

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ASETEK DANMARK A/S,
Petitioner,

v.

COOLIT SYSTEMS, INC.,
Patent Owner.

IPR2019-00705
Patent 9,496,200 B2

Before HUBERT C. LORIN, FRANCES L. IPPOLITO, and
SCOTT C. MOORE, *Administrative Patent Judges*.

MOORE, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining No Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

Asetek Danmark A/S, Asetek USA, Inc., Asetek A/S, and Asetek Holdings, Inc., (collectively “Petitioner”) filed a Petition (Paper 2, “Pet.”) requesting *inter partes* review of claims 1–21 of U.S. Patent No. 9,496,200 B2 (Ex. 1001, “’200 patent”). Patent Owner, CoolIT Systems, Inc., filed a Preliminary Response. Paper 6. We authorized (Paper 11), and Petitioner filed, a Reply to Patent Owner’s Preliminary Response. Paper 12. Patent Owner also filed a Sur-Reply. Paper 15. We subsequently instituted an *inter partes* review as to all asserted grounds and all challenged claims. Paper 19 (“Decision on Institution” or “DI”).

After institution, Patent Owner filed a Response to the Petition (Paper 24, “Response” or “PO Resp.”), Petitioner filed a Reply (Paper 31, “Reply”), and Patent Owner filed a Sur-Reply (Paper 38, “Sur-Reply”). A video oral hearing was held on May 22, 2020, and a transcript of the hearing is in the record. Paper 41 (“Hearing Tr.”).

We have jurisdiction under 35 U.S.C. § 6. This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a). For the reasons that follow, we determine that Petitioner has not shown by a preponderance of the evidence that any challenged claim is unpatentable.

A. *Related Proceedings*

Petitioner indicates that “Petitioner is not aware of any related matters.” Pet. 65. Patent Owner identifies as a related matter, pending U.S. Patent Application No. 15/351,362, which claims priority to the application that matured into the ’200 patent. Paper 5.

B. *The '200 Patent*

The '200 patent is directed to modular heat-transfer systems, such as cooling systems configured to cool one or more arrays of independently operable servers. Ex. 1001, 2:55–60. Embodiments of the invention allow for adequately cooling of a plurality of rack-mounted servers in a data center without requiring the data center to provide chilled water at a temperature below an ambient temperature, eliminating the need for costly and power consuming chillers. *Id.* at 3:4–8.

In general, the '200 patent describes arrays of heat-transfer modules configured to be combined with a manifold module and/or an environmental coupler (e.g., a liquid-liquid heat exchange module) to facilitate heat transfer between an environment and one or more operable elements (e.g., server components). *Id.* at 2:65 – 3:3. Each heat-transfer element in the array corresponds to an operable element, and is configured to transfer heat between a working fluid and the operable element. *Id.* at 3:13–21. A manifold module can have a distribution manifold and a collection manifold. *Id.* at 3:21–22. A decoupleable inlet coupler can correspond to each respective inlet of each respective heat-transfer element in the array. *Id.* at 3:22–24. Each respective inlet coupler can be configured to fluidically couple the distribution manifold to the inlet of the respective heat-transfer element. *Id.* at 3:24–27. A decoupleable outlet coupler can correspond to each respective outlet of each respective heat-transfer element in the array. *Id.* at 3:27–29. Each respective outlet coupler can be configured to fluidically couple the outlet of the respective heat-transfer element to the collection manifold. *Id.* at 3:29–31. An environmental coupler can be configured to receive the working fluid from the collection manifold, to transfer heat to an

environmental fluid from the working fluid or to transfer heat from an environmental fluid to the working fluid, and to discharge the working fluid to the distribution manifold. *Id.* at 3:32–37.

Figure 2 of the '200 patent, reproduced below, is an isometric view of a portion of an embodiment of a modular heat-transfer system.

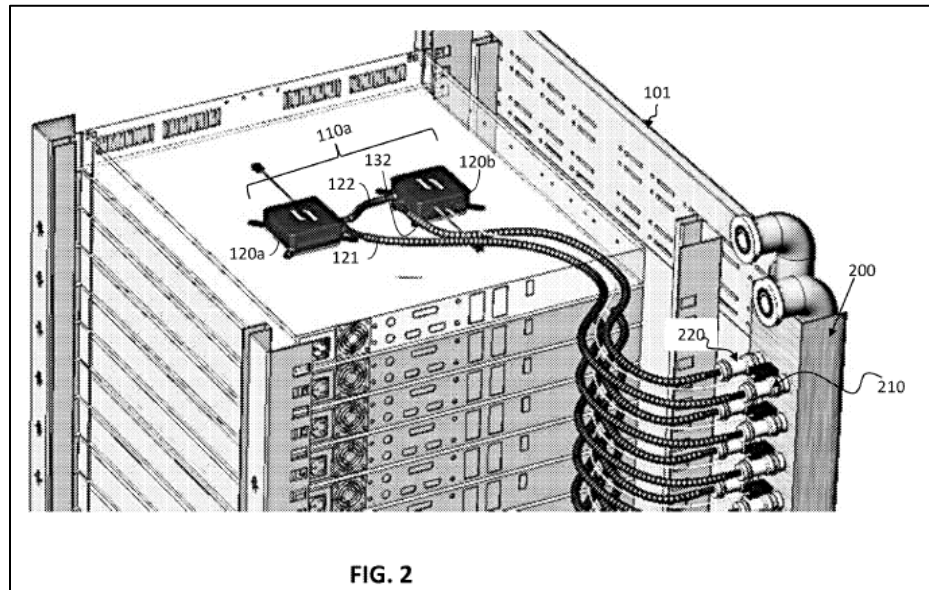


Figure 2 depicts a chassis or rack 101 that contains a plurality of operable servers, a manifold 200, and heat-transfer element 110a having a “modular configuration” including a pair of component heat-transfer modules 120a, 120b configured to cool a corresponding pair of microprocessors or other server components (not shown). *Id.* at 7:58–8:20. An inlet to the heat-transfer element 110a is fluidically coupled to a distribution manifold 210 and an outlet of the heat-transfer element 110a is fluidically coupled to a collection manifold 220. *Id.* at 7:64–68.

