

United States District Court,
N.D. California.

SPACE SYSTEMS/LORAL, INC,
Plaintiff.

v.

LOCKHEED MARTIN CORP,
Defendant.

No. C 96-3418 SI

Aug. 5, 1998.

James H. Wallace, Jr., Gregory Lyons, John B. Wyss, Wiley Rein & Fielding, Washington, DC, Edward V. King, Jr., Michael J. Higgins, King & Higgins LLP, San Francisco, for Space Systems/Loral, Plaintiffs.

Edward V. Filardi, Cecilia O. Lofters, Robert B. Smith, White & Case, New York, NY, Mary B. Cranston, Pillsbury Madison & Sutro LLP, Palo Alto, Roger P. Kennedy, Lockheed Martin Missiles and Space, Sunnyvale, for Lockheed Martin Corporation, defendants.

Edward V. Filardi, Cecilia O. Lofters, Robert B. Smith, White & Case, New York, NY, Mary B. Cranston, Pillsbury Madison & Sutro LLP, Palo Alto, Roger P. Kennedy, Lockheed Martin Missiles and Space, Sunnyvale, for Lockheed Martin Corporation, Counter-claimants.

James H. Wallace, Jr., Gregory Lyons, John B. Wyss, Wiley Rein & Fielding, Washington, DC, Edward V. King, Jr., Michael J. Higgins, King & Higgins LLP, San Francisco, for Space Systems/Loral, Counter-defendants.

ORDER RE: MOTIONS FOR SUMMARY JUDGMENT CONCERNING RAHN PATENT

ILLSTON, District J.

The parties in this case have filed the following motions with respect to U.S. patent No. 5,100,084 (the "Rahn patent"): (1) defendant's motion for partial summary judgment that the Rahn patent is invalid; (2) defendant's motion for partial summary judgment that its Series 7000 satellites do not infringe Claim 3 of the Rahn patent and plaintiff's cross-motion that the Series 7000 satellites literally infringe this claim; and (3) defendant's motion for partial summary judgment that its A2100 series satellites do not infringe Claim 3 of the Rahn patent and plaintiff's cross-motion for partial summary judgment that the A2100 series satellites literally infringe this claim. Having considered the arguments of counsel and the papers submitted, the Court hereby (1) DENIES defendant's motion for partial summary judgment that the Rahn patent is invalid; (2) GRANTS defendant's motion for partial summary judgment that the Series 7000 satellites do not infringe Claim 3 of the Rahn patent, either literally or under the doctrine of equivalents; and (3) GRANTS IN PART and DENIES IN PART defendant's motion for partial summary judgment that the A2100 series satellites do

not infringe Claim 3 of the Rahn patent.

BACKGROUND

Plaintiff Space Systems/Loral Inc. ("SSL") filed this action alleging patent infringement in violation of 35 U.S.C. s. 271(a) against defendant Lockheed Martin Corporation ("Lockheed"). SSL's complaint alleges that Lockheed is engaged in the "manufacture, shipment, and sale" of satellites that infringe Claim 1 of U.S. patent number 4,767,084 (the "Chan patent"), entitled "Autonomous Stationkeeping for Three-Axis Stabilized Spacecraft"; and Claim 3 of U.S. patent No. 5,100,084 (the "Rahn patent"), entitled "Method and Apparatus for Inclined Orbit Attitude Control For Momentum Bias Spacecraft."

Most communications satellites operate optimally in a geosynchronous, equatorial orbit, circling the earth once every 24 hours in the equatorial plane and thus remaining in the same position relative to the earth's surface. Such positioning allows for a consistent relationship between the satellite and a transmitter on earth, from which the satellite receives and relays radio signals. It is also essential that the satellite maintain a proper attitude, or orientation, so that the satellite's communication devices (e.g., antennas) are properly directed towards earth. FN1

FN1. *Webster's II New College Dictionary* defines "attitude" as "the orientation of a spacecraft relative to its direction of motion."

