Trials@uspto.gov
571-272-7822

Paper 20
Entered: April 24, 2020

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ELEKTA INC.,
Petitioner,

v.

BEST MEDICAL INTERNATIONAL, INC.,
Patent Owner.

IPR2020-00067
Patent 7,015,490 B2

Before KARL D. EASTHOM, WILLIAM V. SAINDON, and JOHN A. HUDALLA, *Administrative Patent Judges*.

HUDALLA, *Administrative Patent Judge*.

DECISION
Denying Institution of *Inter Partes* Review
35 U.S.C. § 314

Elekta Inc. ("Petitioner") filed a Petition (Paper 9,[1] "Pet.") requesting an *inter partes* review of claims 1, 4, 10–12, and 17–19 of U.S. Patent No. 7,015,490 B2 (Ex. 1001, "the '490 patent"). Petitioner filed a Declaration of

[1] Petitioner originally filed the Petition as Paper 2. With our authorization (Paper 6), Petitioner filed a motion (Paper 7) to correct its original petition and Exhibit 1023. We granted Petitioner's motion. Paper 8. We refer to the corrected versions of the Petition (Paper 9) and Exhibit 1023.

Arthur L. Boyer, Ph.D. (Ex. 1003) with its Petition. Patent Owner, Best Medical International, Inc. ("Patent Owner"), filed a Preliminary Response (Paper 11, "Prelim. Resp."). Patent Owner filed a Declaration of Daniel J. Chase (Ex. 2002) with its Preliminary Response.

With our authorization (Paper 12), Petitioner also filed a Reply (Paper 13, "Pet. Reply") and Patent Owner filed a Sur-Reply (Paper 15, "PO Sur-reply") addressing certain filing date, service, and 35 U.S.C. § 325(d) issues raised by Patent Owner in the Preliminary Response.

We have authority to determine whether to institute an *inter partes* review. *See* 35 U.S.C. § 314(b); 37 C.F.R. § 42.4(a). Under 35 U.S.C. § 314(a), we may not authorize an *inter partes* review unless the information in the petition and the preliminary response "shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition." For the reasons that follow, we do not institute an *inter partes* review.

I. BACKGROUND

A. Real-Parties-in-Interest

Petitioner identifies Elekta Limited (UK), Elekta Holdings U.S., Inc., and Elekta AB as real-parties-in-interest. Pet. 2. Patent Owner identifies Best Medical International, Inc. as the real-party-in-interest. Paper 5, 1.

B. Related Proceedings

The parties identify the following proceedings related to the '490 patent (Pet. 2; Paper 5, 1–2):

Best Med. Int'l, Inc. v. Elekta Inc., No. 1:19-cv-03409-MLB (N.D. Ga.);

Best Med. Int'l, Inc. v. Elekta AB, No. 1:18-cv-01600-MN (D. Del.);

Best Med. Int'l, Inc. v. Varian Med. Sys., Inc., No. 1:18-cv-01599 (D. Del.); and

Varian Med. Sys., Inc. v. Best Medical Int'l, Inc., IPR2020-00076.

We also note that Petitioner has challenged other patents owned by Patent Owner in IPR2020-00070, IPR2020-00073, and IPR2020-00074.

C. The '490 patent

The '490 patent relates to "optimization of collimator angles for multileaf collimators ('MLC') used in intensity modulated radiation therapy [IMRT] treatment." Ex. 1001, 1:27–31. In particular, the '490 patent discloses "a new algorithm to determine collimator angles in favoring, or enhancing, IMRT radiation therapy treatment plan delivery efficiency." *Id.* at 2:1–4. An advantage of the algorithm is to minimize the maximum travel distance of the MLC leaf pairs. *Id.* a 2:14–19.

The method disclosed in the '490 patent utilizes a "cost function obtained by combining the prior algorithm based upon Brahme's orientation theory with the algorithm utilized in the present invention."[2] *Id.* at 2:7–11. The cost function includes a delivery efficiency portion that is "designed to enhance delivery efficiency by reducing at least one of a number of radiation beam segments and reducing a number of radiation beam monitor units [MUs] required for delivery of the desired prescription." *Id.* at 2:35–40.

[2] Brahme's orientation theory prioritizes conformity with the targets/lesions being treated. *Id.* at 5:65–6:1.

The cost function also includes a target conformity portion "to enhance conformity of the radiation beam arrangement to a target shape as viewed through the opening in the multi-leaf collimator." *Id.* at 2:40–42. "[A] preference can be selected between delivery efficiency and target conformity by assigning weights to the delivery efficiency and target conformity portions of the function." *Id.* at 3:29–34.

