NOTE: This disposition is nonprecedential.

United States Court of Appeals for the Federal Circuit

UNIVERSITY OF PITTSBURGH OF THE COMMONWEALTH SYSTEM OF HIGHER EDUCATION (doing business as University of Pittsburgh),
Plaintiff-Appellee,

v.

VARIAN MEDICAL SYSTEMS, INC.,
Defendant-Appellant.

2012-1575

Appeal from the United States District Court for the Western District of Pennsylvania in No. 08-CV-1307, Judge Arthur J. Schwab.

Decided: April 10, 2014

THOMAS M. PETERSON, Morgan, Lewis & Bockius LLP, of San Francisco, California, argued for plaintiff-appellee. With him on the brief were BRADFORD A. CANGRO, of Washington, DC; WILLIAM P. QUINN, JR., of Philadelphia, Pennsylvania; and WILLIAM S.W. CHANG, of Houston, Texas.

DONALD R. DUNNER, Finnegan, Henderson, Farabow, Garrett & Dunner, LLP, of Washington, DC, argued for defendant-appellant. With him on the brief was KARA F. STOLL. Of counsel on the brief was JAMES T. CANFIELD, of Palo Alto, California.

Before LOURIE, DYK, and O'MALLEY, *Circuit Judges.*

Opinion for the court filed by *Circuit Judge* O'MALLEY.

Dissenting opinion filed by *Circuit Judge* DYK.

O'MALLEY, *Circuit Judge.*

The University of Pittsburgh of the Commonwealth System of Higher Education d/b/a/ University of Pittsburgh ("Pitt") filed suit against Varian Medical Systems, Inc. ("Varian"), alleging infringement of various claims of U.S. Patent No. 5,727,554 ("the '554 patent"). After construing numerous terms of the '554 patent, the district court entered partial summary judgment in favor of Pitt, finding that Varian's accused products infringe the asserted claims of the '554 patent as a matter of law. The district court also found that Pitt had proven as a matter of law that Varian's defenses were not objectively reasonable. The district court then held a trifurcated trial. The same jury presided over a willfulness trial, followed by a damages trial, and finally a validity trial. Pitt prevailed at each phase, culminating with the jury awarding Pitt approximately $37,000,000. After the district court accounted for post-judgment sales, willfulness, and prejudgment interest, it awarded Pitt a total sum slightly over $100,000,000. The district court also awarded Pitt attorneys' fees totaling $9,200,000.

Varian contests the trial court's claim construction of claims 20 and 22. Varian also contests the district court's finding that its accused products infringe claim 20 as a matter of law and that its infringement was willful.

Varian finally contests the damages award in connection with claims 22 and 38. We find that the district court's construction of claim 20 was correct and find no error in the district court's finding that Varian infringes claim 20 as a matter of law. We do, however, reverse the finding that Varian's infringement was willful. We also hold that the district court erred in its construction of claim 22, which consequently requires that the damages award associated with that claim be vacated and remanded. We finally hold that the damages award in connection with claim 38 was not erroneous.

I. BACKGROUND

Pitt is the assignee of the '554 patent, entitled "[a]pparatus responsive to movement of a patient during treatment/diagnosis." In practice, the claimed technology is intended to improve radiation therapy by reducing damage to healthy tissue during treatment. The invention reduces damage to healthy tissue by synchronizing a radiation treatment beam with a patient's movements. According to the invention, the radiation treatment beam can be synchronized with a patient's breathing, for example, so that tumors are irradiated only when in treatment range. In other words, the radiation beam will turn on and off in synchronicity with the patient's breathing.

The '554 patent generally describes using natural or artificial "fiducials" to detect patient movement. *See* '554 patent col. 3, ll. 55–56. Natural fiducials can be scars or moles on a patient's skin. *See id.* at col. 3, ll. 57–58. Artificial fiducials can be structures attached to a patient's skin that have a highly reflective surface under low light conditions. *See id.* at col. 3, ll. 58–64. The patent explains that only one fiducial is necessary to practice the invention, but that it is advantageous to use multiple fiducials. *See id.* at col. 3, l. 65 – col. 4, l. 10. A patient movement detector tracks fiducials to provide information to the system regarding patient movement, allowing

synchronization with those movements. *See id.* at col. 4, ll. 21–47.

Varian manufactures and sells equipment and software used for radiation treatment and diagnosis. Varian has sold the alleged infringing system, the Real-Time Position Management ("RPM") Respiratory Gating System ("RPM System") in the United States since June 1999. Varian's RPM System is a video-based system that monitors and tracks patient respiratory movement during treatment. The system uses an infrared tracking camera, infrared illuminator rings, and reflective markers that measure a patient's respiratory pattern and range of motion. The patient's motions are displayed as a waveform on a work station monitor. The RPM System can generate signals that switch a radiation therapy beam on and off in synchronization with a patient's movements.

Varian's RPM System includes a marker block that has multiple reflective markers on a plastic base. During radiotherapy treatment, the marker block is placed on a patient who is within view of the camera. The block moves with the patient's breathing. The RPM System tracks the movement of the marker block and displays the movement in an amplitude-based display. During radiotherapy treatment, the RPM System sends a signal ("gating signal") to a linear accelerator to start or stop the radiation beam based on the patient's movement.

The RPM System is designed for use with Varian's Clinac and Trilogy radiotherapy treatment machines. The RPM System can be bought separately or in combination with the Clinac or Trilogy devices. The Clinac accelerator is a medical linear accelerator used to provide radiotherapy treatment to patients. The Trilogy System is a suite of products that includes a Clinac iX linear accelerator. The Clinac linear accelerator includes many components, one of which is a beam generator. The Clinac and Trilogy devices may be used with a RPM System, but they can

also be purchased or used without a RPM System. The RPM System was bundled with the Trilogy device between 2005 and 2006, but otherwise was merely an option to be sold with the system.

In 2008, Pitt filed suit against Varian alleging infringement of the '554 patent. That action was dismissed for lack of standing. While that case was on appeal before this court, Pitt filed a second suit against Varian, again alleging infringement of the '554 patent. The district court dismissed that case on res judicata grounds. While the second case was on appeal to this court, we decided the first appeal, reversed the dismissal, and remanded to the district court. The parties then agreed to dismiss the first case and second appeal, and proceed before the district court on the second filed case only. This appeal is from that second filed suit.

While the appeals were pending before this court, in July 2009, Varian petitioned the PTO for *ex parte* reexamination of claims 20–22 of the '554 patent. The '554 patent originally contained 22 claims. *See* '554 patent at col. 8, l. 29 – col. 10, l. 62. In relevant part, Varian relied on Finnish Patent Application No. 861600 ("Peltola"). The PTO rejected claims 20–22 of the '554 patent in view of Peltola in a first office action. But, the PTO ultimately confirmed the patentability of claims 20–22 and noted that Peltola did not teach the precise "camera means" claimed in the '554 patent. Pitt also added new claims 23–38 during the reexamination process.

Pitt asserted some claims against Varian's RPM System alone, and other claims against the Clinac or Trilogy devices sold in combination with the RPM System. Namely, Pitt alleged that Varian's RPM System infringed claims 20, 21, 25, 26, and 36 of the '554 patent. Pitt further alleged that when Varian's Clinac or Trilogy devices incorporated the RPM System therein, those devices infringed claims 22 and 38 of the '554 patent.

The district court appointed a special master to conduct a claim construction hearing.

For purposes of this appeal, claims 20, 22, and 38 are the most relevant. Independent claim 20 reads:

> 20. Apparatus responsive to movement of a patient positioned on a patient positioning assembly, said apparatus comprising:
>
> camera means generating digital image signals representative of an image of said patient; and
>
> processing means comprising means determining movement of said patient from said digital image signals, including movement associated with breathing by said patient, and gating means generating gating signals synchronized with said movement associated with breathing by said patient.

