IN THE UNITED STATES DISTRICT COURT FOR THE DISTRICT OF UTAH

CENTRAL DIVISION

CAO GROUP, INC., **Plaintiff,** **vs.** **MAGPIE TECH CORP.,** **Defendant.**	**MEMORANDUM DECISION AND ORDER** **Case No. 2:15CV697DAK** **Judge Dale A. Kimball**

Plaintiff CAO Group, Inc. filed this action against Magpie Tech Corp., claiming that Magpie Tech has infringed several of CAO Group's United States patents relating to LED dental curing lights. The patents at issue are U.S. Patent Nos. 6,755,648 ("the '648 Patent"), 6,783,362 ("the '362 Patent"), 6,926,524 ("the '524 Patent"), 6,971,875 ("the '875 Patent"), and 7,294,364 ("the '364 Patent"). On December 1, 2016, the court held a hearing pursuant to *Markman v. Westview Instruments, Inc.,* 52 F.3d 967 (Fed. Cir. 1995), *aff'd*, 517 U.S. 370, 134 L. Ed. 2d 577, 116 S. Ct 1384 (1996). The court has carefully considered the parties' written submissions on these matters, as well as the arguments made at the hearing, and issues the following Memorandum Decision and Order construing the disputed claims in the Patents-in-Suit.

I. BACKGROUND

CAO invented a semiconductor laser or light-emitting diode ("LED") dental curing light that is portable, lightweight, inexpensive, and that minimizes heat generation to eliminate a

cooling system and complicated circuitry. CAO filed its first application encompassing its first generation dental curing light on September 24, 1999. LED lights became widely accepted and used in the dental industry during the early 2000s.

Since 1999, CAO has filed thirty six continuation-in-part applications, claiming priority to its original application. Five of CAO's many patents covering LED curing lights are at issue in this case. CAO has successfully enforced and licensed the patents at issue. CAO has licensed the patents to prominent companies in the industry, such as 3M, Ultradent, Discus Dental, Dentsply, Kerr, and others. Magpie is the initial United States distributor of products for Taiwan-based Bonart Co. Ltd. which include LED dental curing lights.

CAO brought this lawsuit to stop Magpie from allegedly infringing its patents. The parties met and conferred to agree upon the claim terms and phrases to submit to the court for construction. The parties dispute the construction of nine terms or phrases in the Patents-in-Suit. As required by the Local Patent Rules, the parties have submitted a Joint Appendix of exhibits and Joint Claim Construction Chart. Several of the patent claims include variations of similar phrases, which are presented in groups as single phrases for construction. The parties have agreed that it is appropriate for the court to treat these various groups of similar phrases as having the same respective constructions. In addition, the parties agree that each term may be considered dispositive to the infringement action.

DISCUSSION

Cross Motions for Claim Construction

A. Claim Construction Standard

The court construes patent claims as a matter of law. *Markman v. Westview Instruments, Inc.*, 517 U.S. 370, 372 (1996). When performing claim construction, the court will first "look to the intrinsic evidence of the record, i.e., the patent itself, including the claims, the specification, and if in evidence, the prosecution history." *CVI/Beta Ventures, Inc. v. Tura LP,* 112 F.3d 1146, 1152 (Fed. Cir. 1997) (quoting *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996)); *Unique Concepts, Inc. v. Brown*, 939 F.2d 1558, 1561 (Fed. Cir. 1991) ("To ascertain the meaning of claims, [courts] consider three sources: the claims, the specification, and the prosecution history."). The context of a term in the claim as a whole is critical. Such intrinsic evidence is the most significant source of the meaning of disputed claim language. *Vitronics,* 90 F.3d at 1582. Extrinsic evidence, such as expert testimony, inventor testimony, dictionaries, and technical treatises, should not be relied upon unless an analysis of the intrinsic evidence alone will not resolve all the ambiguity in a disputed claim term. *Id.* at 1583-84.

The claim construction analysis begins with the words of the claims. *Vitronics,* 90 F.3d at 1582. In most cases, the ordinary and customary meaning–i.e. the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention–should be used to construe the disputed claim terms. *Phillips v. AWH Corp.,*415 F.3d 1303, 1313 (Fed. Cir. 2005).

In addition, the specification "is always highly relevant to the claim construction analysis.

Usually, it is dispositive; it is the single best guide to the meaning of a disputed term." *Vitronics*, 90 F.3d at 1582. This is particularly true where the ordinary meaning is not readily apparent. But the Federal Circuit has repeatedly warned against confining the claims to those embodiments disclosed in the specification. *Phillips*, 415 F.3d at 1323.

