

# United States Court of Appeals for the Federal Circuit

2007-1117

U.S. PHILIPS CORPORATION,

Plaintiff-Appellant,

v.

IWASAKI ELECTRIC COMPANY LTD.,

Defendant-Appellee.

Steven H. Reisberg, Wilkie Farr & Gallagher LLP, of New York, New York, argued for plaintiff-appellant. With him on the brief were John M. DiMatteo, Diane C. Ragosa, and Sean S. Buckley.

John B. Pegram, Fish & Richardson, P.C., of New York, New York, argued for defendant-appellee. With him on the brief were Autumn J.S. Hwang and Jorge M. Torres.

Appealed from: United States District Court for the Southern District of New York

Judge Kevin P. Castel

# United States Court of Appeals for the Federal Circuit

2007-1117

U.S. PHILIPS CORPORATION,

Plaintiff-Appellant,

v.

IWASAKI ELECTRIC COMPANY LTD.,

Defendant-Appellee.

---

DECIDED: November 2, 2007

---

Before NEWMAN, LOURIE, and LINN, Circuit Judges.

LINN, Circuit Judge.

U.S. Philips Corporation appeals from a final judgment entered pursuant to Fed. R. Civ. P. 54(b) in favor of Iwasaki Electric Company Ltd. by the United States District Court for the Southern District of New York. Specifically, U.S. Philips challenges the district court's decision to limit U.S. Philips's right of recovery to acts of infringement after the complaint was filed, based on a failure of notice; its claim construction ruling relating to U.S. Patent No. 5,109,181 ("the '181 patent"); and its decision to grant partial summary judgment of noninfringement as to those accused products not subject to the temporal limitation of liability. Because Iwasaki was properly on notice of potential infringement before the filing of the complaint, we reverse the district court's determination that notice was inadequate until the instant suit was filed and the concomitant limitation of liability. We affirm the district court's claim construction, and

with it the entry of partial summary judgment of no literal infringement. Finally, because the district court erred in concluding that the doctrine of equivalents is foreclosed as to the disputed claim limitation, we vacate the partial summary judgment of noninfringement under the doctrine of equivalents, and we remand for consideration of infringement under the doctrine of equivalents as well as for consideration of literal infringement from June 7, 2000, the date notice was provided, until the filing of the complaint.

## I. BACKGROUND

The '181 patent is directed to high-pressure mercury vapor discharge lamps filled with a gaseous mixture in which "at least one of the halogens Cl, Br or I is present in a quantity between  $10^{-6}$  and  $10^{-4}$   $\mu\text{mol}/\text{mm}^3$ ." '181 patent, claim 1. The halogen transports tungsten evaporated during the normal operation of the lamp back onto the electrodes, creating "an improved color rendition and a longer life." *Id.*, col. 1, l. 49.

U.S. Philips is the assignee of the '181 patent. On June 7, 2000, Mr. Rolfes, an employee of Philips International B.V., Corporate Intellectual Property, sent Iwasaki a letter on Philips International B.V. letterhead ("the Rolfes letter"). That letter notified Iwasaki of potential infringement of "at least four of our patents and patent applications" by Iwasaki's UHE-U HSCR 120 E5H lamp. The '181 patent was listed in the letter, and a copy of the patent was enclosed. The letter also contained an offer for a non-exclusive license. The letter did not identify U.S. Philips as the patent owner or identify Mr. Rolfes as an attorney, nor did it disclose the corporate relationship between U.S. Philips and Philips International B.V. The letter did, however, identify Mr. Rolfes as "Patent Portfolio Manager," speaking on behalf of "Corporate Intellectual Property,

Philips International B.V.” Before the district court, witnesses for U.S. Philips testified that the corporate intellectual property department of Philips International B.V. is responsible for prosecution, licensing, and enforcement of many of the patents that belong to the Philips family of companies, including patents assigned to U.S. Philips Corporation. U.S. Philips Corporation is “an IP holding company on behalf of . . . the overall Philips organization” and has no employees.

U.S. Philips filed suit against Iwasaki, alleging infringement of independent claim 1 of the '181 Patent, which reads in relevant part:

A high-pressure mercury vapor discharge lamp comprising . . . a filling essentially consisting of mercury, a rare gas, and a halogen for maintaining a tungsten transport cycle during lamp operation, characterized in that . . . at least one of the halogens Cl, Br or I is present in a quantity between  $10^{-6}$  and  $10^{-4}$   $\mu\text{mol}/\text{mm}^3$ .

