

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

CoolIT Systems, Inc.
Petitioner

v.

Asetek Danmark A/S,
Patent Owner.

Patent No. 9,733,681

IPR Case No.: IPR2020-00524

PETITION FOR *INTER PARTES* REVIEW

TABLE OF CONTENTS

TABLE OF AUTHORITIES	iv
TABLE OF EXHIBITS	v
I. MANDATORY NOTICES UNDER 37 C.F.R. §42.8(a)(1) FOR INTER PARTES REVIEW	1
A. Real Party in Interest Under 37 C.F.R. §42.8(b)(1)	1
B. Related Matters Under 37 C.F.R. §42.8(b)(2)	1
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)	1
II. PAYMENT OF FEES UNDER 37 C.F.R. §42.15	2
III. REQUIREMENTS FOR IPR UNDER 37 C.F.R. §42.104	3
A. Grounds for Standing Under 37 C.F.R. §42.104(a)	3
B. Identification of Challenge Under 37 C.F.R. §42.104(b) and Relief Requested	3
IV. OVERVIEW OF THE '681 PATENT	4
A. Person of Ordinary Skill in the Art (“POSITA”)	4
B. Embodiments Claimed in Challenged Claims	5
C. Priority Date	10
D. The Prosecution History of the '681 Patent	11
E. Admitted Prior Art (“APA”)	12
F. The Challenged Claims	14
G. Claim Construction	14
1. “reservoir”	14
2. “chamber”	14
3. “impeller”	15
4. “stator”	15
5. “heat radiator”	16
6. “an inlet positioned below the center of the impeller”	16
7. “intermediate member”	19

8.	Other terms.....	20
V.	OVERVIEW OF PRIOR ART	20
A.	Duan (Ex. 1005)	20
B.	Shin (Ex. 1006).....	21
C.	Cheon (Ex. 1007)	21
VI.	SPECIFIC GROUNDS FOR PETITION.....	22
A.	GROUND 1: Claims 1 and 4 are rendered obvious over Duan in view of Shin, and Cheon	22
1.	Claim 1	22
2.	Motivation/Rationale to Combine the Teachings of Duan, Shin, and Cheon	60
3.	Claim 3.....	64
4.	Claim 4.....	66
B.	GROUND 2: Claims 8, 11, 15, and 16 are anticipated by Duan	68
1.	Claim 8.....	68
2.	Claim 11	83
3.	Claim 15.....	86
4.	Claim 16	87
C.	GROUND 3: Claims 8, 11, 15, and 16 are rendered obvious by Duan	89
VII.	THE BOARD SHOULD EXERCISE ITS DISCRETION TO INSTITUTE TRIAL	90
VIII.	SECONDARY CONSIDERATIONS	92
IX.	CONCLUSION.....	92
	CERTIFICATION OF WORD COUNT UNDER 37 C.F.R. §42.24(D).....	94
	CERTIFICATE OF SERVICE	95

TABLE OF AUTHORITIES

	Page(s)
Cases	
<i>In re Cohen</i> , 767 Fed. Appx. 985 (Fed. Cir. 2019).....	12, 63
<i>KSR Int’l Co. v. Teleflex, Inc.</i> , 550 U.S. 398 (2007).....	62, 63, 89, 90
<i>PharmaStem Therapeutics, Inc. v. ViaCell, Inc.</i> , 491 F.3d 1342 (Fed. Cir. 2007)	12, 63
<i>PowerOasis, Inc. v. T-Mobile USA, Inc.</i> , 522 F.3d 1299 (Fed. Cir. 2008)	10
<i>Tokai Corp. v. Easton Enters., Inc.</i> , 632 F.3d 1358 (Fed. Cir. 2011)	92
<i>Williamson v. Citrix Online, LLC</i> , 792 F.3d 1339 (Fed. Cir. 2015)	20
Statutes	
35 U.S.C. §103.....	3, 11
35 U.S.C. §102.....	3, 21
35 U.S.C. §112(6)	19
35 U.S.C. §314.....	90
Other Authorities	
37 C.F.R. §42.8	1
37 C.F.R. §42.15	2
37 C.F.R. § 42.100(b)	14
37 C.F.R. §42.104	3

TABLE OF EXHIBITS

Exhibit	Description
1001	U.S. Patent No. 9,733,681 (“’681 patent”)
1002	File history of U.S. Patent No. 9,733,681 (“’681 FH”)
1003	Declaration of Marc Hodes, Ph.D. Regarding Invalidity of U.S. Patent No. 9,733,681
1004	Joint Claim Construction and Pre-Hearing Statement Under Patent L.R. 4-3, filed on November 8, 2019 in <i>Asetek Danmark A/S v. CoolIT Systems, Inc.</i> , No. 3:19-cv-00410-EMC (N.D. Cal.)
1005	U.S. Patent App. Pub. No. 2006/0185830 to Qiang-Fei Duan et al. (“Duan”)
1006	Certified Translation of Japanese Unexamined Patent App. Pub. No. 2002-151638 to Takayuki Shin (“Shin”)
1007	U.S. Patent No. 5,731,954 to Cheon (“Cheon”)
1008	U.S. Patent No. 7,248,006 to Bail et al.
1009	U.S. Patent App. Pub. No. 2003/0173839 to Torii et al.

CoolIT Systems, Inc. (“Petitioner”) hereby seeks *inter partes* review of Claims 1, 4, 8, 11, 15 and 16 (“the Challenged Claims”) of U.S. Patent No. 9,733,681. (Ex. 1001 (the “’681 patent”).)

I. 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 CoolIT Systems, Inc., 2928 Sunridge Way NE #10, Calgary, AB T1Y 7H9, Canada.

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

A pending federal district court litigation may affect or be affected by the decision in this proceeding: *Asetek Danmark A/S v. CoolIT Systems, Inc.*, Case No. 3:19-cv-00410-EMC (N.D. Cal.). Related IPR matters include IPR2020-00522 and IPR2020-00523, which are filed concurrently. The undersigned is unaware of any other pending judicial or administrative matters that would affect, or be affected by, a decision in the proceeding.

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:

Lead Counsel	Backup Counsel
Vivek Ganti (Reg.No. 71,378) Greenberg Traurig, LLP Terminus 200 3333 Piedmont Road NE, Suite 2500 Atlanta, GA 30305 Telephone: 678.553.2470 Facsimile: E-mail: gantiv@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
Backup Counsel	
Xavier M. Brandwajn (<i>pro hac vice</i> forthcoming) Greenberg Traurig, LLP 1900 University Avenue, 5th Floor East Palo Alto, CA 94303 Telephone: 650.289.7899 Facsimile: 650.328.8508 E-mail: brandwajnx@gtlaw.com	

Service on Petitioner may be made by mail or hand delivery to: Greenberg Traurig, LLP, Terminus 200, 3333 Piedmont Road NE, Suite 2500, Atlanta, GA 30305. Petitioner also consents to and prefers electronic service by emailing counsel of record (shown above).

II. 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) for this Petition. 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.

III. 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 '681 patent is available for *inter partes* review, and that Petitioner is not barred or estopped from requesting an *inter partes* review on the grounds identified in the petition.

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

Petitioner respectfully requests that the Challenged Claims of the '681 patent (Ex. 1001) be cancelled based on the following grounds of unpatentability:

Ground of Unpatentability	'681 Patent Claim(s)	Basis for Rejection under 35 U.S.C. §§102-103
Ground 1	1, 4	Rendered obvious over Duan, Shin, and Cheon
Ground 2	8, 11, 15, 16	Anticipated by Duan
Ground 3	8, 11, 15, 16	Rendered obvious by Duan

In addition, this Petition is supported by the declaration of Dr. Hodes, an engineer holding a PhD in in Mechanical Engineering (Chemical Engineering Minor) with over 10 years working with thermal management of electronics, with a major thrust being liquid cooling in various contexts.

IV. OVERVIEW OF THE '681 PATENT

The '681 patent relates to a liquid-cooling system for a computer system. The specification purports to disclose embodiments of a liquid-cooling system that is more efficient, easier to use, and more compact with integrated components than prior art cooling systems. (Ex. 1001 at 1:12-2:24.) The '681 patent explains that it provides an “integrate element” to limit the number of separate elements and provides an “entire pump [that] is a placed inside the reservoir” or placed “outside the reservoir in the immediate vicinity of the reservoir.” (*Id.* at 2:17-18 and 2:25-29.) The '681 patent further states (and subsequently claims) that these purported improvements may be achieved by having an integrated element comprising the heat exchange interface, the reservoir of cooling liquid, and the pump for pumping the cooling liquid. (*Id.* at 1:53-2:36; claims 1-16.) As shown in detail in this Petition, however, the Challenged Claims of the '681 patent are not inventive.

A. Person of Ordinary Skill in the Art (“POSITA”)

A POSITA in the field of the '681 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 an B.S. (bachelor of science), or equivalent thereof, in electrical or mechanical engineering or a closely-related field, and 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 '681 patent. (Ex. 1003 at ¶¶ 25-30.)

B. Embodiments Claimed in Challenged Claims

The figures discussed below capture the main characteristics of the purported invention claimed in the Challenged Claims. (*Id.* at ¶¶ 37-43.)

“FIG. 8 [which should have been FIG. 7,¹ reproduced and annotated on the right] is a perspective view of the cooling system showing the reservoir housing 14 with the heat 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

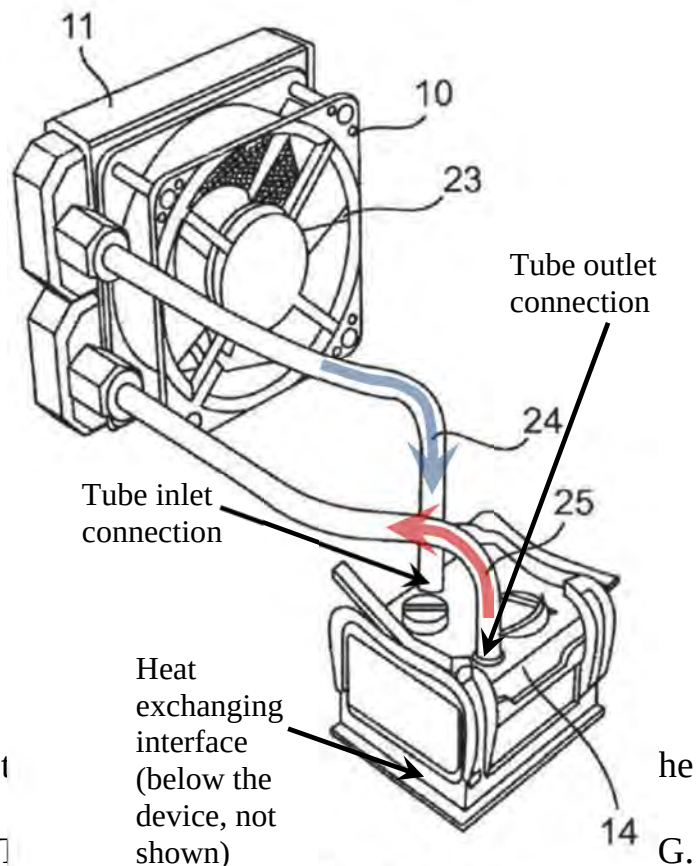


FIG. 7

¹ A POSITA would have understood that the patent's description are transposed. FIG. 7, and the description for FIG. 7 is accurate.

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 conducting/convecting 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 at 16:16-30.)

The internal structures of the claimed reservoir 14 are depicted in FIGS. 17 and 20, reproduced below. “FIG. 17 shows a preferred possible embodiment of a

