

ORIGINAL

In the United States Court of Federal Claims

No. 14-147C

(Filed: February 9, 2018)

FILED

FEB - 9 2018

U.S. COURT OF FEDERAL CLAIMS

PROBIR K. BONDYOPADHYAY,
Plaintiff,
v.
THE UNITED STATES,
Defendant.

Patent Infringement; 28 U.S.C. § 1498;
Summary Judgment; Direct
Infringement; Doctrine of Equivalents;
Insubstantial Differences; Triple
Identity Test.

Probir K. Bondyopadhyay, Ph.D., Houston, TX, pro se.

Benjamin C. Mizer, Gary Hausken, and Alice Suh Jou, U.S. Department of Justice, Civil
Division, Commercial Litigation Branch, Intellectual Property Staff, P.O. Box 480, Ben Franklin
Station, Washington, D.C. 20044, for Defendant.

OPINION AND ORDER

WILLIAMS, Judge.

In this action, Plaintiff pro se Dr. Probir K. Bondyopadhyay,1 the inventor of United States
Patent No. 6,292,134 ("the '134 Patent") for a "Geodesic Sphere Phased Array Antenna System,"
claims that the United States Air Force ("Air Force") infringed Claims 14, 25 and 26 of his patent

1 Dr. Bondyopadhyay received a Ph.D. in electrical engineering from Polytechnic University
of Brooklyn in 1983, and taught electrical engineering and computer science at both New York
Institute of Technology and Maritime College. Tr. 7, 11.

by using and manufacturing a portion of a phased antenna array system.² This matter comes before the Court on Defendant's motion for summary judgment.³

Background⁴

The '134 Patent

The '134 Patent was issued on September 18, 2001, to Plaintiff, inventor Dr. Probir K. Bondyopadhyay, from Application No. 09/513,014 ("the '014 Application") on February 25, 2000. The '014 Application claims priority to provisional Application No. 60/121,874 filed on February 26, 1999. The '134 Patent consists of 30 claims - independent Claims 1, 14, 19, and 25, and dependent Claims 2-13, 15-18, 20-24, and 26-30. Plaintiff asserts that the Air Force infringes Claims 14, 25, and 26 of the '134 Patent.⁵

Claim 14 is illustrative of the invention:

14. A geodesic sphere phased array antenna system for multi-satellite communications and tracking, said antenna system comprising:

a geodesic structure derived from a truncated icosahedron having twelve pentagonal and twenty hexagonal planar faces, a plurality of said geodesic planar surfaces each having mounted thereon a subarray of planar antenna element units;

² In his infringement contentions, Plaintiff also asserts infringement of Claims 1, 2, 4, 5, 7, and 10 based on an Air Force Research Laboratory Report published in September 2004, that, according to Plaintiff, details "the design manufacturing and successful testing of a hexagonal subarray unit of the Geodesic Structure based on the regular icosahedron." Pl.'s Infringement Br. 4. However, this Court already dismissed Plaintiff's claims of infringement "prior to January 11, 2008" as time-barred under this Court's six-year statute of limitations, 28 U.S.C. § 2501 (2016); Bondyopadhyay v. United States, No. 14-147C, 2015 WL 1311726, at *5 (Fed. Cl. Mar. 20, 2015). As this Air Force Report was published in 2004, Plaintiff's claims of infringement based on the Air Force's activity detailed in this report are time-barred and dismissed. Id. ("Any claims prior to January 11, 2008, are time-barred and dismissed.").

³ In ruling on summary judgment, the Court has considered Plaintiff's "Motion for Leave of the Court" docketed as Plaintiff's "Motion of the Infringement Phase." (ECF No. 216).