Furthermore, "an invention is construed not only in light of the claims, but also with reference to the file wrapper or prosecution history in the Patent Office." *Graham v. John Deere Co.*, 383 U.S. 1, 33 (1966). A person of ordinary skill in the art looks to the prosecution history of a patent to understand how the patent applicant and the USPTO understood the claim terms. *Phillips*, 415 F.3d at 1313. Argument and amendments made during patent prosecution may limit the interpretation of claim terms to exclude interpretations that were disclaimed to obtain allowance of a claim. *Southwall Technologies, Inc. v. Cardinal IG Co.*, 54 F.3d 1570, 1576 (Fed. Cir. 1995). Thus, "claims as allowed must be read and interpreted with reference to rejected ones and to the state of the prior art; and claims that have been narrowed in order to obtain the issuance of a patent by distinguishing the prior art cannot be sustained to cover that which was previously by limitation eliminated from the patent." *Graham*, 383 US at 33. "The doctrine of prosecution disclaimer is well established in the Supreme Court precedent, precluding patentees from recapturing through claim interpretation specific meanings disclaimed during prosecution." *Omega Eng'g, Inc. v. Raytek Corp.*, 334 F.3d 1314, 1323 (Fed. Cir. 2003).

With these claim construction guidelines in mind, the court now turns to the construction of the disputed issues and terms in the Patents-in-Suit.

B. Disputed Claim Terms

(1) Claim Term 1: "Wand"

The first disputed term is "wand" in claims 8 and 9 of the '648 Patent and claim 1 of the '524 Patent. CAO contends that the court should construe the term "wand" as an "elongated structure that is designed to be grasped or held by hand." Whereas Magpie contends that the court should define the term as a "slender, straight handheld device."

In several of the specification embodiments, the term "wand" is equated with the term "handpiece." Also, in the language of claim 9, the term "wand" is equated with the term "handle." The specification and claims do not delineate any special shape or configuration of the "wand," although all embodiments shown include a wand/handle/handpiece that is generally elongated to be grasped or held by a hand. In addition, the prosecution histories of the patents do not suggest any special or narrow meaning for "wand."

In the '524 Patent, it refers to "a wand adapted to be grasped by a human hand." In the '648 Patent, claim 8 refers to a 'wand with a proximal end and a distal end, said wand having a longitudinal axis defined between said proximal end and said distal end." The '684 Patent also refers to the wand in claim 9 as "a handle with a proximal end and a distal end, said wand having a longitudinal axis defined between said proximal end and said distal end."

Magpie argues that a person of ordinary skill in the art, having read the '648 Patent and the '524 Patent, would understand "wand" to mean "a slender, straight handheld device." However, the claim language does not clearly delineate any special shape of the wand. A longitudinal axis between a proximal end and a distal end does not necessarily mean the wand

must be slender or straight. Moreover, the claim language makes clear that the term wand is not used to refer to the whole device, rather it is a part of the device.

The '648 Patent claim language refers to the wand interchangeably as a handle. In the specification of the '648 Patent, it refers to wand interchangeably as a "handpiece or wand." Magpie contends that the embodiments in the patent specifications show slender, straight handheld devices, but the '648 Patent shows an embodiment that is neither straight nor slender. The "506 handle" looks like the handle of a pistol. This embodiment would be consistent with the claim's use of the words wand and handle interchangeably.

The '648 Patent and '524 Patent specifications describe six different embodiments using different terms to describe different device shapes. Magpie argues that "when an applicant uses different terms in a claim, it is permissible to infer that he intended his choice of different terms to reflect a differentiation in the meaning of those terms." *Innova/Pure Water v. Safari Water Filtration*, 381 F.3d 1111, 1119 (Fed. Cir. 204). Magpie claims that the specifications of the '648 Patent and the '524 Patent use "housing" for each embodiment as a general descriptor of the enclosure, while casing, handpiece, and wand are used as subsets of the housing category, each with its own connotation and only "casing" and "handpiece" apply to the pistol grip design that is similar to Magpie's product.

However, the claim language does not appear to make such a differentiation in this case. Magpie imports overly narrow limitations into the claim from the specifications and extrinsic dictionary definitions. One embodiment described as having a handle is very similar to Magpie's accused device, and the patents and specifications interchangeably use wand and handpiece and

wand and handle. Magpie's construction is overly narrow because it is based on selected embodiments to the exclusion of other embodiments that are similar to Magpie's accused device. The court does not believe that there is a basis for concluding that the claim term "wand" does not apply to embodiments referred to as a "handle," such as "handle 506," when the claim interchangeably refers to handle and wand in the same sentence.

Magpie contends that CAO's construction impermissibly extends to the term and its equivalents whereas Magpie's construction is based on the actual specifications in the patent. But Magpie's construction limits the term "wand" more narrowly than the exemplary embodiments. There is no disclaimer or special meaning in the prosecution history, and the court concludes that there is no ambiguity to resolve as a result of the intrinsic evidence. Thus, the court finds it is not necessary or appropriate to move beyond the intrinsic evidence to define the term properly. The court, therefore, concludes that CAO's proposed construction captures the appropriate breadth and meaning of the term "wand" as it is used in the claims as a whole. The court, therefore, adopts CAO's proposed construction and defines the term "wand" as an "elongated structure that is designed to be grasped or held by a hand."

