) or 35 U.S.C. § 102(a)(1). I understand that *RayTracker*'s prior art public accessibility is evidenced at least by (1) its reference on a webpage verified by the Internet Archive as being publicly available at as early as October 16, 2008; (2) testimony by persons with personal experience and

knowledge of *RayTracker*; and (3) identification of *RayTracker* as prior art by the Applicant in the prosecution of the '17546 Patent. In general, *RayTracker* discloses a solar tracker mounting and articulation system that at least discloses every element and limitation (and thus anticipates) or certainly renders obvious claims 5 and 6 of the '57546 Patent and claim 1 of the '17546 Patent.

79. As was well known in the art, *RayTracker* discusses predictable benefits of sun trackers. For example, when considering solar systems that, while having a fixed tilt orientation toward the sun, did not track the sun's position in the sky (which is colloquially, albeit incorrectly/inaccurately, described in the '17546 Patent and '57546 Patent as the sun's movement in the sky), *RayTracker* recognized that certain modifications or technical features would improve energy production. For example, *RayTracker* suggested that "[w]hile fixed tilt increases energy production, there is more energy available to capture if the modules track the sun throughout the day." EX1006, p. 3. As suggested by *RayTracker*, such "single axis" solar trackers described therein "[give] a 38% increase in energy production over non-tilted PV panels, and a 25% increase over flat panels tilted to 30°." *Id*. *RayTracker* describes the benefits and value of a system having an axis around which all moving parts (including the PV panel) rotate, namely cost savings and simplicity of design, installation, and maintenance. "Single-axis trackers, like the RayTracker GC, provide a significant energy boost while being low cost and simple." *Id*., p. 3;

"RayTracker GC is simple and elegant, with just two moving parts – the actuator and one structural assembly that rotates on a bearing surface." *Id.*, p. 4.

80. In addition to its teachings regarding the state of the art and technical benefits of simple sun tracker systems, *RayTracker* describes technical designs and details that anticipate claims 5 and 6 of the '57546 Patent and claim 1 of the '17546 Patent.

81. It is my opinion that *RayTracker* is analogous art to the '57546 Patent and the '17546 Patent. The technical designs, approaches, and solutions to construct, use, and improve solar panel tracking systems are in the same technical field of endeavor. And the designs and solutions in *RayTracker* are applicable and pertinent to the particular problems dealt with by the inventor of the '57546 Patent and the '17546 Patent—improving solar panel yield.

82. I understand that *RayTracker* was neither cited nor considered during prosecution of the '57546 Patent. A later version of *RayTracker* was cited during prosecution of the '17546 Patent.

2. RayTracker Specification

83. I understand that the "RayTracker™ GC200 & GC100 Series Product Specifications" (EX1007, "*RayTracker Specification*") was published in 2008 and constitutes prior art under at least under pre-AIA 35 U.S.C. § 102(b) or 35 U.S.C. § 102(a)(1). I understand that *RayTracker Specification*'s prior art public accessibility

is evidenced at least by testimony by persons with personal experience and knowledge of the *RayTracker Specification*. In general, the *RayTracker Specification* discloses a solar tracker mounting and articulation system that at least discloses every element and limitation (and thus anticipates) – or certainly renders obvious – claims 5 and 6 of the '57546 Patent and claim 1 of the '17546 Patent.

84. Specifically, *RayTracker Specification* details an example configuration and implementation of the RayTracker GC described in *RayTracker*. For example, *RayTracker Specification* provides specific details for two example systems: GC200, which is described as being a "Full size single-axis tracker;" and GC100, which is described as being a "Half-size single-axis tracker." The *RayTracker Specification* also includes substantially the same fundamental structure and characteristics as the systems depicted in *RayTracker*.

85. The thorough technical designs and specifications in the *RayTracker Specification* provide additional technical specificity and disclose every element and limitation of claims 5 and 6 of the '57546 Patent and claim 1 of the '17546 Patent.

86. Further, it is my opinion that the *RayTracker Specification* is analogous art to the '57546 Patent and the '17546 Patent. The technical designs, approaches, and solutions to construct, use, and improve —solar panel tracking systems are in the same technical field of endeavor. And the designs and solutions in the *RayTracker Specification* are applicable and pertinent to the particular problem dealt

with by the inventor of the ’57546 Patent and the ’17546 Patent —improving solar panel yield.

87. I also understand that the *RayTracker Specification* was neither cited nor considered during prosecution of the ’57546 Patent or the ’17546 Patent.

3. RayTracker Website

88. I understand that the “First Solar RayTracker GC Product Overview” website (EX1005, “*RayTracker Webpage*”) was published in 2008 and constitutes prior art under at least under pre-AIA 35 U.S.C. § 102(b) or 35 U.S.C. § 102(a)(1). I also understand that *RayTracker Webpage*’s prior art public accessibility is evidenced at least by testimony by persons with personal experience and knowledge of the *RayTracker Webpage*. *RayTracker Webpage* generally discloses a solar tracker mounting and articulation system, namely the *RayTracker GC* system that is described in more detail in *RayTracker* and *RayTracker Specification*, that at least discloses every element and limitation (and thus anticipates) – or certainly renders obvious – claims 5 and 6 of the ’57546 Patent and claim 1 of the ’17546 Patent.

89. *RayTracker Webpage* describes and reiterates predictable benefits of sun trackers, namely, “single-axis tracker system that significantly increases the lifetime energy yield of a photovoltaic system, improving the return on investment for commercial-scale, ground- or carport-mount installations.” EX1005, p. 1. As *RayTracker Webpage* recognized and acknowledged, such “single-axis trackers”

described therein "outperform fixed-tilt installations most importantly during peak energy demand periods." EX1005, p. 1. For example, *RayTracker Webpage* suggests that "[e]nergy boosts of up to 38% are possible compared to flat-mounted panels." EX1005, p. 1. "RayTracker GC achieves this with a ***simple***, low-profile, ***low-parts-count mechanism***." EX1005, p. 1.

90. In addition to teachings regarding the state of the art and technical benefits of sun tracker systems, *RayTracker Webpage* describes technical designs and details that at least disclose every element and limitation (and thus anticipate) – or certainly renders obvious –the challenged claims of the '57546 Patent and the '17546 Patent.

91. And it is my opinion that the *RayTracker Webpage* is analogous art to the '57546 Patent and the '17546 Patent. The technical designs, approaches, and solutions to construct, use, and improve —solar panel tracking systems are in the same technical field of endeavor. And the designs and solutions in the *RayTracker Website* are applicable and pertinent to the particular problem dealt with by the inventor of the '57546 Patent and the '17546 Patent — improving solar panel yield.

92. Further, I understand that the *RayTracker Website* was neither cited nor considered during prosecution of the '57546 Patent or the '17546 Patent.

VII. Claim Construction / Interpretation

93. I do not believe that any claim term requires explicit construction to resolve the issues presented in this Petition. I apply the plain and ordinary meaning to each claim term, as that plain and ordinary meaning would have been understood by a POSITA.

94. I reserve the right to offer opinions on any claim constructions proposed in this proceeding or to offer opinions on additional constructions in the district court.

VIII. Detailed Explanation of the Unpatentability Ground

A. Ground 1A: Claims 5 and 6 of the ′57546 Patent Were Anticipated by *Wattsun*

Summary

95. The challenged claims of the ’57546 Patent recite a solar tracker having four primary elements: (1) a support frame; (2) a panel assembly, rotatably mounted to the support frame, having a central spine (torque tube); (3) a mounting assembly for mounting the panel assembly to the support frame; and (4) an actuator for rotating the panel assembly. Dependent claim 6 further recites solar panels mounted to the panel assembly. As discussed in the ’57546 Patent, the solar tracker is configured so that the panel assembly can rotate to follow the sun’s position throughout the day.

96. In my opinion, *Wattsun* describes a solar tracker that has features that read directly on claims 5 and 6 of the ’57546 Patent and includes structural members

and components that are essentially indistinguishable from those in claims 5 and 6 of the '57546 Patent.

1. Independent Claim 5 of the '57546 Patent

a. 5[p] "A solar tracker comprising:"

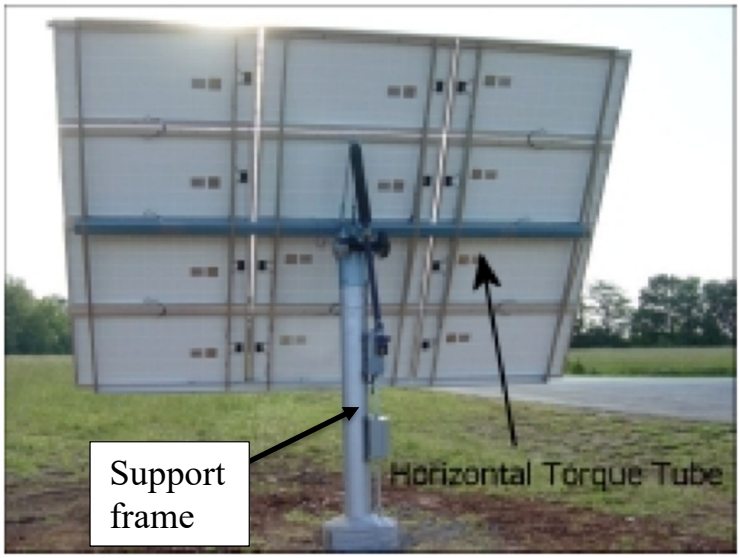
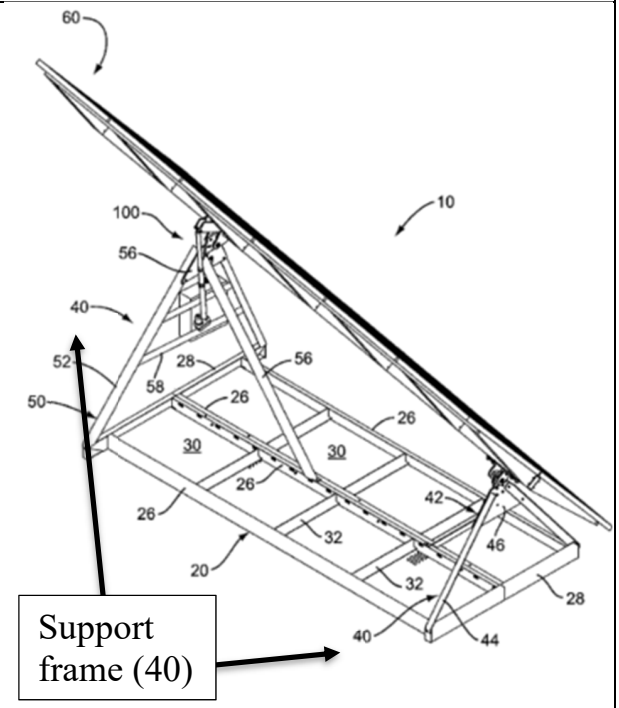
97. I understand that sometimes patent claim preambles are not limiting and sometimes they are. Here, to the extent that the preamble is limiting, it is my opinion that *Wattsun* discloses a device that is described therein as the "AZ-125 Dual-Axis, Azimuth Drive Solar Tracker." EX1004, p. 1.

b. 5[a] "a support frame;"

98. The '57546 Patent describes that "the support frame 40 mounts to the base 20" (shown below). EX1001, 2:57-58. "A panel assembly 60 is rotatably mounted to the support frame 40." EX1001, 3:45-46.

99. In my opinion, *Wattsun* discloses "a support frame," as claimed. For example, *Wattsun* discloses a steel support frame that includes a support post that supports the other components (*e.g.*, solar panels and mounting components) of the solar tracker. Specifically, *Wattsun* states and describes that "[t]he Wattsun™ Tracker requires a length of Eight-Inch ID Schedule 40 Steel Pipe for use as the pipe mast. Specifications for the pipe mast can be found on the data sheet for this particular tracker." EX1004, p. 1.

100. Further, below is an annotated figure from *Wattsun* showing the support frame, which is formed of a support post, as compared with the embodiment depicted in the '57546 Patent. Therefore, in my opinion, *Wattsun* teaches and anticipates this element of the claim.

Wattsun	**U.S. Patent No. 9,057,546**
 EX1004, p. 9	 EX1001, Fig. 2 (support frame 40 (EX1001, 2:57-58))

c. 5[b] "a panel assembly rotatably mounted to the support frame for supporting one or more solar panels, said panel assembly comprising a central spine and a plurality of panel carriers extending outwardly from said spine;"

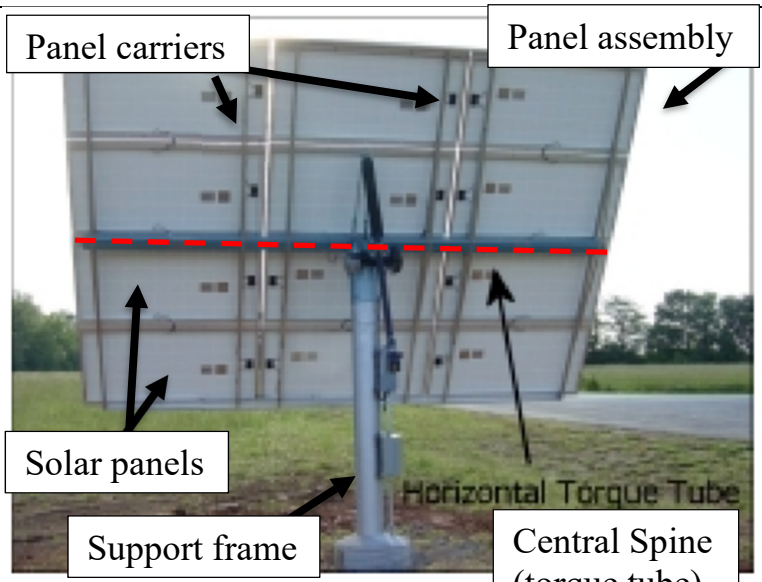
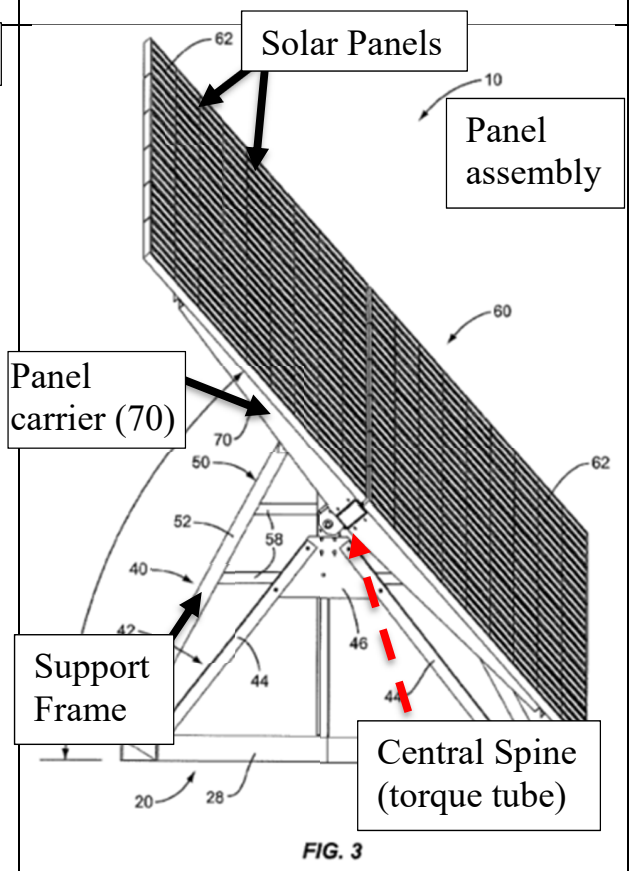
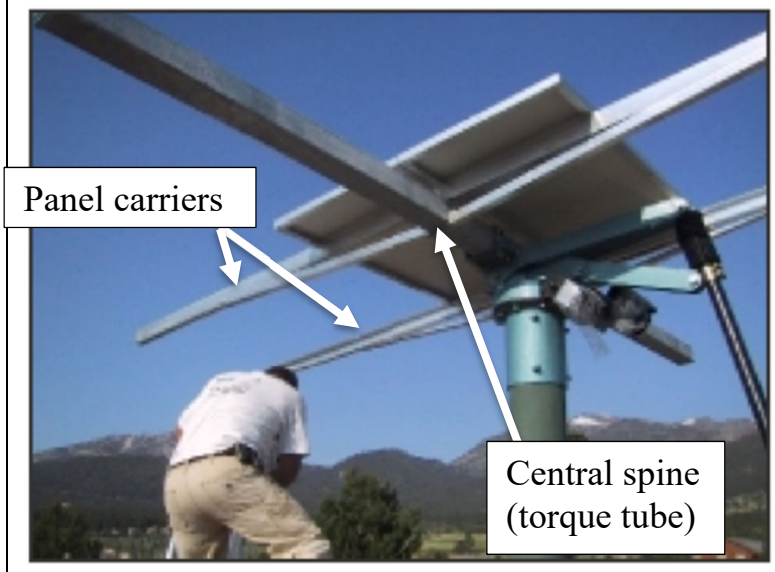
101. The '57546 Patent describes that "a panel assembly 60 includes a plurality of solar panels 62 and a panel support frame 64 to support the solar panels." EX1001, 3:24-26. "The panel support frame 64 comprises a central spine 66, a pair of laterally-spaced side members 68, and a plurality of longitudinally-spaced panel carriers 70, which can be removably connected by bolts and nuts, or other fasteners." EX1001, 3:26-29.

102. In my opinion, *Wattsun* discloses "a panel assembly rotatably mounted to the support frame for supporting one or more solar panels, said panel assembly comprising a central spine and a plurality of panel carriers extending outwardly from said spine," as claimed. For example, *Wattsun* discloses solar panels (a set of solar panels) that move and rotate as a unit to track the sun's position. Specifically, *Wattsun* discloses, "Wattsun™ Solar Trackers utilize a patented, closed loop, optical sensing system to sense the sun's position and track it." EX1004, p. 19.

103. In addition, *Wattsun* discloses a plurality of panel carriers (*e.g.*, elongated members) that extend outwardly from a central spine (*e.g.*, a torque tube beam) that extends along the center of the panel assembly for supporting solar panels. EX1004, pp. 8, 9, 15, 16. For example, *Wattsun* describes a support frame,

on which panels (photovoltaic solar panels) are rotatably mounted via a panel assembly. The panel assembly includes a torque tube (which *Wattsun* describes as a "Horizontal Torque Tube") that extends along the center of the panel assembly. EX1004, pp. 8, 9, 15, 16. *Wattsun* discloses transversely arranged elongated members to which the photovoltaic members are mounted. EX1004, pp. 8, 9, 15, 16.

104. Below is an annotated figure from *Wattsun* depicting the panel assembly with panel carriers, as compared with the panel assembly embodiment depicted in the '57546 Patent. As illustrated, *Wattsun's* panel carriers are clearly illustrated as extending outwardly from the torque tube. Therefore, in my opinion, *Wattsun* teaches and anticipates this element of the claim.

Wattsun	**U.S. Patent No. 9,057,546**
 EX1004, p. 9	 EX1001, Fig. 3 (support frame 40 (EX1001, 2:57-58); panel assembly 60, solar panels 62 (EX1001, 3:24-26); central spine 66, panel carriers 70 (EX1001, 3:26-29))
 One installer, one piece at a time approach. Modules are being used to "square-up: the frame. EX1004, p. 16	

d. 5[c] "a mounting assembly for rotatably mounting the panel assembly to the support frame, the mounting assembly comprising a mounting member rotatably connected to the support frame and a slot in said mounting member configured to receive the spine of the panel assembly; and"

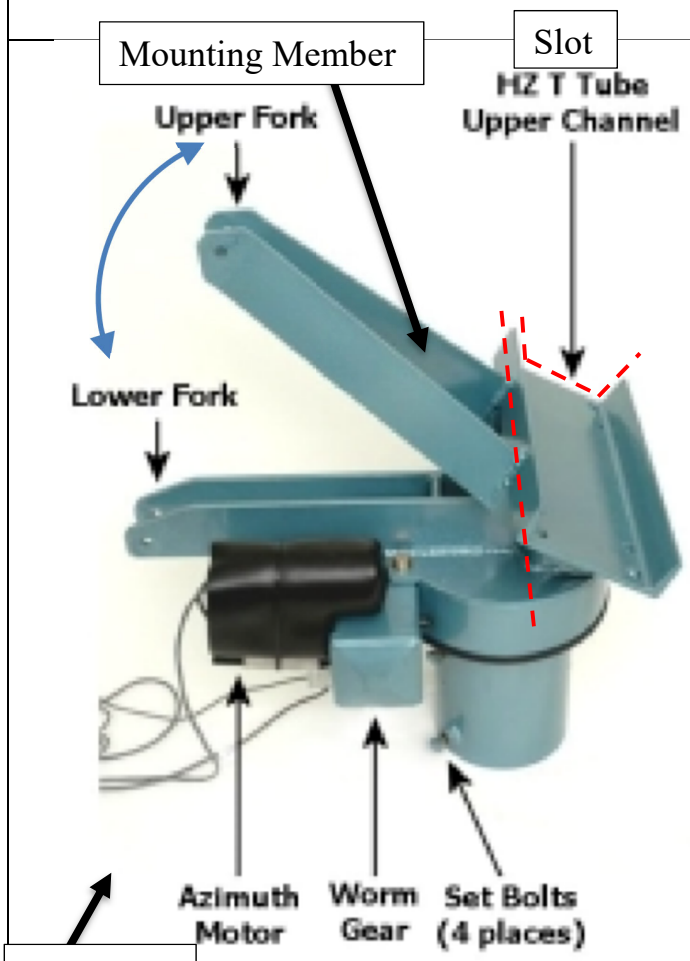
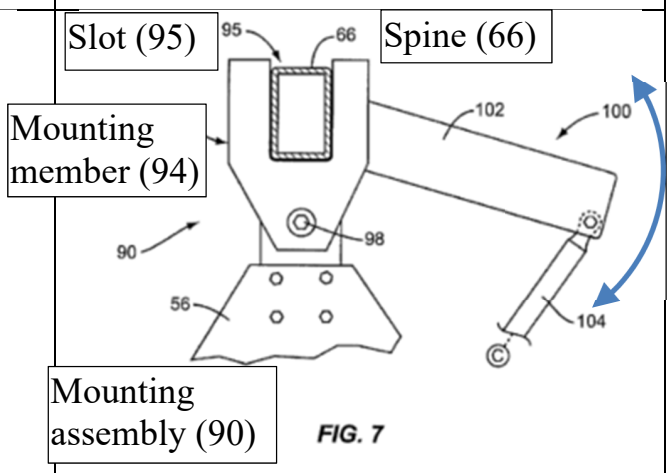
105. The '57546 Patent describes a "second mounting assembly 90 comprises a connecting plate 92, a pair of mounting forks 94, a bearing 96, and a pivot member 98." EX1001, 3:64-66. "The mounting forks 94 include a slot 95 to receive the spine 66." EX1001, 4:1-3. The "[p]ivot member 98 extends through the mounting forks 94, upper end of connecting plate 92, and bearing 96, and is secured in place by a nut threaded onto the end of the pivot member 98." EX1001, 4:5-8. "Pivot member 88 on the first mounting assembly 80 and pivot member 98 on the second mounting assembly 90 are co-axially aligned along the axis and rotation of the panel assembly 60." EX1001, 4:9-12. The '57546 Patent describes that "the rotational axis is aligned when deployed so that the plane of the rotational axis aligns with the sun at the highest altitude. Thus, the panel assembly 60 can rotate to track the path of the sun as the sun travels across the sky during the day." EX1001, 4:13-17. The specification of the '57546 Patent does not recite "mounting member." To the extent the term "mounting member" is supported by the specification of the '57546 Patent, a POSITA would interpret the claimed mounting member to be the mounting fork 94.

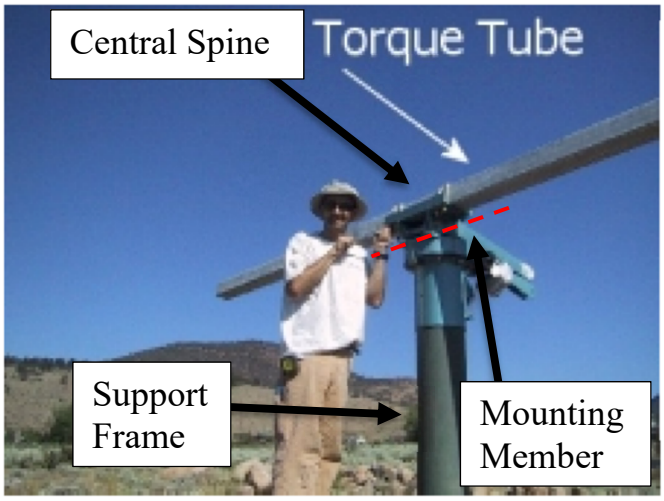
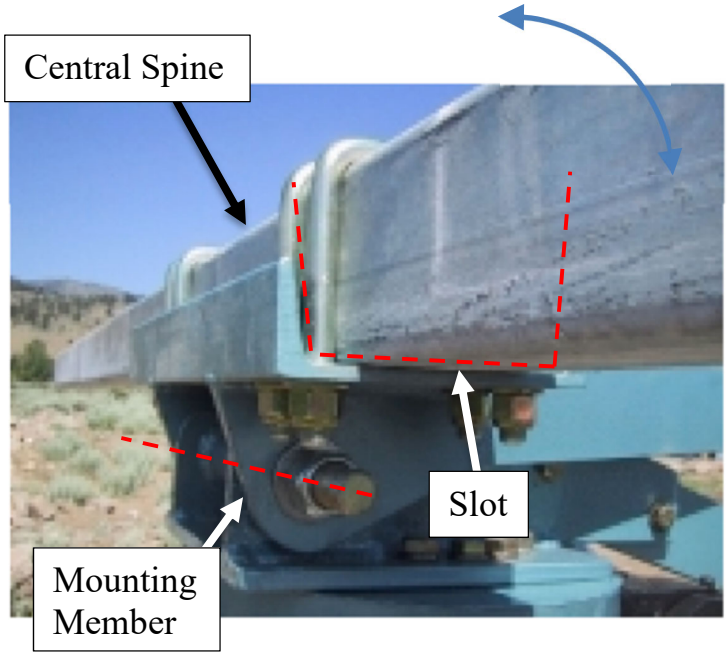
106. In my opinion, *Wattsun* discloses "a mounting assembly for rotatably mounting the panel assembly to the support frame, the mounting assembly comprising a mounting member rotatably connected to the support frame and a slot in said mounting member configured to receive the spine of the panel assembly." That is, *Wattsun* describes a mounting assembly for rotatably mounting the panel assembly to the support frame. And the mounting assembly includes a mounting member.

107. For example, *Wattsun* discloses a horizontal torque tube drive that rotatably mounts on top of the support frame (*e.g.*, the support post) for rotating the panel assembly with respect to the support frame. EX1004, pp. 6, 8, 9, 12, 16. The horizontal torque tube drive includes an upper fork component (a rotatably mounted upper fork) that defines a torque tube upper channel. EX1004, pp. 6, 8, 9, 12, 16. The axis of rotation is denoted in a dashed line below. The upper fork, together with the HZ T Tube Upper Channel attached thereto, is a mounting member and receives the torque tube. Specifically, the upper channel includes or forms a slot (annotated below) in dashed lines and the torque tube spine of the panel assembly can be placed in the slot in the mounting member. EX1004, pp. 6, 8, 9, 12, 16.

108. Below is an annotated figure from *Wattsun* illustrating the mounting assembly, as compared with the mounting assembly embodiment depicted in the

'57546 Patent. Therefore, in my opinion, *Wattsun* teaches and anticipates this element of the claim.

Wattsun	**U.S. Patent No. 9,057,546**
 EX1004, p. 8	 EX1001, Fig. 7 (mounting assembly 90, mounting member 94 (EX1001, 3:64-66); slot 95, spine 66 (EX1001, 4:1-3))

Wattsun	**U.S. Patent No. 9,057,546**
 EX1004, p. 9  EX1004, p. 12	

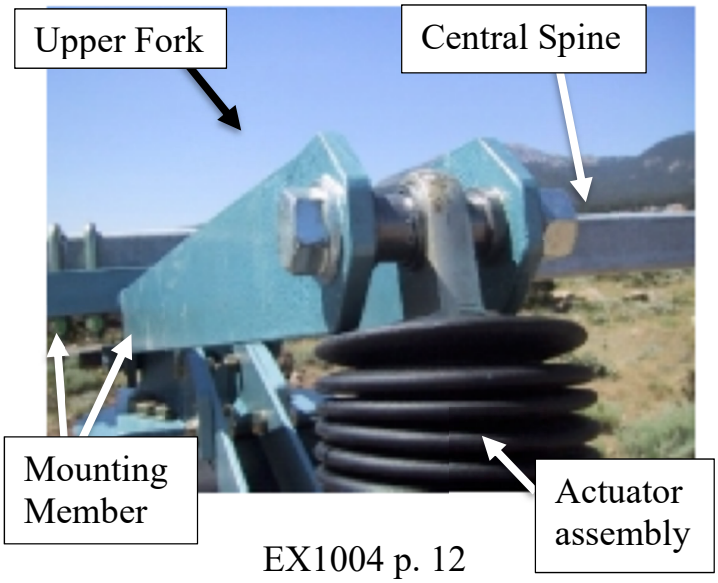
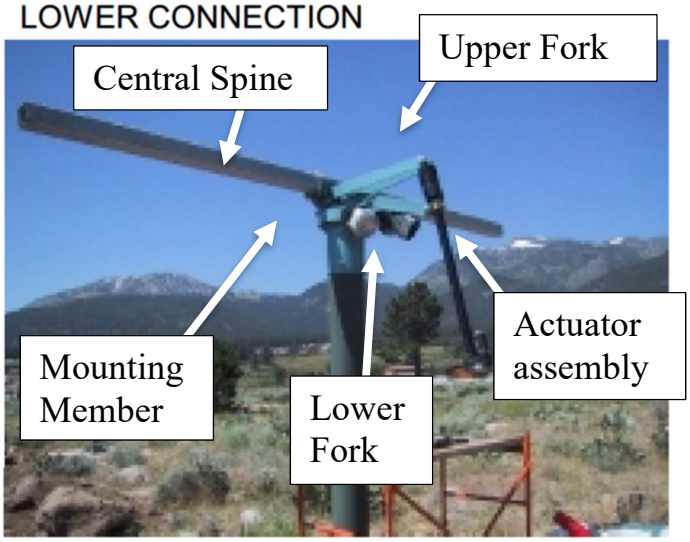
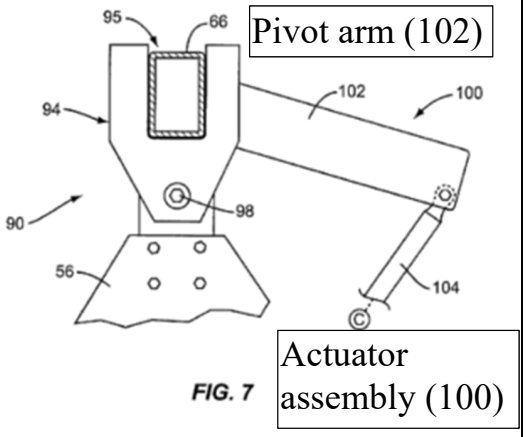
e. 5[d] "an actuator assembly for rotating the panel assembly to track the movement of the sun."

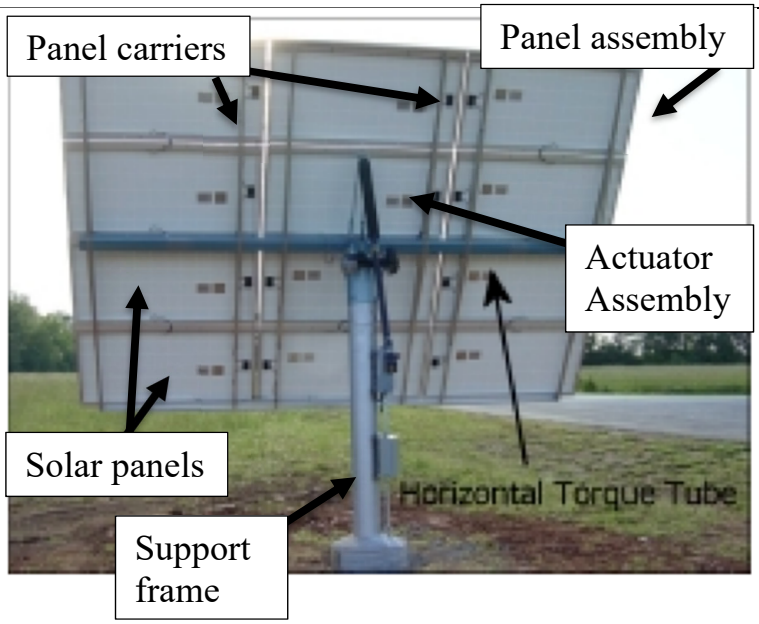
109. The '57546 Patent describes an "[a]ctuator assembly 100 that, as shown in FIG.7, comprises a pivot arm 102, fluid cylinder 104, and control unit 106." EX1001, 4:18-19. The "[p]ivot arm 102 is connected at one end to the spine 66 and extends outward from the spine 66…" EX1001, 4:19-22. The "[f]luid cylinder 104 is connected at one end to the pivot arm 102." EX1001, 4:22-23. The "[c]ontrol unit 106 is mounted to the front frame and controls operation of the fluid cylinder 104." EX1001, 4:23-25.

110. In my opinion, *Wattsun* discloses "an actuator assembly for rotating the panel assembly to track the movement of the sun." For example, *Wattsun* describes an actuator assembly (*e.g.*, an actuator system) to rotate the panel assembly. For example, *Wattsun* discloses an actuator (*e.g.*, an electromechanical actuator) for rotating the panel assembly to track the movement (position) of the sun. Specifically, *Wattsun* discloses that the solar tracker includes an "actuator assembly for dual-axis operation." EX1004, p. 12. *Wattsun* discloses that this actuation is to track the sun's position. Specifically, *Wattsun* discloses "Wattsun™ Solar Trackers utilize a patented, closed loop, optical sensing system to sense the sun's position and track it." EX1004, p. 19.

111. For example, *Wattsun* describes attaching an actuator assembly (*e.g.*, the elevation actuator) to the forks (i.e., the upper fork and lower fork) to move the forks. Specifically, *Wattsun* discloses to an installer to "[c]enter both the eyelet end (the top) of the elevation actuator inside the forks and the elevation actuator clamp eyelet (the bottom)." EX1004, p. 12. *Wattsun* also includes a series of images and assembly instructions to teach how the actuator assembly is attached to the mounting assembly for rotating the panel assembly before the panel assembly is attached to the torque tube spine. EX1004, pp. 8-9, 12-13.

112. Below is an annotated figure from *Wattsun* illustrating the actuator assembly, as compared with the actuator assembly embodiment depicted in the '57546 Patent. Therefore, in my opinion, *Wattsun* teaches and anticipates this element of the claim.

Wattsun	**U.S. Patent No. 9,057,546**
UPPER CONNECTION  EX1004 p. 12 LOWER CONNECTION  EX1004, p. 12	 FIG. 7 EX1001, Fig. 7 (actuator assembly 100, fluid cylinder 104, pivot arm 102 (EX1001, 4:18-19))

Wattsun	**U.S. Patent No. 9,057,546**
 EX1004, p. 9	

2. Dependent Claim 6

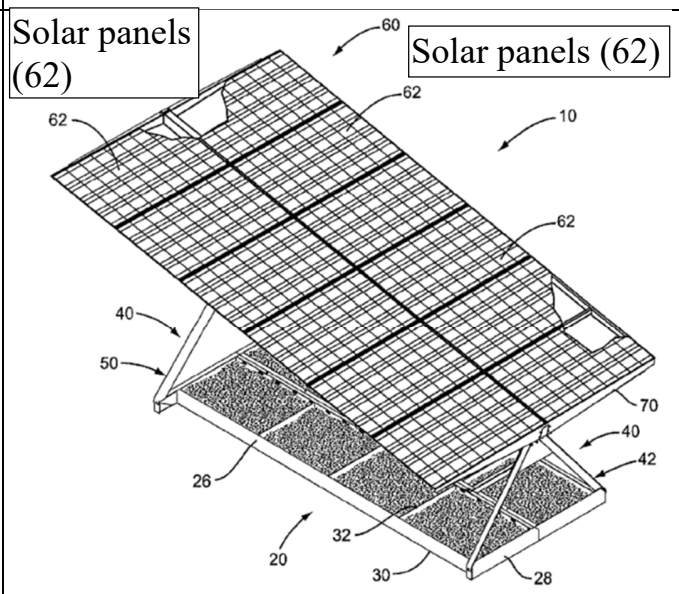
113. Dependent claim 6 recites: "The solar tracker of claim 5 wherein the panel assembly further comprises one or more solar panels mounted to the panel carriers." EX1001, claim 6.

114. The '57546 Patent describes that the "panel assembly 60 comprises a plurality of solar panels 62 and a panel support frame 64 to support the solar panels." EX1001, 3:24-26.