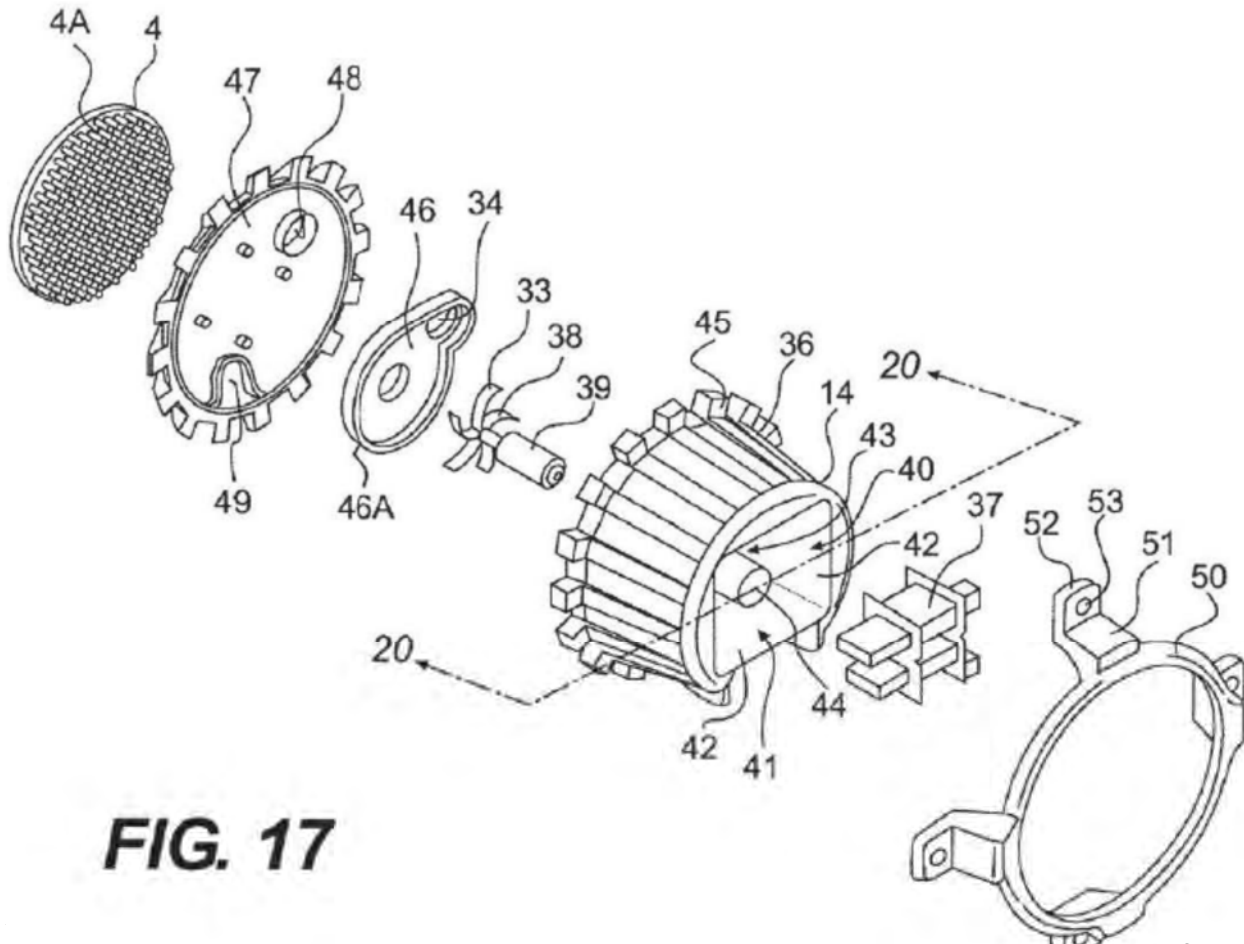


FIG. 17

reservoir according to the invention. The reservoir housing 14, as shown in FIGS. 17 and 20, is in the form of a double-sided chassis configured to mount an electrical motor.” (*Id.* at 21:48-52.) “The reservoir housing 14 may ... be provided with a[tube] inlet [connection] (not shown [in FIGS. 17 or 20]) and a[tube] outlet [connection] (not shown [in FIGS. 17 or 20]) for the cooling liquid. ... The [tube] inlet [connection] and the [tube] outlet [connection] lead to a radiator (not shown [in FIGS. 17 or 20]) intended for cooling the cooling liquid after having been heated by the processing unit via a heat exchanging surface[.]” (*Id.* at 22:31-38.) A POSITA would have understood that the tube “inlet” connection and the tube “outlet” connection mentioned here “are connected to a heat radiator by means of connecting tubes 24 and 25” as shown in FIG. 7 discussed above (*Id.* at 16:19-23; FIG. 7.)

“The radiator may be placed nearby or distant from the reservoir housing 14, depending on the set-up of the computer system. In one possible embodiment, the radiator is placed in the immediate vicinity of the reservoir, thereby possible excluding any tubing extending between the radiator and the [tube] inlet [connection] and the [tube] outlet [connection], respectively. Such embodiment provides a very compact configuration of the entire cooling system, namely a monolithic configuration where all elements needed for the cooling system are

incorporated in one unit” as shown in FIG. 20 (reproduced and annotated below).
(*Id.*, 22:39-48.)

“The reservoir housing 14 has a recess 40 in the centre on the upper side of the reservoir. The recess 40 is intended for accommodating a stator 37 of an electrical motor driving an impeller 33 of the pump, said impeller being attached to a shaft 38 of a rotor 39 of the electrical motor. The recess has an orifice 41, four sidewalls 42, a bottom 43 and a circular jacket 44 extending from the bottom 43 of the recess 40 and outwards towards the orifice 41 of the recess 40. The interior (see FIG. 20) of the jacket 44 is intended for encompassing the rotor 39 of the pump. As shown in FIG. 20, the impeller 33 is housed in a recess on the underside of the reservoir housing 14, the

recess being an extension of the interior of the jacket 44.”
(*Id.* at 21:58-22:9)

“Thereby, a liquid-proof division is made between the rotor 39 of the motor, said rotor 39 being placed inside the interior of the jacket 44 and being

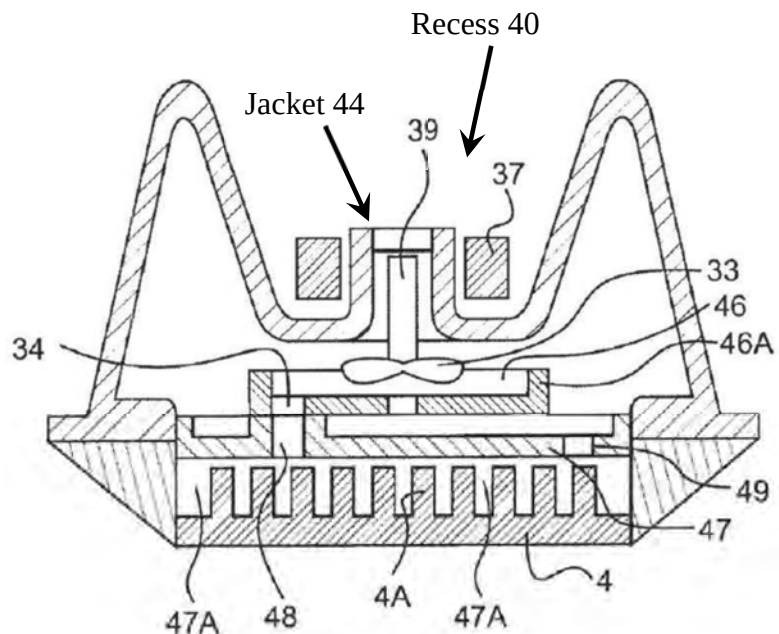
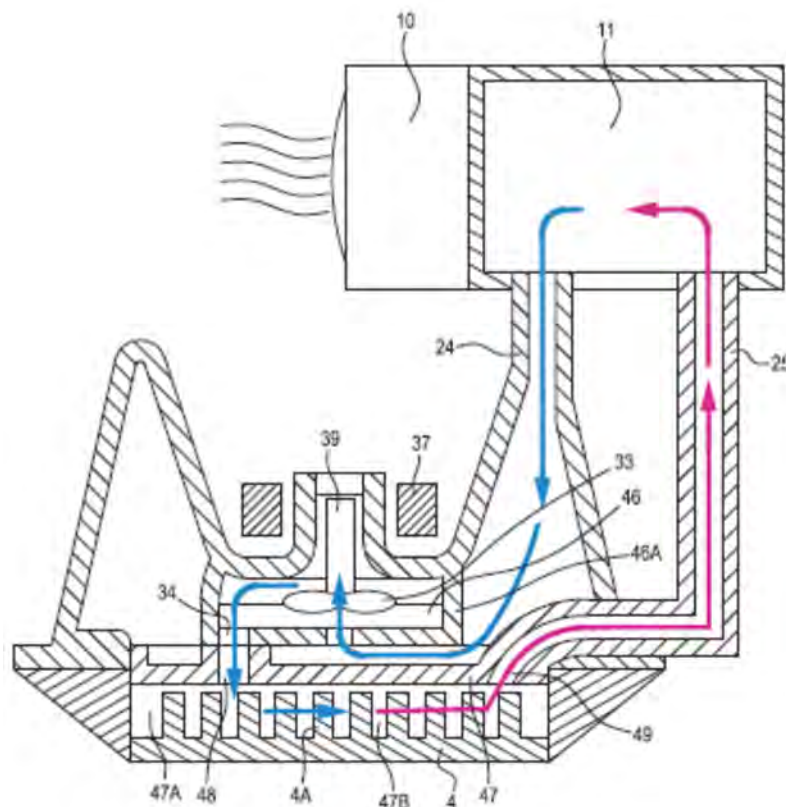


FIG. 20

submerged in the cooling liquid, and the stator 37 of the pump, said stator 37 being positioned in the recess 40 and surrounding the exterior of the jacket 44. Accordingly, the stator 37 need not be sealed against the cooling liquid, because the recess 40 together with the jacket 44 ensures the stator staying dry from the cooling liquid, but the stator 37 still being capable of driving the rotor 39, when being supplied with electrical power from a power supply (not shown) of the computer system.” (*Id.* at 22:10-20.)

A POSITA would have understood that the resulting system, if having the inlet tube connection and the outlet tube connection with the fan and the radiator looks like the following example:



The cycle of the cooling liquid flows can start at the radiator 11. As shown above, the cooling liquid, already cooled by the fan 10 and the radiator 11, flows from the radiator 11 into the reservoir 14 through connecting tube 24, flows to the inlet of the pump chamber 46 and gets sucked up by the impeller 33 through the inlet of the pump chamber 46, gets spun to the circumference of the pump chamber 46, flows downward to the thermal exchange chamber 47A via the first passage 48, flows through the thermal exchange chamber 47A, flows out of the thermal exchange chamber 47A via a second passage 49 and into the connecting tube 25, and finally flows back to the radiator 11 and fan 10 to get cooled, and the cycle continues. (Ex. 1003, ¶¶ 42-43.)

C. Priority Date

The '681 patent issued on August 15, 2017, from Application No. 13/861/593 filed on April 12, 2013 and claims the benefit of Application No. 11/919,974, which is a U.S. National Stage of Int'l application No. PCT/DK2005/00310 filed on May 6, 2005. Petitioner does not concede that the '681 patent is entitled to an effective filing date of May 6, 2005, and reserves the right to contest the priority claim, 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) (explaining that “the burden ... to come forward with evidence to

prove entitlement to claim priority to an earlier filing date” is correctly placed on a patent owner).

D. The Prosecution History of the '681 Patent

On October 6, 2016, the Examiner issued a non-final rejection of then-pending claims 1-7 under 35 U.S.C. 103(a) as being unpatentable over Batchelder (US6019165, as cited in the IDS) in view of Lenehan (US7591302B1, as cited in the IDS). (*Id.* at 256-63.) After the Patent Owner responded without amendment, the Examiner issued a final rejection on the same grounds articulated previously On February 3, 2017. (*Id.* at 279-89 and 293-302.)

In response, on April 3, 2017, Patent Owner filed remarks asking that the remaining claims 1-7 be placed in condition for allowance (*Id.* at 306-322.) Patent Owner also amended claim 1 and added Claims 19-27, arguing that these amendments and new claims traversed the previous rejections:

“For example, Batchelder does not teach or suggest a first passage that ‘directs the cooling liquid into the thermal exchanger chamber ***between a first end and a second end of the thermal exchanger chamber,***’ as claimed. (Emphasis added). Instead, Batchelder discloses, as shown in Fig. 8, the heat transfer fluid enters pocket 230 at either end of the pocket and flow inward through the fins 52. In another example, Batchelder does not teach or suggest ‘the thermal exchange chamber includes at least one second passage configured to direct the cooling liquid out of the thermal exchange chamber, ***the at***

least one second passage is positioned at either the first end or the second end of the thermal exchange chamber,’ as claimed. (Emphasis added). Instead, Batchelder discloses, as shown in Fig. 8, the exit slots 232 are positioned in the center of the fins 52 and pocket 230. And Lenehan does not cure these deficiencies of Batchelder.”

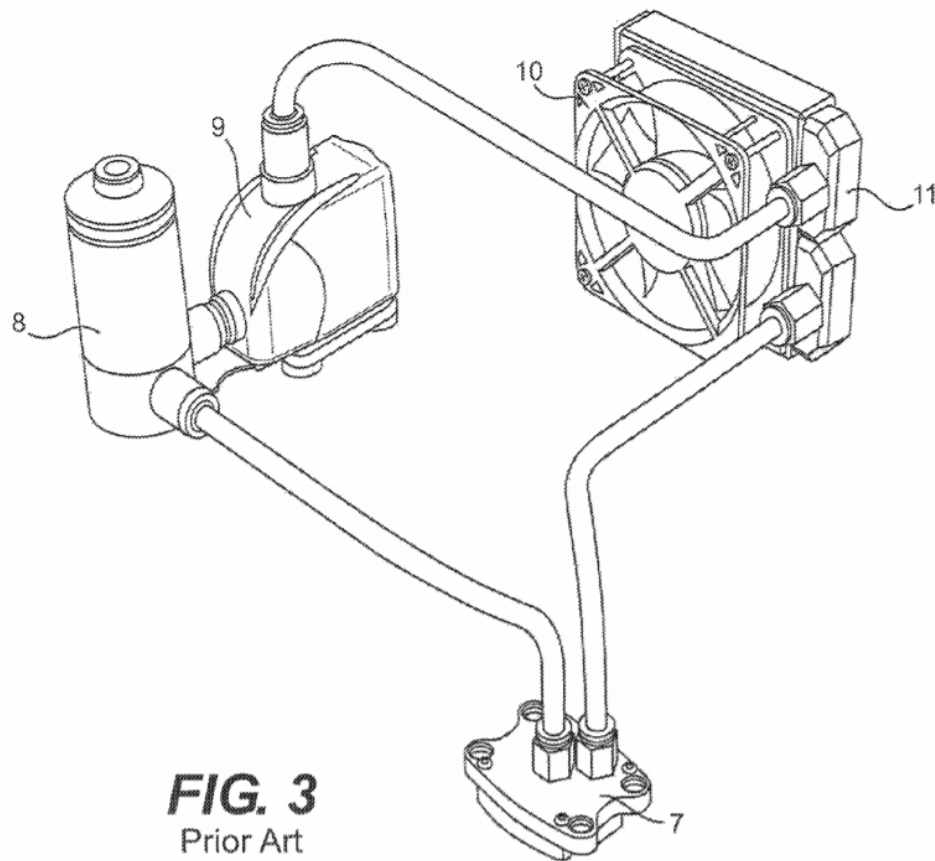
(*Id.* at 330-49.) On June 7, 2017, the Examiner issued a Notice of Allowance, noting that “[t]he closest prior art of record Batchelder (as previously cited) teaches a pump chamber but fails to teach the recited first and second passages. There would be no motivation to modify the pump chamber of Batchelder.” (*Id.* at 370-77.)

E. Admitted Prior Art (“APA”)

Prior art admissions made in the specification of a patent application are binding on a Patent Owner, and may be used as prior art against the patent. *PharmaStem Therapeutics, Inc. v. ViaCell, Inc.*, 491 F.3d 1342, 1362 (Fed. Cir. 2007) (“Admissions in the specification regarding the prior art are binding on the patentee for purposes of a later inquiry into obviousness.”) Patent Owner made such admissions here. FIGS. 1-2 of the ’681 patent show a prior art embodiment of “the typical components in an air-cooling type CPU cooling arrangement”, and FIG. 3 shows an embodiment of “the typical components in a liquid-cooling type CPU cooling arrangement.” (Ex. 1001 at 9:40-48, 10:22-67; FIGS. 1-3.) See *In re Cohen*, 767 Fed. Appx. 985, 987-89 (Fed. Cir. 2019) (affirming an examiner’s

reliance on the disclosure of a “typical” technique in the “Background” section of a patent as applicant-admitted prior art).