(2) Claim Term 2: various language regarding angles "in the range of 30 to 150 degrees"

The second claim dispute includes language of angular terms found in claims 8 and 9 of the '648 Patent, claim 20 of the '362 Patent, claims 1, 13, and 18 of the '524 Patent, claim 16 of the '875 Patent, and claim 1 of the '364 Patent. The angular language at issue includes: 'an angle . . . in the range of 30 to 150 degrees;" "a direction . . . in the range of a 30 to 150 degree angle;" "said angle . . . being in the range of from about 30 degrees to about 150 degrees;" "angular

orientation in the range of from about 30 to 150 degrees;" and "angular orientation of from about 30 to about 150 degrees."

CAO asserts that the court should construe the various phrases referring to an "angle" or "angular orientation" of "30 to 150 degrees" as "at least one angle falling within the range of 30 to 150 degrees." In contrast, Magpie asserts that the court should defined the angular language to mean "an angle in the full range of 30 to 150 degrees i.e. the claimed range is not a range over which the light may be output, however, but a range of 30 to 150 degrees of a full circular radius of 60 degrees from normal, over all of which the light occurs, not just somewhere within that range."

Except for the '364 Patent, the claims recite an angle or angular orientation of light "in the range" of 30 to 150 degrees. The language in the '364 Patent is more broadly worded than the language in the other patents at issue. Instead of using the language "in the range of," the '364 Patent refers to an "angular orientation of from about 30 to about 150 degrees." The full language of the '364 Patent refers to "said light output departing from said curing light in a direction that has an angular orientation of from 30 to about 150 degrees with respect to said heat sink longitudinal axis." The '364 Patent therefore is more susceptible to a construction defining a range of light, not just a directed light at a certain angle like the other patents make more clear.

The specification lists the 30 to 150 degree range as an example of potential angles that the light is emitted from the curing light. In the '648 Specification, there is language explaining that "the LED is mounted so that the average beam of light that it emits is generally at a 45 to 135 degree angle with that axis, and in some instances at a right angle to it." The Specification

also describes that "the mounting platforms 3305a, 3305b and 3305v are arranged at an angle Φ with the longitudinal axis of the heat sink 3301. The angle Φ can be from 0 to 90 degrees, from 10 to 80 degrees, from 20 to 70 degrees, from 30 to 60 degrees, from 40 to 50 degrees, or about 45 degrees as desired to generate the densest usable light footprint." These figures and descriptions in the Specification demonstrate that the light does not emit from the full angular range. Rather, it emits from particular angles within the selected range.

With respect to the '364 Patent, which has broader angular claim language, the figures and descriptions in the Specification similarly explain that the light does not emit from the full angular range. In the detailed description of Figure 4, it states that in "some embodiments of the invention, the chips will be oriented to emit light at an angle with the heat sink longitudinal axis of 70 to 110 degrees, 80 to 100 degrees, or about 90 degrees." *See* '364, col. 7, ll. 4-7. The detailed description also explains that Figure 14 "depicts a cross-section of the light of Figure 13. . . . The light transport means depicted has a curved distal portion to cause light to be emitted in a desired direction, such as at a right angle." These descriptions demonstrate that the light is guided to a desired direction, not a large range such as 30 to 150 degrees.

One patent examiner examining the '364 Patent stated that the light output is across a full circular radius of 60 degrees from normal, over all of which the continuous output of light from the LED occurs, not just somewhere within that range. CAO did not dispute the examiner's statement and Magpie contends that prosecution history estoppel prevents CAO from broadening the claim scope after the patent has issued. *Elkay Mfg. v. Ebco Mfg. Co.*, 192 F.3d 973, 978 (Fed. Cir. 1999). Magpie asserts that this court can rely on the construction imposed by the

examiner during the patent prosecution and apply that construction across all the patents in suit. "When multiple patents derive from the same initial application, the prosecution history regarding a claim limitation in any patent that has issued applies with equal force to subsequently issued patents that contain the same claim limitation." *Id.* at 980.

However, the Federal Circuit has made it clear that such examiners' statements "will not necessarily limit a claim." *Salazar v. Procter & Gamble Co.*, 414 F.3d 1342, 1345 (Fed. Cir. 2005). "An applicant's silence regarding statements made by the examiner during prosecution, without more, cannot amount to a 'clear and unmistakable disavowal' of claim scope." *Id.* The parties dispute whether CAO can benefit from the *Salazar* court's holding because CAO responded to the patent examiner and amended its patent. However, the examiner's letters and CAO's response and amendment was with respect to questions regarding the longitudinal axis. The patent examiner's statement regarding the angular range did not occur until his final notice. CAO did not have a back and forth discussion of the angular range issue with the patent examiner. The examiner's statement did not repeat or accept any statement by CAO, and CAO did not make any subsequent statement that confirmed or agreed with the examiner's statement. Therefore, CAO is not limited to the patent examiner's statement with respect to the angular language.