C. *Challenged Claims and Asserted Grounds*

Petitioner asserts that claims 1–21 of the '200 patent are unpatentable pursuant to 35 U.S.C. § 103 based on two different grounds.

Challenged claims 1 and 17 are independent. Claim 1, reproduced below, is illustrative of the claimed subject matter.

1. A modular heat-transfer system comprising:
 - an array having a plurality of heat-transfer elements, each defining an inlet and an outlet and having at least one component heat-exchange module in thermal contact with a corresponding operable element to provide conduction heat-transfer between the at least one component heat-exchange module and the corresponding operable element, wherein the at least one component heat-exchange module is configured to transfer heat to a working fluid from the operable element, or to transfer heat from the working fluid to the operable element, wherein the at least one component heat exchange module comprises a pump positioned in the at least one component heat-exchange module and being configured to urge the working fluid through the respective heat-transfer element;
 - a manifold module having a distribution manifold and a collection manifold,
 - a decoupleable inlet coupler corresponding to each respective inlet of each respective heat-transfer element in the array, wherein the respective inlet coupler is configured to fluidically couple the distribution manifold to the inlet of the respective heat-transfer element;
 - a decoupleable outlet coupler corresponding to each respective outlet of each respective heat-transfer element in the array, wherein the respective outlet coupler is configured to fluidically couple the outlet of the respective heat-transfer element to the collection manifold; and
 - an environmental coupler configured to receive the working fluid from the collection manifold, to transfer heat to an environmental fluid from the working fluid or to transfer heat from an environmental fluid to the working fluid, and to discharge the working fluid to the distribution manifold, wherein no pumps other than the pumps in the component heat-exchange modules circulate the working

fluid among the plurality of heat transfer elements, the manifold module, and the environmental coupler.

Ex. 1001, 25:37–26:8.

Petitioner asserts the following grounds of unpatentability, each based on 35 U.S.C. § 103(a):

Ground	Reference(s)	Statutory Basis ¹	Challenged Claim(s)
1	Ota ² and Cheon ³	§ 103	1–16
2	Ota, Cheon, and Eriksen ⁴	§ 103	17–21

Pet. 9, 52.

Petitioner also relies on the Declaration of Dr. Donald E. Tilton (Ex. 1003, “Tilton Declaration”) and the Declaration of Steven B. Branton (Ex. 1007, “Branton Declaration”). Pet. 9–65. Patent Owner relies on the Declaration of Dr. Himanshu Pokharna (Ex. 2007, “Pokharna Declaration”). PO Resp. 4.

¹ The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112-29, 125 Stat. 284, 287–88 (2011), amended 35 U.S.C. § 103. Because the effective filing date of the ’200 patent is before March 16, 2013 (the effective date of the relevant amendment), the pre-AIA version of § 103 applies. See Ex. 1001, codes (22), (60), (63).

² U.S. Patent No. 7,318,322 B2, issued Jan. 15, 2008 (Ex. 1004).

³ U.S. Patent Publication No. 2004/0008483 A1, published Jan. 15, 2004 (Ex. 1006).

⁴ U.S. Patent Publication No. US 2009/0218072 A1, published Sept. 3, 2009 (Ex. 1005).

II. ANALYSIS

A. *Obviousness under 35 U.S.C. § 103*

1. *Principles of Law*

An invention is not patentable under 35 U.S.C. § 103 “if the differences between the subject matter sought to be patented 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.” 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, including commercial success, long-felt but unsolved needs, and failure of others. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

When evaluating a combination of teachings, we also “determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007) (citing *In re Kahn*, 441, F.3d 977, 988 (Fed. Cir. 2006)).

2. *Level of Skill in the Art*

Petitioner asserts that a person of ordinary skill in the art to which the ’200 patent pertains would have had “(i) completed college level course work in thermodynamics, fluid mechanics, and heat transfer, and (ii) attained two or more years of experience in designing liquid cooling systems for computers, servers, or other electronic devices.” Pet. 6–7 (citing Ex. 1003, ¶ 14). Patent Owner asserts that such a person “would have at least two

years of graduate-level study in fluid mechanics and heat transfer, or a related field (such as mechanical or aerospace engineering), or a bachelor's degree in mechanical engineering (or equivalent degree) and three or more years of experience working with or researching liquid-cooling techniques for electronics.” PO Resp. 5.

We adopt and apply Petitioner's proposed formulation regarding the level of ordinary skill in the art, which we find is consistent with the level of skill reflected by the cited prior art references. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001). We note, however, that our ultimate determinations would have been the same had we applied Patent Owner's proposed formulation. Indeed, both parties agree that none of the issues before the Board turns on which formulation we adopt. *See* Hearing Tr. 13:5–14, 18:4–11.

3. *Claim Construction*

For *inter partes* reviews filed on or after November 13, 2018, we apply the same claim construction standard used by Article III federal courts set forth in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc), and its progeny. *See* Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board, 83 Fed. Reg. 51340, 51,340, 51,358 (Oct. 11, 2018) (amending 37 C.F.R. § 42.100(b) effective November 13, 2018) (now codified at 37 C.F.R. § 42.100(b) (2019)). Because the instant Petition was filed on March 4, 2019, the *Phillips* standard applies here. Accordingly, we construe each challenged claim of the '200 patent to generally have “the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.” 37 C.F.R. §

42.100(b). Any special definition for a claim term must be set forth in the specification with reasonable clarity, deliberateness, and precision. *See 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).

Only terms that are in controversy need to be construed, and then only to the extent necessary to resolve the controversy. *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999); *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (applying *Vivid Techs.* in the context of an *inter partes* review).

Petitioner asks us to construe the claim terms “decouplable inlet coupler” and “decouplable outlet coupler.” Pet. 7–9. Patent Owner requests that we construe the claim term “a pump positioned in the . . . component heat-exchange module.” PO Resp. 18–24.

We determine that it is not necessary to explicitly construe any claim term in order to resolve the issues presently before us. Accordingly, we decline to provide explicit constructions of any claim terms. *See Vivid Techs.*, 200 F.3d at 803.