115. It is my opinion that *Wattsun* disclosed a solar tracker wherein the panel assembly further comprises one or more solar panels mounted to the panel carriers and anticipated this additional claim feature. *Wattsun* is full of references to, and

disclosures of, solar panels, often referred to forming a photovoltaic (PV) array. *See e.g.*, EX1004, p. 1 ("[t]he tracker comes complete with all the hardware necessary for assembly and mounting the PV modules."); EX1004, p. 5 ("[c]hoose an optimum solar location to install the PV array for in the ground mounting."); EX1004, p. 14 ("[t]he PV modules may be mounted to the struts at this time - prior to installation onto the torque tube assembly."); EX1004, p. 17 ("[t]he azimuth tracker works by rotating the PV array about the pipe mast then tilting the array to the proper elevation angle."); and EX1004, p. 23 ("[t]he sensor mounts on the TOP CENTER (or near the center) of the PV array"). Further, *Wattsun* illustrates the system as including solar panels. For example, the panel assembly comprises one or more solar panels mounted to panel carriers.

116. Below is an annotated figure from *Wattsun* illustrating the solar panels, as compared with the solar panels depicted in the '57546 Patent. Therefore, in my opinion, *Wattsun* teaches and anticipates this element of the claim.

Wattsun	**U.S. Patent No. 9,057,546**
 EX1004, p. 9	 FIG. 1 EX1001, Fig. 2 (solar panel 62 (EX1001, 3:42-43))

B. Ground 1B: Claim 1 of the ′17546 Patent Was Anticipated by *Wattsun*

Summary

117. The challenged claims of the ’17546 Patent recite a support structure for a solar tracker having six primary elements: (1) a support frame; (2) a panel assembly, rotatably mounted to the support frame; (3) a central spine rotatably mounted to the support frame; (4) a plurality of panel carriers fixed relative to the central spine and extending outwardly from both sides of said central spine for supporting said solar panels; (5) an actuator assembly for rotating the panel assembly

to track the movement of the sun; (6) a mounting assembly for rotatably mounting the panel assembly to the support frame, said mounting assembly comprising: (6a) a mounting member configured to be rotatably connected to said support frame; and (6b) an open-ended slot in said mounting member configured to receive the central spine of the panel assembly.

118. *Wattsun* describes a solar tracker that has features that read directly on claim 1 of the ’17546 Patent and includes structural members and components that are essentially indistinguishable from those in claim 1 of the ’17546 Patent.

1. Independent Claim 1 of the ’17546 Patent

a. 1[p] “A support structure for solar tracker comprising:”

119. I understand that sometimes patent claim preambles are not limiting and sometimes they are. Here, to the extent that the preamble is limiting, it is my opinion that *Wattsun* discloses that the device being described therein as the “AZ-125 Dual-Axis, Azimuth Drive Solar Tracker.” EX1004, p. 1.

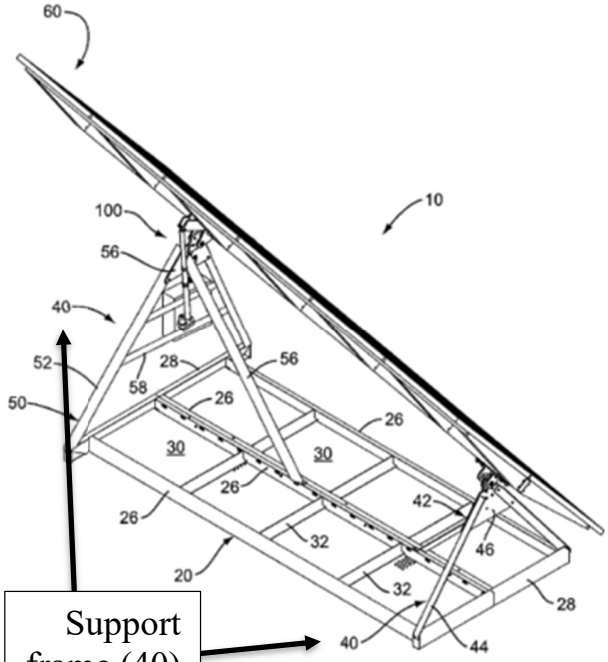
b. 1[a] “a support frame;”

120. The ’17546 Patent describes that “the support frame 40 mounts to the base 20” (shown below). EX1002, 2:66. “The panel assembly 60 is rotatably mounted to the support frame 40.” EX1002, 3:56-57.

121. In my opinion, *Wattsun* discloses “a support frame,” as claimed. For example, *Wattsun* discloses a steel support frame formed of a support post that

supports the other components (*e.g.*, solar panels and mounting components) of the solar tracker. Specifically, *Wattsun* states and describes that "[t]he Wattsun™ Tracker requires a length of Eight-Inch ID Schedule 40 Steel Pipe for use as the pipe mast. Specifications for the pipe mast can be found on the data sheet for this particular tracker." EX1004, p. 1.

122. Further, below is an annotated figure from *Wattsun* showing the support frame, which is formed of a support post, as compared with the embodiment depicted in the '57546 Patent. Therefore, in my opinion, *Wattsun* teaches and anticipates this element of the claim.

Wattsun	**U.S. Patent No. 9,917,546**
 EX1004, p. 9	 EX1002, Fig. 2 (support frame 40 (EX1002, 2:66))

c. 1[b] "a panel assembly rotatably mounted to said support frame and configured to support one or more solar panels, said panel assembly including:"

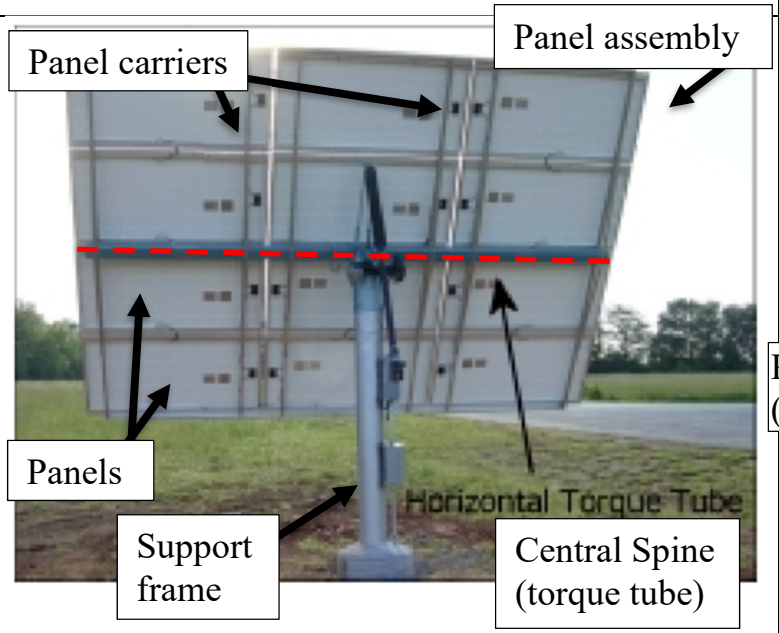
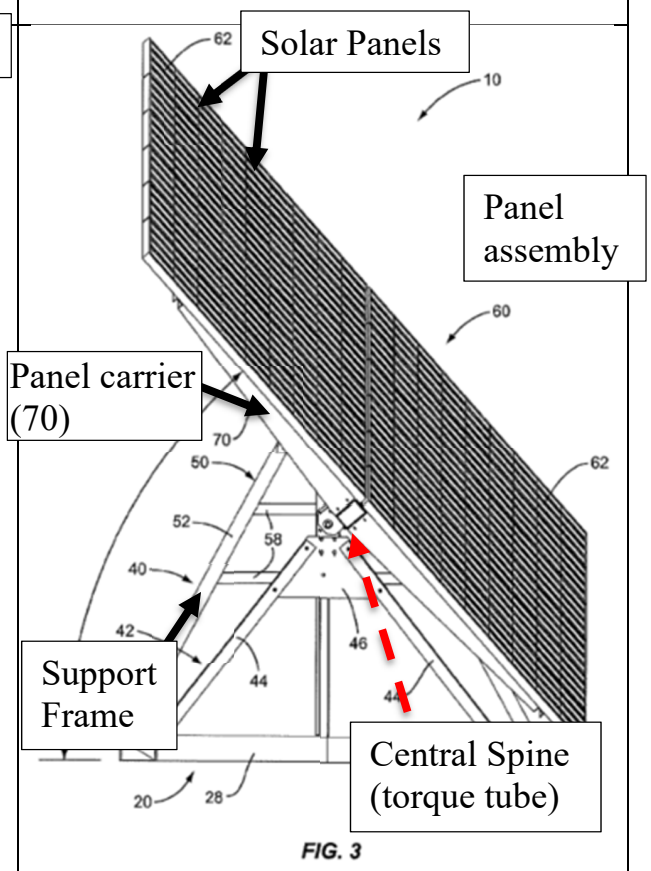
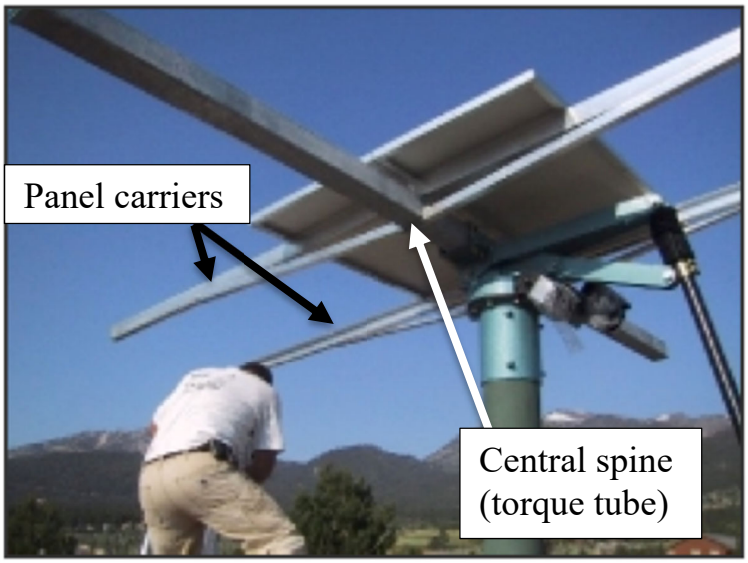
123. The '17546 Patent describes that a "[p]anel assembly 60 comprises a plurality of solar panels 62 and a panel support frame 64 to support the solar panels." EX1002, 3:34-36. "The panel support frame 64 comprises a central spine 66, a pair of laterally-spaced side members 68, and a plurality of longitudinally-spaced panel

carriers 70, which can be removably connected by bolts and nuts, or other fasteners. "EX1002, 3:36-40.

124. In my opinion, *Wattsun* discloses "a panel assembly rotatably mounted to said support frame and configured to support one or more solar panels," as claimed. For example, *Wattsun* discloses solar panels (a set of solar panels) that move and rotate as a unit on a panel assembly to track the sun's position. Specifically, *Wattsun* discloses, "Wattsun™ Solar Trackers utilize a patented, closed loop, optical sensing system to sense the sun's position and track it." EX1004, p. 19.

125. In addition, *Wattsun* discloses a panel assembly having a plurality of panel carriers (*e.g.*, elongated members) that extend outwardly from a central spine (*e.g.*, a torque tube beam) that extends along the center of the panel assembly for supporting solar panels. EX1004, pp. 8, 9, 15, 16. For example, *Wattsun* describes a support frame, on which panels (photovoltaic solar panels) are rotatably mounted via a panel assembly. EX1004, pp. 8, 9, 15, 16.

126. Below is an annotated figure from *Wattsun* illustrating the panel assembly with panel carriers, as compared with the panel assembly embodiment depicted in the '17546 Patent. As depicted below, *Wattsun's* panel carriers are clearly illustrated as extending outwardly from the torque tube. Therefore, in my opinion, *Wattsun* teaches and anticipates this element of the claim.

Wattsun	**U.S. Patent No. 9,917,546**
 EX1004, p. 9	 *FIG. 3* EX1002, Fig. 3 (support frame 40 (EX1002, 2:66); panel assembly 60, solar panels 62 (EX1002, 3:34-36); central spine 66, panel carriers 70 (EX1002, 3:36-38))
 One installer, one piece at a time approach. Modules are being used to "square-up: the frame. EX1004, p. 16	

d. 1[c] "a central spine rotatably mounted to the support frame; and"

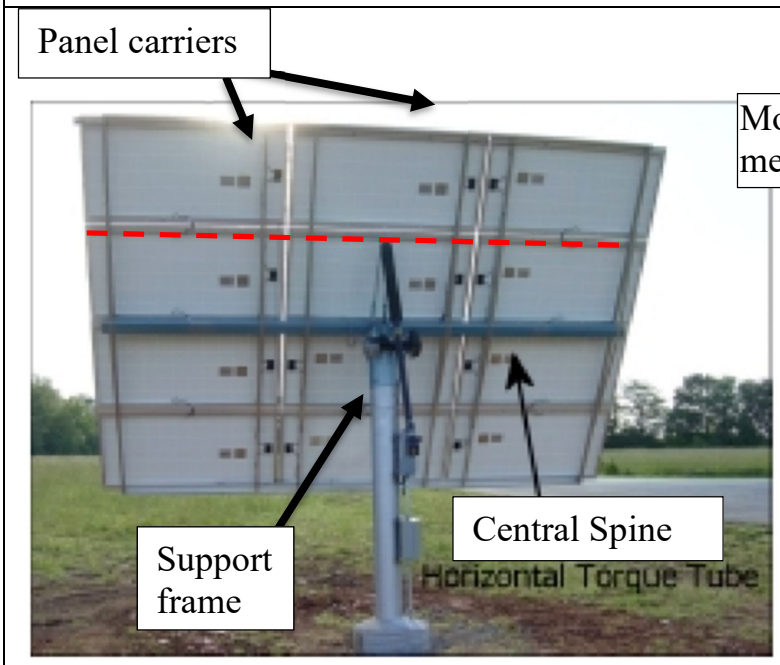
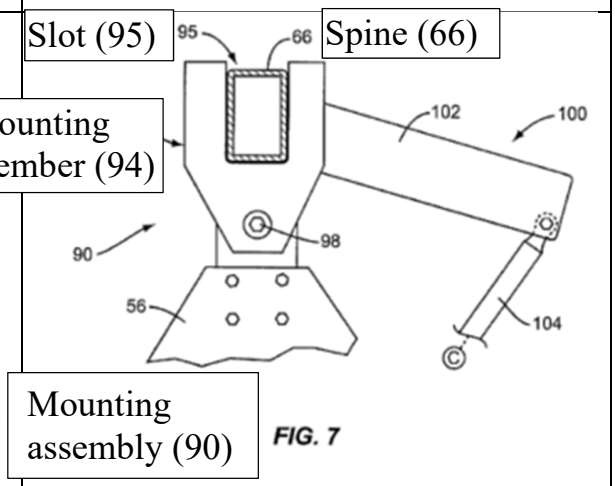
127. The '17546 Patent describes that "[t]he panel support frame 64 comprises a central spine 66, a pair of laterally-spaced side members 68, and a plurality of longitudinally-spaced panel carriers 70, which can be removably connected by bolts and nuts, or other fasteners." EX1002, 3:36-40. The '17546 Patent describes that a "second mounting assembly 90 includes a connecting plate 92, a pair of mounting forks 94, a bearing 96, and a pivot member 98." EX1002, 4:6-11. "The mounting forks 94 include a slot 95 to receive the spine 66." EX1002, 4:12-14.

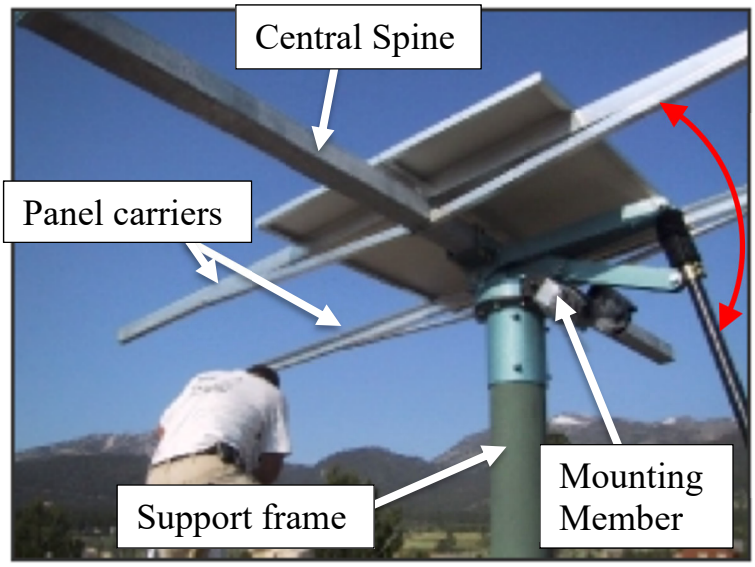
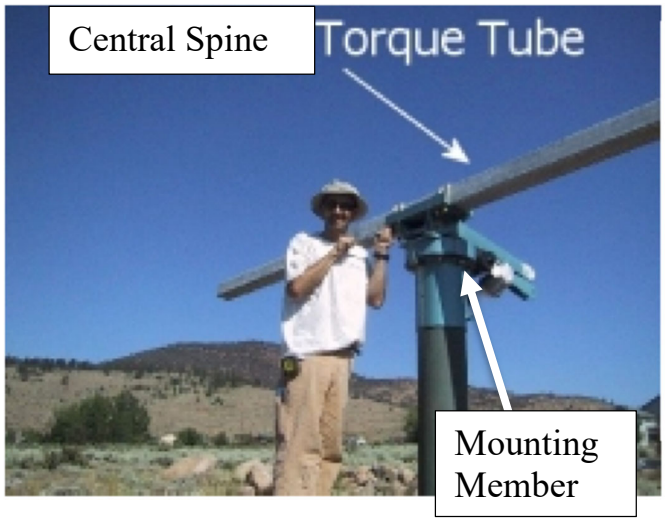
128. In my opinion, *Wattsun* discloses "a central spine rotatably mounted to the support frame," as claimed. For example, *Wattsun* discloses a plurality of panel carriers extending outwardly from a central spine (*e.g.*, a torque tube beam) that extends along the center of the panel assembly for supporting solar panels. For example, *Wattsun* discloses a support frame, on which photovoltaic panels are rotatably mounted, that includes a torque tube that extends along the center of the panel assembly. EX1004, pp. 8, 9, 15, 16.

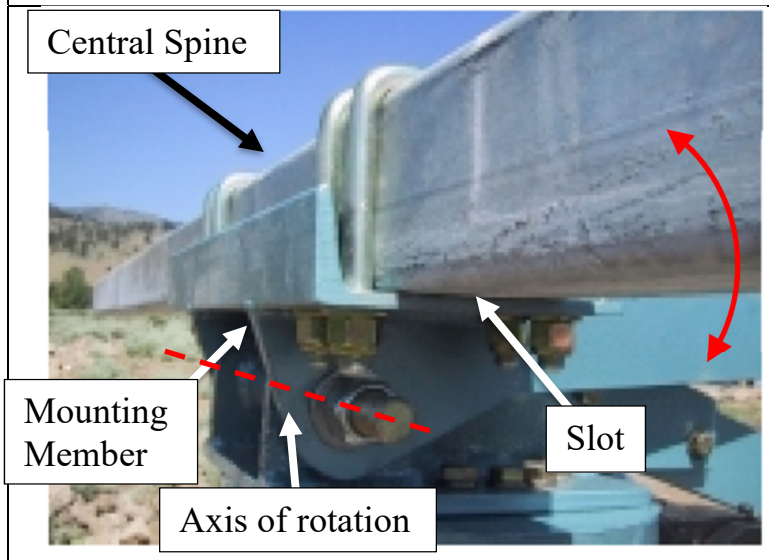
129. Further, *Wattsun* discloses a mounting assembly for rotatably mounting the panel assembly (and thus the central spine) to the support frame. EX1004, pp. 8, 9, 15, 16. For example, *Wattsun* discloses a horizontal torque tube drive that

rotatably mounts on top of the support post for rotatably mounting the panel assembly to the support post. EX1004, pp. 8, 9, 15, 16.

130. Below is an annotated figure from *Wattsun* illustrating the central spine, as compared with the central spine embodiment depicted in the '17546 Patent. Therefore, in my opinion, *Wattsun* teaches and anticipates this element of the claim.

Wattsun	**U.S. Patent No. 9,917,546**
 EX1004, p. 9	 EX1002, Fig. 7 (support frame 40 (EX1002, 2:66); mounting assembly 90, mounting member 94 (EX1002, 4:6-10); slot 95, spine 66 (EX1002, 4:12-15))

Wattsun	**U.S. Patent No. 9,917,546**
 One installer, one piece at a time approach. Modules are being used to "square-up: the frame. EX1004, p. 16  EX1004, p. 9	

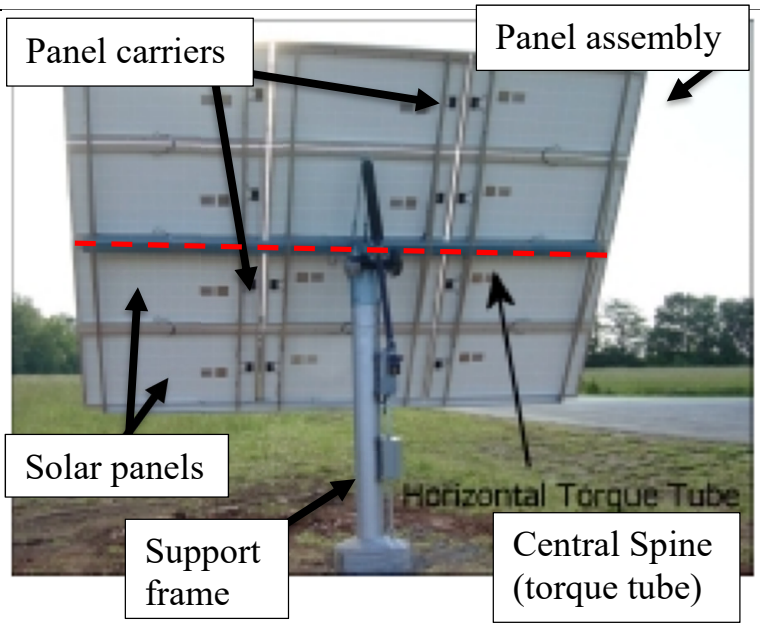
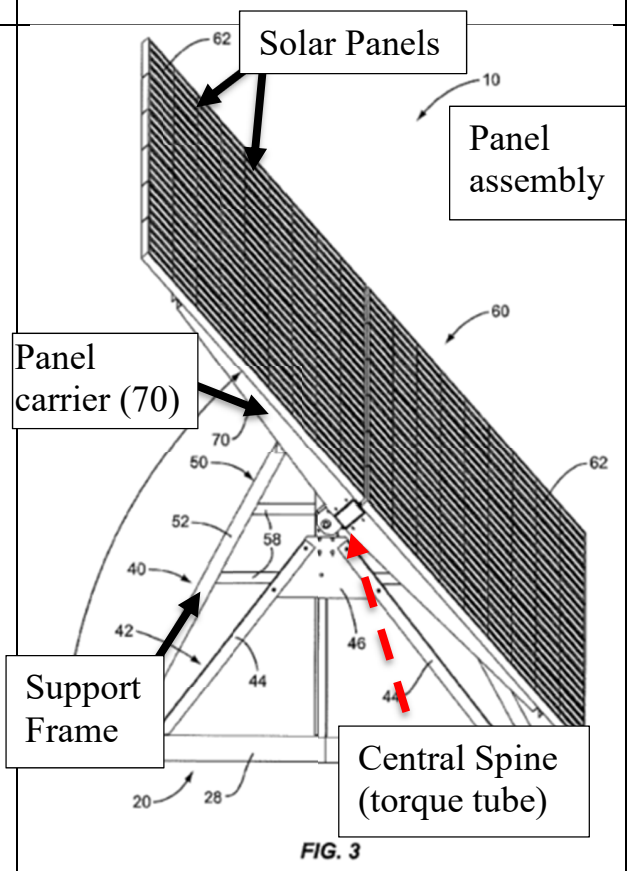
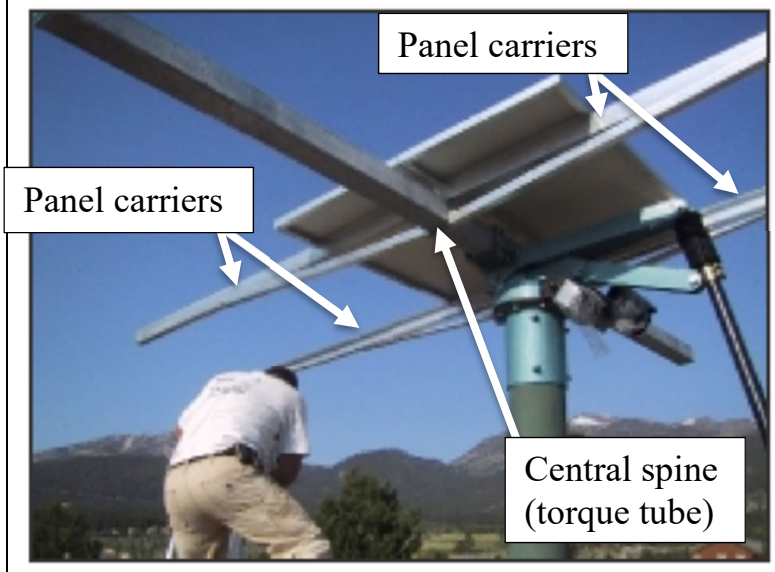
Wattsun	**U.S. Patent No. 9,917,546**
 EX1004, p. 12	

e. 1[d] "a plurality of panel carriers fixed relative to the central spine and extending outwardly from both sides of said central spine for supporting said solar panels;"

131. The '17546 Patent describes that a "[p]anel assembly 60 comprises a plurality of solar panels 62 and a panel support frame 64 to support the solar panels." EX1002, 3:34-36. "The panel support frame 64 comprises a central spine 66, a pair of laterally-spaced side members 68, and a plurality of longitudinally-spaced panel carriers 70, which can be removably connected by bolts and nuts, or other fasteners." EX1002, 3:36-40.

132. In my opinion, *Wattsun* discloses "a plurality of panel carriers fixed relative to the central spine and extending outwardly from both sides of said central spine for supporting said solar panels," as claimed. For example, *Wattsun* discloses panel carriers (*e.g.*, a plurality of panel carriers) that extend outwardly from a central spine (*e.g.*, a torque tube beam) that extends along the center of the panel assembly for supporting solar panels. EX1004, pp. 8, 9, 15, 16. For example, *Wattsun* discloses a panel assembly, on which solar panels (photovoltaic panels) are rotatably mounted, and includes a torque tube that extends along the center of the panel assembly. EX1004, pp. 8, 9, 15, 16. *Wattsun* also teaches transversely arranged elongated members to which the photovoltaic members are mounted. EX1004, pp. 8, 9, 15, 16.

133. Below is an annotated figure from *Wattsun* illustrating the panel assembly with panel carriers, as compared with the panel assembly embodiment depicted in the '17546 Patent. As depicted below, *Wattsun's* panel carriers are clearly illustrated as extending outwardly from the torque tube. Therefore, in my opinion, *Wattsun* teaches and anticipates this element of the claim.

Wattsun	**U.S. Patent No. 9,917,546**
 EX1004, p. 9	 FIG. 3 EX1002, Fig. 3 (support frame 40 (EX1002, 2:66); panel assembly 60, solar panels 62 (EX1002, 3:34-36); central spine 66, panel carriers 70 (EX1002, 3:36-38))
 One installer, one piece at a time approach. Modules are being used to "square-up: the frame. EX1004, p. 16	

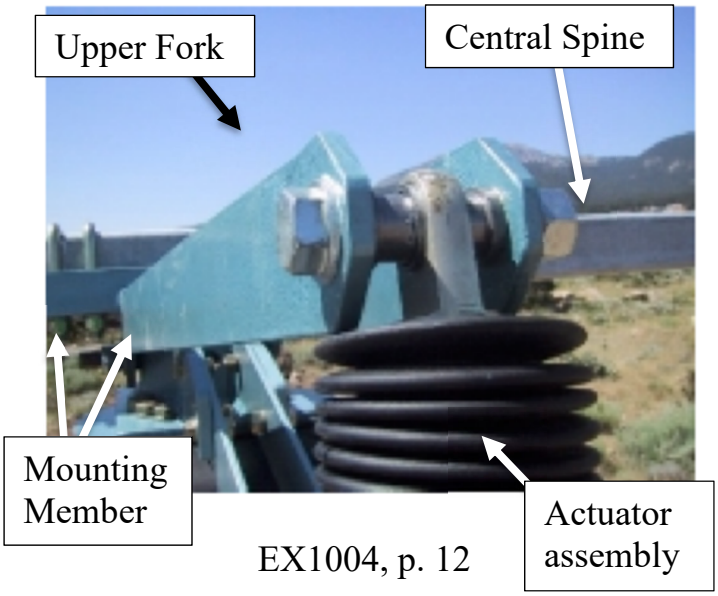
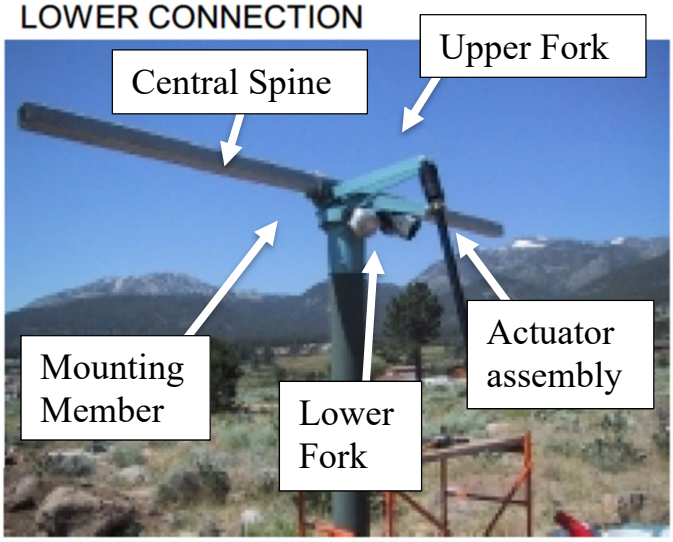
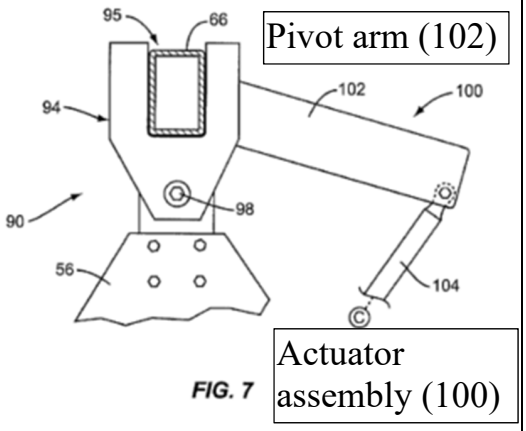
f. 1[e] "an actuator assembly for rotating the panel assembly to track the movement of the sun;"

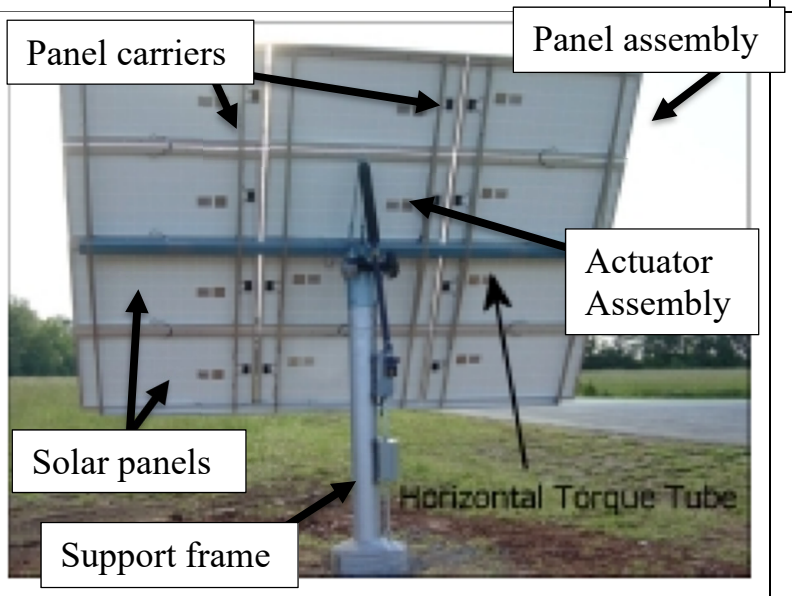
134. The '17546 Patent describes an "[a]ctuator assembly 100 that, as shown in FIG.7, comprises a pivot arm 102, fluid cylinder 102, and control unit 106." EX1002, 4:30-31. The "[p]ivot arm 102 is connected at one end to the spine 66 and extends outward from the spine 66." EX1002, 4:31-33. The "[f]luid cylinder 104 is connected at one end to the pivot arm 102." EX1002, 4:34-35. "The control unit 106 is mounted to the front frame and controls operation of the fluid cylinder 104." EX1002, 4:36-37.

135. In my opinion, *Wattsun* discloses "an actuator assembly for rotating the panel assembly to track the movement of the sun," as claimed. For example, *Wattsun* describes an actuator assembly (*e.g.*, an actuator system) to move and rotate the panel assembly. For example, *Wattsun* discloses an actuator (*e.g.*, an electromechanical actuator) for rotating the panel assembly to track the position (movement) of the sun. Specifically, *Wattsun* discloses that the solar tracker includes an "actuator assembly for dual-axis operation." EX1004, p. 12. *Wattsun* discloses that this actuation is to track the sun's position. Specifically, *Wattsun* discloses, "Wattsun™ Solar Trackers utilize a patented, closed loop, optical sensing system to sense the sun's position and track it." EX1004, p. 19.

136. *Wattsun* describes attaching an actuator assembly (*e.g.*, the elevation actuator) to the forks (i.e., the upper fork and lower fork) to move the forks. Specifically, *Wattsun* discloses to an installer to "[c]enter both the eyelet end (the top) of the elevation actuator inside the forks and the elevation actuator clamp eyelet (the bottom)." EX1004, p. 12. *Wattsun* further includes a series of images and assembly instructions to teach how the actuator is attached to the mounting assembly for rotating the panel assembly before the panel assembly is attached to the torque tube spine. EX1004, p. 8-9, 12-13.

137. Below is an annotated figure from *Wattsun* illustrating the actuator assembly, as compared with the actuator assembly embodiment depicted in the '17546 Patent. Therefore, in my opinion, *Wattsun* teaches and anticipates this element of the claim.