Patent Owner admits that both air-cooling systems and liquid-cooling systems in the prior art included “a prior art air fan” (Ex. 1001 at 10:22-67), and that in prior art liquid-cooling systems the air fan 10 is “provided together with the heat radiator” and “blow[s] air through the heat radiator” (*id.* at 10:50-67). FIG. 3 of the '681 patent, showing air fan 10, is reproduced below:



Accordingly, FIGS. 1-3 of the '681 patent and the descriptions thereof are available as prior art.

F. The Challenged Claims

Claims 1, 4, 8, 11, 15 and 16 are the Challenged Claims of the '681 patent.

G. 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.”

1. “reservoir”

The parties have stipulated, in the pending district court action, to construe the term “reservoir,” as that term is used in claim 1 of the '681 patent, to mean “single receptacle defining a fluid flow path.” (Ex. 1004 at 1.)

2. “chamber”

The parties have also stipulated to construe the term “chamber,” as that term is used in claims 1, 4, 8, and 15 of the '681 patent, to mean “compartment within the reservoir.” (*Id.* at 2.) The claims are directed to both a “pump chamber” and a “thermal exchange chamber.” Petitioners submit that these claimed “chambers” should be given their plain and ordinary meaning in accordance with the stipulated construction for “chamber” above.

3. “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 at ¶ 23.) 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 ’681 patent describes “pumping means with an impeller for pumping the cooling liquid through a pumping housing.” (Ex. 1001 at 8:58-63.) This is consistent with the plain and ordinary meaning of “impeller”.

4. “stator”

Petitioner submits that the term “stator” should be given its plain and ordinary meaning. A stator is a conventional and well-known component of rotary motors. (Ex. 1003 at ¶¶ 24-25.) A stator may refer to the stationary functional parts of a motor during its operation. For example, the ’681 patent explains, “wherein a stationary part of the motor of the pump, such as a stator of an electrical motor, is placed outside the reservoir.” (Ex. 1001 at 2:40-42.) Typically, a component that rotates is coupled to the stator such that the rotating component moves about an axis defined by the stator. (Ex. 1003 at ¶¶ 24-25.)

In the context of electro-magnetic motors, a “stator” is interchangeable with the phrase “stator assembly” such that the stator is in a fixed position while a magnetic rotor rotates in response to magnetic fields created by the stator coil

included in the stator assembly. (See *e.g.*, Ex. 1008 at 5:10-17; *see also* Ex. 1009 at Abstract.) Thus, a stator may refer to an assembly including a coil used in rotary motor applications. (Ex. 1003 at ¶¶ 24-25.)

5. “heat radiator”

Petitioner submits that the term “heat radiator” should be given its plain and ordinary meaning. A heat radiator is a conventional and well-known component included in systems that require cooling. (Ex. 1003 at ¶ 26.) In describing the prior art, the ’681 patent explains that in some systems, a heat 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 10:63-65 and FIG. 3 (labeled as prior art).) In its plain meaning heat radiators are understood byPOSITAs as a system that transfers thermal energy (e.g., heat) by conduction/convection from one medium to another medium. (Ex. 1003 at ¶ 26.) Heat radiators may include structures such as pipes or fins to transfer heat. (*Id.*)

6. “an inlet positioned below the center of the impeller”

Petitioner submits that the term “an inlet positioned below the center of the impeller” encompasses an “opening for fluid entrance near the center of the impeller along the axis around which the impeller rotates.” (Ex. 1003 at ¶¶ 27-28.) The term “below a center of the impeller” in the context of an impeller does not appear in the written description of the ’681 patent. Instead, the ’681 patent states,

“[t]he inlet of the pump chamber 46 is the entire opening into the cavity that the pump chamber configures, said cavity being in direct communication with the interior of the reservoir housing 14 as such.” (Ex. 1001 at 23:1-5.) This is illustrated in FIG. 20 of the '681 patent:

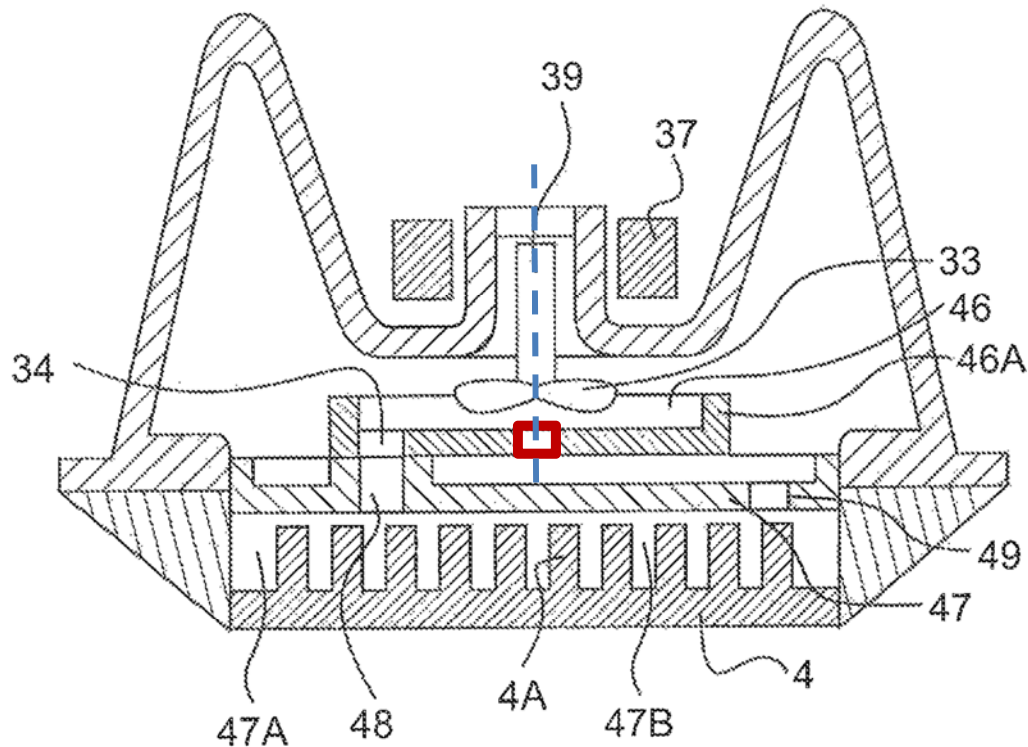


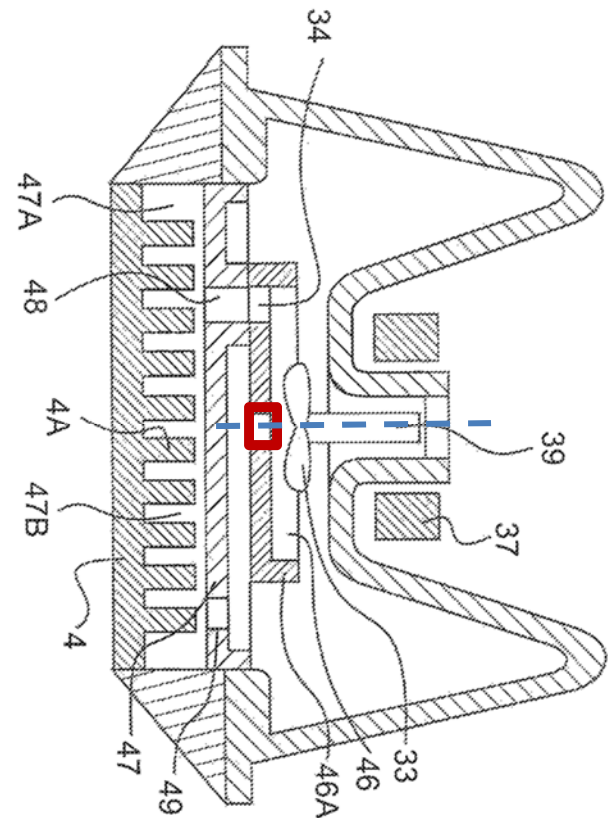
FIG. 20

(Ex. 1001 at FIG. 20 (circle added to show inlet).) As depicted above, FIG. 20 shows an inlet opening (area within the red square) positioned near a center of the impeller (item 33) along the axis around which the impeller rotates (indicated in blue). When read in context, claim 1 states “**an inlet** defined by the impeller cover

positioned **below a center of the impeller** configured to enable the cooling liquid to flow into the center of the pump chamber.” (Emphasis added.) This is shown in FIG. 20, where the inlet provides liquid towards the center of the pump chamber. For example, item 49 of FIG. 20 refers to a “second passage” FIG. 20 also shows an “outlet 34 provided tangentially to the circumference of the impeller 33.” (Ex. 1001 at 22:66-68).

Petitioner further notes that, if FIG. 20 were rotated clockwise so that the impeller 33 faces to the left (instead of downward), then “an inlet ... positioned below a center of the impeller” would refer to the opening to the left of the impeller. This kind of rotation is common in, for example, a tower computer case in which the motherboard is vertical as opposed to horizontal. As a result, the CPU will be install vertically, which in turn cause the claimed device to be so rotated. Such rotation would not materially alter the functioning of the device, as would have been understood and appreciated by a POSITA. This further supports the construction of this

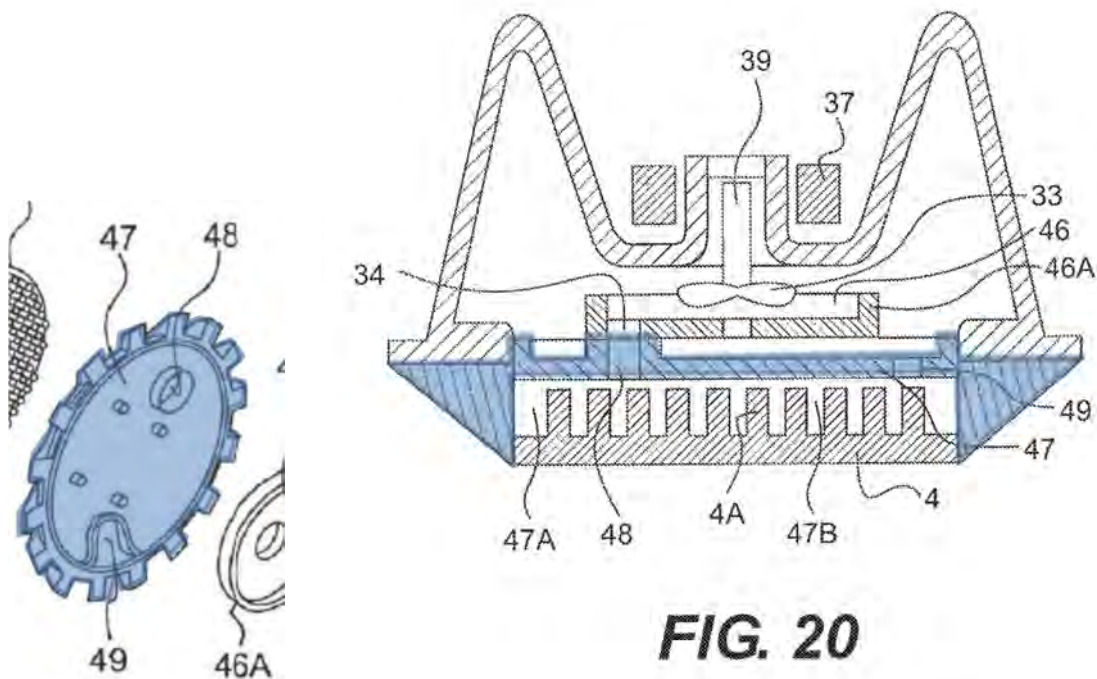
FIG. 20



phrase to mean an opening for fluid entrance near the center of the impeller along the axis around which the impeller rotates.

7. “intermediate member”

The term “intermediate member” is a means-plus-function term appearing in claim 8 and its construction is governed by 35 U.S.C. § 112(6). Petitioner submits that the corresponding structure is element 47 of FIGS. 17 and 20 of the '681 patent. (Ex. 1003 at ¶¶ 29-34.) Images of item 47 are reproduced below:



(Ex. 1001 at FIGS. 17 & 20.) The '681 patent describes element 47 as “[a]n intermediate member 47 is provided between the pump chamber 46 together with the interior of the reservoir and a heat exchanging interface 4.” (Ex. 100 at 23:5-8.)

When read in context of the claim, “intermediate member” is a nonce phrase that is a placeholder for some structure that performs the function of partially defining

the pump chamber, for coupling to the heat-exchanging interface, and for defining a second passage.” For example, the words “intermediate” and “member” connote no structure and are instead generic words. *See Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1349 (Fed. Cir. 2015). To the extent the phrase “intermediate member” is not given means-plus-function treatment, Petitioner submits that this term be given its plain and ordinary meaning.

8. Other terms

As to other terms, a POSITA would have understood the plain and ordinary meaning of the term “double-sided chassis” to be “two-sided frame or base.” Further, a POSITA would have understood the plain and ordinary meaning of “a first end or a second end of the thermal exchange chamber” to be “a first edge or a second edge of the thermal exchange chamber.” Although district court claim construction proceedings are ongoing, Petitioner does not believe any additional constructions are required at this time. (Ex. 1003 at ¶ 35.) Accordingly, all other terms of the ’681 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.

V. OVERVIEW OF PRIOR ART

A. Duan (Ex. 1005)

Duan was filed on February 18, 2005 and published on August 24, 2006 as U.S. Patent Application Publication No. 2006/0185830 to Qiang-Fei Duan et al.

(Ex. 1005.) Thus, Duan is entitled to an effective filing date of at least February 18, 2005, so Duan is prior art to the '681 patent under at least pre-AIA 35 U.S.C. §102(e). Duan was not disclosed during the prosecution of the '681 patent.