In this case, the examiner's statement with regard to the range ignores the plain language of the claim, particularly when viewed in light of the specification. In fact, the examiner's statement is contrary to the examples and descriptions given in the Specification. Accordingly, the court adopts CAO's proposed construction for all the patents at issue and defines the term to

mean "at least one angle falling within the range of 30 to 150 degrees."[1]

(3) Claim Term 3: "heat sink"

The third disputed term is "heat sink," which is used in claim 20 of the '362 Patent, claims 1, 10, and 13 of the '524 Patent, claims 16 and 17 of the '875 Patent, and claim 1 of the '364 Patent. CAO argues that to the extent that construction is needed or helpful for the term "heat sink," the term should be construed as a "body that draws heat away from an LED." In contrast, Magpie asserts that the court should define the term "heat sink" as "a structure in intimate thermal contact with a component that aids in heat transfer and heat dissipation to limit the temperature rise."

Magpie and CAO agree that "heat sink" includes the ability to draw heat away from a heat generating electrical component. However, Magpie's proposed construction of "heat sink" confuses and complicates the term. The LED light source for the curing lights generates heat. Such heat can pose a hazard to patients and dentists. The claim language of the '524 Patent refers to heat sinks "capable of dissipating heat created by a semiconductor light source." Similarly, the '648 Patent Specification refers to a heat sink to "rapidly transfer heat away from the chip(s) . . . for heat dissipation."

The '648 Patent Specification also states that one or more heat sinks is provided "to draw heat away from the semiconductor [LED] and away from the patient's mouth" and "for heat removal from the system." The Specification lists several examples of materials that can be used

[1] The court notes, that even if CAO was not entitled to challenge the patent examiner's statement on the '364 Patent, the examiner's statement would only apply to the '364 Patent because of the difference in the claim language.

for the heat sink, but broadly states: "Any materials with adequate heat conductance can be used."

Magpie uses extrinsic evidence to introduce a somewhat narrow and confusing interpretation of the term. It is not clear what "intimate thermal contact" means and why Magpie believes it is necessary. A heat sink obviously needs to be in thermal contact in order to draw heat away from the source of heat so the inclusion of the additional term "intimate" appears to be unnecessarily redundant or an attempt to limit the definition. But the use of the term intimate to limit the definition is vague. Does intimate thermal contact require the structure to touch the component? How close is intimate? The court finds nothing in the claims or specifications that provides support for using the limiting language of "intimate thermal contact." Moreover, if a heat sink is used to dissipate heat, a heat sink may be used to draw heat away for cooling a component rather than merely to "limit the temperature rise" of the component as Magpie suggests.

Magpie asserts that CAO's construction of "heat sink" is incomplete, but the court finds Magpie's construction unnecessarily limiting and unsupported by the specifications in the relevant patents. There is no disclaimer or special meaning relevant from the prosecution history related to the term "heat sink." Accordingly, the court adopts CAO's construction of "heat sink" and construes the term to mean a "body that draws heat away from an LED."

(4) Claim Terms 4 & 5: "Primary Heat Sink" & "Secondary Heat Sink"

The fourth and fifth disputed terms are "primary heat sink" and "secondary heat sink." "Primary heat sink" is used in claims 1 and 13 of the '524 Patent and claims 16 and 17 of the

‘875 Patent. “Secondary heat sink” is used in claims 8, 10, and 19 of the ‘524 Patent and claim 16 of the ‘875 Patent. CAO contends that the court should construe the term “primary heat sink” and the term “secondary heat sink” to mean “first heat sink” and “second heat sink,” respectively. Whereas, Magpie asserts that the court should define “primary heat sink” as “a heat sink first in position to the heat generating contacted component relative to a secondary heat sink,” and “secondary heat sink” as “a heat sink second in position to the heat generating contacted component relative to a primary heat sink, such that the primary heat sink intercedes between the secondary heat sink and the heat generating contacted component.”

Although CAO seeks to have the primary heat sink defined as the first heat sink and the secondary heat sink defined as the second heat sink, CAO does not advocate that the primary heat sink be first in position to the light source or the secondary heat sink be second in position to the light source. The specifications of the Patents-in-Suit refer to various arrangements of one or more heat sinks for drawing heat away from the light source. The terms are used to describe embodiments having two heat sinks. The primary heat sink is sometimes described as a smaller or small heat sink, while the secondary heat sink is described as an elongated or elongate heat sink. No distinction is made regarding the material or heat conductance of the primary and secondary heat sinks.

In the ‘648 Patent, the Specification states that “the secondary heat sink 1405 may have mounted directly or indirectly to it a plurality of semiconductor light emitting chips or chip modules 1409. Those chips 1409 may be mounted to a primary heat sink such as 1410.” In this example, the Specification states that the secondary heat sink may have the light source directly

mounted to it, which would omit any primary heat sink between the secondary heat sink and the heat generating light source. Therefore, the Specification specifically provides an example in which a secondary heat sink attached to the light source does not convey the heat sink's position with respect to the light source.