4. *Secondary Considerations*

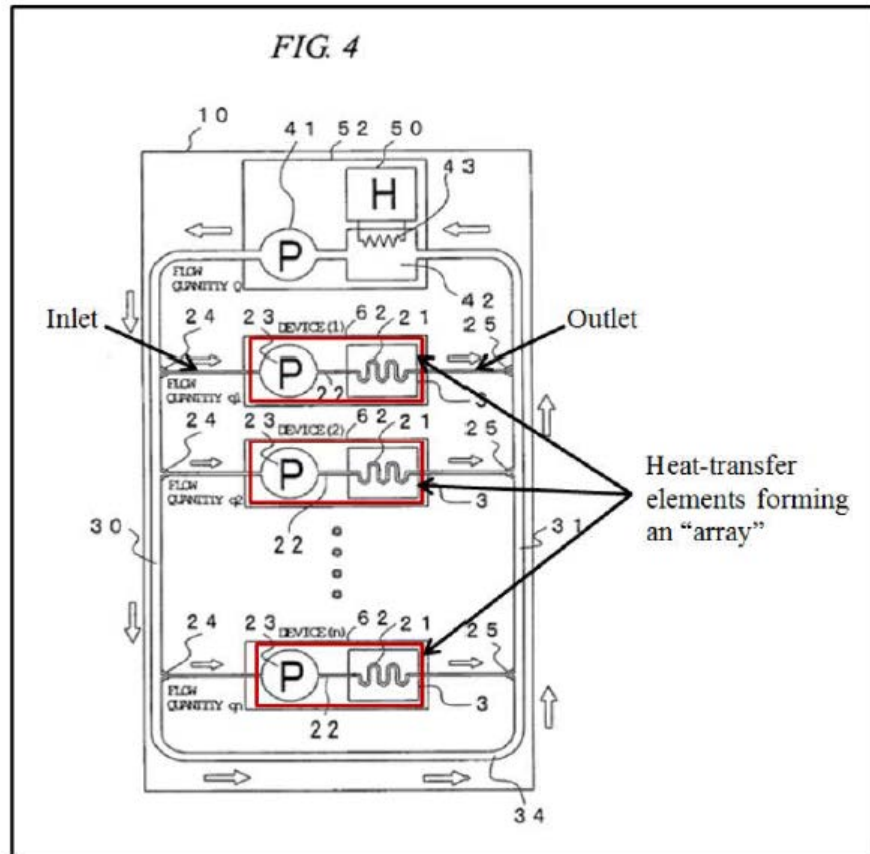
Patent Owner’s Response does not direct us to secondary considerations that allegedly bear on the patentability of the challenged claims. Accordingly, any such arguments are waived. *See Scheduling Order*, Paper 20, 7.

5. *Scope and Content of Prior Art; Differences between Claimed Subject Matter and Prior Art*

a. *Ground 1, Claim 1*

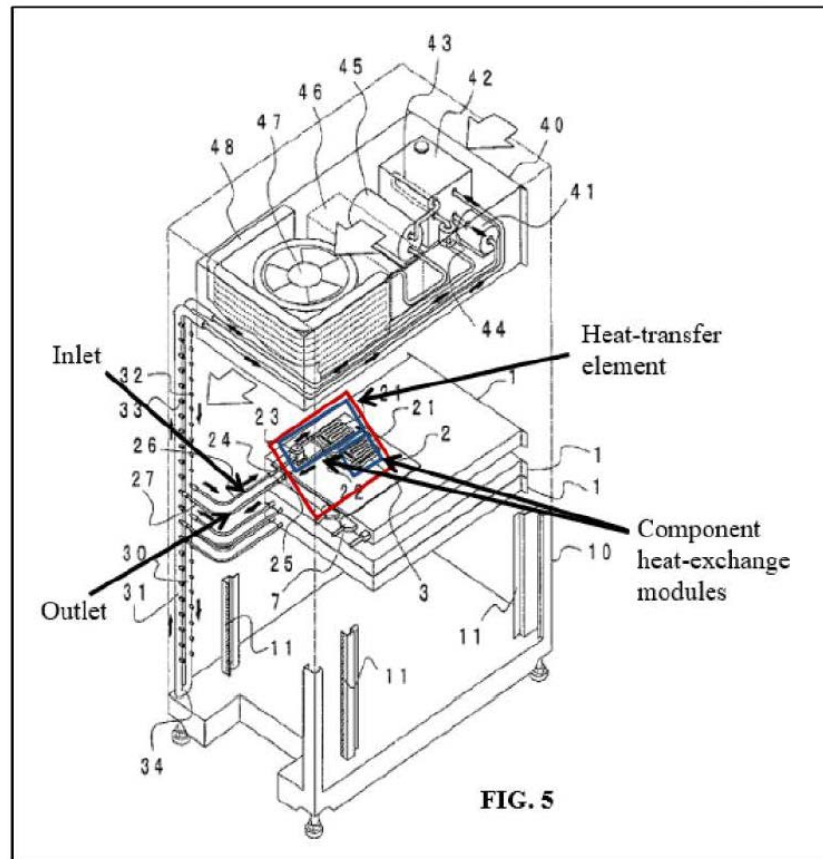
Ota discloses “a cooling method for a rack-mount server system” and, more particularly, a “liquid cooling system in which a coolant is circulated.” Ex. 1004, 1:6–10. Ota discloses that coolant “is supplied to each of the devices of the server modules through the coolant circulation path,” and the coolant is then drained from each of the devices and transferred to “a cooling unit mounted in the rack cabinet.” *Id.* at 2:55–61. Ota discloses that “the pipe serving as the coolant circulation path to circulate the coolant through the rack cabinet is arranged vertically along the post of the rack cabinet” and “the pump functioning as coolant circulation means and the cooling section for cooling the coolant by using an heat exchanger are provided as the cooling unit on the upper side or the lower side of the rack cabinet.” *Id.* at 2:65–3:1.

Below is a marked-up version of Ota's Figure 4 that is reproduced from the Petition, which illustrates some of Petitioner's contentions concerning Ota. See Pet. 24.



