

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CREE, INC.,
Petitioner,

v.

OPTOLUM, INC.,
Patent Owner.

Case IPR2017-01511
Patent 7,242,028 B2

Before TREVOR M. JEFFERSON, BEVERLY M. BUNTING, and
NATHAN A. ENGELS, *Administrative Patent Judges*.

ENGELS, *Administrative Patent Judge*.

DECISION
Denying Institution of *Inter Partes* Review
37 C.F.R. § 42.108

I. INTRODUCTION

Cree, Inc. (“Petitioner”) filed a Petition For *Inter Partes* Review of claims 9–12, 17, 18, 23–26, 30, and 31 (“the challenged claims”) of U.S. Patent No. 7,242,028 B2 (Ex. 1001) (“the ’028 Patent”). Paper 1 (“Pet.”). In response to the Petition, OptoLum, Inc. (“Patent Owner”), the assignee of the ’028 Patent, filed a Patent Owner’s Preliminary Response. Paper 6 (“Prelim. Resp.”). We have authority under 35 U.S.C. § 314(a), which provides that an *inter partes* review may not be instituted “unless . . . there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.”

Upon consideration of the arguments and evidence presented in the Petition and the Preliminary Response, and for the reasons explained below, we conclude that the Petition does not establish a reasonable likelihood that Petitioner would prevail in challenging the patentability of any of claims 9–12, 17, 18, 23–26, 30, and 31 on the grounds asserted. Accordingly, we *deny* the Petition.

II. BACKGROUND

A. Real Party in Interest

Petitioner names Cree, Inc. as the real party in interest. Pet. 68.

B. Related Proceedings

The parties indicate that the ’028 Patent has been asserted in: *OptoLum, Inc. v. Cree, Inc.*, 2:16-cv-3828 (D. Ariz.). Pet. 19, 68; Paper 4, 2. Petitioner identifies two additional petitions related to this proceeding: IPR2017-01260, challenging the patentability of certain claims of related U.S. Patent No. 6,831,303 B2 (“the ’303 Patent”) and IPR2017-01261 (“the

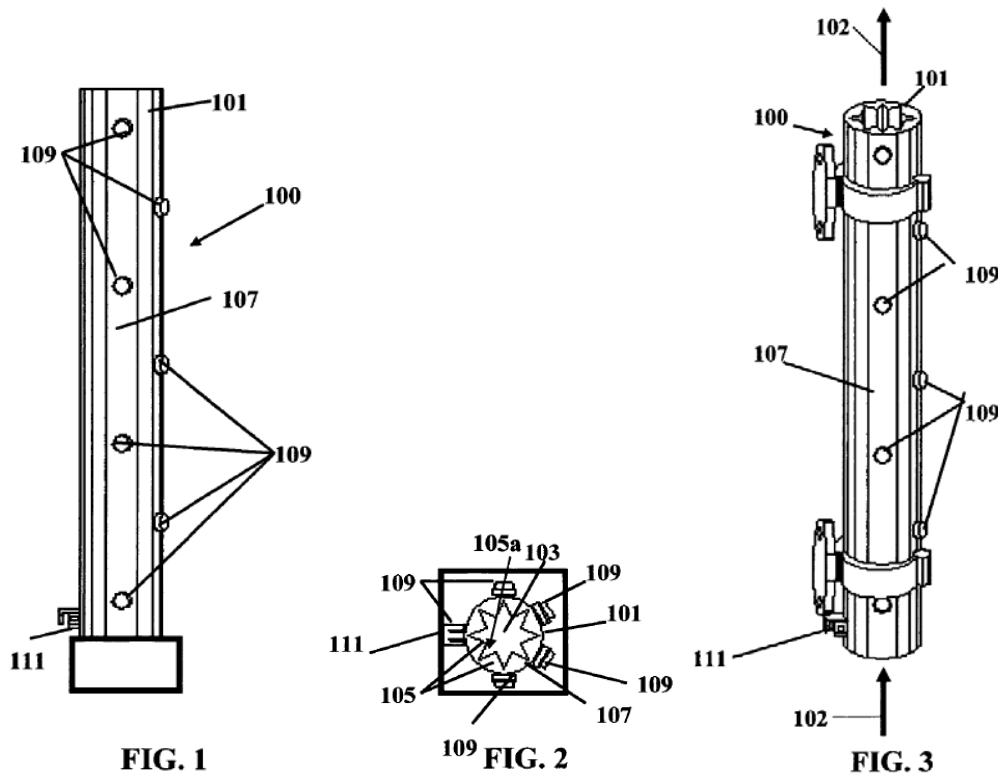
1261 IPR”), challenging the patentability of additional claims of the ’028 Patent. Pet. 68. We note that institution was denied in both these proceedings. *See Cree, Inc. v. OptoLum, Inc.*, Case IPR2017-01260, (PTAB October 26, 2017)(Paper 16); and *Cree, Inc. v. OptoLum, Inc.*, Case IPR2017-01261, (PTAB October 26, 2017)(Paper 15).