'554 patent, col. 10, ll. 41–52.

The parties agreed that the "means determining movement of said patient" limitation is a means-plus-function term, but did not agree on what structure in the patent's written description performed the claimed function. At the claim construction phase, the parties disputed whether the disclosed structure was a computer processor programmed to perform a two-step algorithm as Pitt contended, or a thirty-step algorithm, as Varian contended. *See Univ. of Pittsburgh v. Varian Med. Sys., Inc.*, Civ. No. 2:08–cv–1307, ECF No. 283 (W.D. Pa. Apr. 6, 2011) ("Special Master Report"). The special master recommended that the correct structure was "[a] computer processor programmed as a patient motion detector that (1) identifies at least one fiducial from the image signals; and (2) tracks its movement; and equivalents." *Id.* Varian objected to the special master's recommendation, and urged the district court to adopt a four-step

algorithm instead, abandoning its argument regarding a thirty-step algorithm. *See Univ. of Pittsburgh*, ECF No. 302 (W.D. Pa. May 16, 2011).[1] The district court overruled Varian's objection and adopted the special master's proposed construction. *See id.*

Claim 22 is also relevant to this appeal. Claim 22 depends from claim 20 and reads:

> 22. The apparatus of claim 20 adapted for use during treatment of said patient with a radiation beam generated by a beam generator, wherein said gating means comprises means generating said gating signals synchronized to actuate said beam generator in synchronism with patient breathing.

'554 patent col. 10, ll. 57–62.

The special master construed claim 22 consistently with the construction of claim 20. At the summary judgment phase, however, a dispute arose between the parties as to whether the scope of claim 22 actually included the "beam generator" mentioned in claim 22's preamble (i.e., whether Varian's Clinac or Trilogy devices were within the scope of the claim for infringement purposes). *See Univ. of Pittsburgh*, ECF No. 432 (W.D. Pa. Dec. 30, 2011). The district court determined that the scope of claim 22 included the beam generator. *Id.*

The special master also construed claim 38, which was added during reexamination. Claim 38 reads:

---

[1] The court did not find that Varian had waived this new claim construction argument by not raising it before the Special Master and Pitt does not rely on waiver on appeal. We, accordingly, proceed on the assumption that Varian properly preserved its ability to urge a four-step algorithm as the corresponding structure it proposes.

> 38. The apparatus of claim 20, further comprising a beam generator configured to provide computer-controlled multi-beam conformal dynamic radio therapy for said patient, wherein said gating signals are synchronized to actuate said beam generator in synchronism with patient breathing.

'554 patent reexamination, col. 2, ll. 33–38. The special master construed that claim as:

> a beam generator configured to provide radiation therapy under computer control. The radiation therapy treatment involves using radiation beams corresponding to the shape of the target. The beam generator is configured to be repeatedly repositioned to irradiate the target with multiple treatment beams, each from a different direction.

See Univ. of Pittsburgh, ECF No. 432.

The parties then filed cross-motions for summary judgment. The district court granted summary judgment in favor of Pitt that: (1) Varian's RPM System infringed independent claim 20 and dependent claims 21, 25, 26, and 36; (2) those Varian Clinac or Trilogy devices that incorporated the RPM System infringed dependent claims 22 and 38; and (3) Varian acted despite an objectively high likelihood that its actions constituted infringement of the '554 patent (i.e., that the objective component of the willfulness inquiry was satisfied). The trial court then ordered the remaining issues to trial and trifurcated the proceedings.

The district court held a willfulness trial for the jury to answer the question of whether Varian knew or should have known that it was infringing the '554 patent and that the patent was valid (i.e., the subjective component of the willfulness inquiry). The jury found that Varian knowingly acted despite the risk of infringing a valid patent. The same jury then returned for a second trial,

heard the damages evidence, and assessed an award of a 10.5% royalty on the RPM System and a 1.5% royalty on the sale of the Clinac and Trilogy devices which incorporated the RPM System. The same jury returned a third time to hear Varian's invalidity evidence, and returned a verdict that the '554 patent was not invalid. The district court subsequently doubled the jury's damages award, awarded attorneys' fees and pre-judgment interest, and granted a compulsory license at the rates determined by the jury. The total award amounted to $101,431,292.

II. DISCUSSION

Varian contends that the district court erred in a number of ways. First, Varian contends that the district court erred in its construction of claim 20. Varian argues that, under the proper construction of claim 20, its RPM System does not infringe the '554 patent. Varian also contends that, even if the district court properly construed claim 20, the summary judgment of infringement cannot stand. We disagree on both contentions.

Next, Varian contends that its non-infringement and invalidity defenses were reasonable and that the trial court erred in finding that Varian acted despite an objectively high likelihood that its actions constituted infringement of a valid patent. Varian thus requests that we reverse the trial court's willfulness holding. We agree with Varian that the court erred in its assessment of the objective prong of its willfulness determination because Varian's validity defense under 35 U.S.C. § 103 was not objectively baseless.

Varian further contends that the damages award based on claim 22 should be vacated because the district court improperly construed that claim to include beam generators when sold in combination with the RPM System. According to Varian, when claim 22 is properly construed, Pitt is not entitled to damages based on the sales of the linear accelerators, but only the separate

RPM System. We again agree with Varian. Varian also claims that the damages award regarding claim 38 was improper because Pitt was obligated to apportion its damages according to damages jurisprudence originating from *Garretson v. Clark*, 111 U.S. 120 (1884). We do not agree.

Varian finally asserts that it is entitled to a new trial based on a laundry list of allegedly erroneous evidentiary rulings and jury instructions. We disagree with all such assertions.

We discuss each appellate issue below.

A. CONSTRUCTION OF CLAIM 20

Claim construction is a legal issue that this court reviews without deference on appeal. *See Lighting Ballast Control LLC v. Philips Elecs. N. Am. Corp.*, No. 12-1014, slip. op. at 6–7 (confirming standard of de novo review of claim construction as set out in *Cybor Corp. v. FAS Techs., Inc.*, 138 F.3d 1448 (Fed. Cir. 1998)) (en banc). This court consults the words of the claim, the written description, the prosecution history, and any relevant extrinsic evidence when determining the proper scope and meaning of claim terms. *See Phillips v. AWH Corp.*, 415 F.3d 1303, 1315–17 (Fed. Cir. 2005) (en banc).

At the district court, the parties agreed that the phrase "means determining movement of said patient from said digital image signals, including movement associated with breathing by said patient" in claim 20 of the '554 patent was drafted in means-plus-function format. *See* Special Master Report; *see also Univ. of Pittsburgh*, ECF No. 302. The district court found the function to be "determining movement of the patient from the digital image signals of the patient, including movement associated with breathing by the patient." *See* Special Master Report at 18–19. As for the corresponding structure, both parties agreed that it was an algorithm, but

they disputed which portions of the disclosed algorithm performed the claimed function. Varian first proposed a thirty-step algorithm, then a four-step algorithm when urging reconsideration, while Pitt consistently proposed a two-step algorithm. *See id.*

The district court identified a two-step algorithm as the corresponding structure. Specifically, the district court held that the structure corresponding to the claimed function was "a computer processor programmed as a patient motion detector" which utilizes the following two step process of: (1) identifying at least one fiducial from the image signals, and (2) tracking the movement of the fiducial(s), and equivalents. *See id.* On appeal, Varian contends that the district court erred by relying on an introductory sentence in the written description and ignoring the more detailed description of the algorithm in other portions of the patent. According to Varian, one of ordinary skill in the art would not identify the broad corresponding algorithm the district court specified. Varian also asserts that the district court improperly relied on claim differentiation because that doctrine cannot be used in the context of means-plus-function limitations.