A satellite's position and attitude must be adjusted periodically in order to maintain the satellite's ability to receive radio signals from a specific transmitter on earth and relay them to a targeted region on earth, or "pointing accuracy." These adjustments are necessary because while in orbit satellites are subject to various destabilizing forces, such as gravitational effects from the sun and moon, or even the force exerted by light from the sun. Without a way to counteract these forces as they act on the satellite's position (i.e., through its center of mass), the satellite would drift behind or move ahead in its orbit, or drift out of its orbit in the equatorial plane and into an inclined orbit, FN2 creating pointing inaccuracies. Without a way to counteract these forces as they act on the satellite's attitude (i.e., about its center of mass), the satellite's antennae would twist away from earth, also creating pointing inaccuracies.

FN2. For example, the orbit of a geostationary satellite acquires an inclination at the rate of about .8 degrees a year due to the gravitational forces of the sun and moon.

"Stationkeeping" is the process by which a satellite maintains its designated position in orbit around the earth. It is accomplished with small thrusters located on the surfaces of the satellite. East-west stationkeeping, for example, involves firing the thrusters so as to speed or slow the satellite in its orbit to return it to its proper position. If the satellite has drifted into an inclined orbit, thrusters are fired during north-south stationkeeping to return the satellite to the equatorial plane.

To maintain a proper attitude, most satellites employ at least one momentum wheel powered by an electric motor. A momentum wheel spinning in a satellite creates angular momentum, or "stiffness," which in turn offers resistance to the twisting forces that can change a satellite's attitude. However, the angular momentum created by a spinning momentum wheel does not provide resistance to forces that would twist the satellite around the axis of the wheel. To counteract these forces, the speed of the momentum wheel can be changed.

For example, the speed of the momentum wheel can be increased in order to rotate the spacecraft in the opposite direction. Thus, by careful control, a proper attitude for the satellite can be maintained.

These techniques for maintaining satellite position and attitude are limited, however. The use of a satellite's thrusters requires propellant, which adds to the weight and thus expense of the satellite; therefore propellant is conserved whenever possible. A momentum wheel, employed over time to correct for forces that twist the satellite around the axis of the wheel, will eventually become "saturated" with excess angular momentum. A saturated momentum wheel is one that is spinning either too fast or too slow to control the satellite's attitude. The saturated wheel requires desaturation, or "momentum dumping," to restore the wheel to its nominal spin rate. Desaturation consists of using the satellite's thrusters and/or the wheel's motor to slow or speed the wheel.

When the satellite's propellant is substantially exhausted, the satellite will drift from its geosynchronous equatorial orbit into an inclined orbit. As this orbit becomes more and more inclined (at a rate of about .08 degrees a year), maintaining the satellite's pointing accuracy becomes more and more difficult. Claim 3 of the Rahn patent discloses an attitude control apparatus that employs a satellite's momentum wheels to correct for a satellite's pointing inaccuracies in inclined orbit, thereby extending the operational life of the satellite.

Presently before the Court are the parties' summary judgment motions concerning whether the Rahn patent is valid and, if it is, whether defendant's Series 7000 or A2100 series satellites infringe Claim 3, either literally or under the doctrine of equivalents.

LEGAL STANDARDS

A. Patent Invalidity

In order to obtain a patent, an inventor must prove to the U.S. Patent and Trademark Office ("PTO") that his or her invention is novel, useful and non-obvious, 35 U.S.C. s.s. 101-103, and that the invention's description is set out in "such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains ... to make or use the same." 35 U.S.C. s. 112. The patent issues only after examiners in the PTO have determined that the invention satisfies the requirements of patentability. Once a patent issues, it is presumed valid. 35 U.S.C. s. 282. To overcome the statutory presumption of validity, a challenger must present clear and convincing evidence that demonstrates the invalidity of the patent. *North Am. Vaccine, Inc. v. American Cyanamid Co.*, 7 F.3d 1571, 1579 (Fed.Cir.1993).