B. Shin (Ex. 1006)

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. 1006 at (21), (22), (11), (43).) Thus, Shin is entitled to an effective filing date of at least May 24, 2002. Shin is prior art to the '681 patent under at least pre-AIA 35 U.S.C. §102(a) and (b). Shin was not disclosed during the prosecution of the '681 patent.

C. Cheon (Ex. 1007)

Cheon issued as U.S. Patent No. 5,731,954 on March 24, 1998. (Ex. 1007-Cheon at [11], [45].) Thus, Cheon is prior art to the '681 patent under at least pre-AIA 35 U.S.C. §102(a) and (b). Cheon was disclosed during prosecution of the '681 patent.

VI. **SPECIFIC GROUNDS FOR PETITION**

A. **GROUND 1: Claims 1 and 4 are rendered obvious over Duan in view of Shin, and Cheon**

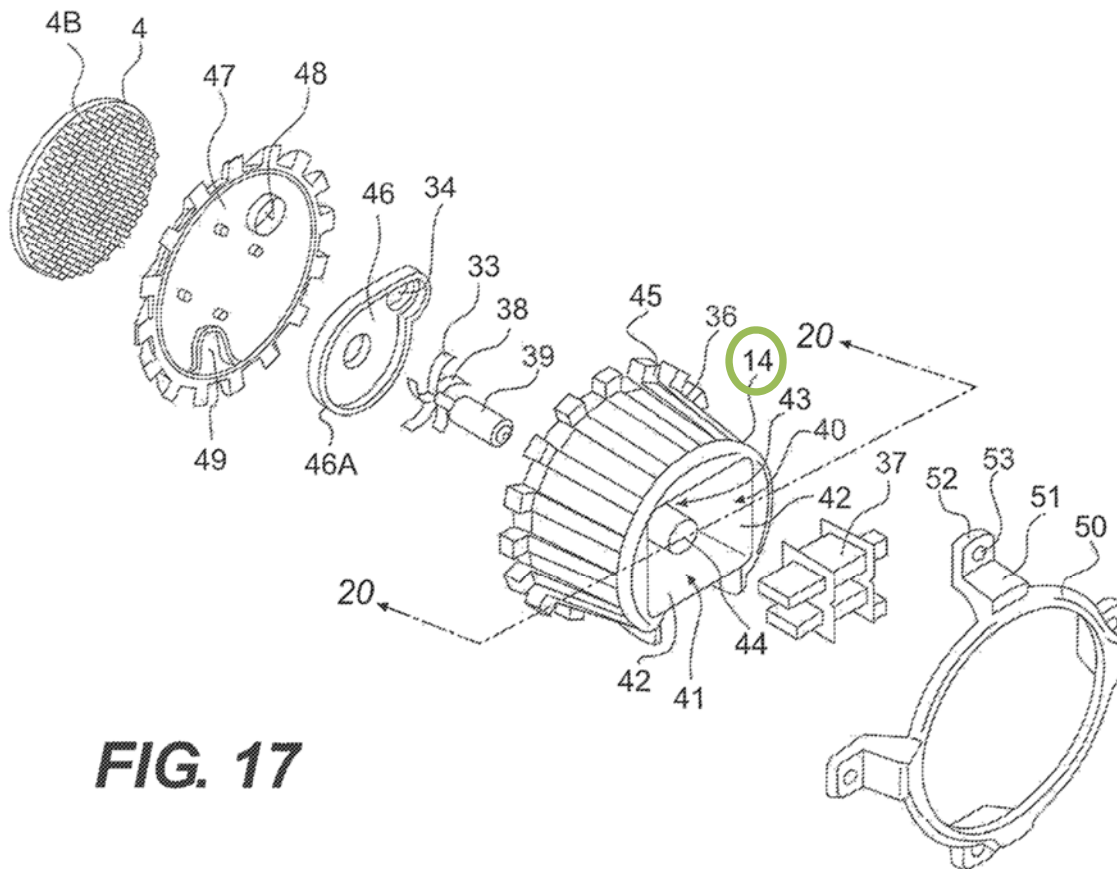
1. **Claim 1**

[1-PRE] “A liquid cooling system for cooling a heat-generating component of a computer, comprising:”

Duan discloses the preamble, regardless of whether it is a limitation. Duan “relates to a cooling plate module, and more particularly to a cooling plate module used for *heat emitting device such as a CPU.*” (Ex. 1005 at [0002] (emphasis added).) Duan further teaches that the disclosed cooling plate module “includes a cooling plate and a *liquid driving module.*” (*Id.* at Abstract (emphasis added); see also Ex. 1003 at ¶ 78.) For these reasons and as explained below with respect to the remaining limitations, Duan discloses the preamble.

[1a] “a double-sided chassis adapted to mount a pump configured to circulate a cooling liquid, the pump comprising a motor with a stator and an impeller, the impeller being positioned on one side of the chassis and the stator being positioned on an opposite side of the chassis and isolated from the cooling liquid;” (Ex. 1003 at ¶¶ 79-95.)

With regard to this limitation, the '681 patent explains an example of how its “reservoir housing” forms “a double-sided chassis configured to mount an electrical motor” in FIG. 17 (Ex. 1001 at FIG. 17; 21:47-56.):



As shown above, the “reservoir substantially has a conical, circular configuration.” (*Id.*). FIG. 20 of the ’681 patent provides an example of a cross section view where “the impeller 33 is housed in a recess on the underside of the reservoir housing 14” (colored in green below):

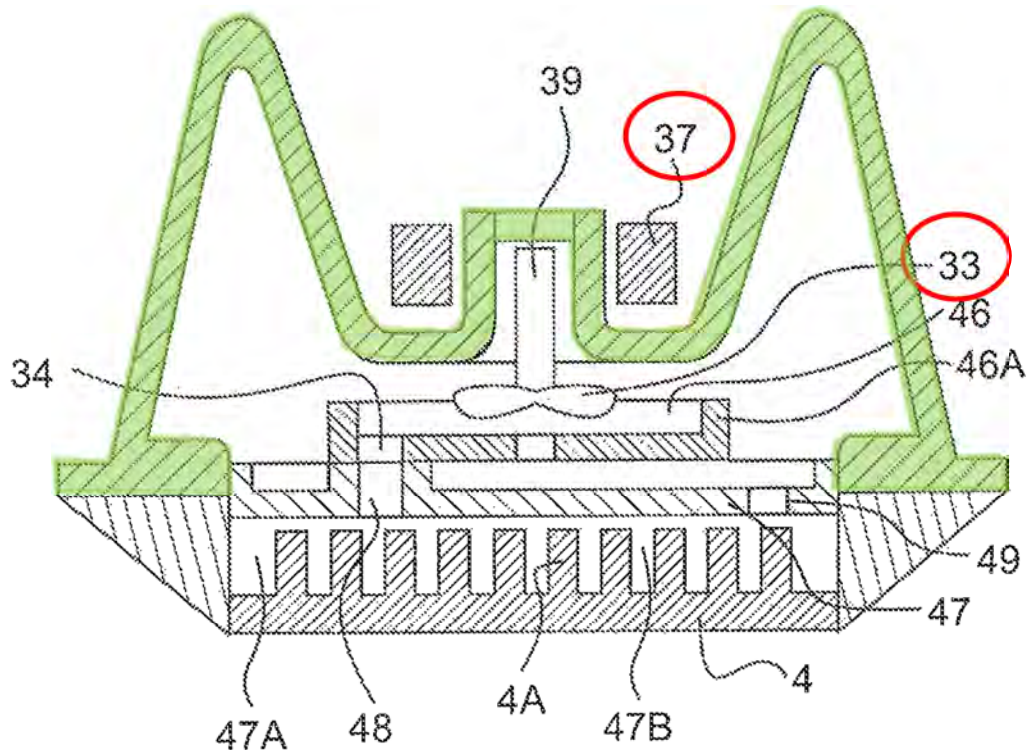


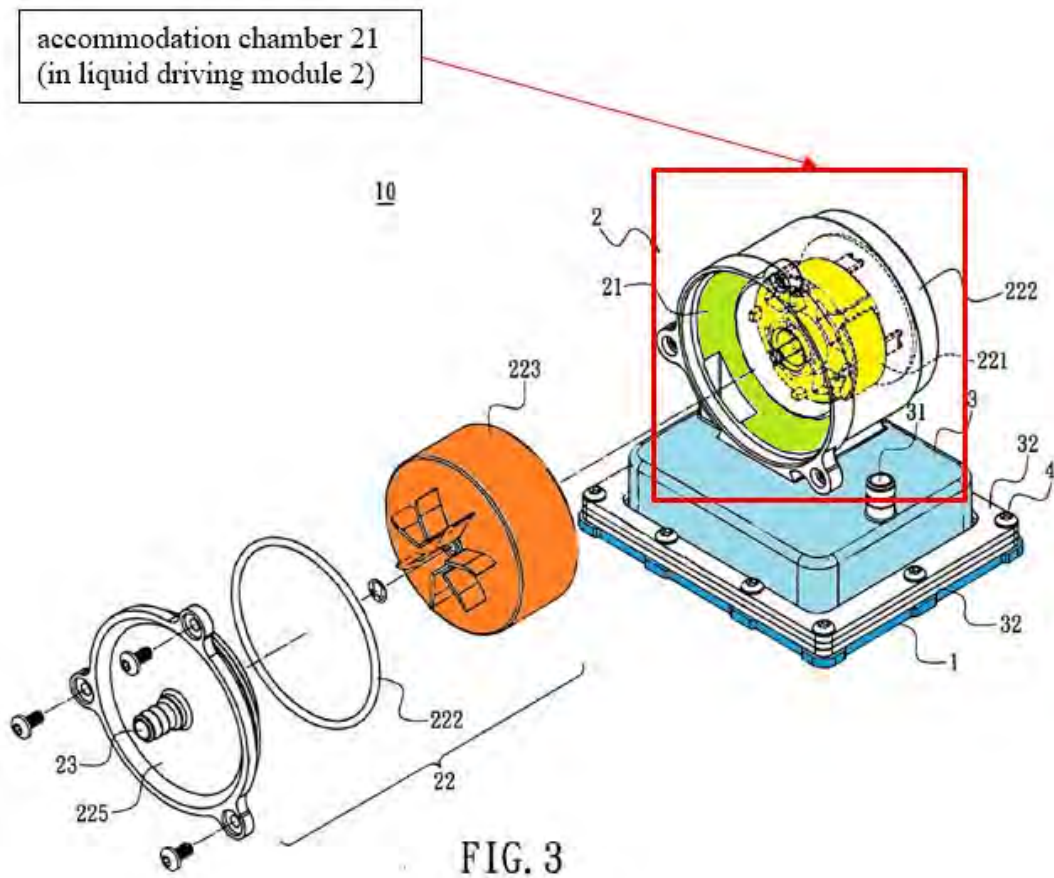
FIG. 20

(Ex. 1001 at 22:6-9 and FIG. 20 (emphasis added).) Specifically, FIG. 20 depicts the impeller 33 on one side of the chassis and the stator 37 on the other side of the chassis.

Duan describes virtually the same embodiment related to the claimed “double-sided chassis.” For example, Duan discloses a pump comprising a motor (e.g., liquid driving module 2) comprised of an impeller (e.g., the impeller stage 223) and a stator (e.g., the coil stage 221).

To illustrate, reproduced below are colored versions of FIGS. 2 and 3 of Duan that use the following color coding scheme:

Color	Duan Element
Yellow	coil stage 221
Orange	impeller stage 223
Light blue	cap 3
Dark blue	cooling plate 1
Lime green	accommodation chamber 21 (interior)



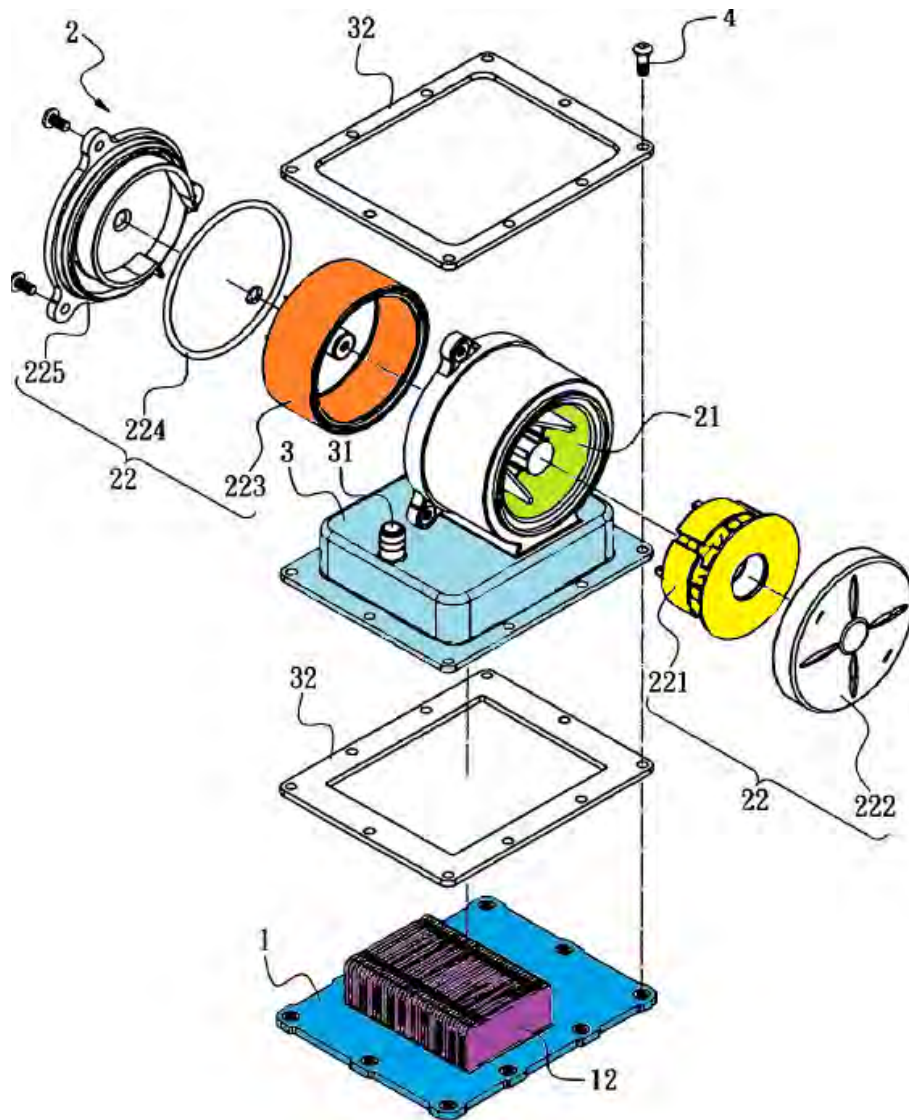


FIG. 2

As illustrated in the above figures, Duan discloses a double-sided chassis (e.g., accommodation chamber 21) adapted to mount a pump (e.g., liquid driving unit 22) configured to circulate a cooling liquid. (See Ex. 1005 at [0023]).

