

UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

COOLER MASTER CO., LTD.

Petitioner,

v.

ASETEK DANMARK A/S,

Patent Owner

Patent No. 8,240,362

Title: COOLING SYSTEM FOR A COMPUTER SYSTEM

IPR Case No.: IPR2023-00667

PETITION FOR *INTER PARTES* REVIEW

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Exhibit	Description
1001	U.S. Patent No. 8,240,362 (“’362 patent”)
1002	File history of U.S. Patent No. 8,240,362 (“’362-FH”)
1003	Declaration of Georgios Karamanis, Ph.D. Regarding Invalidity of U.S. Patent No. 8,240,362 (“Karamanis Dec.”)
1004	(Reserved)
1005	Defendants’ Reply Claim Construction Brief filed on April 12, 2022 in Asetek Danmark A/S v. Shenzhen Apaltek Co., Ltd., Case No. 6:21-cv-501-ADA (W.D. Tex.) (Doc. 61)
1006	U.S. Patent No. 6,019,165 to Batchelder (“Batchelder”)
1007	Certified Translation of Japanese Unexamined Patent App. Pub. No. 2002-151638 to Takayuki Shin (“Shin”)
1008	U.S. Patent No. 6,915,653 to Nakano <i>et al.</i> (“Nakano”)
1009	Patent Owner’s Response, Paper No. 21 in IPR2020-00523 (Nov. 30 2020) (“’354-POR”)
1010	U.S. Patent No. 10,078,354 (the “’354 patent”)
1011	Final Written Decision in IPR2020-00523, Paper No. 36 (Aug. 19, 2021) (“’354-FWD”)

Cooler Master Co., Ltd. (“CMC” or “Petitioner”) hereby seeks *inter partes* review of Claims 1 and 3-19 (“the Challenged Claims”) of U.S. Patent No. 8,240,362. (Ex-1001 (the “’362 patent”)) of Asetek Danmark A/S (“Patent Owner.”)

I. INITIAL STATEMENT

A. Patent Owner Did Not Invent the “All-in-One” Cooler.

The ’362 patent discloses a liquid cooling system used in a computer system. The use of liquid cooling to cool semiconductor chips in computer systems was generally known to a person of ordinary skill in the art (“POSITA”) long before the claimed November 7, 2003 priority date of the ’362 patent claims. (Ex-1003, 26¶.) The use of closed liquid cooling loops that utilize what is sometimes referred to in the industry as an “all-in-one” cooler (*i.e.*, a modular pumping mechanism, what Patent Owner calls a “reservoir” in the ’362 patent, that pumps the liquid through the loop) was also generally known to a POSITA long before the claimed priority date of the ’362 patent. (*Id.*; *see also* Ex-1006-Batchelder; Ex-1007-Shin.) The ’362 patent only discloses and claims a specific embodiment of such an “all-in-one” cooler. (Ex-1003, ¶26.)

B. The ’362 Patent Claims Are Similar to Those This Board Has Already Invalidated.

The ’362 patent is a parent of Application No. 15/626,393, which issued as U.S. Patent No. 10,078,354 (the “’354 patent”). (Ex-1001, 1:4-5; Ex-1010 (’354 patent, issued from “(21) Appl. No.: 15/626,393”).) Claims 1, 4, 8, 14, 15, and 19

of the '354 patent have been found unpatentable by a Final Written Decision in IPR2020-00523. (Ex-1011, 354-FWD). The IPR relating to the '354 patent is instructive, given that the Challenged Claims here are similar to those in the '354 patent the Board has invalidated. (*See id.* at 30-31).

II. IDENTIFICATION OF CHALLENGE UNDER 37 C.F.R. §42.104(B) AND RELIEF REQUESTED

Petitioner respectfully requests that the Challenged Claims of the '362 patent be cancelled based on the following grounds of unpatentability:

Ground of Unpatentability	'362 Patent Claim(s)	Basis for Rejection under 35 U.S.C. §103
Ground 1	1, 3-11, 13, 17-19	Rendered obvious over Batchelder in view of Shin
Ground 2	12, 14-16	Rendered obvious over Batchelder in view of Shin and further in view of Nakano

III. OVERVIEW OF THE '362 PATENT

The '362 patent relates to a liquid-cooling system for a central processing unit (CPU) or other processing unit of a computer system. (Ex-1001, 1:12-14; Ex-1003, ¶25.) The specification purports to disclose embodiments of a small and compact liquid-cooling solution that is more efficient than existing air-cooling arrangements and that can be produced in high volume and at low cost. (*Id.*,

1:53-56.) The '362 patent further states (and subsequently claims) that these improvements may be obtained by:

a cooling system for a computer system, said computer system comprising: at least one unit such as a central processing unit (CPU) generating thermal energy and said cooling system intended for cooling the at least one processing unit, a reservoir having an amount of cooling liquid, said cooling liquid intended for accumulating and transferring of thermal energy dissipated from the processing unit to the cooling liquid, a heat exchanging interface for providing thermal contact between the processing unit and the cooling liquid for dissipating heat from the processing unit to the cooling liquid, a pump being provided as part of an integrate element, said integrate element comprising the heat exchanging interface, the reservoir and the pump, said pump intended for pumping the cooling liquid into the reservoir, through the reservoir and from the reservoir to a heat radiating means, said heat radiating means intended for radiating thermal energy from the cooling liquid, dissipated to the cooling liquid, to surroundings of the heat radiating means.

(*Id.*, 1:63-2:17; *see also id.* claims 1-16.)

As shown in detail in this Petition, however, the Challenged Claims of the '362 patent are not inventive.

A. Embodiments Claimed in Challenged Claims

Figure 8—annotated on the right with red and blue arrows indicating the direction of coolant flow—captures the main characteristics of the purported invention claimed in the Challenged Claims. (Ex-1003, ¶27.) “FIG. 8 is a perspective view of the cooling system showing the reservoir housing 14 with the heat

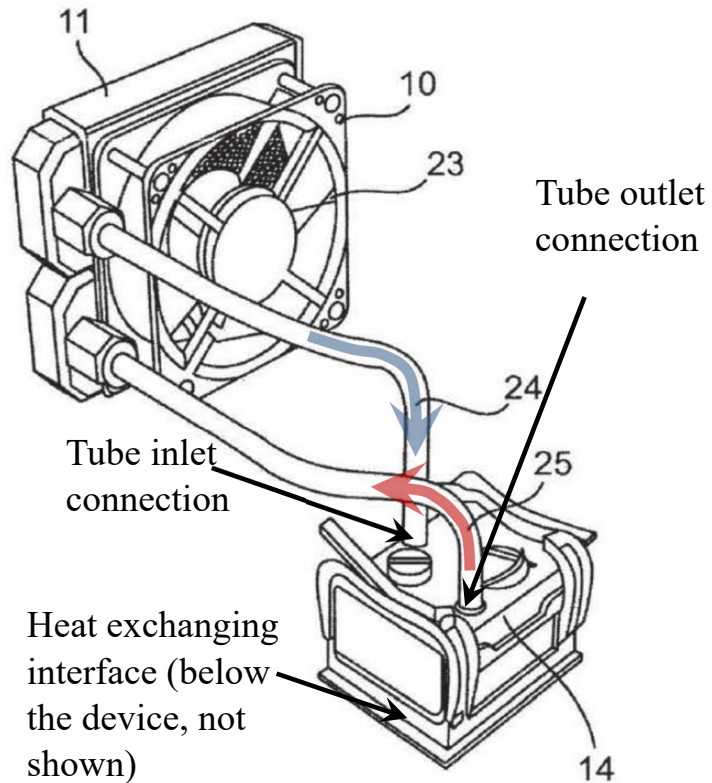


FIG. 8

exchanging surface (not shown) and the pump (not shown) inside the reservoir. The tube inlet connection and the tube outlet connection are connected to a heat radiator by means of connecting tubes 24 and 25 through which the cooling liquid flows into and out of the reservoir and the heat radiator, respectively. Within the heat radiator 11, the cooling liquid passes a number of channels for radiating the heat, which has been dissipated into the cooling liquid inside the reservoir, and to the surroundings of the heat exchanger. The air fan 10 blows air past the channels of the heat radiator in order to cool the radiator and thereby cooling the cooling liquid flowing inside the

channels through the heat radiator and back into the reservoir.” (Ex-1001, 13:28-41.)

B. Priority Date

The '362 patent issued on April 7, 2020 from Application No. 12/826,768 filed on June 30, 2010, claiming a priority date of November 7, 2003. Petitioner does not concede that the '362 patent is entitled to a priority date of November 7, 2003, and reserves the right to challenge such claim of priority, but assumes that this date applies for purposes of this Petition. *See PowerOasis, Inc. v. T-Mobile USA, Inc.*, 522 F.3d 1299, 1303-06 (Fed. Cir. 2008) (burden on patent owner to prove entitlement to priority date).

C. The Challenged Claims

Claims 1 and 3-19 are the Challenged Claims of the '362 patent. Claims 1, 14 and 17 are independent claims. Claims 3-13 depend from claim 1, claims 15 and 16 depend from claim 14, and claims 18 and 19 depend from claim 17.

IV. PERSON OF ORDINARY SKILL IN THE ART (“POSITA”)

A POSITA in the field of the '362 patent at the time of the effective filing date would have been knowledgeable regarding liquid cooling systems for computer systems, would have earned at least a bachelor's degree, such as a B.S. (bachelor of science), or equivalent thereof, in electrical or mechanical engineering or a closely-related field, or would have possessed at least two or three years of experience in liquid cooling systems for computer systems or in similar systems. A person with

less education but more relevant practical experience, depending on the nature of that experience and degree of exposure to liquid cooling systems for computer systems, could also qualify as a POSITA in the field of the '362 patent. (Ex-1003, ¶¶14-19.)

V. CLAIM CONSTRUCTION

Per 37 C.F.R. § 42.100(b):

“[A] claim of a patent in an IPR shall be construed using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. 282(b), including construing the 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 pertaining to the patent. Any prior claim construction ... that is timely made of record in the *inter partes* review proceeding will be considered.”

A. “reservoir”

Petitioner and Patent Owner have stipulated to construe the term “reservoir” in the '362 patent to mean “single receptacle defining a fluid flow path.” (Ex-1005 at 2.) Petitioner submits that the claimed “reservoir” be given such construction. (Ex-1003, ¶29.)

B. “chamber”

Petitioner and Patent Owner have stipulated to construe the term “chamber” to mean “compartment within the reservoir.” (Ex-1005 at 2.) Petitioner submits that the claimed “chambers” be given such construction. (Ex-1003, ¶30.)

C. “impeller”

Petitioner submits that the term “impeller” should be given its plain and ordinary meaning. An impeller is a conventional and well-known component of rotary systems. (Ex-1003, ¶31.) An impeller may refer to a rotor (e.g., a blade, turbine, or rotating arm) that is used to create a pressure difference within a fluid. (*Id.*) The ’362 patent describes a “pumping means with an impeller for pumping the cooling liquid through a pumping housing.” (Ex-1001 at 6:30-31.) This is consistent with the plain and ordinary meaning of “impeller.” (Ex-1003, ¶31.)

D. “radiator”

Petitioner submits that the term “radiator” should be given its plain and ordinary meaning. A radiator is a conventional and well-known component included in systems that require cooling. (Ex-1003, ¶32.) In its plain meaning radiators are understood by a POSITA as a system that transfers thermal energy (e.g., heat) from one medium to another medium. (*Id.*) This is consistent with the ’362 patent, which states that a radiator may serve “as a means for removing the heat from the liquid by means of the air fan 10 blowing air through the heat radiator.” (Ex-1001 at 8:17-19)

and FIG. 3.) Radiators may include structures such as pipes or fins to transfer heat. (Ex-1003, ¶32.)

E. Other Terms

Petitioner does not believe any additional constructions are required at this time. Accordingly, all other terms of the '362 patent have been given their ordinary and customary meaning in this Petition. Petitioner reserves the right to respond to claim construction positions raised by the Board or Patent Owner. (Ex-1003, ¶33.)

VI. OVERVIEW OF PRIOR ART

A. Batchelder (Ex-1006)

Batchelder issued as U.S. Patent No. 6,019,165 on February 1, 2000. (Ex-1006, [11], [45].) Thus, Batchelder is prior art to the '362 patent under at least pre-AIA 35 U.S.C. §102(a) for all Challenged Claims. Batchelder was identified in an Information Disclosure Statement (IDS) at the time the '362 patent was filed (Ex-1002, 764-FH at 333); however, it was not cited by the Examiner.

B. Shin (Ex-1007)

Shin was filed as Japanese Patent Application 2000-345470 on November 8, 2000 and published on May 24, 2002 as Japanese Unexamined Patent Application Publication No. 2002-151638 to Takayuki Shin. (Ex-1007, (21), (22), (11), (43).) Thus, Shin is entitled to an effective filing date of at least May 24, 2002. Shin is therefore prior art to the '362 patent under at least pre-AIA 35 U.S.C. §102(a). Shin

was not disclosed or cited during the prosecution of the '362 patent. (*See generally* Ex-1002, 362-FH.)

C. Nakano (Ex-1008)

Nakano issued as U.S. Patent No. 6,915,653 on July 12, 2005. (Ex-1008, [10], [45].) Nakano, filed on April 8, 2004, published on December 16, 2004 as U.S. Patent Publication No. 2004/0250558, qualifies as prior art under at least pre-AIA 35 U.S.C. § 102(e). Nakano was not disclosed or cited during prosecution of the '362 patent. (*See generally* Ex-1002, 764-FH.)

VII. CLAIM ELEMENT NUMBERING KEY

Because the Challenged Claims have similar claim elements, they are numbered as follows for the element-by-element invalidity analyses of the Challenged Claims in Section VIII *infra*.

'362 Claim Limitations		
[1-PRE] 1. A cooling system for a computer system processing unit, comprising: (Claim 1)	[14-PRE] 14. A cooling system for a processing unit positioned on a motherboard of a computer, comprising: [14-a] a reservoir configured to be coupled to the processing unit positioned	[17-PRE] 17. A method of operating a liquid cooling system for an electronic component positioned on a motherboard of a computer system, comprising: [17-a]

'362 Claim Limitations		
[1-a] an integrated element including a heat exchanging interface, a reservoir, and a pump, (Claim 1)	on the motherboard at a first location, [14-b] the reservoir being adapted to pass a cooling liquid therethrough, (Claim 14)	separably thermally coupling a heat exchanging interface of a reservoir with the electronic component positioned at a first location on the motherboard, (Claim 17)
[1-b] wherein the reservoir is configured to receive a cooling liquid from outside the reservoir through an inlet and pass the cooling liquid to the outside through an outlet, (Claim 1)		
See [1-f] below		

'362 Claim Limitations		
[1-c] the reservoir including an upper chamber and a lower chamber, the upper chamber and the lower chamber being vertically displaced chambers (Claim 1)	[14-c] wherein the reservoir includes an upper chamber and a lower chamber, the upper chamber and the lower chamber being separate chambers containing cooling liquid that are (Claim 14)	[17-b] the reservoir including an upper chamber and a lower chamber, the upper chamber and the lower chamber being separate chambers that are vertically spaced apart (Claim 17)

'362 Claim Limitations		
[1-d] [the upper chamber and the lower chamber being vertically displaced chambers that are] separated from each other by at least a horizontal wall and fluidly coupled together by a plurality of substantially circular passages, at least one of the plurality of substantially circular passages being positioned on the horizontal wall, (Claim 1)	[14-d] [the upper chamber and the lower chamber being separate chambers containing cooling liquid that are] separated by at least a horizontal wall and fluidly coupled together by one or more passageways, at least one of the one or more passageways being a substantially circular passageway positioned on the horizontal wall, (Claim 14)	[17-c] [the upper chamber and the lower chamber being separate chambers that are vertically spaced apart and] separated by at least a horizontal wall, the upper chamber and the lower chamber being fluidly coupled by one or more passageways, at least one of the one or more passageways being positioned on the horizontal wall, (Claim 17)
See [1-e] below	[14-e] the reservoir further including a heat exchanging interface (Claim 14)	

'362 Claim Limitations		
See [1-f] below	[14-f] [a heat exchanging interface] configured to be placed in separable thermal contact with the processing unit, (Claim 14)	
See claim 6 below	[14-g] the heat exchanging interface being removably attached to the reservoir (Claim 14)	[17-d] the heat exchanging interface being removably coupled to the reservoir (Claim 17)
[1-e] a boundary wall of the lower chamber being formed by the heat exchanging interface; (Claim 1)	[14-h] [the heat exchanging interface being removably attached to the reservoir] such that the heat exchanging interface forms a boundary wall of the lower chamber of the reservoir; (Claim 14)	

'362 Claim Limitations		
[1-f] the heat exchanging interface is adapted to provide separable thermal contact between the processing unit and the cooling liquid such that heat is dissipated from the processing unit to the cooling liquid as the cooling liquid passes through the lower chamber of the reservoir; and (Claim 1)	See [14-f] above	

'362 Claim Limitations		
[1-g] the pump is adapted to direct the cooling liquid through the upper chamber and the lower chamber of the reservoir, the pump including a motor having a rotor, a stator and an impeller having a plurality of curved blades, the impeller being positioned within the reservoir; (Claim 1)		
		[17-e] [the heat exchanging interface being removably coupled to the reservoir such that] an inside surface of the heat exchanging interface is exposed to the lower chamber of the reservoir; (Claim 17)

'362 Claim Limitations		
[1-h] a heat radiator spaced apart from the integrated element, the heat radiator being fluidly coupled to the outlet and the inlet of the reservoir, the heat radiator being configured to circulate the cooling liquid therethrough and exhaust heat from the cooling liquid; and (Claim 1)	[14-i] a heat radiator configured to be positioned at a second location horizontally spaced apart from the first location when the reservoir is coupled to the processing unit; (Claim 14)	[17-f] positioning a heat radiator at a second location horizontally spaced apart from the first location, the heat radiator and the reservoir being fluidly coupled together by tubing that extends from the first location to the second location; (Claim 17)
[1-i] a fan configured to direct air through the heat radiator, the fan being driven by a motor separate from the motor of the pump. (Claim 1)	[14-j] a fan adapted to direct air to the heat radiator to dissipate heat from the cooling liquid to surrounding atmosphere; (Claim 14)	

'362 Claim Limitations		
See [1-g] above	[14-k] a pump configured to circulate the cooling liquid between the reservoir and the heat radiator, the pump including a motor having a rotor, a stator, and an impeller having curved blades, the impeller being mechanically coupled to the rotor and at least partially submerged in the cooling liquid in the reservoir, (Claim 14)	[17-g] activating a pump to a circulate a cooling liquid through the reservoir and the heat radiator, the pump including a motor and an impeller having curved blades, the impeller being positioned in the reservoir; and (Claim 17)
	[14-l] wherein a speed of the impeller is configured to be varied independent of the speed of the fan. (Claim 14)	

'362 Claim Limitations		
See [1-i] above	See [14-j] above	[17-h] activating a fan to direct air through the heat radiator, the fan being operated by a motor separate from the motor of the pump. (Claim 17)
3. The cooling system of claim 1, further including a plurality of channels in the lower chamber of the reservoir. (Claim 3)		
4. The cooling system of claim 1, wherein the pump is positioned in the upper chamber of the reservoir. (Claim 4)		

'362 Claim Limitations		
5. The cooling system of claim 1, wherein the cooling liquid is transferred between the upper chamber and the lower chamber of the reservoir only through the plurality of passages that fluidly couple the upper chamber and the lower chamber. (Claim 5)		
6. The cooling system of claim 1, wherein the heat exchanging interface is removably coupled to the reservoir. (Claim 6)		

'362 Claim Limitations		
7. The cooling system of claim 1, wherein a surface of the heat exchanging interface exposed to the lower chamber includes features to enhance heat dissipation. (Claim 7)		
8. The cooling system of claim 7, wherein the plurality of passages includes only two passages. (Claim 8)		

'362 Claim Limitations		
9. The cooling system of claim 1, wherein the lower chamber of the reservoir includes one or more features that are configured to increase an amount of time the cooling liquid takes to flow through the lower chamber. (Claim 9)	15. The cooling system of claim 14, wherein the lower chamber of the reservoir includes one or more features that are configured to increase an amount of time the cooling liquid takes to flow through the lower chamber. (Claim 15)	
10. The cooling system of claim 1, wherein the motor of the pump is an AC motor. (Claim 10)		
11. The cooling system of claim 1, wherein the motor of the pump is a DC motor. (Claim 11)		

'362 Claim Limitations		
12. The cooling system of claim 1, wherein a speed of the fan is configured to be varied independent of a speed of the impeller of the pump. (Claim 12)		
13. The cooling system of claim 1, wherein the integrated element is separate from the heat radiator and the integrated element and the heat radiator are fluidly coupled together by tubing such that the heat radiator can be positioned at a location away from the integrated element when the heat exchanging interface is in thermal contact with the processing unit. (Claim 13)		

'362 Claim Limitations		
	16. The cooling system of claim 14, wherein at least one of a location of the pump or a configuration of the reservoir is selected to create a turbulence of cooling liquid flow proximate the heat exchanging interface. (Claim 16)	
		18. The method of claim 17, wherein activating the pump includes circulating the cooling liquid between the upper and the lower chambers of the reservoir. (Claim 18)

'362 Claim Limitations		
		19. The method of claim 18, wherein circulating the cooling liquid between the upper and the lower chambers includes passing the cooling liquid from the upper chamber to the lower chamber through a single passageway of the one or more passageways. (Claim 19)

VIII. SPECIFIC GROUNDS FOR PETITION

A. GROUND 1: Claims 1, 3-11, 13, and 17-19 are rendered obvious over the combination of Batchelder and Shin.

The obviousness inquiry evaluates “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). The analysis is a flexible one, accounting for “the inferences and creative steps that a person of ordinary skill in the art would employ.” *Id.* Moreover, “it is well-established that a determination of obviousness based on teachings from multiple references does not require an actual, physical substitution of elements.” *In re Mouttet*, 686 F.3d 1322, 1332 (Fed. Cir. 2012). Instead, the relevant question is “what the combined teachings of the

references would have suggested to those having ordinary skill in the art.”

Id. at 1333.

1. Batchelder in view of Shin discloses or teaches each limitation of claim 1.

[1-PRE] “A cooling system for a computer system processing unit, comprising:”

Batchelder discloses or teaches that “[t]he primary objective of this invention is to provide a low cost high reliability heat exchange apparatus that incorporates a composite substrate containing flow channels and a heat transfer fluid, providing low thermal resistance cooling to high density sources.” (Ex-1006, 2:40-45; *see also id.* at 1:5-10 (discussing “our ability to get that waste heat out of semiconductor circuits”).) Shin similarly discloses or teaches that “[t]he heat generating element 1, such as an LSI chip, is installed on a wiring board 2, which is a motherboard” in a computer system. (Ex-1007, [0024].) For these reasons and as explained below with respect to the remaining limitations, Batchelder in view of Shin teaches the preamble. (Ex-1003, ¶39.)