B. Patent Claim Infringement

Patent infringement analysis involves two basic steps: (1) construing the patent claims; and (2) determining whether the accused device infringes the patent claims. *See Markman v. Westview Instruments, Inc.*, 517 U.S. 370 (1996). Construction of the patent claims is a matter of law to be decided by the court, and determination of infringement is a question of fact to be decided by the jury. *See id.* In determining the proper construction of a claim, the Court has numerous sources, intrinsic and extrinsic, that it may properly look to for guidance.

When constructing the patent's claims, the Court begins with the intrinsic evidence of record, consisting of the patent itself, the patent specification, and, if in evidence, the prosecution history. *See Unique Concepts, Inc. v. Brown*, 939 F.2d 1558, 1561 (Fed.Cir.1991). The Court must examine the words of the claims

themselves, both asserted and unasserted, to define the scope of the patented invention. *See Bell Communications Research, Inc. v. Vitalink Communications Corp.*, 55 F.3d 615, 620 (Fed.Cir.1995). Although words in a claim are generally given their ordinary and customary meanings, a patentee is free to act as his own lexicographer provided that the patentee's special definition is clearly stated in the patent specification or prosecution history. *See Hormone Research Foundation, Inc. v. Genentech. Inc.*, 904 F.2d 1558, 1563 (Fed.Cir.1990), *cert. dismissed*, 499 U.S. 955 (1991).

To determine whether the patentee has used any claim terms in a manner inconsistent with their ordinary meanings, the Court must in each case review the patent specification. *See Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed.Cir.1996). The specification is highly relevant to the claim construction analysis. *See id.*

Finally, the Court may consider the prosecution history of the patent, if in evidence. The prosecution history limits the interpretation of claim terms so as to exclude any interpretation that was disclaimed during prosecution. *See Southwall Technologies, Inc. v. Cardinal IG Co.*, 54 F.3d 1570, 1576 (Fed.Cir.), *cert. denied*, 116 S.Ct. 515 (1995).

In most situations, an analysis of the intrinsic evidence alone will resolve claim construction disputes. *See Vitronics*, 90 F.3d at 1583. Reliance on extrinsic evidence is unnecessary and improper when the disputed terms can be understood from a careful reading of the public record. *See id.* at 1584. Nor may such evidence be used to vary the claim terms from how they are defined, even implicitly, in the specification or prosecution history. *See id.* at 1584-85.

C. Summary Judgment

A motion for summary judgment may be granted when "the pleadings, depositions, answers to interrogatories, and admissions on file, together with the affidavits, if any, show that there is no genuine issue as to any material fact and that the moving party is entitled to a judgment as a matter of law." Fed.R.Civ.P. 56(c).

The moving party bears the initial burden of "informing the district court of the basis for its motion" and identifying the matter that "it believes demonstrate[s] the absence of a genuine issue of material fact." *Celotex Corp. V. Catrett*, 477 U.S. 317, 323 (1986). If the moving party meets this burden, the nonmoving party must then set forth "specific facts showing that there is a genuine issue for trial." Fed.R.Civ.P. 56(c); *see also T.W. Elec. Serv., Inc. V. Pacific Elec. Contractors Ass'n*, 809 F.2d 626, 630 (9th Cir.1987).

"[O]nly disputes over facts that might affect the outcome of the suit under the governing law will properly preclude the entry of summary judgment." *Anderson v. Liberty Lobby, Inc.*, 477 U.S. 242, 248 (1986). Conclusory, speculative testimony in affidavits and moving papers is insufficient to raise genuine issues of fact and defeat summary judgment. *See Falls River way Realty, Inc. V. Niagra Falls*, 754 F.2d 49 (2d Cir.1985); *Thornhill Pub. Co. V. GTE Corp.*, 594 F.2d 730, 738 (9th Cir.1979).