In this marked-up version of Figure 4, which depicts a schematic block diagram of an embodiment of Ota' system that includes a bypass route (Ex. 1004, 4:24–26), Petitioner identifies with red highlighting, black arrows, and labels, the structures that allegedly correspond to the “array having a plurality of heat-transfer elements” limitation of claim 1 (i.e., Ota's server modules 62). See Pet. 23–24. Petitioner also identifies with black arrows and labels the structures that allegedly correspond to the “inlet” and “outlet” limitations of claim 1. *Id.*

Below is a marked-up version of Ota's Figure 5 that is reproduced from the Petition, which illustrates some of Petitioner's other contentions concerning Ota. *See* Pet. 25.



In this marked-up version of Figure 5, which depicts an embodiment of Ota's system in which server modules are mounted in a rack cabinet (Ex. 1004, 4:27–29), Petitioner identifies with blue boxes the components that allegedly correspond to the “component heat-exchange module[s]” of claim 1. Pet. 25–26. In particular, Petitioner alleges that “[i]nternal pump 23 and a heat receiver 21 together form a ‘component heat-exchange module’” of the type recited in claim 1. *Id.* at 26 (citing Ex. 1003 ¶ 37). Petitioner further contends that “[i]nternal pump 23” is “a pump positioned in the at least one component heat-exchange module,” as recited in claim 1. *Id.*

Petitioner further asserts that Ota's main circulation pipe 34, which includes upstream pipe 31 and downstream pipe 31, corresponds to the "manifold module" of claim 1, and that Ota's supply tubes 26 and drain tubes 27 correspond, respectively, to the recited "decouplable inlet coupler" and "decouplable outlet coupler." Pet. 27–29. Petitioner contends that Ota's rack-level cooling unit 52 includes tank 42, an "environmental coupler" of the type recited in claim 1. Pet. 29–31.

Claim 1 additionally requires a system wherein "no pumps other than the pumps in the component heat-exchange modules circulate the working fluid among the plurality of heat-transfer elements, the manifold module, and the environmental coupler" (hereinafter, the "no other pumps limitation"). As Petitioner acknowledges, Ota's system does not rely solely on "internal pumps 23" that are allegedly located within Ota's component heat-exchange modules. Pet. 31. Ota's system additionally includes main circulation pump 41 (which Petitioner refers to as the "central pump") that is located outside of the component heat-exchange modules. *See Id.*; Ex. 1004, 7:20–31. Main circulation pump 41 circulates coolant through Ota's main circulation pipe 34 (the Petitioner-identified "manifold module"), server modules 62 (the Petitioner-identified "plurality of heat-transfer elements"), and heat exchanger 50 (part of cooling unit 52, the Petitioner-identified "environmental coupler"). Ex. 1004, 7:20–31.

Petitioner concedes that Ota does not teach an embodiment in which "no pumps other than the pumps in the component heat-exchange modules circulate the working fluid," but asserts that such an embodiment would have been obvious in view of Cheon's "suggestion of a decentralized pumping system." *See* Pet. 31; Pet. 15 (citing Ex. 1006 ¶ 60). Petitioner

contends that one of ordinary skill would have realized that such a modification advantageously would have reduced the cost of Ota's system, and allowed Ota's cooling unit 52 to be reduced in size leaving space for additional server rack modules. *See* Pet. 31 (citing Ex. 1003 ¶¶ 47–48); Pet. 16–22 (citing Ex. 1003 ¶¶ 18, 24–31; Ex. 1007 ¶¶ 10–12).

Cheon discloses “a water cooling type cooling system for an electronic device having a plurality of coolant circulation units and coolant supply units separable from each other and configured such that the plurality of coolant circulation units and coolant supply units are interconnected in series or parallel.” Ex. 1006, ¶ 1.

Figure 9 of Cheon is reproduced below.

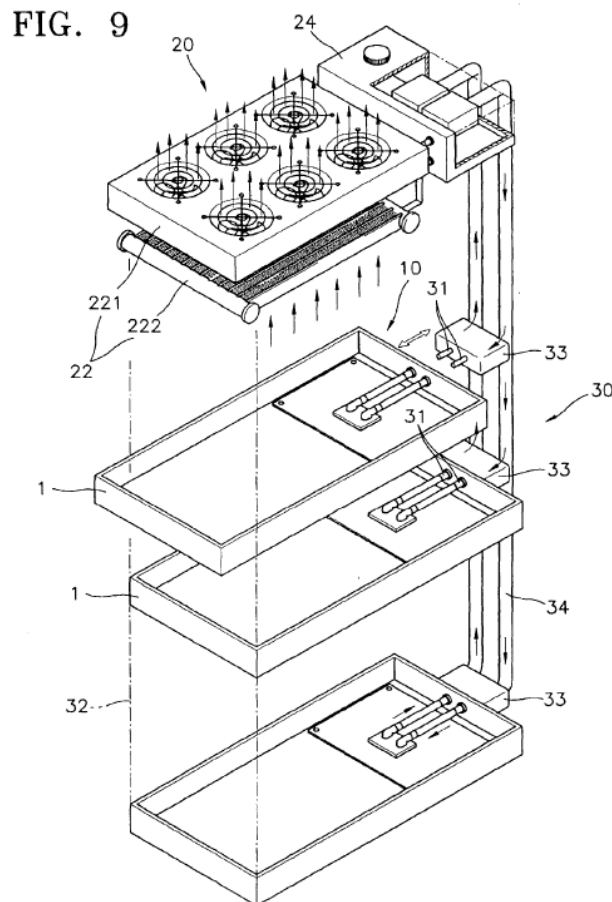
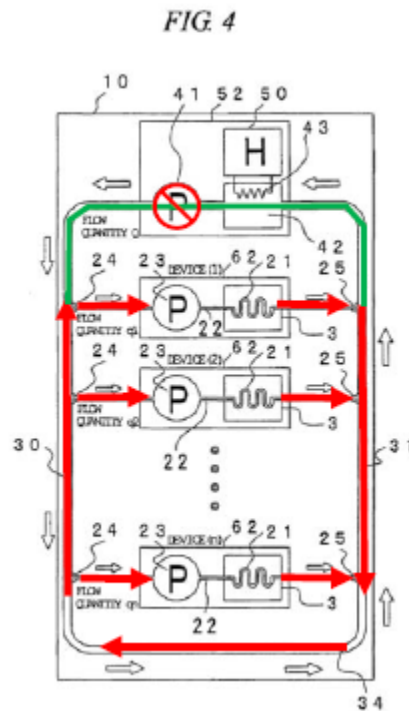


