

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

COOLER MASTER CO., LTD.,
Petitioner,

v.

AAVID THERMALLOY LLC,
Patent Owner.

Case IPR2019-00147
Patent 7,100,680 B2

Before LINDA E. HORNER, KEN B. BARRETT, and
ROBERT A. POLLOCK, *Administrative Patent Judges*.

BARRETT, *Administrative Patent Judge*.

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

I. INTRODUCTION

A. *Background and Summary*

Cooler Master Co., Ltd. (“Petitioner”)¹ filed a Corrected Petition requesting *inter partes* review of U.S. Patent No. 7,100,680 B2 (“the ’680 patent,” Ex. 1001). Paper 3 (“Pet.”). The Petition challenges the patentability of claims 1–3 of the ’680 patent. Aavid Thermalloy LLC (“Patent Owner”)² filed a Preliminary Response to the Petition. Paper 9 (“Prelim. Resp.”).

An *inter partes* review may not be instituted “unless . . . the information presented in the petition . . . shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” 35 U.S.C. § 314(a). Having considered the arguments and evidence presented by Petitioner and Patent Owner, we determine that Petitioner has not demonstrated a reasonable likelihood that it would prevail in establishing the unpatentability of the challenged claims of the ’680 patent. We do not institute an *inter partes* review and the Petition is denied.

B. *Related Proceedings*

One or both parties identify, as matters involving or related to the ’680 patent, *Aavid Thermalloy LLC v. Cooler Master Co.*, Case No. 4:17-cv-5363 (N.D. Cal.), and Patent Trial and Appeal Board cases IPR2019-00144,

¹ Petitioner identifies Cooler Master Co., Ltd. and CMI USA, Inc. as real parties-in-interest. Pet. 1.

² Patent Owner identifies Aavid Thermalloy LLC as the real party-in-interest, and further states that “Aavid is wholly owned by LTI Holdings Inc. (d/b/a Boyd Corporation), which is wholly owned by Basilisk Holdings Inc.” Paper 6, 2.

IPR2019-00145, IPR2019-00146, IPR2019-00333, IPR2019-00334, IPR2019-00337, and IPR2019-00338. Pet. 1–2; Paper 6, 2.

C. The '680 Patent

The '680 patent is titled “Integrated Circuit Heat Pipe Heat Spreader with Through Mounting Holes.” According to the Specification, “[t]his invention relates generally to active solid state devices, and more specifically to a heat pipe for cooling an integrated circuit chip, with the heat pipe designed to be held in direct contact with the integrated circuit.” Ex. 1001, 1:18–21.

The disclosed heat pipe “is constructed to assure precise flatness and to maximize heat transfer from the heat source and to the heat sink, and has holes through its body to facilitate mounting.” *Id.* at 1:66–2:2. The heat pipe “requires no significant modification of the circuit board or socket because it is held in intimate contact with the integrated circuit chip by conventional screws attached to the integrated mounting board.” *Id.* at 2:3–7. “[T]he same screws which hold the heat spreader against the chip can also be used to clamp a finned heat sink to the opposite surface of the heat spreader.” *Id.* at 2:9–11.

The internal structure of the heat pipe is an evacuated vapor chamber with a limited amount of liquid and includes a pattern of spacers extending between and contacting the two plates or any other boundary structure forming the vapor chamber. The spacers prevent the plates from bowing inward, and therefore maintain the vital flat surface for contact with the integrated circuit chip. These spacers can be solid columns,

embossed depressions formed in one of the plates, or a mixture of the two.

Id. at 2:12–20. The spacers “support the flat plates and prevent them from deflecting inward and distorting the plates to deform the flat surfaces which are required for good heat transfer.” *Id.* at 2:26–29.

The spacers also make it possible to provide holes into and through the vapor chamber, an apparent inconsistency since the heat pipe vacuum chamber is supposed to be vacuum tight. This is accomplished by bonding the spacers, if they are solid, to both plates of the heat pipe, or, if they are embossed in one plate, bonding the portions of the depressions which contact the opposite plate to that opposite plate. With the spacer bonded to one or both plates, a through hole can be formed within the spacer and it has no effect on the vacuum integrity of the heat pipe vapor chamber, from which the hole is completely isolated.

Id. at 2:36–46.

Figure 1 is reproduced below.

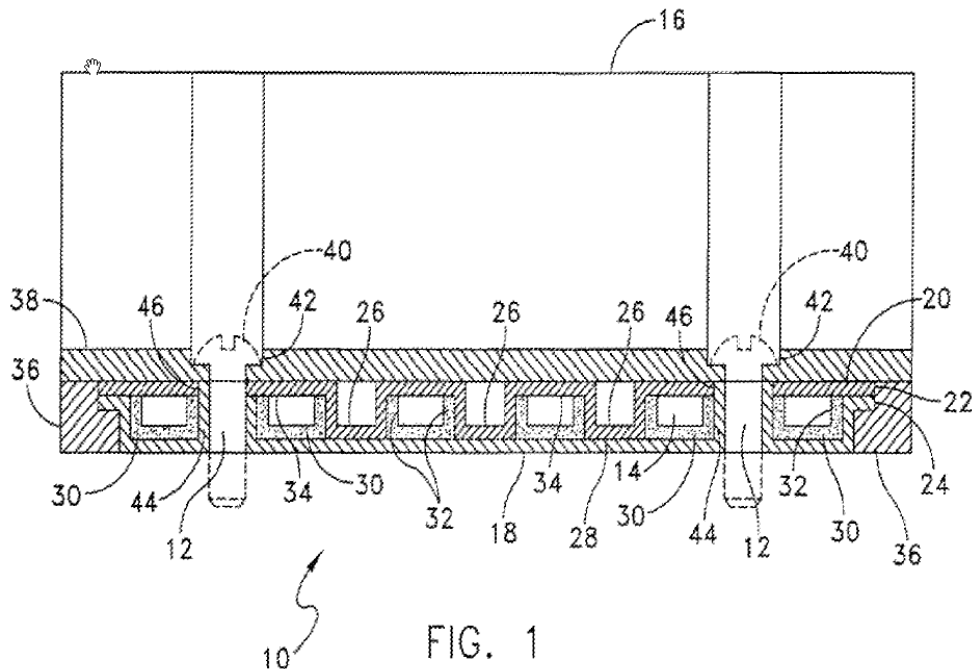


Figure 1 shows “a cross section view of the preferred embodiment of a flat plate heat pipe 10 of the invention with through holes 12 through its vapor

chamber 14 and in contact with finned heat sink 16.” *Id.* at 3:28–31. “When heat pipe 10 is used to cool an integrated circuit chip (not shown) which is held against contact plate 18, cover plate 20 is held in intimate contact with fin plate 38, to which fins 16 are connected.” *Id.* at 4:15–18. “Heat pipe 10 is constructed by forming a boundary structure by sealing together two formed plates, contact plate 18 and cover plate 20.” *Id.* at 3:32–34.