Wattsun	**U.S. Patent No. 9,917,546**
UPPER CONNECTION  EX1004, p. 12 LOWER CONNECTION  EX1004, p. 12	 EX1002, Fig. 7 (actuator assembly 100, fluid cylinder 104, pivot arm 102 (EX1002, 4:30-31))

Wattsun	**U.S. Patent No. 9,917,546**
 EX1004, p. 9	

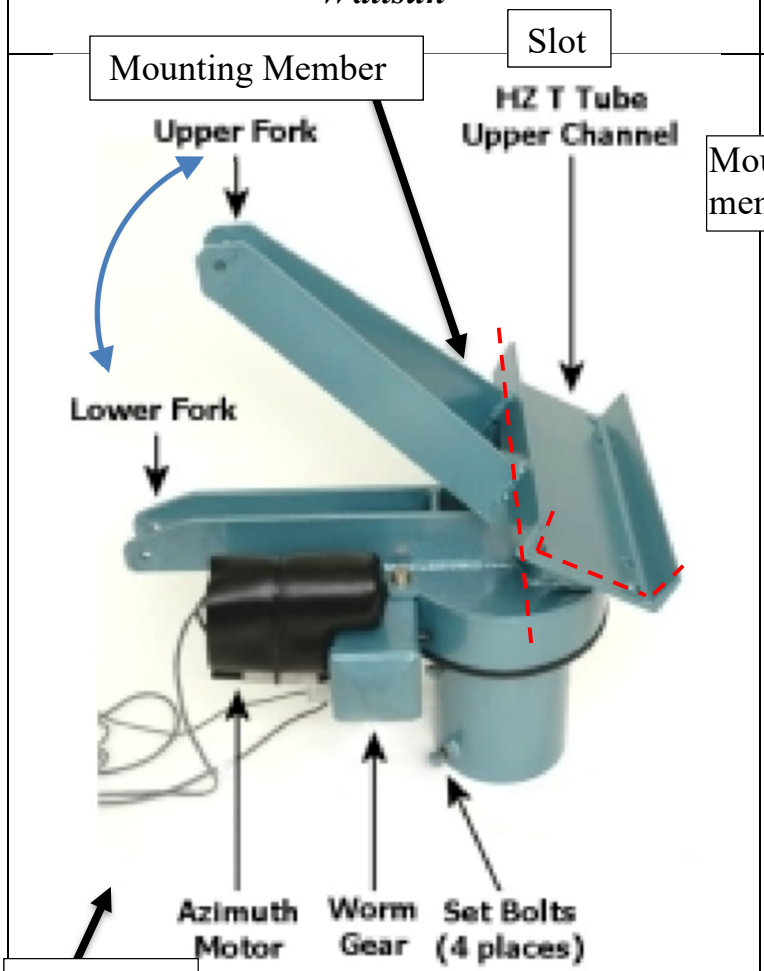
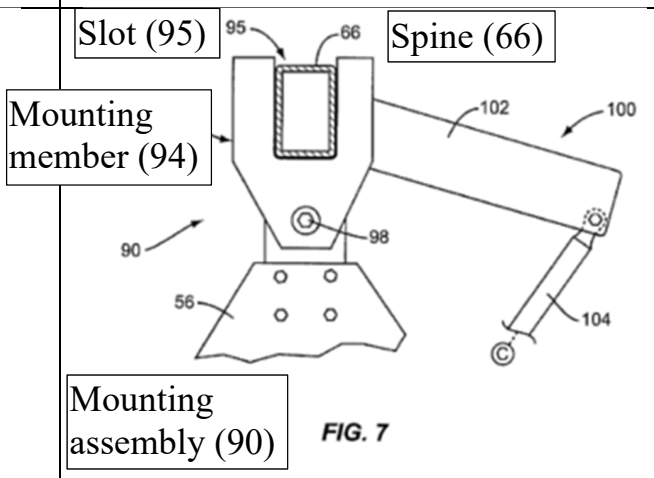
g. 1[f] "a mounting assembly for rotatably mounting the panel assembly to the support frame, said mounting assembly comprising:"

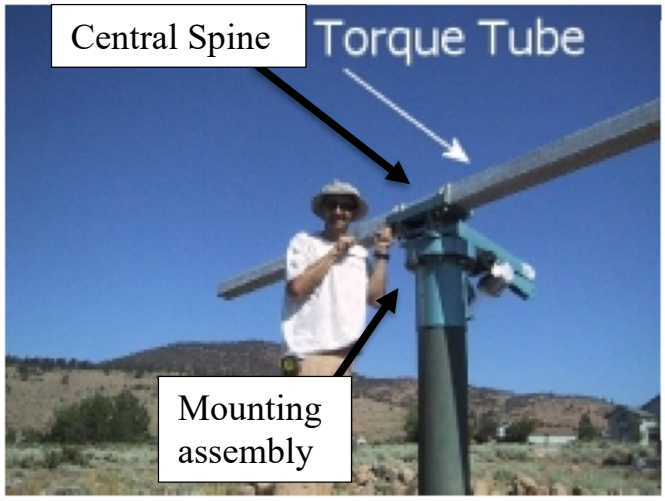
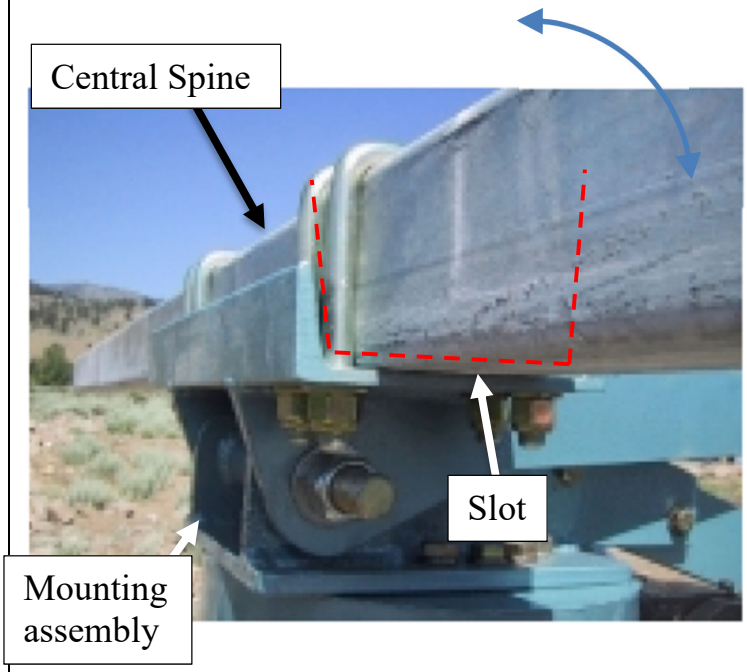
138. The '17546 Patent describes a "[s]econd mounting assembly 90 comprises a connecting plate 92, a pair of mounting forks 94, a bearing 96, and a pivot member 98. "EX1002, 4:6-11.

139. In my opinion, *Wattsun* discloses "a mounting assembly for rotatably mounting the panel assembly to the support frame," as claimed. That is, *Wattsun* describes a mounting assembly for rotatably mounting the panel assembly to the support frame by rotating the torque tube by rotating the mounting member. For example, *Wattsun* discloses a horizontal torque tube drive that mounts on top of the

support posts for rotatably mounting the panel assembly to the support posts via the torque tube of the panel assembly being installed in a slot (annotated below by dashed lines). EX1004, pp. 6, 8, 9, 12, 16.

140. Below is an annotated figure from *Wattsun* illustrating the mounting assembly, as compared with the mounting assembly embodiment depicted in the '17546 Patent. Therefore, in my opinion, *Wattsun* teaches and anticipates this element of the claim.

Wattsun	**U.S. Patent No. 9,917,546**
 EX1004, p. 8	 EX1002, Fig. 7 (mounting assembly 90, mounting member 94 (EX1002, 4:6-10); slot 95, spine 66 (EX1002, 4:12-15))

Wattsun	**U.S. Patent No. 9,917,546**
 EX1004, p. 9  EX1004, p. 12	

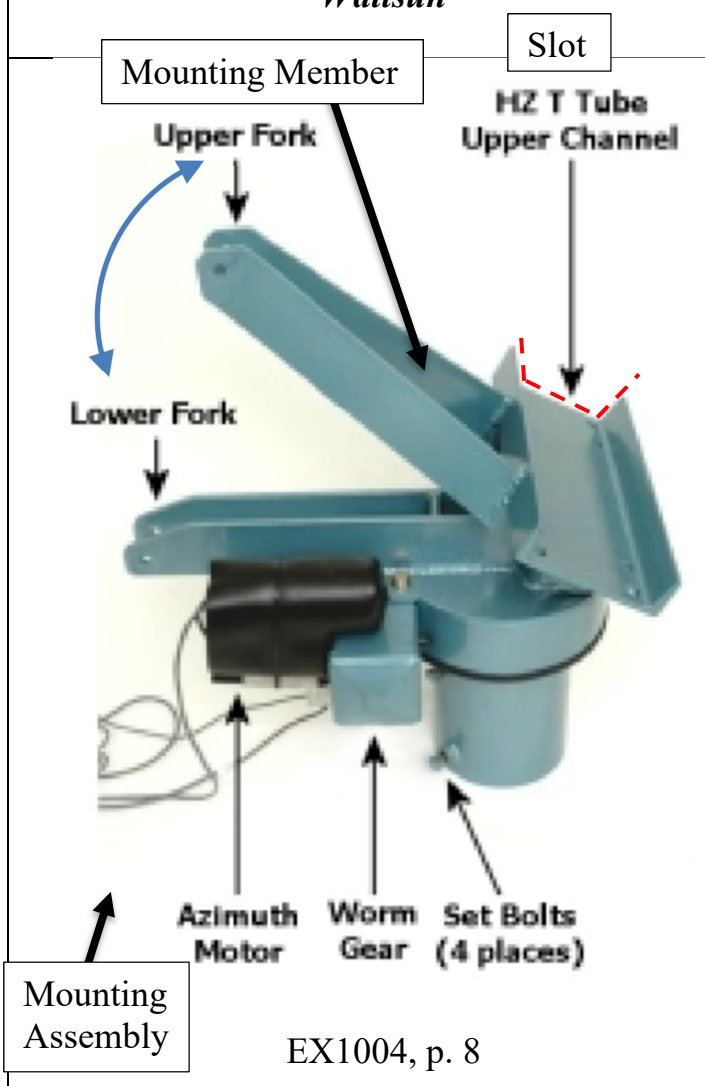
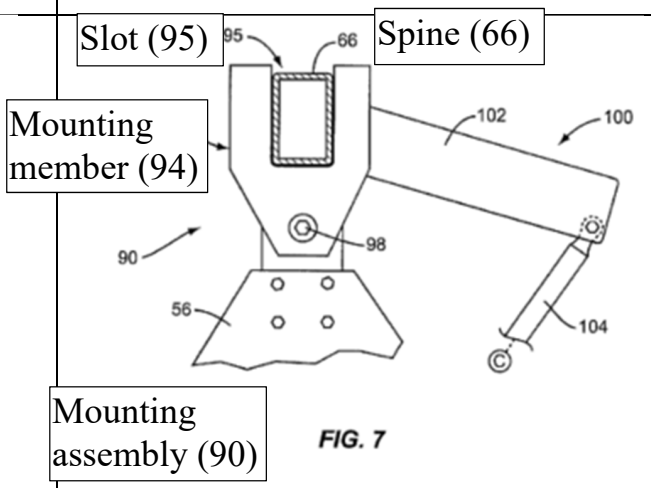
h. 1[g] "a mounting member configured to be rotatably connected to said support frame; and"

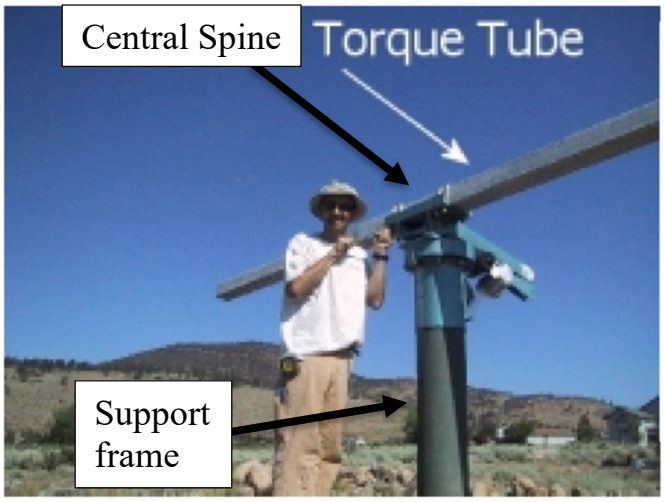
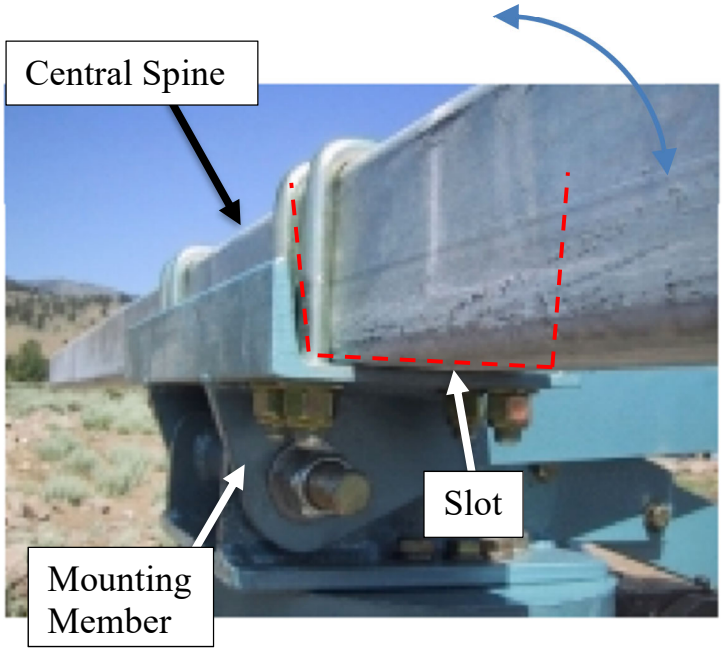
141. The '17546 Patent describes that "[t]he mounting forks 94 include a slot 95 to receive the spine 66." EX1002, 4:12-15. The "[p]ivot member 98 extends through the mounting forks 94, upper end of connecting plate 92, and bearing 96, and is secured in place by a nut threaded onto the end of the pivot member 98." EX1002, 4:17-20. The specification of the '17546 Patent does not recite "mounting member." To the extent the term "mounting member" is supported by the specification of the '17546 Patent, a POSITA would interpret the claimed mounting member to be the mounting fork 94.

142. In my opinion, *Wattsun* discloses "a mounting member configured to be rotatably connected to said support frame," as claimed. For example, *Wattsun* discloses a mounting assembly to rotatably mount the panel assembly to the support frame (support post). The mounting assembly includes a mounting member, as claimed. For example, *Wattsun* describes a horizontal torque tube drive that mounts on top of the support post for rotatably mounting the panel assembly to the support post. EX1004, pp. 6, 8, 9, 12, 16. The horizontal torque tube drive includes a rotatably mounted upper fork that defines a torque tube upper channel. EX1004, pp. 6, 8, 9, 12, 16. The upper fork, together with the HZ T Tube Upper Channel attached

thereto, satisfies a mounting member configured to be rotatably connected to said support frame. EX1004, pp. 6, 8, 9, 12, 16.

143. Below is an annotated figure from *Wattsun* illustrating the mounting member, as compared with the mounting member embodiment depicted in the '17546 Patent. Therefore, in my opinion, *Wattsun* teaches and anticipates this element of the claim.

Wattsun	**U.S. Patent No. 9,917,546**
 EX1004, p. 8	 EX1002, Fig. 7 (mounting assembly 90, mounting member 94 (EX1002, 4:6-10); slot 95, spine 66 (EX1002, 4:12-15))

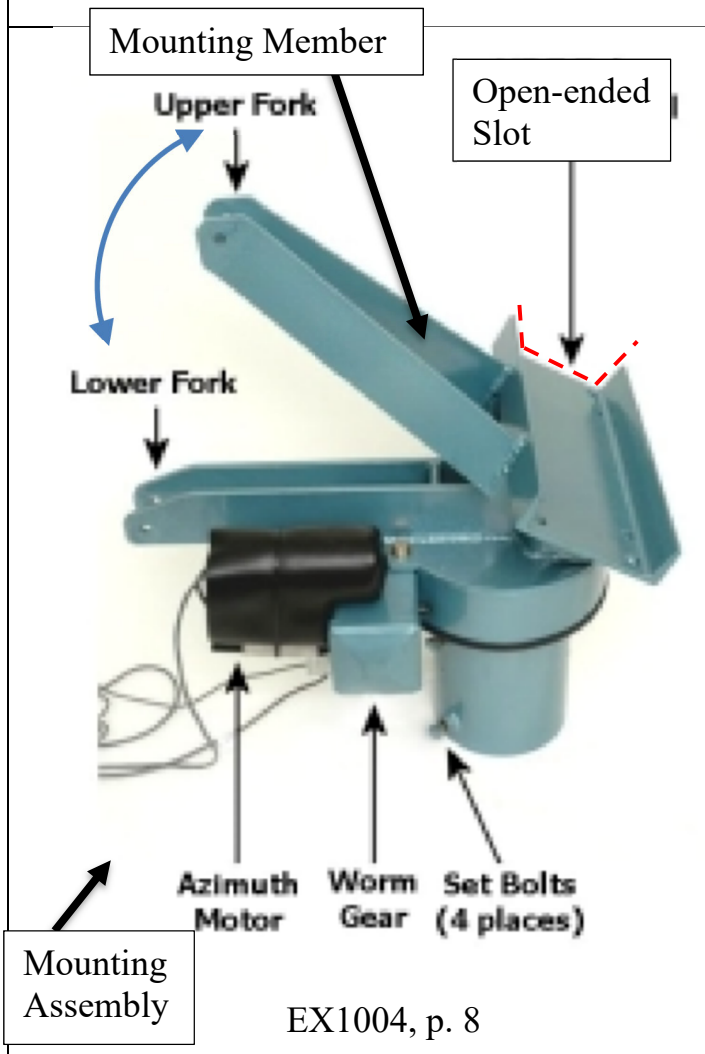
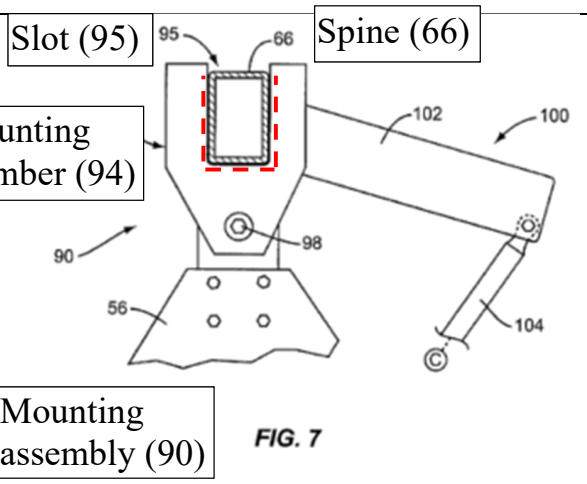
Wattsun	**U.S. Patent No. 9,917,546**
 EX1004, p. 9  EX1004, p. 12	

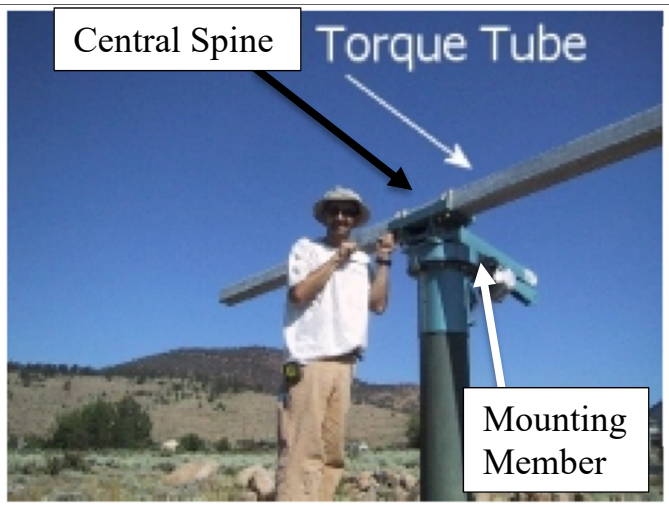
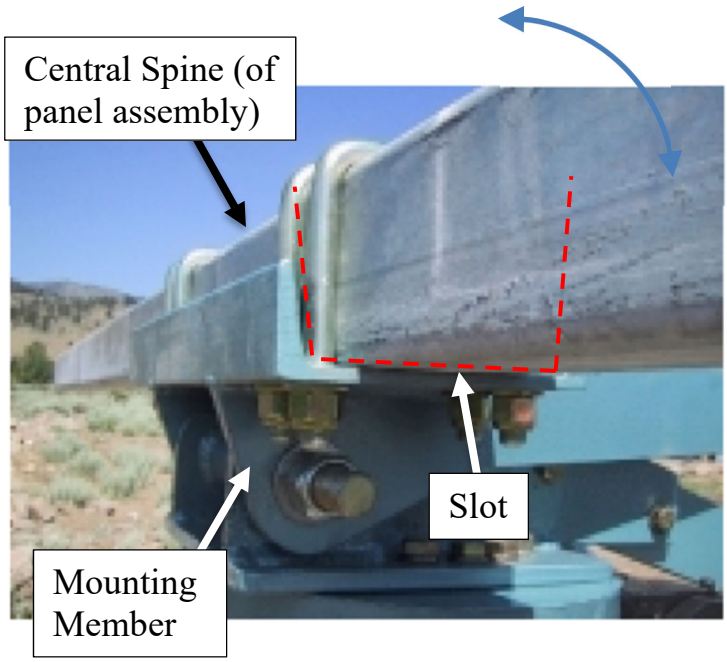
i. 1[h] "an open-ended slot in said mounting member configured to receive the central spine of the panel assembly."

144. The '17546 Patent describes a "second mounting assembly 90 comprises a connecting plate 92, a pair of mounting forks 94, a bearing 96, and a pivot member 98." EX1002, 4:6-11. "The mounting forks 94 include a slot 95 to receive the spine 66..." EX1002, 4:12-15. The specification of the '17546 Patent does not use, let alone define, the term "*open-ended* slot" as recited in the claims. Notwithstanding the term not appearing anywhere in the '17546 Patent, Petitioners have interpreted "open-ended slot" to describe the open slot depicted in Figure 7, as reproduced below.

145. In my opinion, *Wattsun* discloses "an open-ended slot in said mounting member configured to receive the central spine of the panel assembly," as claimed. For example, *Wattsun* discloses a horizontal torque tube drive that mounts on top of the support post to rotatably mount the panel assembly to the support post. EX1004, pp. 6, 8, 9, 12, 16. The horizontal torque tube drive includes a rotatably mounted upper fork that defines a torque tube upper channel. EX1004, pp. 6, 8, 9, 12, 16. The upper channel includes or forms an open-ended slot. EX1004, pp. 6, 8, 9, 12, 16. The spine (*e.g.*, torque tube) of the panel assembly can be placed in the slot in the mounting member. EX1004, pp. 9, 12, 16.

146. Below is an annotated figure from *Wattsun* illustrating the open-ended slot, as compared with the open-ended slot embodiment depicted in the '17546 Patent. Therefore, in my opinion, *Wattsun* teaches and anticipates this element of the claim.

Wattsun	**U.S. Patent No. 9,917,546**
 EX1004, p. 8	 EX1002, Fig. 7 (mounting assembly 90, mounting member 94 (EX1002, 4:6-10); slot 95, spine 66 (EX1002, 4:12-15))

Wattsun	**U.S. Patent No. 9,917,546**
 EX1004, p. 9  EX1004, p. 12	

C. Ground 2A: Claims 5 and 6 of the ′57546 Patent Were Anticipated by *RayTracker*

Summary

147. The challenged claims of the ’57546 Patent recite a solar tracker having four primary elements: (1) a support frame; (2) a panel assembly, rotatably mounted to the support frame, having a central spine; (3) a mounting assembly for mounting the panel assembly to the support frame; and (4) an actuator for rotating the panel assembly. Dependent claim 6 further recites solar panels mounted to the panel assembly. As discussed in the ’57546 Patent, the solar tracker is configured so that the panel assembly can rotate based on the sun’s position in the sky throughout the day.

148. In my opinion, *RayTracker* describes a solar tracker that has features that read directly on claims 5 and 6 of the ’57546 Patent and includes structural members and components that are essentially indistinguishable from those in claims 5 and 6 of the ’57546 Patent.

1. Independent Claim 5 of the ’57546 Patent

a. 5[p] “A solar tracker comprising:”

149. I understand that sometimes patent claim preambles are not limiting and sometimes they are. Here, to the extent that the preamble is construed as limiting, it is my opinion that *RayTracker* discloses “a solar tracker.” EX1006, p. 1, 2. *RayTracker* specifically disclosed the many benefits of a solar tracker system. For

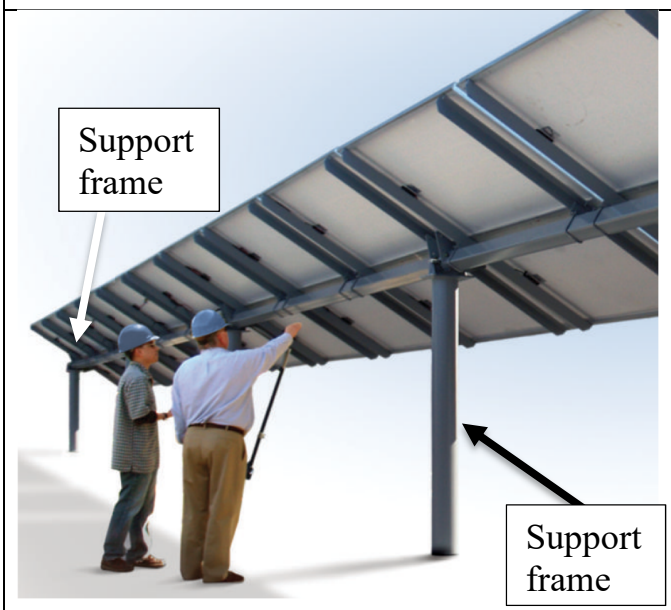
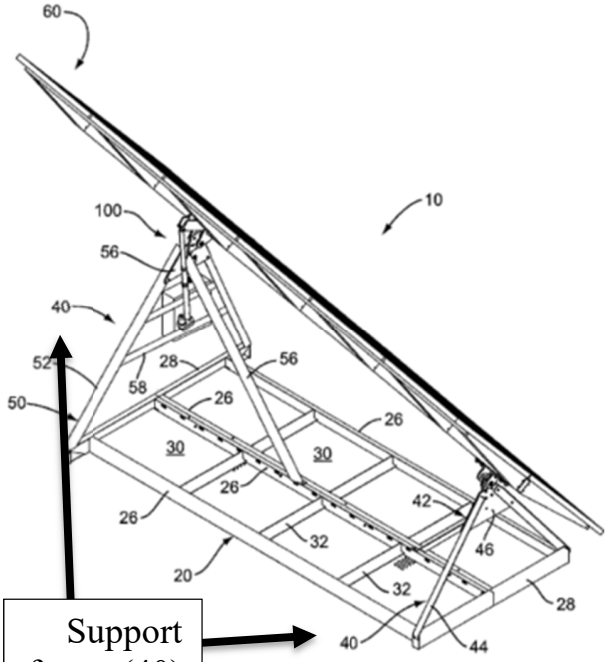
example, *RayTracker* suggested that "single axis" solar trackers described therein "improves energy yield by optimally positioning the solar panels throughout the day. Energy boosts of up to 38% [were] possible compared to flat-mounted panels." EX1006, p. 2.

b. 5[a] "a support frame;"

150. The '57546 Patent describes that "the support frame 40 mounts to the base 20" (shown below). EX1001, 2:57-58. "A panel assembly 60 is rotatably mounted to the support frame 40." EX1001, 3:45-46.

151. In my opinion, *RayTracker* discloses "a support frame," as claimed. For example, *RayTracker* discloses a solar tracking system or structure including a steel support frame formed of multiple support posts to support other components of the tracker. Specifically, *RayTracker* discloses "[t]he installer provides only five vertical steel posts to support the RayTracker GC structure." EX1006, p. 5.

152. Below is an annotated figure from *RayTracker* showing the support frame formed of support posts, as compared with the embodiment depicted in the '57546 Patent. Therefore, in my opinion, *RayTracker* teaches and anticipates this element of the claim.

RayTracker	**U.S. Patent No. 9,057,546**
 EX1006, p. 4	 EX1001, Fig. 2 (support frame 40 (EX1001, 2:57-58))

c. 5[b] "a panel assembly rotatably mounted to the support frame for supporting one or more solar panels, said panel assembly comprising a central spine and a plurality of panel carriers extending outwardly from said spine;"

153. The '57546 Patent describes that a "panel assembly 60 comprises a plurality of solar panels 62 and a panel support frame 64 to support the solar panels." EX1001, 3:24-26. "The panel support frame 64 comprises a central spine 66, a pair of laterally-spaced side members 68, and a plurality of longitudinally-spaced panel

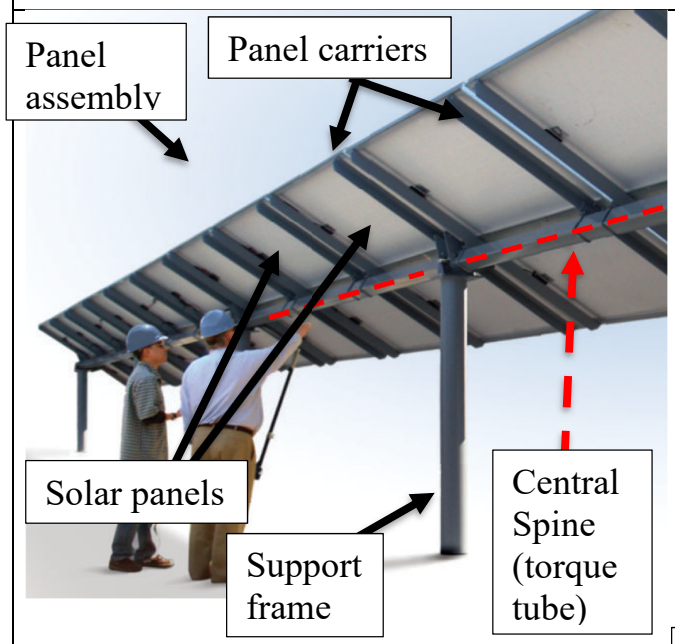
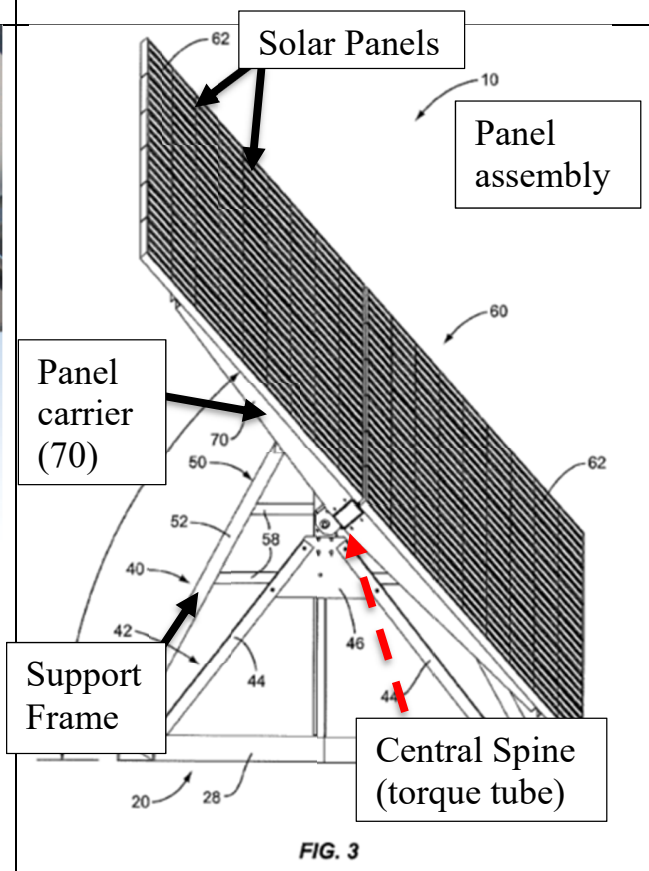
carriers 70, which can be removably connected by bolts and nuts, or other fasteners." EX1001, 3:26-29.

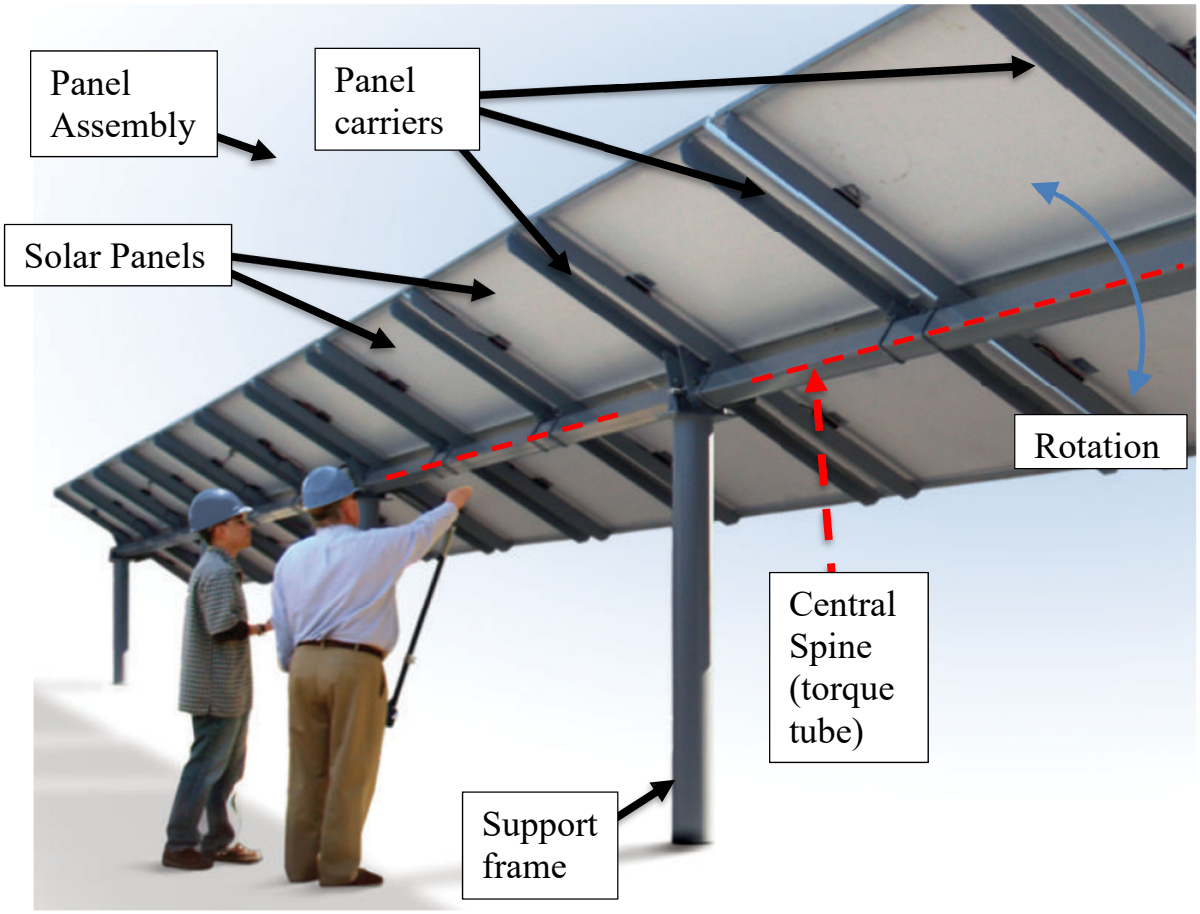
154. In my opinion, *RayTracker* discloses "a panel assembly rotatably mounted to the support frame for supporting one or more solar panels, said panel assembly comprising a central spine and a plurality of panel carriers extending outwardly from said spine," as claimed. For example, *RayTracker* discloses solar panels (a set of solar panels) that move and rotate as a unit to track the sun's position in the sky. Specifically, *RayTracker* describes an assembly that is "simple and elegant, with just two moving parts – the actuator and one structural assembly that rotates on a bearing surface." EX1006, p. 4.

155. For example, *RayTracker* discloses a plurality of panel carriers extending outwardly from a central spine (*e.g.*, a torque tube beam) that extends along the center of the panel assembly for supporting solar panels. EX1006, pp. 4, 5. For example, *RayTracker* discloses a support frame, on which panels (photovoltaic solar panels) are rotatably mounted via a panel assembly. EX1006, pp. 4, 5. The panel assembly includes a torque tube that extends along the center of the panel assembly. EX1006, pp. 4, 5. *RayTracker* further includes a transversely arranged elongated member to which the photovoltaic members are mounted. EX1006, pp. 4, 5.

156. *RayTracker* provides specific teachings regarding the panel assembly and states that "RayTracker GC is a complete PV [photovoltaic] racking system, supplied with module-specific, pre-drilled panel mounts and hardware. Each RayTracker GC unit… accommodates 24 to 32 standard PV modules." EX1006, p. 2. As depicted below, *RayTracker's* panel carriers are illustrated as extending outwardly from the torque tube.

157. Below is an annotated figure from *RayTracker* illustrating the panel assembly with panel carriers, as compared with the panel assembly embodiment depicted in the '57546 Patent. *RayTracker* also illustrates several examples of the rotatable bearings mounted between the support posts and the panel assembly to rotate the panel assembly relative to the support posts. Therefore, in my opinion, *RayTracker* teaches and anticipates this element of the claim.

RayTracker	**U.S. Patent No. 9,057,546**
 EX1006, p. 4	 FIG. 3 EX1001, Fig. 3 (support frame 40 (EX1001, 2:57-58); panel assembly 60, solar panels 62 (EX1001, 3:24-26); central spine 66, panel carriers 70 (EX1001, 3:26-29))


Panel Assembly
Panel carriers
Solar Panels
Rotation
Central Spine (torque tube)
Support frame

EX1006, p. 4


points using the ma
mounting holes with
brackets and hardw
Because each RayTr
mechanical unit, the
the trackers and the
simple low-voltage v
Rotation
RayTracker GC building block
~80ft and 6-7kW
(24.3m)

EX1006, p. 5

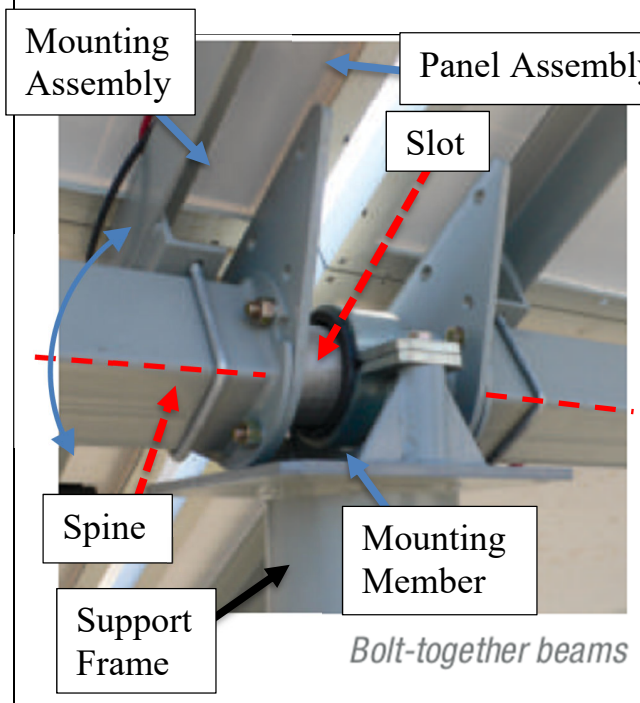
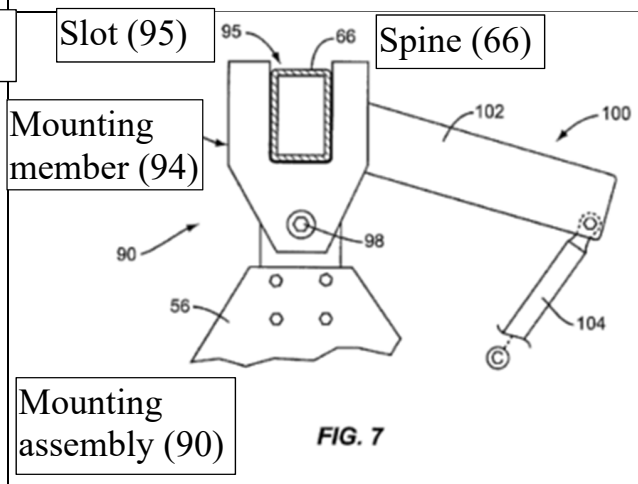
d. 5[c] "a mounting assembly for rotatably mounting the panel assembly to the support frame, the mounting assembly comprising a mounting member rotatably connected to the support frame and a slot in said mounting member configured to receive the spine of the panel assembly; and"

158. The '57546 Patent describes a "second mounting assembly 90 comprises a connecting plate 92, a pair of mounting forks 94, a bearing 96, and a pivot member 98." EX1001, 3:64-66. "The mounting forks 94 include a slot 95 to receive the spine 66…" EX1001, 4:1-3. "The pivot member 98 extends through the mounting forks 94, upper end of connecting plate 92, and bearing 96, and is secured in place by a nut threaded onto the end of the pivot member 98." EX1001, 4:5-8. The specification of the '57546 Patent does not recite "mounting member." To the extent the term "mounting member" is supported by the specification of the '57546 Patent, a POSITA would interpret the claimed mounting member to be the mounting fork 94.