⁴ This background is derived from the '134 Patent as well as the appendices attached to the parties' motion papers. This Court's opinions on claim construction and Defendant's partial motion to dismiss provide additional background. See Bondyopadhyay v. United States, 129 Fed. Cl. 793, 795-800 (2017); Bondyopadhyay, 2015 WL 1311726, at *5. Citations to Tr. are to the Court's September 28, 2016 claim construction hearing. "GA" refers to the appendix to Defendant's motion for summary judgment.

⁵ In his "Claims Infringement Brief," filed on March 20, 2017, following the Court's September 28, 2016 claim construction hearing, Plaintiff limits his claims of infringement to Claims 14, 25, and 26. Pl.'s Infringement Br. 4 ("This work infringed upon Claims 14, 25 and 26 of the Plaintiff's U.S. Patent 6,292,134.").

transmit and receive signal processing means connected to each said planar antenna element unit of each said subarray for simultaneous transmission and reception of signals;

electromagnetic signal feed means connected to each said planar antenna element unit of each said subarray for forming at least one electromagnetic beam in space;

electronic switching means for selectively connecting each said planar antenna element unit of said subarrays to adjacent planar antenna element unit of said subarray or adjacent subarrays for generating multiple electromagnetic beams in selective diverse directions in space;

electronic phase shifting means connected to each said planar antenna element of each said subarray for providing electronic scanning capability to said subarrays of antenna element units connected by said electronic switching means with the phased array communication space being segmented into a plurality of smaller cellular spaces,

each said cellular communication space for electronic scanning being defined by a plurality of discrete chosen directions corresponding to the said geodesic sphere phased array structure and, each said cellular communication space adapted to be electronically scanned by a plurality of active said contiguous phased subarrays corresponding to the said cellular communication space.

'134 Patent 12:65-13:37.

Overview of the Invention

The invention of the '134 Patent is directed to a "geodesic sphere phased array antenna system," used for satellite communications. '134 Patent Abstract. A geodesic sphere phased array antenna system consists of a geodesic sphere with a phased antenna array mounted onto its planar surfaces. A geodesic sphere is a collection of multiple flat planes of various shapes such as triangles, pentagons and hexagons in which the edges of the planes are contiguously linked together to form a sphere. '134 Patent 4:2-6, 5:27-30, 6:4-9. A soccer ball and Disney's Epcot Center's Spaceship Earth "golf ball" are well known examples of geodesic spheres.

A phased array antenna system is a collection of smaller antenna elements that work in a synchronized fashion to create a stronger communication signal than a single antenna alone by harmonizing the signals of multiple smaller antennas. This is accomplished by aligning the "phases" of the smaller antennas - - i.e., the sinusoidal curves that send a communication signal - - which increases the amplitude of that signal. '134 Patent 1:51-57; Haupt Decl. ¶ 31-32 (Aug. 16, 2016). To align these sinusoidal curves, the antennas in the array are connected by a "feed structure" that energizes, or "feeds," electromagnetic signals to each of the individual antennas in the array. '134 Patent 1:51-57.

Figure 1 of the '134 Patent illustrates the invention and depicts a planar triangle 22 studded with a subarray of antenna elements which, when contiguously linked together, form the geodesic sphere structure:

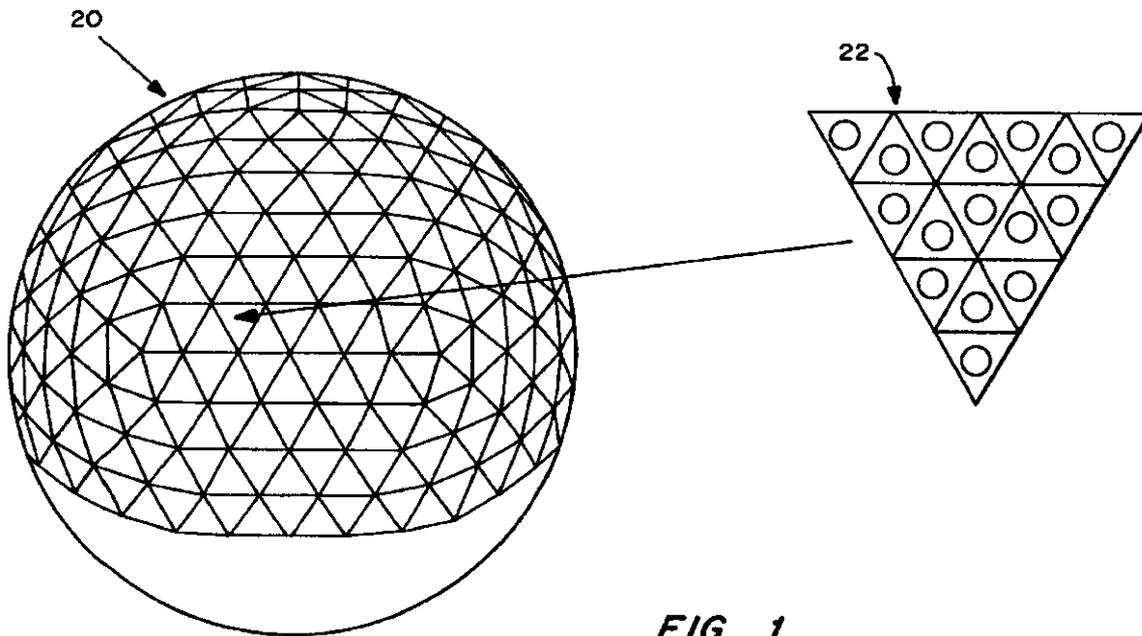


FIG. 1

'134 Patent Fig. 1, 4:46-52 (“FIG. 1 is an exploded view showing a phased array antenna of the present invention which comprises substantially equilateral triangular-shaped subarrays of antenna elements mounted on the faces of a geodesic sphere structure with one of the triangular subarrays broken away and enlarged for purposes of illustration . . .”).

The “main objective” of the '134 Patent was to create a “low cost phased array antenna architecture that will provide communication coverage over the entire hemisphere.” '134 Patent 3:49-52. According to the '134 Patent:

The most important aspect of this invention is the cellular scanning idea wherein the energized portion of the phased array, consisting of the appropriate number of contiguous subarrays that sets up an electromagnetic beam in a given direction, changes with the direction of the beam. The key point of the invention is to limit the electronic scanning requirement for any of these beams to a cellular communication space which in a preferred configuration, could be bounded and defined by the adjacent vertices of the geodesic sphere. The geodesic sphere phased array antenna may be so constructed that this scanning requirement is less than 10° off broadside within a conical scanning space.

Id. at 10:17-28.

In other words, the invention calls for an increased number of planar surfaces with phased array antenna elements to be mounted onto the geodesic sphere. This increase in planar surfaces

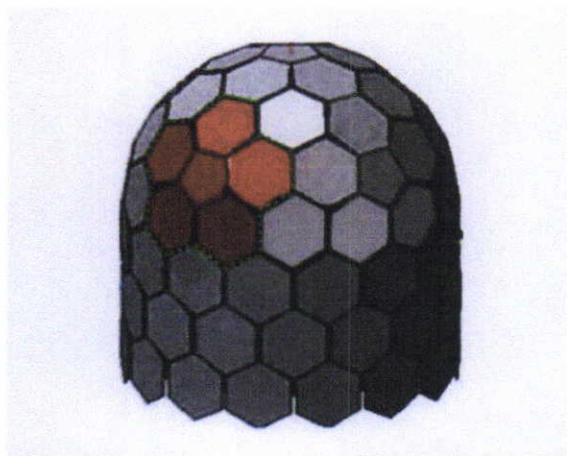
permits communication signals to be sent and received from multiple locations simultaneously along the sphere's surface. '134 Patent 4:15-26; Haupt Decl. ¶ 35 (Aug. 16, 2016). In addition, the greater number of planar surfaces divides the hemispheric communication space into smaller "cellular communication spaces," thus limiting the area that a subarray of antenna elements must scan to transmit and receive signals to "less than 10° off broadside within a conical scanning space." '134 Patent 10:21-28. As a result, a given communication signal from the invention described in the '134 Patent would be stronger and more precise than an antenna that must scan at wider angles to transmit and receive communication signals.