“Contact plate 18 and cover plate 20 are sealed together at their peripheral lips 22 and 24 by conventional means, such as soldering or brazing, to form heat pipe 10.” *Id.* at 3:34–37.

The entire assembly of heat pipe 10, frame 34, and fin plate 38 is held together and contact plate 18 is held against an integrated circuit chip by conventional screws 40, shown in dashed lines, which are placed in holes 42 in fin plate 38 and through holes 12 in heat pipe 10, and are threaded into the mounting plate (not shown) for the integrated circuit chip.

Id. at 4:18–24.

Holes 12 penetrate heat pipe 10 without destroying its vacuum integrity because of their unique location. Holes 12 are located within sealed structures such as solid columns 44, and since columns 44 are bonded to cover plate 20 at locations 46, holes 12 passing through the interior of columns 44 have no affect on the interior of heat pipe 10.

Id. at 4:25–30.

The Specification describes an alternate embodiment. *Id.* at 2:47–59.

This [alternate] embodiment forms the through holes in the solid boundary structure around the outside edges of the two plates. This region of the heat pipe is by its basic function already sealed off from the vapor chamber by the bond between the two plates, and the only additional requirement for forming a through hole

within it is that the width of the bonded region be larger than the diameter of the hole.

Id. at 2:50–57. The Specification explains that, “with the holes located in the peripheral lips, the heat pipe boundary structure can be any shape.” *Id.* at 2:57–59. Figure 2 is reproduced below.

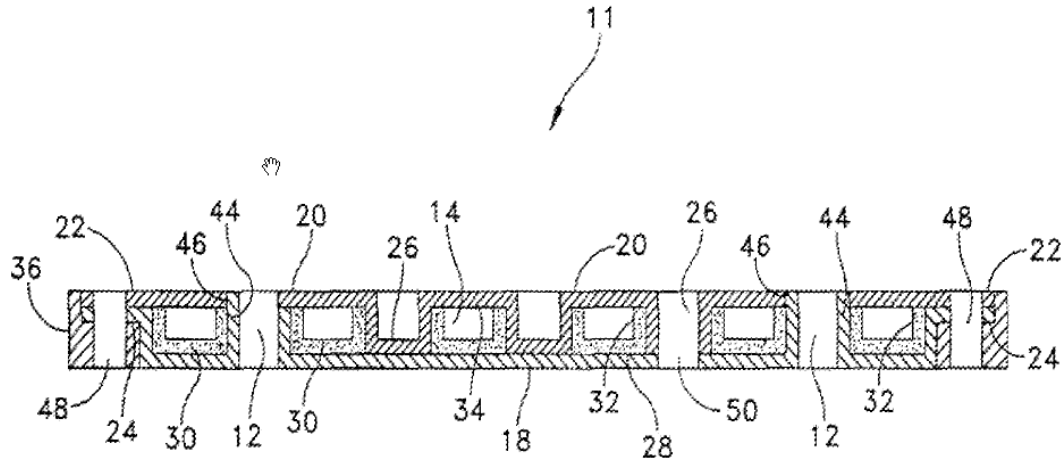


Figure 2 “is a cross section view of an alternate embodiment of the flat plate heat pipe 11 of the invention with through holes 48 located within peripheral lips 22 and 24 of the heat pipe and hole 50 shown in another sealed structure, one of the depressions 26.” *Id.* at 4:42–46. “Of course, the region of the peripheral edges is also a sealed structure since bonding between lips 22 and 24 is inherent because heat pipe 11 must be sealed at its edges to isolate the interior from the outside atmosphere.” *Id.* at 4:49–53.

D. Illustrative Claim

All of the challenged claims of the '680 patent, claims 1–3, are independent claims. Claim 1, reproduced below with emphasis added, is illustrative:

1. A heat pipe for spreading heat comprising:
a boundary structure including a first plate and a second plate arranged in spaced apart relation, *each of said plates including interior confronting surfaces and a peripheral lip*

located at an edge of said boundary structure which are bonded together so as to define an enclosed vapor chamber;

a depression formed in said first plate which projects into said vapor chamber, is spaced from said peripheral lip, and is bonded to said second plate;

an opening defined through said first plate depression and said second plate wherein said depression comprises an annular outer surface that is bonded to a corresponding annular edge surface in said second plate and further wherein said opening is isolated from said vapor chamber;

at least one spacer extending between and contacting said first and second plates; and

a wick positioned upon said confronting interior surfaces including that portion of the interior surface of said first plate that forms a surface of said depression within said vapor chamber.

Ex. 1001, 5:32–53 (emphasis added).

Challenged independent claims 2 and 3 recite, in pertinent part, “a circumferential edge lip bounding an inner surface” rather than “a peripheral lip located at an edge of said boundary structure” as in claim 1. *Id.* at 5:55–56, 6:5–6. Independent claim 5, challenged in related petition but not in this case, recites “an edge lip that bounds a top surface and a bottom surface.” *Id.* at 6:44–45; *see, e.g.*, IPR2019-00145 (challenging claims 5–8 of the ’680 patent).