Varian instead argues that this court should adopt its view of the corresponding structure as entailing an algorithm with four steps.[2] In particular, Varian contends

---

[2] Confusingly, at points in its brief, Varian seems to fall back to its contention that the full corresponding structure is a thirty-step algorithm, calling the four steps highlighted to the district court the "key" steps of this larger algorithm. Varian's vacillation is not helpful. Because its most recent argument to the district court urged a four-step computer implemented process, we hold Varian to that argument. *See Interactive Gift Express, Inc. v. Compuserve Inc.*, 256 F.3d 1323, 1346 (Fed. Cir.

that the algorithm should include: (1) detecting at least one fiducial using templates and successive levels of resolution; (2) fine-tuning the templates; (3) tracking the fiducial(s) at successive levels of resolution using the fine-tuned templates; and (4) determining movement of the patient by estimating the fiducial's direction and distance and comparing changes in its spatial pattern from one image to another.

Once a court has identified the function in a means-plus-function limitation, it must then identify the corresponding structure for that function in the written description. *See Med. Instrumentation & Diagnostics Corp. v. Elekta AB*, 344 F.3d 1205, 1210 (Fed. Cir. 2003). The written description must contain a structure serving as the claimed means. *See Atmel Corp. v. Info. Storage Devices, Inc.*, 198 F.3d 1374, 1378 (Fed. Cir. 1999) ("All one needs to do in order to obtain the benefit of [§ 112, ¶ 6] is to recite some structure corresponding to the means in the specification, as the statute states, so that one can readily ascertain what the claim means and comply with the particularity requirement."). The corresponding structure must be linked to the function recited in the claim. *See B. Braun Med., Inc. v. Abbott Labs.*, 124 F.3d 1419, 1424 (Fed. Cir. 1997).

The special master rejected Varian's thirty-step algorithm by relying on our guidance in *Harris v. Ericsson Inc.*, 417 F.3d 1241 (Fed. Cir. 2005). *See* Special Master Report at 19–20. In *Harris*, we identified a corresponding algorithm to a function recited in the claims and determined that a disclosed two-step algorithm was sufficient corresponding structure to satisfy the particularity requirement. *Harris,* 417 F.3d at 1254. We noted in *Harris* that aspects of the disclosed algorithm could vary based

---

2001) (noting that parties are precluded from adopting new claim construction positions on appeal).

on implementation, as the written description implied, but that the two-step algorithm was disclosed as "the invention." *Id.* As such, the algorithm did not need to include every possible implementation of the function, so long as it was linked to and encompassed the claimed function.

The '554 patent discloses—and specifically links—the function of detecting patient movement to the two-step algorithm identified by the district court. In particular, the written description discloses that patient movement is detected by first identifying fiducials and then tracking those fiducials, consistent with the special master's construction. *See* '554 patent, col. 4, ll. 21–23 ("As will be discussed fully, the patient motion detector 47 detects and identifies the fiducials 39 and then tracks their movement."). As the district court found, the written description links this algorithm to the function of determining patient movement. Varian, on the other hand, relies heavily on the figures in the '554 patent to support its proposed construction. The '554 patent specifically states, however, that the figures in the patent are merely *implementations* of the algorithm. *See* '554 patent, col. 5, ll. 14–15 ("Flow charts of suitable software 100 for implementing the invention are illustrated in FIGS. 6–16.").

Varian's proposed steps further incorporate "specific embodiments of the invention." '554 patent, col. 8, ll. 19–22. While those steps are described in the written description, they are not required. In other words, while the written description describes certain implementations of the algorithm, it expressly notes that other implementations are possible. And, much like *Harris*, while certain conditions may dictate use of the particular implementations identified by Varian in the written description, those implementations are not required. *See* '554 patent, col. 5, ll. 19–20 ("The templates are then fine tuned at 120 for the specific patient and environmental conditions."). The district court properly located the disclosure of an algo-

rithm that covered what was necessary to perform the claimed function of detecting patient movement and nothing more. Varian's attempt to pick and choose which steps it deems necessary by synthesizing steps from disparate portions of the written description is too limiting. The algorithm need only include what is necessary to perform the claimed function. *See Wenger Mfg., Inc. v. Coating Mach. Sys., Inc.*, 239 F.3d 1225, 1233 (Fed. Cir. 2001) ("Under § 112, ¶ 6, a court may not import functional limitations that are not recited in the claim, or structural limitations from the written description that are unnecessary to perform the claimed function.") (citing *Micro Chem., Inc. v. Great Plains Chem., Co.*, 194 F.3d 1250, 1258 (Fed. Cir. 1999)).

Importantly, Varian does not appeal the trial court's description of the function as limited only to "determining movement of said patient from the digital image signals of the patient, including movement associated with breathing by said patient." J.A. at 115; *see* Appellant's Br. 48. While the steps of "fine tuning templates" and "comparing recorded spatial patterns" may be useful to optimizing the potential of the invention, neither step is necessary to perform this particular identified—and uncontested—function.

Varian also contends that the special master improperly relied on claim differentiation, which it contends should have no bearing on interpreting means-plus-function claims. While it is true that "the judicially created doctrine of claim differentiation cannot override the statutory requirements of § 112 ¶ 6," *Wenger Manufacturing*, 239 F.3d at 1233 (citing *Laitram Corp. v. Rexnord, Inc.*, 939 F.2d 1533, 1538 (Fed. Cir. 1991)), a court is entitled to interpret a means-plus-function limitation in light of the other claims of the patent. *Id.* And, that is precisely what the trial court did in this case. The court did not attempt to override the requirements of § 112 ¶ 6 with its construction and did not use claim

differentiation to ignore corresponding structure in the specification; it merely examined the other claims in the patent seeking "guidance and context for interpreting a disputed means-plus-function limitation." *Id.* at 1234.

We find Varian's arguments regarding the construction of claim 20 to be without merit.

B. INFRINGEMENT OF CLAIM 20

Varian alternatively contends that, even if the district court's construction of claim 20 was correct, the undisputed facts demonstrate that Varian's RPM System does not infringe. In particular, Varian argues that its RPM System does not meet the "determin[ing] movement of the patient from the digital image signals of the patient" limitation, i.e., the patient image, because its RPM System processes the patient image to identify and extract only the portions representing the fiducial(s). Varian concludes that this fact demonstrates that no reasonable jury could find that Varian's RPM System infringes. In short, Varian argues that its RPM System does not use patient images, but only fiducials, to determine patient movement.

We review the grant of summary judgment under the law of the regional circuit. *Lexion Med., LLC v. Northgate Techs., Inc.*, 641 F.3d 1352, 1358 (Fed. Cir. 2011). The Third Circuit reviews a district court's grant of summary judgment de novo. *See Doe v. Luzerne Cnty.*, 660 F.3d 169, 174 (3d Cir. 2011). We must view all reasonable inferences in the light most favorable to the nonmoving party, and conclude that summary judgment is appropriate only when there is no genuine dispute as to any material fact. *See Burton v. Teleflex, Inc.*, 707 F.3d 417, 425 (Fed. Cir. 2013).

Infringement is determined, even at summary judgment, through a two-step inquiry. *See Abbott Labs. v. Sandoz, Inc.*, 566 F.3d 1282, 1288 (Fed. Cir. 2009). First,

the claims are properly construed and then those construed terms are compared to the accused product. *Id.*

Varian's infringement argument is belied by its own admission. Varian admits that the RPM System camera captures patient images to identify the location of the fiducials and only then eliminates the image of the patient. In other words, the RPM System *uses* the image of the patient and then processes that image to identify and extract from it the portions representing the fiducials. As such, Varian's argument that it does not use the image of the patient is easily rejected. Accordingly, the district court's construction of, and grant of summary judgment of infringement regarding, claim 20 was not erroneous.