159. In my opinion, *RayTracker* discloses "a mounting assembly for rotatably mounting the panel assembly to the support frame, the mounting assembly comprising a mounting member rotatably connected to the support frame and a slot in said mounting member configured to receive the spine of the panel assembly," as claimed. *RayTracker* discloses a mounting assembly for rotatably mounting the panel assembly to the support frame. EX1006, pp. 1, 4, 5. And the mounting

assembly includes a mounting member. EX1006, pp. 1, 4, 5. For example, *RayTracker* teaches a bearing assembly that mounts on top of the support frame (e.g., posts) for rotating the panel assembly with respect to the support frame. In my opinion, a POSITA would readily understand that the bearing assembly is formed of a split two-piece bearing. The bearing assembly includes an inner bearing race that rotates within outer bearing races. The inner bearing race is a mounting member. The spine of the panel assembly can be placed in a slot in the mounting member (i.e., in the lower portion of the bearing).

160. Below is an annotated figure from *RayTracker* illustrating the mounting assembly, as compared with the mounting assembly embodiment depicted in the '57546 Patent. Therefore, in my opinion, *RayTracker* teaches and anticipates this element of the claim.

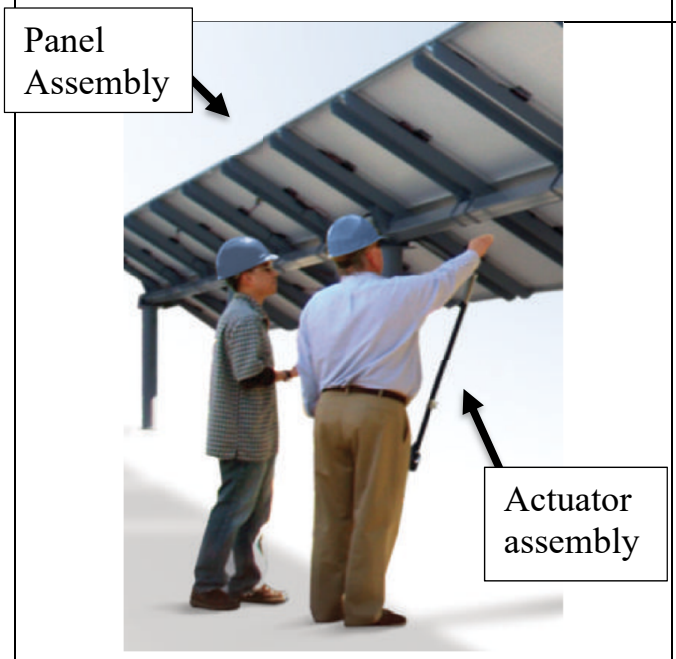
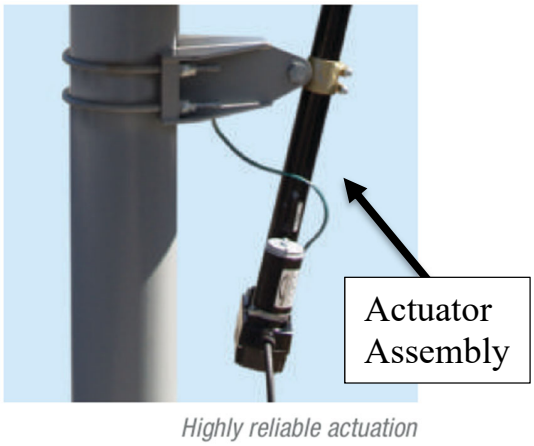
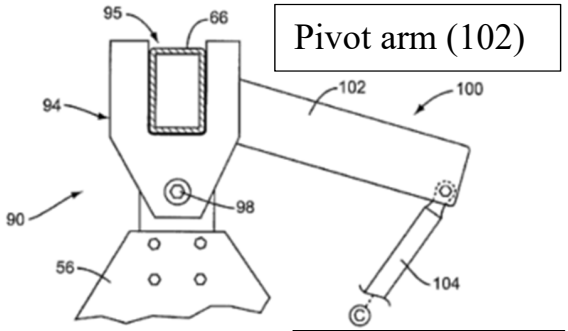
RayTracker	**U.S. Patent No. 9,057,546**
 EX1006, p. 5	 EX1001, Fig. 7 (mounting assembly 90, mounting member 94 (EX1001, 3:64-66); slot 95, spine 66 (EX1001, 4:1-3))

e. 5[d] "an actuator assembly for rotating the panel assembly to track the movement of the sun."

161. The '57546 Patent describes an "[a]ctuator assembly 100, shown in FIG.7, comprises a pivot arm 102, fluid cylinder 104, and control unit 106." EX1001, 4:18-19. "The pivot arm 102 is connected to the spine 66 and extends outward from the spine 66…" EX1001, 4:19-22. The "[f]luid cylinder 104 is connected at one end to the pivot arm 102." EX1001, 4:22-23. "The control unit 106 is mounted to the front frame and controls operation of the fluid cylinder 104." EX1001, 4:23-25.

162. In my opinion, *RayTracker* discloses "an actuator assembly for rotating the panel assembly to track the movement of the sun," as claimed. *RayTracker* describes an actuator assembly (*e.g.*, an actuator system) to move (rotate) the panel assembly. EX1006, pp. 2, 4, 5. For example, *RayTracker* discloses an electromechanical actuator to rotate the panel assembly based on, and to track, the position (referred to as "movement") of the sun. EX1006, pp. 2, 4, 5. *RayTracker* specifically discloses that the system is formed of "just two moving parts – the actuator and one structural assembly that rotates on a bearing surface." EX1006, p. 4.

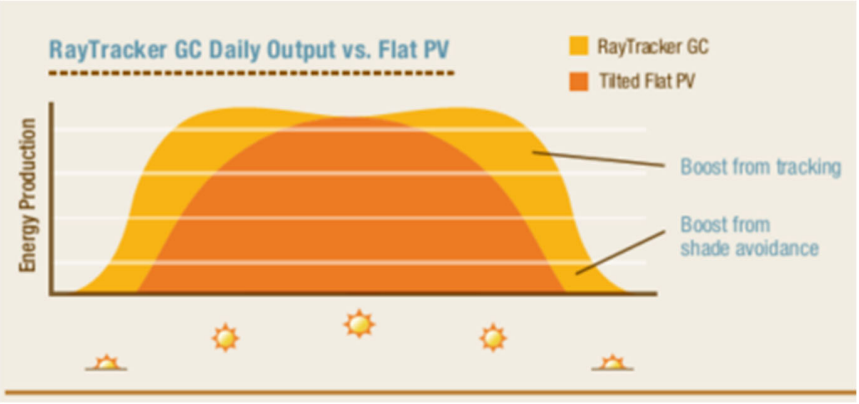
163. Below is an annotated figure from *Wattsun* illustrating the actuator assembly, as compared with the actuator assembly embodiment depicted in the '57546 Patent. Therefore, in my opinion, the *RayTracker* teaches and anticipates this element of the claim.

RayTracker	**U.S. Patent No. 9,057,546**
 EX1006, p. 4  EX1006, p. 2	 EX1001, Fig. 7 (actuator assembly 100, fluid cylinder 104, pivot arm 102 (EX1001, 4:18-19))

164. The *RayTracker* further specifically describes that the system is actuated particularly to track the position (referred to as movement) of the sun. For

example, "[t]he tracking function is provided by a custom microprocessor controller that uses a GPS time reference and a precise astronomical algorithm to automatically and accurately point the panels at the sun. The position of each actuator is monitored by the controller to ensure alignment. One controller serves 12 RayTracker GC units, and is included with the system." EX1006, p. 2.

165. *RayTracker* describes specific benefits of tracking the movement of the sun. For example, "RayTracker GC improves energy yield by optimally positioning the solar panels throughout the day. Energy boosts of up to 38% are possible compared to flat-mounted panels. Single-axis trackers outperform fixed-tilt installations most importantly during peak energy demand periods. RayTracker GC achieves this with a simple, low-profile, low-parts-count mechanism." EX1006, p. 2.



EX1006, p. 2

166. Therefore, in my opinion, *RayTracker* teaches and anticipates this element of the claim.

2. Dependent Claim 6

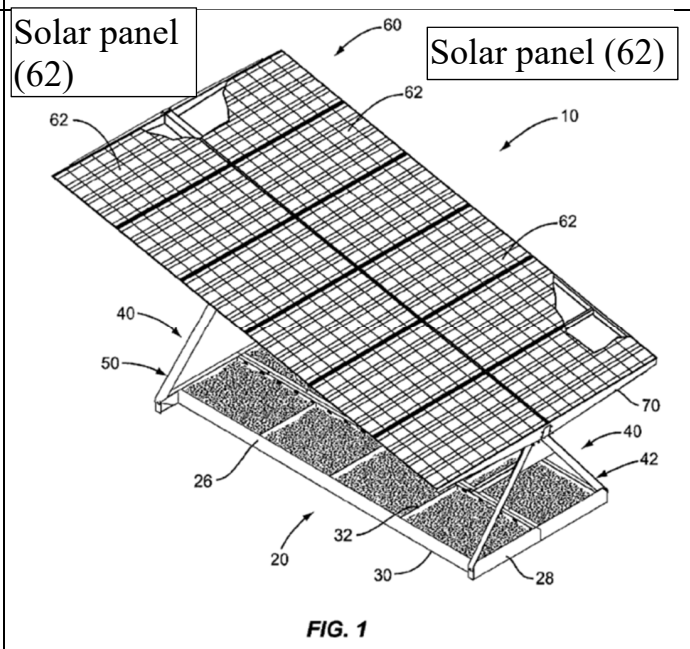
167. Dependent claim 6 recites: "The solar tracker of claim 5 wherein the panel assembly further comprises one or more solar panels mounted to the panel carriers." EX1001, claim 6.

168. The '57546 Patent describes that "[t]he panel assembly 60 comprises a plurality of solar panels 62 and a panel support frame 64 to support the solar panels." EX1001, 3:24-26.

169. In my opinion, *RayTracker* disclosed a solar tracker wherein the panel assembly further comprises one or more solar panels mounted to the panel carriers and anticipated this additional claim feature.

170. *RayTracker* is full of references to, and disclosures of, solar panels. For example, the system accurately points "the panels" (p. 2); the system helps to "keep the panels clean" (p. 4); the system "supports near all panel types" (p. 6), etc.

171. Below is an annotated figure from *RayTracker* illustrating the solar panels, as compared with the solar panels depicted in the '57546 Patent. Therefore, in my opinion, *RayTracker* teaches and anticipates this element of the claim.

RayTracker	**U.S. Patent No. 9,057,546**
	 FIG. 1
EX1006, p. 1	EX1001, Fig. 2 (solar panel 62 (EX1001, 3:42-43))

172. For the sake of completeness, while *RayTracker* describes that the specific commercial offering contemplated therein may not include the panels themselves as part of a sale/installation, it is clear, in my opinion, that the complete system described in *RayTracker* includes solar panels.

D. Ground 2B: Claim 1 of the ′17546 Patent Was Anticipated by *RayTracker*

Summary

173. The challenged claims of the ’17546 Patent recite a support structure for a solar tracker having six primary elements: (1) a support frame; (2) a panel assembly, rotatably mounted to the support frame; (3) a central spine rotatably mounted to the support frame; (4) a plurality of panel carriers fixed relative to the central spine and extending outwardly from both sides of said central spine for supporting said solar panels; (5) an actuator assembly for rotating the panel assembly to track the position (movement) of the sun; (6) a mounting assembly for rotatably mounting the panel assembly to the support frame, said mounting assembly comprising: (6a) a mounting member configured to be rotatably connected to said support frame; and (6b) an open-ended slot in said mounting member configured to receive the central spine of the panel assembly.

174. *RayTracker* describes a solar tracker that has features that read directly on claim 1 of the ’17546 Patent and includes structural members and components that are essentially indistinguishable from those in the claim 1 of the ’17546 Patent.

1. Independent Claim 1 of the '17546 Patent

a. 1[p] "A support structure for solar tracker comprising:"

175. I understand that sometimes patent claim preambles are not limiting and sometimes they are. Here, to the extent that the preamble is construed as limiting, it is my opinion *RayTracker* discloses "a support structure for solar tracker." EX1006, pp. 1, 2. *RayTracker* disclosed benefits of a solar tracker system. For example, *RayTracker* suggested that such "single axis" solar trackers described therein "improves energy yield by optimally positioning the solar panels throughout the day. Energy boosts of up to 38% [were] possible compared to flat-mounted panels." EX1006, pp. 1, 2.

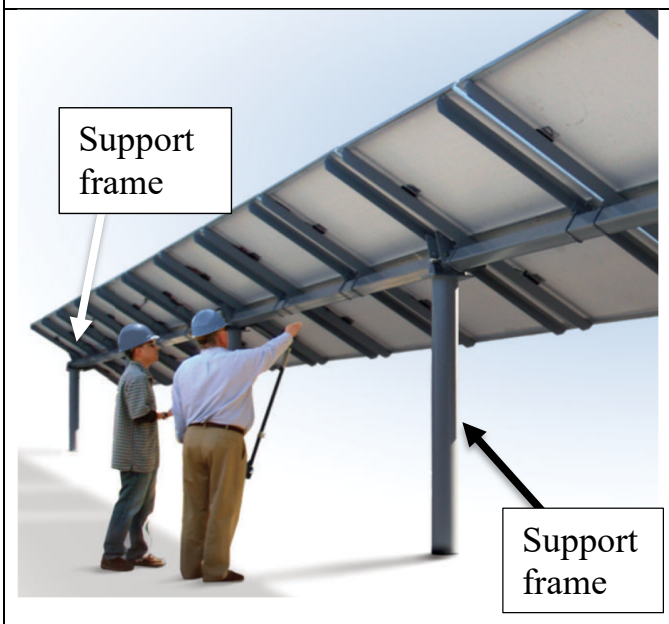
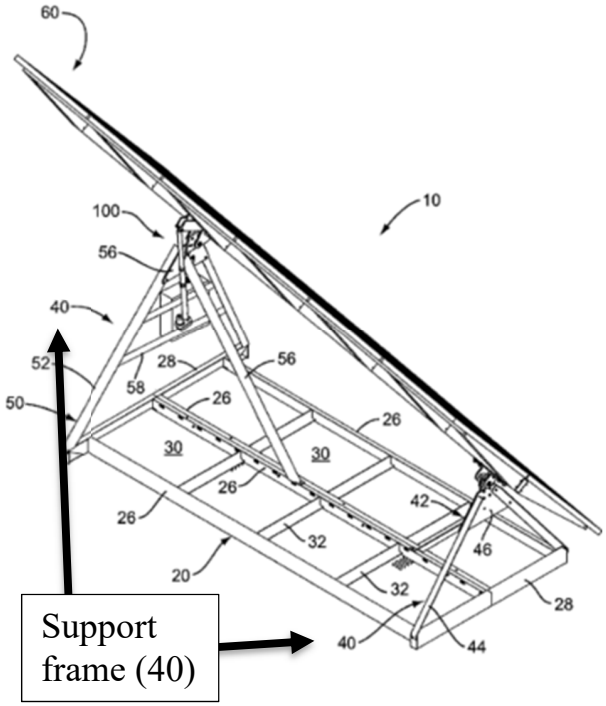
b. 1[a] "a support frame;"

176. The '17546 Patent describes that "[t]he support frame 40 mounts to the base 20" (shown below). EX1002, 2:66. "The panel assembly 60 is rotatably mounted to the support frame 40." EX1002, 3:56-57.

177. In my opinion, *RayTracker* discloses "a support frame," as claimed. For example, *RayTracker* describes a solar tracking system or structure including a steel support frame including multiple support posts to support other components of the tracker. EX1006, pp. 1, 2, 4, 5. Specifically, *RayTracker* "[t]he installer provides only five vertical steel posts to support the RayTracker GC structure. The post foundations should be designed by a certified local civil/structural engineer to be

suitable for the site-specific soil and wind conditions. RayTracker supplies a third-party certified design package for the RayTracker GC mechanism to speed site engineering and permitting." EX1006, p. 5.

178. Below is an annotated figure from RayTracker showing the support frame formed of support posts, as compared with the embodiment depicted in the '17546 Patent. Therefore, in my opinion, *RayTracker* teaches and anticipates this element of the claim.

RayTracker	**U.S. Patent No. 9,917,546**
 EX1006, p. 4	 EX1002, Fig. 2 (support frame 40 (EX1002, 2:66))

c. 1[b] "a panel assembly rotatably mounted to said support frame and configured to support one or more solar panels, said panel assembly including:"

179. The '17546 Patent describes that a "[p]anel assembly 60 comprises a plurality of solar panels 62 and a panel support frame 64 to support the solar panels." EX1002, 3:34-36. "The panel support frame 64 comprises a central spine 66, a pair of laterally-spaced side members 68, and a plurality of longitudinally-spaced panel carriers 70, which can be removably connected by bolts and nuts, or other fasteners." EX1002, 3:36-40.

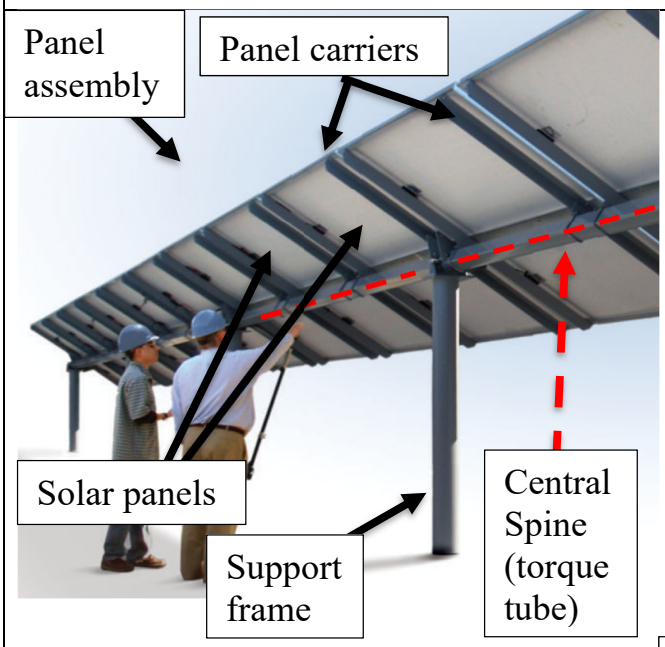
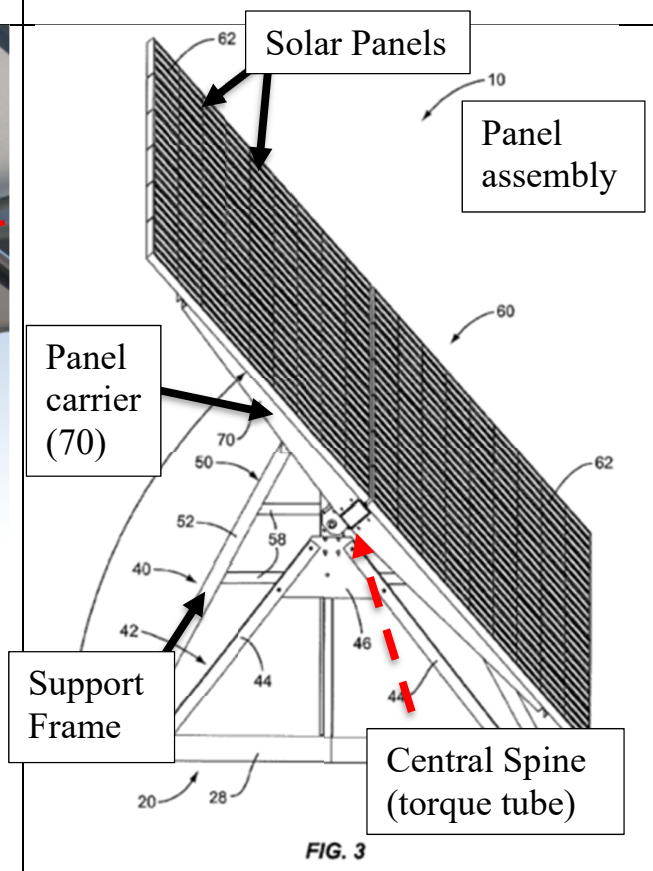
180. In my opinion, *RayTracker* discloses "a panel assembly rotatably mounted to the support frame for supporting one or more solar panels, said panel assembly comprising a central spine and a plurality of panel carriers extending outwardly from said spine," as claimed. For example, *RayTracker* discloses a set of solar panels that move and rotate as a unit to track the sun's position in the sky. Specifically, *RayTracker* describes a structure that is "simple and elegant, with just two moving parts – the actuator and one structural assembly that rotates on a bearing surface." EX1006, p. 4.

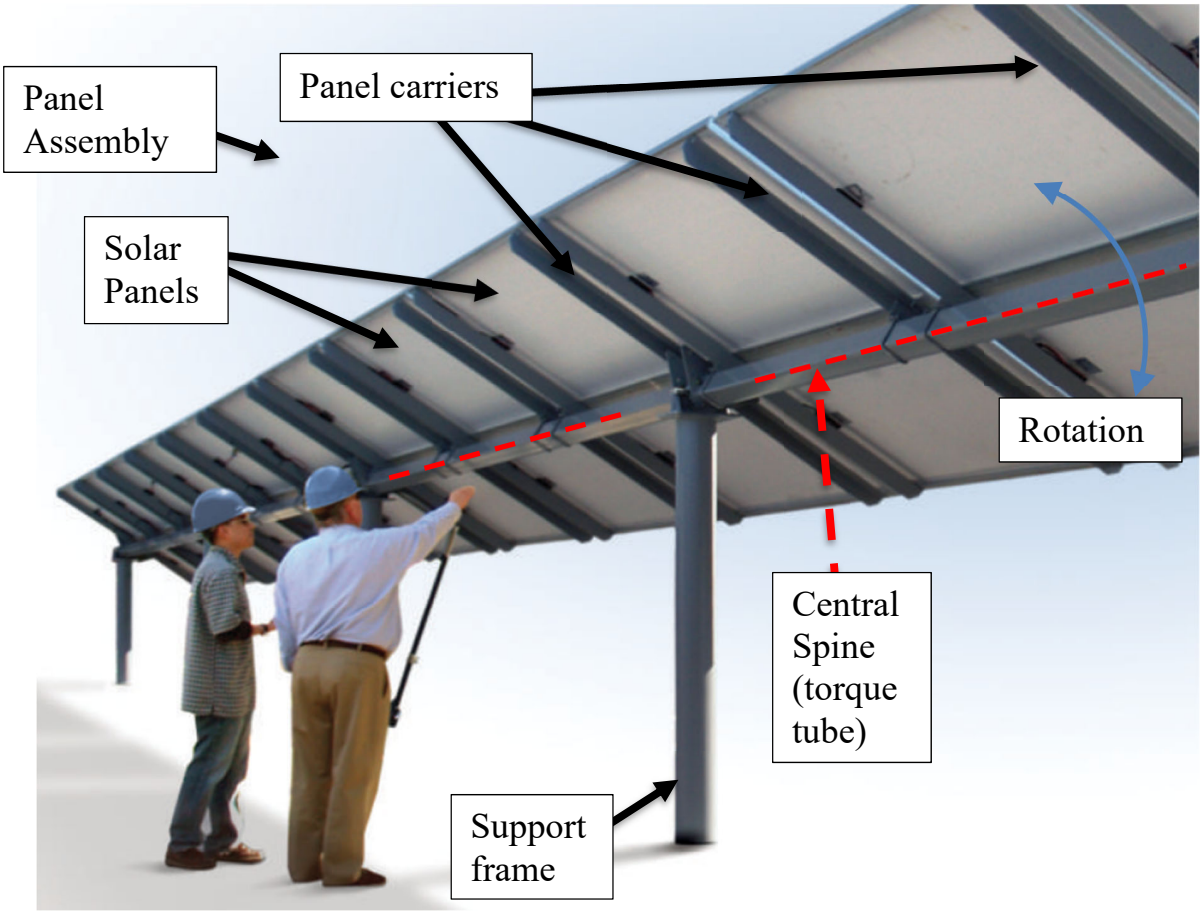
181. For example, *RayTracker* discloses a panel assembly that includes a plurality of panel carriers extending outwardly from a central spine (e.g., a torque tube beam) for supporting solar panels. EX1006, pp. 4, 5. The panel assembly is rotatably mounted to the support frame. EX1006, pp. 4, 5. *RayTracker* discloses

transversely arranged elongated members to which the photovoltaic members are mounted. EX1006, pp. 4, 5.

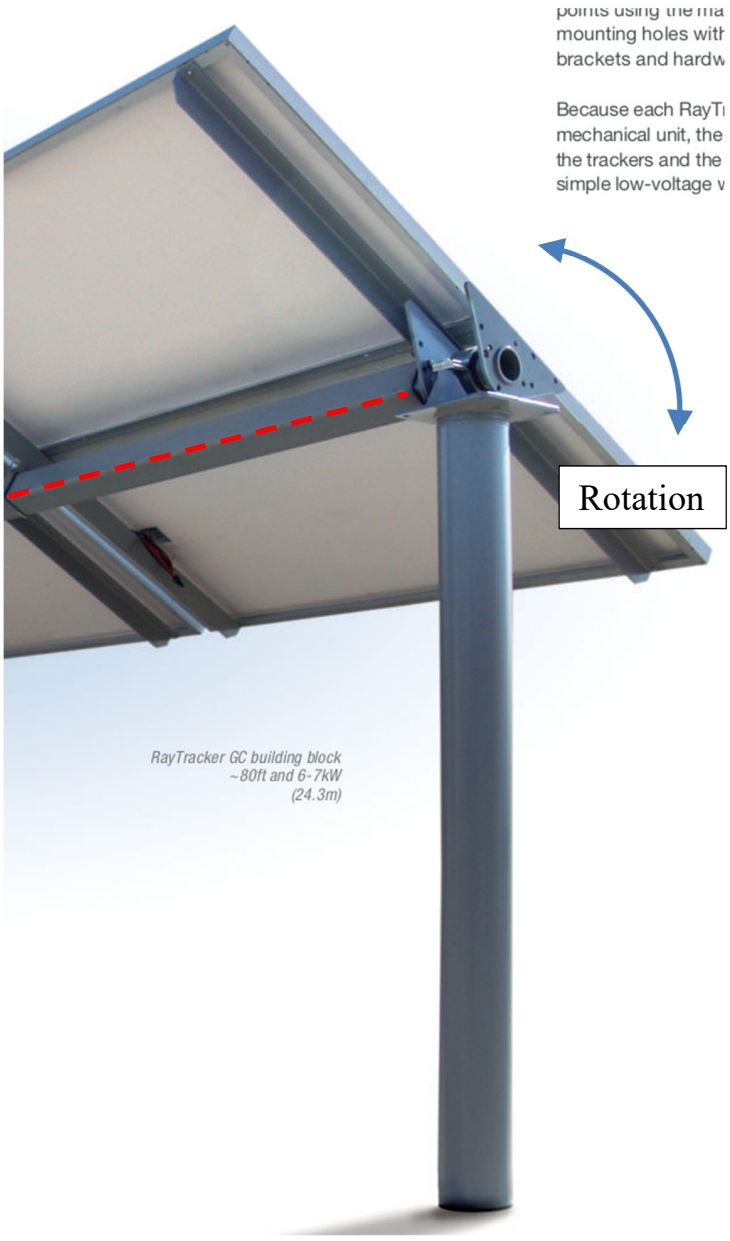
182. Specifically, *RayTracker* further discloses "a complete PV racking system, supplied with module-specific, pre-drilled panel mounts and hardware. Each RayTracker GC unit…accommodates 24 to 32 standard PV modules." EX1006, p. 2. As depicted below, *RayTracker's* panel carriers are clearly illustrated as extending outwardly from the torque tube.

183. *RayTracker* also illustrates several examples of the rotatable bearings mounted between the support posts and the panel assembly to rotate the panel assembly, for example, relative to the support posts. Below is an annotated figure from *RayTracker* illustrating the panel assembly with panel carriers, as compared with the panel assembly embodiment depicted in the '17546 Patent. Therefore, in my opinion, *RayTracker* teaches and anticipates this element of the claim.

RayTracker	**U.S. Patent No. 9,917,546**
 EX1006, p. 4	 FIG. 3 EX1002, Fig. 3 (support frame 40 (EX1002, 2:66); panel assembly 60, solar panels 62 (EX1002, 3:34-36); central spine 66, panel carriers 70 (EX1002, 3:36-38))


Panel Assembly
Panel carriers
Solar Panels
Rotation
Central Spine (torque tube)
Support frame

EX1006, p. 4


points using the ma
mounting holes with
brackets and hardw
Because each RayTr
mechanical unit, the
the trackers and the
simple low-voltage v
Rotation
RayTracker GC building block
~80ft and 6-7kW
(24.3m)

EX1006, p. 5

d. 1[c] "a central spine rotatably mounted to the support frame; and"

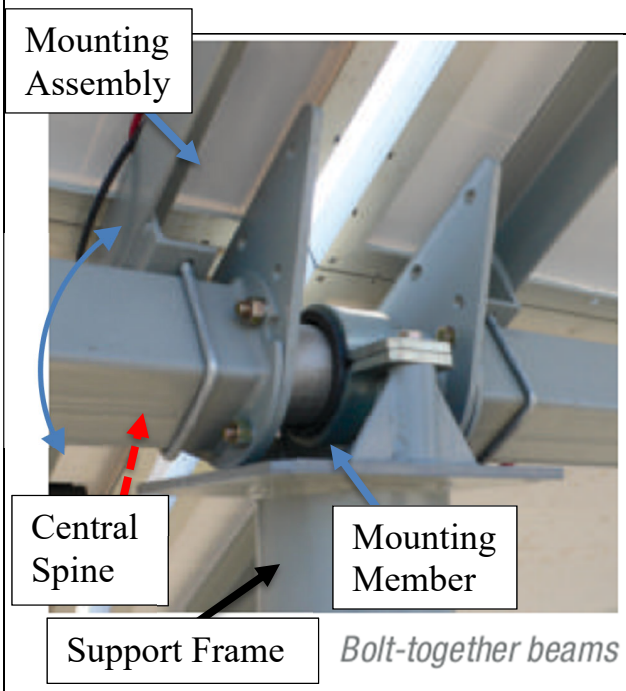
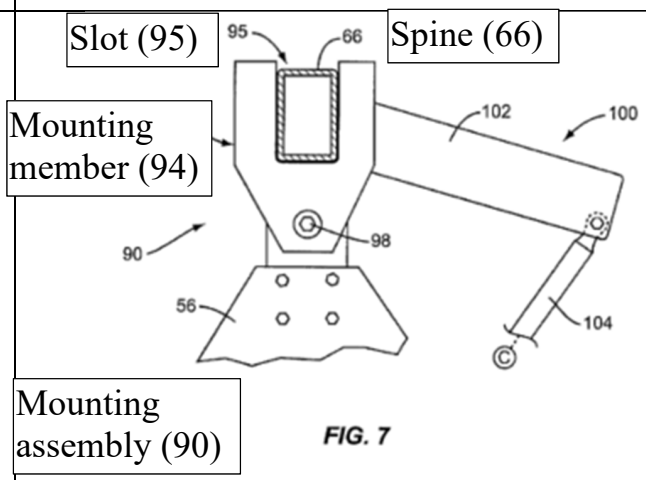
184. The '17546 Patent describes that "[t]he panel support frame 64 comprises a central spine 66, a pair of laterally-spaced side members 68, and a plurality of longitudinally-spaced panel carriers 70, which can be removably connected by bolts and nuts, or other fasteners." EX1002, 3:36-40. The '17546 Patent describes that a "second mounting assembly 90 comprises a connecting plate 92, a pair of mounting forks 94, a bearing 96, and a pivot member 98." EX1002, 4:6-11. "The mounting forks 94 include a slot 95 to receive the spine 66." EX1002, 4:12-14.

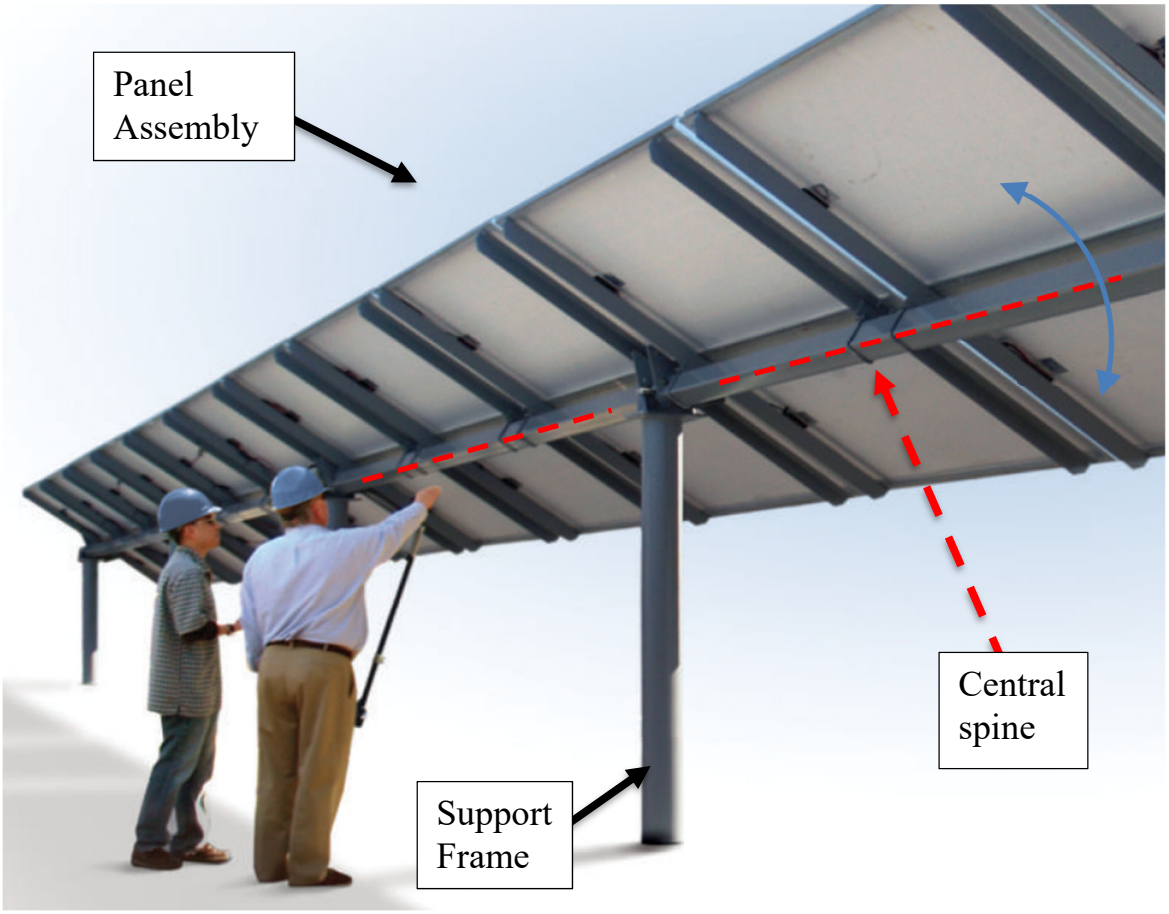
185. In my opinion, *RayTracker* discloses "a central spine rotatably mounted to the support frame," as claimed. *RayTracker* discloses a plurality of panel carriers extending outwardly from a central spine (*e.g.*, a torque tube beam) that extends along the center of the panel assembly for supporting solar panels. For example, *RayTracker* discloses a support frame, on which photovoltaic panels are rotatably mounted, that include a torque tube that extends along the center of the panel assembly. EX1006, pp. 4, 5.