The Accused Product

There is only one accused device at issue - - the Ball Advanced Technology Demonstration antenna. Since at least 2000, the Air Force Research Laboratory was interested in the feasibility of a large antenna system called the Geodesic Dome Phased Array Antenna. As part of this research, the Air Force sponsored a number of small businesses to research and develop technology required for building a full-scale Geodesic Dome Phased Array Antenna. Subsequently, in November 2006, the Air Force awarded a contract to Ball Aerospace & Technologies Corporation to develop a Geodesic Dome Phased Array Antenna advanced technology demonstration. GA043. Accordingly, Ball was "to develop, build, and demonstrate the technological maturity, manufacturing readiness, and mission effectiveness of a scalable sector" of a Geodesic Dome Phased Array Antenna. GA030. The Ball Advanced Technology Demonstration antenna was the result of this research and development.

The Ball Advanced Technology Demonstration antenna was designed in 2006-07, manufactured in 2007-08, and installed at Schriever Air Force Base in Colorado in 2008-09, for testing and demonstration. The actual demonstration of the Ball Advanced Technology Demonstration antenna took place between February 2009 and May 2009.

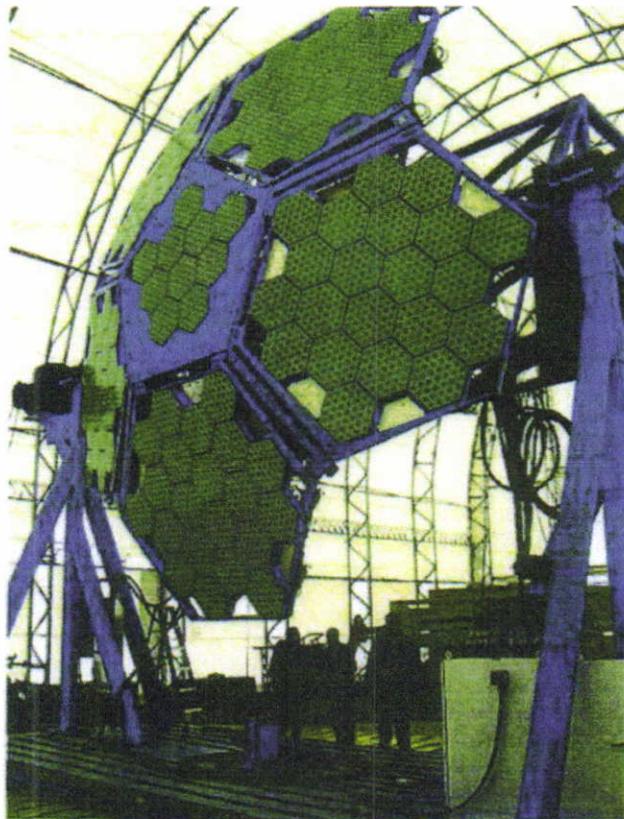
The Ball Advanced Technology Demonstration antenna, which stood roughly one to two stories high, was not completely constructed to constitute a full sphere, and was only made up of six flat panels: a single central pentagonal-shaped panel, surrounded by five outer hexagonal-shaped panels. Def.'s Mot. 7. The figure below depicts the Ball Advanced Technology Demonstration antenna constructed by the Air Force:



GA202 (Ball Final Report (US-000151) Fig. 28.