D. Illustrative Claim

Of the challenged claims, claims 1, 10, and 17 are independent. Claim 4 depends from claim 1; claims 11 and 12 depend directly or indirectly from claim 10; and claims 18 and 19 depend directly or indirectly from claim 17. Claim 1 is illustrative of the challenged claims and recites:

> 1. A computer-implemented method of determining a collimator angle of a multi-leaf collimator having an opening and a plurality of multi-leaf collimator leaf pairs for closing portions of the opening to form a radiation beam arrangement having a plurality of radiation beam segments to apply radiation to a tumor target, the method comprising the steps of:
>
> calculating an initial radiation beam arrangement according to a desired prescription; and
>
> changing the radiation beam arrangement by incorporating a first cost function to determine the collimator angle of the multi-leaf collimator, the first cost function including both a second cost function to enhance delivery efficiency by reducing a number of radiation beam segments and reducing a number of radiation beam monitor units required for delivery of the desired prescription and a third cost function

to enhance conformity of the radiation beam arrangement to a target shape.

Id. at 10:11–29.

E. Prior Art

Petitioner relies on the following prior art:

Chang, S.X. et al. (2000). Intensity modulation delivery techniques: "Step & shoot" MLC auto-sequence versus the use of a modulator. *Medical Physics*, 27(5), 948–59 (Ex. 1007, "Chang 2000");

Chang, S.X. & Potter, L.D. (2001). An iterative "Step & Shoot" MLC-IMRT segmentation algorithm for continuous intensity maps. *International Journal of Radiation Oncology · Biology · Physics*, 51(3), 408 (Ex. 1009, "Chang 2001");

Siochi, R.A.C. (1999). Minimizing static intensity modulation delivery time using an intensity solid paradigm. *International Journal of Radiation Oncology · Biology · Physics*, 43(3), 671–80 (Ex. 1011, "Siochi 1999");

Boyer, A. et al. (2001). Basic applications of multileaf collimators: report of Task Group No 50, Radiation Therapy Committee. *American Institute of Physics for the AAPM, New York, NY* (Ex. 1013, "Boyer 2001");

U.S. Patent No. 6,757,355 B1, filed Aug. 17, 2000, issued June 29, 2004 (Ex. 1015, "Siochi '355");

Webb, S. (2001). A simple method to control aspects of fluence modulation in IMRT planning. *Physics in Medicine & Biology*, 46(7), N187 (Ex. 1016, "Webb 2001"); and

Webb, S. (1993). *The Physics of Three-Dimensional Radiation Therapy: Conformal Radiotherapy, Radiosurgery and Treatment Planning*, 233–35. IOP Publishing Ltd. (Ex. 1018, "Webb 1993").

F. The Asserted Grounds

Petitioner challenges claims 1, 4, 10–12, and 17–19 of the '490 patent on the following grounds (Pet. 10):

Claims Challenged	35 U.S.C. §	References
1, 10, 11, 17	103(a)[3]	Chang 2000, Chang 2001, Boyer 2001
4, 12, 18, 19	103(a)	Chang 2000, Chang 2001, Siochi 1999, Boyer 2001
1, 4, 10, 11, 17, 18	103(a)	Siochi '355, Webb 2001, Siochi 1999
12, 19	103(a)	Siochi '355, Webb 2001, Siochi 1999, Webb 1993

II. ANALYSIS

We now consider Petitioner's asserted grounds and Patent Owner's arguments in the Preliminary Response to determine whether Petitioner has met the "reasonable likelihood" standard for institution under 35 U.S.C. § 314(a).

A. Legal Standards

A claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter

[3] The Leahy-Smith America Invents Act ("AIA"), Pub. L. No. 112-29, 125 Stat. 284, 287–88 (2011), amended 35 U.S.C. § 103. Because the '490 patent was filed before March 16, 2013 (the effective date of the relevant amendment), the pre-AIA version of § 103 applies.

pertains. *See KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) where in evidence, so-called secondary considerations. *See Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). We also recognize that prior art references must be "considered together with the knowledge of one of ordinary skill in the pertinent art." *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994) (citing *In re Samour*, 571 F.2d 559, 562 (CCPA 1978)).

B. Level of Ordinary Skill in the Art

Citing testimony from Dr. Boyer, Petitioner contends a person having ordinary skill in the art would have had "an undergraduate degree in science, computer science, engineering or math, and have additional training in radiation dosimetry, medical physics, medicine, or an equivalent field of study, with at least 2-3 years of computer programming experience and some clinical experience in radiation therapy or radiation therapy treatment planning." Pet. 22–23 (citing Ex. 1003 ¶¶ 77–117). Patent Owner cites testimony from Mr. Chase and contends an ordinarily skilled artisan would have "earned at least a master's or doctoral degree in radiation dosimetry, physics, medical physics, or medicine, or equivalent disciplines" and would have had "three years of clinical experience in radiation treatment planning." Prelim. Resp. 12 (citing Ex. 2002 ¶¶ 63–64).