The district court also found that "image of said patient" in claim 20 includes *both* images of fiducials and images of the patient image. *See Univ. of Pittsburgh*, ECF No. 302. Varian's argument, therefore, that its RPM System only uses the image of the fiducial(s) and not of the patient is irrelevant because, under the court's construction—which Varian has not challenged on appeal—fiducials alone can satisfy the "patient image" limitation. And, Varian concedes that it uses the fiducials to determine patient movement. The district court's finding that the RPM System infringes claim 20 is thus supported on this ground as well.

B. WILLFULNESS

Establishing that a defendant has willfully infringed a valid patent is a two-step inquiry. First, "a patentee must show by clear and convincing evidence that the infringer acted despite an objectively high likelihood that its actions constituted infringement of a valid patent." *In re Seagate Tech., LLC*, 497 F.3d 1360, 1371 (Fed. Cir. 2007) (en banc). After the "threshold objective standard is satisfied, the patentee must also demonstrate that this objectively-defined risk . . . was either known or so obvious that it should have been known to the accused in-

fringer." *Id.* The threshold objective prong "is a question of law based on underlying questions of law and fact and is subject to de novo review." *Bard Peripheral Vascular, Inc. v. W.L. Gore & Assocs., Inc.*, 682 F.3d 1003, 1005 (Fed. Cir. 2012).

At the summary judgment stage, the district court held that Pitt had proven as a matter of law, by clear and convincing evidence, that the objective prong of the willfulness test was met. *See Univ. of Pittsburgh v. Varian Med. Sys., Inc.*, ECF No. 432. In particular, the trial court found that Varian's non-infringement and invalidity defenses were both objectively unreasonable. *Id.*

On appeal, Varian contends that its non-infringement defense (largely based on its claim construction arguments regarding claim 20) and its invalidity defense (based on the Finnish Peltola patent) were reasonable. While we have, as noted, rejected Varian's proposed construction of claim 20, we need not decide whether it was error for the district court to characterize Varian's infringement defense as frivolous. Because we find that that Varian's unsuccessful invalidity defense based on Peltola was not objectively unreasonable, we vacate the trial court's willfulness finding on that ground.

There is no dispute that Peltola is prior art to the '554 patent. Peltola is directed to a method of eliminating errors caused by patient motion during radiation therapy. Joint Appendix ("J.A.") at 5520. Peltola teaches a method by which a "mark," described as a "laser line," is placed or projected on the patient's treatment area. *Id.* The laser line is continually tracked during therapy. *See id.* The treatment device receives a signal when the location coordinates of the laser line indicate the treatment area is within a desired area, so that the radiation beam can be turned on and off in conjunction with patient movement. *See id.* at 5531. Peltola tracked the laser line with a video camera that connects to a display for viewing. *See id.* at

5523. The camera uses a filter such that only the laser line can be seen on the display. *See id.* at 5524. Figure 1 of Peltola depicted an embodiment of the invention:

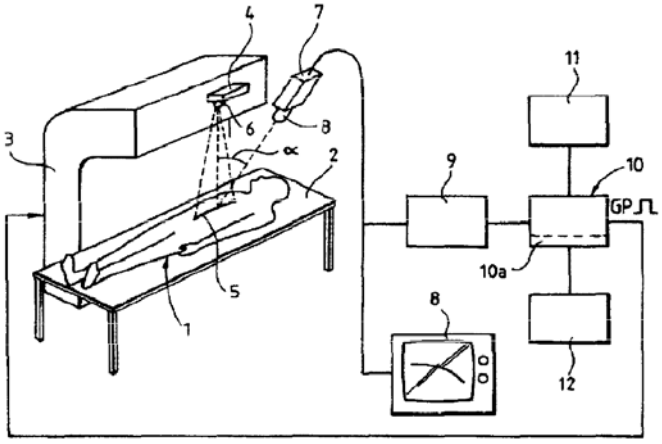

FIG. 1

In sum, Peltola was directed to solving the same problem as the '554 patent and did so by tracking patient movement.

We conclude that, the testimony during the district court trial demonstrates that, while unsuccessful, Varian's invalidity defense was not objectively unreasonable.[3]

---

[3] While not of substantial weight, it is at least worth noting that the PTO initially rejected the claims of the '554 patent in light of Peltola during reexamination. While the PTO ultimately found that Peltola did not invalidate the asserted claims of the '554 patent, the PTO's actions during reexamination lend some credibility to Varian's argument that its invalidity defense based on Peltola was not *objectively* unreasonable when the PTO went so far as to issue an initial rejection of the claims.

At trial, the sole dispute between the parties was whether Peltola's camera actually "generat[ed] digital image signals representative of an image of said patient," a limitation of claim 20. Peltola discloses that the camera "has a filter 8, which allows only the laser wavelength through, so that the monitor 8 connected with the camera shows only the light line 5." *Id.* at 5524. The district court did not explicitly explain why Varian's reliance on Peltola as invalidating prior art was objectively unreasonable. *See Univ. of Pittsburgh v. Varian Med. Sys., Inc.*, ECF No. 909 (W.D. Pa. June, 29, 2012). In defense of the district court's willfulness finding, however, Pitt argues that Varian's own expert, Dr. Martin J. Murphy ("Dr. Murphy") admitted that Peltola does not meet the "capture image of the patient" limitation of claim 20 because Peltola explains that the camera filter works so that only the "light line" is displayed on the monitor. But, Dr. Murphy did not admit what Pitt contends.

Dr. Murphy testified that Pitt's contention that Peltola's camera filter only passes light from the laser was an incorrect reading of a single sentence from that patent. *See* J.A. 1485–88. According to Dr. Murphy, the camera filter would admit light of a particular wavelength, that is, the wavelength of the laser. But, because the laser wavelength was within the "visible" range, at least a dim image of the patient would naturally pass through also and be displayed on the monitor. *See id.*; *see also* J.A. 2582–85; 2588–93. And, while the display could be configured to display primarily the laser line, the camera nevertheless, would capture a faint image of the patient. *Id.* While Dr. Murphy did explain that there was a possibility that a specific type of filter could be placed on the Peltola camera that would prevent the image of the patient from passing through, that mere possibility is not enough to demonstrate that Varian's reliance on Peltola was objectively baseless.

Given the highly factual nature of the inquiry and the cogent view Dr. Murphy took regarding whether Peltola met the patient image limitation of claim 20, the district court's unexplained conclusion that Varian's invalidity defense was objectively unreasonable was improper. We find that Varian did not act despite a high likelihood that it infringed a *valid* '554 patent. As such, we reverse the district court's finding that Pitt clearly and convincingly demonstrated that Varian willfully infringed the asserted claims of the '554 patent.

C. DAMAGES

The jury calculated two separate reasonable royalty rates when it calculated its damages award. First, the jury found that Pitt was entitled to 10.5% of RPM System sales from June 16, 2002 to March 31, 2011 based on its infringement of claim 20. Next, the jury awarded Pitt a 1.5% royalty on Varian's Clinac and Trilogy devices when sold in combination with, or incorporating the, RPM Systems based on its infringement findings related to claims 22 and 38, respectively. Varian now attacks the jury's award in a number of ways.

Though Varian argues that it did not infringe claim 20, it does not otherwise object to the 10.5% royalty figure for independent RPM sales. Varian contends, however, that we should vacate the portion of the damages award that is based on the sale of Varian's Clinac and Trilogy devices. The damages award for those sales was based on claims 22 and 38 of the '554 patent. Varian now argues that the damages awards for those sales should be vacated for three reasons.