[1-a] “an integrated element including a heat exchanging interface, a reservoir, and a pump,”

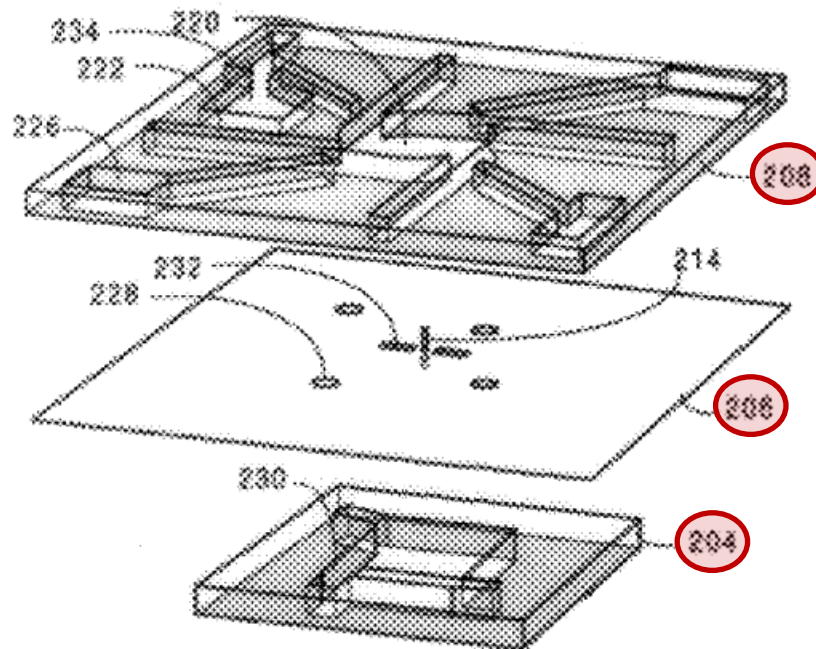
Batchelder discloses or teaches “an integrated element including a heat exchanging interface, a reservoir, and a pump.” Batchelder’s heat sink assembly 240 (Ex-1006, 8:4-12) discloses or teaches this limitation, as shown below:



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“rotatable impeller 54” (Ex-1006, 7:48-51, 8:14-67, FIG. 9)), and a reservoir included in, *e.g.*, the “active spreader plate” 20 (Ex-1006, 7:23-24, FIG. 2). The active spreader plate of Batchelder discloses or teaches a “reservoir” that is a *single* receptacle defining a flow path and configured to circulate a cooling liquid therethrough. (Ex-1003, ¶40.) This active spreader plate is described as a “geometry” (Ex-1006, 1:65) that can take various shapes such as, for example, “a large hemispherical shell” (*id.*, at 3:49-51). Thus, this active spreader plate 20 is a single, unitary receptacle that defines a fluid flow path (60), *i.e.*, a “reservoir” as claimed by the ’362 patent. (*See* Ex-1003, ¶40; Ex-1006, 5:26-28.) This is because Batchelder discloses that “[t]he lower stamped plate (204), the medial sheet (206), the upper stamped plate (208), the channel forming sheet (210), and the top sheet (212) [in FIG. 7] are preferably formed from plastic” and “assembled with ... ultrasonic bonding, solvent bonding, or welding.” (*See* Ex-1003, ¶40; Ex-1006, 7:52-55, 8:4-8.) A POSITA would have understood that these plastic components, once combined together using “ultrasonic bonding, solvent bonding, or welding[,]” are fused together into a continuous, seamless “single receptacle defining a fluid flow path” that is a permanently unitary structure. (*See* Ex-1003, ¶40; Ex-1006, 8:8-12.) Batchelder further discloses that “those skilled in the art will recognize that the individual components of the active spreader plate could be molded, and that several of the described components can be functionally combined if the components are

molded.” (See Ex-1003, ¶40; Ex-1006, 8:8-12.) That is, a POSITA would have understood that, for example, the lower stamped plate (204), the medial sheet (206), and the upper stamped plate (208) can be combined into a unitary “single receptacle” structure with injection molding, as shown below. (See Ex-1003, ¶40; Ex-1006, 8:8-12.)



(Ex-1006, FIG. 7 (excerpt) (shaded red circles added).) After the impeller 54 is placed in the coaxial cavities (220) (Ex-1006, 7:46-48), the channel forming sheet (210) and the top sheet (212) in FIG. 7 can be further combined with this “single receptacle” using “ultrasonic bonding, solvent bonding, or welding” to fuse all of

them together into a continuous, seamless, and permanently unitary structure that, as a whole, can be the “reservoir.” (*See* Ex-1003, ¶40; Ex-1006, 8:8-12.)

Figure 2 of Batchelder shows another embodiment of the active spreader plate 20. The following annotated version of FIG. 2 illustrates the claimed “reservoir” contained in the active spreader plate 20 outlined by the red box:

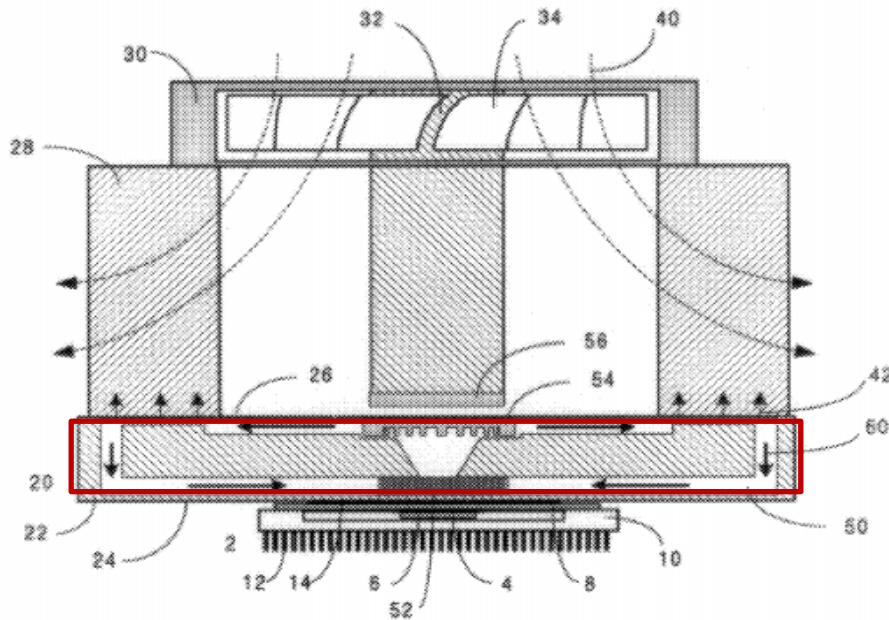


FIG.2

(Ex-1006, FIG. 2 (red box added).) A POSITA would have understood that the portion of the active spreader plate 20 outlined by the read box above can be made into a unitary, one-piece “single receptacle” structure with injection molding, analogous to the lower stamped plate (204), the medial sheet (206), and the upper

stamped plate (208) that can be “functionally combined” in FIG. 7 discussed above (see Ex-1003, ¶41; Ex-1006, 8:8-12.), as shown below:

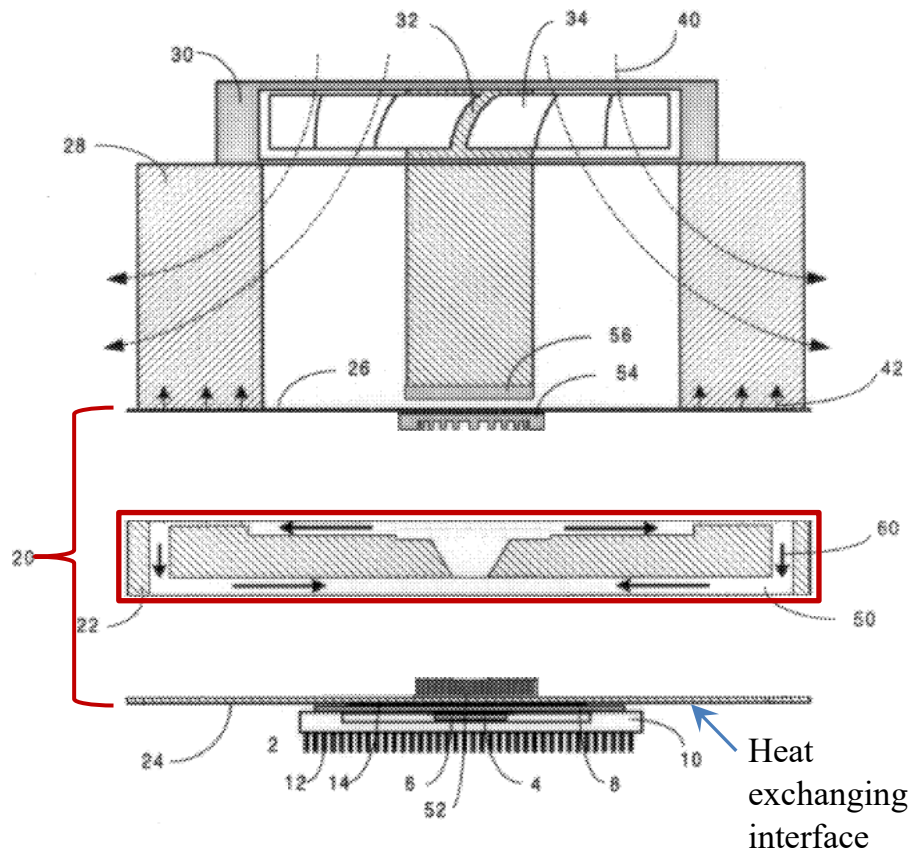


FIG. 2

(Ex-1006 (FIG. 2 (modified).) Analogous to Figure 7, the top sheet having a top surface 26 in Figure 2 can be further combined with this “single receptacle” using “ultrasonic bonding, solvent bonding, or welding” to fuse them together into a continuous, seamless, and permanently unitary structure that, as a whole, can be

the “reservoir.” The lower sheet having a bottom surface 24, *e.g.*, can be a heat exchanging interface. (Ex-1003, ¶41.)

[1-b] “wherein the reservoir is configured to receive a cooling liquid from outside the reservoir through an inlet and pass the cooling liquid to the outside through an outlet,”

This limitation relates to two other limitations in claim 1 below, which are addressed here together:

- [1-h] “a heat radiator spaced apart from the integrated element, the heat radiator being fluidly coupled to the outlet and the inlet of the reservoir, the heat radiator being configured to circulate the cooling liquid therethrough and exhaust heat from the cooling liquid;” and
- [1-i] “a fan configured to direct air through the heat radiator, the fan being driven by a motor separate from the motor of the pump.”

Batchelder does not expressly disclose or teaches these limitations, but Shin does. Specifically, Shin discloses or teaches a radiator (e.g., heat exchange section comprising heat exchangers 27, 28, and 29, as shown in FIG. 3) horizontally spaced apart from and fluidly coupled to an “integral structure”¹ via hoses 13 and 16 (inlet

¹ Shin discloses or teaches a “pump [that] is secured to the top part of [a] liquid cooled heat sink, forming a structure that allows the pump and liquid cooled heat sink to be handled as *an integral structure*” horizontally situated relative to the orientation of the heat generating element 1. (Ex-1007, [0008], [0012], FIGS. 1, 3.)

and outlet of the integrated structure, respectively), as shown in annotated FIGS. 1 and 3 below:

FIG. 1

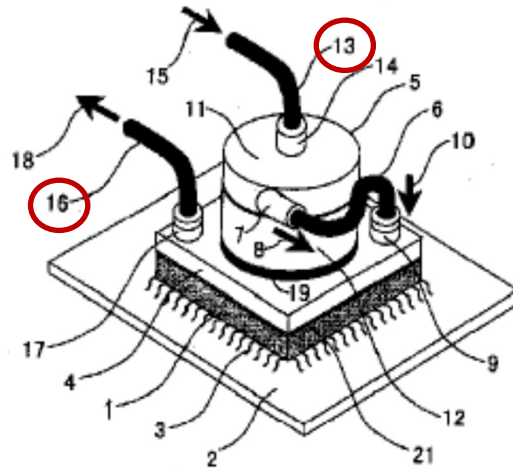
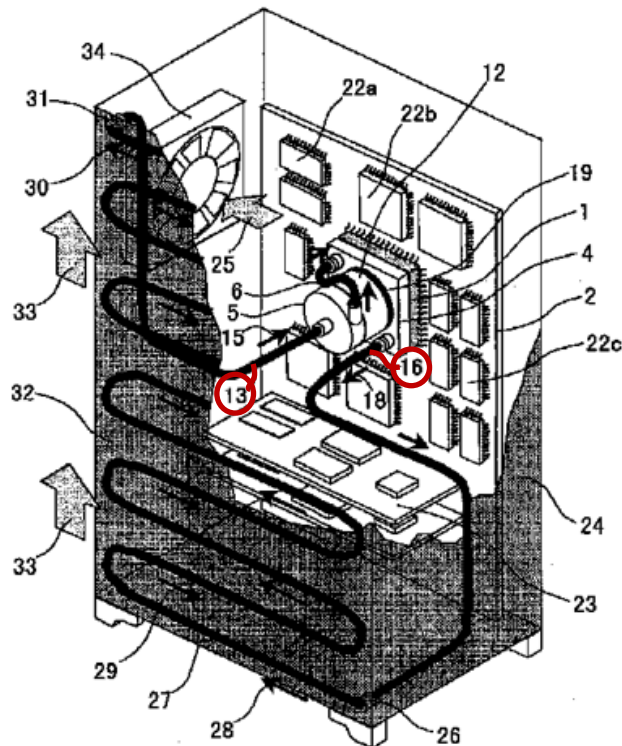


FIG. 3



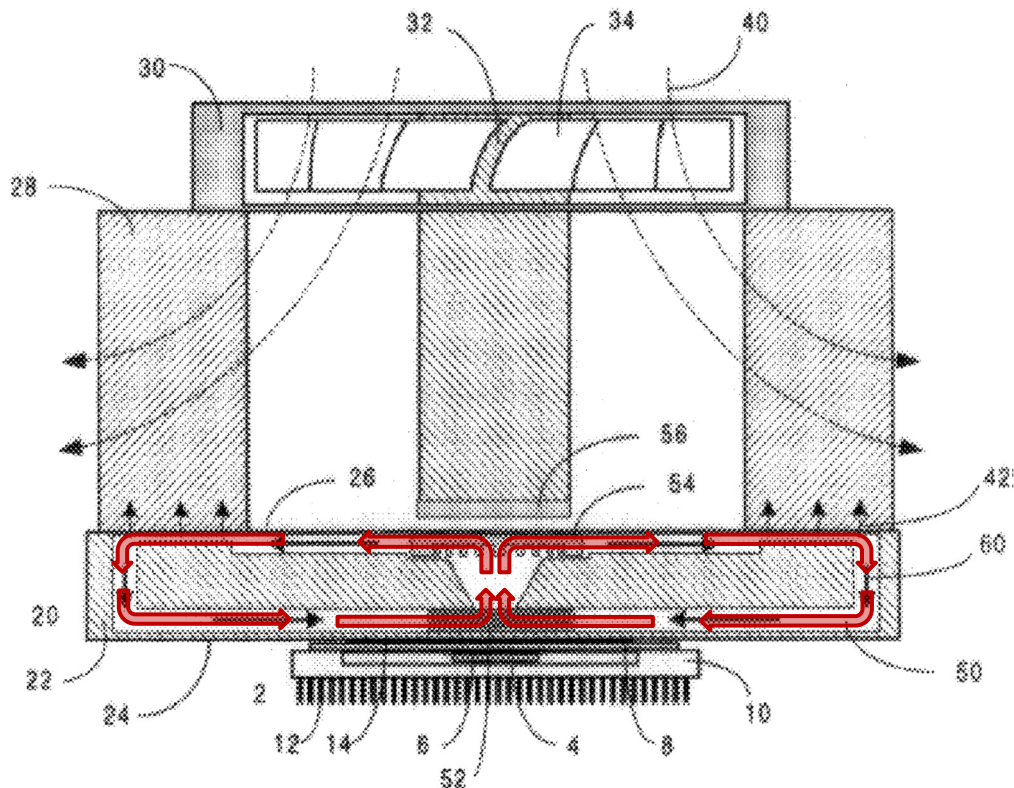
(Ex-1007, FIGS. 1 and 3; Ex-1003, ¶¶43.) In describing the embodiment of FIG. 3,

Shin states:

“Liquid coolant which has been heated in the liquid cooled heat sink 4 flows through hose 16, as shown by 18, which is connected via a connecting coupler 26 to a heat exchanger 27 installed on a side panel 32 of the case. In the present embodiment example, the pipes of the heat exchanger 27 are installed in thermal contact with the side panel 32, and the liquid coolant flows upward while snaking through the inside of the heat exchanger as shown by 28 and 29. The heat of the liquid coolant spreads through thermal conduction to the entirety of the side panel 32 and is then released with the aid of the cooling air 25 provided by the fan 34 and air flow 33 provided by natural convection around the electronic equipment case.”

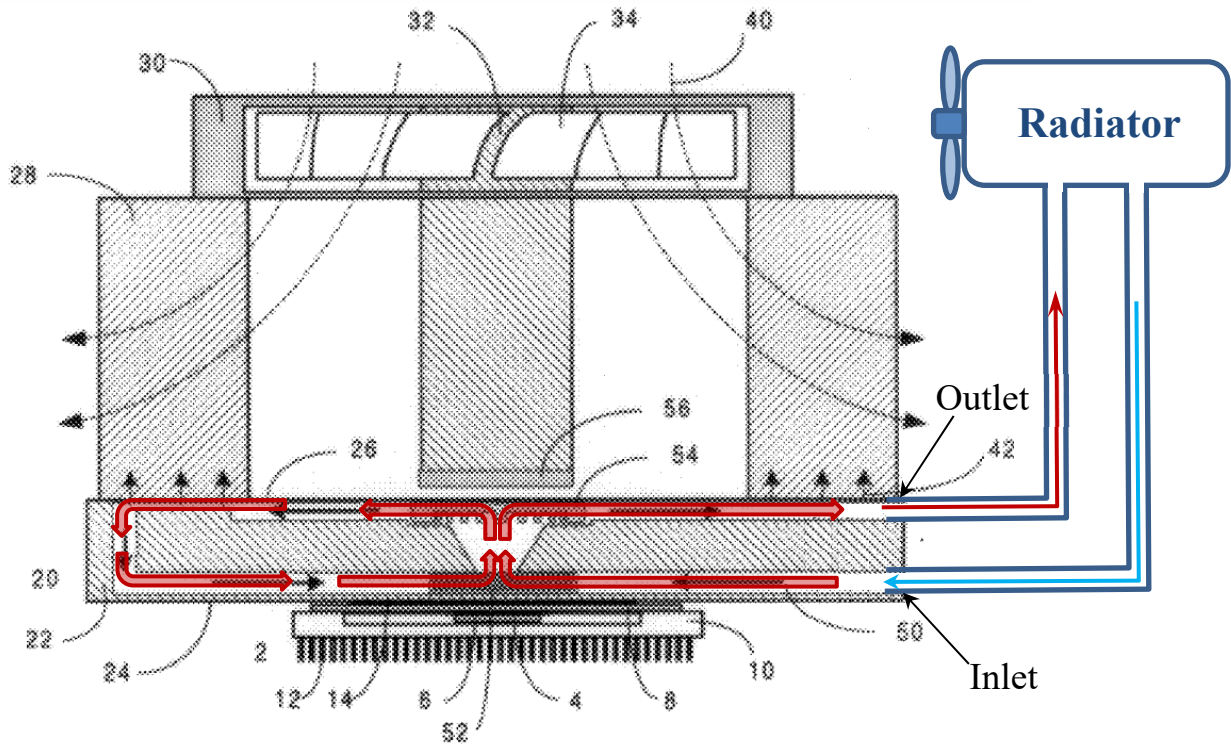
(Ex-1007, [0025]; *see also id.* at [0023].) “The cooled liquid coolant flows as shown by 30, and is connected to the return side hose 13 via connecting coupler 31 and returns to the pump 5 as shown by 15, and is again pressurized and supplied to the liquid cooled heat sink 4.” (*Id.* at [0026]; *see also id.* at [0027] (“As an example of the method of constructing the side panel 32 and heat exchanger 27, there is the method whereby the side panel 32 is fashioned from a metal material such as aluminum, magnesium or steel, the pipes of the heat exchanger are also fashioned from metal material, and the two are connected through metal joining, such as brazing or soldering, or by using a thermally conductive adhesive, or the like. In this case, the thermal conductivity can be improved ...”).)