C. The ’028 Patent (Ex. 1001)

The ’028 Patent issued on July 10, 2007 from U.S. Patent Application No. 10/984,366, filed on November 8, 2004, which is a continuation of U.S. Patent Application No. 10/430,732 (now the ’303 Patent), filed May 5, 2003, which is a continuation of U.S. Patent Application No. 10/156,810 (now U.S. Patent No. 6,573,536 B1), filed May 29, 2002. Ex. 1001 [45], [21], [22], [63].

The ’028 Patent describes combining a plurality of light emitting diodes (“LEDs”) on an elongate heat sink to provide “a high light output light source that may be used for general lighting.” Ex. 1001, 3:25–26. The ’028 Patent states that LEDs typically generate significant amounts of heat that can cause degradation or destruction of the LEDs without adequate heat dissipation. *Id.* at 1:34–39.

Figures 1, 2, and 3, reproduced below, depict a light source as described in the ’028 patent.



Figures 1–3 of the '028 Patent are, respectively, a planar side view, top planar view, and perspective view of the disclosed light source.

Figures 1–3 depict a light source 100 that includes “an elongate thermally conductive member or heat sink **101**.” *Id.* at 2:64–65. Multiple LEDs 109 are arranged on exterior surfaces 107 of elongate heat sink 101. *Id.* at 3:18–19. Figure 2 depicts the elongate tubular heat sink 101 with heat dissipating protrusions 105 in the form of “triangular shaped fins, but may take on other shapes.” *Id.* at 3:7–8. The fins are “integrally formed on the interior of elongate heat sink 101” and define channel 105a. *Id.* at 3:8–9. The '028 Patent states that “elongate heat sink **101** is configured to provide convective heat dissipation and cooling” (*id.* at 3:2–4), with movement of a fluid such as air through the interior cavity as depicted by arrows 102 in Figure 3. *Id.* at 3:11–16 (describing convective cooling provided by movement of a medium 102 through the channel formed by elongate heat sink 101).

In an alternative embodiment illustrated in Figures 4 and 5, fins or protrusions 501, 503 may be added to the exterior surface of elongate tubular heat sink 101, defining channel 505. Ex. 1001, 3:58–61.

D. Illustrative Claim

The '028 Patent includes four independent claims; independent claims 1 and 19 were challenged in a petition filed in the 1261 IPR, and independent claims 18 and 31 are challenged in the instant Petition. Ex. 1001, 4:31–50, 5:28–6:6, 6:46–65. Challenged claims 9–12 and 17 depend from independent claim 1. Ex. 1001, 5:4–13, 25–27. Challenged claims 23–26, and 30 depend from independent claim 19. Ex. 1001, 4:31–50, 5:48–6:6. Claim 19, reproduced below, is illustrative of the challenged claims:

19. A light source comprising:
 - an elongate thermally conductive member having an outer surface;
 - a plurality of solid state light sources carried on said elongate member outer surface at least some of said solid state light sources being disposed in a first plane and others of said solid state light sources being disposed in a second plane not coextensive with said first plane;
 - electrical conductors carried by said elongate thermally conductive member and connected to said plurality of solid state light sources to supply electrical power thereto;
 - said elongate thermally conductive member being configured to conduct heat away from said solid state light sources to fluid contained by said elongate thermally conductive member;
 - said elongate thermally conductive member comprises one or more heat dissipation protrusions, at least one of said heat dissipation protrusions being carried on said elongate member outer surface; and
 - a coating carried on said elongate thermally conductive member, said coating is infused with optically reflective material.

Ex. 1001, 5:28–47.

E. Evidence Relied Upon

Petitioner relies on the following prior art references (Pet. 16):

References	Patent/Printed Publication	Date	Exhibits
Begemann	U.S. Patent No. 6,220,722 B1	Apr. 24, 2001	1002
English	U.S. Patent No. 6,682,211 B2	Jan. 27, 2004	1003
Verdes	U.S. Patent No. 6,425,678 B1	July 30, 2002	1004
Wu	U.S. Patent No. 5,949,347	Sept. 7, 1999	1007
Balestriero	U.S. Patent No. 6,561,690 B2	May 13, 2003	1020

Petitioner also relies on the declaration of Jianzhong Jiao, Ph.D. (Ex. 1008). Patent Owner relies on the declaration of Brent York (Ex. 2001).

F. Grounds Asserted

Petitioner asserts the following grounds of unpatentability (Pet. 16):

References	Basis	Claims Challenged
Begemann	35 U.S.C. § 102(b)	17, 30
Begemann, English	35 U.S.C. § 103(a)	17, 30
Begemann, Balestriero	35 U.S.C. § 103(a)	9–12, 23–26
Begemann, Balestriero, Verdes	35 U.S.C. § 103(a)	11, 12, 25, 26
Begemann, Wu	35 U.S.C. § 103(a)	18, 31

III. ANALYSIS

A. Claim Construction

The Board interprets claims of an unexpired patent using the broadest reasonable construction in light of the specification of the patent in which they appear. *See* 37 C.F.R. § 42.100(b); *Cuozzo Speed Techs., LLC v. Lee*,

136 S. Ct. 2131, 2144–46 (2016) (upholding the Board’s use of the broadest reasonable interpretation standard in *Inter Partes* Review proceedings). Under the broadest reasonable interpretation standard, and absent any special definitions, claims terms are given their ordinary and customary meaning as would be understood by one of ordinary skill in the art in the context of the entire disclosure. *In re Translogic Tech. Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). Any special definitions for claim terms or phrases must be set forth with reasonable clarity, deliberateness, and precision. *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994). In the absence of such a definition, limitations are not to be read from the specification into the claims. *See In re Van Geuns*, 988 F.2d 1181, 1184 (Fed. Cir. 1993).