'181 patent, claim 1. The district court construed the phrase “ a quantity between  $10^{-6}$  and  $10^{-4}$   $\mu\text{mol}/\text{mm}^3$ ” as “a quantity between 1 divided by 1,000,000 and 1 divided by 10,000 micromoles per cubic millimeter,” or, in alternative terms also stated by the district court, “a quantity between  $1 \times 10^{-6}$  and  $1 \times 10^{-4}$   $\mu\text{mol}/\text{mm}^3$ .” U.S. Philips Corp. v. Iwasaki Electric Co., No. 1:03-CV-172-PKC, slip op. at 9 (S.D.N.Y. Jan. 3, 2006) (“Claim Construction Opinion”).

In a subsequent partial summary judgment opinion, the district court confronted the question of whether the Rolfe letter provided adequate notice within the meaning of 35 U.S.C. § 287(a). U.S. Philips Corp. v. Iwasaki Electric Co., No. 1:03-CV-172-PKC, slip op. at 5–8 (S.D.N.Y. Sept. 28, 2006) (“Summary Judgment Opinion”). The district court addressed this as a preliminary matter, rather than simply as a question of damages, because it considered the issue potentially dispositive of literal infringement.

Because it was uncontested that Philips did not mark its lamps as permitted by § 287(a), if the Rolfes letter did not constitute notice under § 287(a), then Iwasaki's liability would be limited to any acts of infringement since January 8, 2003, the date the complaint in this action was filed. Since that date, it is uncontested that Iwasaki's lamps have had a target concentration of bromine (one of the named halogens) of  $1.6 \pm 0.4 \times 10^{-4} \mu\text{mol}/\text{mm}^3$ , and U.S. Philips has not alleged that Iwasaki has produced any lamps with a concentration lower than  $1.08 \times 10^{-4} \mu\text{mol}/\text{mm}^3$ . In contrast, there appears to be at least some evidence that before the filing of the complaint, but after the date of the Rolfes letter, Iwasaki produced lamps with a bromine concentration as low as  $0.68 \times 10^{-4} \mu\text{mol}/\text{mm}^3$ , a concentration within the claimed range even under a strict interpretation of Iwasaki's proffered claim construction. Citing Lans v. Digital Equipment Corp., 252 F.3d 1320 (Fed. Cir. 2001), the district court concluded that the Rolfes letter was inadequate to provide notice to Iwasaki under § 287(a) because it failed to identify U.S. Philips as the owner of the '181 patent and did not purport to speak for U.S. Philips. Summary Judgment Opinion at 7–8.

The district court then proceeded to grant summary judgment of noninfringement both as to literal infringement and under the doctrine of equivalents. As to literal infringement, and looking only to lamps sold or manufactured after January 8, 2003, the court concluded that Iwasaki's entire target concentration range of  $1.6 \pm 0.4 \times 10^{-4} \mu\text{mol}/\text{mm}^3$  "unquestionably exceeds the  $10^{-4}$  (1/10,000)  $\mu\text{mol}/\text{mm}^3$  disclosed in the patent," and noted that U.S. Philips did not challenge the factual accuracy of Iwasaki's claims that it had not made or sold any lamps during the relevant period with a bromine concentration below  $1.0 \times 10^{-4}$ . Id. at 10–11. The court therefore held that summary

judgment of noninfringement was appropriate. Under the doctrine of equivalents, the court held that a finding of infringement would vitiate the claim limitation that “a ‘quantity’ . . . is ‘present’ and that ‘quantity’ is ‘between’ one value ‘and’ another.” Id. at 18. Accordingly, it concluded that recourse to the doctrine of equivalents was foreclosed as a matter of law.

U.S. Philips appeals the district court’s limitation of liability to acts of infringement after the complaint was filed, the claim construction, and the entry of summary judgment as to infringement by equivalents. We have jurisdiction under 28 U.S.C. § 1295(a)(1).