E. Evidence

Petitioner relies on the following references:

Reference	Exhibit No.
Japanese Unexamined Utility Model Application S50-55262; Asserted Year of Publication: 1975; Inventor: Kazuo Nakamura (as translated) (“Nakamura”) ³	Ex. 1004

³ The parties disagree as to whether and when Nakamura was published. Our omission of the word “Publication” from Petitioner’s title of the

Reference	Exhibit No.
Japanese Examined Utility Model Application Publication No. H8-10205; Published March 27, 1996; Inventors: Tadahito Takahashi, Kaoru Hasegawa, Muneaki Sokawa (as translated) (“Takahashi”)	Ex. 1005

Petitioner also relies on the Declaration of Dr. Himanshu Pokharna (Ex. 1002) in support of its arguments.

F. Asserted Grounds of Unpatentability

Petitioner asserts the following grounds of unpatentability:

Reference(s)	Basis	Claim(s)
Nakamura ⁴	§ 103(a)	1–3
Nakamura and Takahashi ⁵	§ 103(a)	1–3

reference and our inclusion of Petitioner’s asserted publication date, *see* Pet. v, does not indicate that we have reached a final determination as to whether Nakamura constitutes a “printed publication” or that we have otherwise made any finding regarding the printed publication issue.

⁴ The Petition contains a heading identifying Ground 1 as Nakamura in view of Takahashi. Pet. 33. However, we understand, based on the articulation of the challenge, Ground 1 to be an assertion of obviousness over Nakamura alone. *See, e.g.*, Pet. 41–42 (asserting, under the heading “Ground 1,” obviousness in view of Nakamura alone and then asserting, under the heading “Ground 2,” that it would have been obvious to combine Nakamura and Takahashi).

⁵ Petitioner also identifies Yamamoto (Ex. 1024) in Ground 2, Pet. 5, but we fail to find any substantive reference to Yamamoto in the Petition, *see, e.g., id.* at 33–37 (providing an overview of Nakamura and Takahashi, but not Yamamoto).

II. ANALYSIS

A. *Principles of Law*

Petitioner bears the burden of persuasion to prove unpatentability of the claims challenged in the Petition, and that burden never shifts to Patent Owner. *Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015).

A patent claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter 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) any objective evidence of non-obviousness.⁶ *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

B. *The Level of Ordinary Skill in the Art*

Petitioner's declarant, Dr. Pokharna, opines:

[A] person of ordinary skill in the art as of May 1999 would have earned at least a graduate degree, such as an M.S., Ph.D., or equivalent thereof, in mechanical engineering or a closely-related field and possessed at least three years of specialized experience in designing and developing heat pipes or

⁶ The parties have not directed our attention to any objective evidence of non-obviousness.

other heat transfer devices for thermal management in electronics and computer systems.

Ex. 1002 ¶ 9; *see* Pet. 12. Patent Owner, at this time, does not address explicitly the level of skill in the art.

Petitioner’s proposed definition is not clearly inconsistent with the cited prior art, and we adopt it for the purposes of this Decision. *See also Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (the prior art itself may reflect an appropriate level of skill in the art).

C. Claim Construction

“A party may request [in the form of a motion] a district court-type claim construction approach to be applied if a party certifies that the involved patent will expire within 18 months from the entry of the Notice of Filing Date Accorded to Petition.” 37 C.F.R. § 42.100(b) (2018).⁷ In this proceeding, Patent Owner filed such a motion certifying that the ’680 patent will expire within 18 months from the entry of the Notice of Filing Date Accorded to Petition, and specifically no later than May 12, 2019, and requesting a district court-type claim construction. Paper 7. Petitioner did not oppose Patent Owner’s motion, and we granted the unopposed motion. Paper 8.

In applying a district court-type construction, we construe a “claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history

⁷ The Petition was filed before November 13, 2018, the effective date of a recent amendment to this rule. *See* Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board, 83 Fed. Reg. 51,340, 51,340 (Oct. 11, 2018).

pertaining to the patent.” Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board, 83 Fed. Reg. 51,340, 51,343 (Oct. 11, 2018) (citing *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–13 (Fed. Cir. 2005) (en banc)).

Lip

The claims of the ’680 patent recite structure in the form of a “lip” on each of the two plates. Specifically, the claims recite three presumptively different lips using different phrases: “a peripheral lip located at an edge of said boundary structure” (independent claim 1), “a circumferential edge lip bounding an inner surface” (independent claims 2, 3, and 4 (the latter claim not challenged by Petitioner)), and “an edge lip that bounds a top surface and a bottom surface” (independent claim 5, challenged in related cases but not in this case). Ex. 1001, 5:35–36, 5:55–56, 6:5–6, 6:24–25, 6:44–45; *see Karlin Tech., Inc. v. Surgical Dynamics, Inc.*, 177 F.3d 968, 971–72 (Fed. Cir. 1999) (Under the doctrine of claim differentiation, “different words or phrases used in separate claims are presumed to indicate that the claims have different meanings and scope.”). At least some claims further explicitly require that those lip structures be bonded together. For example, independent claims 2 and 3 require each of the two plates to have circumferential edge lips and also recites “said edge lips of said first and second plates being bonded together so as to define a vapor chamber.” *Id.* at 5:55–64, 6:5–13.

Petitioner argues that the meaning of “lip” is the “portion of the plate comprising a region bonded to another plate.” Pet. 27. In the context of applying claim 1 to the prior art, Petitioner further argues that “[t]he ‘peripheral lip’ in the ’680 patent, under its broadest reasonable

interpretation, is nothing more than a lip located at a periphery, edge, or circumference of the ‘boundary structure.’” *Id.* at 41. Similarly, in the context of claim 2, Petitioner argues that “a ‘circumferential edge lip’ is nothing more than a ‘lip’ located at a ‘circumferential edge’ of the ‘first plate’ by the term’s broadest reasonable interpretation.” *Id.* at 63.

Patent Owner does not discuss the meaning of any claim term in the Preliminary Response. Petitioner notes that, before the District Court, Patent Owner asserted that “lip” means the “[p]ortion of the plate defined by the bonded region of the plate’s inner or interior surface.” *Id.* at 27 (quoting Ex. 1019, 5).