The Specification discloses that a particular advantage has been found for embodiments in which a small primary heat sink is attached to the light source and then an elongate secondary heat sink is attached to the primary heat sink. But a statement in the Specification that there is an advantage to a certain embodiment does not limit the patents-in-suit to embodiments requiring both heat sinks. Rather, some of the claims refer only to a primary heat sink and others clearly mention that a secondary heat sink can be attached to the light source.

Magpie argues that primary and secondary cannot be construed to mean first and second because CAO's patents use first and second in relation to other components that merely refer to duplicative components. For example, the patents refer to first and second lamps and switches. Magpie, therefore, asserts that the court cannot construe primary and secondary heat sinks to mean only that there are multiple heat sinks. However, based on the examples in the Specification, the terms "primary" and "secondary" do not necessarily connote the heat sink's relative position to the LED or any difference in preference, orientation, or heat conductance properties. Moreover, Magpie's argument that the terms primary and secondary cannot be construed to mean that there are multiple heat sinks because the patent refers to multiple components with the terms first and second, ignores the fact that one could make the same argument regarding a first and second switch as Magpie is making with respect to primary and

secondary. A switch referred to as the first switch could be construed to be in the first position as much as a primary switch could be. One could argue that if a patent was merely referring to multiple or duplicative components, it must state only "a heat sink" and "another heat sink" without any descriptive language. But, in any event, the court cannot construe language to mean something contrary to a specific embodiment provided for in the Specification. In this case, the patent specifications have embodiments with a primary heat sink and no secondary heat sink, both a primary and secondary heat sink, and a secondary heat sink with no primary heat sink.

The court cannot import selected embodiments described in the Specification to define the terms. But, even if a preferred embodiment is considered, it is not to be imported into the claims unless there is a clear reason to do so or an unmistakable disavowal. Magpie's examples from the Specification do not all support Magpie's proposed narrowing of the meaning of primary heat sink and secondary heat sink. The example where the specification expressly suggests an embodiment in which the secondary heat sink may have the light source directly mounted to it clearly does not support Magpie's position.

The plain language of the claims, some of which recite only a primary heat sink, do not require the primary and secondary heat sinks to be in any particular order or position relative to the light source. While CAO's position may appear to extend the definition of the terms primary and secondary, it is the examples in the Specification that demonstrate how the titles of the heat sinks are not always used consistent to a typical understanding of the term. Moreover, the prosecution history does not appear to provide any evidence for construction purposes.

Accordingly, the court concludes that based on the intrinsic evidence in the record, the

terms "primary heat sink" and "secondary heat sink" are properly construed to mean "first heat sink" and "second heat sink," respectively, although these definitions do not connote any particular position of preference between the heat sinks.

(5) Claim Term 6: "longitudinal axis defined between said proximal end and said distal end;" "having a proximal end, a distal end, and a longitudinal axis there between;" and "longitudinal axis of said structure."

The sixth disputed term includes longitudinal axis terms found in claims 8 and 9 of the '648 Patent, claim 20 of the '362 Patent, and claims 1, 13, and 18 of the '524 Patent. The disputed language includes: "longitudinal axis defined between said proximal end and said distal end;" "having a proximal end, a distal end and a longitudinal axis therebetween;" and "longitudinal axis of said [wand/handpiece/housing]." CAO argues that the term "longitudinal axis" should be construed as "an imaginary line extending generally centrally through a structure along its longest dimension" where the "structure" is the wand, handpiece, or housing to which the claim refers. Magpie, however, asserts that the court should define "longitudinal axis" to mean "a real or imaginary straight line extending through the center of an object along its longest dimension from one terminal end to the other terminal end, where the object is the wand/handpiece/housing/heat sink."

CAO contends that its construction is in keeping with the manner in which the term "longitudinal axis" is used in the claims, specification, and prosecution history. Each of the structures is described and shown as a generally elongated structure with a longer dimension, but the examples of structures having a longitudinal axes are not necessarily symmetrical. Therefore, CAO proposes that the line defining the "longitudinal axis" be construed as extending "generally

centrally" through the structure along its longest dimension.

Magpie, however, contends that the court cannot define a term with a phrase such as "generally centrally" because it does not provide a clear reference and would render the claim indefinite and invalid. Magpie asserts that an axis is a center line in which to define a reference of measure or on which a body may rotate, while a longitudinal axis defines the orientation and position of the axis along the central lengthwise direction of the body.

But, the Specifications of the Patents-in-Suit show embodiments, such as he curved handpiece structure, where the object does not have an easily defined center or clearly defined terminal ends. Magpie's resort to dictionary definitions is not helpful in applying the language to the embodiments in the Specification. These definitions do not apply to the Patents-in-Suit, and one of ordinary skill in the art would not rely on any of these definitions in interpreting the claims in the patents.