## II. DISCUSSION

### A. Standard of Review

We exercise plenary review over claim construction. Cybor Corp. v. FAS Techs., Inc., 138 F.3d 1448, 1456 (Fed. Cir. 1998) (en banc). We likewise review the district court’s grant of summary judgment de novo, reapplying the standards applied by the district court. SanDisk Corp. v. Memorex Prods., Inc., 415 F.3d 1278, 1283 (Fed. Cir. 2005). The legal limitations on the applicability of the doctrine of equivalents are determined as a matter of law. Abbott Labs. v. Dey, L.P., 287 F.3d 1097, 1103 (Fed. Cir. 2002).

Summary judgment is generally appropriate where, after making all inferences in favor of the nonmoving party, there are no genuine issues of material fact and the moving party is entitled to judgment as a matter of law. Fed. R. Civ. P. 56(c); Celotex Corp. v. Catrett, 477 U.S. 317, 322 (1986). “Summary judgment on the issue of infringement is proper when no reasonable jury could find that every limitation recited in a properly construed claim either is or is not found in the accused device either literally

or under the doctrine of equivalents.” PC Connector Solutions LLC v. SmartDisk Corp., 406 F.3d 1359, 1364 (Fed. Cir. 2005). Although infringement under the doctrine of equivalents is a question of fact, “[w]here the evidence is such that no reasonable jury could determine two elements to be equivalent, district courts are obliged to grant partial or complete summary judgment.” DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc., 469 F.3d 1005, 1013, 1017 (Fed. Cir. 2006) (quoting Warner-Jenkinson Co. v. Hilton Davis Chem. Co., 520 U.S. 17, 39 n.8 (1997)).

B. Notice Under 35 U.S.C. § 287(a)

We begin with the question of whether the Rolfes letter provided notice of alleged infringement sufficient to satisfy 35 U.S.C. § 287(a). When there has been a failure to mark a patented product, 35 U.S.C. § 287(a) forecloses damages for infringement “except on proof that the infringer was notified of the infringement and continued to infringe thereafter, in which event damages may be recovered only for infringement occurring after such notice. Filing of an action for infringement shall constitute such notice.”

We have held that actual notice under § 287(a) “requires the affirmative communication of a specific charge of infringement by a specific accused product or device.” Amsted Indus. Inc. v. Buckeye Steel Castings Co., 24 F.3d 178, 187 (Fed. Cir. 1994). It is not disputed that the Rolfes letter meets these criteria. However, in Lans, we held that a letter sent by Mr. Lans, the inventor of the patent in suit and the sole shareholder and managing director of the assignee company, was nevertheless insufficient to create notice because it was not sent by the patent owner. 252 F.3d at 1327. We observed that “the actual notice requirement of § 287(a) demands notice of

the patentee's identity as well as notice of infringement," and that the notice must arise by "an affirmative act on the part of the patentee which informs the defendant of infringement." Id. at 1327–28 (citing Amsted, 24 F.3d at 187).

Iwasaki argued before the district court and reiterates here that the Rolfes letter was deficient under Lans because it was not sent by, and did not reference, the patent owner U.S. Philips. The district court held in Iwasaki's favor on both of these grounds. We disagree. Lans is distinguishable and does not support Iwasaki's position. First, unlike the facts in Lans, the front page of the '181 patent, which was enclosed with the Rolfes letter, correctly identifies "U.S. Philips Corporation, New York, N.Y." as the assignee. Although the assignation printed on the face of a patent is not a conclusive indication of the patent's current ownership, we hold that when the information printed on the patent is correct, it is enough to put an accused infringer on notice of the patentee's identity. Second, although the Rolfes letter did not purport to come from U.S. Philips Corporation, it is undisputed that Philips International B.V. had the ultimate responsibility for licensing and enforcement of the '181 patent. Thus, the reasons we articulated in Lans for strictly enforcing the notice requirement were all fulfilled: Philips International B.V.—the sender of the letter—was the party "to contact . . . about an amicable and early resolution of the potential dispute," "to consult with . . . about design changes to avoid infringement," and with whom "to negotiate a valid license." Lans, 252 F.3d at 1327. Under the facts of this case, the Rolfes letter constituted notice under § 287(a), and Iwasaki is liable for any acts of infringement that U.S. Philips can demonstrate took place after the June 7, 2000, date of the letter. The district court's contrary ruling is reversed.