Petitioner advances interpretations of the claim terms “elongate,” “thermally conductive member,” and “heat dissipation protrusions.” Pet. 17–18. In turn, Patent Owner advances interpretations of “thermally conductive member,” “heat dissipation protrusions,” and “configured to.” Prelim. Resp. 17–21. Having considered the evidence of record and as reflected in the discussion below, we determine that express construction of these terms is not necessary for purposes of this Decision. *See Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (“only those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy”).

B. Anticipation

Petitioner challenges the patentability of claims 17 and 30 of the ’028 Patent under 35 U.S.C. § 102(b) as being anticipated by Begemann. Pet. 15, 19–28, 31–37, 43–52. In support of its anticipation arguments, Petitioner presents evidence in the Declaration of Jianzhong Jiao, Ph.D. Ex. 1008.

Patent Owner argues that Begemann fails to teach each of the claim elements of the '028 patent. Prelim. Resp. 21–34.

We have reviewed each of Petitioner's arguments and the supporting evidence. As explained below and given the evidence of record, we are not persuaded that Petitioner has demonstrated a reasonable likelihood that it will prevail on its assertions that Begemann anticipates either of claims 17 or 30.

1. Principles of Law

A claim is anticipated if each limitation of the claim is disclosed in a single prior art reference arranged as in the claim. *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1369 (Fed. Cir. 2008). “The requirement that the prior art elements themselves be ‘arranged as in the claim’ means that claims cannot be ‘treated . . . as mere catalogs of separate parts, in disregard of the part-to-part relationships set forth in the claims and that give the claims their meaning.’” *Therasense, Inc. v. Becton, Dickinson & Co.*, 593 F.3d 1325, 1332 (Fed. Cir. 2010) (quoting *Lindemann Maschinenfabrik GmbH v. Am. Hoist & Derrick Co.*, 730 F.2d 1452, 1459 (Fed. Cir. 1984)). The Federal Circuit has also explained, however, that “a reference can anticipate a claim even if it ‘d[oes] not expressly spell out’ all the limitations arranged or combined as in the claim, if a person of skill in the art, reading the reference, would ‘at once envisage’ the claimed arrangement or combination.” *Kennametal, Inc. v. Ingersoll Cutting Tool Co.*, 780 F.3d 1376, 1381 (Fed. Cir. 2015) (citing *In re Petering*, 301 F.2d 676, 681 (CCPA 1962)).

2. Begemann (Ex. 1002)

Begemann discloses a light-emitting diode lamp comprising “a tubular, hollow gear column (1), which is connected with one end to a lamp cap (2). The other end of the gear column (1) is connected to a substrate (3), which is provided with a number of LEDs (4).” Ex. 1002, 3:40–44.

Begemann’s Figure 1, reproduced below, depicts those structures.

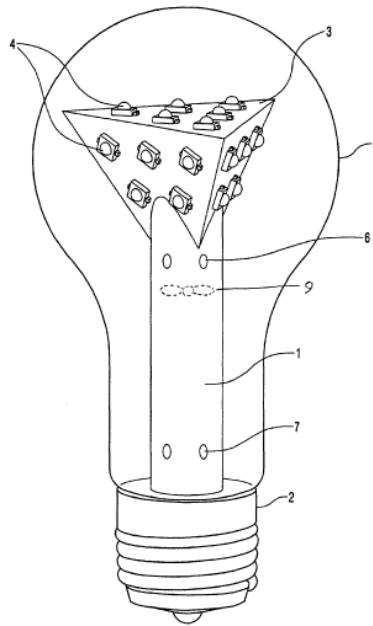


FIG. 1

Begemann Fig. 1: LED lamp including gear column 1,
lamp cap 2, substrate 3, and LEDs 4

Describing Figure 1, Begemann states that “the substrate (3) has the shape of a regular pyramid with four flat faces” (*id.* at 3:53–54) and a number of LEDs 4 adhered to each face (*id.* at 3:59–62). The outer surface of substrate 3 is a metal or metal alloy, “enabling a good heat conduction from the LEDs (4) to the column (1).” *Id.* at 3:55–57. Likewise, the outer surface of gear column 1 is made of a metal or metal alloy, allowing for heat conduction “from the substrate (3) to the (metal) lamp cap (2).” *Id.* at 4:1–2.

Begemann states that the gear column accommodates electronic gear for controlling the LEDs (*id.* at 3:44–46). Additionally, fan 9 is incorporated in the gear column for creating airflow that exits out through holes 6 and reenters the gear column via holes 7 such that the airflow passes by the LEDs positioned on the substrate to provide “improved heat dissipation from the substrate and LEDs.” *Id.* at 4:7–16.