Both Magpie's and CAO's construction of the proposed term include a line through a structure's center. CAO proposes the additional orientation that the line be along the object's longest dimension. Magpie does not object to the inclusion of this language so long as it applies to a continuous dimension in a three dimensional coordinate reference frame. The longitudinal axis is used throughout the specifications, but usually with no explanation or identification in the drawings. However, given the longitudinal axis' function as described and explained in the description of how the devices work and the drawings in the specifications, its location can be understood with enough specificity to be considered definite. Because of the unusual shape of some of the wand configurations, a straight line cannot always be perfectly centered throughout

the wand. The phrase "generally centrally" captures that reality. Given the explanations and function of the longitudinal axis, there is adequate notice to prevent infringement. The court, therefore, adopts CAO's proposed construction of "longitudinal axis" and construes the term to mean "an imaginary line extending generally centrally through a structure along its longest dimension [where the structure is the wand/handpiece/housing]."

(6) Claim Term 7: Pulsed Input to Produce Light Output in Continuous Wave Format

The seventh disputed claim term is in claim 1 of the '364 Patent and involves the use of pulsed input to produce light output in a continuous wave format. Specifically, the claim language states: "using said pulsed electrical input to said LED to produce a light output from said LED that is in a continuous wave format rather than pulsed." CAO argues that the term should be construed as "using the pulsed electrical current input to the LED to produce a light output from the LED that has a constant light intensity, but that is not 'on' between pulses of electrical current input." Magpie contends, however, that the court should define the language to mean that "the light produced from said LED is constantly on to form a continuous wave even during periods of no current input of the pulsed input format."

CAO claims that it would have been a matter of common sense for one of ordinary skill in the art at the time of the invention to know that light cannot be output from an LED at a time when no power is input to the LED. Therefore, CAO contends that the term "continuous wave format" does not mean that the light remains "on" while the pulsed input current is in an "off" stage. Magpie, however, argues that CAO's proposed construction ignores the actual claim language, which requires the light output to be in a continuous wave format rather than pulsed.

Magpie also asserts that CAO's construction contradicts itself and, therefore, cannot be the appropriate construction. CAO proposes that the light output has "constant light intensity" but it is also "not 'on' between pulses." Magpie contends that a light output cannot be both at a constant light intensity and not on at the same time.

The '364 Patent's pulsed input and continuous wave-output function is described in the Specification with reference to Figures 37 and 38. Figure 37 depicts "a graph of electrical current input to the light emitting semiconductor chip(s) of the curing light versus time in a pulsed power input scheme." Figure 37 shows squares representing "a pulse of current input to the semiconductor light source, measured by 'a=duration,' 'b=rest period,' and 'c=current input level." Thus, it shows a pulsed power input scheme in which there are periods of power input separated by times of rest.

Figure 38 "depicts a graph of total light intensity output versus time in order to permit the reader to compare light intensity output when a current input pulsing scheme such as that of Fig. 37 is used to [when] a traditional continuous wave current input approach which generates a heat effect is used." The graph shows the loss of light intensity over time due to heat buildup with the traditional input approached compared to the maintenance of light intensity over time in the pulsed input scheme.

The description explains that "[a] pulsed current input scheme is used in order to enhance light power output from the chip(s) and in order to avoid light intensity reduction due to the heat effect. It has been found that when operated in continuous wave mode, the heat effect or heat buildup in the light emitting semiconductor chips will cause a decrease in light output intensity

over time, until a stabilized output yield is reached." However, "[i]n contrast, when current input to the semiconductor light source is pulsed, a greater even level of light power output with greater intensity is achieved." This increased output has been shown in laboratory experiments "to be more than 20% in some embodiments, providing significantly increased light yield and stable light intensity output in exchange for a simple control modification."

During the prosecution of the '364 Patent, CAO's attorney explained the need for a pulsed input to maintain light output. After describing the differences between a constant electrical power input and a pulsed current input, he stated that with a pulsed input scheme "the chips will not decrease and will be maintained at a higher level than if a constant electrical power input had been used." The invention, therefore, provides "a more powerful curing light . . . because the heat effect of the semiconductor chips is well managed." In addition, the "use of a pulsed electrical input power causes the emission of more light from the semiconductor chips."

The parties dispute the type of output the pulsed input produces. Magpie suggests that Figure 38's depiction of light output intensity over time and the heat effect is a representation of the light's waveform. However, Figure 38 demonstrates that a pulsed power input scheme can reduce reductions in light output over time by reducing the heat effect phenomenon associated with a continuous input scheme. But the figure only demonstrates light intensity over time. The figure does not specifically represent the format of the light output. The prosecution history of claim 1 recites that the pulsed input permits "light to be output from the curing light at an average power output level that resembles a continuous wave output in use," and claim 2 recites that "wherein said average power output level is greater than the power output level that would

result from powering the same chip with a continuous current input at power level 1 instead of pulsed current input." The language of Claim 2, which was discussed in prosecution, included and referred to the average power output level, which "resembles a continuous wave output." These statements from the prosecution history, therefore, appear to explain that the output is not a continuous wave output exactly but, rather, resembles a continuous wave output.