In support of its proposed construction of “lip” as the region where one plate is bonded to another plate, Petitioner points to language in the Specification that “[c]ontact plate 18 and cover plate 20 are sealed together at their peripheral lips,” and that “the region of the peripheral edges is also a sealed structure since *bonding between lips 22 and 24 is inherent* because heat pipe 11 must be sealed at its edges to isolate the interior from the outside atmosphere.” *Id.* at 28 (quoting with emphasis added Ex. 1001, 3:34–37, 4:49–53). The cited passages, however, occur in the context of specific embodiments illustrated in Figures 1 and 2, respectively. We note that the lips in those figures are identified by the use of element numbers with associated lead lines, and are not referenced conceptually as simply the place where bonding has occurred.

The mention in the ’680 patent of an inherent bonding between identified plate lips in a specific embodiment cannot be extrapolated, as Petitioner implies, such that the claimed relationship is necessarily present in any sealed container. Even if it were true that all sealed containers must

have bonding to form the seal, it does not follow that all such containers necessarily have two spaced-apart plates with the claimed lips and with the plates being bonded together at the specifically recited location of those lips.

Petitioner's proposed construction—in terms of where the plates of the claimed invention eventually will be bonded—places too much emphasis on the completed assembly of the heat pipe rather than on the claims' recitation of lips on the individual plates. Under Petitioner's construction, a plate in the assembly will have a lip wherever two plates are bonded but the same plate, prior to assembly, will not have a lip as there is no region where the plate is bonded to another plate. Petitioner does not explain why that is an acceptable result of its proposed construction.

Additionally, Petitioner's proposed construction converts the term “lip” from a structural component to merely a label referring to the bonded area. As such, Petitioner's proposed construction effectively reads out or renders as surplusage the recitation of structure in the form of a “lip.” This becomes evident in Petitioner's application of the prior art to the claims. Petitioner asserts that Nakamura's airtight heat pipe must necessarily have a bonded area to form the airtight seal and therefore, under Petitioner's proposed construction, Nakamura's sealed heat pipe must have bonding at the claimed lips regardless as to the type of lip recited in the claim.⁸ *E.g.*, Pet. 41–42 (Petitioner arguing that Nakamura is a sealed structure and,

⁸ To the extent that Petitioner's proposed construction implies that there is no difference between the recited peripheral lip, circumferential edge lip, and edge lip, we note that, under the doctrine of claim differentiation, “different words or phrases used in separate claims are presumed to indicate that the claims have different meanings and scope.” *Karlin Tech., Inc. v. Surgical Dynamics, Inc.*, 177 F.3d 968, 971–72 (Fed. Cir. 1999).

therefore, the plates “must each have a ‘portion of the plate comprising a region *bonded* to another plate’ located at the periphery, edge, or circumference of the boundary structure.”). Such a proposed construction would absolve a challenger of the responsibility to explain how each of the two plates has the specifically recited type of lip and then how those lips are bonded together so as to define a vapor chamber.

We need not determine at this time the full scope of the term “lip.” We, for purposes of this decision and on the record before us,⁹ determine that Petitioner’s proposed construction is too broad because it reads out a structural limitation of the claim. *See Unique Concepts, Inc. v. Brown*, 939 F.2d 1558, 1562 (Fed. Cir. 1991) (“All the limitations of a claim must be considered meaningful.”). Below, we further discuss Petitioner’s construction of the different specifically recited lips and the “bonded together” recitations in the context of analyzing Petitioner’s application of the prior art to each respective claim.

D. The Alleged Obviousness of Claims 1–3 over Nakamura

Petitioner alleges that claims 1–3 of the ’680 patent would have been obvious over Nakamura. *See* Pet. 37–61 (addressing claim 1). Patent Owner argues that Nakamura is not prior art and, therefore, Petitioner’s challenges, both of which are based on Nakamura, fail. Prelim. Resp. 1. For the reasons given below, we determine that Petitioner has not demonstrated

⁹ Petitioner does not direct our attention to anything in the prosecution history (Ex. 1003) in support of its proposed construction.

a reasonable likelihood of prevailing on its assertion that the challenged claims would have been obvious over Nakamura.¹⁰

1. Overview of Nakamura (Ex. 1004)

According to Petitioner's translation, Nakamura discloses

a heat pipe that transfers heat by a sealed container made of thermally conductive metal plates and a refrigerant enclosed in the sealed container, wherein a portion of one or both of opposing upper and lower surfaces of the sealed container has a molded concavity and a hole for component installation is provided in a concavity joining surface where the concavity and a flat surface opposing the concavity or an opposing concavity are joined together.

Ex. 1004, 4.¹¹ Figures 3 and 4 are reproduced below:

Figure 3

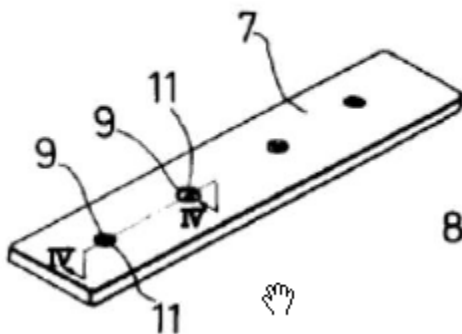
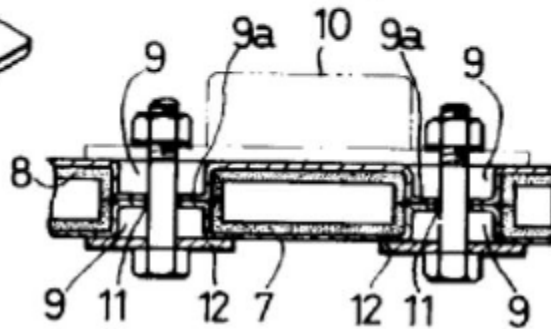


Figure 4



¹⁰ We need not and do not reach Patent Owner's printed publication argument because we determine that Petitioner, for other reasons, has failed to satisfy its initial burden under either ground.