3. Discussion

a. Claim 17

Petitioner’s anticipation arguments include an element-by-element analysis comparing each of the limitations of independent claim 1 and dependent claim 17 of the ’028 Patent to Begemann’s disclosures. Pet. 21–31. Petitioner’s expert also provides evidentiary support for each argument. *See* Ex. 1008 ¶¶ 78–92.

Patent Owner disputes whether Begemann discloses certain limitations of claim 1, i.e., the claimed elongate thermally conductive member, including whether Begemann’s device (i) is “configured to conduct heat . . . to fluid contained by said elongate thermally conductive member,” (ii) carries a plurality of solid state light sources on its outer surface, or (iii) comprises one or more heat dissipation protrusions, at least one of which is “carried on said elongate member outer surface.” Prelim. Resp. 22. Claim 17 includes limitations in addition to those required by claim 1, which Patent Owner does not dispute. *See* generally Prelim. Resp. 22–44. We address the disputed limitations below.

i. “elongate thermally conductive member”

Independent claim 1 recites in relevant part an “elongate thermally conductive member.” Ex. 1001, 4:32. Petitioner argues that this limitation

is satisfied by “the structural unit of the substrate 3, gear column 1, and lamp cap 2” of Begemann. Pet. 21. Petitioner quotes Begemann’s disclosure that “[t]he outer surface of the gear column (1) of the LED lamp is made of a metal or a metal alloy” and “[t]his enables a good heat conduction from the substrate (3) to the (metal) lamp cap (2) to be attained.” *Id.* at 22–23 (quoting Ex. 1002, 3:66–4:2); *see also id.* (citing Ex. 1002, 2:20–22, FIG. 2; Ex. 1008 ¶¶ 73–74).

Patent Owner disputes that Begemann’s substrate and lamp cap are collectively part of the gear column. Prelim. Resp. 28. According to Patent Owner, a person of ordinary skill would understand Begemann’s substrate and lamp cap to be separate elements, distinct from the gear column. *See id.* (arguing the substrate and lamp cap are “materially distinct ‘members’ from the gear column” (citing Ex. 2001 ¶ 78)).

Neither Petitioner nor its expert explains sufficiently how each of the separate and materially distinct substrate, gear column, and lamp cap collectively form an “elongate thermally conductive member.” Thus, on the record before us, Petitioner’s arguments and evidence have not sufficiently established that Begemann discloses an elongate thermally conductive member as required by claim 1.

ii. “configured to conduct heat . . . to fluid contained by said elongate thermally conductive member”

Independent claim 1 further recites that the “elongate thermally conductive member being configured to conduct heat away from said solid state light sources to fluid contained by said elongate thermally conductive member” (the “configured to” limitation). Ex. 1001 4:43–46.

Petitioner argues that the “configured to” limitation is satisfied by Begemann’s teaching of “the assembly of the substrate 3, lamp cap 2, and gear column 3, which is provided with fan 9 and air holes 6, 7 to circulate fluid (air) for conducting heat away from the LEDs 4.” Pet. 26. Noting that Begemann teaches that the outer surfaces of the substrate, gear column and lamp cap are metal and joined together as a unit, Petitioner contends “heat is conducted from LEDs 4 to metal substrate 3 to metal gear column 1 and to metal lamp cap 2.” *Id.* (citing Ex. 1002, 3:40–44, 3:56–4:3. Ex. 1008 ¶¶ 85–86). Addressing the “fluid contained by said elongate thermally conductive member” portion of the limitation, Petitioner states:

[r]egarding heat conduction to contained fluid, Begemann discloses, *e.g.*: “The LED lamp . . . also includes a fan (9) incorporated in the gear column (1), which fan generates an air flow during operation of the lamp. This air flow leaves the gear column (1) via holes (6) provided in the gear column, and re-enters the gear column via the holes (7) provided in the gear column. . . . By virtue thereof, an improved heat dissipation from the substrate and the LEDs is obtained.”

Pet. 26 (quoting Ex. 1002 at 4:7–16); *accord* Ex. 1008 ¶ 87 (quoting Ex. 1002 at 4:7–16).

In its argument that the “configured to” limitation is not disclosed in Begemann, Patent Owner argues Begemann’s primary thermal management strategy is conduction along a heat path from the LEDs to the substrate, through the metal outer surface of the gear column, to the lamp cap, and out through the wiring that provides electricity for the bulb. Prelim. Resp. 24 (citing Ex. 1002 at 1:55–58, Ex. 2001 ¶ 76). According to Patent Owner, where Begemann describes convective cooling, Begemann discloses blowing air on the outer surface of the substrate and LEDs, not the inner

surface of the gear column. Prelim. Resp. 25–27. Further, Patent Owner argues that a person of ordinary skill would understand that Begemann is designed to minimize heat transfer within the gear column to keep the fan-generated air flow as cool as possible, thereby maximizing convective cooling of the outer surface of the LEDs and substrate. Prelim. Resp. 25–27.