For purposes of this Decision, we adopt Patent Owner's definition of the level of ordinary skill in the art. On the present record, we are satisfied

that this definition comports with the relatively high level of skill necessary to understand and implement the teachings of the '490 patent and the asserted prior art.

C. Claim Interpretation

In an *inter partes* review, we construe each claim "in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent." 37 C.F.R. § 42.100(b) (2019). Accordingly, our claim construction standard is the same as that of a district court. *See id*. Under the standard applied by district courts, claim terms are generally given their plain and ordinary meaning as would have been understood by a person of ordinary skill in the art at the time of the invention and in the context of the entire patent disclosure. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313 (Fed. Cir. 2005) (en banc). "There are only two exceptions to this general rule: 1) when a patentee sets out a definition and acts as his own lexicographer, or 2) when the patentee disavows the full scope of a claim term either in the specification or during prosecution." *Thorner v. Sony Comput. Entm't Am. LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012).

Petitioner proposes constructions for "radiation beam segment"/ "segment" and "radiation beam arrangement." Pet. 23–24. Patent Owner disputes Petitioner's constructions and contends that no constructions of these terms are necessary. Prelim. Resp. 13–16. Based on the current record, we determine that no terms require explicit construction. *See, e.g.*, *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) ("[W]e need only construe terms 'that are in

controversy, and only to the extent necessary to resolve the controversy' . . . ." (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).

D. Obviousness Ground Based on Chang 2000, Chang 2001, and Boyer 2001

Petitioner contends the subject matter of claims 1, 10, 11, and 17 would have been obvious over the combination of Chang 2000, Chang 2001, and Boyer 2001. Pet. 25–36, 60–62. Patent Owner disputes Petitioner's contentions. Prelim. Resp. 16–23.

1. Chang 2000

Chang 2000 is an article comparing two IMRT delivery systems: "the 'step & shoot' multileaf collimator (MLC) auto-sequence and the use of an intensity modulator." Ex. 1007, 948. Chang 2000 describes the step & shoot technique as follows:

> Characterized by the finite width of the MLC leaf and the fact that the treatment is delivered one segment at a time, the "step & shoot" MLC-IM technique delivers "skyscraper"-like intensity modulation maps that are discrete in both intensity level and spatial variation within the IM plane. The actual dose optimization quality delivered is related to how close the delivered IM map is to the intended continuous IM map.

Id. at 948–49.

Chang 2000 observes that "[t]he collimator angle, or the orientation of the MLC leaves, can have significant influence on the discrepancy between the discrete 'sky-scraper' IM map created for (and delivered by) the MLC technique and its corresponding original smooth map." *Id.* at 957. An optimal collimator angle "can minimize the field edge jaggedness" and can

"reduce the difference between the discrete IM map and its original smooth map." *Id.*

2. Chang 2001

Chang 2001 is an abstract for a presentation that describes "a new MLC-IM segmentation algorithm for continuous intensity maps." Ex. 1009, 408. According to Chang 2001, a base portion (slab) of the intensity map with the optimal height is sliced from the map and the appropriate MLC segment field is calculated to deliver the intensity slab. *Id.* "The preferable collimator angle for the segment field is chosen based on two weighted criteria: 1) preservation of the steep gradient portion of the intensity map slice and 2) minimization of the difference between the shape of the slice and that of the MLC segment field." *Id.* This approach allegedly "improve[s] the quality and efficiency of the 'step & shoot' treatment delivered by the conventional MLC accelerators." *Id.*

3. Boyer 2001

Boyer 2001 is a report that "provide[s] basic information" and "state[s] fundamental concepts needed to implement the use of a multileaf collimator (MLC) in the conventional clinical setting." Ex. 1013, 1. The report observes that "[r]otation of the direction of leaf travel can optimize the fit of the leaf shape to treatment target volumes." *Id.* at 40. Boyer 2001 describes Brahme's prior work regarding optimizing the collimator angle to optimize the leaf direction based on the field shape. *Id.* Boyer 2001 also describes the work of another researcher (Du) on "determining optimal leaf positioning in concert with optimal collimator angulation." *Id.*

4. Claim 1

Our disposition of this ground turns on Petitioner's obviousness analysis for the recited cost functions of claim 1. In particular, claim 1 recites "changing the radiation beam arrangement by incorporating a first cost function to determine the collimator angle of the multi-leaf collimator." Ex. 1001, 10:20–22. Petitioner cites Chang 2000's teaching that "[t]he orientation of MLC leaves (the collimator angle) should be considered as a variable in the MLC-IM treatment delivery optimization process." Pet. 27 (quoting Ex. 1007, 957). Petitioner further cites Chang 2001's teaching that "[t]he preferable collimator angle for the segment field is chosen based on two weighted criteria: 1) preservation of the steep gradient portion of the intensity map slice and 2) minimization of the difference between the shape of the slice and that of the MLC segment field." *Id.* (quoting Ex. 1009, "Materials and Methods").