First, Varian contends that the damages award for the period prior to the issuance of the reexamination certificate of the '554 patent must be vacated. The damages prior to the reexamination certificate are based only on claim 22 and Varian contends that the district court erred in its construction of claim 22 by including a "beam

generator" (a component of a linear accelerator) within the scope of the claim. Next, Varian argues that the damages award based on both claims 22 and 38 must be vacated because they were improperly calculated—either because they failed to account for the entire market value rule ("EMVR"), or in light of a "second-line" of damages jurisprudence Varian says can be gleaned from *Garretson v. Clark*, 111 U.S. 120 (1884) and its progeny. Varian finally argues, very briefly, that the damages award violates 35 U.S.C. § 284 and that the record evidence does not support the jury award.

1. CLAIM 22

At the summary judgment phase, the district court concluded that claim 22, which depends from claim 20, included a beam generator within its scope. *See Univ. of Pittsburgh*, ECF No. 432. The trial court noted that claim 20 refers to a gating means, but does not specifically include a beam generator. The court ruled that claim 22, in contrast, specifically recites a beam generator and that the beam generator is actuated by the gating signals generated by the RPM. *Id.* Consequently, the district court held that, because claim 22 included the beam generator, Varian's Clinac and Trilogy devices, when sold in combination with the RPM System, infringe claim 22. *Id.*

The trial court later provided more reasoning for its holding that claim 22 included the beam generator when the court denied Varian's motion in limine to exclude sales of Varian's Clinac and Trilogy devices from Pitt's royalty base. The district court noted that the latter portion of claim 22 made explicit that the claimed apparatus comprises a beam generator that is actuated by a gating system. Thus, claim 22 must include the actual beam generator within its scope. The trial court further held that the preamble of claim 22, which recited the beam generator, gives life and meaning to the claim.

Varian argues that the district court's inclusion of the beam generator in the scope of claim 22 was error. We agree. Claim 22 provides that the apparatus of claim 20 is adapted for use with a beam generator during patient treatment. '554 patent, col. 10, ll. 57–60 ("The apparatus of claim 20 *adapted for use* during treatment of said patient with a radiation beam generated by a beam generator.") (emphasis added). The claim, therefore, requires that the apparatus of claim 20 be configured for use with a beam generator. The claim does not, however, require the beam generator to be part of the claimed apparatus. Claim 22 further requires that the apparatus of claim 20 include gating means that generates signals synchronized to actuate a beam generator. Again, however, requiring the apparatus to include such gating means does not also require that the beam generator actually be part of the claimed apparatus. Claim 22 is drawn to a specific intended use of the apparatus of claim 20, but does not, as the trial court concluded, claim the beam generator as part of the apparatus.

As such, the district court erred in its construction of claim 22. The jury awarded a reasonable royalty of 1.5% on Varian's sales of its Clinac and Trilogy devices sold in combination with RPM Systems from June 16, 2002 to March 31, 2011. Consequently, we must vacate the portion of the damages award based on the infringement of claim 22 and the sales of the Clinac and Trilogy devices in combination with the RPM System that predate the issuance of the reexamination certificate.

2. CLAIM 38

Claim 38 was added during reexamination and is different from claim 22 in one critical way. While claim 22 merely claimed the apparatus disclosed in claim 20 further adapted for use with a beam generator, claim 38 explicitly includes the beam generator as a component of the claim. *See* '554 patent reexamination, col. 2, ll. 33–38.

Thus, claim 38 contemplates that the RPM System and beam generator are incorporated into one apparatus. Varian does not contend otherwise. Varian argues, however, that the district court erred in not granting it judgment as a matter of law ("JMOL") on damages. Specifically, Varian contends that the policy concerns behind *Garretson v. Clark*, 111 U.S. 120 (1884), required Pitt to demonstrate its damages based on application of the EMVR. Varian alternatively argues that, even if the EMVR did not apply to Pitt's damages theory, *Garretson* spawned a second line of case law that requires limiting damages to only the value of the claimed improvement and mandated the court to instruct the jury that it must exclude the value of any conventional or prior art elements recited in the claim language. We will discuss each issue in turn.

We review a district court's denial of JMOL based on the law of the regional circuit. *See Marine Polymer Techs. v. HemCon, Inc.*, 672 F.3d 1350, 1357 (Fed. Cir. 2012). The Third Circuit exercises "plenary review" over a district court's order denying a motion for JMOL. *See ZF Meritor, LLC v. Eaton Corp.*, 696 F.3d 254, 268 (3d Cir. 2012) (citing *LePage's Inc. v. 3M*, 324 F.3d 141, 145 (3d Cir. 2003)).

Varian's first argument that the EMVR must be applied fails. *Lucent* requires the patentee to separate or apportion damages attributable to the patented features contained in the accused device to the exclusion of any damages attributable to unpatented features. *See Lucent Techs., Inc. v. Gateway, Inc.*, 580 F.3d 1301, 1337 (Fed. Cir. 2009) (quoting *Garretson*, 111 U.S. at 121) ("The patentee . . . must in every case give evidence tending to separate or apportion the defendant's profits and the patentee's damages between the patented feature and the unpatented features."). Varian contends that the royalty base must exclude the entire value of the linear accelerators because the claims are drawn to the apparatus in

claim 20, not the beam generator. Claim 38, however, uses open-ended language and explicitly includes the beam generator as a claimed component of the apparatus. *See* '554 patent reexamination, col. 2, ll. 33–38 ("the apparatus of claim 20, further comprising a beam generator"). As such, Varian's argument fails because Pitt is not attempting to include the value of *unpatented* features within its royalty base. The beam generator is incorporated into the linear accelerator in claim 38; it is the combination apparatus that is claimed.

Notably, as the district court explained, claim 38 does not just claim beam generators as "an accessory used in conjunction with the RPM System." *Univ. of Pittsburgh*, ECF No. 600 at 18 (W.D. Pa. Feb. 10, 2012). Instead, it claims an apparatus where the beam generator and the RPM System operate via a gating signal where one actuates the other. Indeed, the evidence at trial shows that Varian itself has acknowledged the value added by the function of the combined apparatus.

Varian asserts, nonetheless, that damages should not turn on claim draftsmanship such that the owner of an improvement patent may deliberately add dependent claims directed to unimproved conventional devices to expand the royalty base. We do not disagree. But, *Georgia–Pacific Corp. v. U.S. Plywood Corp.*, 318 F. Supp. 1116, 1120 (S.D.N.Y. 1970), addresses that specific problem by requiring the patentee to provide tangible evidence regarding the relative value of his or her invention in combination with, but distinct from, any conventional elements recited in the claim. A number of the *Georgia-Pacific* factors are directed to that specific point and require the jury to reward the inventor only for the value of his or her innovation. In other words, if the claimed invention only adds an incremental value to the conventional element(s), the damages awarded must also be so limited. But, if the claimed invention adds significant

value to the conventional element(s), the damages award may reflect that value.