Our review of Begemann reveals that the “improved heat dissipation” described in Begemann is influenced “[b]y suitably shaping and positioning the holes (6), the *air flow is led past a substantial number of the LEDs present on the substrate (3).*” Ex. 1002 at 4:12–14 (emphasis added). Reading the passage cited by Petitioner in context with the above sentence supports Patent Owner’s argument that Begemann attributes the “improved heat dissipation” to air flow led past the LEDs, not heat conducted to air contained within gear column 1, as Petitioner suggests. *Id.* at 4:7–16; *see* Prelim. Resp. 25–27.

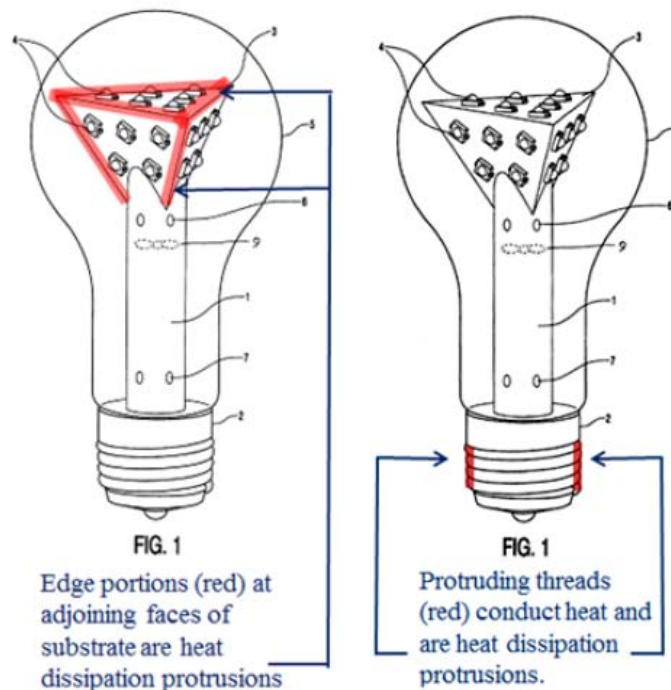
Petitioner’s arguments and evidence do not demonstrate sufficiently that the substrate, gear column, and lamp cap of Begemann conduct heat away from the LEDs to fluid contained by the substrate, gear column, and lamp cap. Indeed, the cited portions of Begemann disclose conducting heat to the *outer surface* of the gear column and disclose heat dissipated by air flow *external* to the gear column. We find nothing in the cited portions of Begemann that discloses conducting heat to an inner surface of the gear column or to air contained in the gear column. In fact, Begemann’s sole disclosure of an “entirely metal” gear column describes a separate embodiment with no mention of a fan, air flow, or heat conduction to a fluid contained in the gear column. *See* Ex. 1002 at 2:25–32; *see also Net MoneyIN*, 545 F.3d at 1371 (“it is not enough that the prior art reference

discloses part of the claimed invention, which an ordinary artisan might supplement to make the whole, or that it includes multiple, distinct teachings that the artisan might somehow combine to achieve the claimed invention”).

Thus, on the record before us, Petitioner’s arguments and evidence have not sufficiently established that Begemann discloses the “configured to” limitation as required by claim 1.

iii. “heat dissipation protrusions”

Independent claim 1 also recites “said elongate thermally conductive member comprises one or more heat dissipation protrusions, at least one of said heat dissipation protrusions being carried on said elongate member outer surface.” According to Petitioner, “Begemann discloses this limitation by virtue of the edge portions of adjoining faces of substrate 3 (and points thereof) and/or the protruding threads of the lamp cap 2 as shown in annotated FIG. 1 below:” Pet. 27.



Ex. 1002, Fig. 1 (annotated as reproduced at Pet. 28)

Petitioner annotated Figure 1 of Begemann, copied above with red markings added by Petitioner to highlight the “edge portions of adjoining faces” of Begemann’s substrate and red marking added to highlight the threads of Begemann’s lamp cap. Pet. 28–29. Petitioner argues the threads are “protruding threads” made of metal that “would conduct heat to the socket in which the LED lamp is mounted.” *Id.* at 28 (citing Ex. 1008, ¶ 89).

Petitioner also argues that because the edge portions are made of metal and “triangularly shaped like the heat dissipating protrusions disclosed in the [’]028 patent . . . , the edges of adjoining faces of the substrate 3 are likewise protrusions that dissipate heat.” *Id.* at 29.

Patent Owner counters that Begemann fails to disclose heat dissipation protrusions being carried on said elongate member outer surface. Prelim. Resp. 29. According to Patent Owner, (1) the threads of Begemann’s lamp cap are not “protrusions” from the surface of the elongate thermally conductive member (*id.* at 30); (2) the lamp cap is shaped to form threads, the threads “do not *protrude* from any surface” (*id.*); and (3) because the threads displace air from a socket, the threads preclude convection of air from the socket (*id.* at 31). Patent Owner further argues that the edges and corners of Begemann’s substrate are also not protrusions from a surface of the elongate thermally conductive member, as they are merely edges of the structure that Petitioner alleges to be the elongate thermally conductive member itself. Prelim. Resp. 30–31.