Petitioner cites the same two weighted criteria from Chang 2001 (*see* Pet. 28) for teaching the next limitation in claim 1:

> the first cost function including both a second cost function to enhance delivery efficiency by reducing a number of radiation beam segments and reducing a number of radiation beam monitor units required for delivery of the desired prescription and a third cost function to enhance conformity of the radiation beam arrangement to a target shape.

Ex. 1001, 10:22–29. Petitioner contends the second criterion from Chang 2001, i.e., "minimization of the difference," enhances conformity of the radiation beam to a target shape. Pet. 28. Regarding the first criterion from Chang 2001, i.e., "preservation of the steep gradient portion," Petitioner contends this "*may* enhance delivery efficiency, consistent with [Chang 2001's] stated goal to 'improve the quality and efficiency.'" *Id.*

(quoting Ex. 1009, "Purpose") (emphasis added). Petitioner further contends that "[d]elivery efficiency is defined by the 'number of radiation beam segments' and/or 'number of radiation beam monitor units,' in Chang 2000." *Id.* (citing Ex. 1007, 949, 955, Fig. 9, Fig. 12).[4]

Patent Owner contends that none of Petitioner's cited references teaches the recited "second cost function." Prelim. Resp. 21 (citing, *inter alia*, Ex. 2002 ¶¶ 94–96). Specifically, Patent Owner argues "Chang 2000 did not suggest using any delivery efficiency cost term, and Chang did not suggest any delivery efficiency cost term related to collimator rotation." *Id.* at 17 (citing Ex. 1007, 949; Ex. 2002 ¶ 78). Patent Owner similarly contends "Chang 2001 does not suggest any criteria for selecting an MLC rotation angle to improve delivery efficiency and does not suggest using a cost function for improving delivery efficiency." *Id.* at 19. According to Patent Owner, both of Chang 2001's weighted criteria "are directed to potentially improving dosimetric fitness." *Id.* at 19 (citing, *inter alia*, Ex. 2002 ¶ 88). Patent Owner cites testimony from Mr. Chase and contends that an ordinarily skilled artisan

> would have . . . understood that the objective of preserving the steep gradient portion of an intensity map slice in the first criteri[on] was to choose an MLC rotation angle that permits the leaves of the MLC to best define the sharp features of the intensity map and potentially improve the dosimetric fitness of the delivered radiation.

Id. (citing Ex. 2002 ¶ 86).

[4] Petitioner also includes a general citation to Dr. Boyer's testimony in support of its analysis for this limitation. Pet. 29 (citing Ex. 1003 ¶¶ 302–304).

We are persuaded by Patent Owner's arguments. Petitioner's analysis for the "second cost function" limitation rests on two premises: (1) that enhanced delivery efficiency was known to be defined precisely as recited in the claim (i.e., as being based on "number of radiation beam segments" and/or "number of radiation beam monitor units") and (2) that Chang 2001's teaching on "preservation of the steep gradient portion" *may* improve that efficiency. *See* Pet. 28. As to the first premise, Petitioner cites Chang 2000, but the cited portions do not include any particular definition of delivery efficiency. *Id.* (citing Ex. 1007, 949, 955, Fig. 9, Fig. 12). We also note that Dr. Boyer testifies about an ordinarily skilled artisan's perspective on efficiency, but the artisan's perspective (and his testimony) is not discussed in the Petition.[5] *See* Ex. 1003 ¶ 303. Thus, Petitioner does not show sufficiently in the Petition how the cited references promote the particular "delivery efficiency" (i.e., reduced number of radiation beam segments and reduced number of radiation beam monitor units) recited in claim 1. Even if we were to credit Dr. Boyer's testimony as supporting the first premise, we would find that Petitioner's analysis of the second premise is deficient, as discussed below.

In particular, Petitioner cites Chang 2001's general goal of improving "the quality and efficiency of the 'step & shoot' treatment delivered by the conventional MLC accelerators." Pet. 28 (citing Ex. 1009, "Purpose"). Yet Chang 2001 does not link "preservation of the steep gradient portion" with enhanced delivery efficiency based on (1) a reduced number of radiation beam segments and (2) a reduced number of radiation beam monitor units,

[5] To the extent Petitioner purports to rely on Dr. Boyer's testimony but does not discuss it in the Petition, Petitioner violates 37 C.F.R. § 42.6(a)(3).