The evidence presented by the parties in support of or opposition to a motion for summary judgment must be admissible. *See Fed.R.Civ.P. 56(e)*. In evaluating this evidence, the Court does not make credibility determinations or weigh conflicting evidence, and draws all inferences in the light most favorable to the nonmoving party. *T.W. Elec. Serv.*, 809 F.2d at 630-31 (citing *Matsushita Elec. Indus. Co. v. Zenith Radio Corp.*, 475 U.S. 574 (1986)); *Ting v. United States*, 927 F.2d 1504, 1509 (9th Cir.1991).

DISCUSSION

I. Lockheed's Motion for Partial Summary Judgment that the Rahn Patent Is Invalid

A. Invalidity Under 35 U.S.C. s. 112

Defendant Lockheed argues that it is entitled to summary judgment that the Rahn patent is invalid because it fails to meet the requirements in the first two paragraphs of 35 U.S.C. s. 112. Section 112 reads in relevant part:

[1] The specification shall contain a written description of the invention, and of the manner and process of using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make or use the same

[2] The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

35 U.S.C. s. 112.

SSL argues that the issue of patent validity, including an inquiry into what "a person skilled in the art" would make of the Rahn patent, is highly factual and therefore usually inappropriate for summary judgment, and that Lockheed has not met its burden of presenting clear and convincing evidence to overcome the presumption of validity under 35 U.S.C. s. 282 that accompanies an issued patent.

SSL correctly points out that the Court must analyze the patent under s. 112 through the eyes of someone "skilled in the art." This requirement not only arises in the plain language of the "enablement" requirement ([1] above) but also in the Federal Circuit's interpretation of the "definiteness" requirement ([2] above). *See* Amgen, Inc. v. Chugai Pharmaceutical Co., LTD., 927 F.2d 1200, 1217 (Fed.Cir.1991) ("A decision as to whether a claim is invalid under this provision requires a determination whether those skilled in the art would understand what is claimed.") Thus, in order to establish invalidity here, Lockheed must convince the Court that there can be no material dispute as to the existence of "clear and convincing evidence" that one of ordinary skill in the art cannot "make or use" or "understand" the claimed invention. *See* North Am. Vaccine, Inc. v. American Cyanamid Co., 7 F.3d 1571 (Fed.Cir.1993).

In light of this factual burden, Lockheed cannot prevail on its motion for summary judgment. In its moving papers, Lockheed attempts to identify for the Court logical inconsistencies within the patent, *see* Def's Motion for Partial Summary Judgment at 7, and between the patent and the inventor, *see id.* at 9. Conspicuously absent is any evidence of the opinions of those "skilled in the art." The Court is therefore unable to conclude that those "skilled in the art" are unable to replicate or understand the invention claimed in the Rahn patent.

B. Failure to Disclose "Best Mode"

35 U.S.C. s. 112 also provides, in relevant part, that the specification "shall set forth the best mode contemplated by the inventor of carrying out his invention." The purpose of this statutory "best mode"

requirement is to prevent inventors from applying for a patent while concealing from the public other preferred embodiments conceived by the inventor. *See Wahl Instruments, Inc. v. Acvious, Inc.*, 950 F.2d 1575, 1579 (Fed.Cir.1991). Determining whether a patent complies with the best mode requirement involves two underlying factual inquiries. First, it must be determined whether, at the time the patent application was filed, the inventor had a best mode of practicing the claimed invention. *See Chemcast Corp. v. Arco Indus. Corp.*, 913 F.2d 923, 927 (Fed.Cir.1990). Second, if the inventor did have a best mode of practicing the claimed invention, it must be determined whether the specification adequately disclosed this best mode so that those having ordinary skill in the art could practice it. *See id.* at 928.