Petitioner’s argument that the threads of Begemann’s lamp cap are heat dissipation protrusions is not convincing because the screw threads do not project from any surface. Moreover, neither Petitioner nor its expert explain sufficiently how the edges and corners formed by adjoining faces of

substrate 3 are protrusions. Instead, we are more persuaded by Patent Owner's argument that the edges and corners of Begemann's pyramid substrate are "part of the surface itself from which nothing is protruding." Prelim. Resp. 31. Thus, on the record before us, Petitioner's arguments and evidence have not sufficiently established that Begemann discloses the heat dissipation protrusions limitation required by claim 1.

Because claim 17 depends from claim 1, and Petitioner's arguments and evidence regarding claim 17 do not remedy the deficiencies discussed above with respect to claim 1, our determination concerning the insufficiency of Petitioner's arguments and evidence applies equally to claim 17.

b. Claim 30

Claim 30 depends from independent claim 19, and Petitioner states "all limitations of independent claim 19 from which [claim 30] depends are addressed, in substantially the same manner as claim 19 was addressed in IPR Petition No. IPR2017-01261." Pet. 52.

To demonstrate how Begemann satisfies the limitations of claim 19, Petitioner refers to similar arguments and evidence proffered with regards to the corresponding limitations in claim 1. Pet. 53–58. For example, Petitioner argues that Begemann discloses an elongate thermally conductive member "for reasons discussed above for claim limitation 1.2." *Id.* at 53. Petitioner also argues that Begemann discloses the "said elongate thermally conductive member being configured to conduct heat away from said radiation emitting semiconductor devices to fluid contained by said elongate thermally conductive member" limitation of claim 19 "for the reasons explained previously for limitation 1.6." *Id.* at 55. Petitioner further argues

that the “said elongate thermally conductive member comprises one or more heat dissipation protrusions; at least one of said heat dissipation protrusions being carried on said elongate member outer surface” limitations are disclosed by Begemann “for the reasons discussed above for claim limitation 1.7.” *Id.* at 56.

In turn, Patent Owner relies on the same arguments and evidence as for claim 1. Namely, that Begemann does not teach an elongate thermally conductive member configured to conduct heat to fluid contained therein (Prelim. Resp. 26–27); the substrate and lamp cap of Begemann are distinct members from the gear column (*id.* at 28–29); and Begemann does not teach one or more heat dissipation protrusions (*id.* at 29–32).

Petitioner’s arguments and evidence regarding claim 19 do not remedy the deficiencies discussed above with respect to the corresponding limitations in claim 1. For the same reasons as discussed above with regards to claim 1, our determination concerning the insufficiency of Petitioner’s anticipation arguments and evidence applies equally to both claim 19 and claim 30.

4. Summary

Based on the record before us, having considered each of Petitioner’s arguments and supporting evidence, Petitioner has not demonstrated a reasonable likelihood that it would prevail on its assertion that claims 17 or 30 of the ’028 patent are anticipated by Begemann.

C. *Obviousness*

Petitioner challenges the patentability of claims 9–12, 17, 18, 23–26, 30, and 31 of the ’028 Patent under 35 U.S.C. § 103(a) as being unpatentable in view of Begemann in combination with various references of record. *See*

Pet. 28–67. In particular, Petitioner argues (1) claims 9–12 and 23–26 would have been obvious based on Begemann and Balestrieri (*id.* at 33–46, 59–61); (2) claims 11, 12, 25, and 26 would have been obvious based on Begemann, Balestrieri, and Verdes (*id.* at 46–52, 61); (3) claims 17 and 30 would have been obvious based on Begemann and English (*id.* at 31–34, 59); and (4) claims 18 and 31 would have been obvious based on Begemann and Wu (*id.* at 61–67). In support thereof, Petitioner identifies the disclosures in the cited references alleged to describe the subject matter in the challenged claims. *See id.* at 33–67. Petitioner also presents evidence in the Declaration of Jianzhong Jiao, PH.D. *See* Ex. 1008.

Patent Owner disputes Petitioner’s contentions as to the limitations discussed above. *See* Prelim. Resp. 35–36, 38–39, 44–49. Further, Patent Owner argues Petitioner’s combinations of references are improper (*see id.* at 39–44) and secondary considerations of non-obviousness weigh against Petitioner’s obviousness arguments (*see id.* at 50–58).

We have reviewed each of Petitioner’s arguments and the supporting evidence. As explained below and given the evidence of record, we are not persuaded that Petitioner has demonstrated a reasonable likelihood that it would prevail on its assertions that claims 9–12, 17, 18, 23–26, 30, and 31 of the ’028 Patent would have been obvious in view of the cited prior art.

1. Principles of Law

A claim is unpatentable under § 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 the subject matter pertains. *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.

Graham v. John Deere Co. of Kansas City, 383 U.S. 1, 17–18 (1966).

2. English (Ex. 1003)

English discloses replaceable automotive lamps having a replaceable LED lamp capsule that fits into a reflector and housing. Ex. 1003 at 1:5–9, 2:23–26. English describes the LED lamp capsule as having LED chips mounted on a support that is preferably made from a material having a high heat conductivity, such as a metal. Ex. 1003 at 2:23–45. English teaches conduction of heat from the LEDs to metal parts of a vehicle, and English additionally teaches cooling fins or other heat dissipating structures on the exterior of the lamp capsule. Ex. 1003 at 3:63–4:9.