as is suggested by Petitioner. *See* Ex. 1009, "Purpose," "Materials and Methods." The lack of support in Chang 2001 is reflected in the wording of Petitioner's contention, which is stated as speculation: that Chang 2001's first criterion *may* result in delivery efficiency. *See* Pet. 28; *see also* Ex. 1003 ¶ 302 (Dr. Boyer using similar "may enhance" language without any further explanation). In contrast, Patent Owner cites Mr. Chase's testimony that preserving the steep gradient portion of an intensity map slice is directed to "to choos[ing] an MLC rotation angle that permits the leaves of the MLC to best define the sharp features of the intensity map and potentially improve the dosimetric fitness of the delivered radiation." Prelim. Resp. 19 (citing Ex. 2002 ¶ 86). We credit Mr. Chase's testimony because, in contrast to Dr. Boyer's unsupported speculation about enhanced delivery efficiency, Mr. Chase explains how Chang 2001's first criterion promotes dosimetric fitness via better definition of sharp features in the intensity map. *See* Ex. 2002 ¶ 86. Thus, Petitioner does not make a threshold showing that Chang 2001's first criterion results in enhanced delivery efficiency.

For these reasons, Petitioner has not persuasively shown that the combination of Chang 2000, Chang 2001, and Boyer 2001 teaches the recited cost functions of claim 1. Based on the present record, we determine that Petitioner has not established a reasonable likelihood that it would prevail in showing that the subject matter of claim 1 would have been obvious over the combination of Chang 2000, Chang 2001, and Boyer 2001.

5. Claims 10, 11, and 17

Petitioner's obviousness contentions for claims 10, 11, and 17 incorporate the same deficient analysis discussed above with respect to claim 1. *See* Pet. 29–36, 60–62. Petitioner's analysis of these claims does not cure the deficiencies. Thus, we determine that Petitioner has not established a reasonable likelihood that it would prevail in showing that the subject matter of claims 10, 11, and 17 would have been obvious over the combination of Chang 2000, Chang 2001, and Boyer 2001.

E. Obviousness Ground Based on Chang 2000, Chang 2001, Siochi 1999, and Boyer 2001

Petitioner contends the subject matter of claims 4, 12, 18, and 19 would have been obvious over the combination of Chang 2000, Chang 2001, Siochi 1999, and Boyer 2001. Pet. 36–42, 60–62. Patent Owner disputes Petitioner's contentions. Prelim. Resp. 23–31.

1. Siochi 1999

Siochi 1999 is a paper directed to "[a] leaf sequencing optimization algorithm that minimizes the delivery time for a static intensity modulated field." Ex. 1011, 671. The algorithm uses two concepts: "(a) intensity maps can be made up of regions with very little modulation below a certain intensity threshold; and (b) the highly modulating regions are most efficiently handled by forcing the leaves to travel in one direction with minimum beam-on time." *Id.* at 672. Siochi 1999 recognizes that "[d]ifferent sets of segments will . . . have different total beam on times and different amounts of leaf travel" and "minimizing the number of segments may produce the minimum treatment time." *Id.* at 671–72. Siochi 1999

further recognizes that "[t]he relative beam-on time coefficients are directly proportional to the number of monitor units to be delivered." *Id.* at 672.

2. Claims 4, 12, 18, and 19

Petitioner's obviousness contentions for claims 4, 12, 18, and 19 incorporate the same deficient analysis discussed above with respect to claim 1 in the Chang 2000–Chang 2001–Boyer 2001 ground. *See* Pet. 36–42; *supra* § II.D.4. Petitioner's analysis of these claims does not cure the deficiencies. Thus, we determine that Petitioner has not established a reasonable likelihood that it would prevail in showing that the subject matter of 4, 12, 18, and 19 would have been obvious over the combination of Chang 2000, Chang 2001, Siochi 1999, and Boyer 2001.

F. Obviousness Ground Based on Siochi '355, Webb 2001, and Siochi 1999

Petitioner contends the subject matter of claims 1, 4, 10, 11, 17, and 18 would have been obvious over the combination of Siochi '355, Webb 2001, and Siochi 1999. Pet. 42–57, 62–63. Patent Owner disputes Petitioner's contentions. Prelim. Resp. 31–37.

1. Siochi '355

Siochi '355 is a U.S. patent directed to delivering radiation treatment. Ex. 1015, 1:7–9. Figure 1 of Siochi '355 is reproduced below.