### C. Claim Construction

We next turn to the question of claim construction. U.S. Philips argues that the term “between  $10^{-6}$  and  $10^{-4}$   $\mu\text{mol}/\text{mm}^3$ ” expresses a range of orders of magnitude, not a range of more-precise numbers, and that it was therefore error for the district court to construe the claim to mean “between  $1 \times 10^{-6}$  and  $1 \times 10^{-4}$   $\mu\text{mol}/\text{mm}^3$ .” According to U.S. Philips, one of ordinary skill in the art of lamp chemistry would understand “ $10^{-4}$ ” to mean something different and less precise than “ $1 \times 10^{-4}$ ”; i.e., the absence of a coefficient (“1”) means that the term encompasses all values that are closer on a logarithmic scale to  $10^{-4}$  than to  $10^{-5}$  or  $10^{-3}$ , or a range of approximately  $3.2 \times 10^{-5}$  to  $3.2 \times 10^{-4}$ .<sup>1</sup> Thus, according to U.S. Philips, the full range should be construed as approximately  $3.2 \times 10^{-7}$  to  $3.2 \times 10^{-4}$   $\mu\text{mol}/\text{mm}^3$ , and Iwasaki’s lamps with admitted halogen concentrations of  $1.2 \times 10^{-4}$  to  $2.0 \times 10^{-4}$   $\mu\text{mol}/\text{mm}^3$  literally infringe.

We disagree with U.S. Philips and, like the district court, conclude that the claim limitation is properly construed to mean “between  $1 \times 10^{-6}$  and  $1 \times 10^{-4}$   $\mu\text{mol}/\text{mm}^3$ .” Although the upper and lower bounds of the claimed range are expressed as powers of ten, this alone is no reason for treating them as anything other than the ordinary numbers that they are. As the district court observed, the overall phrase—“a quantity between \_\_\_\_ and \_\_\_\_”—is a construction that “implies a specific range . . . . It does not imply a range between two values which are themselves ranges.” Claim

---

<sup>1</sup> In other words, under U.S. Philips’s proffered construction, the term “ $10^{-4}$ ,” as an order of magnitude, encompasses a range of values from  $10^{-4.5}$  and  $10^{-3.5}$ —the set of numbers with base-10 logarithms that round to -4. This range is approximately  $3.2 \times 10^{-5}$  to  $3.2 \times 10^{-4}$ . Mathematically,  $10^{-4.5} = 10^{0.5} \times 10^{-5} = \sqrt{10} \times 10^{-5}$ , and  $10^{-3.5} = 10^{0.5} \times 10^{-4} = \sqrt{10} \times 10^{-4}$ ; the square root of 10 is approximately 3.2.

Construction Opinion at 8. The limitation does not refer to either bound as a range, an order of magnitude, or an approximation.

The specification fully supports this construction. In the LAMP 1 embodiment, under the heading “halogen,” the ’181 patent refers to “ $5 \cdot 10^{-6}$   $\mu\text{mol}$  of  $\text{CH}_2\text{Br}_2$  [ $\text{mm}^3$ ] ( $10^{-5}$   $\mu\text{mol}$  of  $\text{Br}/\text{mm}^3$ ).” ’181 patent, col. 3, ll. 53–54. The parenthetical expression apparently refers to the fact that one molecule of  $\text{CH}_2\text{Br}_2$  contains two bromine atoms, so the concentration of atomic bromine (Br) should be double the concentration of  $\text{CH}_2\text{Br}_2$ —two times  $5 \times 10^{-6}$ , or  $1 \times 10^{-5}$ . See Tr. of 11/22/2005 motion hearing at 57, ll. 10–11 (Dist Ct. Dckt. No. 64; Fed. Cir. J.A. 1233) (“You simply multiply the number on the first line by 2 because there are two bromines in every mole.”). This suggests that “ $10^{-5}$ ” is used as a synonym for “ $1 \times 10^{-5}$ .” Moreover, the LAMP 1 example specifies particular quantities for a number of attributes of the embodiment: e.g., an envelope volume of  $23 \text{ mm}^3$ , filling mercury at a concentration of  $0.261 \text{ mg}/\text{mm}^3$ , and power of 50W. It would be odd to infer in this context that “ $10^{-5}$   $\mu\text{mol}$  of  $\text{Br}/\text{mm}^3$ ,” alone among the specified quantities, refers to a range or order of magnitude, solely because it uses a power of ten. Indeed, there is no use of a power-of-ten quantity such as  $10^{-5}$  anywhere in the specification that requires the broader construction that U.S. Philips advocates. We therefore affirm the district court’s claim construction of the halogen range “between  $10^{-6}$  and  $10^{-4}$   $\mu\text{mol}/\text{mm}^3$ ” as meaning “between  $1 \times 10^{-6}$  and  $1 \times 10^{-4}$   $\mu\text{mol}/\text{mm}^3$ .”