As explained by Dr. Haupt,⁶ Defendant's expert, this figure shows the six panels that constitute the Ball Advanced Technology Demonstration antenna array. In Dr. Haupt's opinion, and, as is obvious from the figure, these six panels are a very small fraction of the array panels of a full Geodesic Dome Phased Array Antenna. Haupt Decl. ¶ 10 (Aug. 17, 2017). The Ball Advanced Technology Demonstration antenna is not a "sphere" as defined by the Court in its claim construction opinion because it is not greater than a hemisphere, as it only had six panels.

The picture of the Ball Advanced Technology Demonstration antenna appended to the Complaint shows these six panels as follows:



⁶ Dr. Randy Haupt is a Professor of Electrical Engineering and Computer Science at the Colorado School of Mines, with 38 years of experience in phased array antennas. He has a Ph.D. in Electrical Engineering from the University of Michigan. In 1993, he was named the Federal Engineer of the Year - - the top engineer employed by the United States Government. He is currently the chair of the Institute of Electrical and Electronics Engineers ("IEEE") Antennas and Propagation Society Fellows Committee, and from 1999 to 2014, was a member of the IEEE Antennas Definitions Working Group that defines government and industry terms for antenna specifications. Haupt Decl. ¶¶ 4-11 (Aug. 16, 2016). This Court accepted Dr. Haupt as an expert in the fields of electrical engineering, antenna design, antennas for satellite communications, and phased array antennas. Tr. 103. This Court found Dr. Haupt to be "a well-qualified and credible expert," whose "testimony was clear and helpful to the Court." Order 2 (Nov. 18, 2016).

Compl. Ex. 3.

After the demonstration in 2009, the Ball Advanced Technology Demonstration antenna was disassembled, with one part sent back to Ball Aerospace for further testing, and after 2012, the Air Force Research Laboratory did not engage in any activities to develop, manufacture, or test a Geodesic Dome Phased Array Antenna. Turner Decl. ¶¶ 9-13.⁷

Procedural History

Plaintiff originally filed his complaint on February 23, 2014. On June 24, 2014, Defendant filed a partial motion to dismiss, arguing that some of Plaintiff's claims were time-barred, while others arose after his patent expired. The Court granted Defendant's motion on March 20, 2015. Bondyopadhyay v. United States, No. 14-147C, 2015 WL 1311726, at *7 (Fed. Cl. Mar. 20, 2015).

Following discovery, the Court conducted a claim construction hearing in Houston, Texas in order to determine the definition of the term "Sphere" as used within the patent. Following post-hearing briefing, the Court issued its Claim Construction Opinion on January 18, 2017, agreeing with Defendant that the term "Sphere" should be construed to mean "greater than a hemisphere so as to provide the phased array antenna hemispherical or wider coverage." Bondyopadhyay v. United States, 129 Fed. Cl. 793, 807 (Fed. Cl. 2017). In so ruling, the Court rejected Plaintiff's proposed construction that "Sphere" means "spherical" because such a construction would "fail to give meaning to the term 'sphere' as a noun that defines the overall structure of the claimed phased array antenna." *Id.* at 804 (citing In re Hyatt, 708 F.2d 712, 714 (Fed. Cir. 1983) ("A claim must be read in accordance with the precepts of English grammar.")). Following that decision, Defendant filed its motion for summary judgment on August 23, 2017, and Plaintiff filed his "Motion of the Infringement Phase" on October 5, 2017. Briefing was completed on November 8, 2017, and the matter is now ripe for disposition.

Discussion

Jurisdiction

This Court has subject-matter jurisdiction over this action pursuant to 28 U.S.C. § 1498(a), which provides in relevant part:

Whenever an invention described in and covered by a patent of the United States is used or manufactured by or for the United States without license of the owner thereof or lawful right to use or manufacture the same, the owner's remedy shall be by action against the United States in the United States Court of Federal Claims for the recovery of his reasonable and entire compensation for such use and manufacture.

⁷ Roger K. Turner is the Deputy Chief, Navigation and Communication Branch, Sensors Directorate at the United States Air Force Research Laboratory at Wright-Patterson Air Force Base in Ohio.