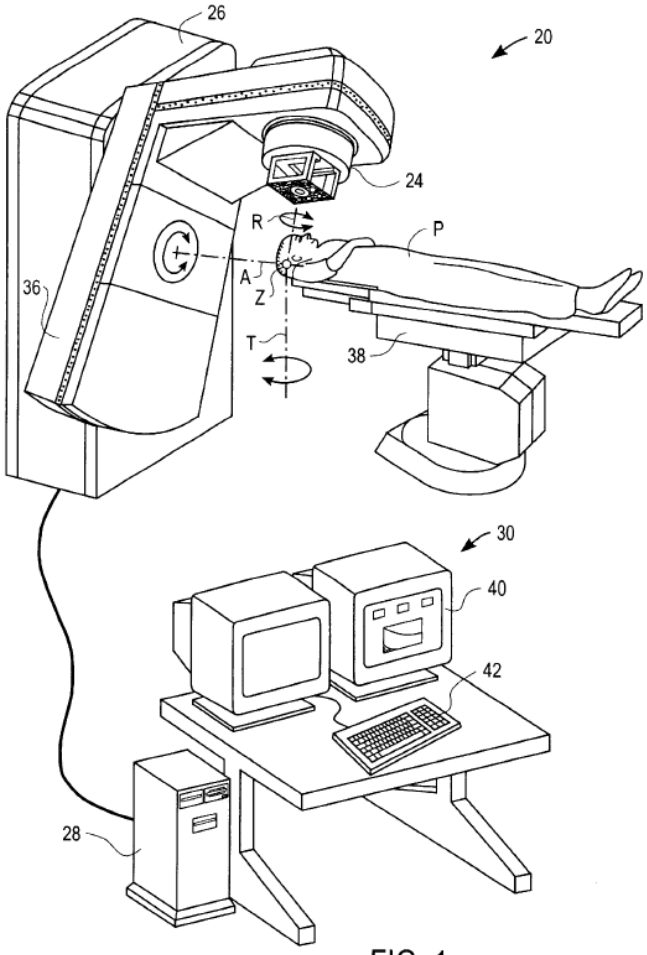

FIG. 1 (PRIOR ART)

Figure 1 depicts radiation treatment device 20 including control unit housing 26 and treatment head 24 fixed to the gantry 36, which can be swiveled for rotation about axis A. *Id.* at 4:17–27. Treatment device 20 is connected to treatment processing unit 30. *Id.* Treatment processing unit 30 includes central processing unit 28, visual display monitor 40, and keyboard 42. *Id.* at 4:39–53, 5:52–55.

Figure 3 of Siochi '355 is reproduced below.

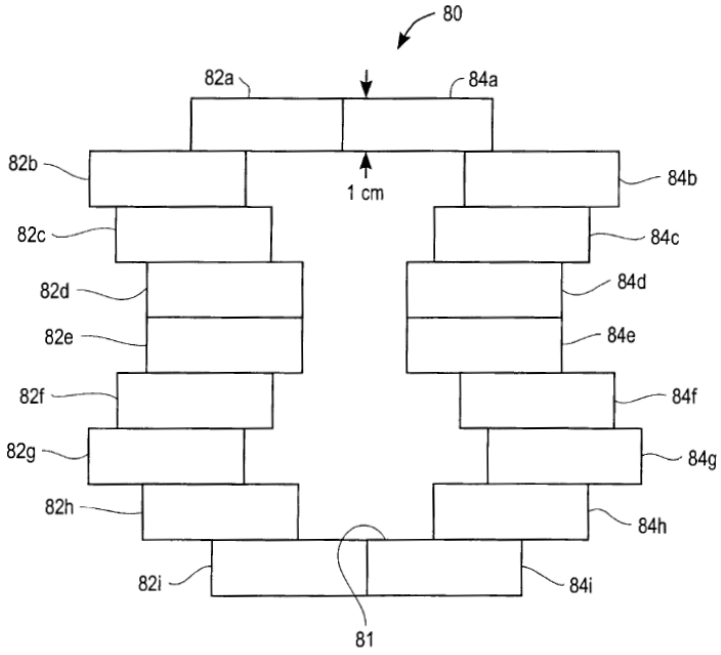

FIG. 3 (PRIOR ART)

Figure 3 depicts leaves of multi-leaf collimator 80 positioned for treatment in radiation treatment device 20. *Id.* at 3:26–28. Leaves 82a–i and 84a–i form leaf pairs of multi-leaf collimator 80, which is mounted between the radiation source and patient and positioned to define a treatment field by delimiting the electron beam. *Id.* at 5:16–23. Multi-leaf collimator 80 is operable to rotate about axis R (*see* Fig. 1) of the radiation beam. *Id.* at 5:65–6:3. In order to reduce the stair-step effect created by the width of the leaves, radiation is delivered in two or more separate treatment fields, such as at an optimum collimator orientation and at an angular offset from the optimum (e.g., rotated 90°) about axis R. *Id.* at 6:3–25. The intensity map may be decomposed into separate treatment maps at the given angular (e.g., orthogonal) offsets, and the decomposition may be optimized to yield the shortest delivery time. *Id.* at 10:13–27.