3. Verdes (Ex. 1004)

Verdes describes LED obstruction lamps, such as those used around airport runways, tall buildings, and towers. Ex. 1004 at 1:6–10. Verdes describes its obstruction lamps as having an internal illuminating unit comprising a metal vertical cylinder on which multiple high-power LEDs are mounted. Ex. 1004 at 3:38–46. Verdes teaches that “[i]t is important to provide a heat sinking for . . . high power LEDs” and that its metal vertical cylinder “is specifically designed to be made of a metal which provides a heat sinking for the LEDs.” Ex. 1004 at 3:51–54.

4. Balestriero (Ex. 1020)

Balestriero describes a luminaire comprising LEDs mounted on a support in a housing. Ex. 1020 at 3:11–13. Balestriero teaches that “[t]he

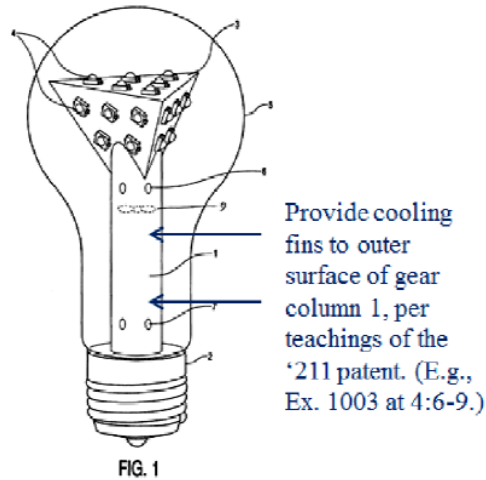
housing is advantageously constructed from a heat-conducting material, for example anodized aluminum, and its outer surface comprises an undulating surface.” *Id.* at 5:9–11. Balestrieri additionally describes embodiments in which the housing is made of extruded aluminum. *Id.* at 6:9–14.

5. Discussion

a. Claims 17 and 30 in view of Begemann and English

Because of their dependencies on claims 1 and 19, claims 17 and 30 likewise require that the thermally conductive member includes the “configured to” limitation and “one or more heat dissipation protrusions, at least one of said heat dissipation protrusions being carried on said elongate member outer surface” limitations discussed above. Ex. 1001 at 4:47–50, 5:60–63. In addition to the anticipation arguments for claims 17 and 30, Petitioner argues in the alternative, “[s]hould it be determined that Begemann does not disclose the claimed heat dissipation protrusions, then claim 17 is obvious in view of Begemann in combination with English” (Pet. 28) and “claim 30 is obvious in view of Begemann in combination with English . . . for reasons previously explained . . . for claim 17” (Pet. 59). According to Petitioner, English expressly discloses the placement of cooling fins on an exterior of a hollow, metal base portion of an elongated, thermally conductive metal support to further enhance heat dissipation for cooling LEDs mounted on the metal support. Pet. 31. Petitioner argues a person of ordinary skill would have been motivated to provide the cooling fins of the lamp of English to the outer surface of Begemann’s gear column to enhance the performance and/or efficiency of cooling the LEDs by enhancing heat dissipation away from the gear column, substrate, and LEDs “to air circulating inside and at the outer surface of the gear column 1.” Pet.

31 (citing Ex. 1008 ¶¶ 93–94). Further, Petitioner presents the following annotated copy of Begemann’s Figure 1 to illustrate its proposed modification of Begemann’s gear column using English’s fins:



Petitioner's annotated version of Begemann Figure 1 with accompanying text that describes providing cooling fins to the outer surface of Begemann's gear column 1.

Pet. 33 (citing Ex. 1003 at 4:6–9).

As Patent Owner argues (Prelim. Resp. 39), Petitioner does not rely on English to meet the “configured to” limitation for either of claim 17 or 30 (*see, e.g.*, Pet. 26–27, 55–56 (citing only Begemann for the “configure to” limitation)). Having determined above that Begemann fails to disclose the “configured to” limitation, Petitioner’s reliance on English to satisfy the heat dissipation protrusions limitation fails to cure the noted deficiencies in Begemann with regards to the “configured to” limitation of claims 17 and 30 of the ’028 Patent.

For the same reasons as discussed above with regards to the “configured to” limitation of claim 1, our determination concerning the insufficiency of Petitioner’s arguments and evidence applies equally to claims 17 and 30.

b. Claims 9–12 and 23–26 in view of Begemann and Balestrieri

Because of their dependencies on claims 1 and 19, each of dependent claims 9–12 and 23–26 includes the “configured to” limitation and “one or more heat dissipation protrusions, at least one of said heat dissipation protrusions being carried on said elongate member outer surface.” Ex. 1001 at 4:47–50, 5:60–63. Petitioner contends Balestrieri “discloses a luminaire comprising LEDs 2, 22 mounted on a surface of an elongated, tubular housing 1, 20 made of heat conducting, extruded aluminum with undulating surface 14 of heat dissipating protrusions on the outer surface of the housing 1, 22.” Pet. 36 (citing Ex. 1020 at 3:11–26, 5:9–29, Figs. 1, 2). Based on those disclosures, Petitioner argues “even if it were determined that Begemann did not itself disclose heat dissipation protrusions as claimed . . . , this feature is taught by Balestrieri, and a POSA would have been motivated to include it in Begemann’s gear column 1 as explained above.” Pet. 43. Petitioner additionally cites Balestrieri for additional limitations found in each of claims 9–12 and 23–26. Pet. 35, 44–46, 59–61.