28 U.S.C. § 1498(a) (2016). Because Plaintiff is the inventor and owner of the '134 Patent, and accuses the Air Force of making and using a geodesic sphere phased array antenna as claimed in the '134 Patent without lawful rights, this Court has jurisdiction.

Summary Judgment Standard

Summary judgment is appropriate where there is “no genuine dispute as to any material fact and the movant is entitled to judgment as a matter of law.” RCFC 56(a); see also Anderson v. Liberty Lobby, Inc., 477 U.S. 242, 247-48 (1986). A genuine dispute is one that “may reasonably be resolved in favor of either party.” Liberty Lobby, 477 U.S. at 250. A fact is material if it “might affect the outcome of the suit.” Id. at 248. The moving party bears the burden of establishing the absence of any material fact, and any doubt over factual disputes will be resolved in favor of the nonmoving party. Mingus Constructors, Inc. v. United States, 812 F.2d 1387, 1390 (Fed. Cir. 1987). Once this burden is met, the onus shifts to the nonmovant to present evidence from which a finder of fact might rule in his favor. If he does so, there is a genuine issue of fact that requires a trial. Liberty Lobby, 477 U.S. at 257.

When considering a motion for summary judgment, a court does not weigh each side’s evidence, but views the inferences to be drawn from the underlying facts in the light most favorable to the party opposing the motion. United States v. Diebold, Inc., 369 U.S. 654, 655 (1962) (per curiam). When opposing parties both move for summary judgment, “the court must evaluate each party’s motion on its own merits, taking care in each instance to draw all reasonable inferences against the party whose motion is under consideration.” Mingus Constructors, 812 F.2d at 1391.

Literal Direct Infringement

Infringement is a question of fact. Absolute Software, Inc. v. Stealth Signal, Inc., 659 F.3d 1121, 1129-30 (Fed. Cir. 2011). As such, a grant of summary judgment of noninfringement is proper when no reasonable factfinder could find that the accused product contains every claim limitation or its equivalent. PC Connector Sols., LLC v. SmartDisk Corp., 406 F.3d 1359, 1364 (Fed. Cir. 2005); see Warner-Jenkinson Co., Inc. v. Hilton Davis Chem. Co., 520 U.S. 17, 29, 39 n.8 (1997). Evaluation of noninfringement is a two-part inquiry: “first, a court construes the scope and meaning of the asserted patent claims, and then compares the construed claims to the accused product or process.” Medgraph, Inc. v. Medtronic, Inc., 843 F.3d 942, 949 (Fed. Cir. 2016).

In undertaking the first step of this process, this Court construed the term “Sphere” to mean “greater than a hemisphere so as to provide the phased array antenna hemispherical or wider coverage.” Bondyopadhyay, 129 Fed. Cl. at 804.

In comparing the construed claim to the accused device, the Court finds that in order to directly infringe the patented device, the Ball Advanced Technology Demonstration antenna would be required to be greater than a hemisphere such that it provided hemispherical or wider coverage. It is undisputed that the partially completed Ball Advanced Technology Demonstration antenna neither meets the spatial definition nor provides the requisite coverage. The Ball Advanced Technology Demonstration antenna is a six-panel structure designed to be a testable part of a larger geodesic dome phased array antenna – one pentagon-shaped panel at the center surrounded by five hexagonal panels. In contrast, Claim 14 of the '134 Patent described the structure as having 12 pentagonal and 20 hexagonal planar faces. '134 Patent 14:36-38.

The Ball Advanced Technology Demonstration antenna was only capable of providing a field of view of 120 degrees, well short of the 180 degrees required for hemispherical coverage. GA111; Haupt Decl. ¶¶ 16-17 (Aug. 17, 2017). Indeed, the Ball Advanced Technology Demonstration antenna required mounting on a steel frame to allow it to be manually rotated in order to test communications with satellites anywhere in the sky. GA076. In contrast, the fundamental objective of the patented invention is to provide a phased antenna array capable of providing at least hemispheric coverage, thereby allowing it to communicate with any satellite in the sky without having to be repositioned to directly face that satellite. The Demonstration antenna is substantially different than the patented invention.