Figure 9 depicts an embodiment in which coolant supply unit 20 is used to cool a rack-type computer docking station. *See* Ex. 1006, ¶ 56. This embodiment contains two types of pumps: the “circulation pumps of the coolant supply unit 20” (i.e., “circulation pumps 23”) (not shown in the figure), and “intermediate circulation pumps 33 installed in the respective racks of the docking station 32 [that] preferably adjust an intermediate pressure of the coolant.” *See Id.* ¶¶ 43 (referring to Fig. 1), 60. Paragraph 60 of Cheon discloses an additional advantage of using intermediate circulation pumps 33 in addition to the circulation pumps 23 of coolant supply unit 20: “[E]ven if the pumps of the coolant supply unit **20** are out of order, it is possible to prevent all the electronic devices **1** from being interrupted.” *Id.*

Petitioner contends that Paragraph 60 of Cheon “suggests a *fully* decentralized pumping system where the device-level intermediate pumps 33 are the *only* pumps that circulate coolant through the entire cooling system.” Pet. 15 (citing Ex. 1006 ¶ 60; Ex. 1003 ¶ 23; Ex. 1002, 203). “Specifically, *Cheon* discusses that even if circulation pumps 23 are ‘out of order,’ the cooling system will not be interrupted because intermediate pumps 33 can continue to pump coolant through the system.” Pet. 15–16 (citing Ex. 1006 ¶ 60; Ex. 1003 ¶ 23). Petitioner further contends that one of ordinary skill in the art would have been led by this disclosure to modify *Ota*’s system “to eliminate central pump 41 (and retain internal pumps 23).” Pet. 17 (citing Ex. 1003 ¶ 26). According to Petitioner, such a modification advantageously would have reduced the cost of *Ota*’s system, and allowed *Ota*’s cooling unit 52 to be reduced in size leaving space for additional

server rack modules. See Pet. 31 (citing Ex. 1003 ¶¶ 47–48); Pet. 16–22 (citing Ex. 1003 ¶¶ 18, 24–31; Ex. 1007 ¶¶ 10–12).

Patent Owner argues in its Response that “Ota’s system requires a central pump to function.” PO Resp. 40–41 (citing Ex. 2007 ¶¶ 69–76.) The Response illustrates this second contention with a marked-up version of Ota’s Figure 4, which is reproduced below.

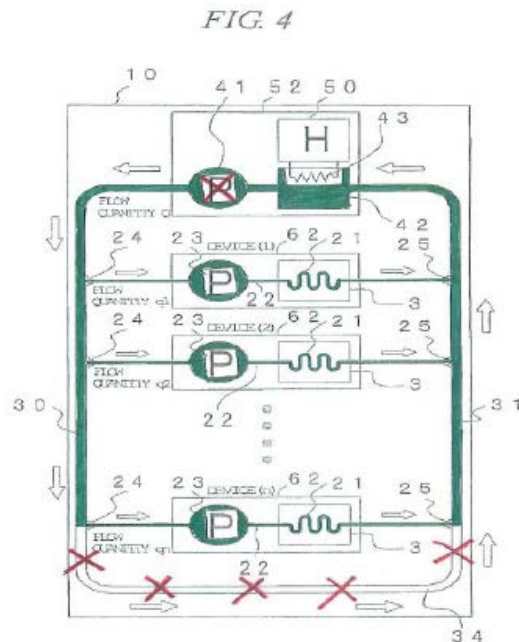


Resp. 51. This marked up version of Figure 4, depicting an embodiment of Ota’s system that includes a bypass route (Ex. 1004, 4:24–26), illustrates with red arrows how Patent Owner contends coolant would flow in Ota’s system if main circulation pump 41 were removed. *Id.* 50–51. Specifically, Patent Owner contends that the flow path through upstream pipe 31 and coolant tank 42 (highlighted in green) would have a higher flow resistance than the bypass path (highlighted with the left-facing red arrow) at the bottom of the figure. *Id.* (citing Ex. 1007 ¶ 73). Accordingly, if Ota’s main circulation pump 41 were removed, most coolant fluid would flow

backwards through the bypass path and little coolant fluid would pass through cooling section 43, resulting in degraded fluid performance. *Id.* at 50–52 (citing Ex. 1007 ¶¶ 72–74).

Patent Owner also attacks the rationales offered by Petitioner. Patent Owner argues that the last sentence of Cheon’s Paragraph 60 “does not teach or suggest removing the central pump entirely.” PO Resp. 41 (citing Ex. 2007 ¶¶ 98–104). Patent Owner argues that Petitioner relies on impermissible hindsight when it contends that one of skill in the art would have realized that removing Ota’s main circulation pump 41 advantageously would have reduced the cost of Ota’s system, and reduced the size of Ota’s cooling unit so as to create space for additional servers. PO Resp. 43–44.

In its Reply, Petitioner does not directly dispute Patent Owner’s assertion that, if Ota’s main circulation pump 41 were removed and further modifications were not made, most of the cooling fluid would flow back through Ota’s bypass path, rather than through cooling section 43. *See* Reply 16. Instead, Petitioner argues that one of ordinary skill in the art would have known to make an additional modification: disconnecting Ota’s bypass path. *Id.* Petitioner illustrates this additional modification with a marked-up version of Ota’s Figure 4, reproduced below.



Reply 17. In the above version of Figure 4, depicting an embodiment of Ota's system that includes a bypass route (Ex. 1004, 4:24–26), figure, a red X mark over main circulation pump 41 indicates that this component has been eliminated. *See id.* Five additional red X marks along the bottom of the figure indicate that the bypass path also has been disconnected. *See id.* Thus, it is clear from the Reply that Petitioner is now asserting that one of ordinary skill in the art would have been motivated to make two separate modifications to Ota's system.