Lockheed contends that it is entitled to summary judgment of invalidity because a July 15, 1988 office memorandum written by Dr. Rahn allegedly indicates that the most preferred momentum wheel arrangement for the patented apparatus was a four wheel, "dual-V" configuration. *See Declaration of Scott T. Weingaertner* filed October 18, 1996, Ex. D at 6730. Lockheed alleges that because such a configuration was not disclosed by the patent specification, section 112's "best mode" requirement was not satisfied, and that the patent is therefore invalid.

SSL counters that while the dual-V system mentioned by Rahn is an "acceptable wheel configuration" for the Rahn apparatus, it does not constitute a "better" or "best" mode. SSL argues that the memorandum at issue was based on specific design constraints for a specific satellite project, the Intelsat VII, and is not related to the designation of a best mode for implementing the patented invention.

"To establish invalidity for failure to disclose the best mode, the party seeking to invalidate the patent must present clear and convincing evidence that the inventor both knew of and concealed a better mode of carrying out the claimed invention than was set forth in the specification." *Young Dental Mfg. Co., Inc. v. Q3 Special Products*, 112 F.3d 1137 (Fed.Cir.1997). The memorandum Lockheed relies on-written before the patent application was filed-was created in response to requests for information on how the invention would function under particular circumstances with a particular satellite. *See Weingaertner Decl. Exh. D. para. . 6730-31.* SSL emphasizes that the memo was created as a response to a specific question about the design constraints of a specific satellite, a position supported by the language of the memo. *See id.* at 6730 ("The purpose of this memo is to answer [questions arising out of] the Intelsat VII Negotiations. [These questions] concern[] operation of the spacecraft in an inclined orbit.").

Lockheed offers no other evidence that Rahn knew of or intended to conceal a best mode of practicing the patent. After carefully reviewing the memorandum, the Court concludes that, while Rahn does appear to suggest that a dual-V wheel arrangement would be beneficial in certain satellites in certain inclined orbits, the memo standing alone does not constitute clear and convincing evidence that Rahn "knew of and concealed" the dual-V wheel arrangement as a best mode for his invention.

C. "On Sale" Prior to Filing Date

"A person shall be entitled to a patent unless ... the invention was ... on sale in this country, more than one year prior to the date of the application for patent" 35 U.S.C. s. 102(b). Under the Federal Circuit's decision in *UMC Electronics Co. v. U.S.*, 816 F.2d 647, 656-57 (Fed.Cir.1987), *cert. denied* 484 U.S. 1025 (1988), in certain circumstances a product which is the subject matter of a "definite offer to sell," even if no "reduction to practice" has occurred, may be "on sale" for the purpose of s. 102(b).

Lockheed alleges that the "Intelsat VII Negotiations" mentioned in the Rahn interoffice memo constituted a

"definite offer to sell" the invention claimed by the Rahn patent to the International Telecommunications Satellite Organization. Lockheed dates this offer to "before July 1988" based on the interoffice memo (dated July 15, 1988) and an "Invention Disclosure" form filled out by the inventors. *See Weingaertner Decl. Ex. D & E.* Because the first Rahn patent application was not filed until April 16, 1990, Lockheed concludes that the filing was barred by the "on sale" requirement of 35 U.S.C. s. 102(b).

SSL counters that the invention disclosed in the Rahn patent was not "on sale" before April 16, 1989. SSL argues that, pursuant to *Robotic Vision Sys., Inc. v. View Eng'g, Inc.*, 112 F.3d 1163, 1167-68 (Fed.Cir.1997), the on sale bar does not apply to an offer of sale unless the offer is of an invention that is "substantially complete" at the time of the offer. In that case, the court held that "subsequent completion of an invention after the critical date does not relate back to the date of an earlier ... offer of sale ." *Id.* The Federal Circuit in *Robotic Vision* explicitly held that if software necessary for successful operation of the invention was developed after the alleged "on sale" date, a finding that the invention was "on sale" is precluded. *See id.* at 1167.