186. In addition, for rotatably mounting the torque tube to the support frame, *RayTracker* illustrates several examples of rotatable bearings mounted between the support frame and the panel assembly to rotate the panel assembly relative to the

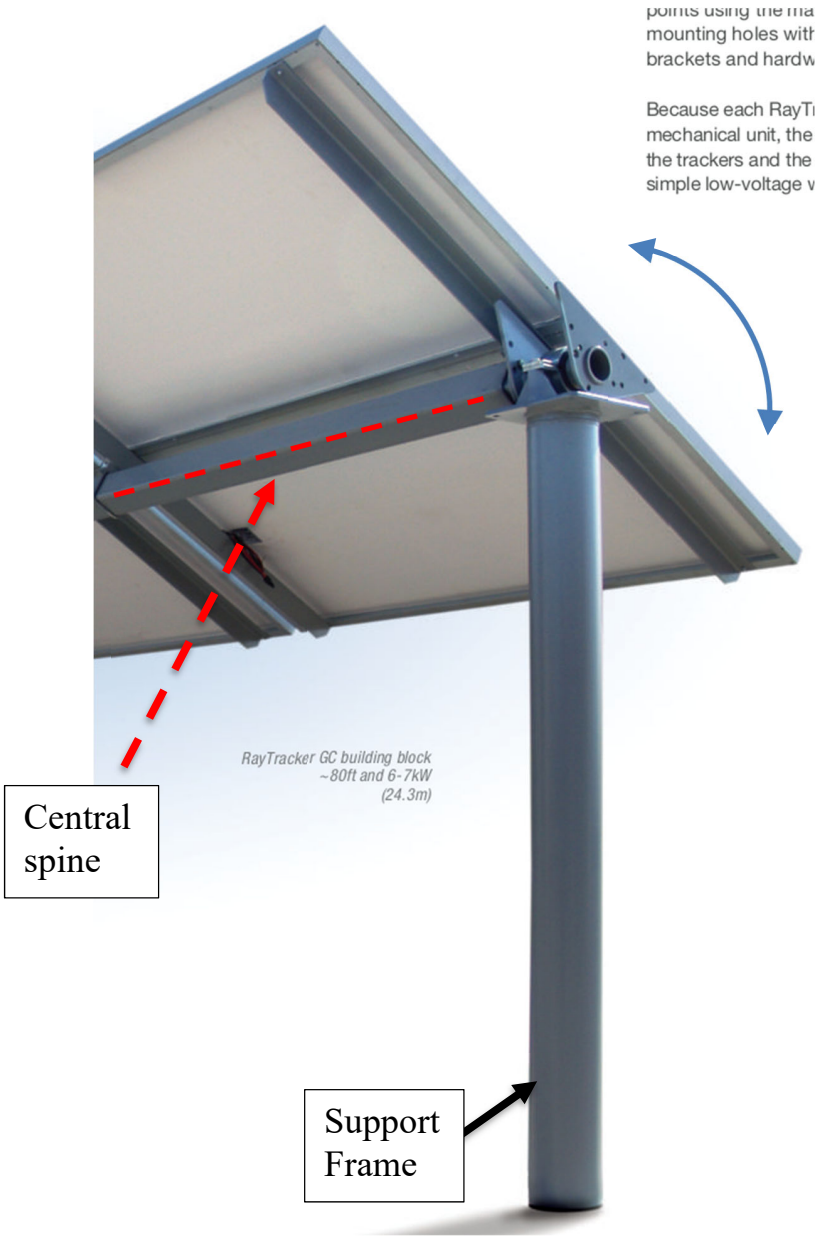
torque tube's axis. EX1006, pp. 4, 5. Specifically, *RayTracker* discloses a bearing assembly that mounts on top of the support posts for rotatably mounting the panel assembly (*e.g.*, by the torque tube) to the support posts. EX1006, pp. 4, 5.

187. Below is an annotated figure from *RayTracker* illustrating the central spine, as compared with the central spine embodiment depicted in the '17546 Patent. Therefore, in my opinion, *RayTracker* teaches and anticipates this element of the claim.

RayTracker	**U.S. Patent No. 9,917,546**
 EX1006, p. 5	 EX1002, Fig. 7 (support frame 40 (EX1002, 2:66); mounting assembly 90, mounting member 94 (EX1002, 4:6-10); slot 95, spine 66 (EX1002, 4:12-15))



EX1006, p. 4


mounting holes with
brackets and hardw
Because each RayTi
mechanical unit, the
the trackers and the
simple low-voltage v
RayTracker GC building block
~80ft and 6-7kW
(24.3m)
Central spine
Support Frame

EX1006, p. 5

e. 1[d] "a plurality of panel carriers fixed relative to the central spine and extending outwardly from both sides of said central spine for supporting said solar panels;"

188. The '17546 Patent describes that a "[p]anel assembly 60 comprises a plurality of solar panels 62 and a panel support frame 64 to support the solar panels." EX1002, 3:34-36. "The panel support frame 64 comprises a central spine 66, a pair of laterally-spaced side members 68, and a plurality of longitudinally-spaced panel carriers 70, which can be removably connected by bolts and nuts, or other fasteners." EX1002, 3:36-40.

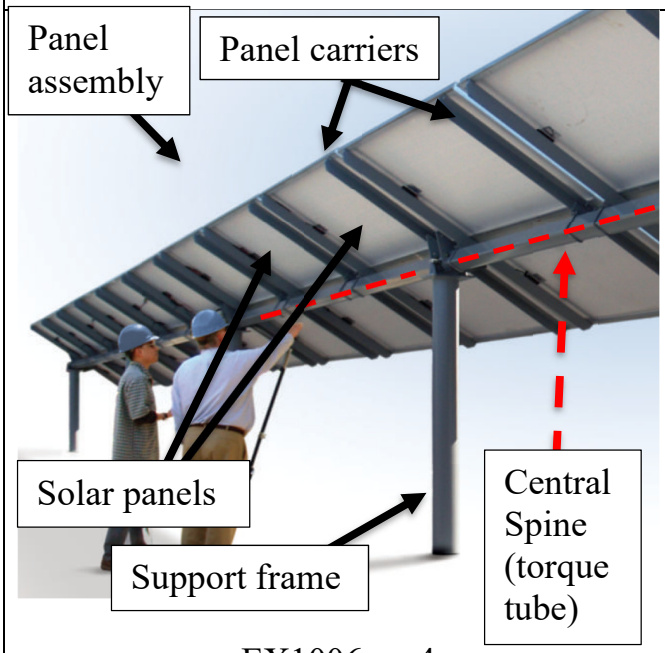
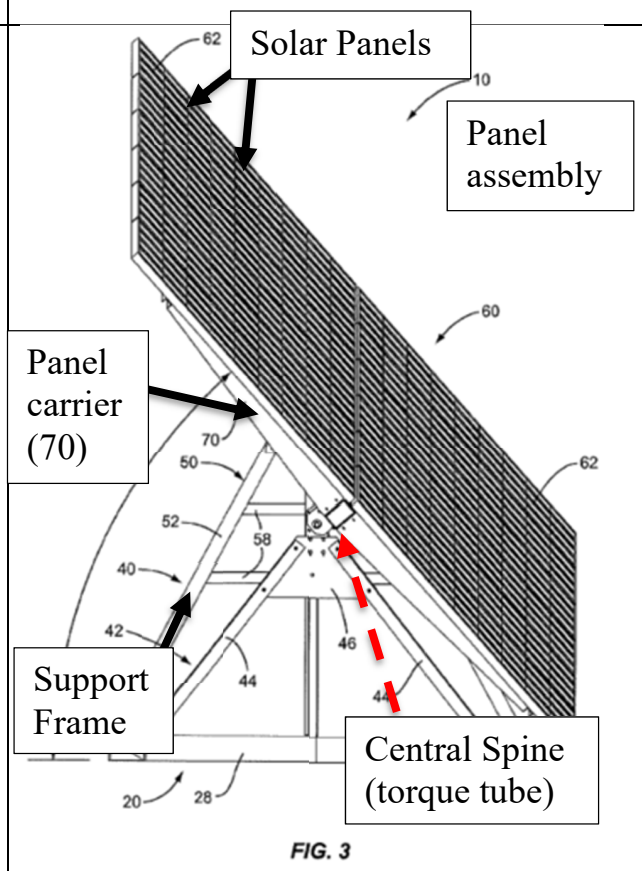
189. In my opinion, *RayTracker* discloses "a plurality of panel carriers fixed relative to the central spine and extending outwardly from both sides of said central spine for supporting said solar panels," as claimed. For example, *RayTracker* discloses a set of solar panels that rotate as a unit to track the sun's position. Specifically, *RayTracker* that its tracker "is simple and elegant, with just two moving parts – the actuator and one structural element that rotates on a bearing surface." EX1006, p. 4.

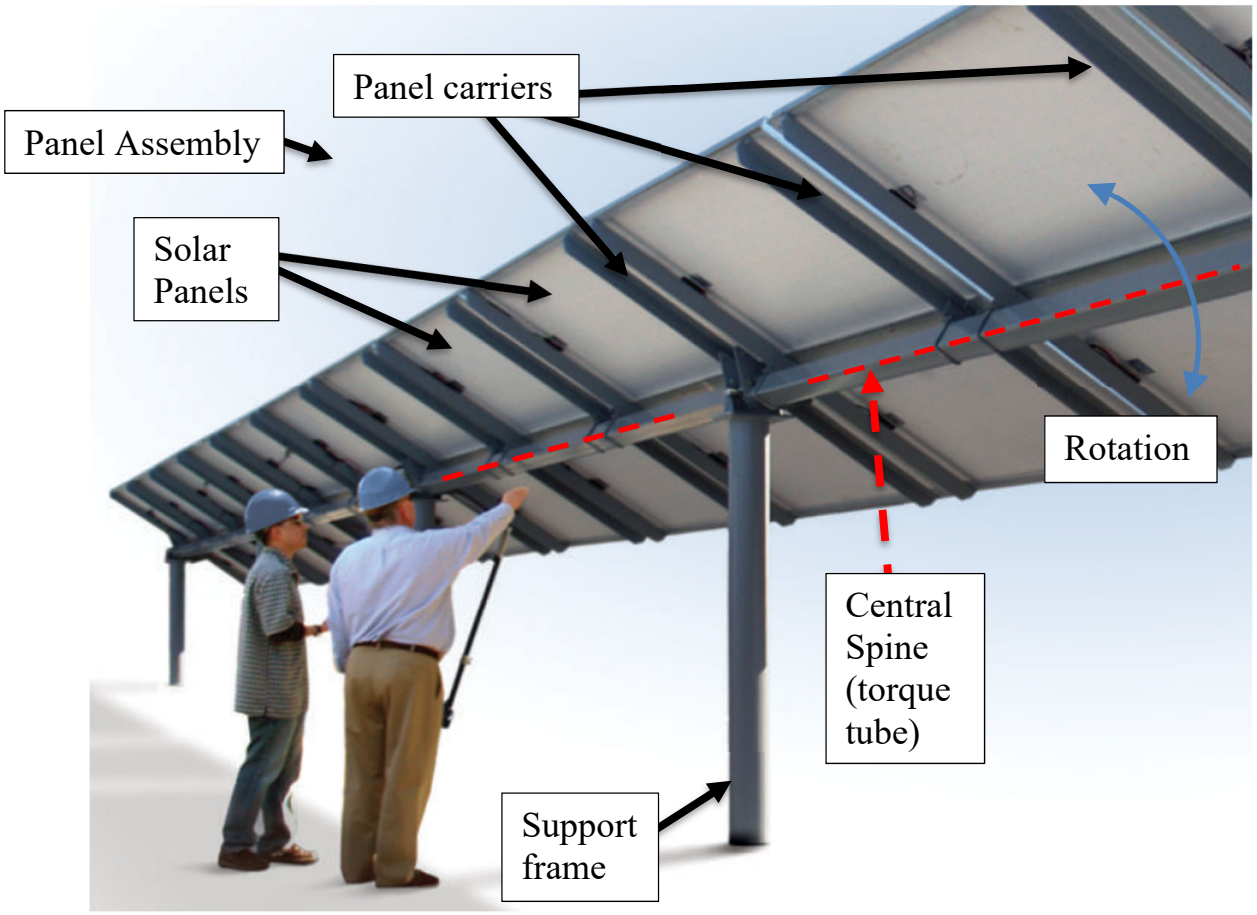
190. *RayTracker* discloses a plurality of panel carriers extending outwardly from a central spine (*e.g.*, a torque tube beam) that extends along the center of the panel assembly for supporting solar panels. EX1006, pp. 4, 5. For example, *RayTracker* describes a support frame, on which photovoltaic panels are rotatably

mounted, that include a torque tube that extends along the center of the panel assembly to rotate the torque tube relative to the support frame. EX1006, pp. 4, 5. *RayTracker* describes and illustrates transversely arranged elongated members to which the photovoltaic members are mounted. EX1006, pp. 4, 5.

191. *RayTracker* specifically discloses that "RayTracker GC is a complete PV racking system, supplied with module-specific, pre-drilled panel mounts and hardware. Each RayTracker GC unit…accommodates 24 to 32 standard PV modules." EX1006, p. 2.

192. Below is an annotated figure from *RayTracker* illustrating the panel assembly with panel carriers, as compared with the panel assembly embodiment depicted in the '17546 Patent. As depicted below, *RayTracker's* panel carriers are clearly illustrated as extending outwardly from the torque tube. Therefore, in my opinion, *RayTracker* teaches and anticipates this element of the claim.

RayTracker	**U.S. Patent No. 9,917,546**
 EX1006, p. 4	 *FIG. 3* EX1002, Fig. 3 (support frame 40 (EX1002, 2:66); panel assembly 60, solar panels 62 (EX1002, 3:34-36); central spine 66, panel carriers 70 (EX1002, 3:36-38))



EX1006, p. 4

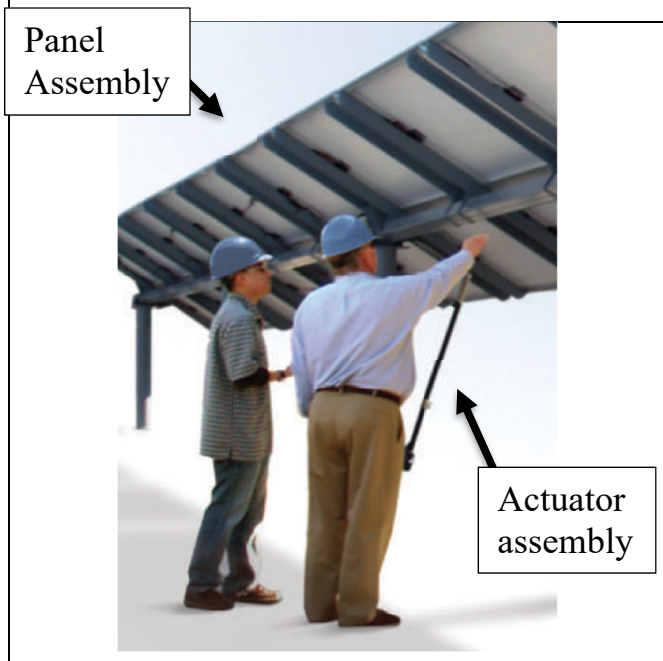
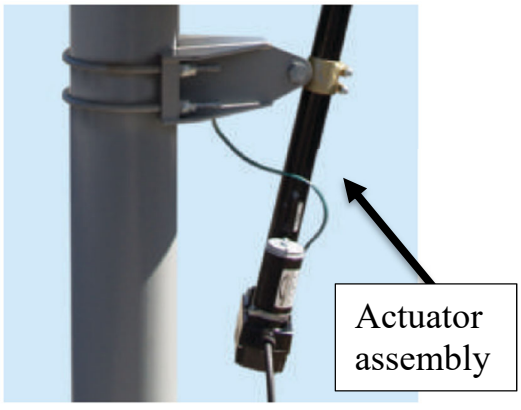
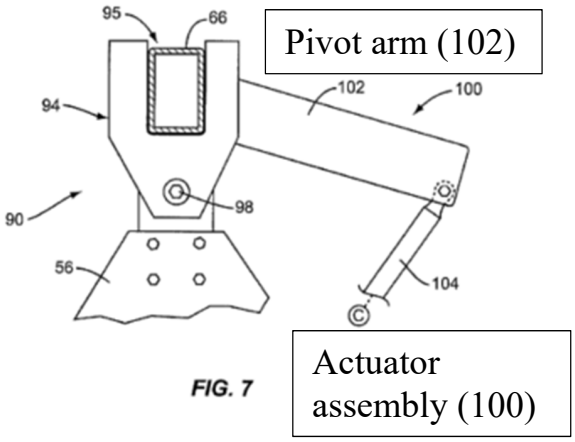
f. 1[e] "an actuator assembly for rotating the panel assembly to track the movement of the sun;"

193. The '17546 Patent describes an "[a]ctuator assembly 100, shown in FIG.7, comprises "a pivot arm 102, fluid cylinder 102 [*sic.*], and control unit 106." EX1002, 4:30-31. The "pivot arm 102 is connected to the spine 66 and extends outward from the spine 66…" EX1002, 4:31-33. The "[f]luid cylinder 104 is connected at one end to the pivot arm 102." EX1002, 4:34-35. "The control unit 106

is mounted to the front frame and controls operation of the fluid cylinder 104." EX1002, 4:36-37.

194. In my opinion, *RayTracker* discloses "an actuator assembly for rotating the panel assembly to track the movement of the sun," as claimed. For example, *RayTracker* describes an actuator assembly (*e.g.*, an actuator system) that moves the panel assembly (i.e., structural assembly). EX1006, pp. 2, 4, 5. For example, *RayTracker* describes an electromechanical actuator that rotates the panel assembly to track the position (movement) of the sun in the sky. EX1006, pp. 2, 4, 5. Specifically, *RayTracker* discloses that the system has "just two moving parts – the actuator and one structural assembly that rotates on a bearing surface." EX1006, p. 4.

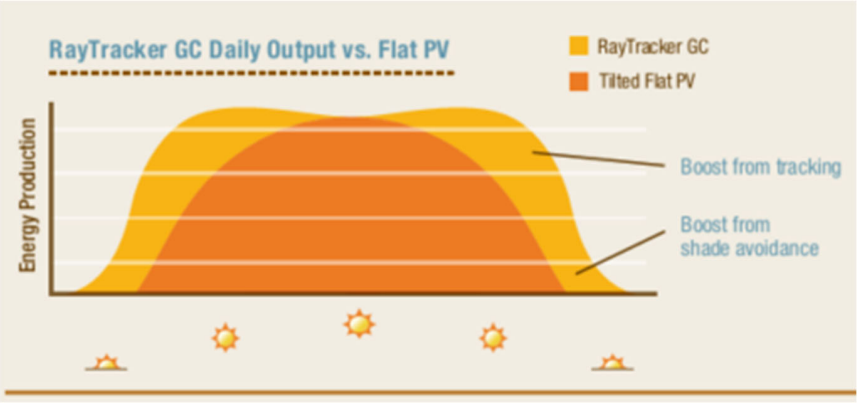
195. Below is an annotated figure from *RayTracker* illustrating the actuator assembly, as compared with the actuator assembly embodiment depicted in the '17546 Patent. Therefore, in my opinion, *RayTracker* teaches and anticipates this element of the claim.

RayTracker	**U.S. Patent No. 9,917,546**
 EX1006, p. 4  EX1006, p. 2	 EX1002, Fig. 7 (actuator assembly 100, fluid cylinder 104, pivot arm 102 (EX1002, 4:30-31))

196. *RayTracker* further specifically describes that the system is actuated particularly to track the position (movement) of the sun. For example, "[t]he

tracking function is provided by a custom microprocessor controller that uses a GPS time reference and a precise astronomical algorithm to automatically and accurately point the panels at the sun. The position of each actuator is monitored by the controller to ensure alignment. One controller serves 12 RayTracker GC units, and is included with the system." EX1006, p. 2.

197. *RayTracker* describes specific benefits of tracking the movement of the sun. For example, "RayTracker GC improves energy yield by optimally positioning the solar panels throughout the day. Energy boosts of up to 38% are possible compared to flat-mounted panels. Single-axis trackers outperform fixed-tilt installations most importantly during peak energy demand periods. RayTracker GC achieves this with a simple, low-profile, low-parts-count mechanism." EX1006, p. 2.



EX1006, p. 2

198. Therefore, in my opinion, *RayTracker* teaches and anticipates this element of the claim.

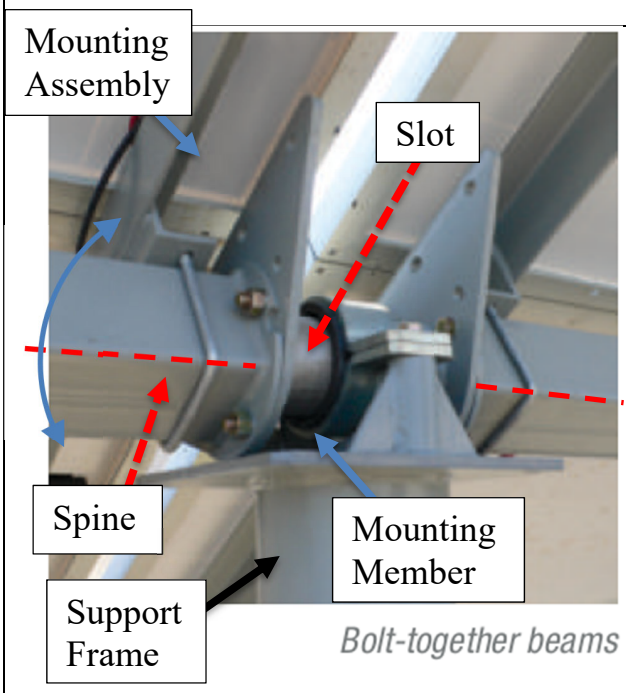
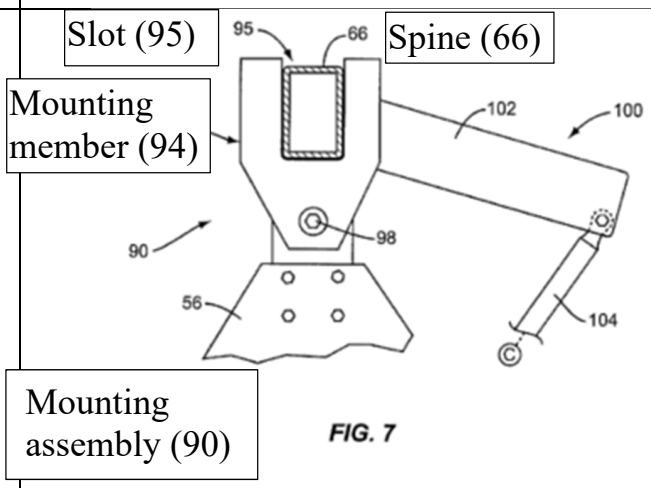
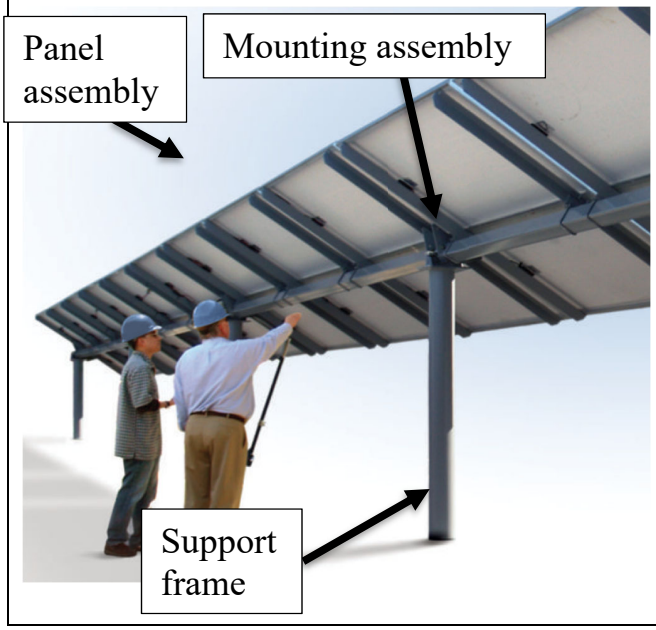
g. 1[f] "a mounting assembly for rotatably mounting the panel assembly to the support frame, said mounting assembly comprising:"

199. The '17546 Patent describes a "second mounting assembly 90 comprises a connecting plate 92, a pair of mounting forks 94, a bearing 96, and a pivot member 98." EX1002, 4:6-11. The specification of the '17546 Patent does not recite "mounting member." To the extent the term "mounting member" is supported by the specification of the '17546 Patent, a POSITA would interpret the claimed mounting member to be the mounting fork 94.

200. In my opinion, *RayTracker* discloses "a mounting assembly for rotatably mounting the panel assembly to the support frame," as claimed. For example, *RayTracker* describes a mounting assembly for rotatably mounting the panel assembly to the support frame by rotating the torque tube. EX1006, pp. 4, 5. For example, *RayTracker* discloses a bearing assembly that mounts on top of the support posts for rotatably mounting the panel assembly (i.e., by rotating the torque tube) to the support posts. EX1006, pp. 2, 4, 5.

201. Below is an annotated figure from *RayTracker* illustrating the mounting assembly, as compared with the mounting assembly embodiment depicted in the

'17546 Patent. Therefore, in my opinion, *RayTracker* teaches and anticipates this element of the claim.

RayTracker	**U.S. Patent No. 9,917,546**
 EX1006, p. 5	 EX1002, Fig. 7 (mounting assembly 90, mounting member 94 (EX1002, 4:6-10); slot 95, spine 66 (EX1002, 4:12-15))
	

RayTracker	**U.S. Patent No. 9,917,546**
EX1006, p. 4	

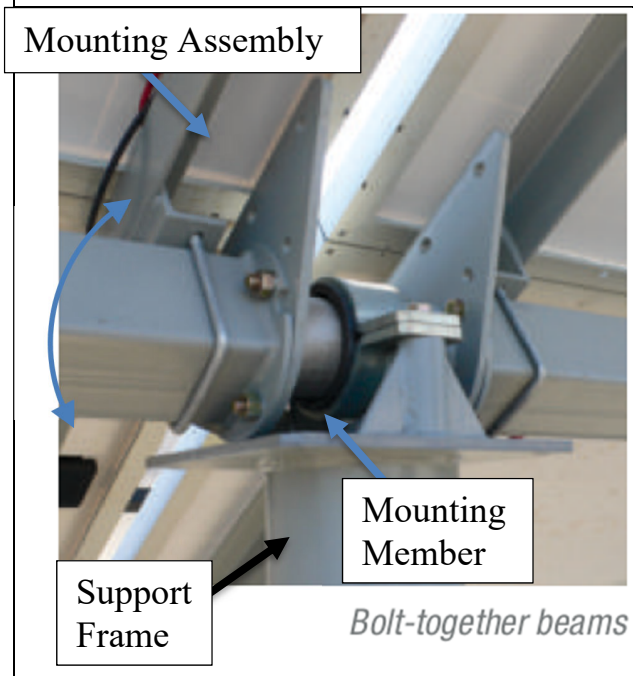
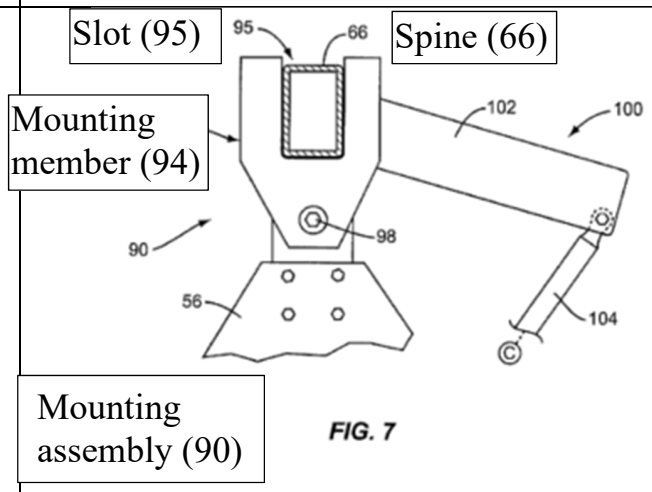
h. 1[g] "a mounting member configured to be rotatably connected to said support frame; and"

202. The '17546 Patent describes that "the mounting forks [mounting member] 94 include a slot 95 to receive the spine 66." EX1002, 4:12-15. The "[p]ivot member 98 extends through the mounting forks 94, upper end of connecting plate 92, and bearing 96, and is secured in place by a nut threaded onto the end of the pivot member 98." EX1002, 4:17-20.

203. In my opinion, *RayTracker* discloses "a mounting member configured to be rotatably connected to said support frame," as claimed. For example, *RayTracker* discloses a mounting assembly to rotatably mount the panel assembly to the support frame (support posts). EX1006, pp. 1, 4, 5. The mounting assembly includes a mounting member. EX1006, pp. 1, 4, 5. For example, *RayTracker* describes a bearing assembly mounted on top of the support posts for rotatably mounting the panel assembly (*e.g.*, via the torque tube) to the support posts. EX1006, pp. 1, 4, 5. The bearing assembly is formed of a split two-piece bearing. The bearing assembly includes an inner bearing race that rotates within outer bearing races. The

inner bearing race is a mounting member. The spine of the panel assembly can be placed in the slot in the mounting member.

204. Below is an annotated figure from *RayTracker* illustrating the mounting assembly, as compared with the mounting assembly embodiment depicted in the '17546 Patent. Therefore, in my opinion, *RayTracker* teaches and anticipates this element of the claim.

RayTracker	**U.S. Patent No. 9,917,546**
 EX1006, p. 5	 EX1002, Fig. 7 mounting assembly 90, mounting member 94 (EX1002, 4:6-10); slot 95, spine 66 (EX1002, 4:12-15))

i. 1[h] "an open-ended slot in said mounting member configured to receive the central spine of the panel assembly."

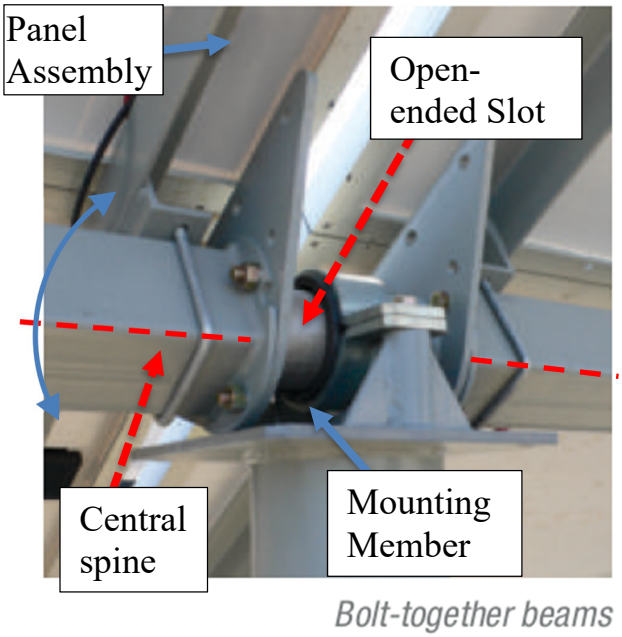
205. The '17546 Patent describes a "second mounting assembly 90 comprises a connecting plate 92, a pair of mounting forks 94, a bearing 96, and a pivot member 98." EX1002, 4:6-11. "The mounting forks 94 include a slot 95 to receive the spine 66..." EX1002, 4:12-15. The specification of the '17546 Patent does not use, let alone define, the term "*open-ended* slot" as recited in the claims. Notwithstanding the term not appearing anywhere in the '17546 Patent, Petitioners have interpreted "open-ended slot" to describe the open slot depicted in Figure 7, as reproduced below.

206. In my opinion, *RayTracker* discloses "an open-ended slot in said mounting member configured to receive the central spine of the panel assembly," as claimed. For example, *RayTracker* discloses a mounting member that includes an open-ended slot. EX1006, pp. 4, 5. For example, *RayTracker* discloses a bearing assembly mounted to the top of the support posts for rotatably mounting the panel assembly (*e.g.*, via the torque tube) to the support posts. EX1006, pp. 4, 5. A POSITA would understand that the bearing assembly is formed a split two-piece bearing. The bearing assembly includes an inner bearing race that rotates within outer bearing races. The inner bearing race is a mounting member. The spine of the panel assembly can be placed in a slot (*e.g.*, the open-ended slot of the bearing) in the mounting member (i.e., in the lower portion of the bearing).

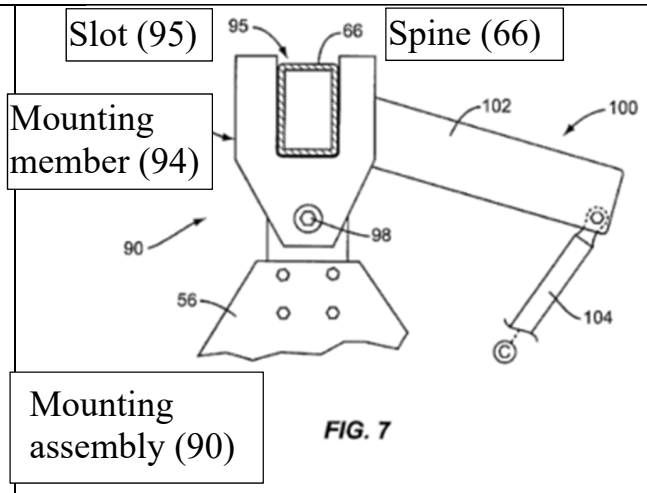
207. To the extent that it is argued that *RayTracker's* bearing assembly does not include two moving races, it would instead be a stationary bearing (such as a plain bearing, bushing, sleeve bearing, or the like, which can be split-two piece bearings). It is my opinion that a POSITA would understand that such a bearing would include an inner bearing surface along which an inner cylinder rotates. In such an interpretation, the cylinder would be the mounting member. And the spine of the panel assembly can be placed in an open-ended slot in the mounting member (*e.g.*, the open-ended slot of the inner cylinder within the bearing). For example, the open-ended slot receives the torque tube.

208. Below is an annotated figure from *RayTracker* illustrating the open-ended slot, as compared with the open-ended slot embodiment depicted in the '17546 Patent. Therefore, in my opinion, *RayTracker* teaches and anticipates this element of the claim.

RayTracker	**U.S. Patent No. 9,917,546**



EX1006, p. 5



EX1002, Fig. 7

(mounting assembly 90, mounting member 94 (EX1002, 4:6-10); slot 95, spine 66 (EX1002, 4:12-15))

E. Ground 3A: Claims 5 and 6 of the '57546 Patent Were Rendered Obvious by *Wattsun* in view of *RayTracker*

Summary of Prior Art Combination

209. The challenged claims of the '57546 Patent recite a solar tracker having four primary elements: (1) a support frame; (2) a panel assembly, rotatably mounted to the support frame, having a central spine; (3) a mounting assembly for mounting the panel assembly to the support frame; and (4) an actuator for rotating the panel assembly. Dependent claim 6 further recites solar panels mounted to the panel assembly. As discussed in the '57546 Patent, the solar tracker is configured so that the panel assembly can rotate based on the sun's position throughout the day.

210. In my opinion, *Wattsun* describes a solar tracker that include all of the elements and limitations of claims 5 and 6 of the '57546 Patent and includes structural members and components that are essentially indistinguishable from those in claims 5 and 6 of the '57546 Patent.

211. But to the extent that it is argued that *Wattsun* fails to anticipate any particular element, either structurally or functionally, (which I disagree with and, in my opinion would be incorrect), it is my opinion that the teachings in *RayTracker* would sufficiently remedy and fill any such potential gaps and would have motivated a POSITA to operate *Wattsun's* system in a way so as to meet all of the limitations of the asserted claims. For example, a POSITA seeking to further improve the power generation yield of a set of solar panels on a solar tracker, such as the solar tracker of *Wattsun*, would be motivated to seek and consider other available teachings regarding improved solar trackers, such as those in *RayTracker*.

212. And while *Wattsun* may include a two-axis solar tracker and *RayTracker* may only be a one-axis system, a POSITA would nevertheless appreciate the sun tracking components and techniques or *RayTracker* and benefits thereof. Both *Wattsun* and *RayTracker* describe the same types of systems – solar trackers – and are in the same field of endeavor. A POSITA would further have recognized that the techniques disclosed in *RayTracker* would improve the functionality of the solar tracker of *Wattsun*, which is a similar device that operates

in a similar way (albeit with *Wattsun's* system being two-axis and *RayTracker* only being one-axis).

213. Further, in my opinion, a POSITA would have reasonably expected a benefit (*e.g.*, in efficiency and operation control from *RayTracker's* GPS tracking methods) from the combination of the teachings of *RayTracker* with the solar trackers of *Wattsun*. Further, integrating the teachings of *RayTracker* into *Wattsun* would be obvious to try and would yield expected results. Therefore, there would have been ample motivation to combine the teachings of *Wattsun* and *RayTracker.*

1. Independent Claim 5 of the '57546 Patent

a. 5[p] "A solar tracker comprising:"

214. I understand that sometimes patent claim preambles are not limiting and sometimes they are. Here, to the extent that the preamble is limiting, it is my opinion that *Wattsun* discloses a device being described therein is an "AZ-125 Dual-Axis, Azimuth Drive Solar Tracker." *Wattsun*, p. 1.