Magpie points to a response to office action with respect to another patent in which CAO stated "that pulsed electrical input to the chip does not necessarily mean that the light output will be pulsed. If the pulses of electrical input are not of very low frequency, then the chip will never stop emitting light, and the light output will be continuous (NOT pulsed). Therefore, it is false to assume that discontinuous electrical input will result in pulsed electrical output. Applicant pulses electrical input to the chip to reduce heat effect and to improve intensity of light output. Applicant is not claiming to have invented pulsed light output." But the court cannot rely on this prosecution history because it relates to a different patent and was referring to claim language in the related application regarding non-pulsed light output, not continuous wave format.

If the court finds the intrinsic evidence unclear on this term, CAO refers the court to extrinsic evidence from a supplier of technologically advanced components for optoelectronic systems regarding LED lights and pulsed operation modes. This evidence explains that so-called "quasi-continuous wave mode" means "that an LED is switched on only for certain time intervals, which are short enough to reduce thermal effects significantly, but still long enough that the LED process is close to steady state." The scheme described with reference to Figure 38

in the Specification of the '364 Patent, in which a continuous power input is provided to the LED, is referred to in the same extrinsic evidence as "hard" continuous wave and "not recommended" based on its loss of output intensity. Whereas, a "pulse mode" operating "with short pulse time (less than 50 ms) helps obtaining the maximum peak power." The distinction between "pulse mode" and "quasi-continuous wave mode" is in the very short duration of power provided in the pulse mode.

The court finds that the evidence suggests that the light appears to stay on, like it would with a continuous wave format, even though there is no electrical input. When there is no electrical input, the output cannot be considered to be "on" even if the light output remains constant. The pulsed input makes the light appear to stay on "in a near steady state." The parties agree, based on the claim language, that the output does not appear to be pulsed. The specification extensively explains that the input is pulsed and that a pulsed input achieves a greater light intensity than the continuous input. Although the input increases light output over time, it does not necessarily mean that the output is always "on." In other words, the output from the LED is not "on" between the pulsed input even though the LED has a constant light intensity. Magpie wants the court to determine that the constant wave output is continuously "on" even when there is no electrical input. But it would seem impossible for a light to be on when there is no electrical input. The claim language stating that the output from the LED "is in a continuous wave format rather than pulsed" must mean that the light output only appears to be continuous rather than pulsed. That interpretation is also consistent with the prosecution history stating that the output resembles a continuous wave.

As CAO cautions, the claim phrase "continuous wave format" cannot be confused with the constant light output intensity described in the specification and with the phrase "non-pulsed light output" from the related applications. The claim language of the related application does not recite "continuous wave format" and refers to the light output intensity rather than to the waveform of the light.

Accordingly, the court concludes that CAO offers the proper interpretation for Claim Term 7 and construes the term to mean "using the pulsed electrical current input to the LED to produce a light output from the LED that has a constant light intensity, but that is not 'on' between pulses of electrical current input."

(7) Claim Term 8: light direction in a 30 to 150 degree angle to the longitudinal axis

The eighth disputed claim term involves several different phrases referring to the angle of the light emission. These disputed phrases appear in claims 8 and 9 of the '648 Patent, claim 20 of the '362 Patent, claim 1 of the '364 Patent, and claims 1 and 13 of the '524 Patent. The phrases include the following language: "at least some that light emitted . . . travels . . . in a direction that represents an angle with respect to said . . . longitudinal axis in the range of 30 to 150 degrees;" "at least some light that travels in a direction that is in the range of a 30 to 150 degree angle to said . . . longitudinal axis;" "light output . . . in a direction that has an angular orientation of from about 30 to about 150 degrees with respect to said heat sink longitudinal axis;" and "at least some of said light produced . . . being emitted . . . at an angular orientation θ with respect to said . . . longitudinal axis, said angle θ being in the range of from about 30 degrees to about 150 degrees."

CAO asserts that the court should construe the phrases contained in Claim Term 8 as "at least some light from the LED travels in at least one angle falling within the range of 30 to 150 degrees." Whereas, Magpie asks the court to define the phrases to mean "at least some light emitted travels in a direction that represents an angle with respect to the longitudinal axis in the full range of 30 to 150 degrees i.e. the claimed range is not a range over which the light may be output, however, but a range of 30 to 150 degrees with respect to the respective longitudinal axis, of a full circular radius of 60 degrees from normal, over all of which the light occurs, not just somewhere within that range."

This claim term is similar to Claim Term 2 above regarding angular ranges but this claim term includes additional surrounding language regarding the light emission, output, or production. The angle in the range of 30 to 150 degrees is addressed in Claim 2 and the court has already determined that the angle referred to a single angle falling within the 30 to 150 degree range rather than the full range between 30 to 150 degrees. Here, the issue is the construction of the rest of the claimed limitation directed at the "at least some" light or the "light output." The focus is on the light emission at the angle rather than the angle itself.