¹¹ In citing to Nakamura in this and following sections, we follow Petitioner's convention of citing to the numbers in parentheses at the bottom center of the translation rather than those used in numbering the pages of the exhibit overall. We also omit the translator's marginalia, parentheticals, and italics.

Figures 3 and 4 illustrate examples of a heat pipe of Nakamura's invention, with Figure 3 being a perspective view and Figure 4 being a partial cross-sectional view of Figure 3 at cutting plane line IV–IV. *Id.* at 4, 7. “In Figures 3 and 4, 7 is a sealed container where thin plates of a material with favorable thermal conductivity such as copper or aluminum are formed into a sealed configuration by soldering, brazing, or the like and 8 is a wick that . . . is affixed to an inner-wall surface of the sealed container 7.” *Id.* at 5.

On both surfaces of the sealed container 7, a concavity 9 of a depth one-half of a thickness of the sealed container 7 is provided via pressing or the like in a state of the thin plate prior to being assembled into the sealed configuration. A concavity joining surface 9a of the concavity 9 is finished flat after pressing is completed and is applied in advance to preliminary soldering. The concavity joining surfaces 9a can then be readily and [reliably] adhered by being pressurized and heated before and after work of forming the sealed container 7 by soldering or the like. Then, after air inside the sealed container 7 is extracted, a refrigerant is enclosed in an interior hollow portion.

Id.

To install the heat pipe to component 10 to be cooled, holes 11 “can be drilled into the concavity joining surfaces 9a and installation can be performed via a bolt or the like via a washer 12.” *Id.* at 5–6. “By mounting the component to be cooled in this manner, the component to be cooled can be made to directly contact the heat panel [and, t]herefore, an efficiency of heat transfer is very favorable.” *Id.* at 6.

2. Analysis of the Alleged Obviousness of Claim 1 over Nakamura

The dispositive issue with regard to this ground pertains to the structural configuration where the bonding occurs.

Claim 1 recites a boundary structure that includes two spaced-apart plates with:

each of said plates including interior confronting surfaces and a peripheral lip located at an edge of said boundary structure which are bonded together so as to define an enclosed vapor chamber.

Ex. 1001, 5:33–38. Thus, the claim requires each of the two plates to have a peripheral lip, with that peripheral lip being located at an edge of the boundary structure. The Specification explains that, in the disclosed invention, the plates are bonded together at the peripheral lips. For example, the Specification, in describing the embodiment of Figure 1, states:

Heat pipe 10 is constructed by forming a boundary structure by sealing together two formed plates, contact plate 18 and cover plate 20. Contact plate 18 and cover plate 20 are sealed together at their peripheral lips 22 and 24 by conventional means, such as soldering or brazing, to form heat pipe 10.

Ex. 1001, 3:32–37. As another example, the Specification describes the “alternate embodiment” of Figure 2¹² as having “through holes 48 located within peripheral lips 22 and 24,” and explaining that the region of the peripheral edges is sealed due to “bonding between lips 22 and 24.” *Id.* at 4:42–53.

Similarly, all of the other independent claims of the ’680 patent, claims 2–5, explicitly require the lips to be bonded together. *Id.* at 5:62–64, 6:11–13, 33–34, 47–49 (claims 2–5 all reciting: “said edge lips of said first and second plates being bonded together so as to define a vapor chamber”). Although the wording of claim 1 is slightly different, the parties have not

¹² During prosecution and in response to a restriction requirement, “Applicants elect[ed] the invention of the alleged species shown in Figure 2.” Ex. 1003, 104 (underlining omitted).

directed our attention to any evidence indicating a deviation from this recurring theme of lip bonding or otherwise supporting a reading of claim 1, by a person of ordinary skill in the art, as broadly encompassing subject matter not having bonding at the lips.¹³

We construe claim 1 consistent with this disclosure and, therefore, with the understanding that the phrase “which are bonded together so as to define an enclosed vapor chamber” modifies the immediately-preceding element—the two peripheral lips (one on each plate). Accordingly, claim 1 calls for two lips—one on the first plate and one on the second plate—and for those two lips to be bonded together.

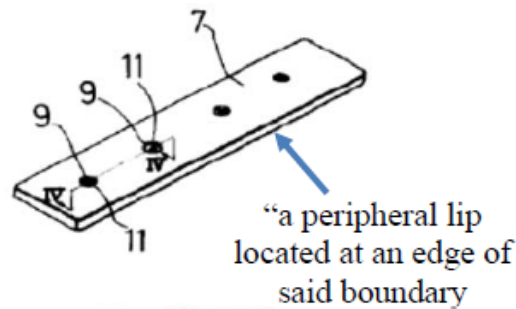
Additionally, we decline to adopt Petitioner’s proposed construction of “peripheral lip” as “nothing more than a lip located at a periphery, edge, or circumference of the ‘boundary structure.’” Pet. 41. Petitioner’s use of the disjunctive conjunction “or” removes the “at an edge” requirement clearly set forth in the claim language “a peripheral lip located at an edge of said boundary structure.” Ex. 1001, 5:35–36. Under Petitioner’s proposed construction, a peripheral lip could be located at a periphery or, alternatively, at a circumference, but not at an edge. We decline Petitioner’s implicit invitation to read out words from the claim.

We now turn to Petitioner’s articulation as to how Nakamura allegedly renders obvious the claimed subject matter having two plates bonded together at peripheral lips.

¹³ Both parties have proposed a construction for “lip,” either before us or before the District Court, that indicates their agreement that bonding must be at the portion of each plate that is the lip. *See* Pet. 27; Ex. 1019, 5.

Petitioner parses the claim language to such a degree that it initially separates the analysis of the two-plate aspect and peripheral lips. *See* Pet. 40–42. Petitioner first asserts that Nakamura’s top and bottom thin plates correspond to the claimed “a first plate and a second plate arranged in spaced apart relation.” *Id.* at 38–41. Petitioner then addresses, in a vacuum and apart from its context, the phrase: “a peripheral lip located at an edge of said boundary structure,” asserting that such a lip would have been obvious. *Id.* at 41. Petitioner uses an annotated version of Nakamura’s Figure 3, shown below, to depict its contentions.