In addition, as shown above, FIGS. 2 and 3 further disclose the impeller (e.g., impeller of impeller stage 223) being positioned on one side of the chassis

(e.g., accommodation chamber 21) and the stator (e.g., at least part of the coil stage 221) being positioned on the upper side of the chassis and isolated from the cooling liquid. (*Id.*; *see also* Ex. 1005 at [0026] (“In the present invention, during the assembling of the liquid cooling cyclic mechanism 100, the liquid inlet 23 of the cooling plate module 10 is communicated to the liquid outlet 521 of the liquid exit region 52 of the water tank 20 through duct 6”).

A POSITA reading Duan would have understood that Duan’s coil stage 221 is part of an electric rotary motor’s stationary portion, i.e., a stator, which is a common structure of a rotary motor that includes the stationary functional parts of a motor during its operation. (Ex. 1001 at 2:40-42) Thus, Duan’s disclosure of a coil stage and impeller stage further discloses the presence of a stator needed to cause the impeller to rotate about an axis for purposes of providing a fluid pump. Petitioner notes that the impeller stage 223 of Duan includes blades of a fan. (Ex. 1005 at FIG. 3, item 223.)

Duan further discloses that the impeller is “positioned on one side of the chassis and the stator being positioned on an opposite side of the chassis and isolated from the cooling liquid,” as recited in claim 1. A POSITA reading Duan would have understood that the impeller of the impeller stage is in contact with the liquid for performing the liquid pump functionality provided by Duan’s liquid driving module. Specifically, Duan states that “[t]he lower cover 225 comprises a

liquid inlet 23” which means that the impeller makes contact with liquid. (Ex. 1005 at [0023].) Duan also teaches the use of a “a sealing washer 224” to prevent liquid from escaping around the impeller.

In addition, Duan’s coil stage (including the stator) is not in contact with fluid. This is shown in FIG. 2 of Duan where the impeller 223 is separated from the coil stage. In this respect, Duan protects its coil stage from the fluid that is being moved by the impeller stage. As a result, FIG. 2 of Duan shows separating the coil stage (which includes a stator) and the impeller (which is part of the impeller stage) such that former is not submerged while the latter is submerged. By positioning Duan’s stator on the opposite side of the impeller stage, Duan discloses isolating the stator from the cooling liquid. (*Id.*)

FIG. 7 of Duan provides yet another view of a double-sided chassis that separates the impeller and stator on opposite sides of the chassis so that the stator is isolated from liquid. FIG. 7, below, shows the locations of the impeller (item 223) and the coil stage that includes a stator (item 221).

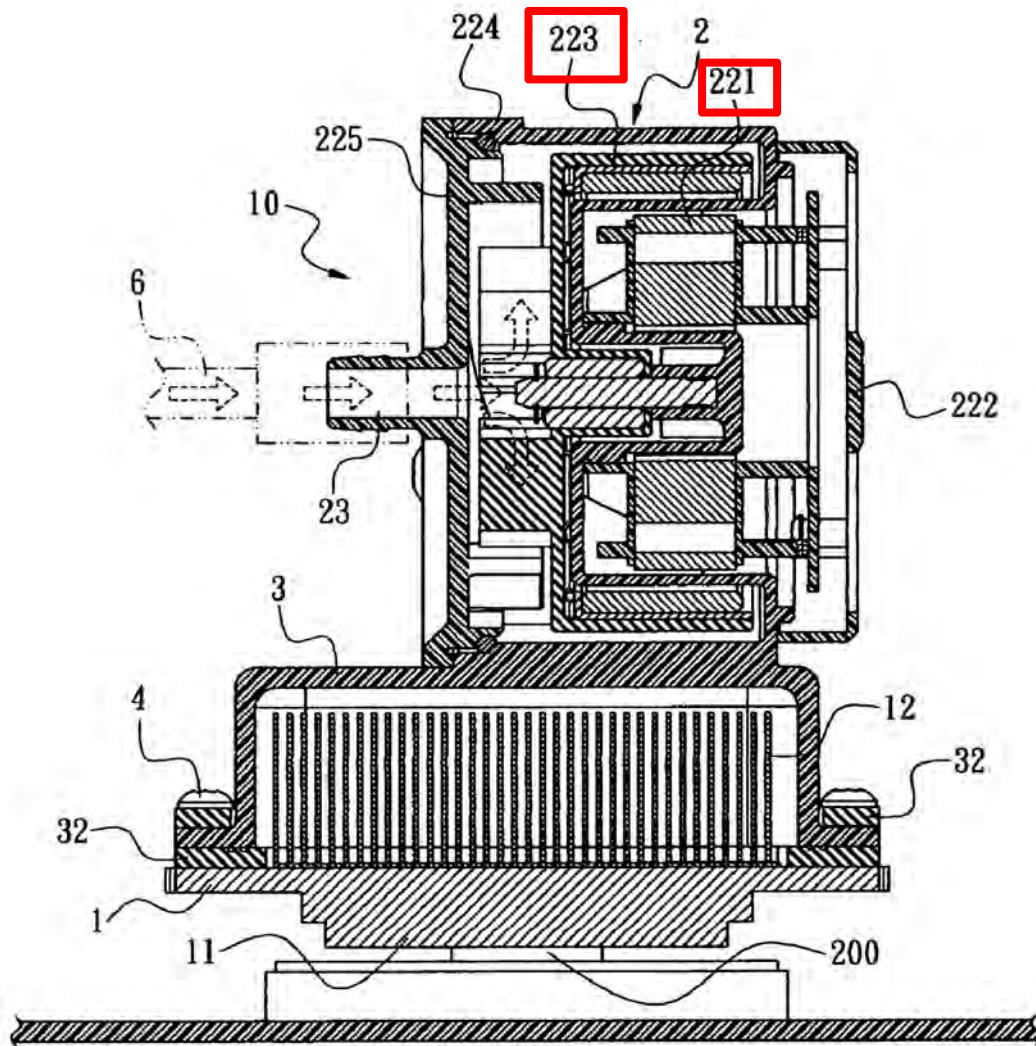


FIG. 7

(Ex. 1005 at FIG. 7 (emphasis added to show items 221 and 223).) In addition, a red line is added to FIG. 7 below to show a cross-section of the chassis as it separates items 221 and 223.



30

[1b] “a reservoir adapted to pass the cooling liquid there-through, the reservoir including:” (Ex. 1003 at ¶¶ 96-99.)

As discussed above, the parties agree that “reservoir” should be construed as a “single receptacle defining a fluid flow path.” (Ex. 1004 at 1.) Duan discloses this limitation as construed.

Specifically, Duan discloses the claimed “reservoir” (e.g., the combined structure including accommodation chamber 21, cap 3, and cooling plate 1) that is adapted to pass cooling liquid therethrough. (Ex. 1005 at [0023] and FIGS. 2 & 3.) Thus, Duan discloses a structure formed by an accommodation chamber 21, cap 3, and cooling plate 1 that forms the claimed reservoir. The reservoir disclosed by Duan is further shown in FIG. 7 of Duan with a red outline added to show the boundaries of the reservoir.

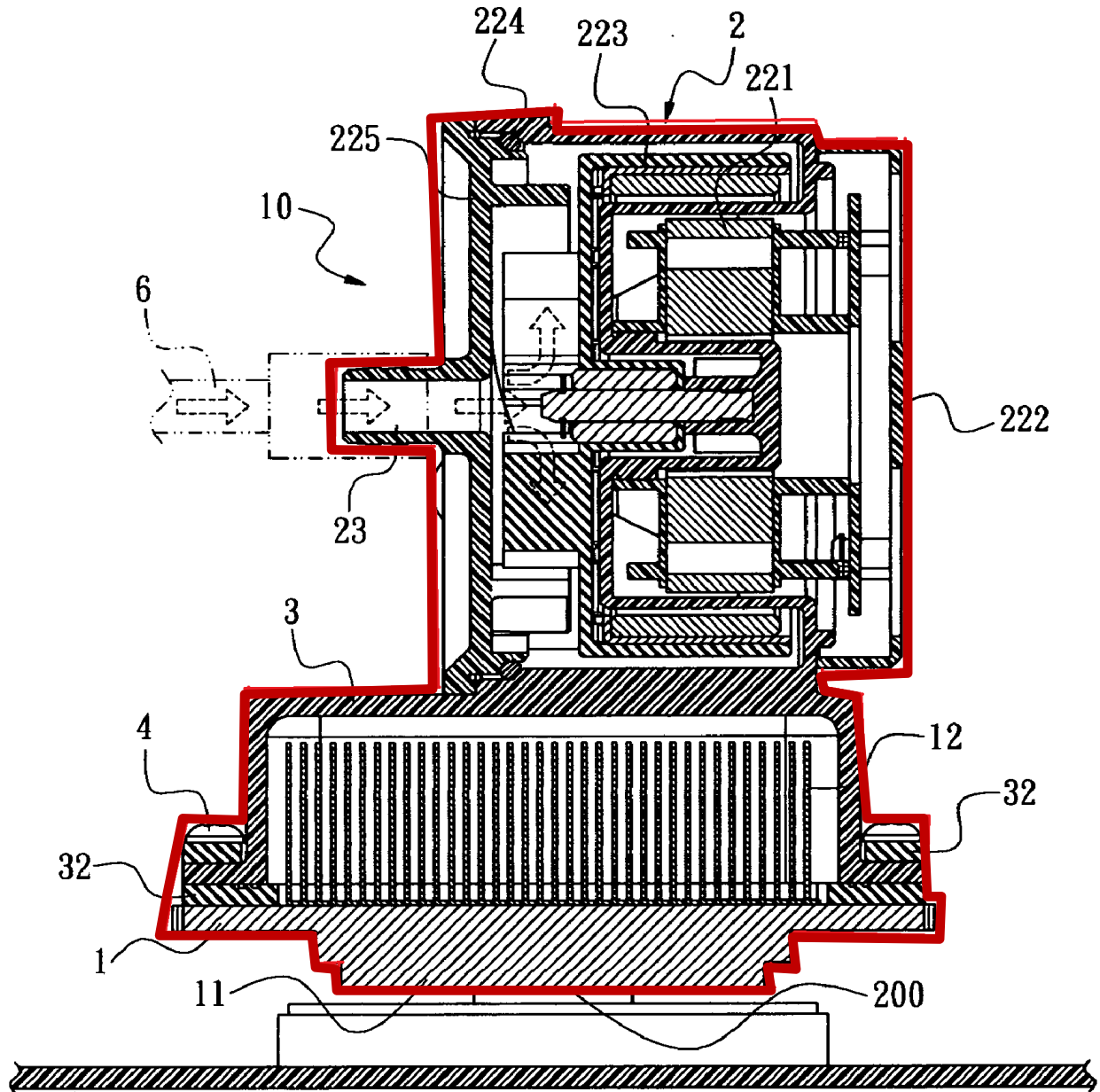


FIG. 7

As discussed above, Duan discloses the reservoir by describing a structure formed by the combination of accommodation chamber 21, cap 3, and cooling plate 1 configured to pass cooling liquid there-through. It would be obvious to