The Court finds that Lockheed has failed to carry its burden of proving that the invention claimed in the Rahn patent was "on sale" before April 16, 1989. At the very least SSL has created a material factual dispute regarding this issue. Scott W. Tilley, the design lead on the Intelstat VII, was asked in his deposition:

Q. As of November 13th, 1989, what additional work needed to be done to generate the inclined orbit controller?

A. Chris Rahn had completed some preliminary simulations at that time, but at that time I do not believe there were detailed simulations, and there was not code written for the spacecraft processor, and there had been no subsystem testing.

....

Q. At the time you became design lead on the INTELSAT-VII project [fall of 1989], had the inclined orbit control algorithms been fully perfected, tested, simulated?

A. No.

Deposition of Scott W. Tilley at 47-48, 99-100, attached as Exhibit 7 to the Declaration of James M. Ross filed June 16, 1997. The Court concludes that Mr. Tilley's testimony is sufficient to deny Lockheed's motion for summary judgment under s. 102(b). FN3

FN3. The Rahn patent does assert that certain components of the invention can be implemented in either "hardware, software or firmware;" however, Lockheed offers no evidence that this flexibility changes the "on sale" analysis: Lockheed has not provided evidence that hardware or firmware rather than software was completed before the critical date.

For the above reasons and for good cause shown, defendant's motion for summary judgment of invalidity of the Rahn patent is hereby DENIED.

II. Cross-Motions for Summary Judgment Re: Whether the Series 7000 Satellites Infringe the Rahn Patent

Defendant Lockheed Martin has filed a motion for partial summary judgment that its Series 7000 satellites do not infringe the Rahn patent, either literally or under the doctrine of equivalents. Plaintiff Space Systems/Loral alleges in its motion for partial summary judgment that Lockheed's Series 7000 satellites literally infringe Claim 3 of the Rahn patent.

A determination of infringement requires a two-step analysis. *See Gentry Gallery, Inc. v. Berkline Corporation*, 134 F.3d 1473, 1476 (Fed.Cir.1998). "First, the claim must be properly construed to determine its scope and meaning. Second, the claim as properly construed must be compared to the accused device or process." *Carroll Touch, Inc. v. Electro Mechanical Sys., Inc.*, 15 F.3d 1573, 1576 (Fed.Cir.1993).

While the parties did dispute the proper construction of each element of Claim 3, the focus of the Court's ruling on whether defendant's Series 7000 satellites infringe the Rahn patent is on the proper construction of "yaw momentum commands," which appear in elements [b] and [d]. *See Rahn patent col. 11:9-20*. In element [d], a "modeling circuit" determines "appropriate roll commands, pitch commands, and yaw momentum commands to established [sic] a particular aim point for a selected target." *Rahn patent col. 11:15-20*. These commands are then received by element [e]'s "short term tracker circuit," which "provide[s] attitude control information in response to said commands." *Id. col. 21-25*. In element [b], the "momentum biasing attitude control apparatus" "effect[s] attitude control in response to" these same "roll commands, pitch commands, and yaw momentum commands." *Id. col. 11:9-11*.

Element [b] suggests that the "roll commands, pitch commands, and yaw momentum commands" function as instructions for moving the satellite-i.e., changing its attitude. SSL's proposed construction of these terms partially conforms to that suggestion:

A "roll command" is a command (*e.g.*, rotate 3 degrees clockwise) which, if all other inputs to the short term tracker (element e) are unchanged, will cause a corresponding rotation of the spacecraft about its roll axis.

A "pitch command" is a command issued by the modeling circuit (*e.g.*, roll 1 degree counterclockwise) which, if all other inputs to the short term tracker are unchanged, will cause a corresponding rotation about the spacecraft's pitch axis.

A "yaw momentum command" is a command issued by the modeling circuit (*e.g.*, increase or decrease momentum by a certain amount) which, if all other inputs to the short term tracker are unchanged, will cause a corresponding change in the component of angular momentum along the yaw axis.