Plaintiff advances two arguments in support his contention that the Ball Advanced Technology Demonstration antenna infringed his patent: 1) Claim 14 was directed to a “geodesic structure” rather than a “sphere” (“[T]he ‘sphere’ word is NOT the critically relevant one in this Phased Array Antenna design case. The explicitly stated KEY DEFINING WORD is GEODESIC STRUCTURE.”); and 2) because the definition accorded to the term “sphere” by the court as a result of claim construction does not literally appear in the patent, such a definition must be incorrect. (“NONE of the following ten words . . . are there in the said Claim 14. (or for that matter in any of the Claims!) ‘to provide the phased array antenna hemispherical or wider coverage’”) Pl.’s Third Resp. to Claim Construction Op. 6 (ECF No. 211); Pl.’s Resp. to Def.’s Mot. to Bar 15 (ECF No. 224) (emphasis in originals).

Both arguments merely repeat arguments rejected by the Court in the claim construction phase of this case. The Court ruled:

In sum, three factors persuade the Court that the preambles recited in independent Claims 1, 14, 19, and 25 limit all claims to sphere shaped structures. First, the body of the independent Claims 1, 14, 19, and 25 each derive meaning from the term “sphere” in their preambles. Second, every dependent claim refers to its corresponding independent claims as “geodesic sphere phased array antenna.” Third, the ’135 Specification defines the “present invention” as a “geodesic sphere phased array antenna.”

Bondyopadhyay, 129 Fed. Cl. at 804.

Similarly, in arguing that the ’134 patent does not contain the words “to provide the phased array antenna hemispherical or wider coverage” Plaintiff attempts to re-litigate the Court’s construction of the term “sphere.” This Court sees no reason to revisit its claim construction. See Del Mar Avionics, Inc. v. Quinton Instrument Co., 836 F.2d 1320, 1324 (Fed. Cir. 1987) (finding that prior findings and the claim construction based on those findings are law of the case and “are not available for redetermination”); see also Anderson Corp. v. Fiber Composites, LLC, 474 F.3d 1361, 1371 n.2 (Fed. Cir. 2007) (stating that district court’s claim construction was law of the case for purposes of trial).

In sum, because the Court has found the term “sphere” to mean “greater than a hemisphere so as to provide the phased array antenna hemispherical or wider coverage,” and because it is undisputed that the alleged infringing device as constructed was not greater than a hemisphere and was incapable of providing hemispherical or wider coverage, the accused device does not literally infringe Plaintiff’s patent.

Direct Infringement Under the Doctrine of Equivalents

The Court next turns to whether the device could be found as infringing under the doctrine of equivalents. Under the doctrine of equivalents, “a product or process that does not literally infringe upon the express terms of a patent claim may nonetheless be found to infringe if there is ‘equivalence’ between the elements of the accused product or process and the claimed elements of the patented invention.” Warner-Jenkinson Co., 520 U.S. at 21. In Warner-Jenkinson Co. the Supreme Court identified two possible approaches to analyze whether there is equivalence: the “insubstantial differences” approach and the “triple identity test.” The “insubstantial differences” test looks to whether the element asserted to be an equivalent in the accused device is insubstantially different from the claimed element. The “triple identity test” focuses on: 1) the function served by a particular claim element; 2) the way that element serves that function; and 3) the result thus obtained by that element. Id. at 39.