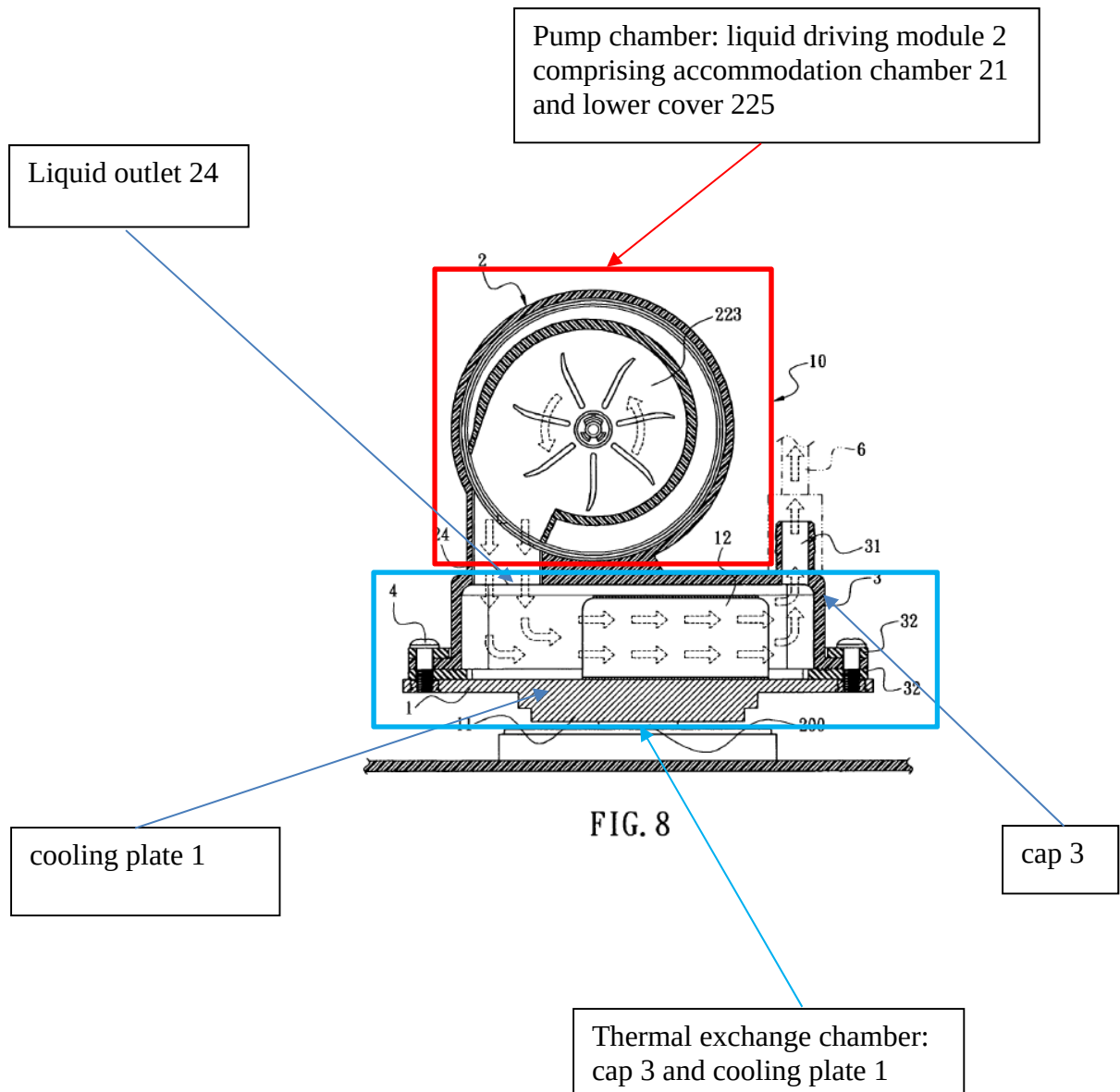
combine these structures as a single receptible to achieve the claimed reservoir. Duan emphasized the need for “integrally formed” components to track to the “compact trend of computer[s]”). (Duan at [[0006]-[0007].) Duan teaches that modifications can be made to integrate components to “minimize space.” (*Id.*) Thus, a POSITA would be motivated to minimize the number of components to form singular integrated components for more compact computing applications. In addition, the accommodation chamber 21, cap 3, and cooling plate 1 of Duan perform the same functions and purpose as the claimed “reservoir” as discussed in Ground 1. Thus, integrating these components into a single receptible would disclose the claimed “reservoir.”

[1b-i] “a pump chamber including the impeller; and,” (Ex. 1003 at ¶¶ 100-102.)

As discussed above, the parties agree that “chamber” should be construed as a “compartment within the reservoir.” (Ex. 1004 at 2.) Duan discloses a pump chamber (e.g., accommodation chamber 21 and lower cover 225) that includes the impeller (the impeller stage 223). (see Ex. 1005 at [0023] (“With reference to FIGS. 2, 3, and 4, *the liquid driving module 2 comprises an accommodation chamber 21 and a liquid driving unit 22* located in the accommodation chamber 21” (emphasis added).)

[1b-ii] “a thermal exchange chamber formed below the pump chamber and vertically spaced apart from the pump chamber, the pump chamber and the thermal exchange chamber being separate enclosed chambers that are fluidly coupled;” (Ex. 1003 at ¶¶ 103-108.)

Duan discloses a thermal exchange chamber (e.g., cap 3 and cooling plate 1) formed below the pump chamber (e.g., accommodation chamber 21 and lower cover 225) and vertically spaced apart from the pump chamber, the pump chamber and the thermal exchange chamber being separate enclosed chambers that are fluidly coupled (by first liquid inlet 24). (Ex. 1005 at [0023] and FIGS. 2, 3, 4.) FIG 8 of Duan also shows the spacing and orientation of these elements and the path of cooling liquid:



As shown above, Duan's thermal exchange chamber (depicted in the blue box) is formed below the pump chamber (shown in the red box). Below, is a cross sectional view showing the thermal exchange chamber vertically spaced apart from the pump chamber with red arrows showing the vertical spacing:

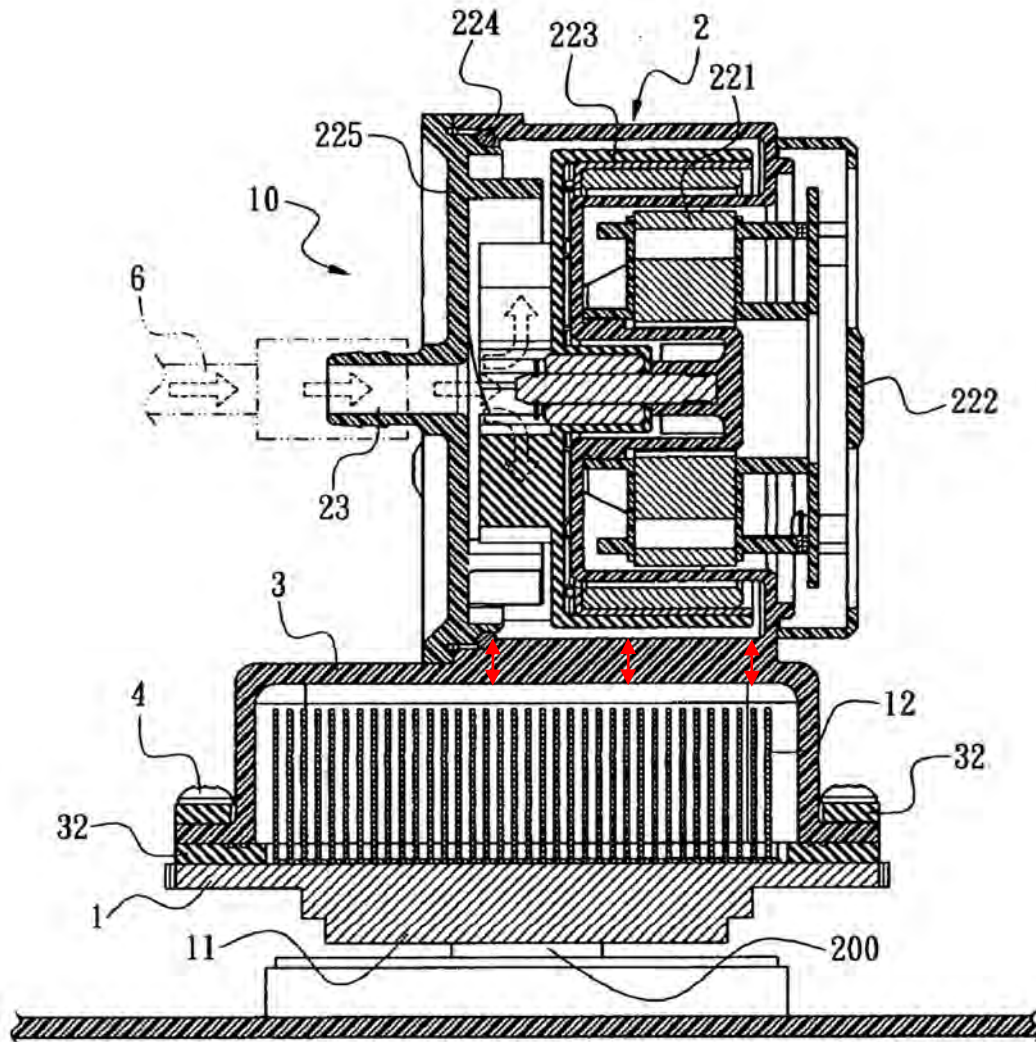
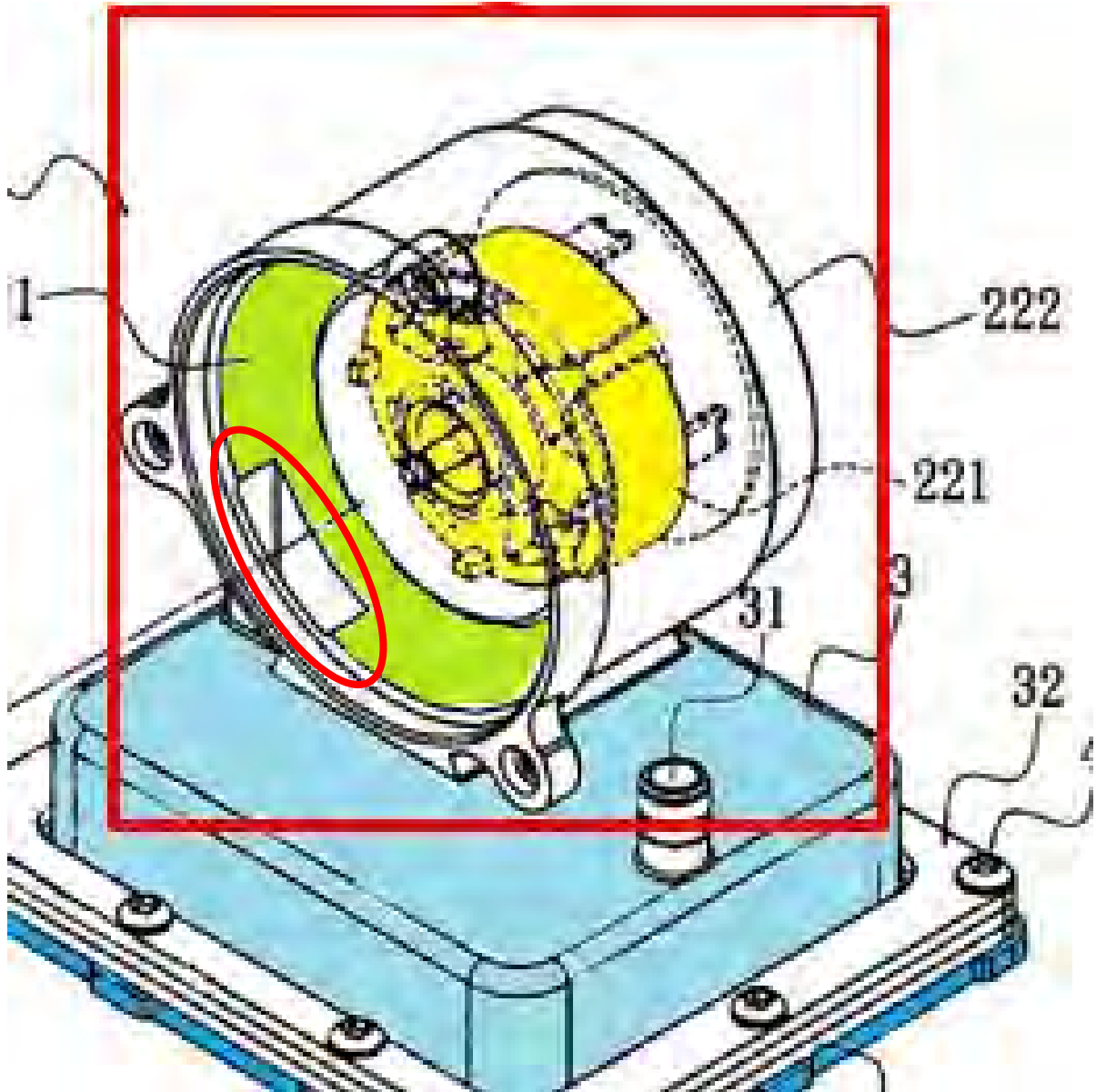


FIG. 7

(Ex. 1005 at FIG. 7 (arrows added).) Moreover, FIGS. 7 and 8 show these two chambers being separate but within the structure that forms the reservoir. A portion of FIG. 3 of Duan is presented below to show how these two chambers are fluidly coupled by way of liquid outlet 24 (indicated by the left-tilted red oval):



(Ex. 1005 at FIG. 3 (red circle added to show liquid outlet). The liquid outlet depicted above is also shown in FIG. 8 of Duan as item 24.

[1c] “a heat-exchanging interface removably coupled to the reservoir, the heat-exchanging interface forming a boundary wall of the thermal exchange chamber and configured to be placed in thermal contact with a surface of the heat-generating component;” (Ex. 1003 at ¶¶ 109-116.)

A POSITA would have understood that Duan discloses a heat-exchanging interface (e.g., cooling plate 1) removably coupled (e.g., via bolt units 4) to the reservoir (e.g., accommodation chamber 21, cap 3, and cooling plate 1), the heat-exchanging interface forming a boundary wall of the thermal exchange chamber (e.g., cap 3 and cooling plate 1) and configured to be placed in thermal contact (e.g., via heat-absorbing face 11) with a surface of the heat-generating component (e.g., CPU 200). For example, Duan teaches:

The cooling plate 1 comprises a heat absorbing face 11 on bottom thereof and being in contact with a heat source. A plurality of heat-dissipating plates 12 are formed on top face of the cooling plate 1 and can be arranged in longitudinal or transverse manner.