It would have been obvious to connect Batchelder's heat spreader plate to a radiator, a well-known component used to transfer thermal energy (e.g., heat) from one medium to another, like the one taught in Shin. (Ex-1003, ¶44.) As the cooling liquid in the lower chamber heats up, a POSITA would have been motivated to use an external radiator to help further cool the heated cooling liquid, which is a conventional technique known to a POSITA, before the cooling liquid returns to the pump. (*Id.*) In particular, Batchelder's Figure 2 show two looped flow paths:



For example, a POSITA would have known how to, and would have been motivated to, modify one of the two looped flow paths in Batchelder's Figure 2 in view of Shin

to connect Batchelder's "reservoir" to an external radiator and a fan horizontally spaced apart from the reservoir (as those in Shin) as follows:



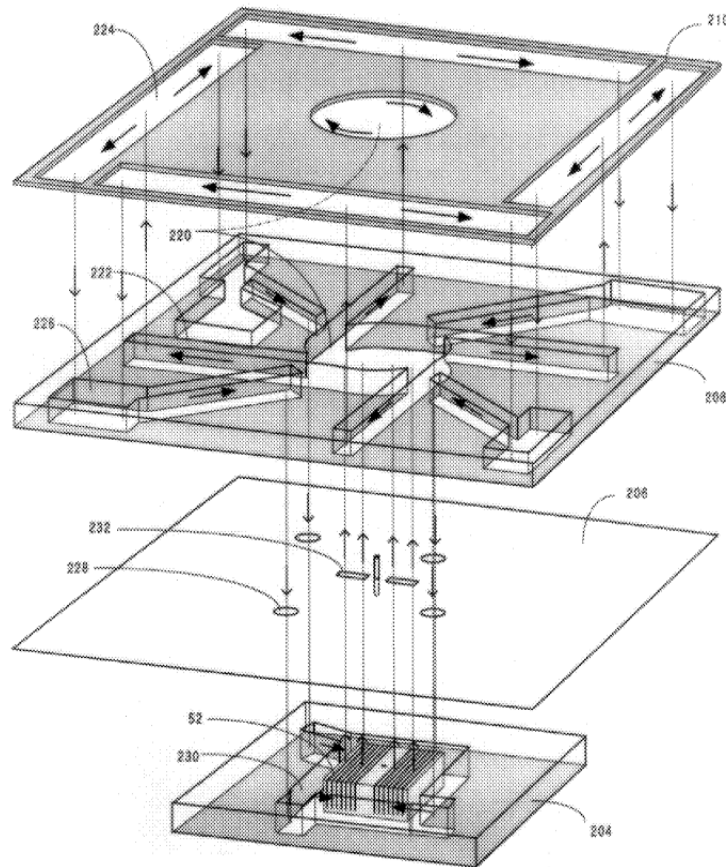
(Ex-1003, ¶45.) A POSITA would have understood that the heat spreader plate 20 in Batchelder and the "integrated structure" in Shin are analogous to each other. Thus, a POSITA would have been motivated to connect Shin's external radiator with a fan to Batchelder's heat spreader plate 20. (*Id.*, ¶46.) As can be seen above, the modified Batchelder device in view of Shin with an external radiator teaches "the reservoir is configured to receive a cooling liquid from outside the reservoir through an inlet and pass the cooling liquid to the outside through an outlet." (*Id.*)

A POSITA would have been motivated to combine Shin with Batchelder to further increase heat management efficiency by using an external radiator that cools

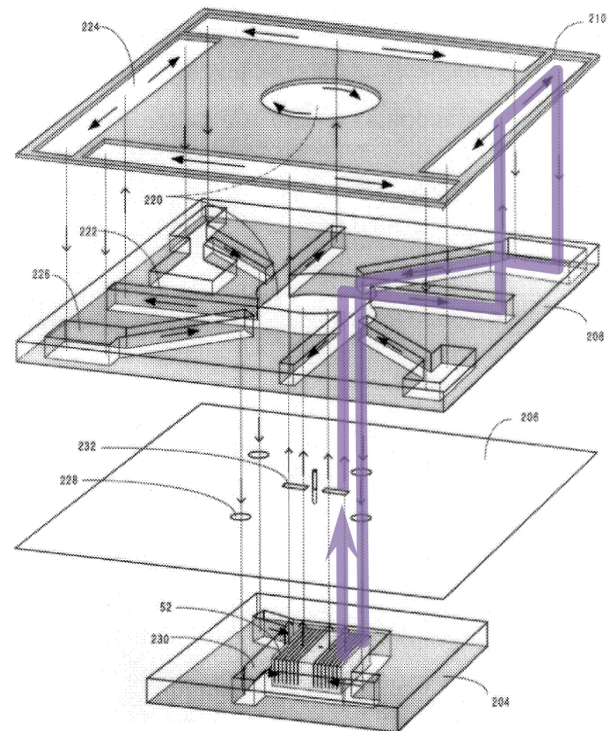
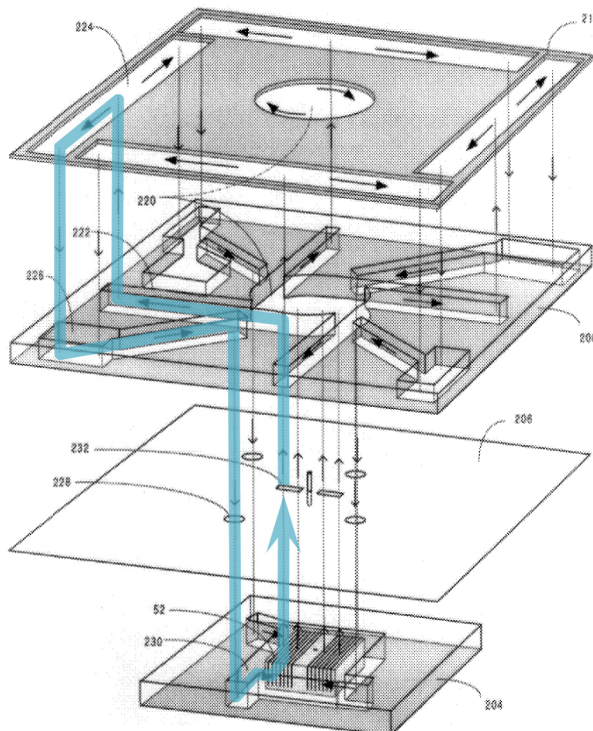
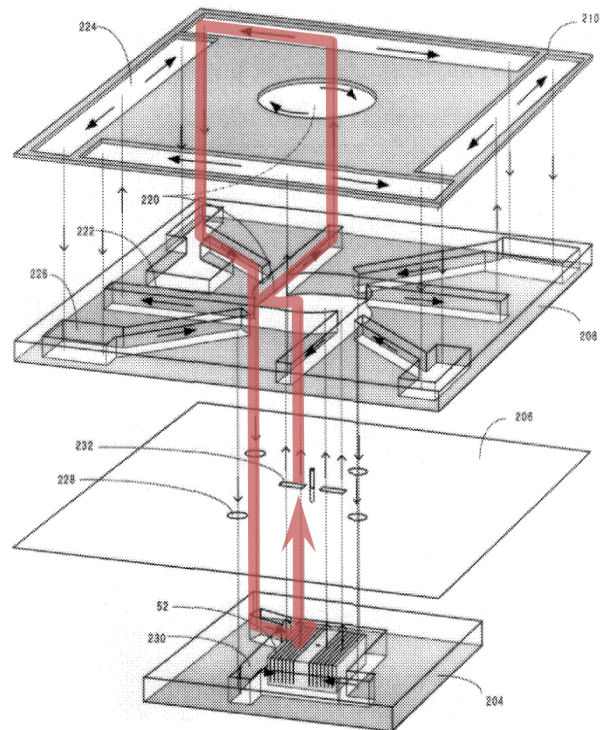
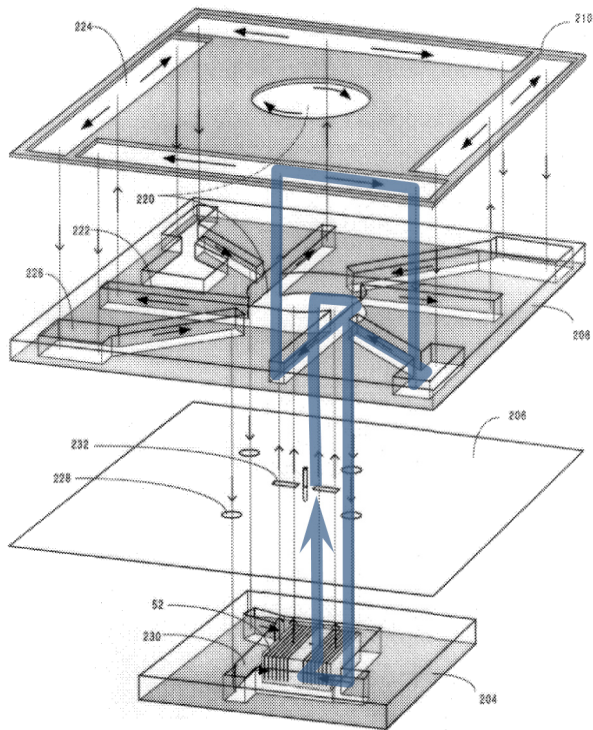
the heated cooling liquid after “snaking through the inside of the heat exchanger as shown by 28 and 29.” (Ex-1007, [0025].) This is because the technique allows heat to more efficiently escape the system. (Ex-1003, ¶47.) Moreover, Shin teaches coupling the radiator to the reservoir to circulate liquid away, to space it apart from the reservoir to divert heat away from the reservoir, and then to circulate the *cooled* cooling liquid back to the reservoir. Adding a radiator to Batchelder would have been an obvious modification to improve Batchelder’s objective of cooling electronic components. (Ex-1006, 2:46-50; Ex-1003, ¶47.)

A POSITA would have also been motivated to modify Batchelder in view of Shin to add an external radiator when the heat load is too high for Batchelder’s existing heat spreader plate. (Ex-1003, ¶48.) Because there is limited real estate near a heat-generating component for dissipating heat, and depending on how much heat it dissipates, the heat spreader plate by itself may not be sufficient to handle the heat. (*Id.*) The active heat spreader plate used by Batchelder would eventually be insufficient to extract the heat as the heat-generating components continued to advance and produce more heat, as suggested by Batchelder. (Ex-1006, 1:34-38 (“The thermal power density emerging from the chip will be so high in ten years than even copper or silver spreader plates will not be adequate.”)) Indeed, the top sheet (212) in Batchelder is “preferably formed from plastic” to be “assembled with [the rest of the active heat spreader plate’s plastic structure with] ultrasonic bonding,

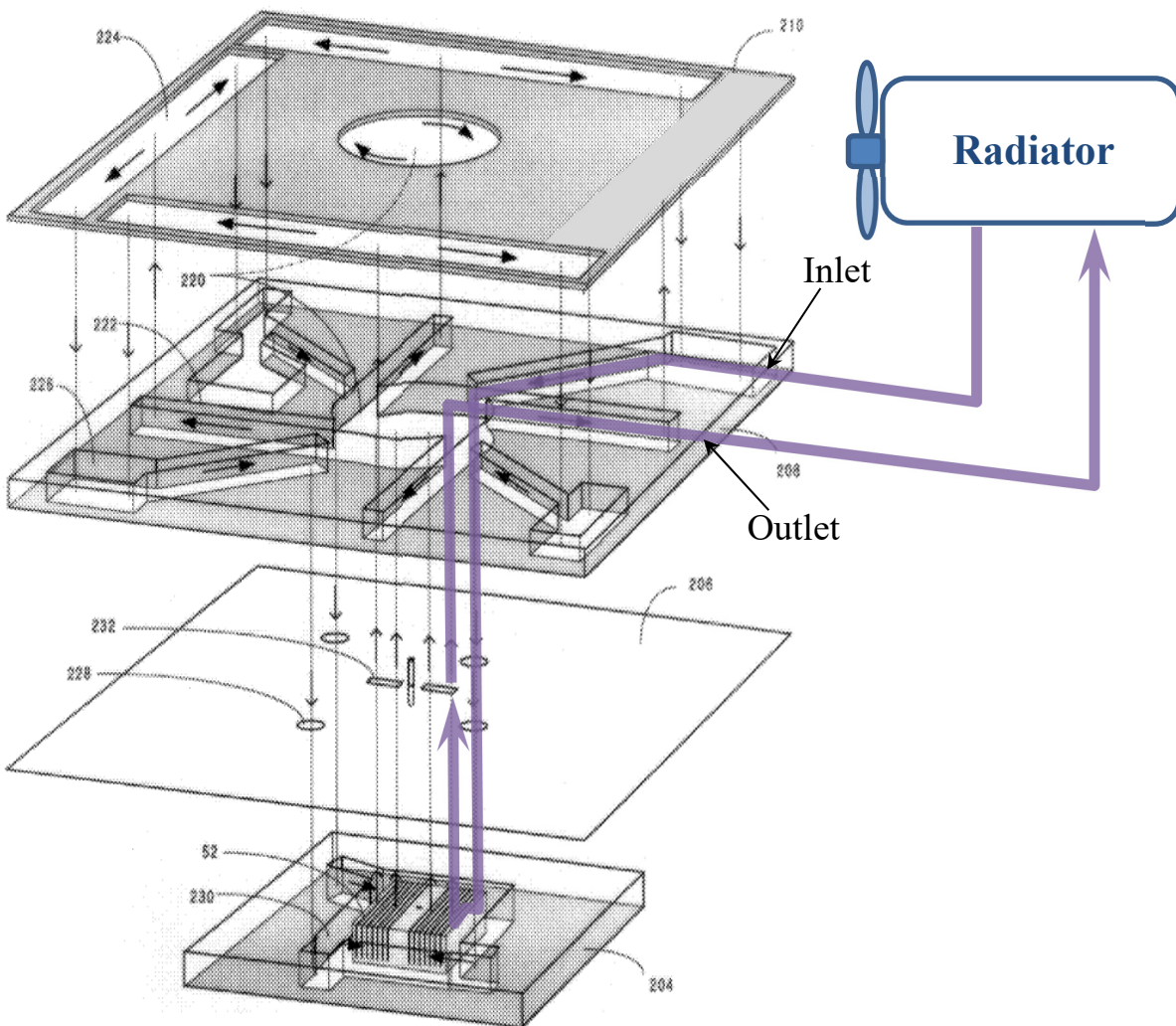
solvent bonding, or welding.” (See Ex-1003, ¶48; Ex-1006, 7:52-55, 8:4-8.) A POSITA would have understood that the heat dissipation through the plastic top sheet would eventually be insufficient, which is a further motivation to add an external radiator with a fan such as those in Shin to add heat dissipation in FIGS. 2, 7, and 8 of Batchelder. (Ex-1003, ¶48.) FIG. 8 shows the flow paths of the embodiment in FIG. 7 in detail, as follows:



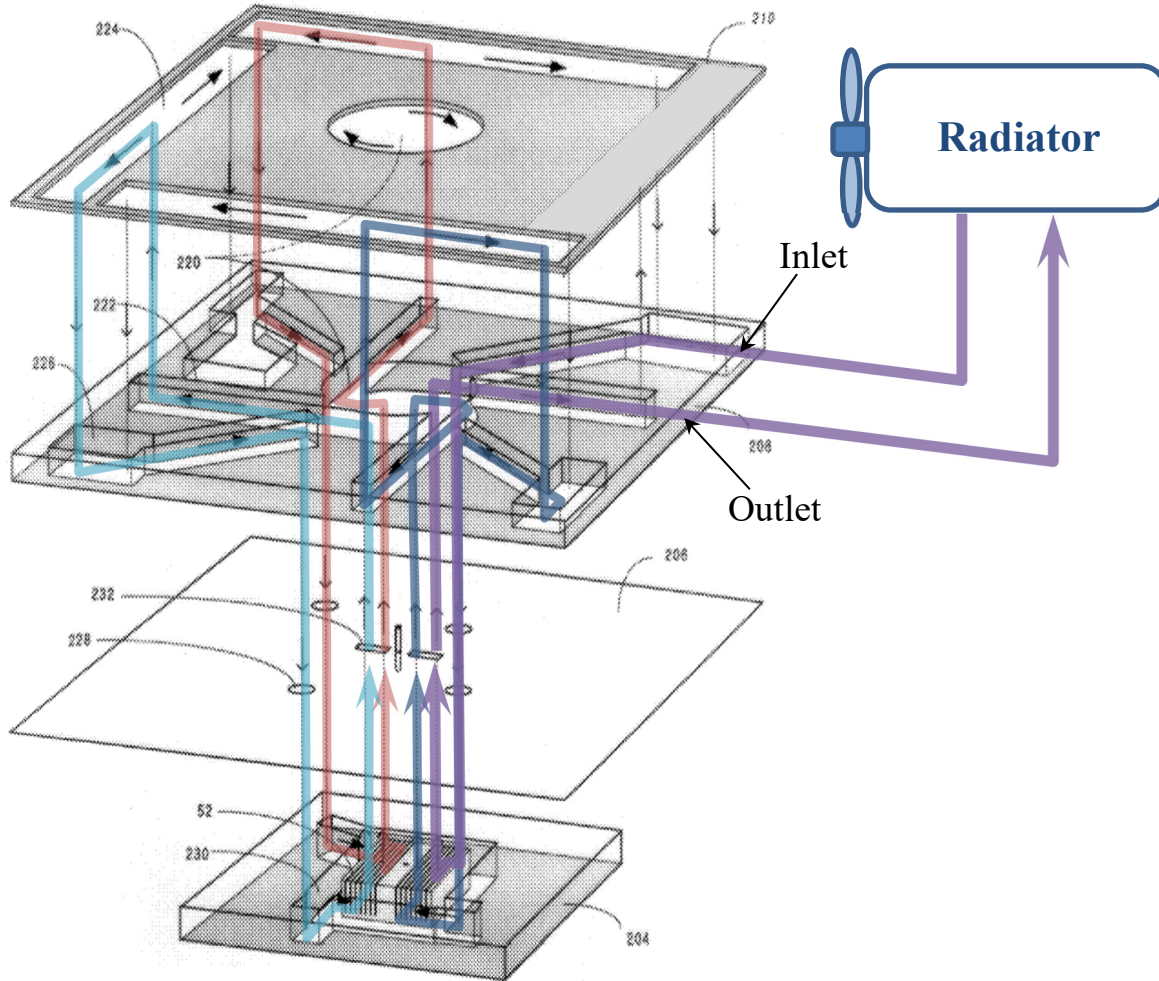
(Ex-1006, FIG. 8.) A POSITA would have understood that there are at least four exemplary looped flow paths in FIG. 8 above, as shown below:



(Ex-1003, ¶49.) Analogous to the discussion above regarding Figure 2, for example, a POSITA would have known how to, and would have been motivated to, modify one of the four exemplary looped flow paths in Batchelder's Figure 8 in view of Shin to connect Batchelder's "reservoir" to an external radiator and a fan in Shin with a reasonable expectation of success as follows:



(Ex-1003, ¶50.) Adding the other three exemplary looped flow paths back, a POSITA would have understood the embodiment in FIG. 8 of Batchelder, as modified in view of Shin, to become the following system:



(Ex-1003, ¶51.)

Accordingly, a POSITA would have been motivated to modify Batchelder in view of Shin to incorporate a radiator into the embodiments in FIG. 2 and the embodiment in FIGS. 7 and 8, and would have had a reasonable expectation of

success in doing so.² (Ex-1003, ¶52.) Thus, Batchelder in view of Shin renders limitations [1-b], [1-h], and [1-i] obvious. (*Id.*, ¶53.)

² Contrary to Patent Owner’s prior arguments in IPR2020-00523 (Ex-1009, 354-POR at 40-41), Batchelder does not teach away from adding a radiator with a fan because of: (1) higher cost due to the added fan and radiator; or (2) lower reliability due to the need for hoses and couplings to connect the heat spreader plate to the radiator. Batchelder is silent concerning the use of an external radiator with a fan, and certainly does not provide “‘clear discouragement’ from implementing” a radiator with a fan. *In re Ethicon, Inc.*, 844 F.3d 1344, 1351 (Fed. Cir. 2017). Batchelder describes a disadvantage of hoses or couplings in the context of adding an external pump (not a radiator). And, even in that context, it does not “clearly discourage” hoses or couplings or indicate they should be avoided. Ultimately, a POSITA would have understood that any cost or reliability concerns associated with adding a remote radiator with a fan (which can often be an existing case fan that does not cost extra) is outweighed by the cost of failure of the heat generating component if its heat cannot be handled by Batchelder’s active heat spreader plate alone. (Ex-1003, ¶¶54-56.) Indeed, the Board found that “Batchelder expresses a preference for the simpler design without a radiator but does not teach away from using one.” (Ex-1011, 354-FWD at 18 (emphasis added).) Specifically, the Board concluded that “skilled artisans would have had adequate reason to modify Batchelder” in view of Shin to include the radiator. (*Id.* at 18-19.)

[1-c] “the reservoir including an upper chamber and a lower chamber, the upper chamber and the lower chamber being vertically displaced chambers”

Batchelder discloses or teaches this limitation as shown in the following annotated figures:

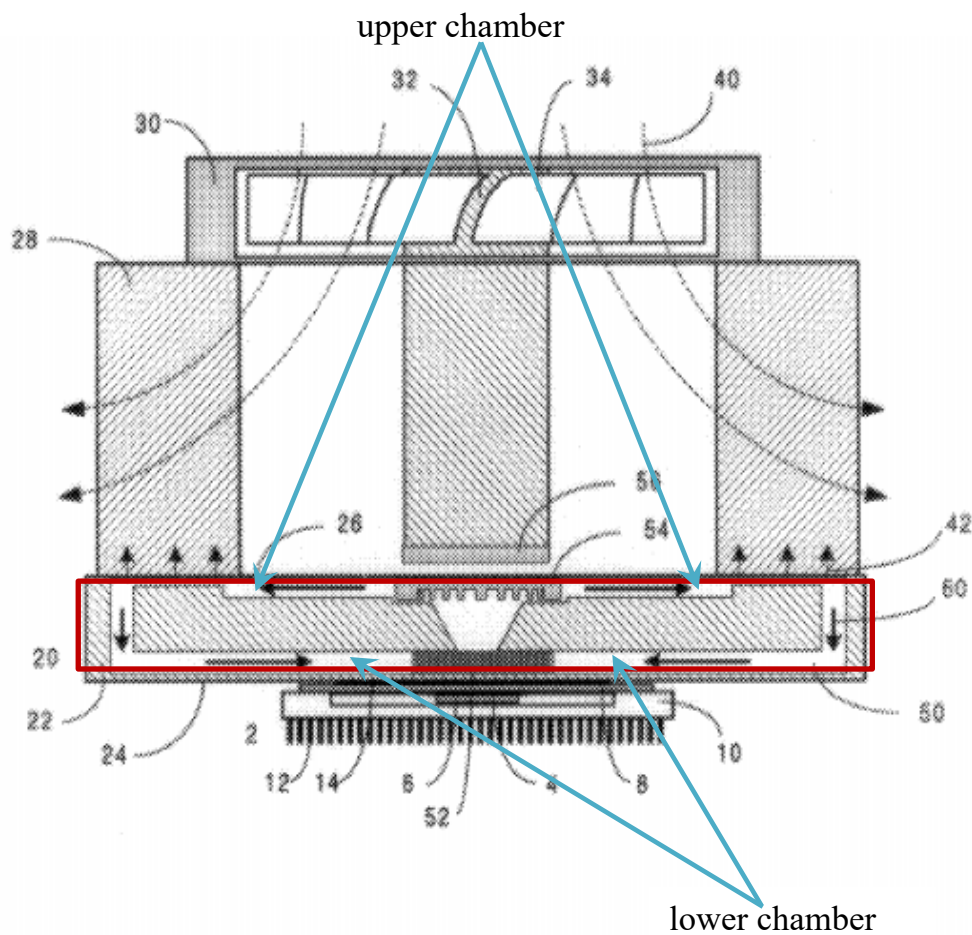
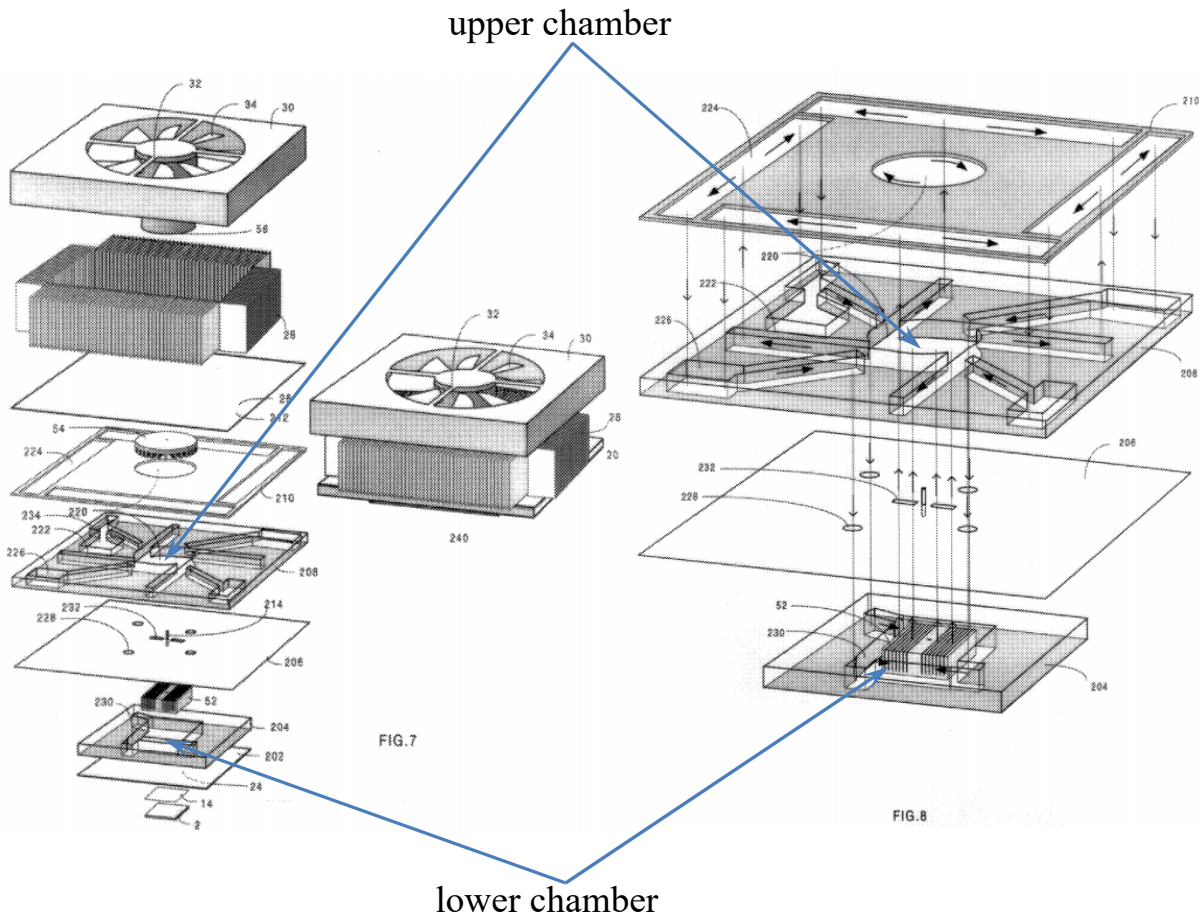
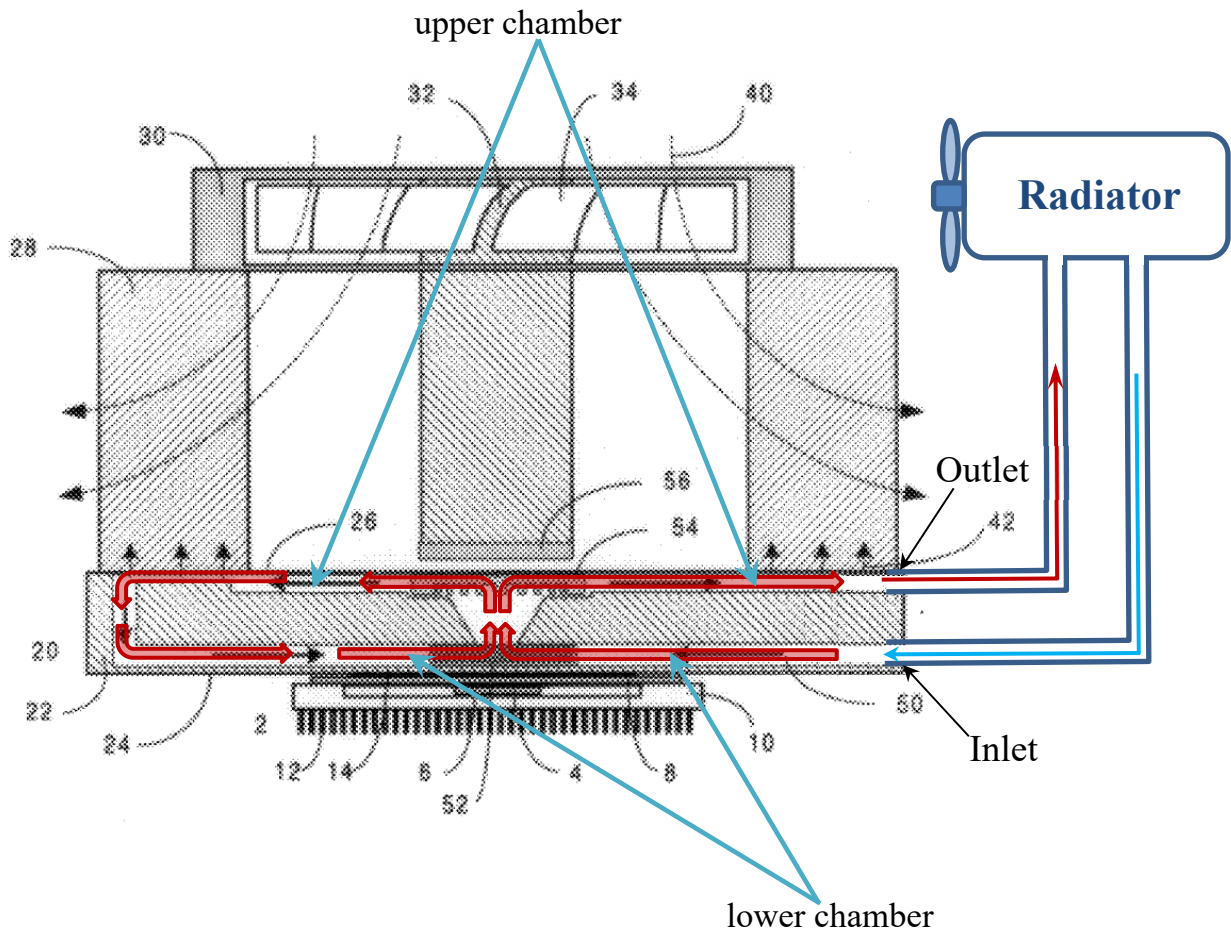


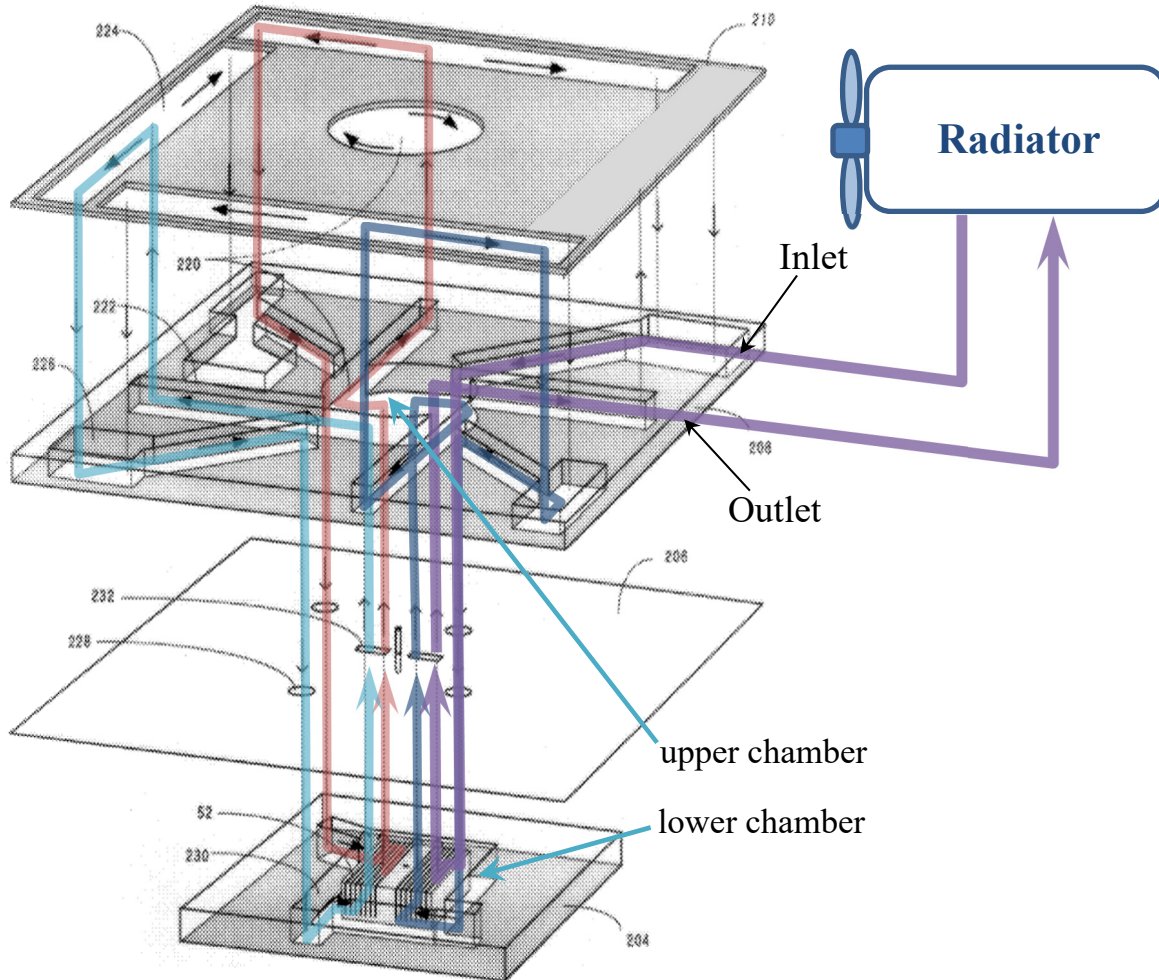
FIG. 2



(Ex-1006, FIGS. 2, 7, 8.) As discussed above, Batchelder discloses or teaches a reservoir included in the active spreader plate 20, which is a single receptacle that includes an upper chamber (or compartment) below the top surface 26 in FIG. 2, or the center space in the channel forming sheet 210 and the upper stamped plate 208 in FIGS. 7 and 8. Batchelder also discloses or teaches a lower chamber (or compartment) as the flow channels 50 above the lower surface 24 in FIG. 2, or the center space in the lower stamped plate 204 in FIGS. 7 and 8. The upper and lower chambers are vertically displaced and separated from each other by boundary walls, shown as the shaded middle region between the lower surface 24 and top surface 26

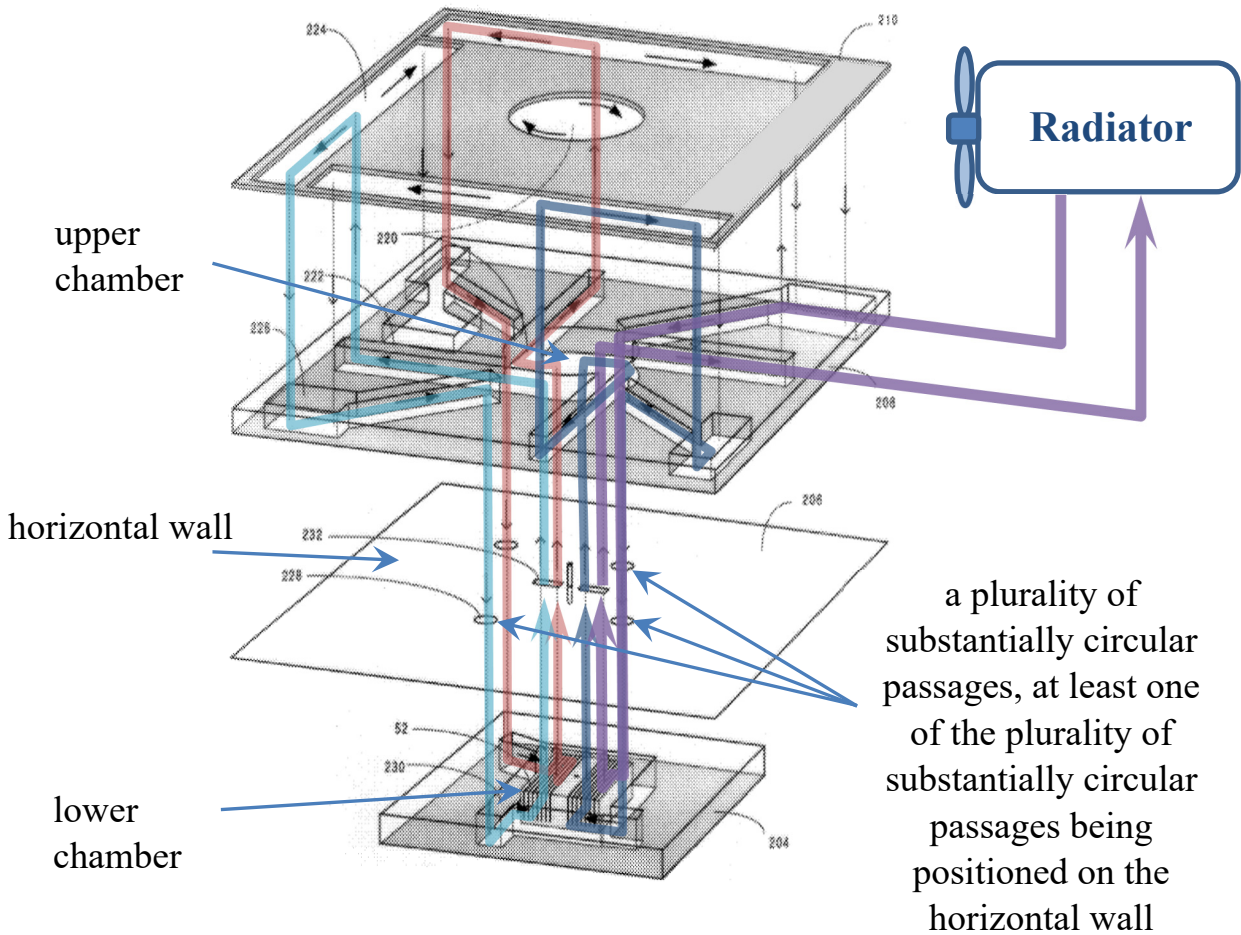
in FIG. 2, and as the medial sheet 206 in FIGS. 7 and 8. (Ex-1003, ¶59.) After the modification of Batchelder in view of Shin (reproduced again below), the disclosures and teachings by Batchelder of these limitations do not change, as shown below. Thus, Batchelder in view of Shin renders this limitation obvious. (*Id.*, ¶60.)





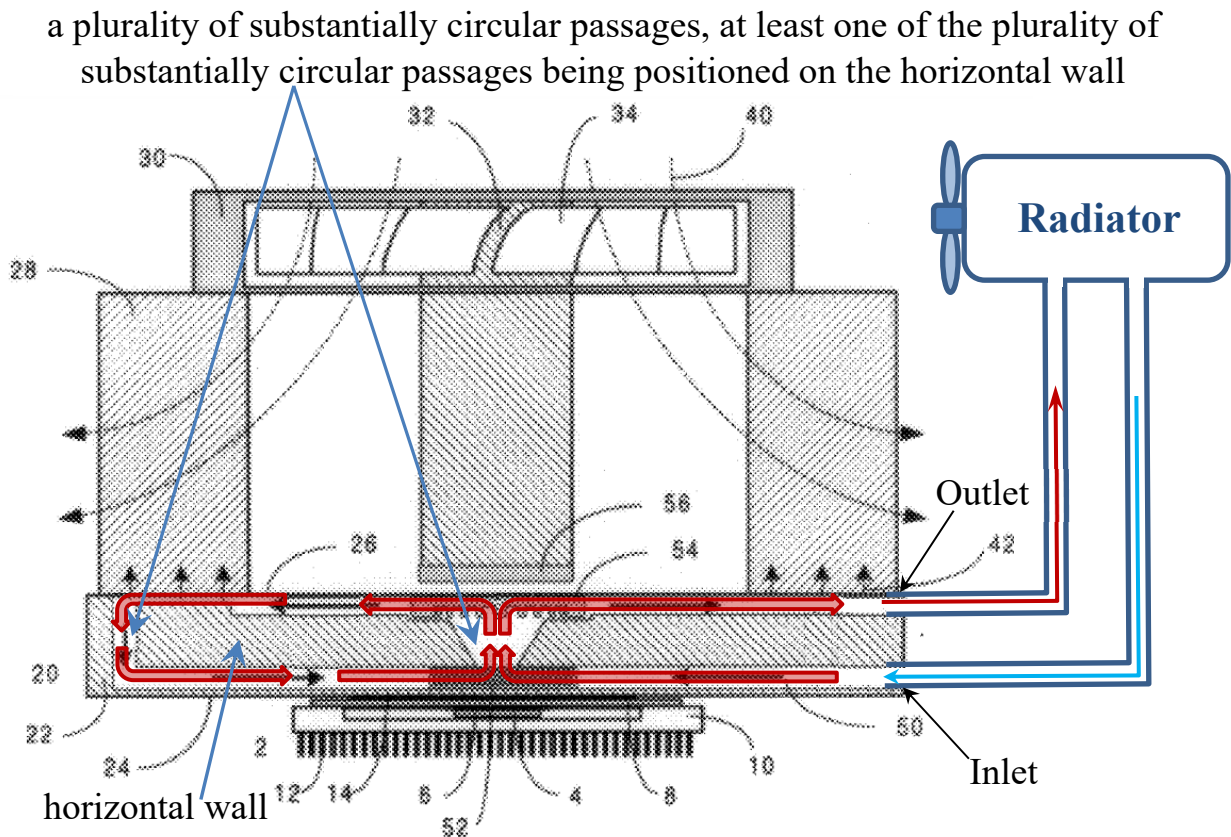
[1-d] “[the upper chamber and the lower chamber being vertically displaced chambers that are] separated from each other by at least a horizontal wall and fluidly coupled together by a plurality of substantially circular passages, at least one of the plurality of substantially circular passages being positioned on the horizontal wall,”

Batchelder discloses or teaches this limitation, as shown below:



As illustrated in the annotated Figure 8 (as modified in view of Shin) above, the upper chamber and the lower chamber are separated by a horizontal wall (*e.g.*, the medial sheet 206) that includes a plurality of substantially circular passages (*e.g.*, the holes 228). (Ex-1003, ¶62.) The upper and lower chambers are fluidly coupled together through these substantially circular passages, at least one of which is located on the horizontal wall. As can be further seen above, the upper chamber and the lower chamber of the modified Batchelder device in view of Shin are vertically displaced chambers that are separated from each other by at least a horizontal wall

and fluidly coupled together by a plurality of substantially circular passages, at least one of the plurality of substantially circular passages being positioned on the horizontal wall. (*Id.*) The modified system in Figure 2 of Batchelder in view of Shin similarly shows a horizontal wall:



(Ex-1003, ¶63.) A POSITA would have understood the two passages in the modified Figure 2 of Batchelder in view of Shin are substantially circular, with the one on the left shaped like a cylinder (🔲) and the one in the middle shaped like an upside-down, flat-headed cone (🔴). This is because they can be effectively made with drills, as a POSITA would have understood. (*Id.*, ¶64.) Thus, as can be seen above,

the upper chamber and the lower chamber of the modified Batchelder Figure 2 in view of Shin are vertically displaced chambers that are separated from each other by at least a horizontal wall and fluidly coupled together by a plurality of substantially circular passages, at least one of the plurality of substantially circular passages being positioned on the horizontal wall.

In sum, Batchelder in view of Shin renders this limitation obvious. (*Id.*, ¶65.)