Patent Owner argues in its Sur-Reply that neither the Petition nor Dr. Tilton's supporting declaration contends that one of ordinary skill in the art would have known to remove Ota's bypass path in addition to removing Ota's main circulation pump. Sur-Reply 2. Patent Owner contends that raising this new argument in the Reply is improper. *Id.*

Having considered all of the evidence and arguments of the parties, we agree that modifying Ota in the manner described in the Petition—i.e., removing main circulation pump 41 *but not making any other changes*—

would have rendered Ota's system inoperable for its intended purpose. On this record, we find that if Ota's main circulation pump 41 were eliminated or disconnected in the manner described in the Petition (see Pet. 17, 20, 31–32), leaving “only server-level pumps 23 to circulate the coolant” (*id.* at 20), most of Ota's coolant would flow backwards through Ota's bypass pathway (where fluid resistance would be relatively low) and relatively little coolant fluid would pass through cooling section 43 (where fluid resistance would be relatively high), degrading cooling performance and rendering the system unable to function for its intended purpose. See PO Resp. at 50–52 (citing Ex. 2007 ¶¶ 72–74); see also Ex. 2007 ¶¶ 81–90 (also explaining why eliminating Ota's main circulation pump 41 would render Ota's system inoperable). We credit Dr. Pokharna's testimony in this regard because it is well-reasoned and consistent with Ota's disclosure. See Ex. 2007 ¶¶ 72–74; 81–90. For example, Ota discloses that the bypass path has a relatively large diameter, resulting in “low flow resistance.” See Ex. 1004, 6:3–5, 6:60–61. We also agree that cooling section 43 would necessarily contain conduits with a relatively small diameter, resulting in increased flow resistance. See Ex. 2007 ¶ 73. Accordingly, Petitioner has failed to demonstrate by a preponderance of the evidence that claim 1 is unpatentable over Ota and Cheon based on the contentions set forth in the Petition.

As discussed above, Petitioner does not directly dispute Dr. Pokharna's testimony that Ota's system would fail to perform for its intended purpose if modified in the manner set forth in the Petition by removing main circulation pump 41 but leaving the bypass path in place. See Reply 16. Petitioner instead argues in its Reply that one of ordinary skill also would have disconnected the bypass path. See *id.* But if

Petitioner's unpatentability grounds depended on demonstrating that a skilled artisan would have had reason to remove or disconnect *both* Ota's main circulation pump 41 *and* Ota's bypass path, Petitioner was required to state both contentions in the Petition.

"Unlike district court litigation—where parties have greater freedom to revise and develop their arguments over time and in response to newly discovered material—the expedited nature of IPRs bring with it an obligation for petitioners to make their case in their petition to institute." *Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1369 (Fed. Cir. 2016). In an *inter partes* review, the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable. *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016). Thus, although "the introduction of new evidence in the course of the trial is to be expected in inter partes review trial proceedings," *Genzyme Therapeutic Prods. LP v. Biomarin Pharm. Inc.*, 825 F.3d 1360, 1366 (Fed. Cir. 2016), the shifting of arguments is not, *Wasica Fin. GmbH v. Cont'l Auto. Sys., Inc.*, 853 F.3d 1272, 1286 (Fed. Cir. 2017).

For the above reasons, removing or disconnecting Ota's main circulation pump 41 would have resulted in a system unsuitable for its intended purpose unless Ota's bypass path also were removed or disconnected. Thus, to make out a *prima facie* case of unpatentability, Petitioner was required to identify both of these modifications "in writing and with particularity" in the Petition. See 35 U.S.C. § 312(a)(3); *see also* PTAB Consolidated Trial Practice Guide 73 (Nov. 2019), *available at* <https://www.uspto.gov/TrialPracticeGuideConsolidated> ("Petitioner may not submit new evidence or argument in reply that it could have presented

earlier, e.g., to make out a prima facie case of unpatentability.”) Having failed to do so, Petitioner cannot cure this deficiency by proposing the second modification in its Reply. Accordingly, Petitioner has failed to demonstrate by a preponderance of the evidence that claim 1 is unpatentable over Ota and Cheon based in whole or in part on its argument that one of ordinary skill in the art would have had reason to remove or disconnect Ota’s bypass path.

Even assuming *arguendo* that Petitioner were permitted to propose an additional modification to Ota in its Reply, this would not change the ultimate result. On this record, and weighing all of the evidence and argument submitted by both parties (including the new theory and arguments submitted in the Reply), we are not persuaded by a preponderance of the evidence that one of ordinary skill in the art would have had sufficient reason to modify Ota’s system by removing or disconnecting both main circulation pump 41 and Ota’s bypass path.

As discussed above, Petitioner’s primary rationale for modifying Ota comes from Paragraph 60 of Cheon. In particular, Petitioner contends that the last sentence of Paragraph 60 “suggests a *fully* decentralized pumping system where the device-level intermediate pumps 33 are the *only* pumps that circulate coolant,” and that one of ordinary skill in the art “would have been led by this disclosure to modify *Ota*’s system to eliminate central pump 41 (and retain internal pumps 23).” Pet. 15, 17 (citing Ex. 1006 ¶ 60; Ex. 1003 ¶¶ 23, 26, Ex. 1002, 203); *see also* Ex. 2016, 62:1–63:1 (Petitioner’s declarant testifying that he relied on the final sentence of Paragraph 60 of Cheon to supply a rationale for obviousness); *Id.* at 81:14–20 (Petitioner’s

declarant admitting that Ota does not describe an embodiment without a central pump).

Paragraph 60 of Cheon is reproduced below in its entirety, with underscoring used to identify the text that Petitioner contends suggests a “fully decentralized pumping system”:

[0060] Here, the coolant supplied to all electronic devices can be made to flow simultaneously by increasing the capacity of circulation pumps of the coolant supply unit **20**. However, the intermediate circulation pumps **33** installed in the respective racks of the docking station **32** preferably adjust an intermediate pressure of the coolant. Thus, even if a plurality of coolant circulation units **10** are provided inside the plurality of electronic devices **1**, coolant circulation in each rack can be smoothly performed without applying any tension to the circulation pumps of the coolant supply unit **20**. Also, even if the pumps of the coolant supply unit **20** are out of order, it is possible to prevent all the electronic devices **1** from being interrupted.