(Ex. 1005 at [0022]; *see also id.* at [0024] and [0027].) Specifically, Duan states “sealing pads 32 are provided between the cap 3 and the cooling plate 1 and provided atop the cap 3, and are retained by bolt units 4.” (Ex. 1005 at [0024].) A POSITA would have understood that the use of bolt units 4 to secure the cooling plate 1 indicates the cooling plate 1 is *removable* by unscrewing the bolts. Thus, the cooling plate 1 is removably coupled to the reservoir. FIGS. 7 and 8 are also illustrative:

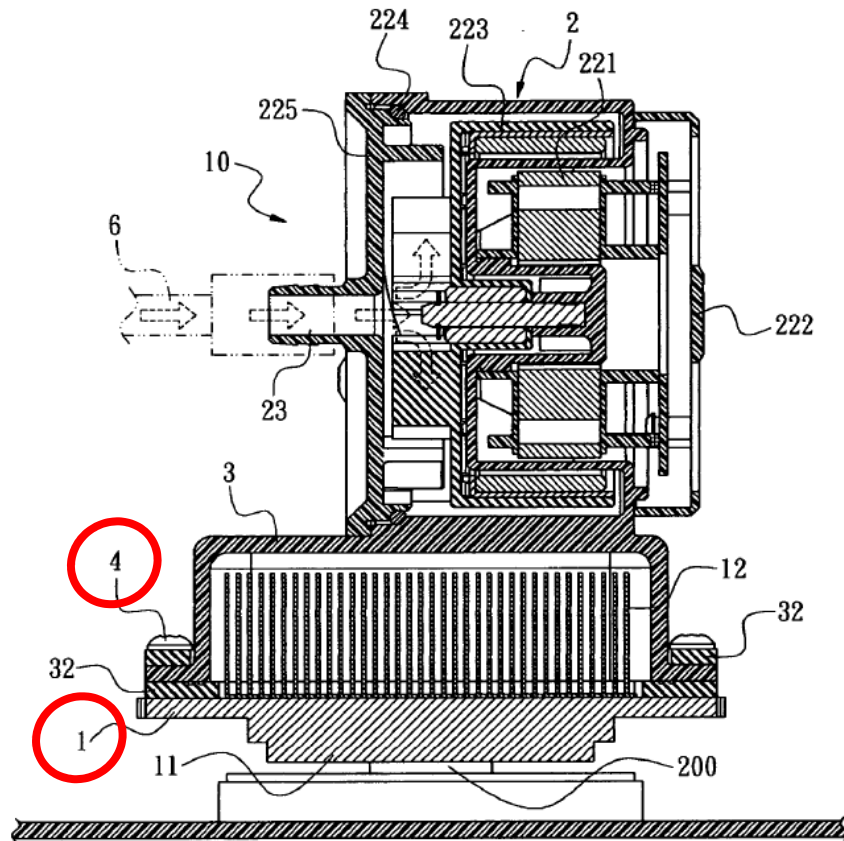
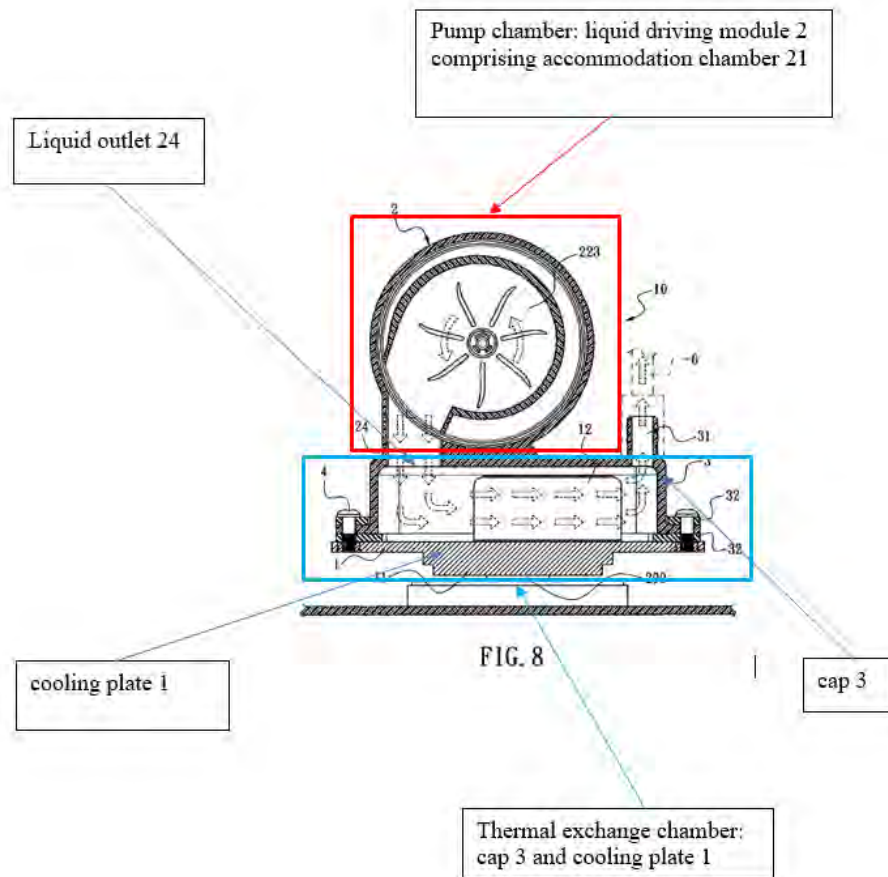


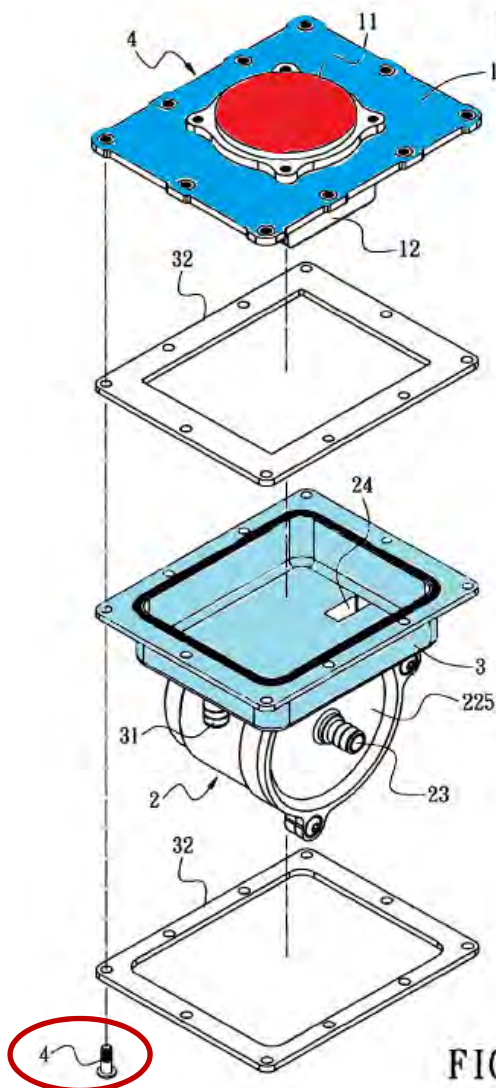
FIG. 7

FIG. 7 of Duan shows a heat-exchanging interface (e.g., cooling plate 1) removably coupled (e.g., via bolt units 4). This is also depicted below in FIG. 8.



Reproduced below is a colored version of FIG. 4 of Duan that uses the following color coding scheme and illustrates the disclosure of this limitation. Again, the use of bolt 4 indicates the plate 1 is removably coupled:

Color	Duan Element
Red	Heat-absorbing face 11
Light blue	cap 3
Dark blue	cooling plate 1



[1d] “a heat radiator adapted to pass the cooling liquid there-through, the heat radiator being fluidly coupled to the reservoir and positioned at a location horizontally spaced apart from the heat-generating component, the heat radiator being configured to dissipate heat from the cooling liquid;” (Ex. 1003 at ¶¶ 117-121.)

A POSITA would have understood that Duan discloses a heat radiator (e.g., cooling stage 53, heat-dissipating fins 531, and runners 532 which are components within box 5) adapted to pass the cooling liquid there-through (e.g., via ducts 6, liquid inlet 511, and liquid outlet 521), fluidly coupled to the reservoir (e.g., accommodation chamber 21, cap 3, and cooling plate 1) via conducts (e.g., ducts 6), and configured to dissipate heat from the cooling liquid (e.g., duct 6, liquid inlet 511, and liquid outlet 521). This is shown with respect to FIG. 6 of Duan, reproduced below:

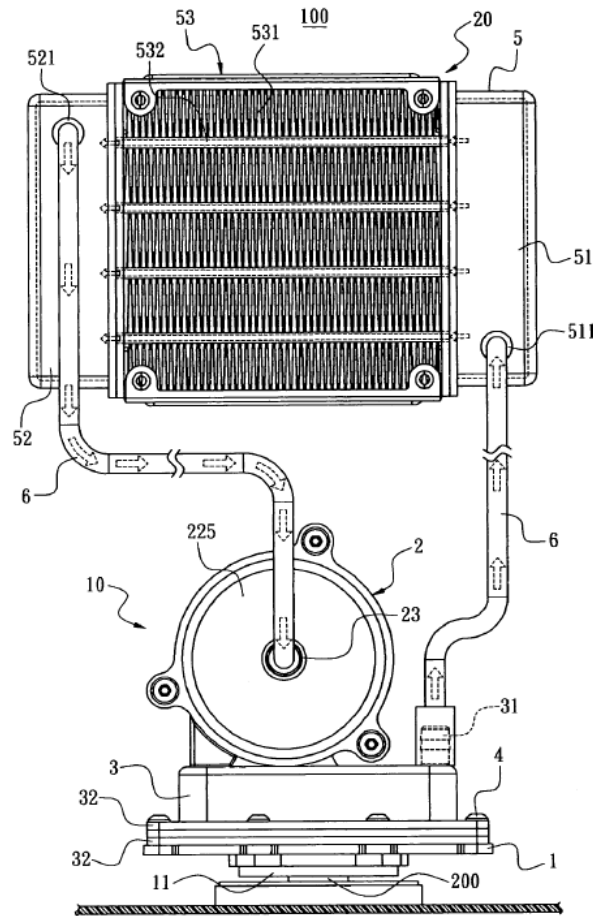


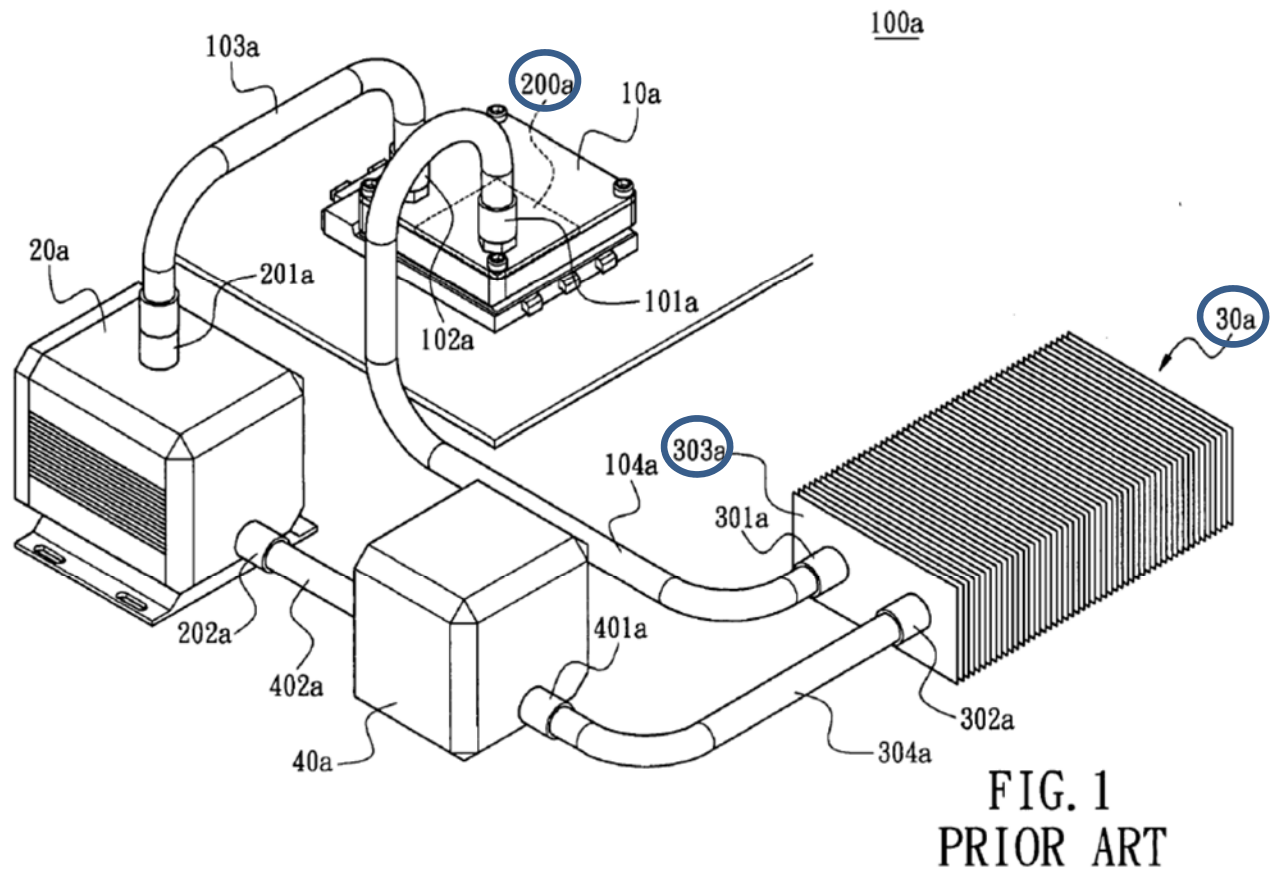
FIG. 6

With reference to Figure 6, Duan teaches:

As shown in FIG. 6, the water tank 20 of the liquid cooling cyclic mechanism 100 comprises a box 5 with a liquid entrance region 51 and a liquid exit region 52 provided on both sides of the water tank 20, respectively. The box 5 comprises a cooling stage 53 at center thereof and composed of a plurality of stacked heat-dissipating fins 531 arranged in rows.

(Ex. 1005 at [0025].) Based on these disclosures, a POSITA would further understand from the teachings of Duan that the heat radiator, which is to be

mounted on the side of the computer case, is positioned at a location horizontally spaced apart by at least some distance from the heat-generating CPU. (*Id.*; see Ex. 1005 at FIG. 6.) For example, FIG. 1 of Duan (reproduced and annotated below) shows arranging components along a horizontal plane such as a radiator (e.g., cooling stage 30a with heat dissipating fins 303a, which a POSITA would have understood is a radiator) and a heat-generating component (e.g., 200a).



[1e] “a fan configured to direct air through the heat radiator, the fan being driven by a motor separate from the motor of the pump; and” (Ex. 1003 at ¶¶ 122-130.)

As discussed above, Duan discloses a radiator by describing a box 5 that includes a cooling stage 53, heat-dissipating fins 531, and runners 532. Duan’s radiator is separate from the motor of the pump (e.g., liquid driving unit 22). (See, e.g., Ex. 1005 at FIG. 6.) A POSITA reading FIG. 6 of Duan would have understood that the heat-dissipating fins 531 release heat through air. In other words, the heat-dissipating fins heat up and release the heat to the surrounding air such that the air transfers heat away from the heat dissipating fins 531. (*Id.*).