[1-e] “a boundary wall of the lower chamber being formed by the heat exchanging interface;”

In Batchelder’s Figure 2, the heat exchanging interface with the lower surface 24 (which a POSITA would have understood is analogous to the bottom sheet 202 in FIG. 7) forms a boundary wall of the lower chamber, as can be seen below:

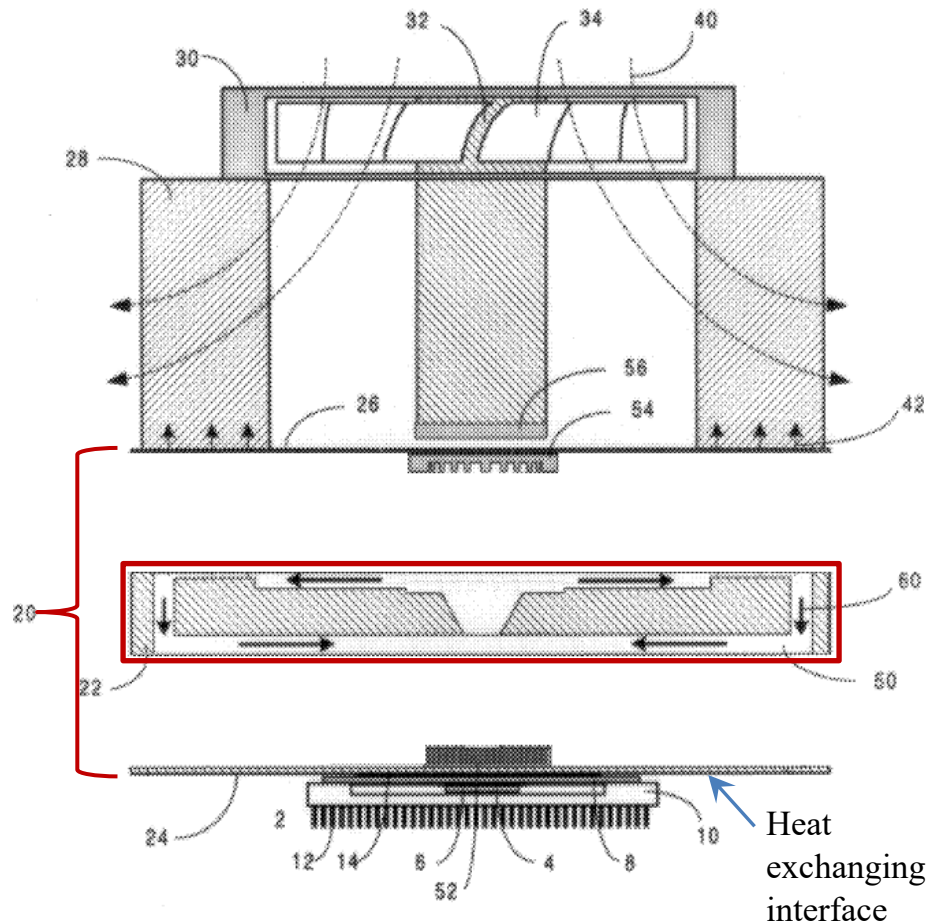
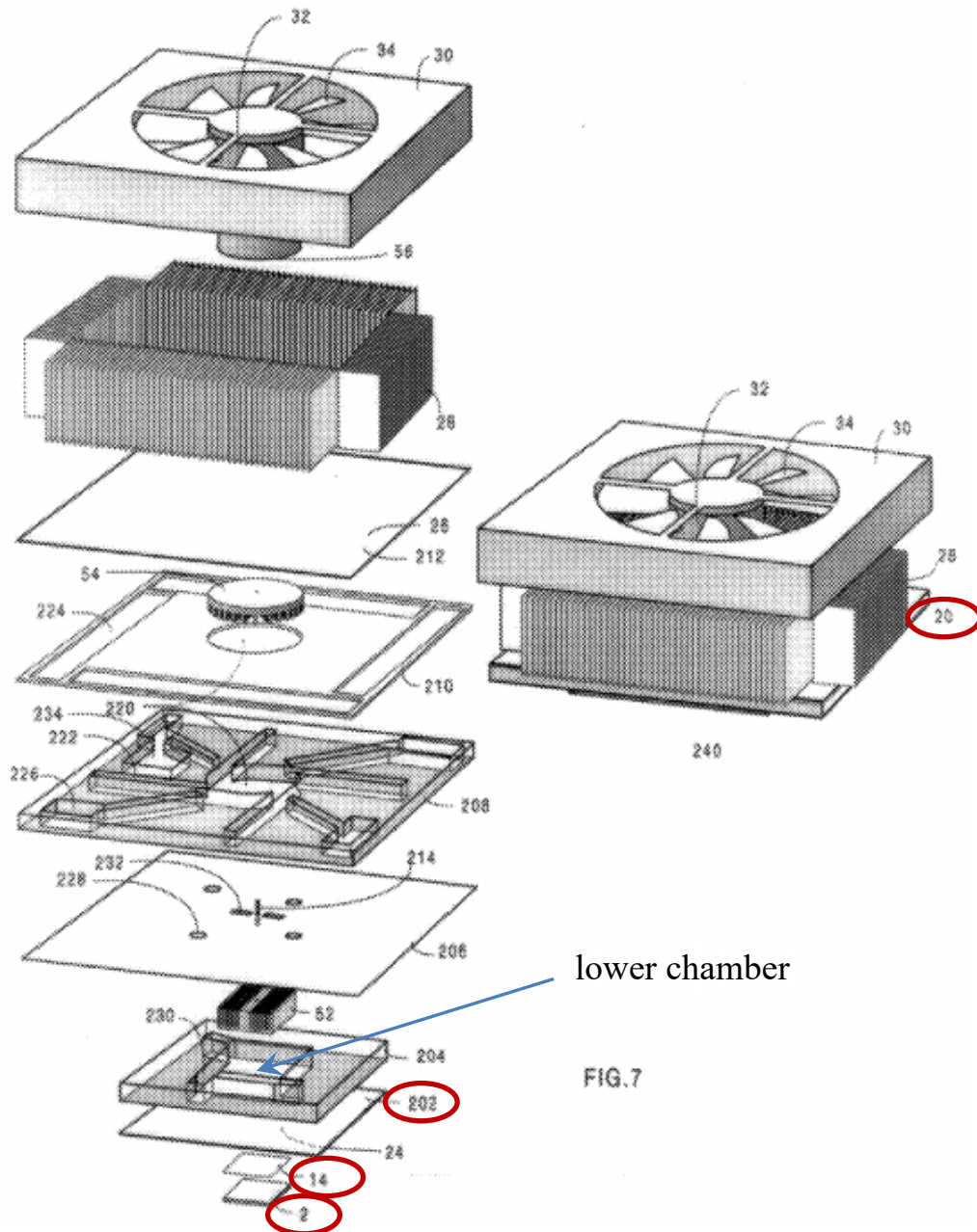


FIG. 2

(Ex-1006, FIG. 2 (modified and annotated); Ex-1003, ¶66.) This does not change in Batchelder's modified Figure 2 device in view of Shin, as would have been understood by a POSITA. (*Id.*) This limitation can also be illustrated in annotated FIG. 7 below, which also does not change in Batchelder's modified Figure 8 device in view of Shin, as a POSITA would have understood. (*Id.*, ¶67.) Thus, Batchelder in view of Shin renders this limitation obvious. (*Id.*, ¶68.)



[1-f] “the heat exchanging interface is adapted to provide separable thermal contact between the processing unit and the cooling liquid such that heat is dissipated from the processing unit to the cooling liquid as the cooling liquid passes through the lower chamber of the reservoir; and”

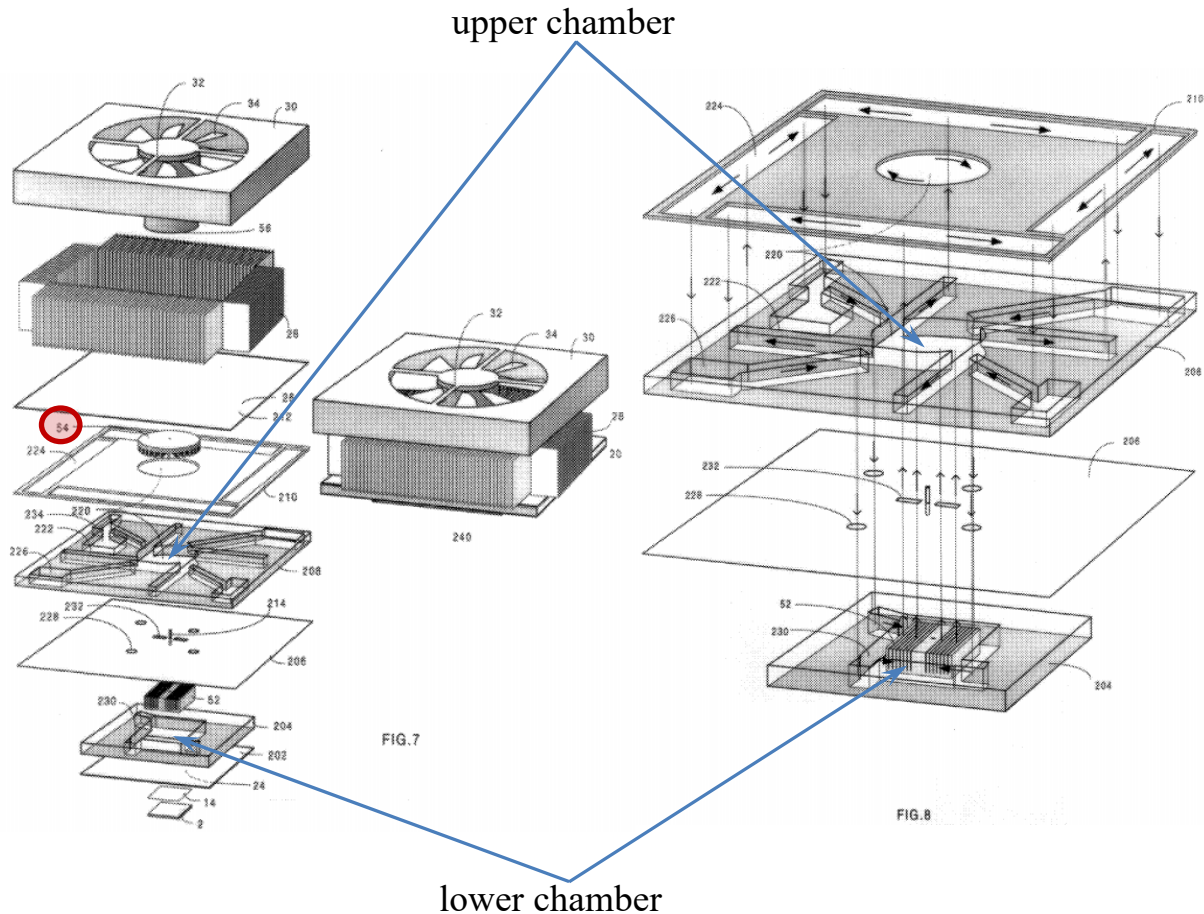
As can be seen above in the annotated FIG. 7 of Batchelder, the heat exchanging interface in Batchelder (e.g., the bottom sheet 202) is adapted to provide

separable thermal contact (via, e.g., the compliant thermal conductor and electrical insulator 14 that conducts heat from the heat source 2 to the heat spreader plate 20 (Ex-1006, 4:35-37)) between the processing unit (e.g., the heat source 2) and the cooling liquid in the lower chamber such that heat is dissipated from the processing unit (e.g., the heat source 2) to the cooling liquid as the cooling liquid passes through the lower chamber of the reservoir included in, e.g., the heat spreader plate 20. The compliant thermal conductor and electrical insulator 14 between the heat exchanging interface 202 and the processing unit 2 discloses or teaches that the thermal contact between the processing unit and the cooling liquid in the lower chamber is “separable.” (Ex-1003, ¶69.) Thus, Batchelder discloses or teaches this limitation. And in turn, Batchelder in view of Shin renders this limitation obvious. (*Id.*)

[1-g] the pump is adapted to direct the cooling liquid through the upper chamber and the lower chamber of the reservoir, the pump including a motor having a rotor, a stator and an impeller having a plurality of curved blades, the impeller being positioned within the reservoir;

Batchelder discloses or teaches this limitation. As can be seen in the annotated FIGS. 7 and 8 of Batchelder below, the pump (e.g., the fluid impeller 54, circled in red on the left in FIG. 7) is adapted to direct the cooling liquid through the upper chamber and the lower chamber of the reservoir included in, e.g., the heat spreader plate 20, as shown the modified FIG. 8 on the right (*see* [1-d] *supra*, explaining that openings 232 are substantially circulate passages). Reading Batchelder, a POSITA would have understood that the fluid impeller 54 is part of a pump with a motor that

includes a rotor and a stator, as discussed below (*see also* Ex-1003, ¶70 (citing Ex-1006, 3:20-23, 4:53-55, 5:11-13, 6:5-7, 9:22-10:53, FIG. 10)):



As disclosed and taught by Batchelder, different pumps can be used as the impeller 54 in the active spreader plate 20 in Figure 2. In the embodiment shown in Figure 2 of Batchelder, “the impeller (54) is a centripetal or centrifugal pump[.]” (Ex-1006, 5:26-32; Ex-1003, ¶71.) Batchelder also discloses that the “centripetal or centrifugal pump 300,” shown in the “lower left” corner of FIG. 9 below, is one of “several examples of fluid impellers that can effectively be used in an active spreader plate” (i.e., item 20 of FIG. 2) (Ex 1006, 8:14-15, 8:36-47):

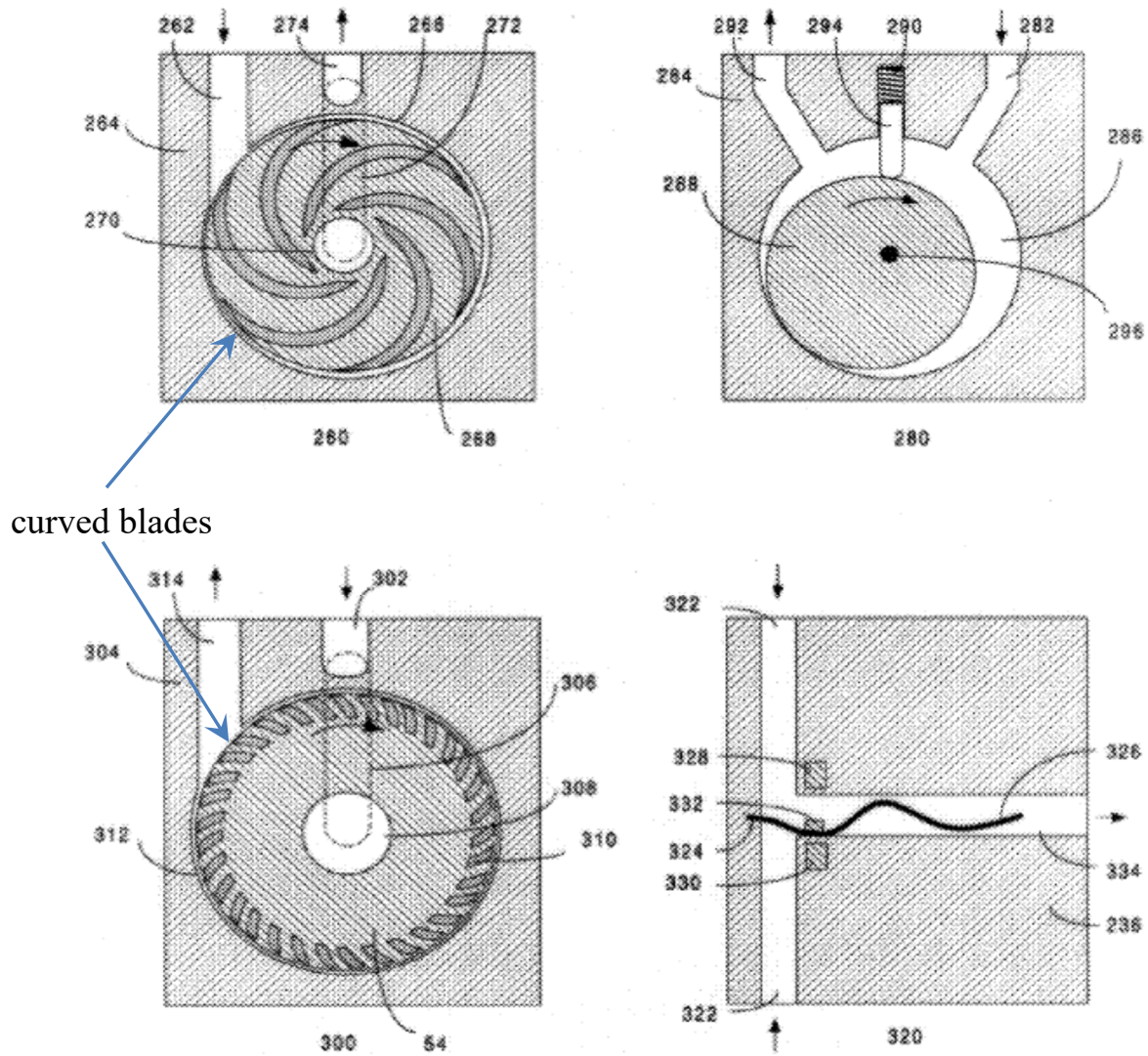
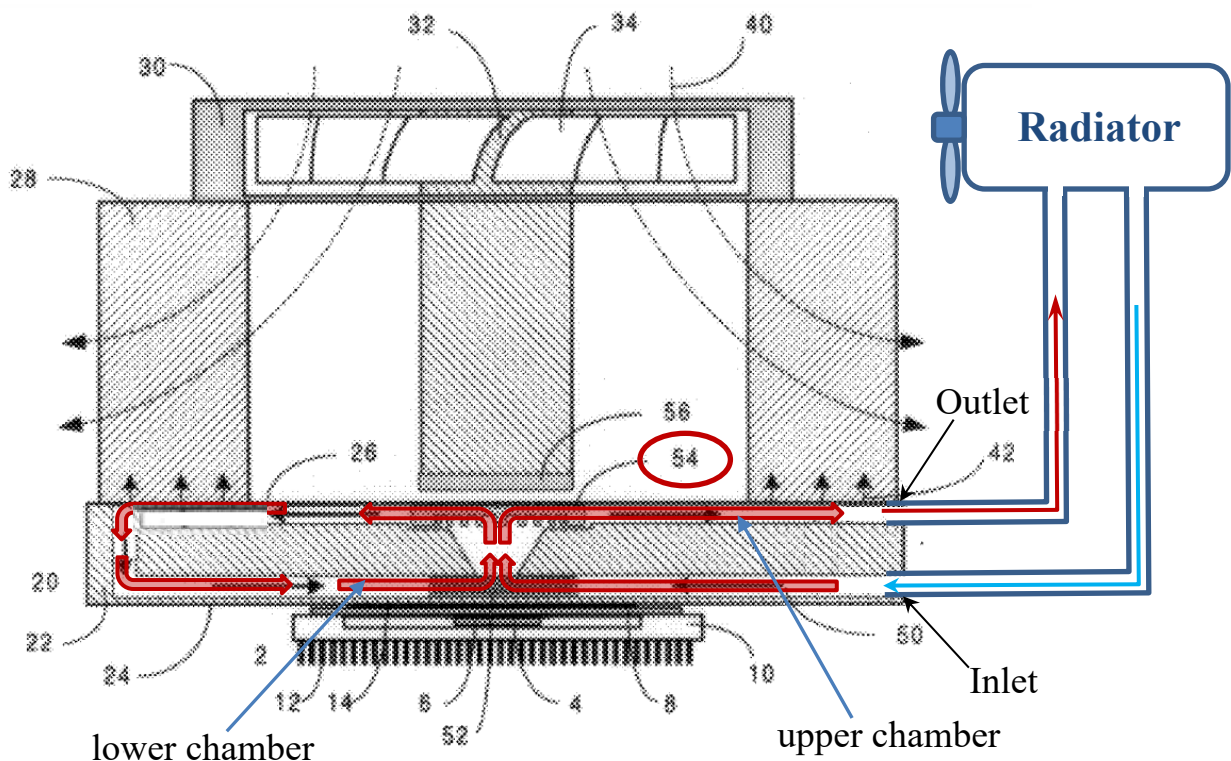
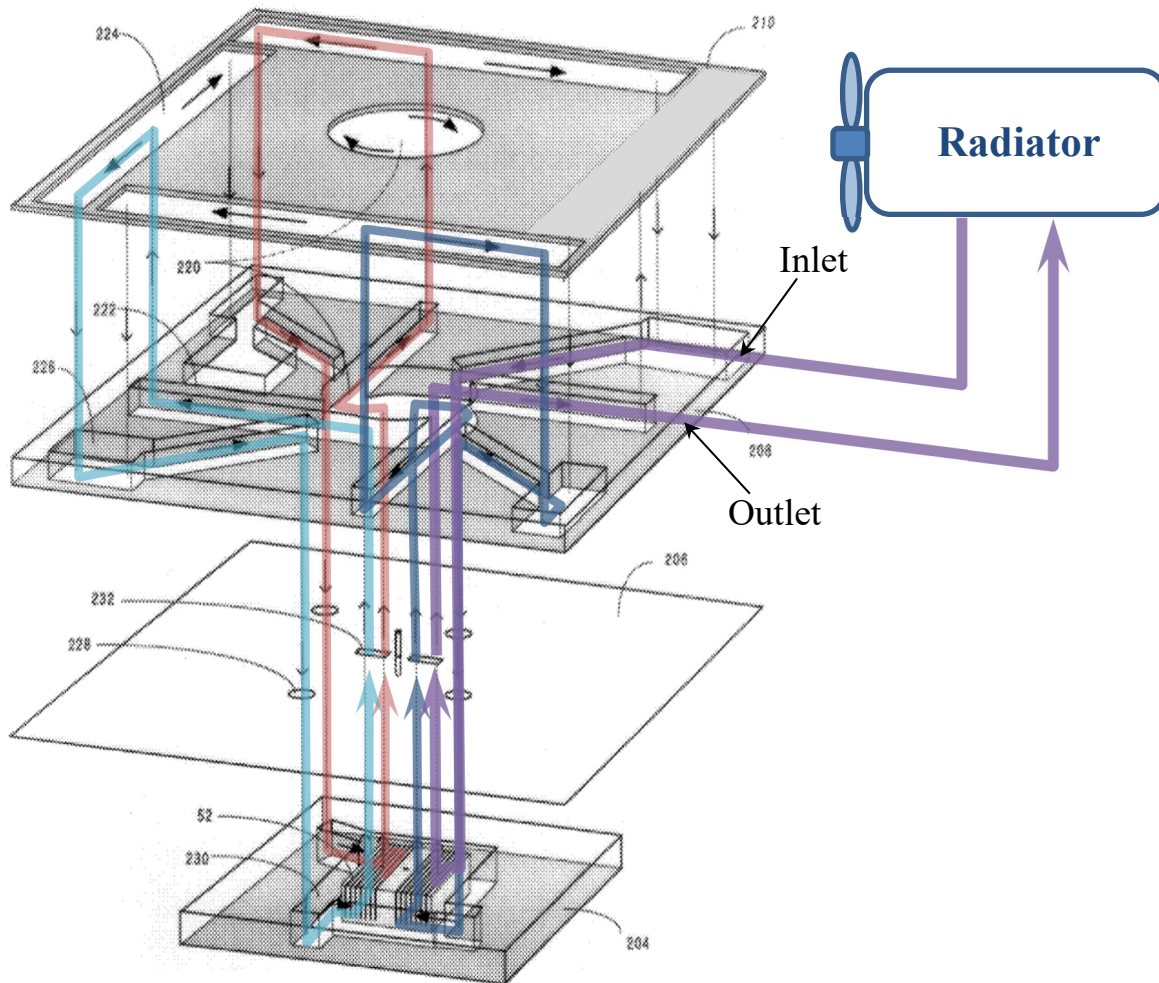


FIG. 9

As can be seen above and below, when either the “viscosity pump 260” (top left) or the “centripetal or centrifugal pump 300” (bottom left) is adopted for impeller 54 in the modified Batchelder device in view of Shin, the “rotatable impeller 54” has curved blades as claimed by the ’362 patent. (Ex-1006, 8:14-27, 8:36-47.) Batchelder discloses or teaches a rotor 268 in the viscosity pump 260 and a rotor 288 (i.e., element 54) in the centripetal or centrifugal pump 300. (*Id.*) Reading

Batchelder, a POSITA would have understood that the rotatable impeller 54 is driven by the magnetic field emanated from the magnet in the rotor 32 that is part of a motor. (*Id.*, 6:5-18; Ex-1003, ¶72.) A POSITA would have also understood that the motor includes a stator as well, which is the motor's stationary part that must be present for the motor to work. (Ex-1003, ¶72.)





(Ex-1003, ¶72.)

Thus, Batcheler in view of Shin teaches that the pump is adapted to direct the cooling liquid through the upper chamber and the lower chamber of the reservoir, with the pump including a motor having a rotor, a stator and an impeller having a plurality of curved blades, further with the impeller being positioned within the reservoir. That is, Batchelder in view of Shin renders this limitation obvious. (Ex-1003, ¶73.)

[1-h] a heat radiator spaced apart from the integrated element, the heat radiator being fluidly coupled to the outlet and the inlet of the reservoir, the heat radiator being configured to circulate the cooling liquid therethrough and exhaust heat from the cooling liquid; and

Batchelder in view of Shin teaches this limitation, as discussed above in [1-b], which is incorporated herein by reference. (Ex-1003, ¶74.)

[1-i] a fan configured to direct air through the heat radiator, the fan being driven by a motor separate from the motor of the pump.

Batchelder in view of Shin teaches this limitation, as discussed above in [1-b], which is incorporated herein by reference. (Ex-1003, ¶75.)

* * *

For at least the reasons stated above, Batchelder in view of Shin discloses or teaches each limitation of claim 1 and renders it obvious. (Ex-1003, ¶76.)

2. Batchelder in view of Shin discloses or teaches each limitation of claims 3-11 and 13.

[Claim 3] “The cooling system of claim 1, further including a plurality of channels in the lower chamber of the reservoir.”