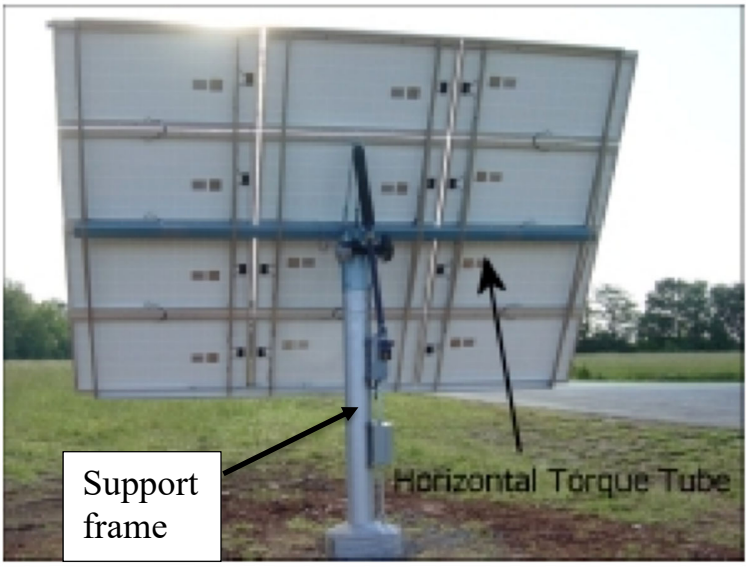
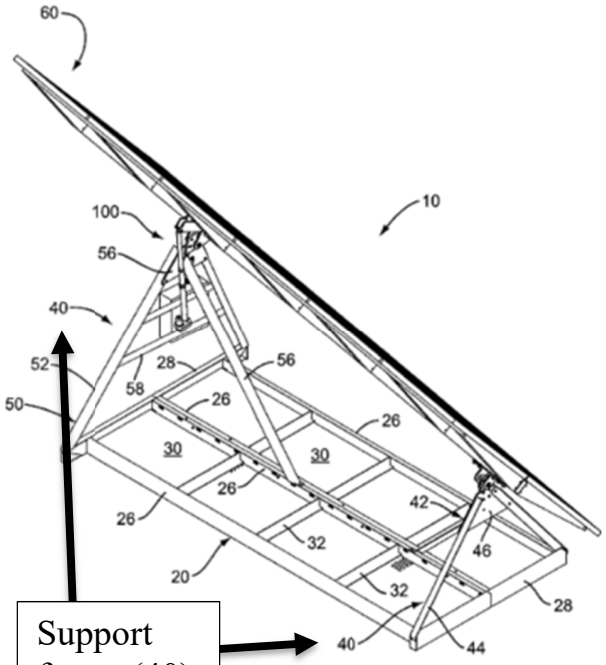
b. 5[a] "a support frame;"

215. The '57546 Patent describes that the "support frame 40 mounts to the base 20" (shown below). EX1001, 2:57-58. "The panel assembly 60 is rotatably mounted to the support frame 40." EX1001, 3:45-46.

216. In my opinion, *Wattsun* discloses or at least renders obvious "a support frame," as claimed. For example, *Wattsun* discloses a steel support frame that

includes a support post that supports the other components (*e.g.*, solar panels and mounting components) of the solar tracker. Specifically, *Wattsun* states and describes that "[t]he Wattsun™ Tracker requires a length of Eight-Inch ID Schedule 40 Steel Pipe for use as the pipe mast. Specifications for the pipe mast can be found on the data sheet for this particular tracker." EX1004, p. 1.

217. Further, below is an annotated figure from *Wattsun* showing the support frame, which is formed of a support post, as compared with the embodiment depicted in the '57546 Patent. Therefore, in my opinion, *Wattsun* alone or in view of *RayTracker* teaches, anticipates, and/or renders obvious this element of the claim.

Wattsun	**U.S. Patent No. 9,057,546**
 EX1004, p. 9	 EX1001, Fig. 2

	(support frame 40 (EX1001, 2:57-58))

218. To the extent that it is argued or determined that *Wattsun* fails to explicitly disclose any particular limitation of this element, in my opinion, such limitations would have been obvious to a POSITA, either in view of a POSITA's knowledge at the time, or in view of *RayTracker*.

c. 5[b] "a panel assembly rotatably mounted to the support frame for supporting one or more solar panels, said panel assembly comprising a central spine and a plurality of panel carriers extending outwardly from said spine;"

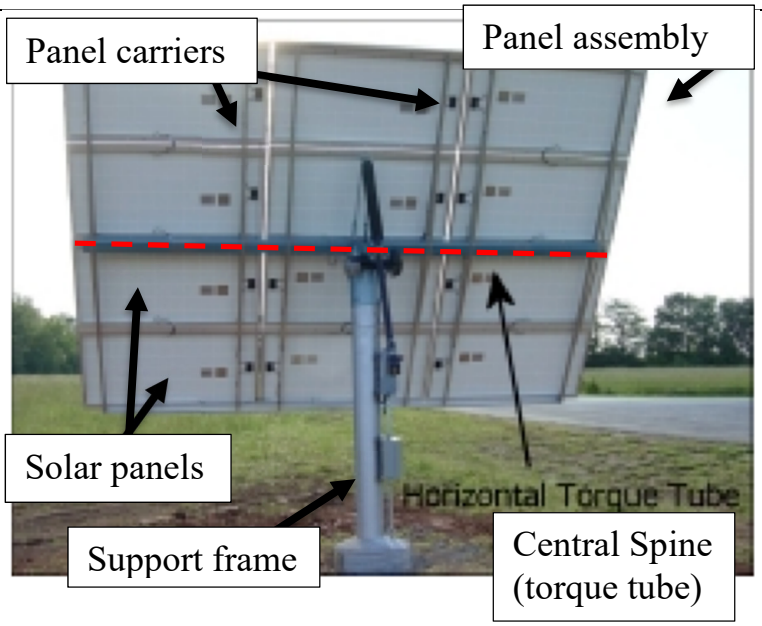
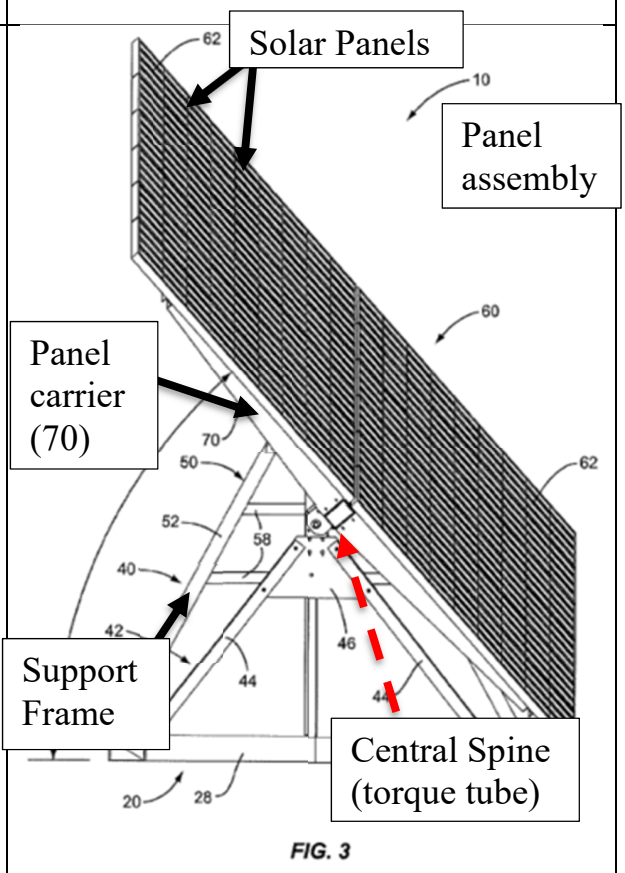
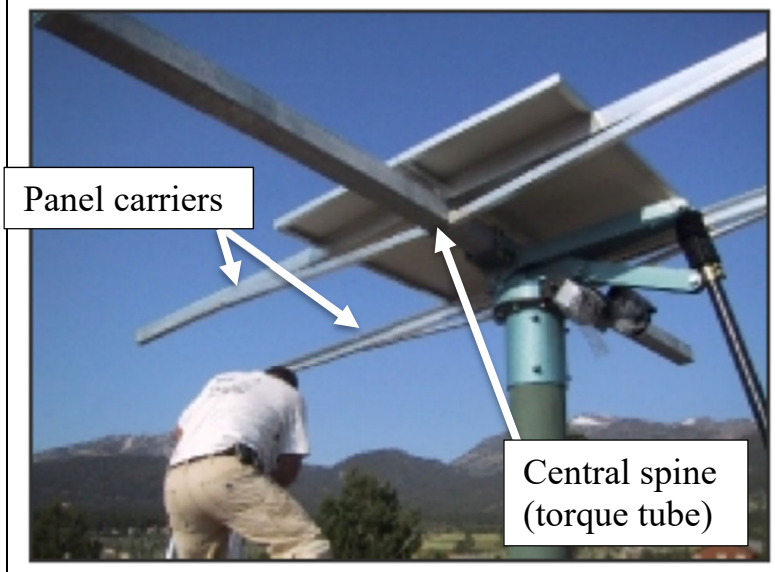
219. The '57546 Patent describes that a "panel assembly 60 comprises a plurality of solar panels 62 and a panel support frame 64 to support the solar panels." EX1001, 3:24-26. "The panel support frame 64 comprises a central spine 66, a pair of laterally-spaced side members 68, and a plurality of longitudinally-spaced panel carriers 70, which can be removably connected by bolts and nuts, or other fasteners." EX1001, 3:26-29.

220. In my opinion, *Wattsun* discloses or at least renders obvious "a panel assembly rotatably mounted to the support frame for supporting one or more solar panels, said panel assembly comprising a central spine and a plurality of panel carriers extending outwardly from said spine," as claimed. For example, *Wattsun* discloses solar panels (a set of solar panels) that move and rotate as a unit to track

the sun's position. Specifically, *Wattsun* discloses, "Wattsun™ Solar Trackers utilize a patented, closed loop, optical sensing system to sense the sun's position and track it." EX1004, p. 19.

221. In addition, *Wattsun* discloses a plurality of panel carriers (e.g., elongated members) that extend outwardly from a central spine (*e.g.*, a torque tube beam) that extends along the center of the panel assembly for supporting solar panels. EX1004, pp. 8, 9, 15, 16. For example, *Wattsun* describes a support frame, on which panels (photovoltaic solar panels) are rotatably mounted via a panel assembly. EX1004, pp. 8, 9, 15, 16. The panel assembly includes a torque tube (which *Wattsun* describes as a "Horizontal Torque Tube") that extends along the center of the panel assembly. EX1004, pp. 8, 9, 15, 16. *Wattsun* discloses transversely arranged elongated members to which the photovoltaic members are mounted. EX1004, pp. 8, 9, 15, 16.

222. Below is an annotated figure from *Wattsun* illustrating the panel assembly with panel carriers, as compared with the panel assembly embodiment depicted in the '57546 Patent. As depicted below, *Wattsun's* panel carriers are clearly illustrated as extending outwardly from the torque tube. Therefore, in my opinion, *Wattsun* alone or in view of *RayTracker* teaches, anticipates, and/or renders obvious this element of the claim.

Wattsun	**U.S. Patent No. 9,057,546**
 EX1004, p. 9	 FIG. 3 EX1001, Fig. 3
 One installer, one piece at a time approach. Modules are being used to "square-up: the frame. EX1004, p. 16	(support frame 40 (EX1001, 2:57-58); panel assembly 60, solar panels 62 (EX1001, 3:24-26); central spine 66, panel carriers 70 (EX1001, 3:26-29))

223. To the extent that it is argued or determined that Wattsun fails to explicitly disclose any particular limitation of this element, in my opinion, such limitations would have been obvious to a POSITA, either in view of a POSITA's knowledge at the time, or in view of RayTracker.

d. 5[c] "a mounting assembly for rotatably mounting the panel assembly to the support frame, the mounting assembly comprising a mounting member rotatably connected to the support frame and a slot in said mounting member configured to receive the spine of the panel assembly; and"

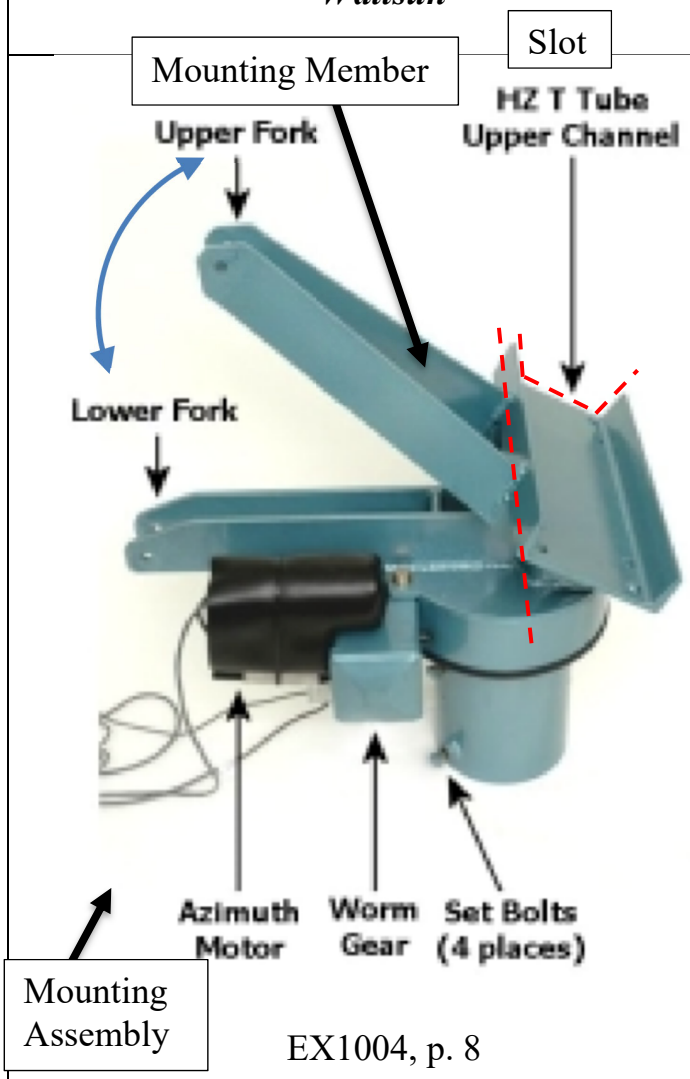
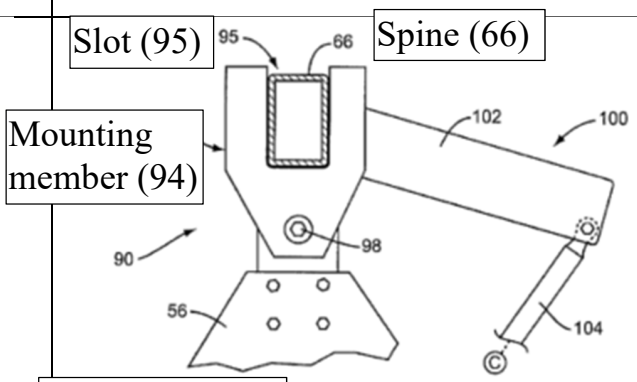
224. The '57546 Patent describes a "second mounting assembly 90 comprises a connecting plate 92, a pair of mounting forks 94, a bearing 96, and a pivot member 98." EX1001, 3:64-66. "The mounting forks 94 include a slot 95 to receive the spine 66..." EX1001, 4:1-3. The "[p]ivot member 98 extends through the mounting forks 94, upper end of connecting plate 92, and bearing 96, and is secured in place by a nut threaded onto the end of the pivot member 98." EX1001, 4:5-8. The specification of the '57546 Patent does not recite "mounting member." To the extent the term "mounting member" is supported by the specification of the '57546 Patent, a POSITA would interpret the claimed mounting member to be the mounting fork 94.

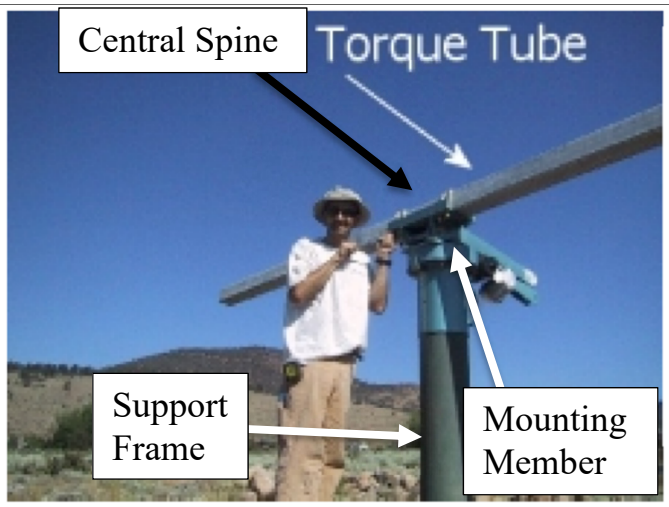
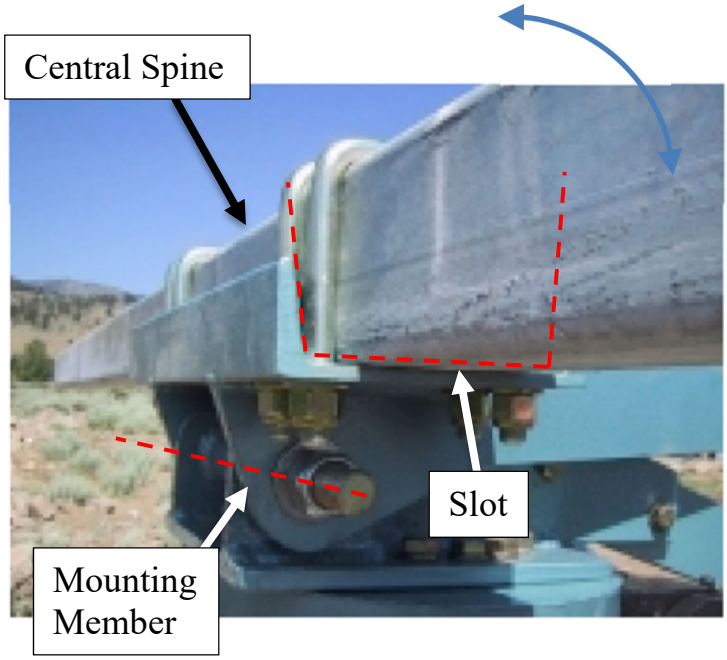
225. In my opinion, *Wattsun* discloses or at least renders obvious "a mounting assembly for rotatably mounting the panel assembly to the support frame,

the mounting assembly comprising a mounting member rotatably connected to the support frame and a slot in said mounting member configured to receive the spine of the panel assembly." That is, *Wattsun* describes a mounting assembly for rotatably mounting the panel assembly to the support frame. And the mounting assembly includes a mounting member.

226. For example, *Wattsun* discloses a horizontal torque tube drive that rotatably mounts on top of the support frame (*e.g.*, the support post) for rotating the panel assembly with respect to the support frame. EX1004, pp. 6, 8, 9, 12, 16. The horizontal torque tube drive includes an upper fork component (a rotatably mounted upper fork) that defines a torque tube upper channel. EX1004, pp. 6, 8, 9, 12, 16. The axis of rotation is denoted in a dashed line below. The upper fork, together with the HZ T Tube Upper Channel attached thereto, is a mounting member and receives the torque tube. Specifically, the upper channel includes or forms a slot (annotated below in dashed lines and the torque tube spine of the panel assembly can be placed in the slot in the mounting member. EX1004, pp. 6, 8, 9, 12, 16.

227. Below is an annotated figure from *Wattsun* illustrating the mounting assembly, as compared with the mounting assembly embodiment depicted in the '57546 Patent. Therefore, in my opinion, *Wattsun* alone or in view of *RayTracker* teaches, anticipates, and/or renders obvious this element of the claim.

Wattsun	**U.S. Patent No. 9,057,546**
 EX1004, p. 8	 EX1001, Fig. 7 (mounting assembly 90, mounting member 94 (EX1001, 3:64-66); slot 95, spine 66 (EX1001, 4:1-3))

Wattsun	**U.S. Patent No. 9,057,546**
 EX1004, p. 9  EX1004, p. 12	

228. To the extent that it is argued or determined that *Wattsun* fails to explicitly disclose any particular limitation of this element, in my opinion, such limitations would have been obvious to a POSITA, either in view of a POSITA's knowledge at the time, or in view of *RayTracker*.

e. 5[d] "an actuator assembly for rotating the panel assembly to track the movement of the sun."

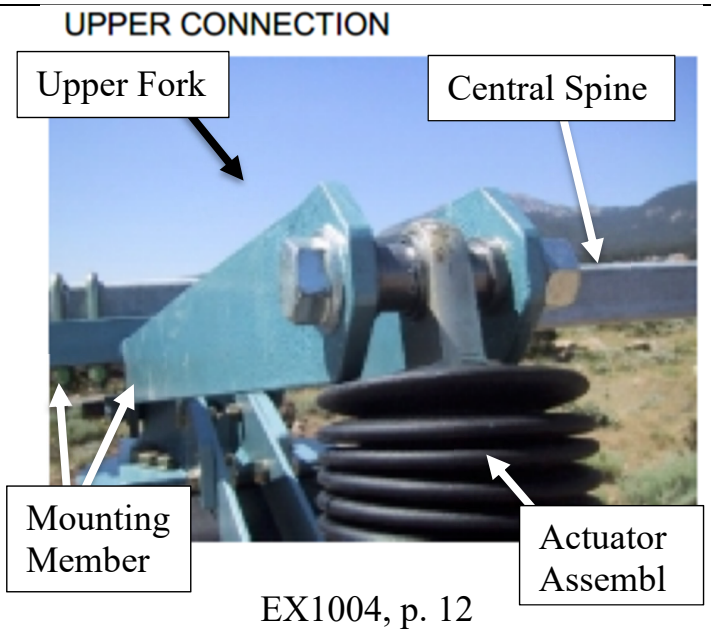
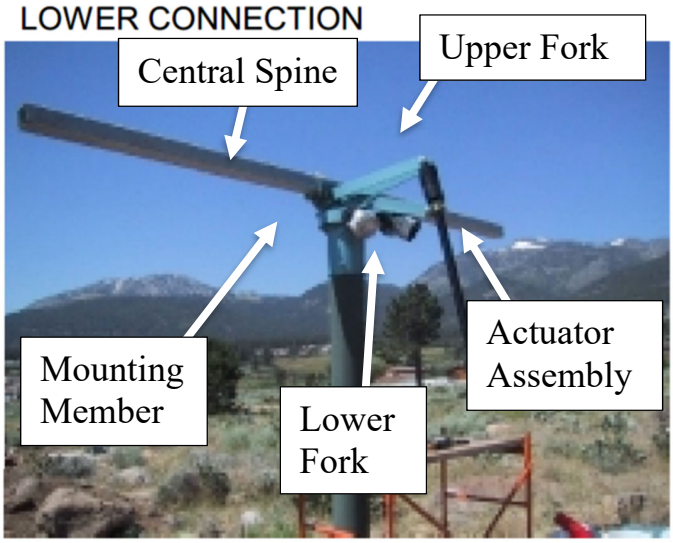
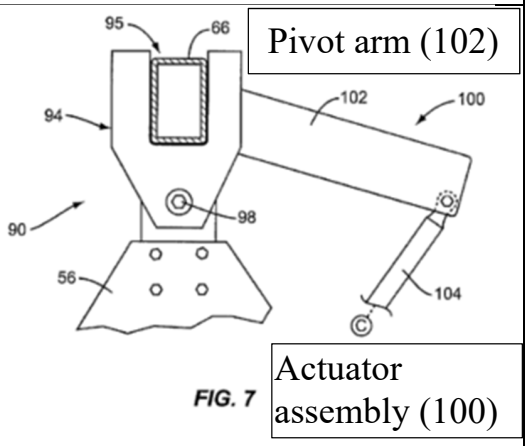
229. The '57546 Patent describes an "[a]ctuator assembly 100, shown in FIG.7, comprises a pivot arm 102, fluid cylinder 102 [*sic.*], and control unit 106." EX1001, 4:18-19. The "[p]ivot arm 102 is connected at one end to the spine 66 and extends outward from the spine 66…" EX1001, 4:19-22. The "[f]luid cylinder 104 is connected at one end to the pivot arm 102." EX1001, 4:22-23. "The control unit 106 is mounted to the front frame and controls operation of the fluid cylinder 104." EX1001, 4:23-25.

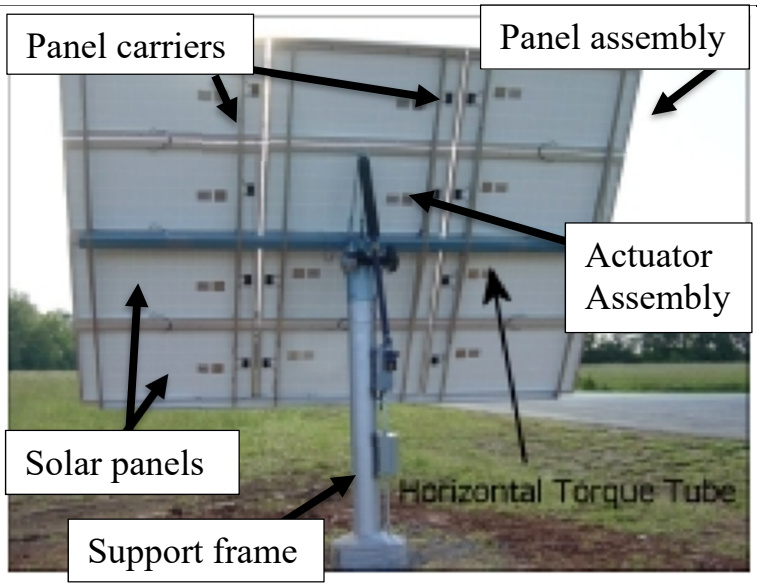
230. In my opinion, *Wattsun* discloses or at least renders obvious "an actuator assembly for rotating the panel assembly to track the movement of the sun." For example, *Wattsun* describes an actuator assembly (*e.g.*, an actuator system) to rotate the panel assembly. For example, *Wattsun* discloses an actuator (*e.g.*, an electromechanical actuator) for rotating the panel assembly to track the position (movement) of the sun. Specifically, *Wattsun* discloses that the solar tracker includes an "actuator assembly for dual-axis operation." EX1004, p. 12. *Wattsun*

discloses that this actuation is to track the sun's position. Specifically, *Wattsun* discloses "Wattsun™ Solar Trackers utilize a patented, closed loop, optical sensing system to sense the sun's position and track it." EX1004, p. 19.

231. *Wattsun* teaches attaching an actuator assembly (e.g., the elevation actuator) to the forks (i.e., the upper fork and lower fork) to move the upper fork and therefore the connect panel assembly attached to it. Specifically, *Wattsun* instructs an installer to "[c]enter both the eyelet end (the top) of the elevation actuator inside the forks and the elevation actuator clamp eyelet (the bottom)." EX1004, p. 12. *Wattsun* also includes a series of images and assembly instructions to teach how the actuator assembly is attached to the mounting assembly for rotating the panel assembly. EX1004, pp. 8-9, 12-13.

232. Below is an annotated figure from *Wattsun* illustrating the actuator assembly, as compared with the actuator assembly embodiment depicted in the '57546 Patent. Therefore, in my opinion, *Wattsun* alone or in view of *RayTracker* teaches, anticipates, and/or renders obvious this element of the claim.

Wattsun	**U.S. Patent No. 9,057,546**
 EX1004, p. 12  EX1004, p. 12	 FIG. 7 EX1001, Fig. 7 (actuator assembly 100, fluid cylinder 104, pivot arm 102 (EX1001, 4:18-19))

Wattsun	**U.S. Patent No. 9,057,546**
 EX1004, p. 9	

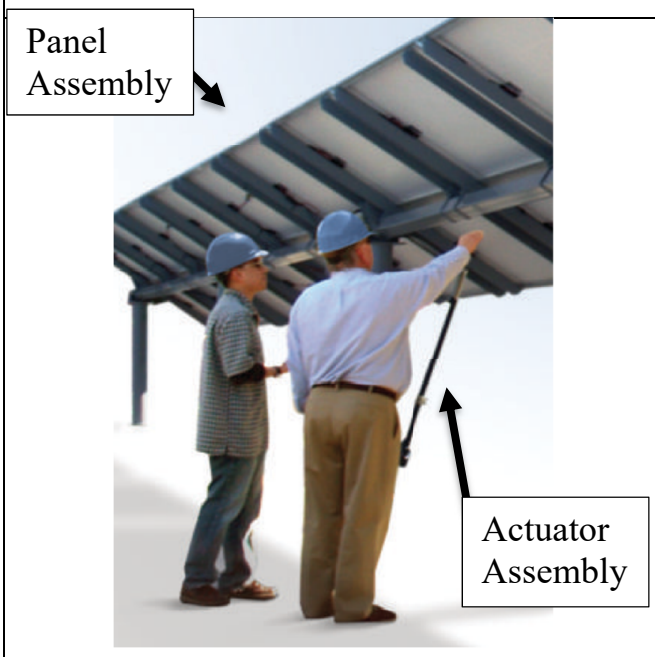
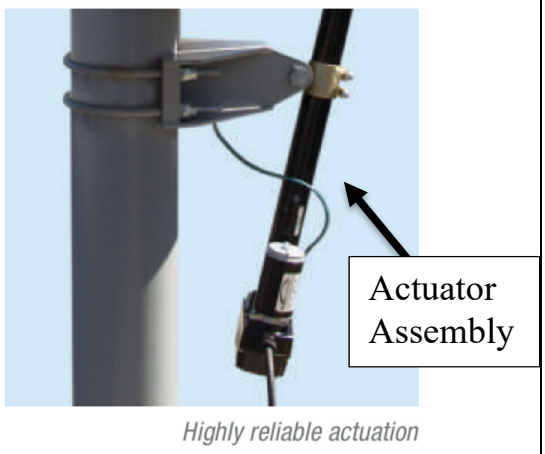
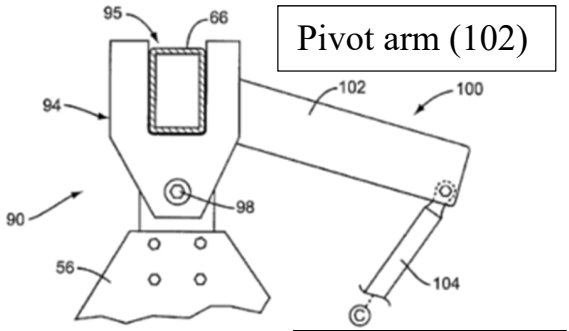
233. To the extent that it is argued, or considered by the Board, or argued by Patent Owner, that *Wattsun* fails to adequately describe or otherwise anticipate this element, namely "an actuator assembly for rotating the panel assembly to track the movement of the sun," in my opinion, such limitations would have been obvious to a POSITA, either in view of a POSITA's knowledge at the time, or in view of *RayTracker*, which would remedy any such deficiency and render the claim element, and the claim as a whole, invalid as being obvious.

234. For example, *RayTracker* describes an actuator assembly (e.g., an actuator system) to move (rotate) the panel assembly. EX1006, pp. 2, 4, 5. For

example, *RayTracker* discloses an electromechanical actuator to rotate the panel assembly based on, and to track, the movement of the sun. EX1006, pp. 2, 4, 5. *RayTracker* specifically discloses that the system is formed of "just two moving parts – the actuator and one structural assembly that rotates on a bearing surface." EX1006, p. 4.

235. In addition, *RayTracker* states that "RayTracker GC is a single-axis tracker system that significantly increases the lifetime energy yield of a photovoltaic system, improving the return on investment for commercial-scale, ground- or carport-mount installations." EX1006, p. 1.

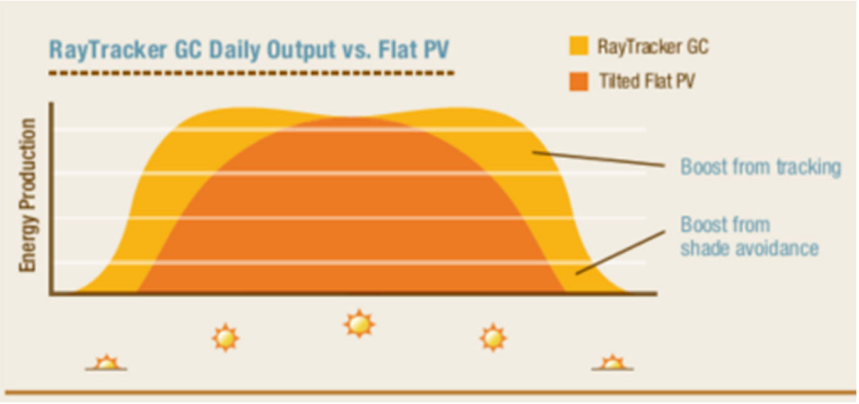
236. Below is an annotated figure from *RayTracker* illustrating the actuator assembly, as compared with the actuator assembly embodiment depicted in the '57546 Patent.

RayTracker	**U.S. Patent No. 9,057,546**
 EX1006, p. 4  EX1006, p. 2	 EX1001, Fig. 7 (actuator assembly 100, fluid cylinder 104, pivot arm 102 (EX1001, 4:18-19))

237. In addition, *RayTracker* further specifically describes that the system is actuated particularly to track the position (movement) of the sun. For example,

"[t]he tracking function is provided by a custom microprocessor controller that uses a GPS time reference and a precise astronomical algorithm to automatically and accurately point the panels at the sun. The position of each actuator is monitored by the controller to ensure alignment. One controller serves 12 RayTracker GC units, and is included with the system." EX1006, p. 2.

238. *RayTracker* describes specific benefits of tracking the movement of the sun. For example, "RayTracker GC improves energy yield by optimally positioning the solar panels throughout the day. Energy boosts of up to 38% are possible compared to flat-mounted panels. Single-axis trackers outperform fixed-tilt installations most importantly during peak energy demand periods. RayTracker GC achieves this with a simple, low-profile, low-parts-count mechanism." EX1006, p. 2.



EX1006, p. 2

239. And, in my opinion, it would have been obvious to a POSITA to use the system disclosed in *Wattsun* in the manner as described in *RayTracker*, including making any implementation modifications that could be required in order to do so, to arrive at the claimed limitation of an actuator assembly for rotating the panel assembly to track the movement of the sun.

240. As detailed above, in my opinion, *Wattsun* discloses a solar tracker that is configured to rotate solar panels toward the sun as the sun moves throughout the sky. EX1004, pp. 12, 19. *Wattsun* plainly states "Wattsun™ Solar Trackers utilize a patented, closed loop, optical sensing system to sense the sun's position and track it." EX1004, p. 19. Similarly, *RayTracker* also describes a solar tracker system that rotates solar panels toward the sun as the sun moves through the sky. *RayTracker* states "RayTracker GC improves energy yield by optimally positioning the solar panels throughout the day…Single-axis trackers outperform fixed-tilt installations most importantly during peak energy demand periods." EX1006, p. 2.

241. In my opinion, a POSITA would have found it obvious to try modifying *Wattsun's* solar tracker to include features, components, or techniques described in *RayTracker* for any of a variety of reasons. For example, *Wattsun* and *RayTracker* address the same problem as one another (i.e., increasing energy yield over fixed-panel solar systems) with similar approaches and solutions as one another (i.e., mechanically rotating the solar panels about an axis using a solar tracker to face the

sun throughout the day). RayTracker's actuator and controller system was therefore a known, predictable, suitable, and thus obvious, technique for addressing that *Wattsun's* problem of directing the solar panel toward the sun to increase yield.

242. Therefore, in my opinion, *Wattsun* alone or in view of *RayTracker* teaches, anticipates, and/or renders obvious this element of the claim.

2. Dependent Claim 6

243. Dependent claim 6 recites: "The solar tracker of claim 5 wherein the panel assembly further comprises one or more solar panels mounted to the panel carriers." EX1001, claim 6.

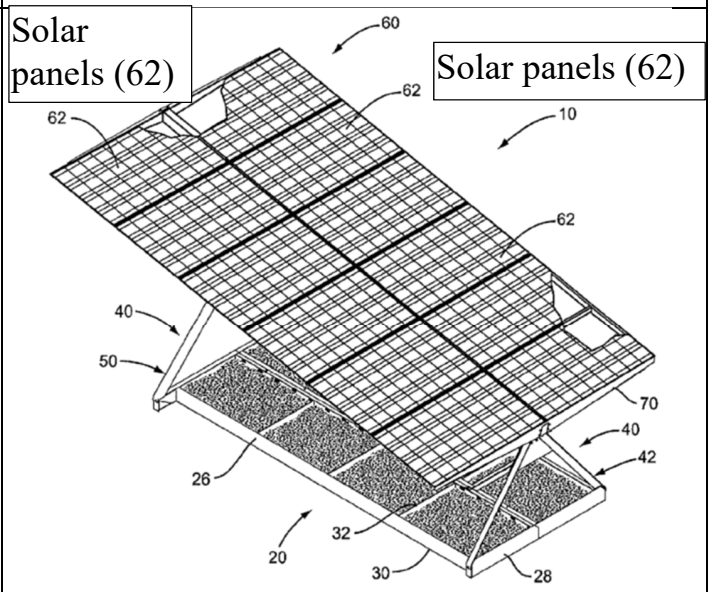
244. The '57546 Patent describes that the "panel assembly 60 comprises a plurality of solar panels 62 and a panel support frame 64 to support the solar panels." EX1001, 3:24-26.