However, there remains the question of how this construction is to be applied to the accused lamps. Before the district court, U.S. Philips argued that even under a claim construction of “between  $1 \times 10^{-6}$  and  $1 \times 10^{-4}$   $\mu\text{mol}/\text{mm}^3$ ,” a lamp with a halogen

concentration toward the lower end of Iwasaki's admitted range—for instance, with a concentration of  $1.2 \times 10^{-4} \mu\text{mol}/\text{mm}^3$ —might still literally infringe due to rounding. The question of whether and how to apply rounding, it argued, is a question of fact that should have been left for the jury rather than decided as part of the claim construction or at summary judgment. See Summary Judgment Opinion at 11. The district court disagreed and held that the question of whether to apply rounding should be treated solely as a claim construction issue that did not present any factual questions for a jury. Id. at 12. U.S. Philips declined to argue its position as to rounding as a matter of claim construction, instead limiting its claim construction argument to its contentions regarding the meaning of the phrase “between  $10^{-6}$  and  $10^{-4} \mu\text{mol}/\text{mm}^3$ ,” as discussed supra. Id. at 13.

In its opening brief on appeal, U.S. Philips does not challenge the district court's decision to treat the question of rounding as an issue of claim construction, nor does it challenge the district court's entry of summary judgment of no literal infringement under the district court's claim construction. Its sole infringement arguments on appeal are that the bounds of the claimed range refer to orders of magnitude rather than ordinary numbers—the claim construction argument we reject above—and that the doctrine of equivalents should have been available, an argument we address below. Accordingly, we deem the argument based on rounding to have been waived as to the Iwasaki products that the district court considered. See SmithKline Beecham Corp. v. Apotex Corp., 439 F.3d 1312, 1319 (Fed. Cir. 2006) (“[A]rguments not raised in the opening brief are waived.”). We therefore affirm the entry of summary judgment of no literal infringement as to Iwasaki's alleged acts of infringement after the filing of the

complaint.<sup>2</sup> We do not reach U.S. Philips's argument that the question of rounding should have been presented to a jury, nor do we determine in this case where the process of claim construction ends and the literal infringement analysis begins.

We emphasize that the claim construction we affirm today should not be read to state the endpoints of the claimed range with greater precision than the claim language warrants. In some scientific contexts, "1" represents a less precise quantity than "1.0," and "1" may encompass values such as 1.1 that "1.0" may not. See Viskase Corp. v. Am. Nat'l Can Co., 261 F.3d 1316, 1320–21 (Fed. Cir. 2001) (discussing distinction between "0.91 g/cm<sup>3</sup>" and "0.910 g/cm<sup>3</sup>"). In other words, "1.0" may be said to have more significant digits than "1" with no decimal point. Because "10<sup>-6</sup>" and "10<sup>-4</sup>" are simply the numbers 0.000001 and 0.0001 expressed as powers of ten, the claim language provides no basis for inferring any level of precision beyond the single digit "1." The way that power-of-ten quantities are used in the specification, discussed supra, confirms that the quantities of halogen described by the claims are not intended to be more precise. Thus, it is technically incorrect to assert, as Iwasaki does in its brief before this court, e.g., Br. for Appellee at 35, that "10<sup>-x</sup>" should be construed to mean "1.0 × 10<sup>-x</sup>." It means, simply, "1 × 10<sup>-x</sup>." "1.0 × 10<sup>-x</sup>" expresses a quantity with greater precision, reflected in the recitation of a significant digit following the decimal point.

The claim construction that we affirm today is "between 1 × 10<sup>-6</sup> and 1 × 10<sup>-4</sup> μmol/mm<sup>3</sup>," not "between 1.0 × 10<sup>-6</sup> and 1.0 × 10<sup>-4</sup> μmol/mm<sup>3</sup>." We leave for another day the question of whether this claim construction is sufficient to answer the

---

<sup>2</sup> In so doing, we do not decide whether and to what extent this waiver applies to further proceedings in this case on remand with respect to alleged literal infringement occurring between the Rolfe letter and the filing of the complaint.

infringement questions presented by a future record. See E-Pass Techs., Inc. v. 3Com Corp., 473 F.3d 1213, 1219 (Fed. Cir. 2007) (“[A]ny articulated definition of a claim term ultimately must relate to the infringement questions that it is intended to answer.”).