Magpie asserts that in this claim term light may fall outside of the range, but the light must encompass the full range. The court, however, has already determined that the intrinsic evidence does not support a determination that the light must encompass the full range. For the same reasons as in Claim Term 2, Magpie's attempt to narrow the meaning of the claim terms relating to the angular range is improper. In particular, Magpie proposes a construction that requires light transmission throughout the entire angular range of 30 to 150 degrees in reliance on

a unilateral statement of a patent examiner with respect to one patent. CAO has given no statement that amounts to a clear and unmistakable disavowal of the plain meaning of the angular range terms. The meaning of "at least some light . . . in the range" properly means that at least some light falls within the range, not that the entire range is filled with light or that some light falls outside of the range.

There is not any real dispute between the parties about the language "at least some light." In addition, there does not appear to be any real dispute about the language referring to the light being emitted, being output, or traveling. The court, therefore, concludes that the intrinsic evidence supports CAO's interpretation of Claim Term 8 and that the term should be construed as "at least some light from the LED travels in at least one angle falling within the range of 30 to 150 degrees."

(8) Claim Term 9: at least some light directly emitted is/will be emitted forward

The ninth disputed claim term involves language referring to light directly emitted forward in claim 18 of the '524 Patent and claim 16 of the '875 Patent. The claim language includes the following: "At least some light directly emitted . . . is emitted forward . . . at an angular orientation θ with respect to said longitudinal axis, said angle θ being in the range of from about 30 degrees to about 150 degrees;" and "at least some of the light directly emitted . . . will be emitted forward . . . so that it travels . . . in a direction that forms an angular orientation in the range of from about 30 to 150 degrees with respect to said elongate heat sink longitudinal axis."

CAO argues that the court should construe the disputed language as "at least some non-

incidental light from the LED travels in at least one angle falling within the range of 30 to 150 degrees without the use of a light guide." Magpie, however, asserts that the court should define the language to mean "at least some non-incidental light is emitted without the use of a light guide in a direction that represents an angle with respect to the longitudinal axis in the full range of 30 to 150 degrees i.e., the claimed range is not a range over which the may be output, however, buy a range of 30 to 150 degrees with respect to the respective longitudinal axis, of a full circular radius of 60 degrees from normal, over all of which the occurs, not just somewhere within that range."

This claim term also includes language used in Claim Terms 2 and 8 regarding the angle orientation and longitudinal axis. The court has already determined that the intrinsic evidence supports CAO's proposed construction of the angular orientation of the lights with respect to Claim Terms 2 and 8. Accordingly, the court does not need to readdress those issues.

Claim Term 9 focuses on the "directly emitted" and "emitted forward" language. The language not included in the other claim terms–"at least some light directly emitted is/will be emitted forward . . ."–was added during the prosecution history because of similarities with prior art and explained by CAO's attorney as follows:

> The "directly" limitation is intended to exclude from within its scope interpretations where the "emitted light" is eventually emitted from an angled light guide as that of Mills at 41. The "forward from the light emitting semiconductor device" limitation is intended to exclude from within its scope interpretations of incidental light that is emitted from the semiconductor at an angle as that disclosed by Doiron et al.

CAO amended its claims to include the limitations indicated by the patent examiner to make the

invention patentable in light of the prior art. That prosecution history constrains the construction of Claim Term 9 to mean "non-incidental" light that falls within the angular range "without the use of a light guide." No other language in the prosecution history or specification alter the meaning.

The parties agree that the prosecution history requires the language "light directly emitted" to mean that the light is emitted "without the use of a light guide." However, at the Markman hearing, CAO argued that it considers the measurement of light angle prior to the light guide as part of "non-incidental." CAO asserted that "without the use of a light guide" was overly restrictive and asked the court to add the language "prior to" to its proposed construction. CAO claims that "prior to" should be added based on prosecution history stating that "[t]his language clarifies the angular orientation of the light emitted by the chip prior to it being reflected by a light reflector (if any). . ."

But the attorney's explanation CAO relied on in its briefing clearly states that "[t]he 'directly' limitation is intended to exclude from within its scope interpretations where the 'emitted light' is eventually emitted from an angled light guide." That explanation does not support the inclusion of the words "prior to" to CAO's original proposed construction. Therefore, the court concludes that Claim Term 9 is properly construed to mean "at least some non-incidental light from the LED travels in at least one angle falling within the range of 30 to 150 degrees without the use of a light guide."

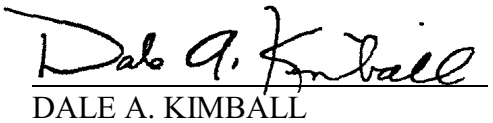
CONCLUSION

Having relied on the intrinsic evidence, and extrinsic evidence where necessary, the nine

disputed claim terms of the Patents-in-Suit are construed by the court as set forth above.

DATED this 30th day of January, 2017.

BY THE COURT:



DALE A. KIMBALL
United States District Judge