245. It is my opinion that *Wattsun* disclosed a solar tracker wherein the panel assembly further comprises one or more solar panels mounted to the panel carriers and anticipated this additional claim feature.

246. *Wattsun* is full of references to, and disclosures of, solar panels, often referred to a photovoltaic (PV) array. *See e.g.*, EX1004, p. 1 ("[t]he tracker comes complete with all the hardware necessary for assembly and mounting the PV modules."); EX1004, p. 5 ("[c]hoose an optimum solar location to install the PV array for in the ground mounting."); EX1004, p. 14 ("[t]he PV modules may be

mounted to the struts at this time - prior to installation onto the torque tube assembly."); EX1004, p. 17 ("[t]he azimuth tracker works by rotating the PV array about the pipe mast then tilting the array to the proper elevation angle."); and EX1004, p. 23 ("[t]he sensor mounts on the TOP CENTER (or near the center) of the PV array"). Further, *Wattsun* illustrates the system as including solar panels.

247. Below is an annotated figure from *Wattsun* illustrating the solar panels, as compared with the solar panels depicted in the '57546 Patent. Therefore, in my opinion, *Wattsun* alone or in view of *RayTracker* teaches, anticipates, and/or renders obvious this element of the claim.

Wattsun	**U.S. Patent No. 9,057,546**
 EX1004, p. 9	 FIG. 1 EX1001, Fig. 2 (solar panel 62 (EX1001, 3:42-43))

248. To the extent that it is argued or determined that *Wattsun* fails to explicitly disclose any particular limitation of this element, in my opinion, such limitations would have been obvious to a POSITA, either in view of a POSITA's knowledge at the time, or in view of *RayTracker*.

249. In addition, to the extent that it is argued, or considered by the Board that *Wattsun* fails to adequately describe or otherwise anticipate this element, namely "an actuator assembly for rotating the panel assembly to track the movement of the sun" in the independent claim 5 from which claim 6 depends, *RayTracker* remedies

such a deficiency and renders the claim element, and the claim as a whole, invalid as being obvious for at least the reasons discussed above at claim element 5(d). The arguments from Section 5(d) above are hereby incorporated here by reference in their entirety.

F. Ground 3B: Claim 1 of the ′17546 Patent Was Rendered Obvious by *Wattsun* in view of *RayTracker*

Summary of Prior Art Combination

250. The challenged claims of the ’17546 Patent recite a support structure for a solar tracker having six primary elements: (1) a support frame; (2) a panel assembly, rotatably mounted to the support frame; (3) a central spine rotatably mounted to the support frame; (4) a plurality of panel carriers fixed relative to the central spine and extending outwardly from both sides of said central spine for supporting said solar panels; (5) an actuator assembly for rotating the panel assembly to track the movement of the sun; (6) a mounting assembly for rotatably mounting the panel assembly to the support frame, said mounting assembly comprising: (6a) a mounting member configured to be rotatably connected to said support frame; and (6b) an open-ended slot in said mounting member configured to receive the central spine of the panel assembly.

251. In my opinion, *Wattsun* describes a solar tracker that include all of the elements and limitations of claims 5 and 6 of the ’57546 Patent and includes

structural members and components that are essentially indistinguishable from those in claims 5 and 6 of the ’57546 Patent.

252. But to the extent that it is argued that *Wattsun* fails to anticipate any particular element, either structurally or functionally, (which I disagree with and, in my opinion would be incorrect), it is my opinion that the teachings in *RayTracker* would sufficiently remedy and fill any such potential gaps and would have motivated a POSITA to operate *Wattsun’s* system in a way so as to meet all of the limitations of the asserted claims. For example, a POSITA seeking to further improve the power generation yield of a set of solar panels on a solar tracker, such as the solar tracker of *Wattsun*, would be motivated to seek and consider other available teachings regarding improved solar trackers, such as those in *RayTracker*.

253. And while *Wattsun* may include a two-axis solar tracker and *RayTracker* may only be a one-axis system, a POSITA would nevertheless appreciate the sun tracking components and techniques or *RayTracker* and benefits thereof. A POSITA would further have recognized that the techniques disclosed in *RayTracker* would improve the functionality of the solar tracker of *Wattsun*, which is a similar device that operates in a similar way (albeit with *Wattsun’s* system being two-axis and *RayTracker* only being one-axis).

254. Further, a POSITA would have expected a benefit (e.g., in efficiency and operation control from *RayTracker’s* GPS tracking methods) from the

combination of the teachings of *RayTracker* with the solar trackers of *Wattsun*. Further, integrating the teachings of *RayTracker* into *Wattsun* would be obvious to try and would yield expected results. Therefore, there would have been ample motivation to combine the teachings of *Wattsun* and *RayTracker.*

1. Independent Claim 1 of the '17546 Patent

a. 1[p] "A support structure for solar tracker comprising:"

255. I understand that sometimes patent claim preambles are not limiting and sometimes they are. Here, to the extent that the preamble is limiting, it is my opinion that *Wattsun* discloses a device being described therein is an "AZ-125 Dual-Axis, Azimuth Drive Solar Tracker." EX1004, p. 1.

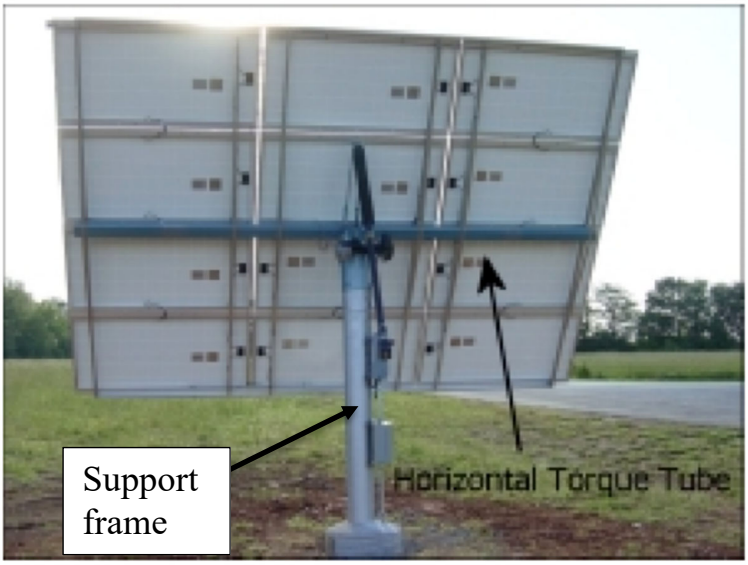
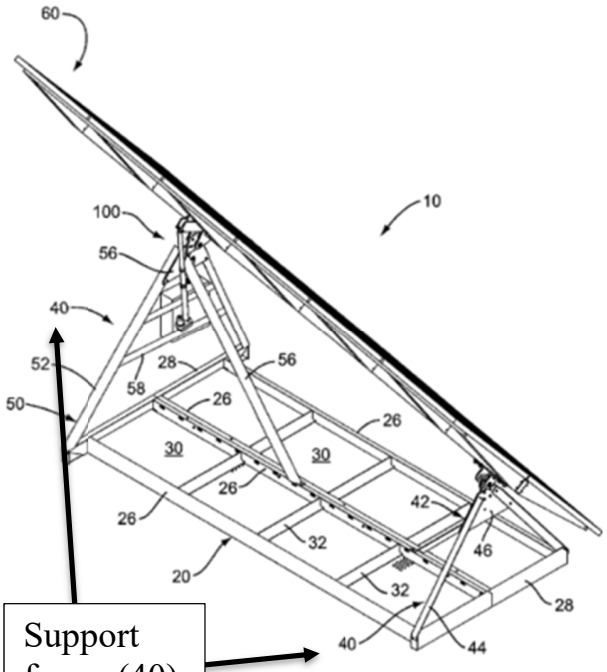
b. 1[a] "a support frame;"

256. The '17546 Patent describes that "the support frame 40 mounts to the base 20" (shown below). EX1002, 2:66. "The panel assembly 60 is rotatably mounted to the support frame 40." EX1002, 3:56-57.

257. In my opinion, *Wattsun* discloses or at least renders obvious "a support frame," as claimed. For example, *Wattsun* discloses a steel support frame formed of a support post that supports the other components (*e.g.*, solar panels and mounting components) of the solar tracker. Specifically, *Wattsun* states and describes that "[t]he Wattsun™ Tracker requires a length of Eight-Inch ID Schedule 40 Steel Pipe

for use as the pipe mast. Specifications for the pipe mast can be found on the data sheet for this particular tracker." EX1004, p. 1.

258. Further, below is an annotated figure from *Wattsun* showing the support frame, which is formed of a support post, as compared with the embodiment depicted in the '57546 Patent. Therefore, in my opinion, *Wattsun* alone or in view of *RayTracker* teaches, anticipates, and/or renders obvious this element of the claim.

Wattsun	**U.S. Patent No. 9,917,546**
 EX1004, p. 9	 EX1002, Fig. 2 (support frame 40 (EX1002, 2:66))

259. To the extent that it is argued or determined that *Wattsun* fails to explicitly disclose any particular limitation of this element, in my opinion, such limitations would have been obvious to a POSITA, either in view of a POSITA's knowledge at the time, or in view of *RayTracker*.

c. 1[b] "a panel assembly rotatably mounted to said support frame and configured to support one or more solar panels, said panel assembly including:"

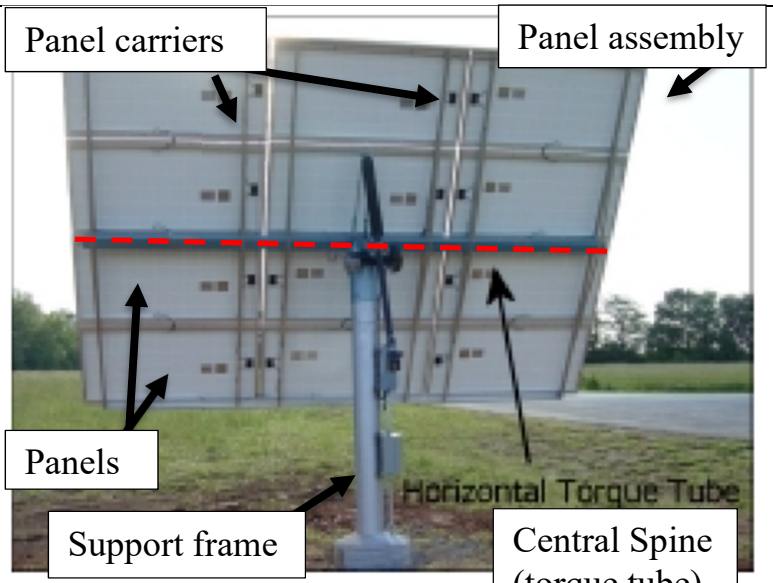
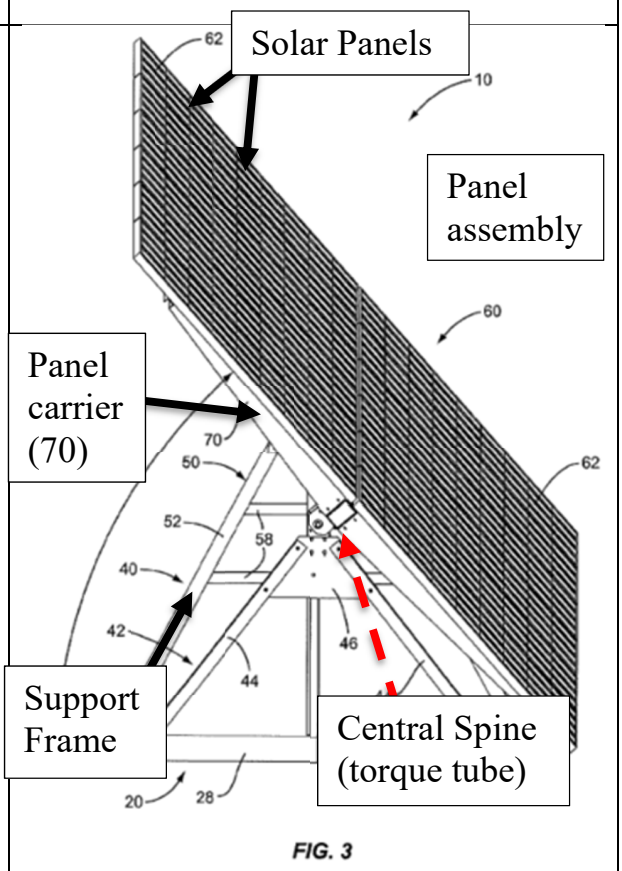
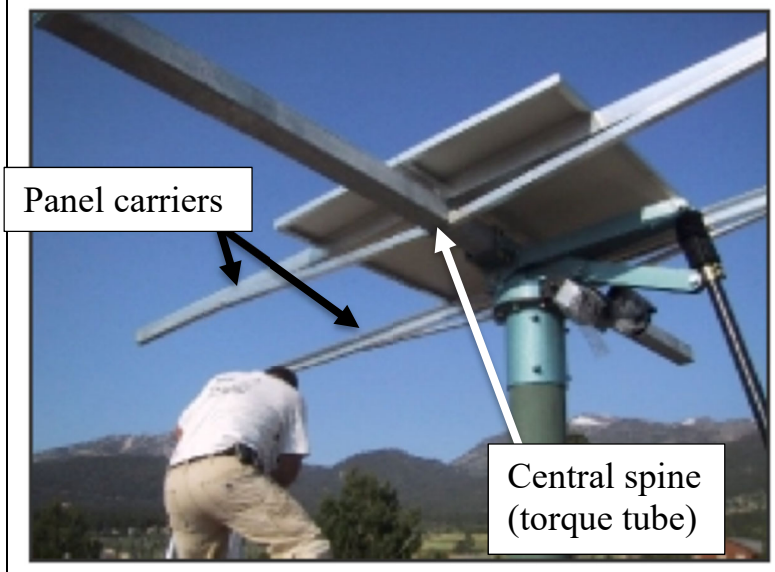
260. The '17546 Patent describes that a "[p]anel assembly 60 comprises a plurality of solar panels 62 and a panel support frame 64 to support the solar panels." EX1002, 3:34-36. "The panel support frame 64 comprises a central spine 66, a pair of laterally-spaced side members 68, and a plurality of longitudinally-spaced panel carriers 70, which can be removably connected by bolts and nuts, or other fasteners." EX1002, 3:36-40.

261. In my opinion, *Wattsun* discloses or at least renders obvious "a panel assembly rotatably mounted to said support frame and configured to support one or more solar panels," as claimed. For example, *Wattsun* discloses solar panels (a set of solar panels) that move and rotate as a unit to track the sun's position. Specifically, *Wattsun* discloses, "Wattsun™ Solar Trackers utilize a patented, closed loop, optical sensing system to sense the sun's position and track it." EX1004, p. 19.

262. In addition, *Wattsun* discloses a panel assembly having a plurality of panel carriers (e.g., elongated members) that extend outwardly from a central spine

(e.g., a torque tube beam) that extends along the center of the panel assembly for supporting solar panels. EX1004, pp. 8, 9, 15, 16. For example, *Wattsun* describes a support frame, on which solar panels (photovoltaic solar panels) are rotatably mounted via a panel assembly. EX1004, pp. 8, 9, 15, 16.

263. Below is an annotated figure from *Wattsun* illustrating the panel assembly with panel carriers, as compared with the panel assembly embodiment depicted in the '17546 Patent. As depicted below, *Wattsun's* panel carriers are clearly illustrated as extending outwardly from the torque tube. Therefore, in my opinion, *Wattsun* alone or in view of *RayTracker* teaches, anticipates, and/or renders obvious this element of the claim.

Wattsun	**U.S. Patent No. 9,917,546**
 EX1004, p. 9	 FIG. 3 EX1002, Fig. 3 (support frame 40 (EX1002, 2:66); panel assembly 60, solar panels 62 (EX1002, 3:34-36); central spine 66, panel carriers 70 (EX1002, 3:36-38))
 One installer, one piece at a time approach. Modules are being used to "square-up: the frame. EX1004, p. 16	

264. To the extent that it is argued or determined that *Wattsun* fails to explicitly disclose any particular limitation of this element, in my opinion, such limitations would have been obvious to a POSITA, either in view of a POSITA's knowledge at the time, or in view of *RayTracker*.

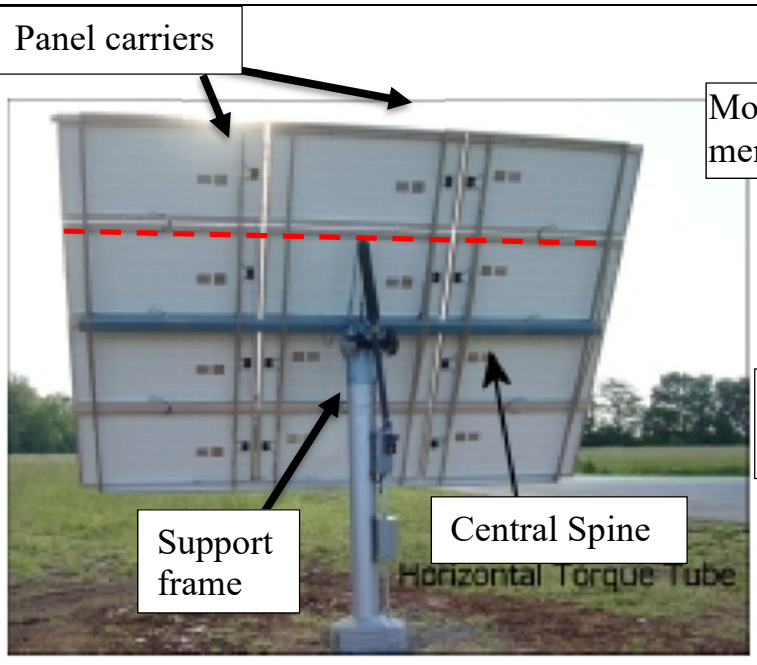
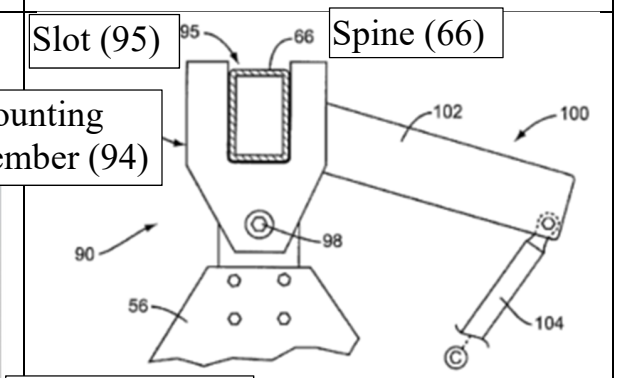
d. 1[c] "a central spine rotatably mounted to the support frame; and"

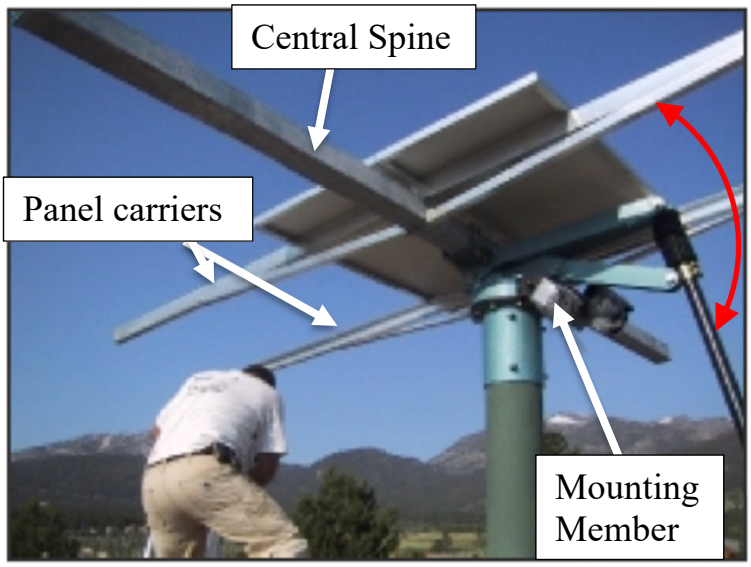
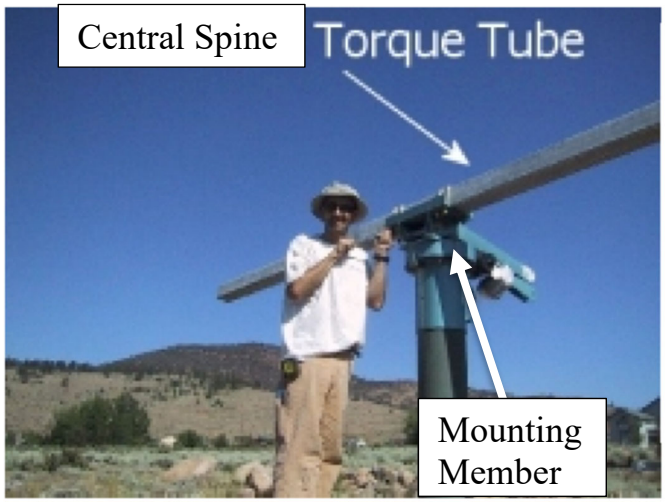
265. The '17546 Patent describes that "the panel support frame 64 comprises a central spine 66, a pair of laterally-spaced side members 68, and a plurality of longitudinally-spaced panel carriers 70, which can be removably connected by bolts and nuts, or other fasteners." EX1002, 3:36-40. The '17546 Patent describes that a "second mounting assembly 90 includes a connecting plate 92, a pair of mounting forks 94, a bearing 96, and a pivot member 98." EX1002, 4:6-11. "The mounting forks 94 include a slot 95 to receive the spine 66." EX1002, 4:12-14.

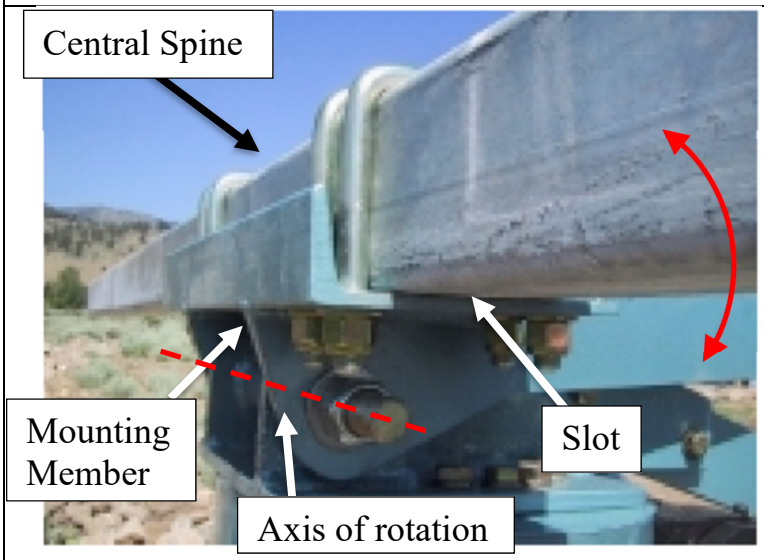
266. In my opinion, *Wattsun* discloses or at least renders obvious "a central spine rotatably mounted to the support frame," as claimed. For example, *Wattsun* discloses a plurality of panel carriers extending outwardly from a central spine (*e.g.*, a torque tube beam) that extends along the center of the panel assembly for supporting solar panels. For example, *Wattsun* discloses a panel assembly, on which photovoltaic panels are rotatably mounted, that includes a torque tube that extends along the center of the panel assembly. EX1004, pp. 8, 9, 15, 16.

267. Further, *Wattsun* discloses a mounting assembly for rotatably mounting the panel assembly (and thus the central spine) to the support frame. EX1004, pp. 8, 9, 15, 16. For example, *Wattsun* discloses a horizontal torque tube drive that rotatably mounts on top of the support post for rotatably mounting the panel assembly to the support post. EX1004, pp. 8, 9, 15, 16.

268. Below is an annotated figure from *Wattsun* illustrating the central spine, as compared with the central spine embodiment depicted in the '17546 Patent. Therefore, in my opinion, *Wattsun* alone or in view of *RayTracker* teaches, anticipates, and/or renders obvious this element of the claim.

Wattsun	**U.S. Patent No. 9,917,546**
 EX1004, p. 9	 EX1002, Fig. 7

Wattsun	**U.S. Patent No. 9,917,546**
 One installer, one piece at a time approach. Modules are being used to "square-up: the frame. EX1004, p. 16  EX1004, p. 9	

Wattsun	**U.S. Patent No. 9,917,546**
 EX1004, p. 12	

269. To the extent that it is argued or determined that *Wattsun* fails to explicitly disclose any particular limitation of this element, in my opinion, such limitations would have been obvious to a POSITA, either in view of a POSITA's knowledge at the time, or in view of *RayTracker*.

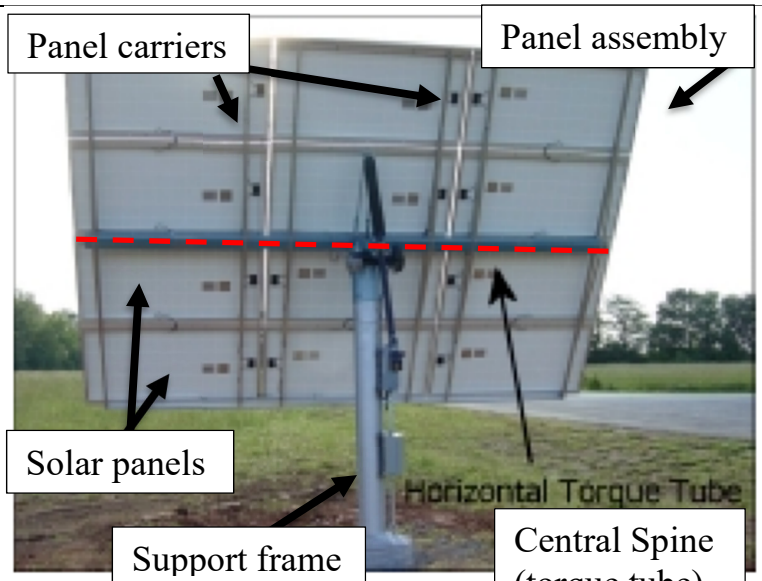
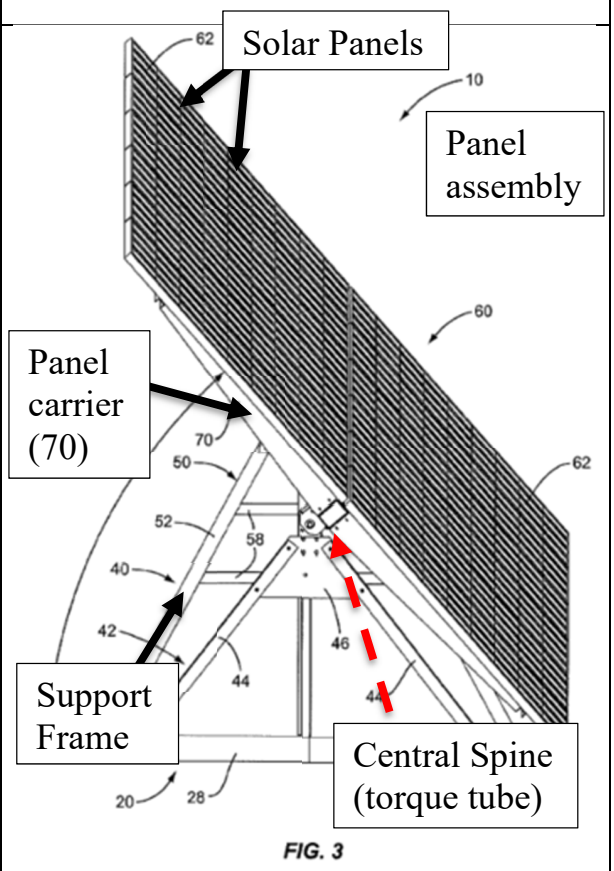
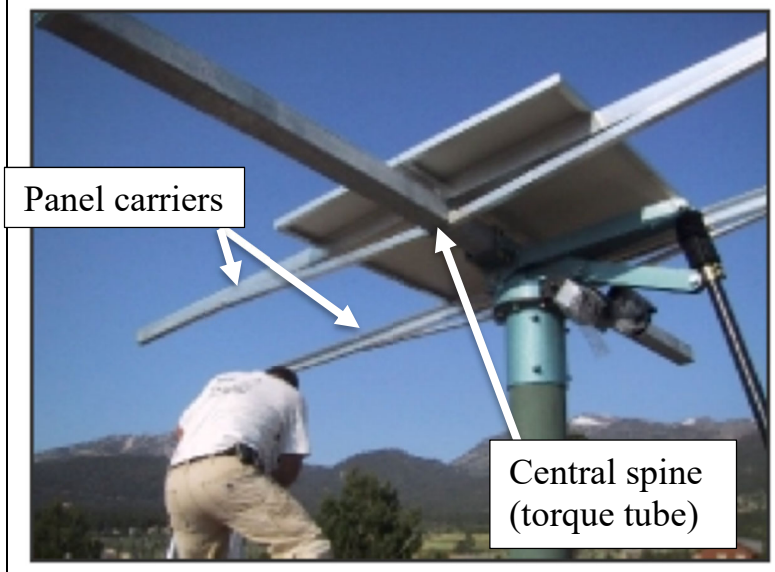
e. 1[d] "a plurality of panel carriers fixed relative to the central spine and extending outwardly from both sides of said central spine for supporting said solar panels;"

270. The '17546 Patent describes that a "[p]anel assembly 60 comprises a plurality of solar panels 62 and a panel support frame 64 to support the solar panels." EX1002, 3:34-36. "The panel support frame 64 comprises a central spine 66, a pair

of laterally-spaced side members 68, and a plurality of longitudinally-spaced panel carriers 70, which can be removably connected by bolts and nuts, or other fasteners." EX1002, 3:36-40.

271. In my opinion, *Wattsun* discloses or at least renders obvious "a plurality of panel carriers fixed relative to the central spine and extending outwardly from both sides of said central spine for supporting said solar panels," as claimed. For example, *Wattsun* discloses panel carriers (*e.g.*, a plurality of panel carriers) that extend outwardly from a central spine (*e.g.*, a torque tube beam) that extends along the center of the panel assembly for supporting solar panels. EX1004, pp. 8, 9, 15, 16. For example, *Wattsun* discloses a panel assembly, on which solar panels (photovoltaic panels) are rotatably mounted, and includes a torque tube that extends along the center of the panel assembly. EX1004, pp. 8, 9, 15, 16. *Wattsun* also teaches transversely arranged elongated members to which the photovoltaic members are mounted. EX1004, pp. 8, 9, 15, 16.

272. Below is an annotated figure from *Wattsun* illustrating the panel assembly with panel carriers, as compared with the panel assembly embodiment depicted in the '17546 Patent. As depicted below, *Wattsun's* panel carriers are clearly illustrated as extending outwardly from the torque tube. Therefore, in my opinion, *Wattsun* alone or in view of *RayTracker* teaches, anticipates, and/or renders obvious this element of the claim.

Wattsun	**U.S. Patent No. 9,917,546**
 EX1004, p. 9	 FIG. 3 EX1002, Fig. 3 (support frame 40 (EX1002, 2:66); panel assembly 60, solar panels 62 (EX1002, 3:34-36); central spine 66, panel carriers 70 (EX1002, 3:36-38))
 One installer, one piece at a time approach. Modules are being used to "square-up: the frame. EX1004, p. 16	

273. To the extent that it is argued or determined that *Wattsun* fails to explicitly disclose any particular limitation of this element, in my opinion, such limitations would have been obvious to a POSITA, either in view of a POSITA's knowledge at the time, or in view of *RayTracker*.

f. 1[e] "an actuator assembly for rotating the panel assembly to track the movement of the sun;"

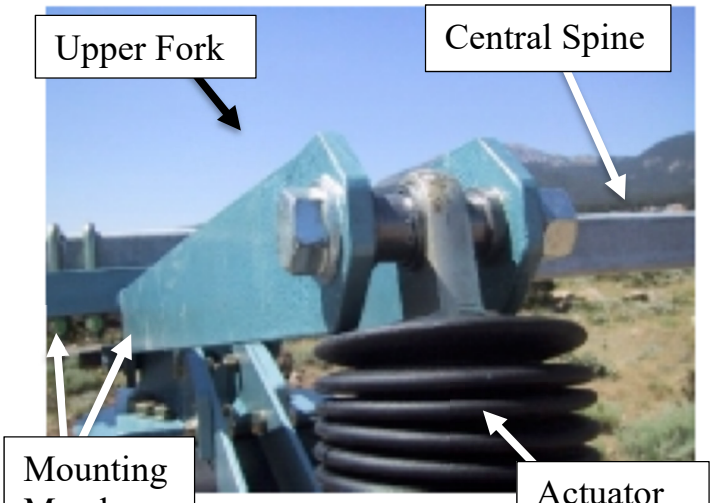
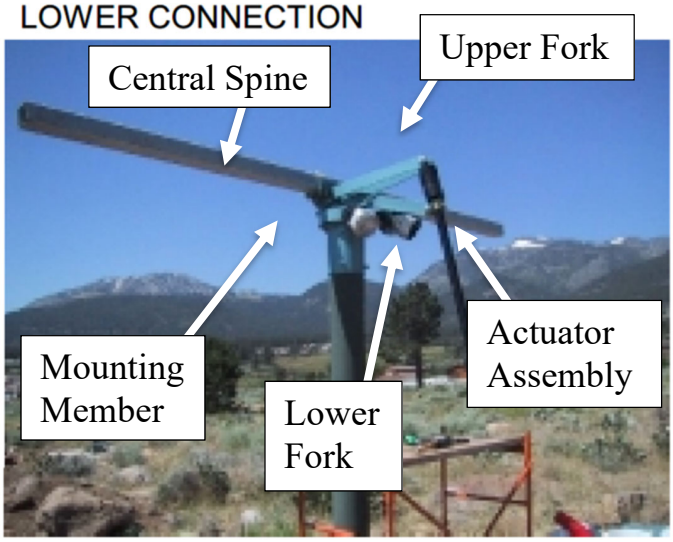
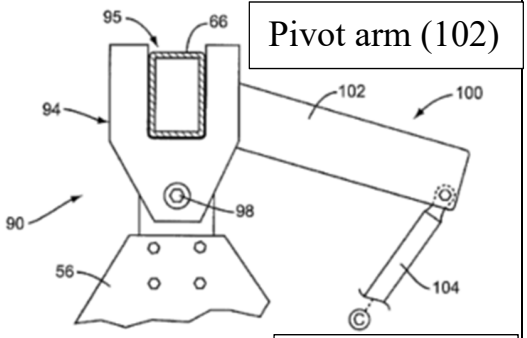
274. The '17546 Patent describes an "[a]ctuator assembly 100 that, as shown in FIG.7, comprises a pivot arm 102, fluid cylinder 104, and control unit 106." EX1002, 4:30-31. "The pivot arm 102 is connected to the spine 66 and extends outward from the spine 66..." EX1002, 4:31-33. The "[f]luid cylinder 104 is connected to at one end to the pivot arm 102." EX1002, 4:34-35. The "[c]ontrol unit 106 is mounted to the front frame and controls operation of the fluid cylinder 104." EX1002, 4:36-37.

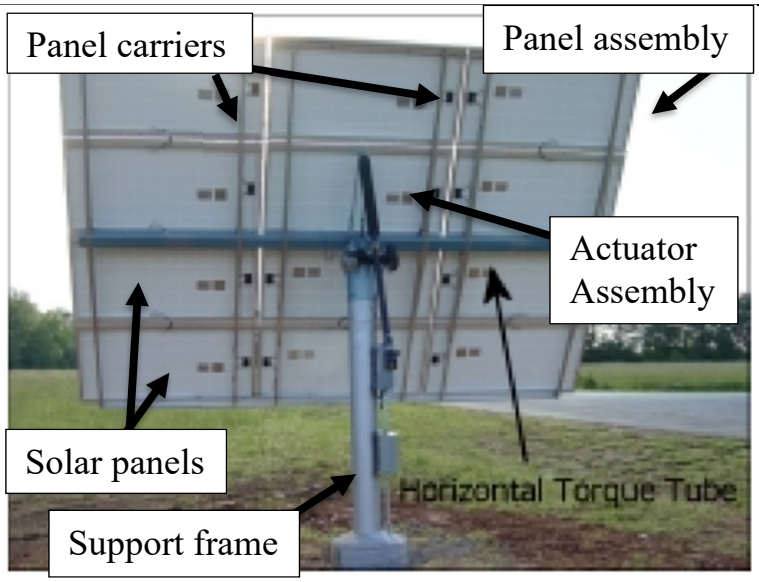
275. In my opinion, *Wattsun* discloses or at least renders obvious "an actuator assembly for rotating the panel assembly to track the movement of the sun," as claimed. For example, *Wattsun* describes an actuator assembly (e.g., an actuator system) to move and rotate the panel assembly. For example, *Wattsun* discloses an actuator (e.g., an electromechanical actuator) for rotating the panel assembly to track the movement of the sun. Specifically, *Wattsun* discloses that the solar tracker includes an "actuator assembly for dual-axis operation." EX1004, p. 12 *Wattsun*

discloses that this actuation is to track the sun's position. Specifically, *Wattsun* discloses, "Wattsun™ Solar Trackers utilize a patented, closed loop, optical sensing system to sense the sun's position and track it." EX1004, p. 19.