2. Webb 2001

Webb 2001 is an article titled "A simple method to control aspects of fluence modulation in IMRT planning." Ex. 1016, 187. The article recognizes "a tradeoff between obtaining desirable features in beam-space and high conformality in dose-space." *Id.* Accordingly, Webb 2001 proposes computation of a hybrid cost function with "two extra parameters at each iteration which characterize beam-space and then make use of them."[6] *Id.* at 189. The first of these parameters reflects that "the treatment time is directly given by the sum of the positive-going fluence changes added to the fixed time for a leafpair to sweep the field at maximum speed." *Id.* The second of these parameters seeks to maximize the minimum field size. *Id.* Weights can be assigned to these two parameters (individually and/or collectively) in the hybrid cost function to "control the relative contributions to the overall cost which is to be minimized." *Id.* at 190.

3. Claim 1

In its obviousness analysis for claim 1, Petitioner relies primarily on Siochi '355. *See* Pet. 42–46. Petitioner also relies on Siochi 1999 and Webb 2001 for teaching various aspects of the recited cost functions. *See id.* at 46. Our disposition of this ground turns on Petitioner's reasons for combining Siochi '355, Webb 2001, and Siochi 1999, which we now discuss in detail.

[6] Patent Owner characterizes the beam-space term of the hybrid cost function as the "delivery term." *See* Prelim. Resp. 33 (citing, *inter alia*, Ex. 2002 ¶ 156).

Petitioner notes Siochi '355, Webb 2001, and Siochi 1999 "all pertain to methods of conformal radiation therapy . . . as well as the consideration of MLC constraints and capabilities in such treatments." Pet. 62 (citing Ex. 1003 ¶ 274). Petitioner contends Siochi '355 incorporates U.S. Patent No. 5,663,999 ("the '999 patent") by reference, and Petitioner characterizes this patent as disclosing "the algorithm described in Siochi 1999." *Id.* (citing Ex. 1015, 9:10–15). Petitioner also notes that Siochi 1999 references the algorithm from the '999 patent. *Id.* at 62–63 (citing Ex. 1011, 672, 680). In light of this, Petitioner contends an ordinarily skilled artisan "would have reason to combine the teachings of Siochi '355 and Siochi 1999." *Id.* at 63 (citing Ex. 1003 ¶ 276).

In addition, Petitioner notes "Webb 2001 is directed to the general problem of controlling the trade-off between efficiency in beam-space and conformality in dose-space." Pet. 63 (citing Ex. 1003 ¶ 277). Petitioner contends "Webb 2001, Siochi '355 and Siochi 1999 all contemplate the inclusion of delivery constraints in the treatment planning process, and all identify constraints based upon the time for MLC leaf movement." *Id.* (citing Ex. 1003 ¶¶ 278–279). As such, Petitioner contends an ordinarily skilled artisan would have had a reason to combine these references. *Id.* (citing Ex. 1003 ¶ 280).

Patent Owner disputes Petitioner's reasons for the combination based on a number of alleged incompatibilities among the references. Prelim. Resp. 34–35.

We are not persuaded by Petitioner's reasons for the combination. In particular, Petitioner's rationale for combining Siochi '355 and Siochi 1999 is based on a false premise. Petitioner contends Siochi '355 incorporates the

teachings of the '999 patent by reference (Pet. 62), but Siochi '355 does not actually mention the '999 patent in its specification. In fact, Siochi '355 incorporates a *different* patent by reference in the passage cited by Petitioner. *See* Ex. 1015, 9:10–15 (incorporating U.S. Patent No. 6,134,*296* by reference). The only mention of the '999 patent in Siochi '355 appears in its list of cited references (*id.* at code (56)), but this does not support Petitioner's contention that Siochi '355 employs the same algorithm as Siochi 1999 based on incorporation by reference. *See* Pet. 62–63. Thus, we do not credit Petitioner's posited reason for combining Siochi '355 and Siochi 1999.

Moreover, Petitioner's mention of certain commonalities in Webb 2001, Siochi '355, and Siochi 1999—i.e., inclusion of delivery constraints in the treatment planning process and identifying constraints based upon the time for MLC leaf movement (*see* Pet. 62–63)—does not explain why a person of ordinary skill in the art would have had reason to incorporate any particular aspect of one of these references with aspects from the others. At most, it is merely a prerequisite to the obviousness analysis and helps show that the references are sufficiently similar that an ordinarily skilled artisan could have combined their teachings, not that such an individual would have done so to achieve a method employing the particular cost functions of the claim. *See Belden Inc. v. Berk-Tek LLC*, 805 F.3d 1064, 1073 (Fed. Cir. 2015) ("[O]bviousness concerns whether a skilled artisan not only *could have made* but w*ould have been motivated to make* the combinations or modifications of prior art to arrive at the claimed invention."); *Johns Manville Corp. v. Knauf Insulation, Inc.*, IPR2018-00827, Paper 9 at 10–11 (PTAB Oct. 16, 2018) (informative) ("Mere