Batchelder discloses or teaches these limitations. Batchelder states: “Heat enters the active spreader plate (20) on its lower surface (24), and is conducted into a metallic fin array (52). Instead of the heat primarily being conducted by the solid bulk material of the active spreader plate (22), it is transfer from the fin array (52) into a heat transfer fluid sealed in flow channels (50) inside the active spreader plate (20).” (Ex-1006, 4:63-5:6.) Batchelder’s fin array is described in FIG. 6, in which at least embodiments 110 and 120 disclose or teach such “channels”:

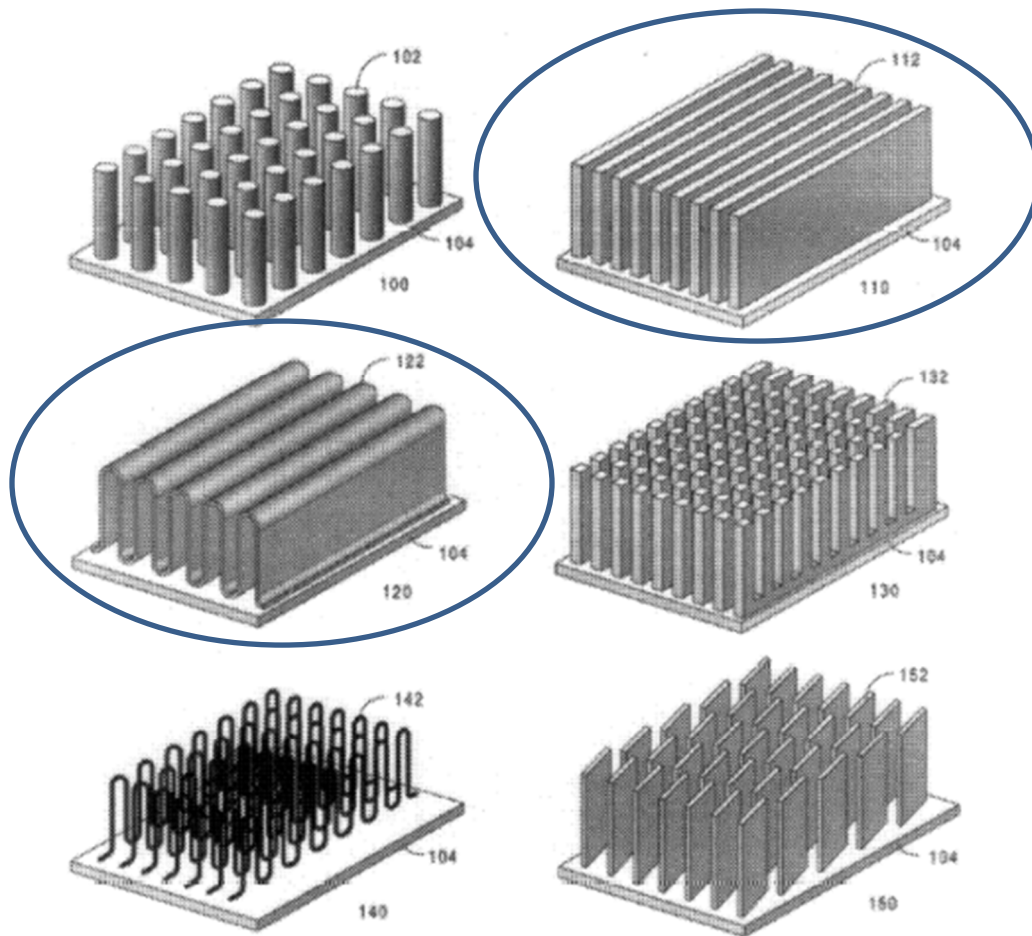
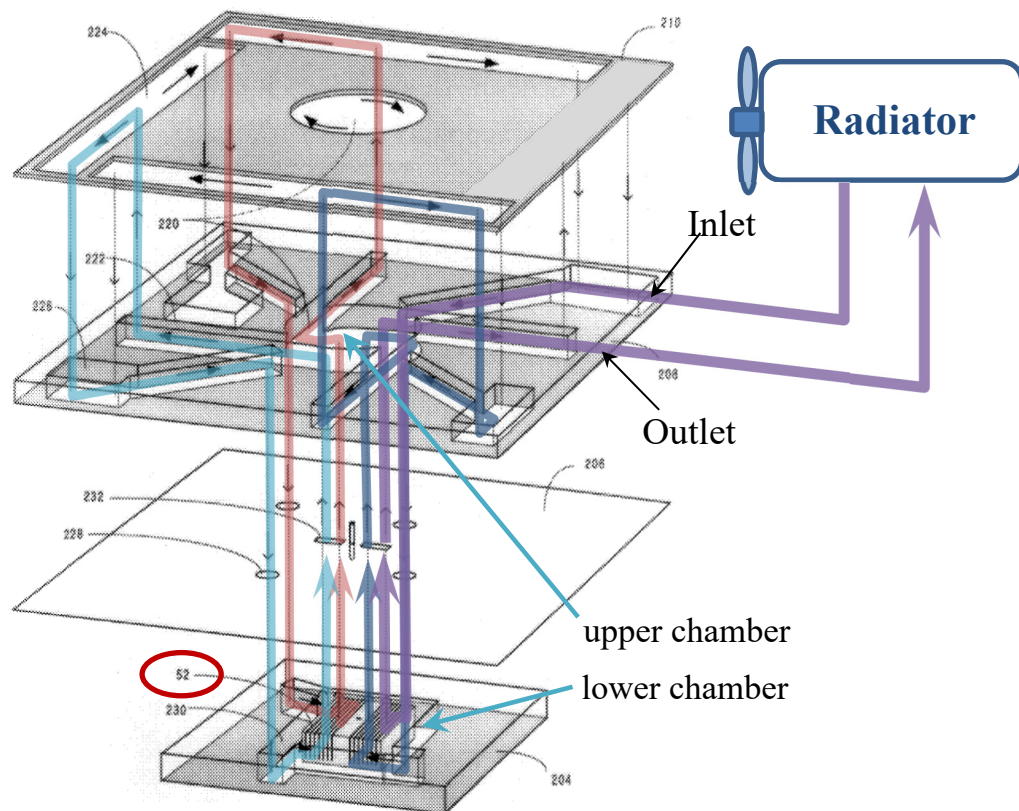
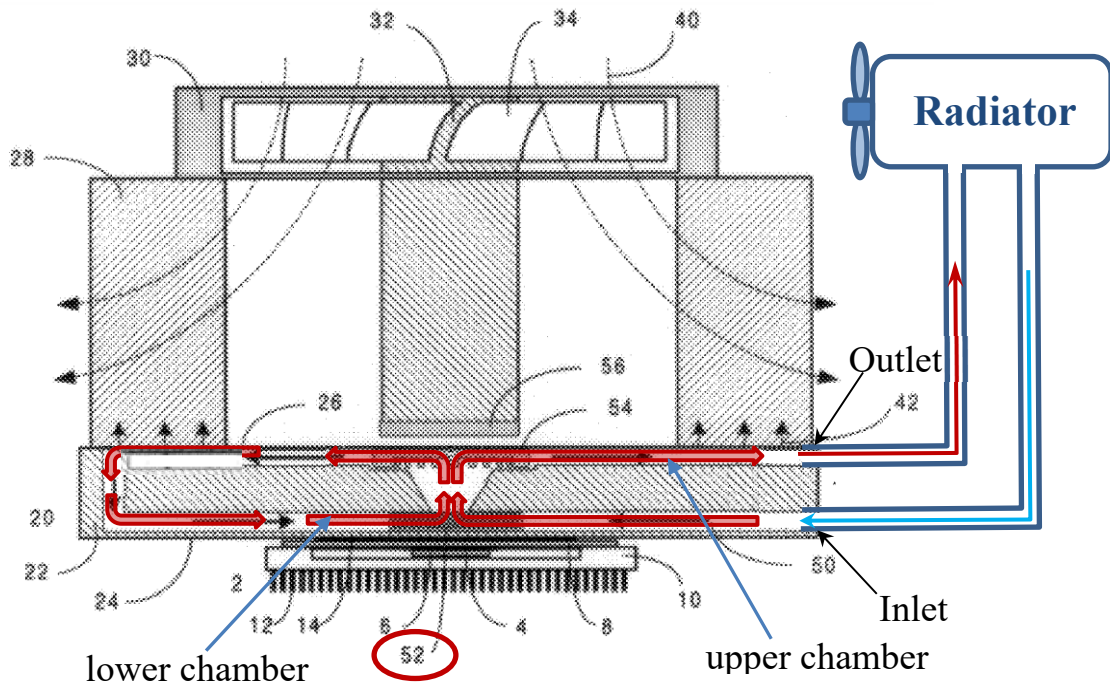


FIG. 6

(Ex-1006, FIG. 6, 7:4-22.) A POSITA, reading Batchelder, would have understood that these channels are included in the lower chamber of the reservoir as part of, *e.g.*, the heat spreader plate 20. (Ex-1003, ¶77.) The same applies to the lower chamber of the modified Batchelder devices in view of Shin:



(Ex-1003, ¶78.)

Thus, Batchelder in view of Shin renders claim 3 obvious. (*Id.*, ¶79.)

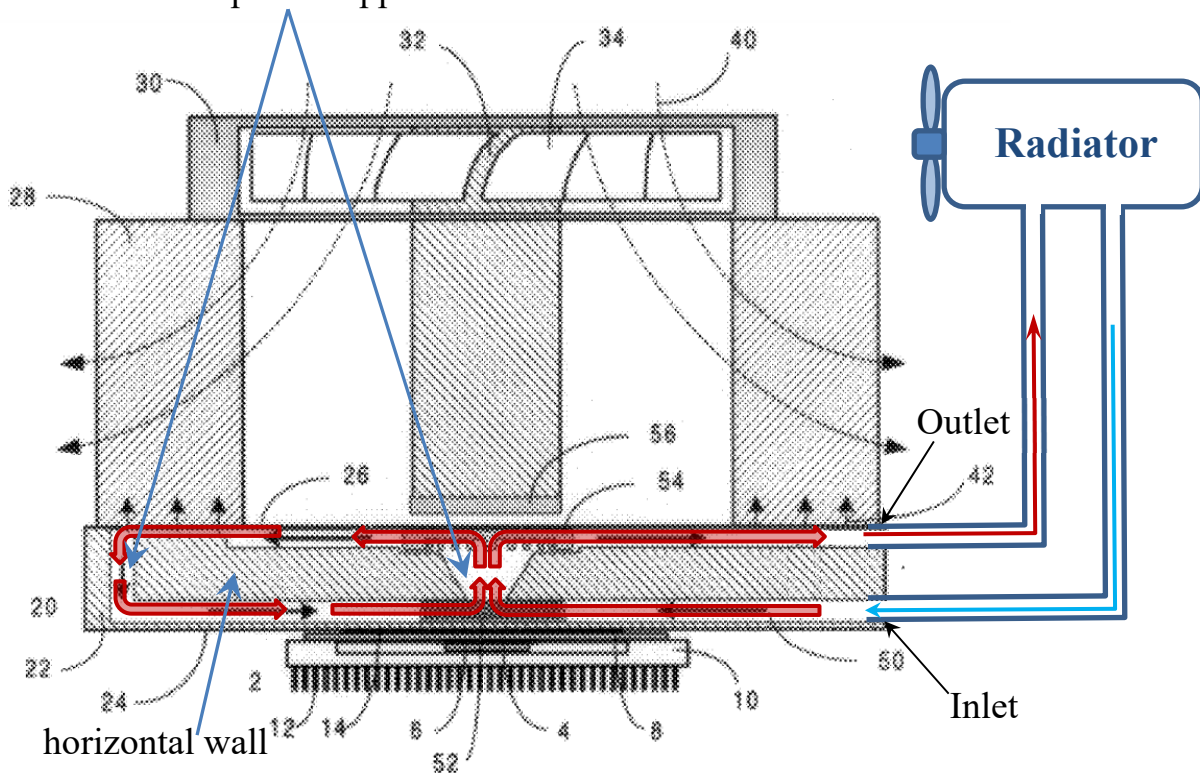
[Claim 4] “The cooling system of claim 1, wherein the pump is positioned in the upper chamber of the reservoir.”

As can be seen above, the pump (e.g., liquid impeller 54) in the modified Batchelder device in view of Shin is positioned in the upper chamber of the reservoir included in, e.g., the heat spreader plate 20. Thus, Batchelder in view of Shin renders claim 4 obvious. (Ex-1003, ¶80.)

[Claim 5] “The cooling system of claim 1, wherein the cooling liquid is transferred between the upper chamber and the lower chamber of the reservoir only through the plurality of passages that fluidly couple the upper chamber and the lower chamber.”

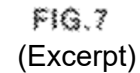
Batchelder in view of Shin teaches this limitation, as discussed above in [1-d], which is incorporated herein by reference. In particular, the cooling liquid is transferred between the upper chamber and the lower chamber of the reservoir in the modified Batchelder device in view of Shin only through the passages that fluidly couple the upper chamber and the lower chamber, as shown below. Thus, Batchelder in view of Shin renders claim 5 obvious. (Ex-1003, ¶¶81-82.)

the cooling liquid is transferred between the upper chamber and the lower chamber of the reservoir only through the plurality of passages that fluidly couple the upper chamber and the lower chamber



[Claim 6] “The cooling system of claim 1, wherein the heat exchanging interface is removably coupled to the reservoir.”

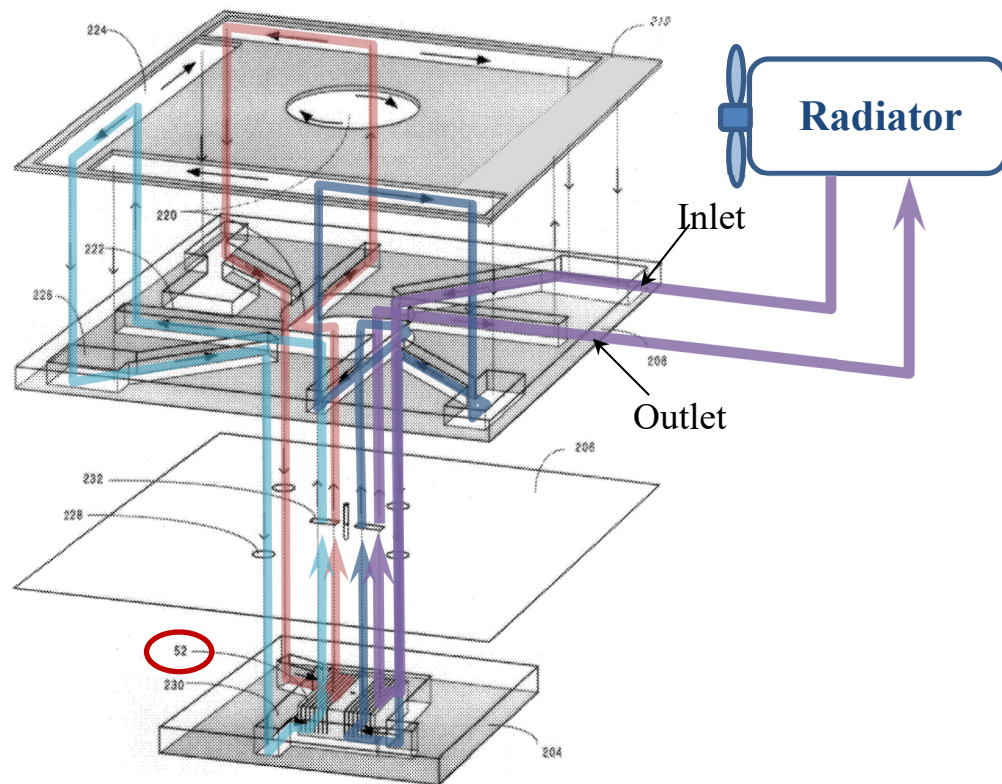
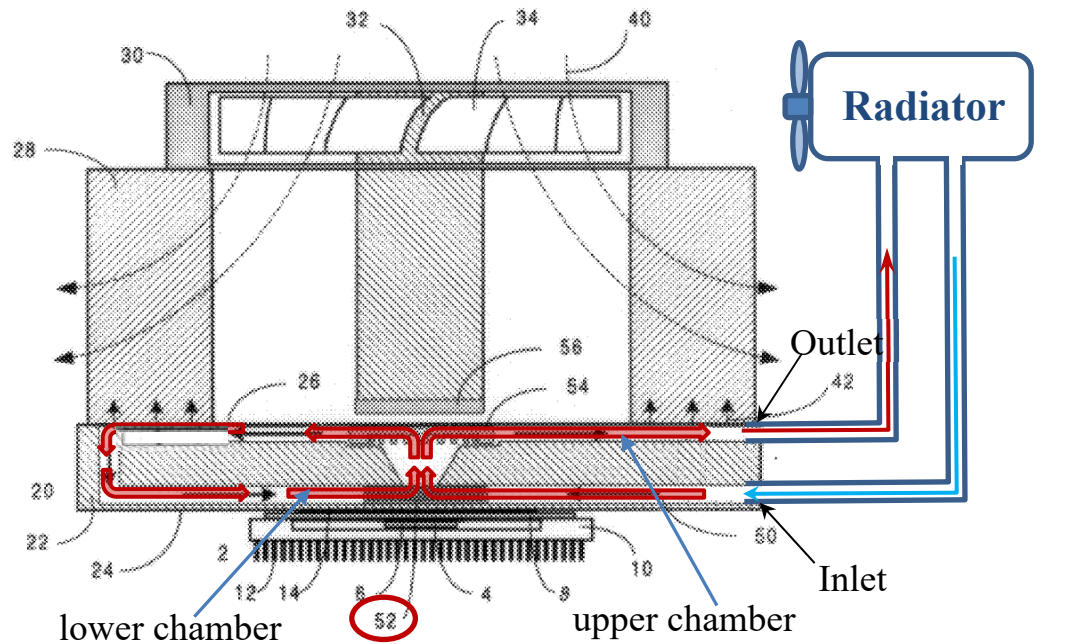
Batchelder discloses or teaches a heat exchanging interface (*e.g.*, the bottom sheet 202 in FIG. 7) removably coupled to the reservoir included in, *e.g.*, the active spreader plate 20. (Ex-1003, ¶83.) This is illustrated in FIG. 7 (excerpt) below by the yellow annotations:



[Claim 7] “The cooling system of claim 1, wherein a surface of the heat exchanging interface exposed to the lower chamber includes features to enhance heat dissipation.”

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cooling liquid. (Ex-1003, ¶84.) The same applies to the lower chamber of the modified Batchelder device in view of Shin:

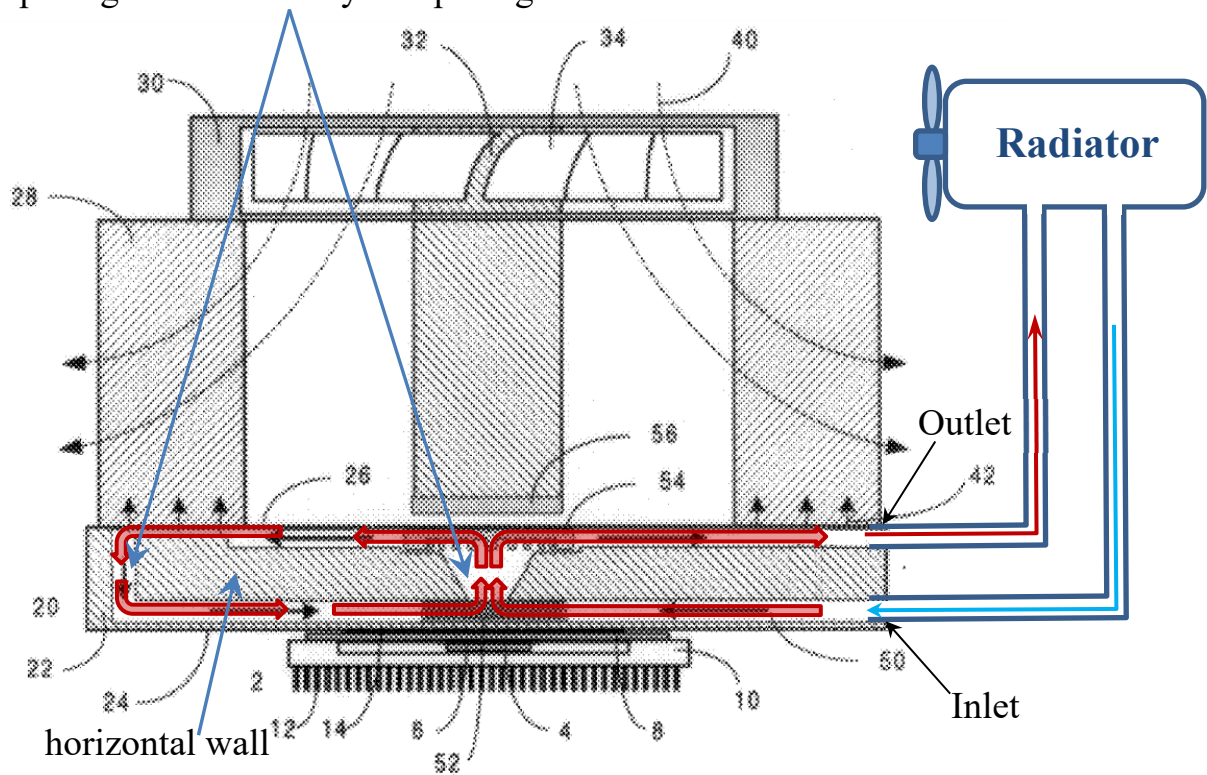


Thus, Batchelder in view of Shin renders claim 7 obvious. (*Id.*, ¶87.)

[Claim 8] “The cooling system of claim 7, wherein the plurality of passages includes only two passages.”