As Patent Owner argues (Prelim. Resp. 45), Petitioner does not rely on Balestrieri to meet the “configured to” limitation for any of claims 9–12 or 23–26 (*see, e.g.*, Pet. 26–27, 55–56 (citing only Begemann for the “configure to” limitation)). Having determined above that Begemann fails to disclose the “configured to” limitation, Petitioner’s reliance on Balestrieri to satisfy other limitations fails to cure the noted deficiencies in Begemann with regards to the “configured to” limitation of claims 9–12 and 23–26 of the ’028 Patent.

For the same reasons as discussed above with regards to the “configured to” limitation of claim 1, our determination concerning the

insufficiency of Petitioner's arguments and evidence applies equally to claims 9–12 and 23–26.

c. Claims 11, 12, 25, and 26 in view of Begemann, Balestrieri, and Verdes

Because of their dependency on independent claims 1 or 19, claims 11, 12, 25, 26 include the “configured to” limitation. Petitioner argues “[s]hould the substrate 3 of Begemann not be considered part of the claimed tubular member, then claims 11-12 are at least obvious in view of Begemann and Balestrieri in combination with Verdes.” Pet. 46. Petitioner states that “Verdes discloses an LED obstruction lamp that can replace incandescent lamps, wherein an internal illuminating unit 30 comprises a vertical metal cylinder 35 on which a plurality of high-power LEDs 31 and driving circuitry are mounted and which provides heat sinking for the plural LEDs 31.” *Id.* (citing Ex. 1004 at 3:38–46, 51–55, Fig. 3; Ex. 1008 ¶¶ 121–122).

As Patent Owner argues (Prelim. Resp. 47), Petitioner does not rely on Balestrieri and Verdes to meet the “configured to” limitation for any of claims 11, 12, 25, and 26 (*see, e.g.*, Pet. 26–27, 55–56 (citing only Begemann for the “configure to” limitation)). Having determined above that Begemann fails to disclose the “configured to” limitation, Petitioner's reliance on Balestrieri and Verdes to satisfy other limitations fails to cure the noted deficiencies in Begemann with regards to the “configured to” limitation of claims 11, 12, 25, and 26 of the '028 Patent.

For the same reasons as discussed above with regards to the “configured to” limitation of claim 1, our determination concerning the insufficiency of Petitioner's arguments and evidence applies equally to claims 11, 12, 25, and 26.

d. Claims 18 and 31 in view of Begemann and Wu

Both of independent claims 18 and 31 recite the “configured to” limitation and additionally recite “a coating carried on said elongate thermally conductive member, said coating is infused with optically reflective material.” Ex. 1002 at 5:45–47, 6:63–65. The Petition cites Begemann for teaching the “configured to” limitation of claim 18 (Pet. 63) and claim 31 (Pet. 66–67) and cites Wu for teaching the claimed coating (Pet. 63–65, 67).

As Patent Owner argues (Prelim. Resp. 49), Petitioner does not rely on Wu to meet the “configured to” limitation for either of claims 18 or 31 (*see* Pet. 63, 66–67 (citing only Begemann for the “configured to” limitation)). Having determined above that Begemann fails to teach or suggest the “configured to” limitation, Petitioner’s reliance on Wu to satisfy the coating limitations fails to cure the noted deficiencies in Begemann with regards to the “configured to” limitation of claims 18 and 31 of the ’028 Patent.

For the same reasons as discussed above with regards to the “configured to” limitation of claim 1, our determination concerning the insufficiency of Petitioner’s arguments and evidence applies equally to claims 18 and 31.

e. Secondary Considerations of Nonobviousness

Having determined above that Petitioner has not demonstrated that Begemann discloses the “configured to” limitation, we need not consider Patent Owner’s arguments concerning secondary considerations of nonobviousness. *See* Prelim. Resp. 50–59.

6. Summary

Based on arguments and supporting evidence of record, Petitioner has not demonstrated sufficiently a reasonable likelihood that it would prevail with respect to its contention that 9–12, 17, 18, 23–26, 30, and 31 of the '028 Patent would have been obvious based at least in part on Begemann.

IV. SUMMARY

For the foregoing reasons, we determine that the information presented in the Petition does not establish a reasonable likelihood that Petitioner would prevail in establishing the unpatentability of claims 9–12, 17, 18, 23–26, 30, and 31 of the '028 patent based on the asserted grounds. We therefore do not institute an *inter partes* review of any of the asserted grounds as to any of the challenged claims.

V. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that the Petition is DENIED.

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Patent 7,242,028 B2

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