Ex. 1006, ¶ 60 (emphasis added). We agree with Patent Owner that this disclosure does not teach or suggest removing Cheon’s main circulation pump in order to obtain what Petitioner calls a “fully decentralized pumping system.”⁵ See PO Resp. 42 (citing Ex. 2007 ¶¶ 98–104). Paragraph 60 indicates that it might be *possible* to operate Cheon’s system without the main circulation pump, but nothing in Paragraph 60 suggests that it would be advisable or advantageous to do so. To the contrary, Paragraph 60, when read in its entirety, suggests that it would be advantageous to employ both intermediate circulation pumps and one or more main circulation pumps (i.e., the pumps located in coolant supply unit 20). In other words,

⁵ To be consistent with the Petition, we use the term “fully decentralized pumping system” to refer to a system that does not employ a central pump.

Paragraph 60 suggests that it would be disadvantageous to eliminate Cheon's main circulation pump. *See* Ex. 2007 ¶¶ 94–98.

In addition, as Patent Owner points out, Ota also suggests that main circulation pump 41 is necessary for Ota's system to operate as intended. *See* PO Resp. 48–49; Ex. 2007 ¶ 70. In particular, Ota explicitly states that in the embodiment depicted in Figure 4 (the embodiment Petitioner proposes to modify), “it is necessary that the flow quantity Q through the main circulation pipe 34 is larger than the sum of the flow quantities q through each of the server modules 62.” Ex. 1004, 7:44–47; *see also id.* at 9:47–49 (“[I]t is necessary that the flow quantity through the main circulation pipe 34 is larger than the sum of the flow quantities through each of the server modules 62”), *id.* at 12:44–48 (“[T]he flow quantity of the coolant passing through each of the devices can be kept uniform as long as the flow quantity through the main circulation pipe 34 is larger than the sum of the flow quantities through the mounted devices.”) Flow quantity Q is the flow that exits main circulation pump 41, and flow quantities q are the quantities that travel through each internal pump 23. *See* Ex. 1004, Fig. 4. Accordingly, these portions of Ota teach that it is necessary to employ a main circulation pump 41 having a capacity greater than the sum of the capacities of internal pumps 23. *See* Ex. 1004, 7:44–47, 9:47–49, 12:44–48, Fig. 4; Ex. 2007 ¶ 70. We find that these portions of Ota would have suggested to one of ordinary skill in the art that it would have been disadvantageous to remove or disconnect Ota's main circulation pump 41. *See* Ex. 2007 ¶¶ 70, 77–80.

The additional arguments that Petitioner offers do not persuade us that one of ordinary skill in the art would have found it obvious to modify Ota to eliminate both main circulation pump 41 and the bypass path.

Petitioner begins its motivation to combine discussion with an assertion that it was well known as of July 2011 (the filing date of the application that issued as the '705 Patent) that “decentralized pumping” systems could operate without centralized pumps. *See* Pet. 16–17 (citing Ex. 1003 ¶¶ 18, 24; Ex. 2007 ¶¶ 10–12; Ex. 1002, 203). This assertion is the premise for the specific rationales set forth on pages 17–22 of the Petition and reiterated at pages 14–16 of the Reply. But Petitioner offers no persuasive evidence that fully decentralized pumping systems were known in the art as of this date.

As discussed above, both Ota and Cheon employ central pumps. Thus, neither reference discloses a fully decentralized pumping system of the type required by claim 1. The cited paragraphs of the Tilton Declaration also are conclusory in nature, and do not cite any evidence that fully decentralized pumping systems were known in the art. *See* Ex. 1003 ¶¶ 18, 24 (failing to cite any prior art patents or printed publications that disclose or discuss fully decentralized pumping systems). The cited portions of the Branton Declaration also are conclusory in nature. It also appears that Mr. Branton is an interested witness. *See* Ex. 1007 ¶¶ 1, 4 (stating that Mr. Branton has been employed with Petitioner for ten years), 10–12 (failing to cite any prior art patents or printed publications that disclose or discuss fully decentralized pumping systems). The deposition testimony from Mr. Branton that Petitioner cites in its Reply (*see* citing Ex. 2017, 82:3–82:7, cited at Reply 22) merely indicates that a particular product was in “early development” during 2009 and 2010. Even assuming *arguendo* that this under-development product did employ a fully decentralized pumping system, this deposition testimony would not demonstrate that an ordinarily

skilled artisan would have had knowledge of this product as of July 2011. Accordingly, we accord the testimony of Dr. Tilton and Mr. Branton little weight.

In contrast, Patent Owner's declarant, Dr. Pokharna, has cited ample evidence that supports his opinions that fully decentralized pumping systems were not well known in the art as of July 2011. *See* Ex. 2007 ¶¶ 20–29 (citing Ex. 2010 (a May, 2008 paper), Ex. 2009 (a July 2011 presentation), Ex. 2014 (a 2006 paper), Ex. 2019 (a March, 2011 paper)). On this record, we find Dr. Pokharna's testimony to be more persuasive than the testimony of Dr. Branton and Mr. Tilton.

Petitioner's argument regarding the prosecution history of the '705 Patent (*see* Pet. 16–17, citing Ex. 1002, 203) also is unpersuasive. Specifically, Petitioner contends that the Examiner found in an office action that it would have been obvious in view of paragraph 60 of Cheon to eliminate Cheon's circulation pumps 23. *See id.* Petitioner's argument here, however, is different than any determinations the Examiner made in the cited office action, and any such determinations would have been based on a different record than the evidentiary record before us. Moreover, the applicant responded to the cited office action by distinguishing Cheon (*see* Ex. 1002, 171–72), and the Examiner subsequently allowed the relevant claims (*see id.* at 121–126). It is not clear whether the Examiner maintained the view that it would have been obvious to eliminate Cheon's circulation pumps 23. *See id.* In any event, Petitioner contends in this proceeding that one of ordinary skill in the art would have found it obvious to modify *Ota's* system, not *Cheon's* system. *See* Pet. 17. Thus, the Examiner's findings relate to an issue that is not presently in dispute.