For example, factor six covers the "effect of selling the patented specialty in promoting sales of other products of the licensee; th[e] existing value of the invention to the licensor as a generator of sales of his non-patented items; and the extent of such derivative or convoyed sales." *Id.* Factors nine and ten require an assessment of the "utility and advantages of the patent property over the old modes or devices" and "[t]he nature of the patented invention; the character of the commercial embodiment of it as owned and produced by the licensor, and the benefits to those who have used the invention," respectively. *Id.* Most importantly, factor thirteen requires an assessment of "[t]he portion of realizable profit that should be credited to the invention as distinguished from non-patented elements, the manufacturing process, business risks, or significant features or improvement added by the infringer." *Id.*

The jury heard substantial evidence regarding application of the *Georgia-Pacific* factors to the sales of the apparatus claimed in claim 38. Pitt's damages expert, Mr. John L. Hansen, testified regarding the incremental value he believed the RPM System added to a standard linear accelerator when operated in conjunction with a beam generator, and testified to the royalty rate he believed would reflect this incremental value. *See e.g.*, J.A. at 1917–18; 1951; 1996; 2004–05; 2011–16; 11288–89. He testified, moreover, based in part on the Varian internal documents referenced above, that the combination devices claimed in claim 38 were more valuable to Varian than was the RPM System and linear accelerator when sold separately, i.e., that there was a value a would be purchaser would find in the combination system claimed in claim 38 that would not be found when the components were sold separately and not designed to be immediately interoperable. *See e.g.*, J.A. 1917–18. Importantly, as

explained in more detail below, Varian offered no expert testimony on this issue.

Much like its theory regarding the construction of claim 20, Varian's damages arguments at the trial court kept shifting. Varian first moved to exclude the sales of the Clinac and Trilogy linear accelerators from Pitt's royalty base as a violation of "the EMVR." *See Univ. of Pittsburgh*, ECF No. 567 (W.D. Pa. Feb. 3, 2012). The trial court correctly denied Varian's motion, as explained above. *See Univ. of Pittsburgh*, ECF No. 600 at 13–20. Varian's expert Mr. McFarlane, moreover, failed to provide an opinion in a timely manner as to an alternative royalty base for the combination devices. *See id.* at 13. Varian was, thus, left with no viable argument under which it had urged exclusion of Pitt's expert testimony and no testimony to contradict it.

Varian then moved for clarification of, and some relief from, the trial court's ruling. *See Univ. of Pittsburgh*, ECF No. 609 (W.D. Pa. Feb. 13, 2012). In particular, Varian argued that, because Pitt did not invent the linear accelerators, Varian should be permitted to argue that Pitt's damages should be limited only to its "contribution to [the linear accelerators], i.e., a royalty on RPM." *Id.* at 4. Most importantly, *Varian* argued that it should be permitted to present such testimony and argument regarding Varian's own contributions to the claimed elements because they fell squarely within the contemplation of *Georgia-Pacific* factor 13. *See id.* Only then did Varian first cite *Garretson*. *See id.* at 4–5. Varian then argued that, if Pitt was allowed to include the linear accelerators in its royalty base, Varian should be able to offer evidence and argument that the jury should award no royalty on the same. *See id.*

Thus, Varian chose only to seek exclusion of testimony that purported to seek a royalty based on anything *other than* the cost of a stand-alone RPM sale. It did not

argue or offer evidence that some other royalty base was more appropriate, however. Varian, thus, depended on an all or nothing argument—i.e., that the court should exclude any testimony that would use any royalty base other than that applicable to stand alone RPM sales. Because that argument ignored the actual nature of claim 38, the trial court rejected it. In response to Varian's motion for reconsideration, however, the trial court agreed to allow Varian's expert to testify that Pitt's proposed royalty was too high, and to do so premised, among other things, on Varian's own contribution to the claimed limitations. The trial court also permitted Varian to argue—on those same grounds—that the jury should award zero damages on the Clinac and Trilogy sales. At trial, Varian's expert did attack the royalty rate Pitt proposed (i.e., 3%). And, its counsel did argue that the royalty rate should be zero on the sales covered by claim 38, albeit only briefly. *See* J.A. at 2334, 8185.

Following testimony and argument, the jury was instructed that it could award damages on sales of linear accelerators incorporating the RPM System, based on whatever royalty percentage it deemed justified under the *Georgia-Pacific* factors. For example, the jury heard instructions on *Georgia-Pacific* factor 13, regarding the portion of "profits that should be considered attributable to the invention," as distinguished from unpatented elements and features provided by Varian. *See* J.A. 2384. And, the verdict form required the jury to separately assess royalties on the stand-alone sales of the RPM System and the sales of the Clinac and Trilogy devices incorporating the RPM System, i.e., the combination devices. *See Univ. of Pittsburgh*, ECF No. 666 (W.D. Pa. Feb. 23, 2012). During deliberations, moreover, the jury asked the district court to clarify the allowable range of royalties it may award in each damages category and the district court amended the jury instructions to confirm that the jury was entitled to award a zero percent royalty

on sales of the linear accelerators. *See Univ. of Pittsburgh*, ECF No. 867 (W.D. Pa. April 25, 2012).

Put simply, the evidence the jury heard regarding the *Georgia-Pacific* factors and how those factors might impact any value added by the RPM System to the combination devices claimed in claim 38, the evidence and argument it heard regarding the need to guard against application of an unduly high royalty rate on sales of linear accelerators so as to not award Pitt for what it did not invent, and the fact that the jury was instructed on all the *Georgia-Pacific* factors and was instructed that it was free to award a zero percent royalty on the linear accelerators, were sufficient to guard against any unduly excessive damages award in this case. On this record, the *Georgia-Pacific* factors were sufficient to safeguard against over compensation for the infringing combination sales at issue.

Varian cites a handful of circuit cases that pre-date *Georgia–Pacific* and argues that they reflect a distinct line of damages jurisprudence originating from the Supreme Court's decision in *Garretson* which it says prohibits any consideration of the value added to claimed conventional features. Varian argues that this "second-line" of damages jurisprudence requires that, when a claim is directed to an improvement, but also claims other conventional elements, the royalty base must be limited to the sales cost of the improvement alone. In other words, Varian argues that the jury may not use reductions in the royalty rate to take account of the fact that conventional elements are recited in the claims. It argues that the beam generators must be extracted from the combination apparatuses claimed in claim 38 and that the royalty base must be based only on the value the RPM System could command if sold separately. Not only is this argument one which was only first made to the district court in a motion for reconsideration, it is also contrary to several arguments Varian did make in reliance on the

Georgia-Pacific factors. If we were to adopt Varian's position, moreover, we impliedly would render many of the *Georgia-Pacific* factors superfluous to the extent they address the precise issue of limiting damages to the value of the improvement in an invention which includes conventional elements. While we do not disagree that it is important to guard against compensation for more than the added value attributable to the invention, Varian's proposed rule assumes that no conventional element can be improved or rendered more valuable by its use in combination with an invention. That argument goes too far.

A close inspection of the cases Varian cites reveals, moreover, that they were decided under an antiquated damages regime. Indeed, the cases that Varian relies upon ask the question of whether an owner of an infringed improvement patent is entitled to disgorge all of the infringer's *profits* from sale of an accused device that incorporates the improvement. Not surprisingly, those cases counsel in favor of apportioning the profits between the infringer and the patentee according to the value of the improvement. *See Garretson*, 111 U.S. at 121 ("[T]he plaintiff proved the cost of his mop-heads, and the price at which they were sold, and claimed the right to recover the difference as his damages."); *Herman v. Youngstown Car Mfg., Co.*, 216 F. 604, 606–09 (6th Cir. 1914) (rejecting special master's award of all profits made on the sale of the accused device); *see also Dunn Mfg. Co. v. Standard Computing Scale Co.*, 204 F. 617, 618–19 (6th Cir. 1913) (same); *Metallic Rubber Tire Co. v. Hartford Rubber Works Co.*, 275 F. 315, 325–26 (2d Cir. 1921) (same); *Seeger Refrigerator Co. v. American Car & Foundry Co.*, 212 F. 742, 745 (D.N.J. 1914) (taking the special master's reasoning "to a logical extreme, would show that the [patentee] is entitled to recover the entire profits realized by the defendant"). In the context of a reasonable royalty, that is precisely what the *Georgia–Pacific* factors purport

to do. Pitt, additionally, did not claim that it is entitled to all of Varian's *profits* gained from sale of Varian's Clinac and Trilogy devices which incorporate the RPM System. And, Pitt did not argue that it was entitled to a 10.5% royalty on the sales of those devices, even though it asked for that level of royalty on the stand alone RPM sales. Instead, Pitt claimed that its patented improvement increased the overall value of Varian's Clinac and Trilogy devices by a certain percentage (i.e., 3%), and argued that it was entitled to a royalty sufficient to reflect that added value. The jury, properly instructed on the *Georgia-Pacific* factors and aware of its option to award a zero royalty rate on such sales, chose a smaller number (1.5%) to reflect its assessment of the law and the evidence presented. There is simply no reason on this record to further complicate our damages jurisprudence based on reasoning from isolated circuit court decisions from the early 1900s decided under a different damages regime. We therefore affirm the jury's damages award based on the infringement of claim 38.