#### D. Infringement Under the Doctrine of Equivalents

The final issue on appeal is whether the doctrine of equivalents is available to extend the claimed concentration range beyond its literal scope. The district court held that the language of the claim was “intended to establish the demarcation of boundaries” and that those boundaries were expressed with “the type of precision that is closely analogous to the metes and bounds of a deed of real property.” Summary Judgment Opinion at 18. Thus, the district court reasoned, a finding of infringement would vitiate the claim limitation, and resort to the doctrine of equivalents is foreclosed as a matter of law. Id. at 18–19. U.S. Philips argues that the district court’s decision misreads our precedent regarding vitiation and is inconsistent with our decision in Abbott Laboratories v. Dey, L.P., 287 F.3d 1097 (Fed. Cir. 2002), and the Supreme Court’s decision in Warner-Jenkinson, 520 U.S. at 17. Iwasaki counters that Abbott Laboratories and Warner-Jenkinson are distinguishable and that other precedents support the district court’s holding.

We agree with U.S. Philips and conclude that resort to the doctrine of equivalents is not foreclosed with respect to the claimed concentration range. In Abbott Laboratories, we noted that “the fact that a claim recites numeric ranges does not, by itself, preclude . . . [reliance] on the doctrine of equivalents.” 287 F.3d at 1107–08. Indeed, in that case, we allowed consideration of the doctrine of equivalents as to such a range. Id. at 1100 (discussing claim to a material “characterized in that the overall

phospholipid content is 68.6–90.7%”); see also Warner-Jenkinson, 520 U.S. at 32–33 (permitting consideration of the doctrine of equivalents with respect to a claim to a pH range “from approximately 6.0 to 9.0”).

Iwasaki contends that our decisions in Moore U.S.A., Inc. v. Standard Register Co., 229 F.3d 1091 (Fed. Cir. 2000), Cooper Cameron Corp. v. Kvaerner Oilfield Products, Inc., 291 F.3d 1317, 1322 (Fed. Cir. 2002), and Elekta Instrument S.A. v. O.U.R. Scientific International, Inc., 214 F.3d 1302 (Fed. Cir. 2000), preclude U.S. Philips from relying on the doctrine of equivalents and support the district court’s determination that a finding of infringement by equivalents would vitiate the recited end points of the stated range. Contrary to Iwasaki’s arguments, however, these cases do not foreclose resort to the doctrine of equivalents on the facts of this case. As we observed in DePuy Spine, “[a] holding that the doctrine of equivalents cannot be applied to an accused device because it ‘vitiates’ a claim limitation is nothing more than a conclusion that the evidence is such that no reasonable jury could conclude that an element of an accused device is equivalent to an element called for in the claim, or that the theory of equivalence to support the conclusion of infringement otherwise lacks legal sufficiency.” 469 F.3d at 1018–19.

Our decision in Moore was based on the claim’s use of the term “majority,” a claim limitation that is qualitatively different from a range. See 229 F.3d at 1106 (“[T]o allow what is undisputedly a minority (i.e., 47.8%) to be equivalent to a majority would vitiate the requirement . . . . If a minority could be equivalent to a majority, this limitation would hardly be necessary.”). In Moore, no reasonable juror could have concluded that an adhesive strip running only 47.8% of the lengths of the accused product’s margins—

a minority of the lengths—was equivalent to one running a “majority of the lengths.” Even though the term “majority” means a quantity greater than 50% and less than or equal to 100%, holding 47.8% to be equivalent to a majority changes the character of the claim limitation in a way that merely broadening a range need not. See id. (“[I]t would defy logic to conclude that a minority—the very antithesis of a majority—could be insubstantially different from a claim limitation requiring a majority, and no reasonable juror could find otherwise.”); see also Asyst Techs. v. Emtrak, Inc., 402 F.3d 1188, 1195 (Fed. Cir. 2005) (discussing the “specific exclusion” principle by which “the term ‘mounted’ can fairly be said to specifically exclude objects that are ‘unmounted’”).