Regardless of which test is applied to the alleged infringing device here, Plaintiff cannot establish infringement under the doctrine of equivalents. First, under the “insubstantial differences” approach, courts have noted that a “fundamental difference between the accused systems and the claimed invention that goes to the heart of the claimed invention” may preclude a finding of equivalence. Tech. Patents LLC v. T-Mobile (UK) Ltd., 700 F.3d 482, 500 (Fed. Cir. 2012). In this case, the patented invention plainly describes a “sphere,” and this Court construed the term “sphere” to mean “greater than a hemisphere so as to provide the phased array antenna hemispherical or wider coverage.” The six-panel structure of the Ball Advanced Technology Demonstration antenna did not provide hemispheric or wider coverage. Haupt Decl. ¶ 17 (Aug. 17, 2017). Because this difference between the invention claimed in the ’134 patent and the Ball Advanced Technology Demonstration antenna is fundamental and goes to the heart of the claimed invention, Plaintiff has not established equivalence or infringement under the “insubstantial differences” approach.

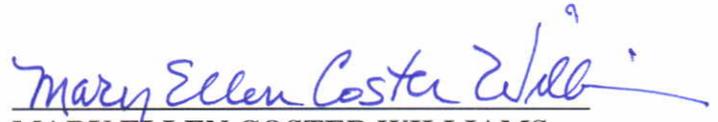
Under the “triple identity test,” Plaintiff must show that the accused device performs substantially the same function as the patented device in substantially the same way to achieve substantially the same result. Warner-Jenkinson Co., 520 U.S. at 40. Here, as Defendant argues, Plaintiff cannot meet this burden because the function of Plaintiff’s geodesic “sphere” antenna array is to provide hemispherical or wider coverage, using a large number of planar surfaces and vertexes to create beams in many directions, resulting in its ability to communicate with any satellite in the sky without mechanically rotating the antenna array. Def.’s Mot. 16-17. On the other hand, the function of the Ball Advanced Technology Demonstration antenna was to demonstrate a “scalable sector” of a Geodesic Dome Phased Array Antenna using a very small fraction of the array panels of a full Geodesic Dome Phased Array Antenna. GA030; Haupt Decl. ¶ 10 (Aug. 17, 2017). So too, the way the claim element would provide hemispherical or wider coverage and the resultant coverage are radically different in the claimed element and the accused device. The Ball Advanced Technology Demonstration antenna had to be mounted on a static, steel frame during testing and demonstration, because it was incapable of providing hemispheric or greater coverage, and could not communicate with any satellite in the sky without movement. Thus, because the main objective of the ’134 patent was to provide a phased array antenna with hemispheric or wider coverage and the Ball Advanced Technology Demonstration antenna definitively did not provide hemispheric or wider coverage, the accused device did not perform

substantially the same function in substantially the same way to achieve substantially the same result.

Although the Ball Advanced Technology Demonstration antenna was commissioned to prove the feasibility of a future antenna which might have, if constructed, been considered infringing, that future antenna was never built. Courts have recognized that infringement does not occur in the absence of an actual infringing device being created. See FastShip LLC v. United States, 122 Fed. Cl. 71, 86 (Fed. Cl. 2015) (holding that a device which was incomplete and inoperable at the time when the patents-in-suit expired was not “manufactured” for purposes of Section 1498(a) and thus could not infringe the patent); see also deGraffenried v. United States, 25 Cl. Ct. 209, 212 (Cl. Ct. 1992) (accused device which was ordered but not assembled or delivered until after expiration of the patent did not infringe).

Conclusion

In sum, because the Ball Advanced Technology Demonstration antenna was incapable of providing hemispheric or greater coverage, it did not literally infringe the '134 patent. Under either test for infringement under the doctrine of equivalents, the accused device cannot be found as infringing. Accordingly, Defendant’s motion for summary judgment is **GRANTED**, and Plaintiff’s “Motion of the Infringement Phase” (ECF No. 216) is **DENIED**. The Clerk is directed to enter judgment for Defendant. No costs.


MARY ELLEN COSTER WILLIAMS
Judge