We emphasize the fact- and record-specific nature of our holding. Varian did not submit expert testimony refuting the expert testimony Pitt offered regarding the value added to Varian's products by the incorporation of the RPM Systems into them. *See Univ. of Pittsburgh*, ECF No. 600 at 13. Varian originally only sought to exclude Pitt's chosen royalty base on EMVR grounds—and no other. Varian also did not seek to exclude the royalty percentage chosen by Pitt's expert, complaining *only* about using any royalty base other than that attributable to stand alone RPM sales. On reconsideration, Varian expressly relied on *Georgia-Pacific* factor 13 to convince the trial court that Varian should be permitted to urge a zero royalty on the linear accelerators, but failed to explain that concept to the jury other than in passing. And, despite having relied on Georgia-Pacific factor 13 in support of its motion for reconsideration, it now seeks to

abandon reliance on *Georgia-Pacific*. Finally, Varian received the additional jury instruction it sought regarding the jury's right to find that *no value* was added by the combination claimed in claim 38. On this precise record, we affirm the damages award as to claim 38.

We have reviewed Varian's remaining arguments and do not find them persuasive. We note, moreover, that those arguments were not properly raised in any event. *See SmithKline Beecham Corp. v. Apotex Corp.*, 439 F.3d 1312, 1320 (Fed. Cir. 2006) ("[M]ere statements of disagreement with the district court . . . do not amount to a developed argument.").

III. CONCLUSION

Based on the foregoing, we affirm the district court's construction of claim 20 of the '554 patent. We also find no error in the district court's grant of summary judgment regarding infringement of claim 20. We reverse the district court's finding that Varian's infringement was willful and we also reverse the district court's construction of claim 22. Consequently, we vacate the portion of the damages award based on claim 22, but affirm the portion based on claim 38. As such, we remand to the district court for recalculation of the damages award and prejudgment interest calculations consistent with our holdings. Because we have vacated the trial court's finding of willful infringement, moreover, on remand, the trial court shall reconsider the propriety of its award of enhanced damages and its attorneys' fee award. We express no opinion as to whether or to what extent such awards might still be appropriate. Finally, we find Varian's request that we specify that a new trial judge be assigned to this case wholly unsupported and decline to enter such an order.

AFFIRMED IN PART, REVERSED IN PART, VACATED IN PART, AND REMANDED

NOTE: This disposition is nonprecedential.

United States Court of Appeals for the Federal Circuit

UNIVERSITY OF PITTSBURGH OF THE COMMONWEALTH SYSTEM OF HIGHER EDUCATION (doing business as University of Pittsburgh),
Plaintiff-Appellee,

v.

VARIAN MEDICAL SYSTEMS, INC.,
Defendant-Appellant.

2012-1575

Appeal from the United States District Court for the Western District of Pennsylvania in No. 08-CV-1307, Judge Arthur J. Schwab.

DYK, *Circuit Judge*, dissenting.

I agree with the majority's decision to reverse the willfulness finding. However, I respectfully dissent from the majority's decision to affirm the construction of claim 20. In my view, the majority's construction is plainly incorrect, and the resulting infringement findings as to claim 20 as well as claims 22 and 38, which depend from and recite the same apparatus as claim 20, should be set aside.

Claim 20 recites a "processing means comprising means determining movement of said patient from digital image signals, including movement associated with breathing by said patient." '554 patent col. 10 ll. 46–49. The parties do not dispute that claim 20 is a means-plus-function claim governed by 35 U.S.C. § 112(f). In construing functional claim language, the first step is to "'determine the claimed function'" and the second is to "'identify the corresponding structure in the written description of the patent that performs the function.'" *Noah Sys., Inc. v. Intuit Inc.*, 675 F.3d 1302, 1311 (Fed. Cir. 2012) (quoting *Applied Med. Res. Corp. v. U.S. Surgical Corp.*, 448 F.3d 1324, 1332 (Fed. Cir. 2006)). The corresponding structure must be "'capable of performing the claimed function'" and "'[t]he specification must be read as a whole to determine'" what that structure is. *Default Proof Credit Card Sys., Inc. v. Home Depot U.S.A., Inc.*, 412 F.3d 1291, 1298 (Fed. Cir. 2005) (quoting *Budde v. Harley–Davidson, Inc.*, 250 F.3d 1369, 1379 (Fed. Cir. 2001)). Accordingly, the proper construction "must include all structure that actually performs the recited function." *Id.* (citing *Cardiac Pacemakers, Inc. v. St. Jude Med., Inc.*, 296 F.3d 1106, 1119 (Fed. Cir. 2002)).

Here, because the claimed function is implemented by a "processing means," *i.e.*, a computer, the specification must "'disclose an algorithm for performing the claimed function.'" *Noah*, 675 F.3d at 1302, 1312 (quoting *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1367 (Fed. Cir. 2008)); *see also Aristrocrat Techs. Austl. Pty Ltd. v. Int'l Game Tech.*, 521 F.3d 1328, 1333 (Fed. Cir. 2008). The algorithm may be disclosed "'in any understandable terms including as a mathematical formula, in prose, or as a flow chart, or in any other manner that provides sufficient structure.'" *Noah*, 675 F.3d at 1312 (quoting *Finisar Corp. v. DirecTV Grp., Inc.*, 523 F.3d 1323, 1340 (Fed. Cir. 2008) (internal citation omitted in original)). As

the majority concludes, the algorithm "need only include what is necessary to perform the claimed function." Maj. Op. 14 (citing *Wenger Mfg., Inc. v. Coating Mach. Sys., Inc.*, 239 F.3d 1225, 1233 (Fed. Cir. 2001). Contrary to the majority, what is "necessary" is not what is in theory "necessary" to perform the function. Rather, the structure must include what the specification discloses as "necessary" to perform the function. *See Harris Corp. v. Ericsson Inc.*, 417 F.3d 1241 (Fed. Cir. 2005) (discussed below).

The district court correctly identified the function as "determining movement of the patient from the digital image signals of the patient, including movement associated with breathing by the patient." Maj. Op. 10 (quoting Special Master Report at 18–19). But the district court and the majority on appeal incorrectly identify the structure for performing that function as a two-step algorithm. Those two steps do not accomplish the claimed function of determining a patient's movement. Rather, the specification describes additional steps that are necessary to accomplish that function. The construction must include those steps as well.

The majority's identification of structure—the two steps of detecting and tracking fiducials—relies on a single statement in the specification that "[a]s will be discussed fully, the patient motion detector 47 detects and identifies the fiducials 39 and then tracks their movement." Maj. Op. 13 (quoting '554 patent col. 4 ll. 21–23). The majority concludes that this disclosure identifies the corresponding structure as a two-step algorithm because the specification "links this algorithm to the function of determining patient movement." *Id.* But the statement in the specification does not explain how the fiducials are detected and tracked or how performing those steps accomplishes the function of determining a patient's movement during radiation treatment.