Likewise, the use of “between” in Cooper Cameron described a spatial relationship among two “plugs” and a “workover port” that was claimed as lying “between” them on a subsea wellhead. 291 F.3d at 1319. Given the arrangement of components and the overall description of the claimed wellhead, no reasonable juror could have concluded that a workover port placed somewhere other than between the two plugs was insubstantially different from a workover port that was between the plugs. Here, in contrast, the limits of the claimed halogen range are not themselves components of an invention that a third component must physically lie between; rather, they place limitations on a single quantity of halogen. A reasonable juror could make a finding that a quantity of halogen outside that range is insubstantially different from a quantity within that range without “ignor[ing] a material limitation” of the patent claim. Id. at 1322.

For similar reasons, Elekta’s use of a claim limitation containing the word “only” presents a question more akin to Moore than to Abbott Labs, Warner-Jenkinson, or the

instant case. 214 F.3d at 1304. Moreover, the precedential value of Elekta is limited by the fact that we explicitly declined to decide the question of whether the accused device infringed under the doctrine of equivalents and by our suggestion that prosecution history estoppel might apply. Id. at 1309 & n.2.

In short, this case is distinguishable from Moore, Cooper Cameron, and Elekta and indistinguishable from Abbott Labs and Warner-Jenkinson. Here, as in Abbott Labs and Warner-Jenkinson, a numeric range is claimed. The language “between x and y” of the present case has the same meaning as the phrase “x – y” of Abbott Labs. Likewise, the phrase is also essentially the same as that used in Warner-Jenkinson, with the exception of the absence of the qualifier “approximately.” However, terms like “approximately” serve only to expand the scope of literal infringement, not to enable application of the doctrine of equivalents. Notably, the Supreme Court in Warner-Jenkinson did not even mention the qualifier in allowing consideration of the doctrine of equivalents. 520 U.S. at 25–28.

Iwasaki’s final argument against application of the doctrine of equivalents is that the upper concentration limit here was included to avoid a prior art German patent, DE-AS 14 89 417, and its American counterpart, U.S. Patent No. 3,382,396 (collectively, both here and at the district court, “the Holmes reference”). The Holmes reference disclosed lamps with a halogen concentration of  $5 \times 10^{-4}$  to  $5 \times 10^{-2}$   $\mu\text{mol}/\text{mm}^3$ . ’181 patent, col. 1, ll. 22–23. Iwasaki analogizes the inclusion of an upper bound that avoids Holmes to prosecution history estoppel and argues that U.S. Philips must demonstrate that it has not “surrender[ed] the particular equivalent in question.” Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co., Ltd., 535 U.S. 722, 740 (2002). However,

there has been no narrowing amendment to the claim at issue, and Iwasaki has not asserted prosecution history estoppel in this case. Given these facts, there is no reason to presume that U.S. Philips has “surrendered” anything. Rather, the relevant inquiry is whether “a ‘hypothetical claim’ that literally recites the range of equivalents asserted to infringe . . . could have been allowed by the PTO over the prior art.” Abbott Labs., 287 F.3d at 1105 (quoting Wilson Sporting Goods Co. v. David Geoffrey & Assocs., 904 F.2d 677, 684 (Fed. Cir. 1990)). Here, the asserted equivalents have halogen concentrations that lie below the range disclosed by the Holmes reference, there has been no showing that the lamps disclosed in Holmes meet all the other limitations of the claim, and Iwasaki has not established that Holmes alone or with other references would have rendered the claimed lamps obvious. Holmes therefore does not foreclose the application of the doctrine of equivalents to lamps with halogen concentrations between  $1 \times 10^{-4}$  and  $5 \times 10^{-4}$   $\mu\text{mol}/\text{mm}^3$ .

For the above reasons, we vacate the district court’s summary judgment of noninfringement under the doctrine of equivalents. On remand, the district court should consider on a lamp-by-lamp basis whether Iwasaki’s lamps infringe under the doctrine of equivalents. We do not foreclose partial or complete resolution of this issue at summary judgment based, inter alia, on development of the record on remand with respect to alleged acts of infringement after the date of the Rolfe’s letter and prior to the filing of the complaint.

### III. CONCLUSION

For the foregoing reasons, the judgment of the district court is

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

## COSTS

No costs.