Figure 3



The above version of Nakamura’s Figure 3 shows a perspective view of a heat pipe with Petitioner’s annotations in the form of a labeled arrow pointing to the feature identified as the claimed peripheral lip of the first plate. Ex. 1004, 7; Pet. 41. We understand Petitioner to identify, as a peripheral lip, that which appears to be a vertical surface spanning the distance between Nakamura’s upper and lower metal plates. Pet. 41 (referring, in text next to the above-depicted figure, to “a lip located at a periphery, edge, or circumference of the ‘boundary structure’” and annotated Figure 4 identifying two spaced apart plates). Thus, at this point in its analysis, Petitioner has identified only one alleged peripheral lip.

Petitioner then brings in the concept of two plates, quoting from the '680 patent and asserting that, because some kind of bonding is inherent in all sealed heat pipes, each plate of Nakamura “must” have a portion bonded to another plate and therefore must have a peripheral lip under Petitioner’s proposed construction of “lip” as a region of a plate bonded to another plate. *Id.* at 41–42. After this apparent assertion that the pertinent limitation is inherently disclosed in Nakamura, Petitioner further asserts that, because of this, a peripheral lip located at the edge of a boundary structure would have been obvious. *Id.* at 42. Petitioner then concludes its analysis with the statement: “For the same reasons stated above, Nakamura also renders it obvious that ‘each of said plates including interior confronting surfaces and a peripheral lip located at an edge of said boundary structure . . . are bonded together.’” *Id.* at 42 (quoting claim 1 (alterations by Petitioner) and citing Ex. 1002 (Pokharna Decl.) ¶ 63). It is not clear as to what Petitioner refers by the phrase “the same reasons stated above.” And we observe that the cited paragraph of the Pokharna Declaration appears to be the same or substantively the same as the arguments in the Petition without further elaboration by Dr. Pokharna. *Compare* Pet. 41–42 *with* Ex. 1002 ¶ 63.

Notwithstanding the multiple uses of the word “obvious,” we understand Petitioner to contend that the recited feature is inherently disclosed in Nakamura and that this inherency proposition flows, in part, from Petitioner’s proposed construction of “lip.” As discussed above in the claim construction section, we do not adopt Petitioner’s proposed construction involving inherency of the specifically recited lips in a sealed vessel.

Petitioner does not direct our attention to any description in Nakamura of the relationship between the spaced apart upper and lower plates other than by providing the annotated Figure 3 discussed above. *See* Pet. 41–42. Figure 3 does not help Petitioner’s case as that figure depicts a six-sided heat pipe having what could be a separate vertical wall between the spaced apart top plates, which would seemingly thereby preclude those two plates from being bonded directly to each other. *Cf.* Ex. 1005, 3, Fig. 8 (Takahashi disclosing a heat pipe utilizing end caps 18 and 19 to seal the gap between two plate members 11 and 12 rather than bonding together the two plates at those ends). Thus, any inherency or obviousness-by-inherency argument is not persuasive.

If our understanding is incorrect and Petitioner’s theory is not one of inherency, then the assertions of obviousness merely are conclusory statements. We are unable to recognize any proffered reasoning underlying the assertions of obviousness. “[Challenges] on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006).

As yet another possible alternative, Petitioner may be basing its case on improper hindsight by relying on and quoting the Specification of the ’680 patent in its obviousness analysis. *See* Pet. 41. That, too, is unpersuasive.

Regardless as to Petitioner’s theory of the case, we determine that Petitioner has failed to explain sufficiently why the claimed heat pipe having a configuration of two plates having bonded together peripheral lips would have been obvious. Accordingly, Petitioner has not demonstrated a

likelihood of prevailing in its obviousness challenge to claim 1 based on Nakamura alone.

3. Analysis of the Alleged Obviousness of Claims 2 and 3 over Nakamura

Independent claim 2 recites features somewhat similar to those of claim 1 discussed above except that claim 2 has a circumferential edge lip rather than a peripheral lip. Specifically, claim 2 recites:

a first plate having a circumferential edge lip bounding an inner surface . . .; a second plate arranged in spaced apart confronting relation to said first plate and including a circumferential edge lip bounding an inner surface . . ., said edge lips of said first and second plates being bonded together so as to define a vapor chamber.

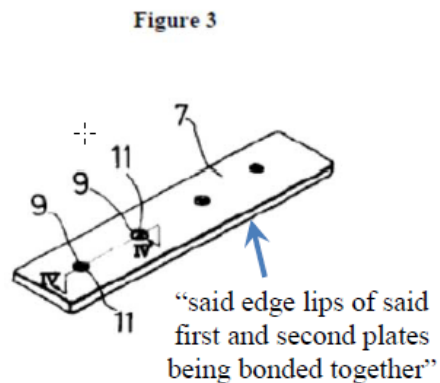
Ex. 1001, 5:55–64. Independent claim 3 similarly recites two plates with “[circumferential] edge lips of said first and second plates being bonded together.” *Id.* at 6:5–12.

For claim 2, Petitioner’s analysis regarding a plate having the recited lip is substantively similar to that for claim 1. *See* Pet. 63, 72. Petitioner again relies on its proposed construction of a “lip” (being the region of plate bonded to another plate) in conjunction with its apparent assertion that all sealed vessels inherently have whatever lip configuration is recited in any claim. *Id.* at 63 (“That is, the first plate of the sealed container in Nakamura *must* provide the boundary of an inner surface by the ‘portion of the plate comprising a region bonded to another plate’ located at the circumferential edge of the ‘sealed container of an air-tight structure.’” (emphasis added)), 72 (the “second plate” analysis incorporating by reference the arguments for the first plate). Thus, Petitioner impliedly argues, without any persuasive explanation, that there is no substantive difference between “a

peripheral lip located an edge of said boundary structure” of claim 1 and “a circumferential edge lip bounding an inner surface” of claim 2.

Petitioner does not include an annotated figure depicting its contentions regarding the lip of the first plate, but does for the second plate. *Id.* at 63, 72. That annotated version of Nakamura Figure 3 appears to identify, as the second plate’s circumferential edge lip, the same vertical wall of Nakamura’s heat pipe that Petitioner identified previously as a peripheral edge lip of claim 1. *See id.* at 72.