276. *Wattsun* describes attaching an actuator assembly (e.g., the elevation actuator) to the forks (i.e., the upper fork and lower fork) to move the upper fork and therefore the connect panel assembly attached to it. Specifically, *Wattsun* discloses to an installer to "[c]enter both the eyelet end (the top) of the elevation actuator inside the forks and the elevation actuator clamp eyelet (the bottom)." EX1004, p. 12. *Wattsun* further includes a series of images and assembly instructions to teach how the actuator is attached to the mounting assembly for rotating the panel assembly. EX1004, pp. 8-9, 12-13.

277. Below is an annotated figure from *Wattsun* illustrating the actuator assembly, as compared with the actuator assembly embodiment depicted in the '17546 Patent. Therefore, in my opinion, *Wattsun* alone or in view of *RayTracker* teaches, anticipates, and/or renders obvious this element of the claim.

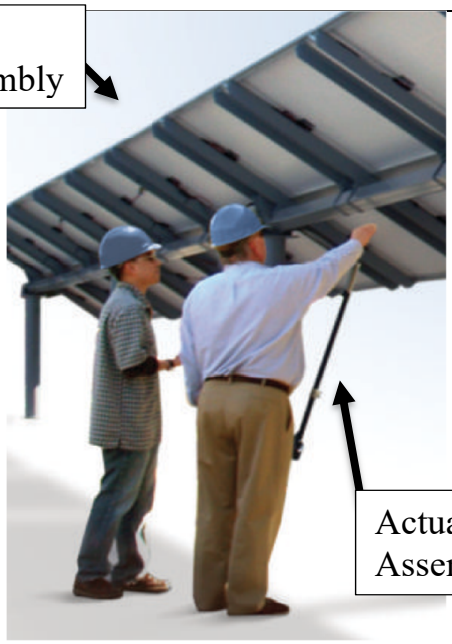
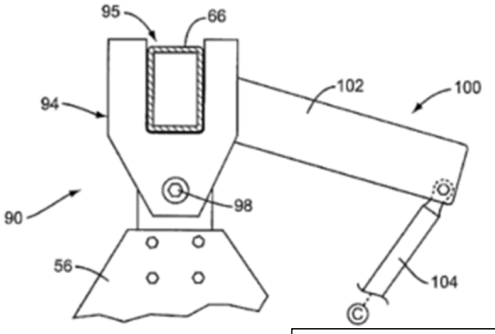
Wattsun	**U.S. Patent No. 9,917,546**
UPPER CONNECTION  EX1004, p. 12 LOWER CONNECTION  EX1004, p. 12	 EX1002, Fig. 7 (actuator assembly 100, fluid cylinder 104, pivot arm 102 (EX1002, 4:30-31))

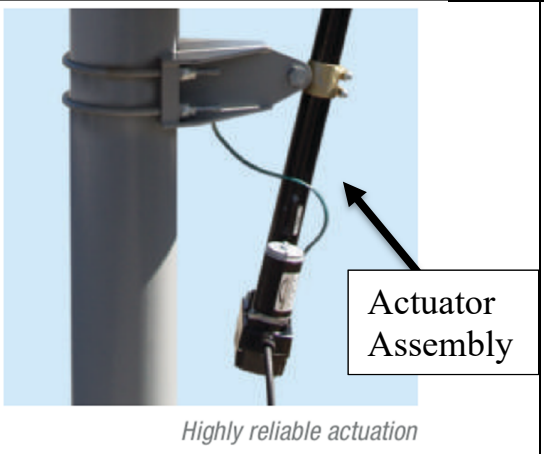
Wattsun	**U.S. Patent No. 9,917,546**
 EX1004, p. 9	

278. To the extent that it is argued, or considered by the Board, or argued by Patent Owner, that *Wattsun* fails to adequately describe or otherwise anticipate this element, namely the limitation that the "rotat[ion] of the panel assembly [is] to track the movement of the sun," in my opinion, such limitations would have been obvious to a POSITA, either in view of a POSITA's knowledge at the time, or in view of *RayTracker*, which would remedy any such deficiency and render the claim element, and the claim as a whole, invalid as being obvious.

279. For example, *RayTracker* describes an actuator assembly (*e.g.*, an actuator system) to move (rotate) the panel assembly. EX1006, pp. 2, 4, 5. For

example, *RayTracker* discloses an electromechanical actuator to rotate the panel assembly based on, and to track, the movement of the sun. EX1006, pp. 2, 4, 5. *RayTracker* specifically discloses that the system is formed of "just two moving parts – the actuator and one structural assembly that rotates on a bearing surface." EX1006, p. 4.

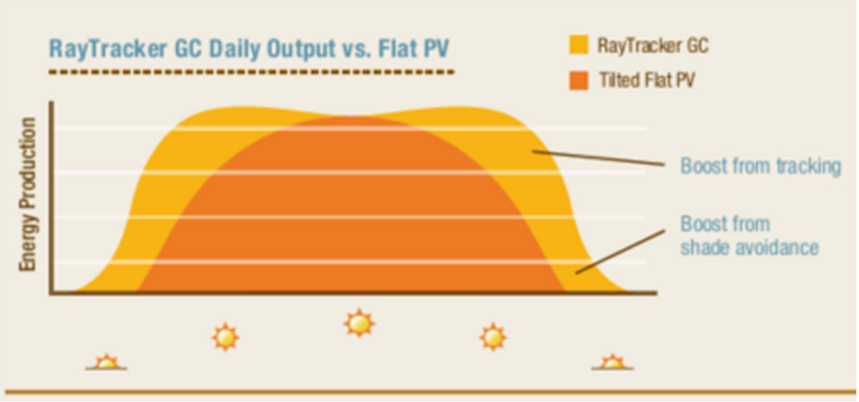
RayTracker	**U.S. Patent No. 9,917,546**
 EX1006, p. 4	 EX1002, Fig. 7

RayTracker	**U.S. Patent No. 9,917,546**
 EX1006, p. 2	

280. In addition, *RayTracker* further specifically describes that the system is actuated particularly to track the movement of the sun. For example, "[t]he tracking function is provided by a custom microprocessor controller that uses a GPS time reference and a precise astronomical algorithm to automatically and accurately point the panels at the sun. The position of each actuator is monitored by the controller to ensure alignment. One controller serves 12 RayTracker GC units, and is included with the system." EX1006, p. 2.

281. *RayTracker* describes specific benefits of tracking the movement of the sun. For example, "RayTracker GC improves energy yield by optimally positioning the solar panels throughout the day. Energy boosts of up to 38% are possible

compared to flat-mounted panels. Single-axis trackers outperform fixed-tilt installations most importantly during peak energy demand periods. RayTracker GC achieves this with a simple, low-profile, low-parts-count mechanism." EX1006, p. 2.



EX1006, p. 2

282. And, in my opinion, it would have been obvious to a POSITA to use the system disclosed in *Wattsun* in the manner as described in *RayTracker*, including making any implementation modifications that could be required in order to do so, to arrive at the claimed limitation of an actuator assembly for rotating the panel assembly to track the movement of the sun.

283. As detailed above, in my opinion, *Wattsun* discloses a solar tracker that is configured to rotate solar panels toward the sun as the sun moves throughout the sky. EX1004, pp. 12, 19. *Wattsun* plainly states "Wattsun™ Solar Trackers utilize a patented, closed loop, optical sensing system to sense the sun's position and track

it." EX1004, p. 19. Similarly, *RayTracker* also describes a solar tracker system that rotates solar panels toward the sun as the sun moves through the sky. *RayTracker* states "RayTracker GC improves energy yield by optimally positioning the solar panels throughout the day…Single-axis trackers outperform fixed-tilt installations most importantly during peak energy demand periods." EX1006, p. 2.

284. In my opinion, a POSITA would have found it obvious to try modifying *Wattsun's* solar tracker to include features, components, or techniques described in *RayTracker* for any of a variety of reasons. For example, *Wattsun* and *RayTracker* address the same problem as one another (i.e., increasing energy yield over fixed-panel solar systems) with similar approaches and solutions as one another (i.e., mechanically rotating the solar panels about an axis using a solar tracker to face the sun throughout the day). RayTracker's actuator and controller system was therefore a known, predictable, suitable, and thus obvious, technique for addressing that *Wattsun's* problem of directing the solar panel toward the sun to increase yield.

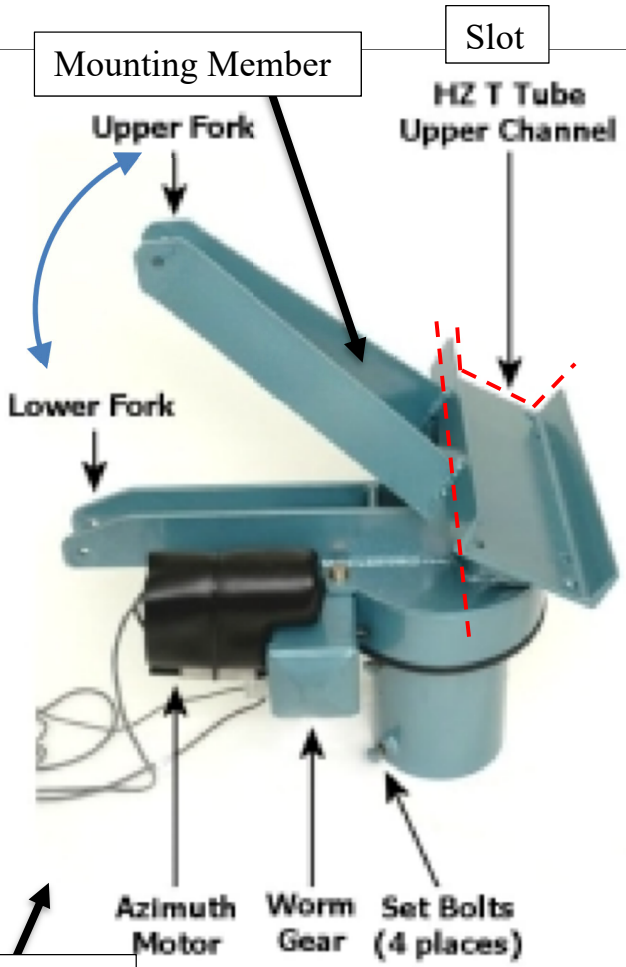
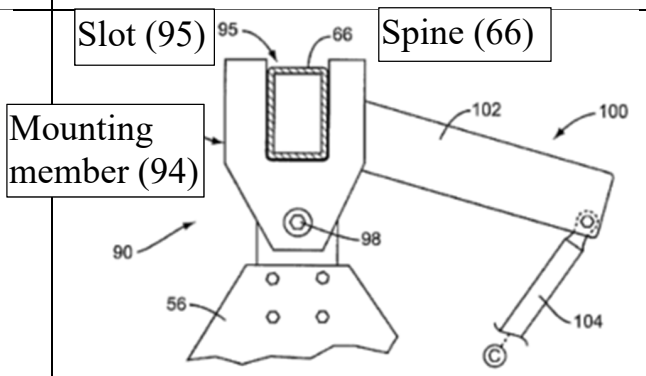
285. Therefore, in my opinion, *Wattsun* in view of *RayTracker* satisfies this element of the claim.

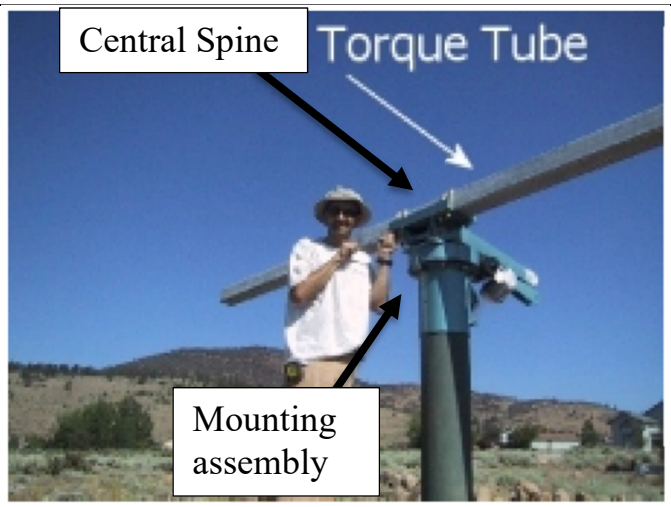
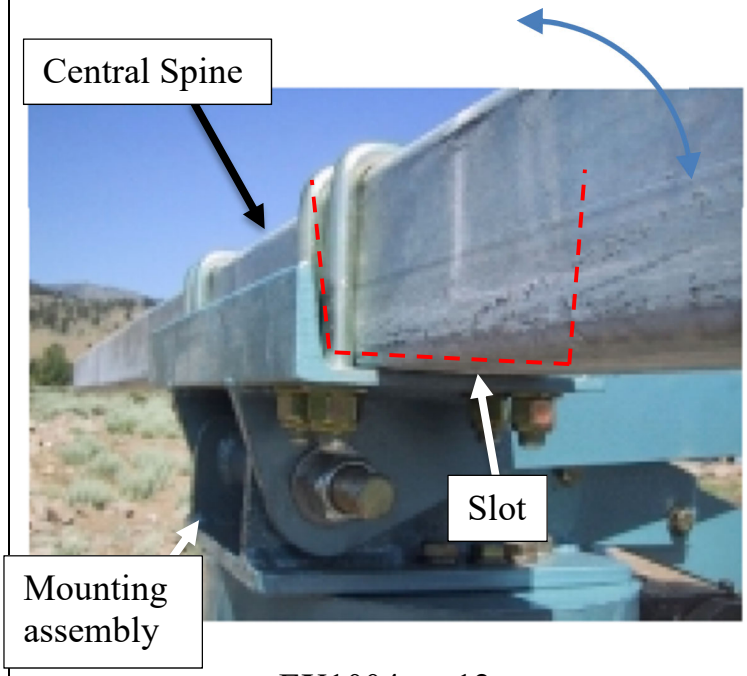
g. 1[f] "a mounting assembly for rotatably mounting the panel assembly to the support frame, said mounting assembly comprising:"

286. The ’17546 Patent describes a “second mounting assembly 90 that comprises a connecting plate 92, a pair of mounting forks 94, a bearing 96, and a pivot member 98.” EX1002, 4:6-11.

287. In my opinion, *Wattsun* discloses or at least renders obvious “a mounting assembly for rotatably mounting the panel assembly to the support frame,” as claimed. That is, *Wattsun* describes a mounting assembly for rotatably mounting the panel assembly to the support frame by rotating the torque tube. For example, *Wattsun* discloses a horizontal torque tube drive that mounts on top of the support posts for rotatably mounting the panel assembly to the support posts via the torque tube of the panel assembly being installed in a slot (annotated below by dashed lines). EX1004, pp. 6, 8, 9, 12, 16.

288. Below is an annotated figure from *Wattsun* illustrating the mounting assembly, as compared with the mounting assembly embodiment depicted in the ’17546 Patent. Therefore, in my opinion, *Wattsun* alone or in view of *RayTracker* teaches, anticipates, and/or renders obvious this element of the claim.

Wattsun	**U.S. Patent No. 9,917,546**
 EX1004, p. 8	 *FIG. 7* EX1002, Fig. 7 (mounting assembly 90, mounting member 94 (EX1002, 4:6-10); slot 95, spine 66 (EX1002, 4:12-15))

Wattsun	**U.S. Patent No. 9,917,546**
 EX1004, p. 9  EX1004, p. 12	

289. To the extent that it is argued or determined that *Wattsun* fails to explicitly disclose any particular limitation of this element, in my opinion, such limitations would have been obvious to a POSITA, either in view of a POSITA's knowledge at the time, or in view of *RayTracker*.

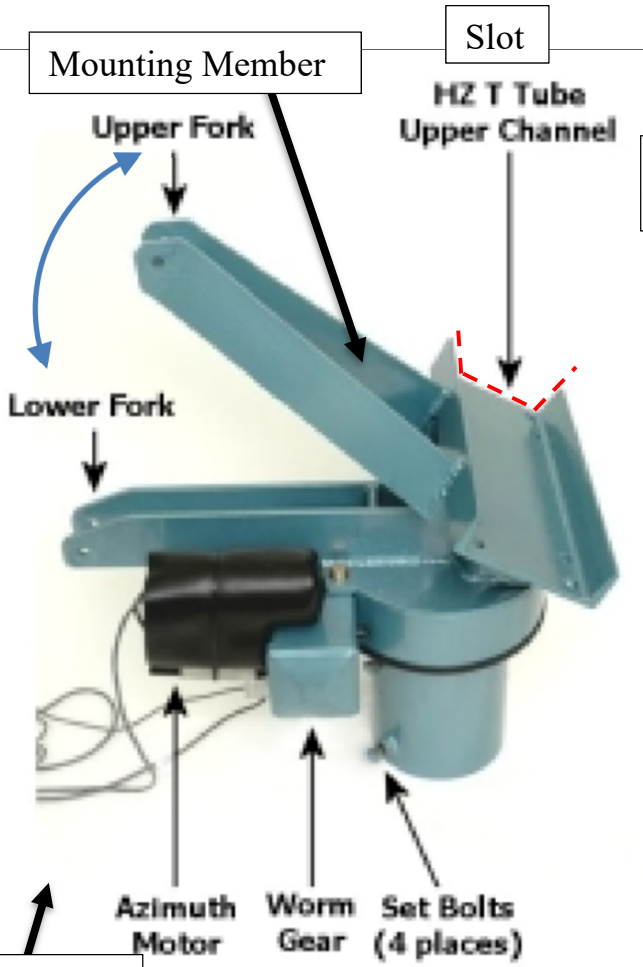
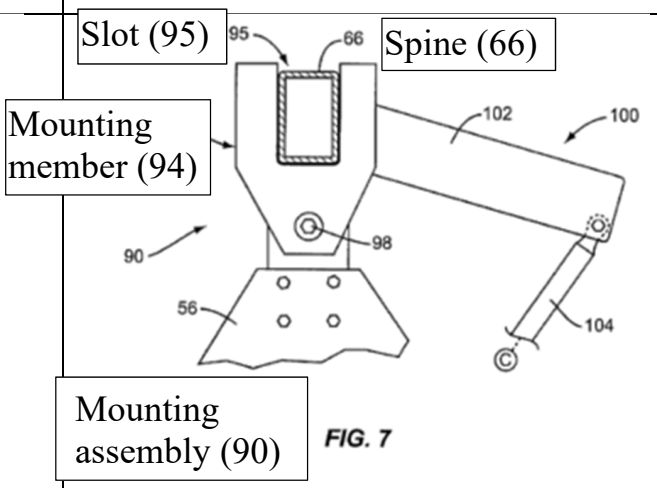
h. 1[g] "a mounting member configured to be rotatably connected to said support frame; and"

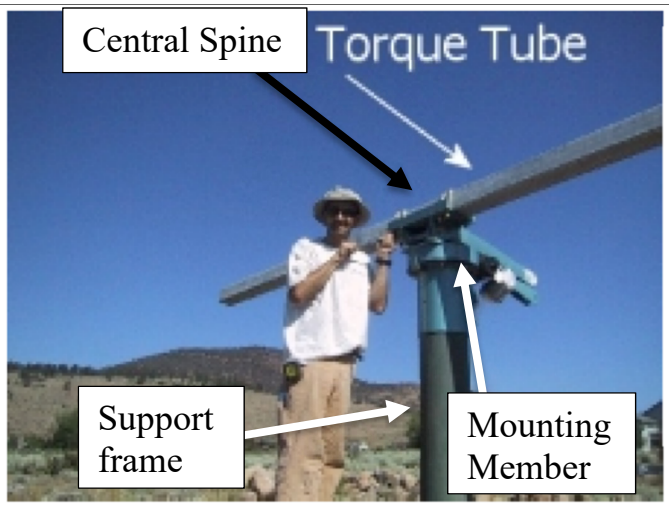
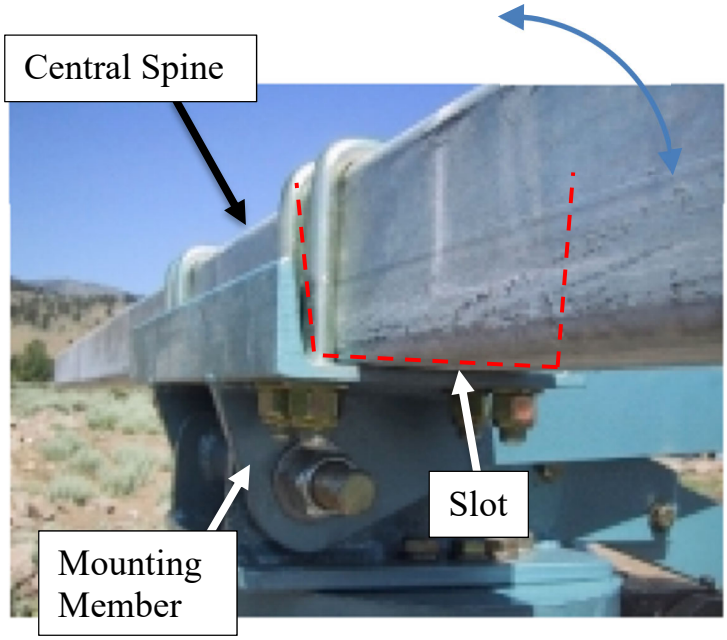
290. The '17546 Patent describes that "[t]he mounting forks 94 include a slot 95 to receive the spine 66…" EX1002, 4:12-15. "The pivot member 98 extends through the mounting forks 94, upper end of connecting plate 92, and bearing 96, and is secured in place by a nut threaded onto the end of the pivot member 98." EX1002, 4:17-20. The specification of the '17546 Patent does not recite "mounting member." To the extent the term "mounting member" is supported by the specification of the '17546 Patent, a POSITA would interpret the claimed mounting member to be the mounting fork 94.

291. In my opinion, *Wattsun* discloses or at least renders obvious "a mounting member configured to be rotatably connected to said support frame," as claimed. For example, *Wattsun* discloses a mounting assembly to rotatably mount the panel assembly to the support frame (support post). The mounting assembly includes a mounting member, as claimed. For example, *Wattsun* describes a horizontal torque tube drive that mounts on top of the support post for rotatably

mounting the panel assembly to the support post. EX1004, pp. 6, 8, 9, 12, 16. The horizontal torque tube drive includes a rotatably mounted upper fork that defines a torque tube upper channel. EX1004, pp. 6, 8, 9, 12, 16. The upper fork, together with the HZ T Tube Upper Channel attached thereto, is a mounting member configured to be rotatably connected to said support frame. EX1004, pp. 6, 8, 9, 12, 16.

292. Below is an annotated figure from *Wattsun* illustrating the mounting member, as compared with the mounting member embodiment depicted in the '17546 Patent. Therefore, in my opinion, *Wattsun* alone or in view of *RayTracker* teaches, anticipates, and/or renders obvious this element of the claim.

Wattsun	**U.S. Patent No. 9,917,546**
 EX1004, p. 8	 EX1002, Fig. 7 (mounting assembly 90, mounting member 94 (EX1002, 4:6-10); slot 95, spine 66 (EX1002, 4:12-15))

Wattsun	**U.S. Patent No. 9,917,546**
 EX1004, p. 9  EX1004, p. 12	

293. To the extent that it is argued or determined that *Wattsun* fails to explicitly disclose any particular limitation of this element, in my opinion, such limitations would have been obvious to a POSITA, either in view of a POSITA's knowledge at the time, or in view of *RayTracker*.

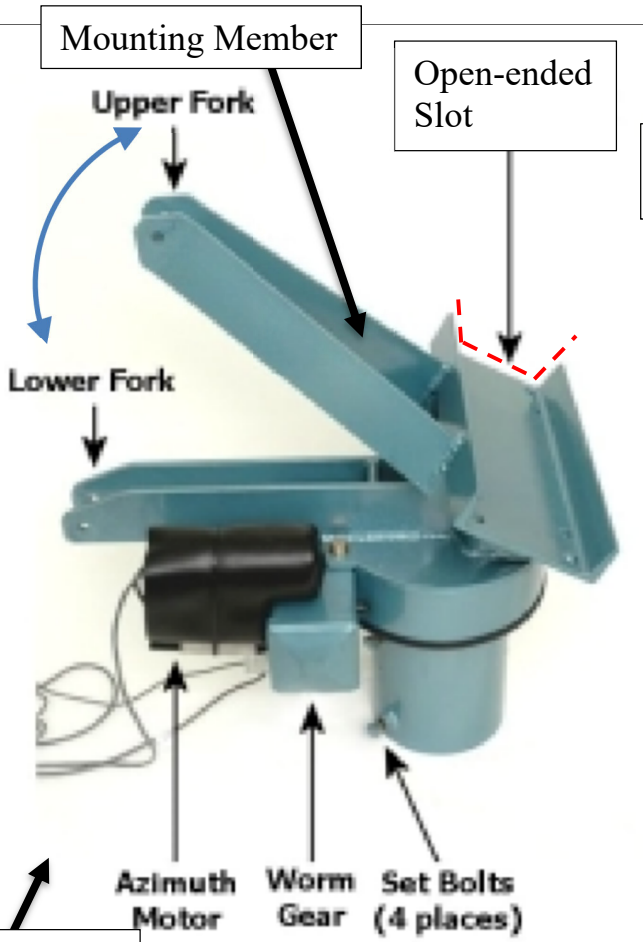
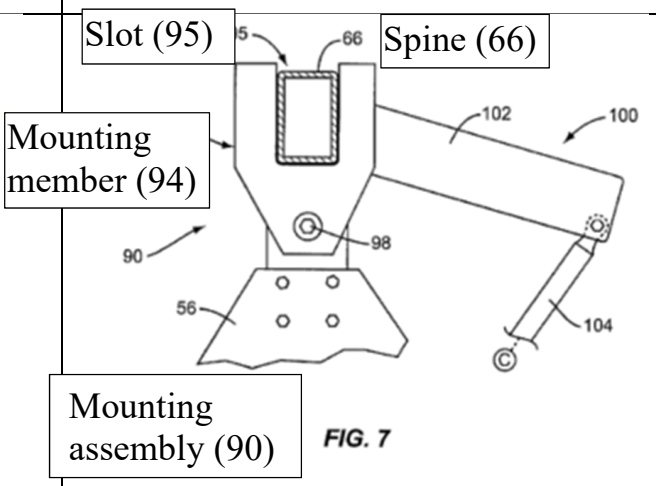
i. 1[h] "an open-ended slot in said mounting member configured to receive the central spine of the panel assembly."

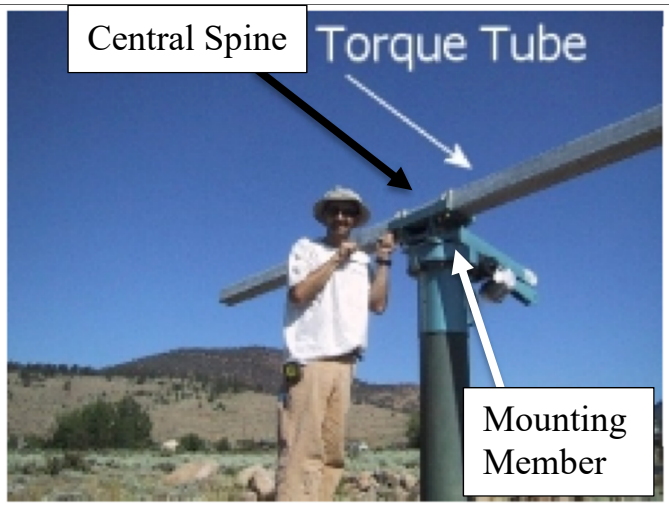
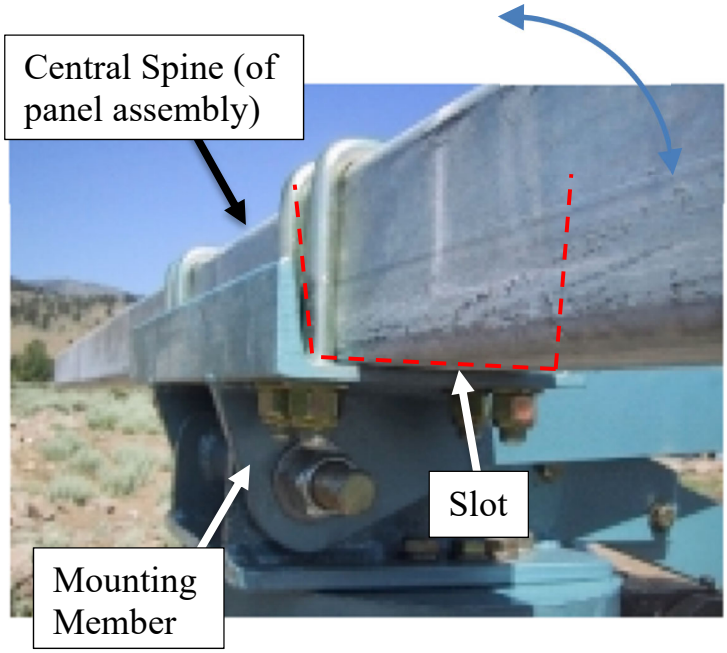
294. The '17546 Patent describes a "[s]econd mounting assembly 90 comprises a connecting plate 92, a pair of mounting forks 94, a bearing 96, and a pivot member 98." EX1002, 4:6-11. "The mounting forks 94 include a slot 95 to receive the spine 66..." EX1002, 4:12-15. The specification of the '17546 Patent does not use, let alone define, the term "*open-ended* slot" as recited in the claims. Notwithstanding the term not appearing anywhere in the '17546 Patent, Petitioners have interpreted "open-ended slot" to describe the open slot depicted in Figure 7, as reproduced below.

295. In my opinion, *Wattsun* discloses or at least renders obvious "an open-ended slot in said mounting member configured to receive the central spine of the panel assembly," as claimed. For example, *Wattsun* discloses a horizontal torque tube drive that mounts on top of the support post to rotatably mount the panel assembly to the support post. EX1004, pp. 6, 8, 9, 12, 16. The horizontal torque tube drive includes a rotatably mounted upper fork that defines a torque tube upper

channel. EX1004, pp. 6, 8, 9, 12, 16. The upper channel includes or forms an open-ended slot. EX1004, pp. 6, 8, 9, 12, 16. The spine (*e.g.*, torque tube) of the panel assembly can be placed in the slot in the mounting member – the upper fork. EX1004, pp. 9, 12, 16.

296. Below is an annotated figure from *Wattsun* illustrating the open-ended slot, as compared with the open-ended slot embodiment depicted in the '17546 Patent. Therefore, in my opinion, *Wattsun* alone or in view of *RayTracker* teaches, anticipates, and/or renders obvious this element of the claim.

Wattsun	**U.S. Patent No. 9,917,546**
 EX1004, p. 8	 EX1002, Fig. 7 (mounting assembly 90, mounting member 94 (EX1002, 4:6-10); slot 95, spine 66 (EX1002, 4:12-15))

Wattsun	**U.S. Patent No. 9,917,546**
 EX1004, p. 9  EX1004, p. 12	

297. To the extent that it is argued or determined that *Wattsun* fails to explicitly disclose any particular limitation of this element, in my opinion, such limitations would have been obvious to a POSITA, either in view of a POSITA's knowledge at the time, or in view of *RayTracker*.

IX. Conclusion

298. For the reasons set forth above, I believe that, and it is my opinion that, claims 5 and 6 of the '57546 Patent and claim 1 of the '17546 Patent are unpatentable in view of the prior art.

299. In signing this declaration, I recognize that it will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I also recognize that I may be subject to cross-examination in the case and that cross-examination will take place in the United States. If cross-examination is required of me, I will appear for cross-examination within the United States during the time allotted for cross-examination.

300. The statements and opinions in this declaration comprise and are based upon my review, analysis and understanding of the source materials that I have reviewed as discussed herein, based on the disclosure and statements made within such source materials.

301. I reserve the right to supplement my opinions in the future to respond to any arguments that the Patent Owner raises and to take into account new information as it becomes available to me.

302. I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

Respectfully Submitted



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Edward C. Kern, Jr.

Date: April 28, 2023

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Dr. Kern has over four decades experience designing and building solar photovoltaic power systems. He is a director of Irradiance, Inc. a firm designing and manufacturing instruments for solar resource measurement. Dr. Kern consults on renewable energy technology development, infrastructure, and utility power system integration through KRNLPWR LLC and consults and serves as an expert witness in areas pertaining to photovoltaic panel and array structural products and system design concepts.

He is a founder, past president and director of the Solar Energy Business Association of New England. From 2002 through 2004, Dr. Kern lectured in wind and solar energy technology as part of MIT's subject 10.319j "Sustainable Energy". He was Director of Engineering for Schott Applied Power Corporation until 2002 when he formed Irradiance, Inc. and focused his activities on technology consulting and instrumentation design and manufacturing. Since 2015 he has devoted pro bono efforts within his community of Lincoln, Massachusetts and his alma mater Dartmouth College advocating for and providing design guidance toward their initial investments in solar power generation.

Dr. Kern has participated in solar power system research, development, and engineering projects across the United States and internationally since the mid-1970s. After leaving Schott, he worked with an electric utility in the Philippines and the International Finance Corporation to design and build the first megawatt-scale solar photovoltaic system to support clean electric power development in developing countries. He has worked with the United Nations Environment Program and electric utilities in Mexico, El Salvador, Costa Rica, Peru, India, Thailand and the Philippines on planning megawatt-scale PV installations. He worked with the Tata Power Company in Mumbai developing a megawatt-scale PV installation in collaboration with the U.S. Department of State's Asian-Pacific Partnership on Clean Development and Climate. He has served as a consultant to the International Finance Corporation, World Bank Group, in the area of renewable energy and infrastructure.

Dr. Kern has been active in the field of solar energy resources assessment, solar power system design, and power system performance modeling throughout his renewable energy career which started in 1977. Irradiance manufactures a rotating shadowband radiometer (RSR), a field survey instrument for measuring and recording global, direct and diffuse solar irradiance that Dr. Kern invented in the early 1990s. Since 2005 over one thousand RSR instruments have been installed in the United States, Australia, Bahrain, Brazil, Canada, China, Chile, Costa Rica, Ethiopia, Ghana, Greece, India, Indonesia, Israel, Italy, Jordan, Libya, Mexico, Morocco, Pakistan, Peru, the Philippines, Qatar, Russia, Saudi Arabia, South Africa, Spain, Switzerland, Tunisia, Turkey, and

Uruguay. Irradiance and the National Renewable Energy Laboratory's Solar Radiation Research Laboratory worked collaboratively for many years to characterize and improve rotating shadowband radiometers. A third generation of RSR instruments has been developed by Irradiance, Inc. under his son Chris Kern's leadership.

As founder and president of Ascension Technology (1987-1999) Dr. Kern oversaw the design and installation of over 200 grid-connected photovoltaic systems, in over 20 U.S. states from Hawaii to Massachusetts and internationally, totaling over two megawatts. These seminal grid-tie projects ranged in size from a 300-watt "AC-Module" to 100-kW systems installed within a wind farm in Tamil Nadu State, India and at the Pentagon in Washington, DC. The earliest of these projects were co-funded by the EPA, EPRI and electric utilities across the United States to demonstrate the feasibility of grid-connected solar photovoltaic systems and to determine the air emission offsets derived from clean PV power displacing fossil fuel fired generation. In these and many subsequent projects, system performance-monitoring and solar energy resource measurement equipment was developed under the supervision of Dr. Kern and used in these projects.

Before founding Ascension Technology in 1987, Dr. Kern was a member of the Massachusetts Institute of Technology faculty and research staff. He joined the MIT Lincoln Laboratory Photovoltaic Field-Test and Applications Project in 1977 and was promoted to Assistant Group Leader in 1980. In 1979 he planned and then managed the U.S. Department of Energy's Residential Rooftop Photovoltaic Systems Project. From 1982 until 1987 he continued this photovoltaic systems development activity at the MIT Energy Laboratory.

Before entering the solar photovoltaic power field in 1977, Dr. Kern's professional activities were in the field of hydrodynamics, particularly studying the dynamics of floating ocean structures for the control of oil spills. During the mid-1970s he was an Assistant Professor at MIT's Department of Ocean Engineering.

A Senior Member of the IEEE, Dr. Kern served as a member of the IEEE Standards Coordinating Committee on Dispersed Storage and Generation. During the early 1980s this committee developed the *IEEE Guide for Interfacing Dispersed Storage and Generation with Utility Systems*. He has consulted to the Electric Power Research Institute on photovoltaic applications, has served on the Science and Technology Review Committee for the National Renewable Energy Laboratory's Solar Radiation Resource Assessment Project and has served as a Peer Reviewer for the U.S. Department of Energy's Solar Program for Evaluation, Validation and Analysis.

Dr. Kern earned an A.B. in Engineering Sciences from Dartmouth College, a B.Eng. from Dartmouth's Thayer School of Engineering and a Ph.D. in the field of hydrodynamics from the Massachusetts Institute of Technology. He is a Fellow of the American Solar Energy Society.