Other portions of the '554 patent's specification describe how the claimed "invention" determines patient movement using fiducials:

> Detection of motion of a patient using passive fiducials requires an implementation which is robust enough to accommodate for the variations in the shapes, appearance and lighting conditions to which the fiducials are subjected and, at the same time, is fast enough to provide real time tracking of patient movement. *The invention satisfies these requirements by utilization of successive levels of filtering and templates* which are modified to accommodate for actual conditions. The result is a system which can track patient movement at 20 Hz or better.

'554 patent col. 5 ll. 4–13 (emphasis added). The invention must accommodate variation among fiducials because it can use either natural fiducials (such as scars) or artificial fiducials (such as plastic marker-blocks). As a result, the fiducials may not all look the same. The determination of what the fiducials are must occur before the fiducials can be tracked. To do this, "templates are used to identify the locations of the fiducials. The templates indicate what the pattern of digital signals representing the fiducial should look like." *Id.* col. 5 ll. 41–46. Although "[t]here are several ways in which the templates can be generated," *id.* col. 5 ll. 49–50, "[o]ne template is used for each family of fiducials." *Id.* col. 5. ll. 55–56. Templates are the mechanism through which the fiducials are initially detected and subsequently tracked.

Before the fiducials can be tracked, the templates must be fine tuned. Fine tuning is "*[a]n important aspect of the invention*" that "adapts the selection of the template to be used for tracking to the actual conditions existing at the time of the selection." *Id.* col. 6 ll. 63–64 (emphasis added) and col. 7 ll. 5–6. Figure 10 illustrates the details

of fine tuning, which is "accomplished for each template family." *Id.* col. 6 ll. 64–65 and col. 7 ll. 11–12. The fine-tuning step requires matching each fiducial to the template that will be used to track its movement and recording the fiducial's appearance and initial position. The specification explains that it is only after fine tuning the templates that "[t]he program then enters the tracking loop." *Id.* col. 7 ll. 4–14; *see also id.* col. 5 ll. 19–23.

Even after the fiducials have been tracked, the patient's movement cannot be determined. The specification explains that after tracking:

> The direction and distance traveled by each currently actively tracked fiducial since the detection step is estimated at 201. The special pattern of the actively tracked fiducials is compared with the initial pattern and previous patterns at 202. Any quasi-periodic motion associated with the individual fiducials and/or the special pattern is predicted at 203 such as by using past data analysis. This would include movement associated with breathing or tremor of the patient.

Id. col. 8 ll. 8–17. This final step is when the claimed function—determining patient movement, including movement associated with breathing—is accomplished. It does not occur before this final step.

The majority concludes that "[w]hile those steps are described in the written description, they are not required." Maj. Op. 13. This is inconsistent with the specification in two respects. First, that conclusion ignores the detailed description in the specification quoted above and the flow chart in figure 6. Figure 6 is the only depiction of the necessary steps; it is not an alternative implementation, as the majority suggests. *See* Maj. Op. 13. The specification states that "FIGS. 6–16 are flow charts of software *used in implementation of the invention*," '554

patent col. 2 ll. 41–42 (emphasis added), and that "*FIG. 6 illustrates the main routine of the software* 100." *Id.* col. 5 ll. 15–16 (emphasis added). The flow charts in figures 7–16 illustrate the steps shown in figure 6 in greater detail, but none of them encompasses the function of determining patient movement as figure 6 does.

Figure 6 requires "detecting fiducials on the patient's body [] in the current camera image at 110," which "is accomplished utilizing templates." *Id.* col. 5 ll. 15–19. "The templates are then fine tuned at 120 for the specific patient and environmental conditions." *Id.* col. 5 ll. 19–20. After fine tuning, "a loop is entered in which each individual fiducial is tracked as indicated at 140." *Id.* col. 5 ll. 21–23. After tracking, "[t]he direction and distance traveled by each currently actively tracked fiducial . . . is estimated at 201" and "[t]he special pattern of the actively tracked fiducials is compared with the initial pattern and previous patterns." *Id.* col. 8 ll. 8–12. Only then is it possible to predict "quasi-periodic motion associated with the individual fiducials . . . includ[ing] movement associated with breathing or tremor of the patient." *Id.* col. 8 ll. 13–17. The steps of (1) detecting fiducials, (2) fine tuning templates, (3) tracking fiducials, and (4) comparing the recorded spatial patterns are not optional—they are required to perform the function of determining patient movement.

Second, the additional steps were included because they were necessary to distinguish the prior art. The prior art used markings to track a patient's movement during radiation treatment more than ten years before the '554 patent's priority date. In the initial office action rejecting the application that issued as the '554 patent, the examiner cited U.S. Patent No. 5,446,548, which disclosed "camera means 130, 160, passive fiducials 111–114, and processing means 200" as part of a "position/movement detection system subsidiary to the main (treatment)

system." Examiner's Initial Rejection of Patent Application at 4, 5, Ser. No. 08/715,835, (P.T.O. Feb. 28, 1997). The examiner also identified three other prior art references—U.S. Patent Nos. 5,295,483; 5,558,430; and 5,389,101—disclosing "[p]lural cameras used to track patient position in conjunction with camera-identifiable fiducials." *Id.* at 5. The application for the '554 patent included the additional steps, described above, to distinguish the abundance of prior art. Claim 20 cannot be construed broadly to cover all methods of determining patient movement by tracking markings that are visible on a patient.

The majority relies on *Harris Corp. v. Ericsson Inc.*, 417 F. 3d 1241 (Fed. Cir. 2005) to support its exclusion of required steps described by the specification on the ground that the claimed function does not require them. *See* Maj. Op. 14. In *Harris*, the question was whether to construe the structure corresponding to the claimed "time domain processing means" as a one- or two-step algorithm. 417 F. 3d at 1254. The court reached the conclusion opposite to the majority here, and "reject[ed] [the patentee's] argument that the disclosed algorithm is broad enough to literally encompass one-step processes." *Id.* at 1254. The court explained that the specification "characterize[d] the two-step process as 'the invention,' not merely an implementation of the invention." *Id.* (citing U.S. Patent No. 4,365,338 col. 5 ll. 50–55 and col. 7 ll. 18–27 (describing "functions implemented by way of processor 37" and "employed in accordance with the invention")). As a result, a one-step process could not constitute the corresponding structure.

Far from supporting the majority's approach, *Harris* demonstrates the majority's error. In *Harris*, we explained that "Figure 9 illustrates how th[e] algorithm is implemented" and relied on that figure in construing the algorithm as a two-step procedure. *Id.* Here, "FIG. 6

illustrates the main routine of the software." '554 patent col. 5 ll. 15–16. As in *Harris*, the additional steps are characterized as the "invention," not merely an implementation. *See also, e.g.*, '554 patent col. 6 ll. 63–64 ("An important aspect of the invention is the fine tuning of the tracking templates called for at 120 in FIG. 6."); *id.* col. 5 ll. 9–12 ("The invention satisfies these requirements by utilization of successive levels of filtering and templates which are modified to accommodate for actual conditions."). The structure for determining patient movement must be a four-step process that includes those steps.

I respectfully dissent from the majority's affirmance of the district court's construction of claim 20. Because Varian's system does not use templates to detect or track fiducials, does not fine tune templates, and does not compare recorded spatial patterns of fiducials, it appears not to infringe. I would vacate the findings of infringement as to claims 20, 22 and 38, and remand for a determination of infringement under the correct claim construction.