SSL's Reply in Support of Its Cross-Motion for Partial Summary Judgment that Lockheed Martin's Series 7000 Satellites Literally Infringe the Rahn Patent at 6. FN4 But while the above constructions of "roll command" and "pitch command" describe what these instructions will do (i.e., cause a certain rotation of the satellite about the roll or pitch axis), the proposed construction is deficient in that it does not describe the effect of the "yaw momentum command" on the satellite's attitude, which is the clear purpose of the commands.

FN4. After the August 1, 1997 hearing on claim construction, SSL submitted a Supplemental Memorandum

Regarding Construction of Certain Rahn Patent Claim Terms. In that memorandum, SSL slightly modified its construction:

"Roll commands," "pitch commands" and "yaw momentum commands" are signals that are sent to the short term tracker circuit (element [5]). If the other inputs to the short term tracker remain unchanged, then: (a) a change in the "roll commands" will cause the spacecraft's aim point to rotate by a corresponding amount about the roll axis; (b) a change in the "pitch commands" will cause the spacecraft's aim point to rotate by a corresponding amount about the pitch axis; and (c) a change in the "yaw momentum commands" will cause a corresponding change in the component of angular momentum along the yaw axis.

Memo at 2.

Lockheed proposes that the Court look to the patent language to arrive at a complete understanding of "yaw momentum commands." Lockheed argues that "yaw momentum commands," as the term is used in the Rahn patent, are commands to momentum/reaction wheels "used to control the roll angle" of the satellite. Lockheed's Motion at 28. The yaw momentum command, according to Lockheed, instructs the momentum biasing apparatus to change the relative speed of its momentum/reaction wheels, thereby changing the balance of yaw momentum between the wheels and causing the satellite to rotate about its roll axis.

Because SSL is unable to offer a sufficiently concrete construction of what a "yaw momentum command" does, the Court agrees in large part with Lockheed's proposed construction. Language in the patent relating to "yaw momentum commands" is sparse, but two passages in particular from the background section are helpful. The first is in reference to "roll ground track errors" (i.e., the satellite's erroneous pointing north or south of where it should be pointing on earth): "The yaw momentum storing wheels are controlled to minimize nutation and allow for roll tracking." Rahn patent col. 3:43-45. The second, one of the objectives of the background control system: "To provide for roll angle tracking by varying a distribution of yaw momentum between a roll angle (ϕ)>>>>, and a yaw momentum in the wheels *Distribution of yaw momentum is controlled by varying a speed of a momentum wheel through the yaw momentum command*" *Id.* col. 4:50-55 (emphasis added).

The patent discloses only one such arrangement, in its description of "specific embodiments": "at least two nonparallel momentum/reaction wheels in a pitch/yaw plane of a spacecraft. Included among acceptable wheel configurations are the L-wheel system and the V-wheel system" *Id.* col. 9:6-10. While the Court is mindful of the prohibition on importing limitations from the specification into the claims, in order to determine the meaning of the term "yaw momentum command," the Court is forced to rely on the above language. As a result, the Court concludes that "yaw momentum commands" are instructions to at least two nonparallel momentum/ reaction wheels in a pitch/yaw plane of a spacecraft concerning the wheels' relative rates of speed, the purpose of which is to control the angular momentum in the yaw direction and to control the attitude of the satellite by changing the roll angle.

The parties do not dispute that Lockheed's Series 7000 satellites lack "yaw momentum commands," as thus construed. The Series 7000 satellites have a single momentum wheel connected to the spacecraft body by a pivot mechanism, and roll angle error is corrected by activating a magnetic torque. Therefore, defendant's motion for partial summary judgment that its Series 7000 satellites do not infringe the Rahn patent is granted. The Court also finds that Lockheed is entitled to partial summary judgment that its Series 7000 satellites do not infringe under the doctrine of equivalents, because the Series 7000 does not as a matter of law contain elements "identical or equivalent" to those elements in the Rahn patent that rely on "yaw momentum commands." *See Warner-Jenkinson Company, Inc. v. Hilton Davis Chemical Co.*, 117 S.Ct.