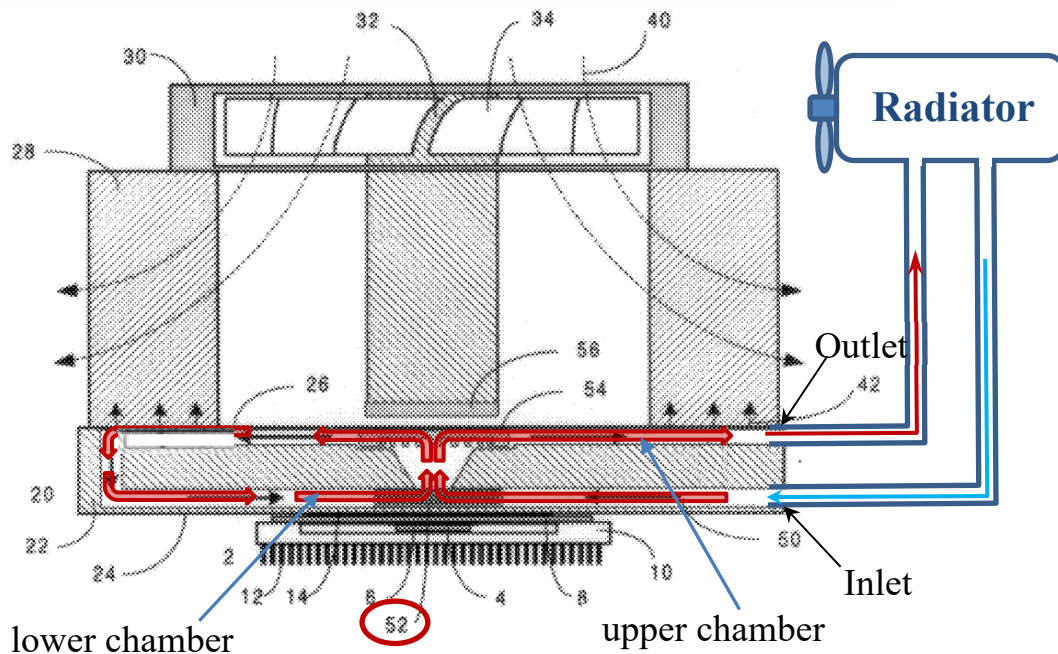
As shown below, the modified Batchelder device in view of Shin in Figure 2 includes only two passages. Thus, Batchelder in view of Shin renders this claim obvious. (Ex-1003, ¶¶87-88.)

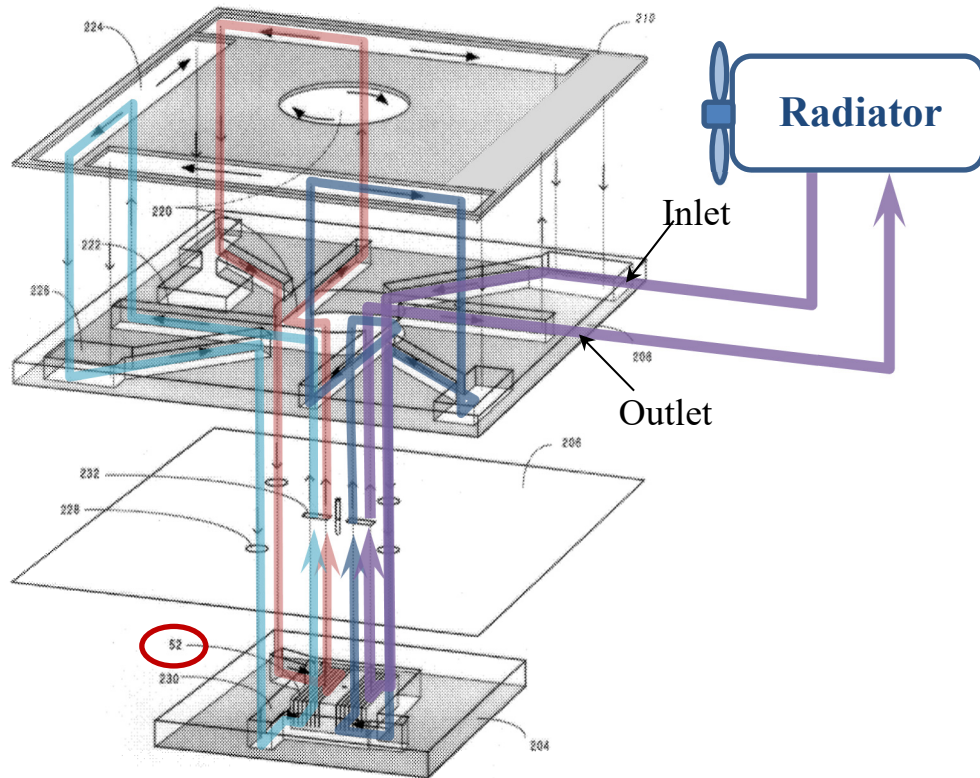
the plurality of substantially circular passages includes only two passages



[Claim 9] “The cooling system of claim 1, wherein the lower chamber of the reservoir includes one or more features that are configured to increase an amount of time the cooling liquid takes to flow through the lower chamber.”

For the same reasons as described above in claim 3, which are incorporated by reference herein, Batchelder in view of Shin renders this limitation obvious. In particular, a POSITA, reading Batchelder, would have understood that the fin array included in the lower chamber of the reservoir as part of, *e.g.*, the heat spreader plate 20 increases the flow resistance and thus slows down the flow. The fin array creates features configured to increase an amount of time the cooling liquid takes to flow through the lower chamber. (Ex-1003, ¶89.) The same applies to the lower chamber of the modified Batchelder device in view of Shin:





(Ex-1003, ¶90.)

Thus, Batchelder in view of Shin renders claim 9 obvious.

[Claim 10] “The cooling system of claim 1, wherein the motor of the pump is an AC motor.”

Batchelder does not expressly disclose or teach whether the motor of the pump uses alternating current (“AC”) or direct current (“DC”), but Shin does. Specifically, Shin states that “the present invention does not necessarily limit the motor 12 to a DC motor, and an AC motor driven by alternating current of, for example, 100 (V) or 200 (V) may be used as well.” (Ex-1007, [0020].) AC motors were commonly used in cooling systems (as evidenced by Shin) and would have been to try as one of a finite number of design choices. (*See Hoffmann-La Roche Inc. v. Apotex Inc.*,

748 F.3d 1326, 1340 (Fed. Cir. 2014) (“For an invention to be obvious to try, there must be a finite number of known choices in the prior art, and a reasonable expectation of success for the choice that is tried.”); Ex-1003, ¶92.) Thus, Batchelder in view of Shin renders claim 10 obvious. (*Id.*)

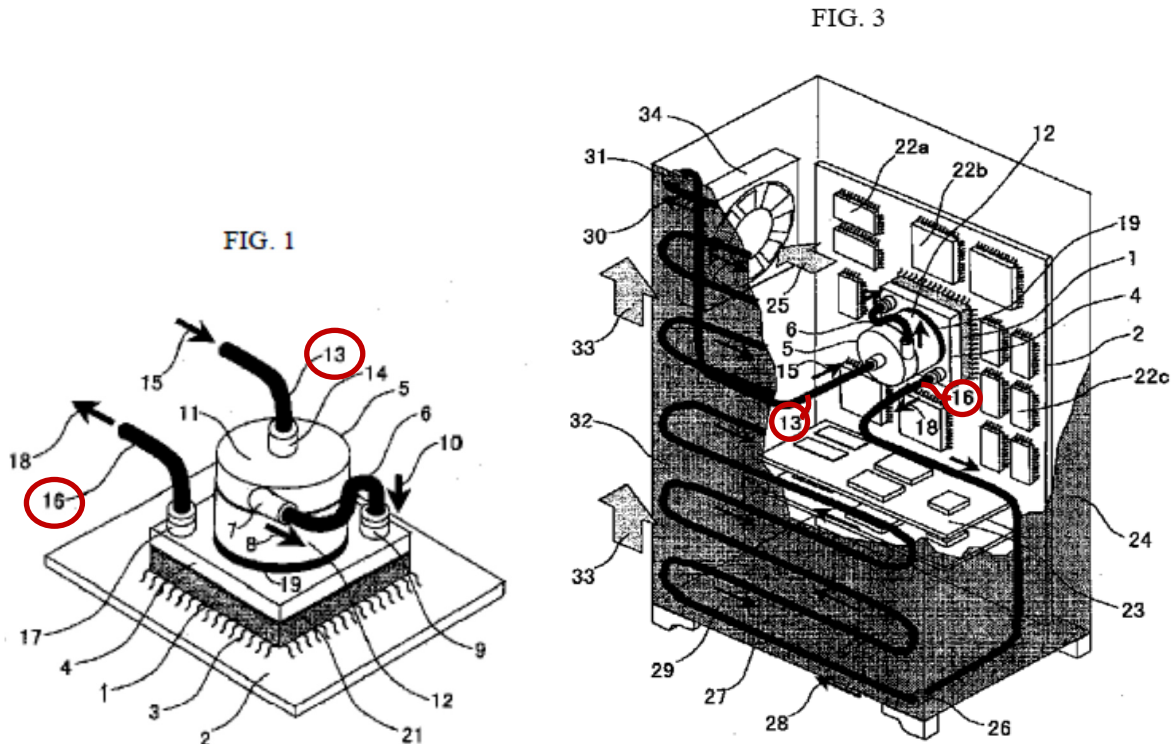
[Claim 11] “The cooling system of claim 1, wherein the motor of the pump is a DC motor.”

Batchelder does not expressly disclose or teach whether the motor of the pump uses alternating current (“AC”) or direct current (“DC”), but Shin does. Specifically, Shin states: “The motor 12 [for the pump] is a DC motor driven by a direct current power supply.” (Ex-1007, [0019].) DC motors were commonly used in cooling systems (as evidenced by Shin) and would have been to try as one of a finite number of design choices. (*See Hoffmann-La Roche*, 748 F.3d at 1340; Ex-1003, ¶93.) Thus, Batchelder in view of Shin renders claim 11 obvious. (*Id.*)

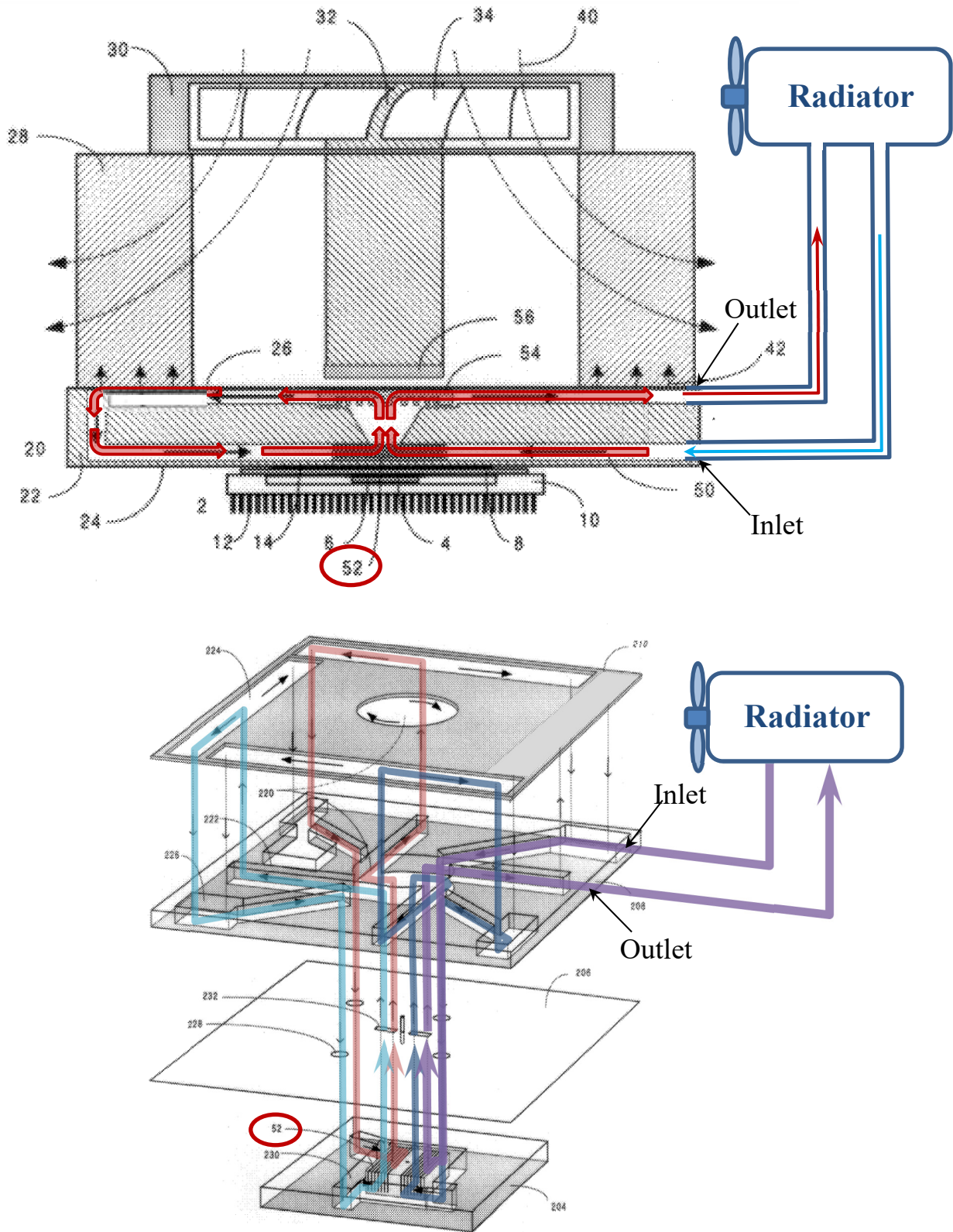
[Claim 13] “The cooling system of claim 1, wherein the integrated element is separate from the heat radiator and the integrated element and the heat radiator are fluidly coupled together by tubing such that the heat radiator can be positioned at a location away from the integrated element when the heat exchanging interface is in thermal contact with the processing unit.”

For the same reasons as [1-b], which are incorporated herein by reference, Batchelder in view of Shin discloses or teaches these limitations. Specifically, Shin discloses or teaches that the “radiator” (e.g., heat exchange section comprising heat exchangers 27, 28, and 29, as shown in FIG. 3) is “separate from” and “fluidly coupled” to the “integrated element” (e.g., the “integral structure”) by “tubing” (e.g.,

the hoses 13 and 16, which are the inlet and outlet of the integrated structure, respectively), as shown in annotated FIGS. 1 and 3 below:



(Ex-1007, FIGS. 1 and 3; Ex-1003, ¶¶83-84.) Accordingly, in the modified Batchelder device in view of Shin, the radiator and the integrated element are arranged such that the heat radiator can be positioned at a location away from the integrated element when the heat exchanging interface is in thermal contact with the processing unit, as shown below:



(Ex-1003, ¶94.)

Thus, Batchelder in view of Shin renders claim 13 obvious. (*Id.*, ¶95.)

3. Batchelder in view of Shin discloses or teaches each limitation of claim 17.

[17-PRE] “A method of operating a liquid cooling system for an electronic component positioned on a motherboard of a computer system, comprising:”

For the same reasons as stated in [1-PRE], [1-a], and [1-b], which are incorporated herein by reference, Batchelder in view of Shin discloses or teaches this preamble. Thus, Batchelder in view of Shin renders this preamble obvious. (Ex-1003, ¶96.)

[17-a] “separably thermally coupling a heat exchanging interface of a reservoir with the electronic component positioned at a first location on the motherboard,”

For the same reasons as stated in [1-f], which are incorporated herein by reference, Batchelder in view of Shin discloses or teaches this limitation. Thus, Batchelder in view of Shin renders this limitation obvious. (Ex-1003, ¶97.)

[17-b] “the reservoir including an upper chamber and a lower chamber, the upper chamber and the lower chamber being separate chambers that are vertically spaced apart”

For the same reasons as stated in [1-c], which are incorporated herein by reference, Batchelder in view of Shin discloses or teaches this limitation. Thus, Batchelder in view of Shin renders this limitation obvious. (Ex-1003, ¶98.)

[17-c] “[the upper chamber and the lower chamber being separate chambers that are vertically spaced apart and] separated by at least a horizontal wall, the upper chamber and the lower chamber being fluidly coupled by one or more passageways, at least one of the one or more passageways being positioned on the horizontal wall,”

For the same reasons as stated in [1-d], which are incorporated herein by reference, Batchelder in view of Shin discloses or teaches this limitation. Thus, Batchelder in view of Shin renders this limitation obvious. (Ex-1003, ¶99.)

[17-d] “the heat exchanging interface being removably coupled to the reservoir”

For the same reasons as stated in [Claim 6], which are incorporated herein by reference, Batchelder in view of Shin discloses or teaches this limitation. Thus, Batchelder in view of Shin renders this limitation obvious. (Ex-1003, ¶100.)

[17-e] “[the heat exchanging interface being removably coupled to the reservoir such that] an inside surface of the heat exchanging interface is exposed to the lower chamber of the reservoir;”

For the same reasons as stated in [Claim 7], which are incorporated herein by reference, Batchelder in view of Shin discloses or teaches this limitation. Thus, Batchelder in view of Shin renders this limitation obvious. (Ex-1003, ¶101.)

[17-f] “positioning a heat radiator at a second location horizontally spaced apart from the first location, the heat radiator and the reservoir being fluidly coupled together by tubing that extends from the first location to the second location;”

For the same reasons as stated in [1-h], which are incorporated herein by reference, Batchelder in view of Shin discloses or teaches this limitation. Thus, Batchelder in view of Shin renders this limitation obvious. (Ex-1003, ¶102.)

[17-g] “activating a pump to a circulate a cooling liquid through the reservoir and the heat radiator, the pump including a motor and an impeller having curved blades, the impeller being positioned in the reservoir; and”

For the same reasons as stated in [1-g], which are incorporated herein by reference, Batchelder in view of Shin discloses or teaches this limitation. Thus, Batchelder in view of Shin renders this limitation obvious. (Ex-1003, ¶103.)

[17-h] “activating a fan to direct air through the heat radiator, the fan being operated by a motor separate from the motor of the pump.”

For the same reasons as stated in [1-i], which are incorporated herein by reference, Batchelder in view of Shin discloses or teaches this limitation. Thus, Batchelder in view of Shin renders this limitation obvious. (Ex-1003, ¶104.)

4. Batchelder in view of Shin discloses or teaches each limitation of claims 18 and 19.

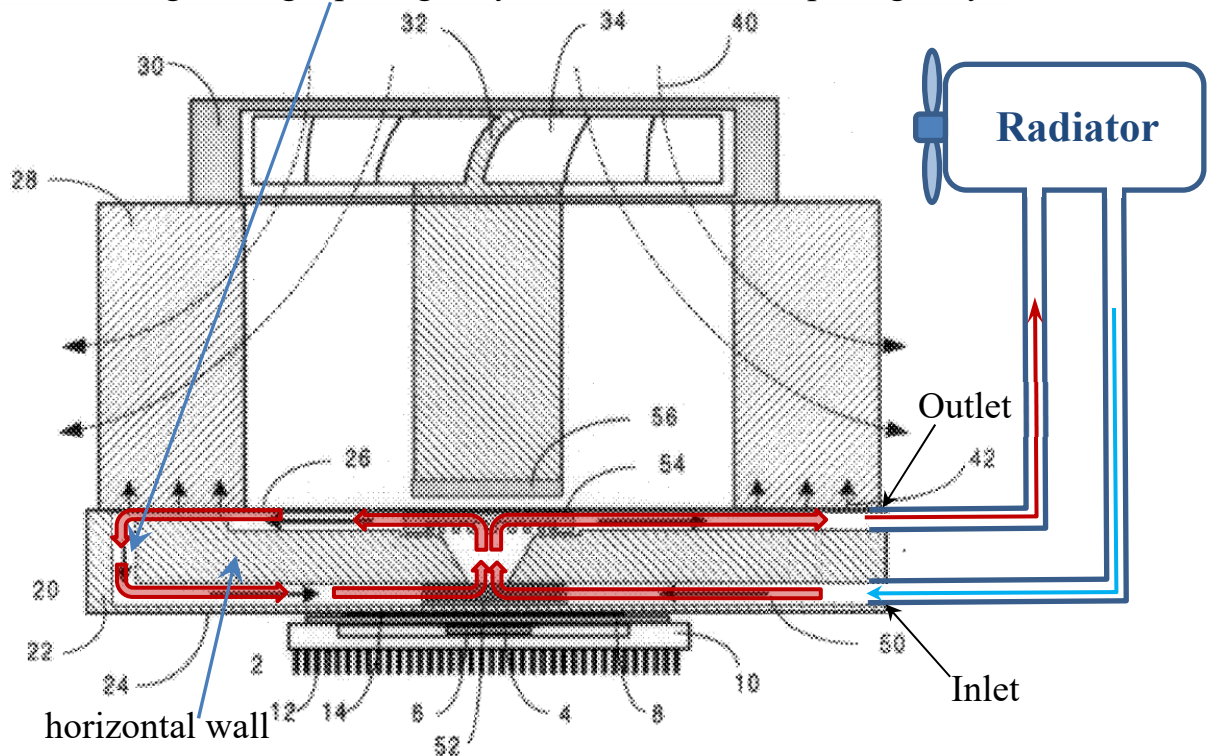
[Claim 18] “The method of claim 17, wherein activating the pump includes circulating the cooling liquid between the upper and the lower chambers of the reservoir.”

For the same reasons as stated in [Claim 5], which are incorporated herein by reference, Batchelder in view of Shin discloses or teaches this limitation. Thus, Batchelder in view of Shin renders this limitation obvious. (Ex-1003, ¶105.)

[Claim 19] “The method of claim 18, wherein circulating the cooling liquid between the upper and the lower chambers includes passing the cooling liquid from the upper chamber to the lower chamber through a single passageway of the one or more passageways.”

For the same reasons as stated in [Claim 8], which are incorporated herein by reference, Batchelder in view of Shin discloses or teaches this limitation.

passing the cooling liquid from the upper chamber to the lower chamber through a single passageway of the one or more passageways



B. GROUND 2: Claims 12 and 14 to 16 are rendered obvious over the combination of Batchelder and Shin in view of Nakano.

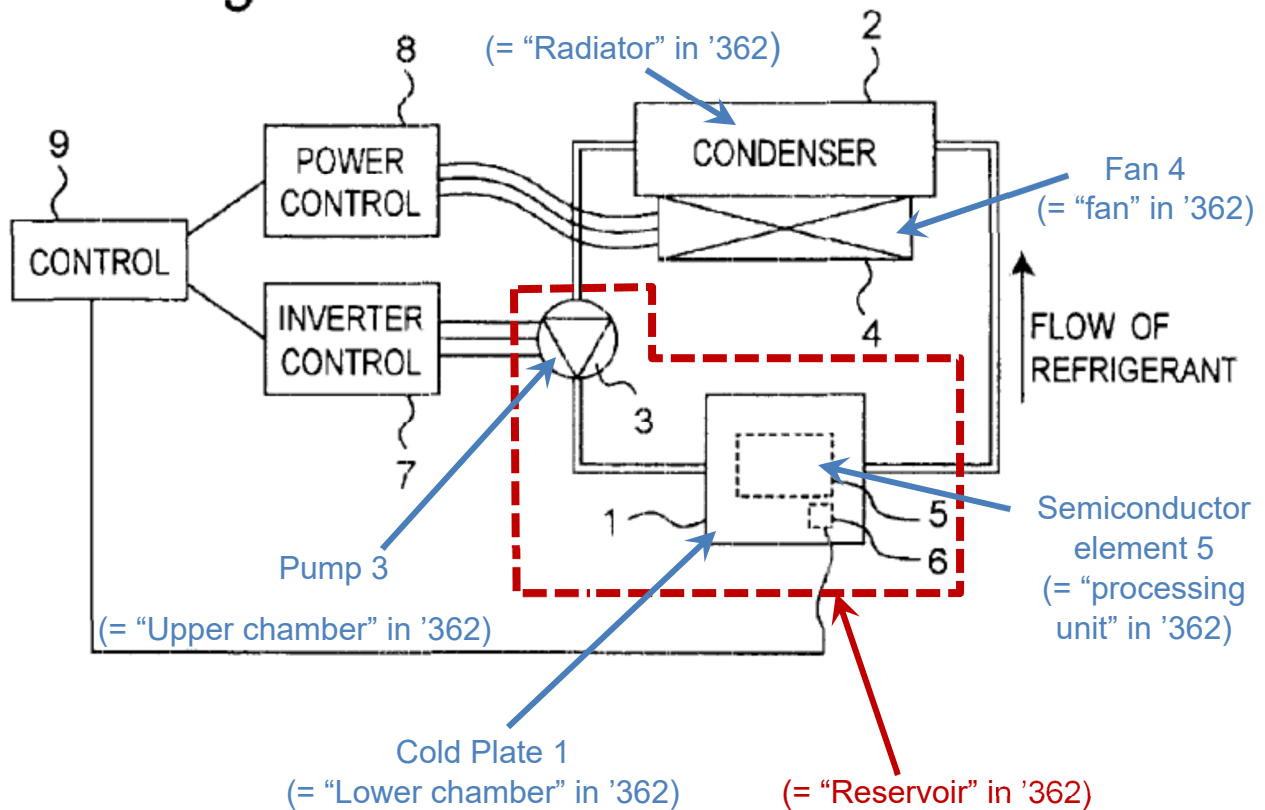
1. Batchelder in view of Shin and further in view of Nakano discloses or teaches each limitation of claim 12.