For the limitation of claim 2 requiring that “said edge lips of said first and second plates being bonded together so as to define a vapor chamber,” Petitioner incorporates by reference its earlier arguments made in the context of claim 1. *Id.* at 76. Petitioner additionally includes the annotated version of Figure 3 reproduced below.



The above version of Nakamura’s Figure 3 shows a perspective view of a heat pipe with Petitioner’s annotations in the form of an arrow apparently pointing to the vertical wall and labeled as “said edge lips of said first and second plates being bonded together.” Ex. 1004, 7; Pet. 76.

Thus, Petitioner appears to point to only one alleged circumferential lip whereas claim 2 calls for two plates each having a circumferential lip. Accordingly, Petitioner has not explained adequately how Nakamura either

discloses or renders obvious a heat pipe having two circumferential edge lips on spaced apart plates bonded together. Further, we do not find persuasive the incorporated-by-reference reasons in the context of claim 1, and we also do not find them persuasive in the context of claim 2.

For independent claim 3, Petitioner merely incorporates these unpersuasive arguments made in the context of claim 2. Pet. 81, 83.

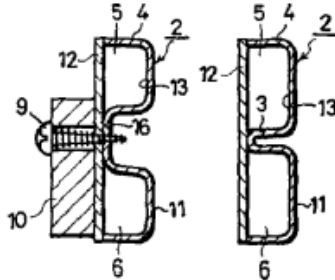
Petitioner has not demonstrated a likelihood of prevailing in its obviousness challenges to claims 2 and 3 based on Nakamura alone.

E. The Alleged Obviousness of Claims 1–3 over Nakamura and Takahashi

Petitioner’s second ground is directed primarily to the bonded plate configuration discussed above. Petitioner argues that “[i]t would also have been obvious for a person of ordinary skill in the art to combine Nakamura with Takahashi to create ‘each of said plates including interior confronting surfaces and a peripheral lip located at an edge of said boundary structure which are bonded together.’” Pet. 42 (addressing claim 1, citing Ex. 1002 ¶ 64). Petitioner’s proposed combination involves the application of Takahashi’s flanges to Nakamura’s sealed container, and Petitioner contends that a person of ordinary skill in the art would have expected that modification to yield a “bonded and sealed edge, periphery, or circumference of the sealed container in Nakamura.” *Id.* at 43–44. As mentioned, Patent Owner argues that Nakamura is not prior art and, therefore, Petitioner’s challenges, both of which are based on Nakamura, fail. Prelim. Resp. 1. For the reasons given below, we determine that Petitioner has not demonstrated a reasonable likelihood of prevailing on its assertion that the challenged claims would have been obvious over Nakamura in combination with Takahashi.

1. Overview of Takahashi (Ex. 1005)

Takahashi discloses a heat pipe “fixed with screws for mounting heating elements, such as transistors or the like.” Ex. 1005, 3:14–15, 26–29. By way of illustration, Takahashi Figures 3 and 4 are reproduced below.



Figures 3 and 4 show cross-sectional views of one embodiment of the disclosed heat pipe “wherein the inside of a square tube container (2) with both ends sealed [and] made of aluminum . . . is divided into a gas-phase hydraulic fluid passage (5) on the upper side and a liquid-phase hydraulic fluid passage (6) on the lower side by an intermediate partition wall (3). *Id.* at 4:48–57; *see id.* at 8:9–11.

[T]he container (2) is provided with a first plate member (11) that has a concave part for hydraulic fluid passage (13) over almost the total length on one side, a peripheral wall (4) surrounding it, and an intermediate partition wall (3); and a second plate member (12) in a strip shape for covering the opening of the concave part for hydraulic fluid passage (13).

Id. at 4:65–5:4.

The container (2) is formed by mutually superimposing the first and second plate members (11) and (12) that constitute a container (2) and bonding by a vacuum brazing method the tip of the peripheral wall (4) of the first plate member (11), the peripheral edge part of the second plate member (12) in a strip shape, the tip of the intermediate partition wall (3) of the first plate member (11), and the facing surface of the junction for

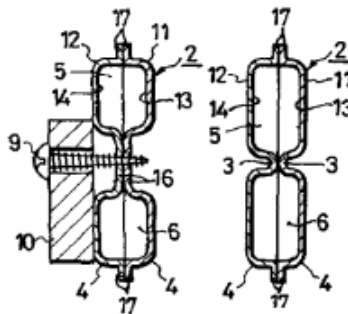
mounting heating elements (16) and the second plate member (12).

Id. at 5:12–20.

The screws (9) for mounting heating elements (10), such as transistors, or the like, are directly fastened into the container (2) in the junction portion for mounting heating elements (16) in an intermediate partition wall (3), allowing the heating elements (10) to be in direct contact with the wall surfaces of the container (2). Therefore, thermal resistance of a heat pipe (1) is small, and even when the pipe is installed horizontally, for example, it can be operated normally, and has excellent heat radiation performance. The plate fins (15) [shown in Figure 2] are mounted in parallel at the end of the evaporator side of the container (2).

Id. at 5:28–38.

Takahashi Figures 5 and 6, reproduced below.



Figures 5 and 6 show cross-sectional views of a second embodiment with plate members (11) and (12) “constitut[ing] a square tube container (2) with both ends sealed [and] are both built by press-molded aluminum plates.” *Id.* at 6:4–9, *see id.* at 8:12–16.

The tips of the peripheral walls (4) and (4) of both plate members (11) and (12) are provided with flanges (17) and (17), respectively, where these plate members (11) and (12) are superimposed with the concave parts (13) and (14) facing inwards, for example, the flanges (17) and (17) at the tips of the peripheral walls (4) and (4) of both plate members (11) and (12),

and the tips of intermediate partition walls (3) and (3) are joined to each other by a vacuum brazing method to form a container (2).

Id. at 6:14–22.