On this record and for the reasons set forth above, we are not persuaded that one of ordinary skill in the art would have known of fully decentralized pumping systems of the type required by claim 1, or of the supposed advantages Petitioner contends such systems would have had. These arguments are not supported by persuasive testimony or evidence, and appear to be the product of improper hindsight. *See* Ex. 2007 ¶¶ 20–29.

The four rationales that Petitioner sets forth on pages 17–21 of the Petition are each unpersuasive because they rely on unfounded assertions regarding what an ordinarily skilled artisan would have known, and for additional reasons.

Regarding Petitioner’s first rationale (*see* Pet. 17–18), we agree with Petitioner that Ota’s internal pumps 23 help regulate the flow of coolant into heat receivers. *See id.* at 17 (citing Ex. 1004, 9:37–46). But Petitioner does not adequately explain why this fact would have lead an ordinarily skilled artisan to eliminate main circulation pump 41. *See* Pet. 17–18. The cited portion of the Tilton Declaration (Ex. 1003 ¶ 26.a) is conclusory in nature, and assumes that one of ordinary skill in the art would have been aware of the supposed advantages and disadvantages of fully decentralized cooling systems vis-à-vis centralized cooling systems. For the reasons discussed above, we are not persuaded that one of ordinary skill in the art would have had such knowledge. *See* Ex. 2007 ¶¶ 20–29.

Petitioner’s second, third, and fourth rationales (*see* Pet. 18–21) are based almost entirely on supposed advantages of fully decentralized pumping systems vis-à-vis centralized pumping systems. The cited portions of the Tilton and Branton declarations are conclusory in nature and do not cite any supporting evidence. *See* Ex. 1003 ¶¶ 26.b–d; Ex. 1007 ¶¶ 10–11.

As discussed above, we are not persuaded that one of ordinary skill in the art would have been aware of these supposed advantages and disadvantages of fully decentralized pumping systems. *See* Ex. 2007 ¶¶ 20–29. Accordingly, these rationales lack sufficient support.

Petitioner’s “obvious to try” contentions (*see* Pet. 21–22, Reply 22–23) are unpersuasive for similar reasons. Petitioner contends that one of ordinary skill in the art in July 2011 would have faced “the choice of whether to use decentralized pumping, centralized, pumping, or a combination of the two.” Pet. 22. As discussed above, however, we are not persuaded that such a person would have been aware of fully decentralized pumping systems, or of the alleged advantages of such systems. *See* Ex. 2007 ¶¶ 20–29. Accordingly, we are not persuaded that such a person would have found it obvious to try to modify Ota by removing main circulation pump 41 and the bypass path in order to implement a fully decentralized pumping system. On this record, we are not persuaded that one of ordinary skill in the art in July 2011 would have known, or had reason to pursue, a fully decentralized pumping configuration.

For each of the foregoing reasons, having considered the arguments of the parties and the evidence of record, we determine that Petitioner has not demonstrated by a preponderance of the evidence that claim 1 would have been unpatentable under 35 U.S.C. § 103(a) over Ota and Cheon.

b. Ground 1, Claims 2–16

Claims 2–16 depend from, and incorporate the limitations of, claim 1. Petitioner’s contentions regarding claims 2–16 all depend on Petitioner’s contention that claim 1 would have been unpatentable over Ota and Cheon. Pet. 32–52. Accordingly for the same reasons discussed above, Petitioner

has not demonstrated by a preponderance of the evidence that claims 2–16 would have been unpatentable under 35 U.S.C. § 103(a) over Ota and Cheon.

c. Ground 2, Claim 17

Independent claim 17 recites “wherein no pump other than the pump corresponding to the respective component heat-exchange modules circulate the working fluid among the plurality of heat-transfer elements, the distribution and collection manifolds, and the environmental coupler.” This language is substantively the same as the no other pumps limitation of claim 1, and Petitioner’s contentions regarding this limitation are the same as its contentions regarding the no other pumps limitation of claim 1. *See* Pet. 52 (citing Sections V.A.2 and V.A.3 of the Petition, i.e., Petitioner’s arguments that Cheon teaches or suggests decentralized pumping, and that an ordinarily skill artisan would have had reason to combine Cheon and Ota); Pet. 60 (contending that the above-quoted limitation of claim 17 is satisfied for the same reasons as the no other pumps limitation of claim 1). Petitioner does not contend that Eriksen cures the deficiencies discussed above in Petitioner’s contentions regarding claim 1.

Having considered the arguments of the parties and the evidence of record, and for the same reasons discussed above with respect to claim 1, we determine that Petitioner has not demonstrated by a preponderance of the evidence that claim 17 would have been unpatentable under 35 U.S.C. § 103(a) over Ota, Cheon, and Eriksen.

d. *Ground 2, Claims 18–21*

Claims 18–21 depend from, and incorporate the limitations of, claim 17. Petitioner’s contentions regarding claims 18–21 all depend on Petitioner’s contention that claim 17 would have been unpatentable over Ota Cheon, and Eriksen. Pet. 32–52. Accordingly for the same reasons discussed above, Petitioner has not demonstrated by a preponderance of the evidence that claims 18–21 would have been unpatentable under 35 U.S.C. § 103(a) over Ota, Cheon, and Eriksen.

III. CONCLUSION

For the foregoing reasons, we determine that Petitioner has not shown by a preponderance of the evidence that any challenged claim of the ’200 patent is unpatentable.

In summary,

Claims	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1–16	103(a)	Ota, Cheon		1–16
17–21	103(a)	Ota, Cheon, Eriksen		17–21

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that claims 1–21 of U.S. Patent 9,496,200 B2 have not been shown to be unpatentable; and

FURTHER ORDERED that because this is a final written decision, parties to the proceeding seeking judicial review of this decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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Patent 9,496,200 B2

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