[Claim 12] “The cooling system of claim 1, wherein a speed of the fan is configured to be varied independent of a speed of the impeller of the pump.”

The combination of Batchelder and Shin does not expressly disclose or teach this limitation, but Nakano does. Nakano discloses or teaches a system similar to that claimed by the '362 patent: “The semiconductor cooling device shown in FIG. 2 includes a cold plate **1** for cooling a highly exothermic semiconductor element **5** that tends to emit a substantial amount of heat when in operation, a condenser **2**, and an inverter-controlled refrigerant pump **3**, all connected in series with each other to define a refrigerating cycle. A refrigerant is filled in this refrigerating cycle. The condenser **2** is adapted to be cooled by a fan **4**.” (Ex-1008, 2:38-45.)

A POSITA would have understood Nakano’s cooling system to be similar to that of the '362 patent, as demonstrated by the followed annotated version of Nakano FIG. 2 (Ex-1008, FIG. 2; Ex-1003, ¶109):

Fig. 2



Nakano also states that “the cold plate 1 is provided with a temperature sensor 6 mounted thereon in proximity to the semiconductor element 5, and the temperature sensor 6 is electrically connected to a controller 9.” (Ex-1008, 2:57-60.) Nakano further states:

In accomplishing the above and other objectives, the semiconductor cooling device according to the present invention includes a cold plate for cooling a semiconductor element, a condenser, and an inverter-controlled refrigerant pump, all of which are fluid connected in series with each other to define a refrigerating cycle. The semiconductor cooling device also includes a fan for cooling the condenser, a temperature detector disposed in proximity to the semiconductor

element, and a controller for controlling the refrigerant pump and the fan. **The controller controls the number of revolutions of the refrigerant pump and that of the fan depending on a value measured by the temperature detector.** The temperature detector may be accommodated in the semiconductor element.

(Ex-1008, 1:42-55.) Nakano also discloses or teaches “adjust[ing] the pump speed” as follows (*id.*, ¶149):

When the value measured by the temperature sensor 6 increases more than a predetermined value within a predetermined period of time, **the controller 9 first maximizes the number of revolutions of the fan 4 and then increases the number of revolutions of the refrigerant pump 3** step by step while comparing the measured value by the temperature sensor 6 with a value set in the controller 9.

(Ex-1008, 3:7-13.)

The controller 9 appropriately controls the number of revolutions of the refrigerant pump 3 and that of the fan 4 based on a value measured by the temperature sensor 6. **The controller 9 is designed so as to preferentially reduce, when the amount of heat emitted from the semiconductor element 5 is less than a predetermined level, the number of revolutions of the fan 4 before that of the refrigerant pump 3,** making it possible to provide a cooling device that is low in noise level.

(Ex-1008, 2:65-3:6; Ex-1003, ¶110.) Reading Nakano, a POSITA would have understood that the controller is capable of adjusting the speed of the pump

independent of the fan speed. Nakano therefore discloses or teaches “a speed of the impeller is configured to be varied independent of the speed of the fan.” (*Id.*, ¶111.) Thus, Batchelder in view of Shin and further in view of Nakano renders this limitation obvious. (*Id.*, ¶112.)

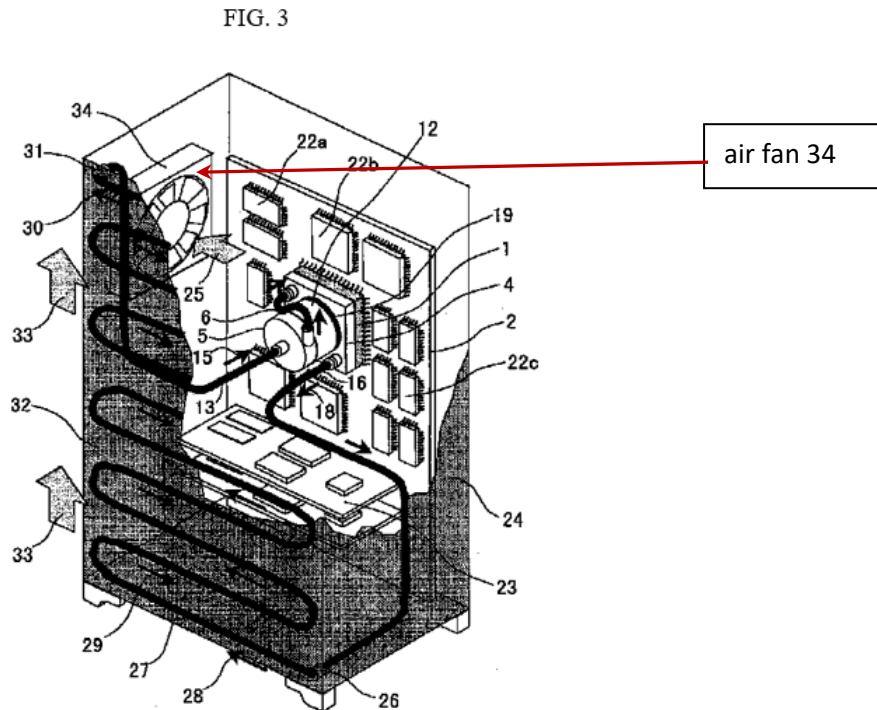
2. The motivation to combine Nakano with Batchelder and Shin.

A POSITA would have been motivated to modify the combination of Batchelder and Shin to incorporate the control system of Nakano. (Ex-1003, ¶¶113-115.) Shin recognized: “Using a DC motor *allows the motor speed to be easily changed by changing the DC voltage, thus enabling control of cooling power.* Moreover, *making the motor into a DC brushless motor makes it possible to implement a pump of low noise and long service life.*” (Ex-1007, [0019]; *see also id.* at [0006] (“It is an object of the present invention to *provide a cooling structure for electronic devices which is compact, has low noise, superior cooling performance and high reliability.*”).) Shin also teaches with respect to the embodiment in FIG. 3:

Besides the heat generating element 1, heat generating elements 22a, 22b, 22c, such as memory LSI and driver LSI chips, *which can be cooled by air cooling*, as well as an IO card, memory card, hard disk or other card mounting board 23 are also installed on the wiring board 2. The wiring board 2 is housed inside case 24, which is an electronic equipment case. *An air cooling fan 34 is installed in the case 24, and*

the aforementioned multiple air cooled components are air-cooled by cooling air 25.

(*Id.* at [0024].) These elements are also shown in FIG. 3:



(*Id.* at FIG. 3; *see also* Ex-1003, ¶113-114.)

A POSITA reading Batchelder, Shin, and Nakano together would have been motivated to incorporate Nakano's control system into the Batchelder/Shin system in order to adjust the fan speed and the pump speed to reduce noise and meet the needed cooling capacity. (Ex-1003, ¶115.) The POSITA would have had a reasonable expectation of success because a pump, a fan, and a control system are familiar elements that can be readily combined with predictable results. *Id.*; *KSR Int'l Co. v. Teleflex, Inc.*, 550 U.S. 398, 401 (2007) ("a combination of familiar

elements according to known methods is likely to be obvious when it does no more than yield predictable results”).

3. Batchelder in view of Shin and further in view of Nakano discloses or teaches each limitation of claim 14.

[14-PRE] “A cooling system for a processing unit positioned on a motherboard of a computer, comprising:”

For the same reasons as stated in [1-PRE], [1-a], and [1-b], which are incorporated herein by reference, Batchelder in view of Shin discloses or teaches this preamble. In turn, Batchelder in view of Shin and further in view of Nakano renders this preamble obvious. (Ex-1003, ¶116.)

[14-a] “a reservoir configured to be coupled to the processing unit positioned on the motherboard at a first location,”

For the same reasons as stated in [1-PRE], [1-a], and [1-b], which are incorporated herein by reference, Batchelder in view of Shin discloses or teaches this limitation. In turn, Batchelder in view of Shin and further in view of Nakano renders this limitation obvious. (Ex-1003, ¶117.)

[14-b] “the reservoir being adapted to pass a cooling liquid therethrough,”

For the same reasons as stated in [1-b], which are incorporated herein by reference, Batchelder in view of Shin discloses or teaches this limitation. In turn, Batchelder in view of Shin and further in view of Nakano renders this limitation obvious. (Ex-1003, ¶118.)

[14-c] “wherein the reservoir includes an upper chamber and a lower chamber, the upper chamber and the lower chamber being separate chambers containing cooling liquid that are”

For the same reasons as stated in [1-c], which are incorporated herein by reference, Batchelder in view of Shin discloses or teaches this limitation. In turn, Batchelder in view of Shin and further in view of Nakano renders this limitation obvious. (Ex-1003, ¶119.)

[14-d] “[the upper chamber and the lower chamber being separate chambers containing cooling liquid that are] separated by at least a horizontal wall and fluidly coupled together by one or more passageways, at least one of the one or more passageways being a substantially circular passageway positioned on the horizontal wall,”

For the same reasons as stated in [1-d], which are incorporated herein by reference, Batchelder in view of Shin discloses or teaches this limitation. In turn, Batchelder in view of Shin and further in view of Nakano renders this limitation obvious. (Ex-1003, ¶120.)

[14-e] the reservoir further including a heat exchanging interface

For the same reasons as stated in [1-a], [1-c], and [1-e], which are incorporated herein by reference, Batchelder in view of Shin discloses or teaches this limitation. Specifically, the reservoir in Batchelder (e.g., the heat spreading plate 20) includes the heat exchanging interface (e.g., the metal sheet 202) that forms a boundary wall of the reservoir’s lower chamber. That is, Batchelder’s reservoir includes a heat exchanging interface. Thus, Batchelder in view of Shin discloses or teaches this

limitation. In turn, Batchelder in view of Shin and further in view of Nakano renders this limitation obvious. (Ex-1003, ¶121.)

[14-f] “[a heat exchanging interface] configured to be placed in separable thermal contact with the processing unit,”

For the same reasons as stated in [1-f], which are incorporated herein by reference, Batchelder in view of Shin discloses or teaches this limitation. In turn, Batchelder in view of Shin and further in view of Nakano renders this limitation obvious. (Ex-1003, ¶122.)

[14-g] “the heat exchanging interface being removably attached to the reservoir”

For the same reasons as stated in [Claim 6], which are incorporated herein by reference, Batchelder in view of Shin discloses or teaches this limitation. In turn, Batchelder in view of Shin and further in view of Nakano renders this limitation obvious. (Ex-1003, ¶123.)

[14-h] “[the heat exchanging interface being removably attached to the reservoir] such that the heat exchanging interface forms a boundary wall of the lower chamber of the reservoir;”

For the same reasons as stated in [1-e], which are incorporated herein by reference, Batchelder in view of Shin discloses or teaches this limitation. In turn, Batchelder in view of Shin and further in view of Nakano renders this limitation obvious. (Ex-1003, ¶124.)

[14-i] “a heat radiator configured to be positioned at a second location horizontally spaced apart from the first location when the reservoir is coupled to the processing unit;”

For the same reasons as stated in [1-h], which are incorporated herein by reference, Batchelder in view of Shin discloses or teaches this limitation. In turn, Batchelder in view of Shin and further in view of Nakano renders this limitation obvious. (Ex-1003, ¶125.)

[14-j] “a fan adapted to direct air to the heat radiator to dissipate heat from the cooling liquid to surrounding atmosphere;”

For the same reasons as stated in [1-h] and [1-i], which are incorporated herein by reference, Batchelder in view of Shin discloses or teaches this limitation. In turn, Batchelder in view of Shin and further in view of Nakano renders this limitation obvious. (Ex-1003, ¶126.)

[14-k] a pump configured to circulate the cooling liquid between the reservoir and the heat radiator, the pump including a motor having a rotor, a stator, and an impeller having curved blades, the impeller being mechanically coupled to the rotor and at least partially submerged in the cooling liquid in the reservoir,

For the same reasons as stated in [1-g] and [1-h], which are incorporated herein by reference, Batchelder in view of Shin discloses or teaches this limitation. In turn, Batchelder in view of Shin and further in view of Nakano renders this limitation obvious. (Ex-1003, ¶127.)

[14-I] “wherein a speed of the impeller is configured to be varied independent of the speed of the fan.”

For the same reasons as stated in [Claim 12], which are incorporated herein by reference, Batchelder in view of Shin discloses or teaches this limitation. In turn, Batchelder in view of Shin and further in view of Nakano renders this limitation obvious. (Ex-1003, ¶128.)

4. Batchelder in view of Shin and further in view of Nakano discloses or teaches each limitation of claims 15 and 16.

[Claim 15] The cooling system of claim 14, wherein the lower chamber of the reservoir includes one or more features that are configured to increase an amount of time the cooling liquid takes to flow through the lower chamber.

For the same reasons as stated in [Claim 3], which are incorporated herein by reference, Batchelder in view of Shin discloses or teaches this limitation. In turn, Batchelder in view of Shin and further in view of Nakano renders this limitation obvious. (Ex-1003, ¶129.)

[Claim 16] The cooling system of claim 14, wherein at least one of a location of the pump or a configuration of the reservoir is selected to create a turbulence of cooling liquid flow proximate the heat exchanging interface.

For the same reasons as stated in [1-PRE], [1-a], and [1-b], which are incorporated herein by reference, Batchelder in view of Shin discloses or teaches this limitation. A POSITA would have understood that the location of the pump (e.g., the impeller 54) or the configuration of the reservoir included in, e.g., the heat spreader plate 20 in Batchelder is selected to create a turbulence of cooling liquid flow in the proximity of the heat exchanging interface. (Ex-1003, ¶130.) This is

because the turbulence of the cooling liquid flow enhances its absorption of heat from the heat exchanging interface, as would have been understood by a POSITA. (*Id.*) That is, a POSITA would have been motivated to position the pump or to configure the reservoir in Batchelder such that the turbulence of the cooling liquid is near the heat exchanging interface. (*Id.*) Thus, Batchelder in view of Shin and further in view of Nakano renders this limitation obvious. (*Id.*)

IX. SECONDARY CONSIDERATIONS

Petitioner is unaware of any secondary considerations that would overcome the strong showing of obviousness provided by the Petition. *See Tokai Corp. v. Easton Enters., Inc.*, 632 F.3d 1358, 1370 (Fed. Cir. 2011).

X. PAYMENT OF FEES UNDER 37 C.F.R. §42.15

The undersigned provides online USPTO Deposit Account No. 50-2638 to pay the required fees at the time of filing this Petition, as set forth in 37 C.F.R. § 42.15(a). The undersigned further authorizes the U.S. Patent & Trademark Office to charge this Deposit Account for any additional fees (or fee deficiency) that might be due in connection with this Petition.

XI. REQUIREMENTS FOR IPR UNDER 37 C.F.R. §42.104

A. Grounds for Standing Under 37 C.F.R. §42.104(a)

Petitioner certifies that the '362 patent is available for IPR and that Petitioner is not barred or otherwise estopped. Because Petitioner files an accompanying

motion for joinder within one month of institution in IPR2022-01316, this petition is timely under 35 U.S.C. §315(c) and 37 C.F.R. §42.122.

B. Identification of Challenge Under 37 C.F.R. §42.104(b) and Relief Requested

Petitioner respectfully requests that the Challenged Claims of the '362 patent be cancelled based on the four grounds of unpatentability detailed above. (*See* §II, *supra*.) In addition, this Petition is supported by the declaration of Dr. Karamanis, an engineer holding a Ph.D. in Mechanical Engineering from Tufts University whose thesis was entitled “Nusselt Numbers for Superhydrophobic Microchannels and Shrouded Longitudinal-Fin Heat Sinks,” and who currently conducts R&D in the area of thermal management of electronics and heat/mass/momentum transfer modeling. (Ex-1003, ¶¶2, 4.)

XII. CONCLUSION

For the foregoing reasons, Petitioner respectfully requests that the *inter partes* review of the '362 patent be instituted and that claims 1 and 3-19 be cancelled as unpatentable.

XIII. MANDATORY NOTICES UNDER 37 C.F.R. §42.8(a)(1) FOR INTER PARTES REVIEW

A. Real Party in Interest Under 37 C.F.R. §42.8(b)(1)

The real party-in-interest in this petition is CMC, located at 398 Xinhua First Road, 6th Floor, Neihu District, Taipei 114065, Taiwan, R.O.C.³

³ Patent Owner may incorrectly allege that CMI USA, Inc. (“CMI”), a separate corporate entity different from CMC, is also a real party in interest (“RPI”). Not so. Patent Owner originally sued both CMI and CMC in *Asetek Danmark A/S v. CMI USA, Inc.*, Case No. 4:13-cv-00457-JST (N.D. Cal.) for alleged infringement of the ’362 patent, *but dismissed CMC with prejudice before trial.* (*Id.*, Docs. 84-85.) CMI went to trial alone without CMC, and a judgment against *only* CMI was rendered. (*See, e.g., id.*, Docs. 219, 249, 339.) During post-trial proceedings, Patent Owner incorrectly alleged privity between CMC and CMI, causing the district court to enter an injunction against CMC as a third party (*id.*, Doc. 322), *which was then vacated by the Federal Circuit* (*id.*, Doc. 375). After the vacatur, CMC settled with Patent Owner under a consent judgment (*id.*, Doc. 399), in which “[n]o liability of CMC ha[d] been established against or admitted by CMC, but to resolve the case and to conserve resources, CMC agree[d] to be bound by” the injunction. Subsequently, Patent Owner incorrectly accused CMC and CMI of violating the injunction in a motion for contempt against both CMC and CMI, which was denied by the district court. (*See id.*, Doc. 426.) Because of Patent Owner’s motion for contempt against them jointly, CMC and CMI filed an action in June 2021 seeking a declaratory judgment of non-infringement of the ’362 patent (among others), *Cooler Master Co.*,

B. Related Matters Under 37 C.F.R. §42.8(b)(2)

Two co-pending federal district court cases may affect or be affected by the decision in this proceeding: *Cooler Master Co., Ltd. et al v. Asetek Danmark A/S*, Case No. 5:21-cv-04627-EJD (N.D. Cal.) and *Asetek Danmark A/S v. Shenzhen Apaltek Co.*, No. Case No. 3:22-cv-06179-WHO (N.D. Cal.). The undersigned is unaware of any other judicial or administrative matter that would affect, or be affected by, a decision in the proceeding. Related IPR matters include IPR2020-00522, IPR2020-00523, and IPR2020-00524, which were filed in February 2020 and concluded in August 2021, IPR2021-01195 against U.S. Patent No. 10,613,601 and IPR2021-01196 against U.S. Patent No. 10,599,196, which were terminated in October 2022.

C. Lead and Backup Counsel Under 37 C.F.R. §42.8(b)(3) and Service Information under 37 C.F.R. §42.8(b)(4)

Petitioner designates the following lead and backup counsel:

Ltd. et al v. Asetek Danmark A/S, Case No. 5:21-cv-04627-EJD (N.D. Cal.). The case was then stayed due to related IPR proceedings. (*Id.*, Doc. 42.) Throughout the entire history, no privity between CMC and CMI, nor any abetting of CMI by CMC, have ever been established. CMI also does not financially support, nor have any control over, the present IPR petition and joinder proposed by CMC.

Lead Counsel	Backup Counsel
James L. Ryerson (Reg. No. 64,617) Greenberg Traurig, LLP 500 Campus Drive, Suite 400 Florham Park, NJ 07932 Telephone: 973-443-3246 Facsimile: 973-295-1346 RyersonJ@gtlaw.com	Heath J. Briggs (Reg. No. 54,919) Greenberg Traurig, LLP 1144 15th St., Suite 3300 Denver, CO 80202 Telephone: 303-685-7418 Facsimile: 720-904-6118 BriggsH@gtlaw.com Kyle D. Chen (<i>pro hac vice</i> forthcoming) Greenberg Traurig, LLP 1900 University Avenue, 5th Floor East Palo Alto, CA 94303 Telephone: 650.289.7887 Facsimile: 650.328.8508 E-mail: kchen@gtlaw.com

Service on Petitioner may be made by mail or hand delivery to: Greenberg Traurig, LLP, 500 Campus Drive, Suite 400, Florham Park, NJ 07932. Petitioner also consents to and prefers electronic service by emailing counsel of record (shown above).

Respectfully submitted,
GREENBERG TRAURIG, LLP

Date: March 6, 2023

By: /James L. Ryerson/
James L. Ryerson (Reg. No. 64,617)
Counsel for Petitioner

CERTIFICATION OF WORD COUNT UNDER 37 C.F.R. §42.24(D)

Petitioner certifies that the word count in this Petition is 11,942 words, as counted by the word-processing program (Microsoft Word 2016) used to generate this Petition, where such word count excludes the table of contents, table of authorities, mandatory notices, certificate of service, appendix of exhibits, and this certificate of word count. This Petition is in compliance with the 14,000 word limit set forth in 37 C.F.R. §42.24(a)(1)(i).

CERTIFICATE OF SERVICE

The undersigned certifies that a true and correct copy of the Petition together with all exhibits identified in the above Table of Exhibits and Petitioner's Power of Attorney, were served on counsel of record for the '362 patent by Federal Express and electronic mail. Both parties consented to electronic service prior to the filing of this Petition.

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U.S. Patent No. 8,240,362
IPR2023-00667

Date: March 6, 2023

Petition Requesting *Inter Partes* Review

By: /James L. Ryerson/

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