compatibility of the references is . . . not sufficient."); *see also Securus Techs., Inc. v. Global Tel*Link Corp.*, 701 F. App'x 971, 977 (Fed. Cir. 2017) (unpublished) (holding that "a broad characterization of [two references] as both falling within the same alleged field," without more, was not "a sufficient rationale to support an obviousness conclusion," as "[s]uch short-cut logic would lead to the conclusion that any and all combinations of elements known in th[e] broad field would automatically be obvious, without the need for any further analysis"); *Microsoft Corp. v. Enfish, LLC*, 662 F. App'x 981, 990 (Fed. Cir. 2016) (unpublished) (holding that the fact that two references "were directed to the same art or same techniques" was "inadequate to show persuasively that a relevant skilled artisan would have been motivated to combine the references").

Accordingly, even if we could credit Petitioner's reasons for combining Siochi '355 and Siochi 1999, Petitioner still does not articulate a persuasive reason with a rational underpinning why an ordinarily skilled artisan would have further included Webb 2001 in the combination. This is another fatal flaw in Petitioner's proposed combination.

For these reasons, we are not persuaded by Petitioner's reasons for combining Siochi '355, Webb 2001, and Siochi 1999. Thus, we determine that Petitioner has not established a reasonable likelihood that it would prevail in showing that the subject matter of claim 1 would have been obvious over the combination of Siochi '355, Webb 2001, and Siochi 1999.

4. Claims 4, 10, 11, 17, and 18

Petitioner's obviousness contentions for claims 4, 10, 11, 17, and 18 incorporate the same deficient analysis discussed above with respect to

claim 1. *See* Pet. 47–57, 62–63. Petitioner's analysis of these claims does not cure the deficiencies. Thus, we determine that Petitioner has not established a reasonable likelihood that it would prevail in showing that the subject matter of claims 4, 10, 11, 17, and 18 would have been obvious over the combination of Siochi '355, Webb 2001, and Siochi 1999.

G. Obviousness Ground Based on Siochi '355, Webb 2001, Siochi 1999, and Webb 1993

Petitioner contends the subject matter of claims 12 and 19 would have been obvious over the combination of Siochi '355, Webb 2001, Siochi 1999, and Webb 1993. Pet. 58–60, 62–63. Patent Owner disputes Petitioner's contentions. Prelim. Resp. 37–39.

1. Webb 1993

Webb 1993 is a portion of a book titled *The Physics of Three-Dimensional Radiation Therapy: Conformal Radiotherapy, Radiosurgery and Treatment Planning*. Ex. 1018, title page. Webb 1993 describes Brahme's theory of orientation as "the optimal angulation of the MLC leaves (at some particular static orientation relative to the target volume)." *Id.* at 233. Brahme's theory posits that "the leaves should be aligned to minimize the opening of the collimator from the fully closed position." *Id.* at 234. According to Webb 1993, "[t]he problem reduces to finding the optimum way of arranging the leaves so as to minimize the volume (represented by an area 'seen' in the beam's-eye-view) of normal tissue outside the target volume." *Id.*

2. Claims 12 and 19

Petitioner's obviousness contentions for claims 12 and 19 incorporate the same deficient analysis discussed above with respect to claim 1. *See* Pet. 58–60, 62–63. Petitioner's analysis of these claims does not cure the deficiencies. Thus, we determine that Petitioner has not established a reasonable likelihood that it would prevail in showing that the subject matter of claims 12 and 19 would have been obvious over the combination of Siochi '355, Webb 2001, Siochi 1999, and Webb 1993.

III. CONCLUSION

After considering the evidence and arguments presented in the Petition and the Preliminary Response, we determine that Petitioner has not demonstrated a reasonable likelihood of prevailing with respect to at least one claim of the '490 patent challenged in the Petition. Therefore, we do not institute an *inter partes* review on the asserted grounds as to any of the challenged claims.

IV. ORDER

Accordingly, it is

ORDERED that the Petition is *denied* as to all challenged claims of the '490 patent.

PETITIONER:

Tamara Fraizer
Christopher Adams
Vid Bhakar
SQUIRE PATTON BOGS (US) LLPbuchanan
Tamara.fraizer@squirepb.com
Chirstopher.adams@squirepb.com
Vid.bhakar@squirepb.com

PATENT OWNER:

Anthony H. Son
Matthew Ruedy
Kaveh Saba
Jeremy Edwards
MADDOX EDWARDS PLLC
ason@meiplaw.com
mruedy@meiplaw.com
ksaba@meiplaw.com
jedwards@meiplaw.com
lit-team@meiplaw.com