III. Cross-Motions for Summary Judgment Re: Whether the A2100 Series Satellites Infringe the Rahn Patent

Like the Series 7000, the A2100 Series satellites are 3-axis stabilized satellites designed to operate in equatorial, geosynchronous orbit. However, unlike the Series 7000, the actuators used to alter the attitude of the spacecraft consist of four reaction wheels arranged in a pyramid configuration. The spin axes of the reaction wheels are angled at 30 degrees relative to the pitch axis and the wheels are positioned about the pitch axis such that the plane that passes through the axes of each pair of opposed wheels projects midway (45 degrees) between the roll and yaw axes. *See* Def's Motion for Partial Summary Judgment at 6.

Therefore, to begin with, under the construction made above with respect to "yaw momentum commands," the A2100 Series does not literally infringe elements [b] and [d] of the Rahn patent because it does not rely on yaw momentum commands-instructions to "at least two nonparallel momentum/reaction wheels in a pitch/yaw plane."

However, the Court cannot conclude as a matter of law that the A2100 Series does not infringe the Rahn patent under the doctrine of equivalents. Apart from the angle at which the momentum/reaction wheels are arrayed, the momentum biasing apparatus in the A2100 Series appears to be very similar to the one disclosed in the Rahn patent, and therefore defendant's "torque commands" appear to be similar to the Rahn patent's "yaw momentum commands" as construed by the Court. Because SSL has not completely briefed the issue of a doctrine of equivalents analysis *see* SSL's Oppo. at 20, the Court will not decide the extent of this similarity-whether infringement under the doctrine of equivalents has occurred-on the present motion for summary judgment.

Moreover, because the question of infringement under the doctrine of equivalents is present, the Court makes the following determinations with respect to literal infringement of the other elements of Claim 3 of the Rahn patent by the A2100 Series, based on the parties' cross-motions:

The Court agrees with plaintiff that the A2100 Series infringes element [a] of Claim 3 because the satellite's attitude control contains a sensor that produces output signals for both "roll error" and "pitch error."

The Court also agrees with plaintiff that the A2100 Series contains both a "model generating circuit" and a "short term tracker circuit" as those terms are used in the Rahn patent. The A2100 Series therefore infringes elements [c] and [e] of Claim 3.

However, the Court concludes that the A2100 Series does not infringe element [f] of Claim 3. Element [f] calls for a "long term tracker to observe long term orbit rate dynamics." The A2100 Series uses a "long term tracker," but this tracker is a separate apparatus from its attitude control system: a human operator relays information between the two. *See* Def's Motion for Partial Summary Judgment at 17. Therefore, the A2100 Series does not contain a long term tracker "[i]n a satellite attitude control" Rahn patent col. 11:3. As with elements [b] and [d], the Court will wait for plaintiff's briefing before deciding whether the A2100 Series infringes element [f] under the doctrine of equivalents.

CONCLUSION

For the above reasons and for good cause shown.

- (1) Defendant's motion for partial summary judgment that the Rahn patent is invalid is DENIED;
- (2) Defendant's motion for partial summary judgment that the Series 7000 satellites do not infringe Claim 3 of the Rahn patent, either literally or under the doctrine of equivalents, is GRANTED;
- (3) Defendant's motion for partial summary judgment that the A2100 series satellites do not literally infringe Claim 3 of the Rahn patent is GRANTED;
- (4) Defendant's motion for partial summary judgment that the A2100 series satellites do not infringe Claim 3 of the Rahn patent under the doctrine of equivalents is DENIED.

N.D.Cal.,1998.

Space Systems/Loral, Inc. v. Lockheed Martin Corp.

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