2. *Analysis of the Alleged Obviousness of Claims 1–3 over Nakamura and Takahashi*

Again, independent claim 1 recites “each of said [first and second] plates including . . . a peripheral lip located at an edge of said boundary structure which are bonded together so as to define an enclosed vapor chamber.” Ex. 1001, 5:33–37. Somewhat similarly, independent claims 2 and 3 both recite “[two plates, each] having a circumferential edge lip bounding an inner surface . . . , said edge lips of said first and second plates being bonded together so as to define a vapor chamber.” *Id.* at 5:55–64, 6:5–13.

Petitioner’s ground is based on the proposed combination of Takahashi’s flanges with Nakamura’s sealed container. Pet. 43–44 (citing Ex. 1002 (Pokharna Decl.) ¶ 84. We understand Petitioner to assert the same purported motivations to combine for all the claims of the ’680 patent regardless as to the recited location of the lip. *See id.* at 42 (“A POSITA would have been motivated to combine Nakamura and Takahashi in connection with the related features of ‘lips’ located at the periphery, circumference, or edge of the plates of the heat pipe’s sealed container.”); *see also id.* at 76 (Petitioner asserting that, for claim 2, the combination “discloses this [lips bonding] limitation for the same reasons as stated above in Section IX.B.3.” (bolding omitted), citing Ex. 1002 ¶ 90), 83 (for claim 3, “*See* Section IX.C.7 above.” (bolding omitted); citing Ex. 1002 ¶ 101).

Petitioner asserts that “both Nakamura and Takahashi disclose heat pipes that include through holes located at the interior regions of the heat pipes for securing them onto the heat generating elements.” Pet. 42–43. Based on this, Petitioner argues, “[t]hus, in general, a skilled artisan would have been motivated to combine the features in the two references already because the devices in Nakamura and Takahashi are similar and analogous.” *Id.* at 43 (citing Ex. 1002 ¶ 83). Along the same lines, Petitioner asserts that the references disclose heat pipes created using “related manufacturing processes” “that would have motivated a skilled artisan to combine them.” *Id.* at 43 (citing, *inter alia*, Ex. 1002 ¶ 84¹⁴).

Simply noting that Nakamura and Takahashi disclose similar devices made using related processes, however, says nothing about *why* one of ordinary skill in the art would combine them in a manner that renders the claimed subject matter obvious. *See Kinetic Concepts, Inc. v. Smith & Nephew, Inc.*, 688 F.3d 1342, 1368 (Fed. Cir. 2012) (quoting *Innogenetics, N.V. v. Abbott Labs.*, 512 F.3d 1363, 1374 n.3 (Fed. Cir. 2008) (“We must still be careful not to allow hindsight reconstruction of references to reach the claimed invention without any explanation as to how or why the references would be combined to produce the claimed invention.”)). Petitioner’s argument that the references are “similar and analogous” is not adequate reasoning to support a conclusion of obviousness.

¹⁴ The cited paragraph 84 of the Pokharna Declaration does not appear to pertain to the proposition. However, a statement that is very similar to Petitioner’s argument is found at paragraph 66 of Dr. Pokharna’s testimony (Ex. 1002 ¶ 66).

Petitioner offers further reasoning, arguing that one of ordinary skill in the art would see a benefit in the proposed combination. Specifically, Petitioner argues:

[A] skilled artisan would have been motivated to combine Takahashi's "flanges (17) and (17)" with Nakamura's sealed container because it would have made sealing the edge, periphery, or circumference of the "sealed container" in Nakamura easier by simply "pressing," "brazing," and or "soldering" the two "flanges (17) and (17)" together. That is, because these "flanges (17) and (17)" are protruding outwardly and exposed on the outside, it is easier to press and clamp together while heating them to make them bond and seal together during the manufacturing processes. Because these were well-known manufacturing processes, a skilled artisan would have reasonably expected the combination of Nakamura and Takahashi to yield predictably successful results with easier and better bonded and sealed edge, periphery, or circumference of the sealed container in Nakamura. The combination would have been straight forward for a skilled artisan without having to change the functionalities of either Nakamura or Takahashi. Thus, a POSITA would have been motivated to combine these related features in Nakamura and Takahashi when reading both references together.

Pet. 43–44 (citing Ex. 1002 (Pokharna Decl.) ¶ 84).

As is self-evident, there are several specific, technology-related factual assertions set forth in and underlying Petitioner's arguments. The cited paragraph 84 of the Pokharna Declaration (Ex. 1002), however, does not support the above-quoted propositions contained in the Petition. That paragraph pertains to a "hollow column" limitation. Ex. 1002 ¶ 84. Equally unhelpful are the paragraphs of Dr. Pokharna's Declaration cited for support regarding a reason to combine in the context of claims 2 and 3. *See, e.g.*, Pet. 64–65 (citing Ex. 1002 ¶ 81 (for claim 2: "As discussed above, a person skilled in the art would have been motivated to combine Nakamura and

Takahashi in connection with the ‘lip’ limitation.”), 76 (citing Ex. 1002 ¶ 90 (“A skilled artisan would have found it obvious that Nakamura alone or Nakamura in view of Takahashi discloses this limitation for the same reasons as stated above in Section IX.B.3.” (bolding omitted)), 83 (citing Ex. 1002 ¶ 101 (for claim 3: “*See* Section IX.C.7 above.” (bolding omitted))). The paragraphs relied upon for claims 2 and 3 are, at best, a series of cross-references and incorporations by reference of the unpersuasive arguments addressed above.

As such, Petitioner has failed to direct our attention to evidence to support what remains as mere attorney-argument regarding why a person of ordinary skill in the art would have combined the references. In light of this, we determine that Petitioner has not demonstrated a likelihood of prevailing in its obviousness challenge to claims 1–3 based on the combination of Nakamura and Takahashi.

III. CONCLUSION

Petitioner has not demonstrated that there is a reasonable likelihood of establishing the unpatentability of any of claims 1–3 of the ’680 patent.

IV. ORDER

For the foregoing reasons, it is

ORDERED that the Petition is *denied* as to the challenged claims, and no trial is instituted.

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Patent 7,100,680 B2

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