Because stagnant air will continue to heat up, a POSITA was well-aware before the time of invention to use a fan to disperse stagnant hot air. For example, the ’681 patent acknowledges that that it was known prior to the time of invention that liquid-cooling systems included an air fan “provided together with the heat radiator” and for “blowing air through the heat radiator.” (Ex. 1001 at 10:50-65 & FIG. 3 (labeled as prior art).) A POSITA thus would have found it obvious to add a fan to any liquid-cooling system to direct air through the heat radiator for breaking up stagnant hot air. A POSITA would have further found it obvious, as a matter of basic design of a liquid-cooling system, that such a prior art air fan would need to be driven by a motor separate from the motor of the pump because this would allow for the individual operation of the fan and the pump, which is

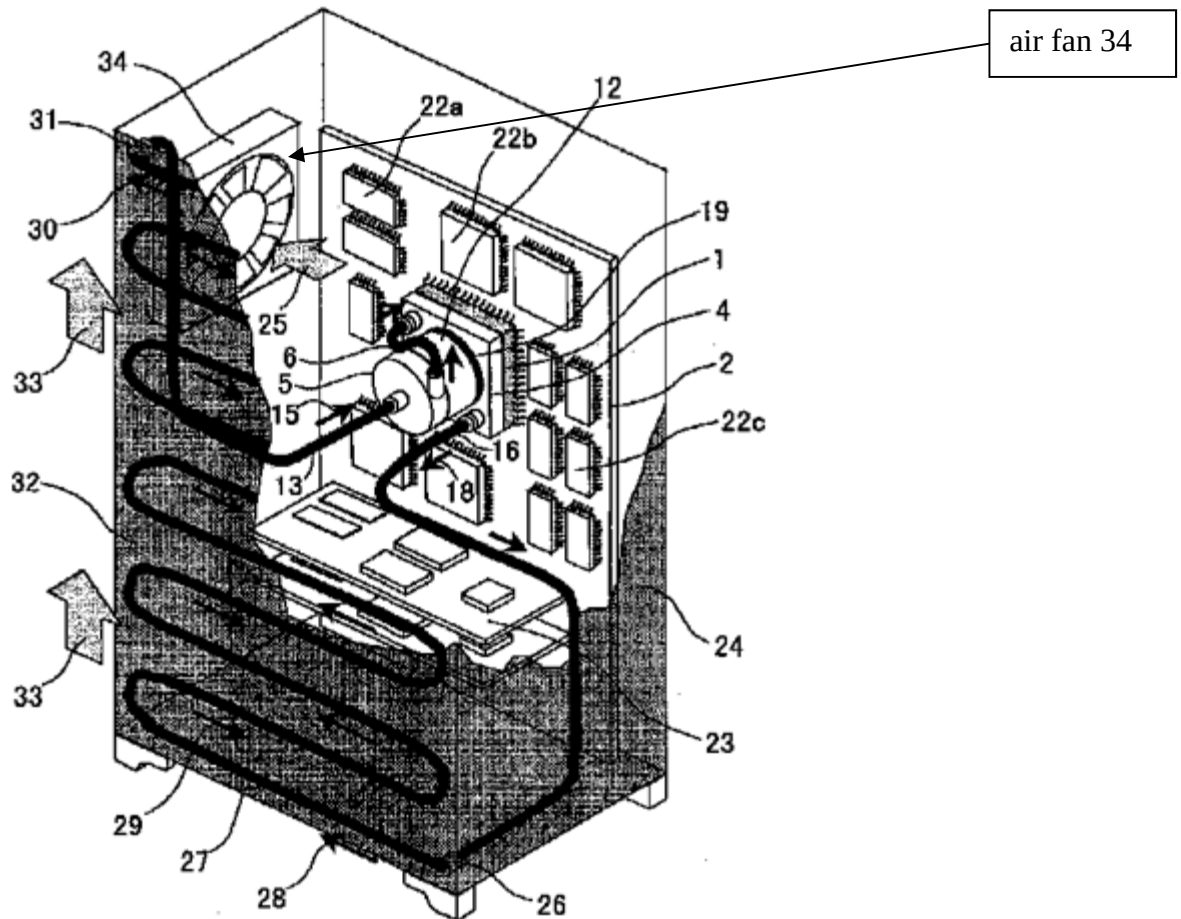
advantageous to independently regulate the airflow and the liquid flow to achieve an optimal efficiency of the system while reducing noise.

Other prior art, such as for example, Shin, documents the conventional practice of using a fan to disperse hot air accumulated at a radiator. For example, Shin teaches: “Using a DC motor ***allows the motor speed to be easily changed by changing the DC voltage, thus enabling control of cooling power.***” (Ex. 1006 at [0019] (emphasis added).) Shin also teaches with respect to the embodiment in FIG. 3:

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 [0023]-[0024].) These elements are also shown in FIG. 3:

FIG. 3



(*Id.* at FIG. 3.) Based on these teachings, a POSITA would have understood that Shin discloses or suggests an air fan (34) configured to direct air through a heat radiator, the fan being driven by a motor separate from the motor of the pump, for the same reasons discussed above.

[1f] “a control system configured to independently control a speed of the pump and a speed of the fan;” (Ex. 1003 at ¶¶ 131-136.)

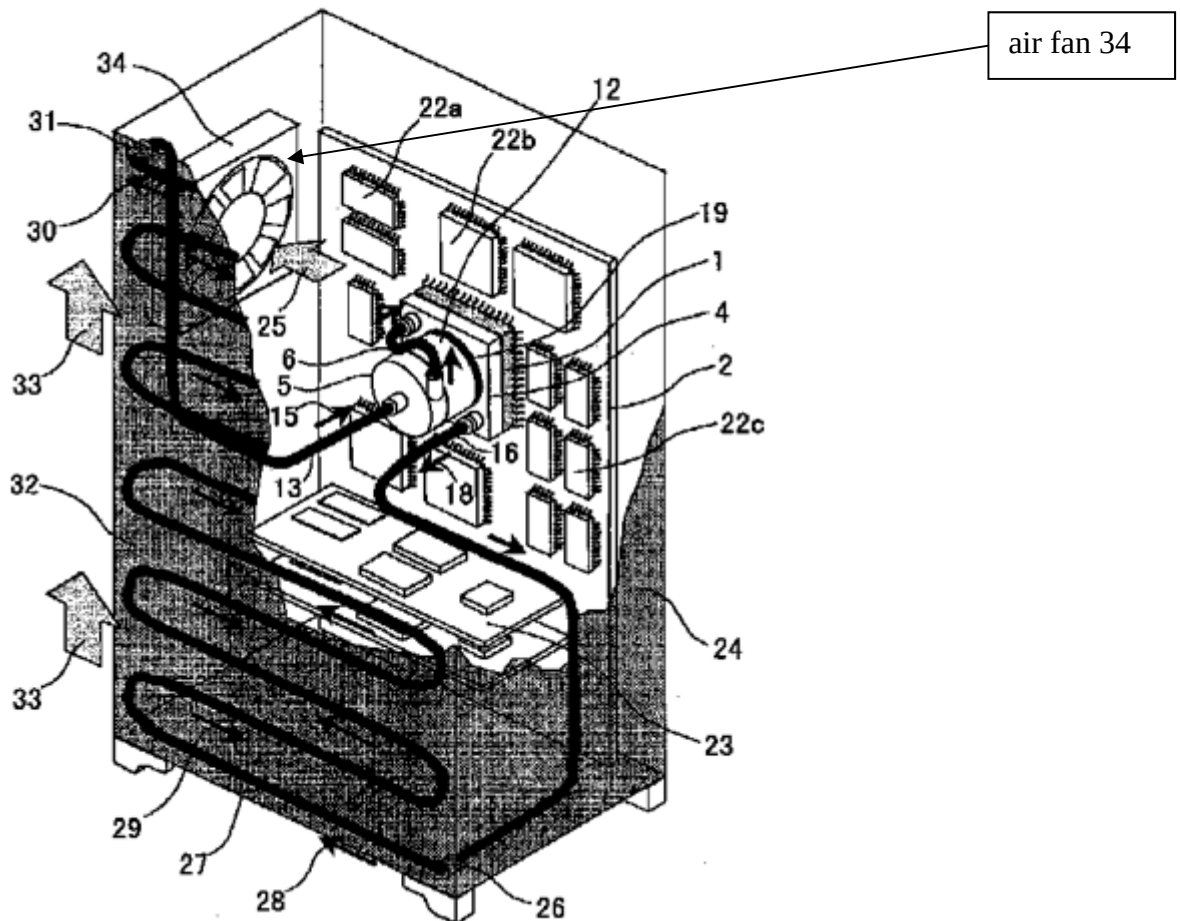
Shin teaches: “Using a DC motor *allows the motor speed to be easily changed by changing the DC voltage, thus enabling control of cooling power.*”

Moreover, ***making the motor into a DC brushless motor makes it possible to implement a pump of low noise and long service life.***” (Ex. 1006-Shin at [0019] (emphasis added).) Shin also teaches:

“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 [0023]-[0024] (emphasis added).) These elements are also shown in FIG. 3 of Shin:

FIG. 3



(*Id.* at FIG. 3.) Based on these teachings, a POSITA would have understood that Shin discloses or suggests a control system configured to independently control a speed of the pump (pump 5) and a speed of the fan (34). (Ex. 1003 at ¶__.) As shown above, a POSITA would have further found it obvious, as a matter of basic design of a liquid-cooling system, to independently control a speed of the fan and a speed of the pump because this would allow for the individual operation of the fan and the pump, which is advantageous to independently regulate the airflow and the

liquid flow to achieve an optimal efficiency of the system while reducing noise. (*Id.* at ¶___; *see also* Ex. 1002 at 261.) Moreover, a motor that drives the fan that blows air is different and physically separate from the motor that drives an impeller to move cooling liquid. Given that these motors are different and physically separate, it would have been obvious to independently control them for a POSITA.

To the extent a control system configured to independently control a speed of a pump is not fully disclosed or suggested by Shin, it is disclosed or suggested by Shin in view of Cheon. Specifically, Cheon teaches:

“Referring to FIGS. 3-5, a mounting plate 76 is secured to the vertical inwardly-facing (relative to the computer) outer surface of the cylindrical portion of the reservoir casing 50 by fasteners 77. ***The plate 76 serves as a circuit board for the motor control circuit 78. The circuit 78 controls circulation of coolant C based on feedback from one or more sensors indicating the temperatures of the components to which heat transfer devices are attached.*** FIG. 4 illustrates a thermistor 80 mounted on the second heat transfer device 30. ***The thermistor 80 monitors the temperature of the device 30 and provides feedback to the circuit 78. When the temperature is below a predetermined level, the pump P may be shut down, assuming that the temperature at the microprocessor component 8 is within limits, to prevent unnecessary operation of the cooling system. When the temperature at the thermistor 80 rises above the predetermined level, the circuit 78 causes the pump P to be operated***

to circulate coolant C and bring the temperature down below the predetermined level.”

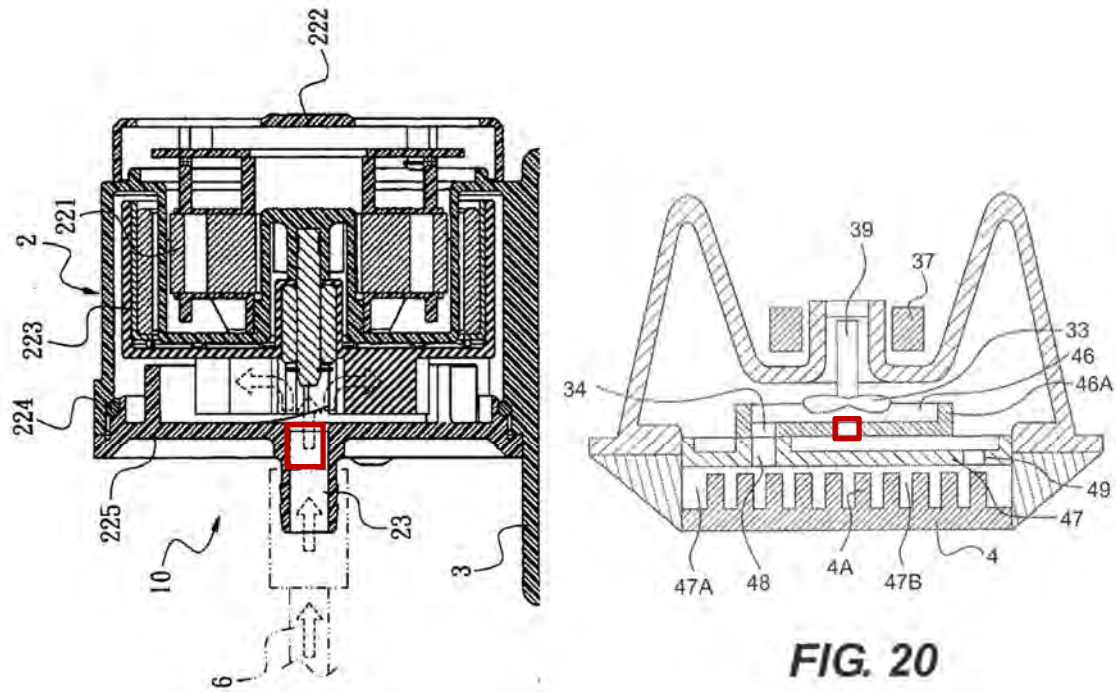
(Ex. 1008-Cheon at 5:66-6:16 (emphasis added).) Thus, Cheon teaches controlling the pump speed of a liquid driving module based on temperatures of a liquid. This is separate and independent from the temperature of the air surrounding a radiator. Based on these collective teachings, a POSITA would have understood that this limitation is rendered obvious.

[1g] “wherein the pump chamber includes:” (Ex. 1003 at ¶¶ 137-139.)

As discussed above, Duan discloses a pump chamber (e.g., accommodation chamber 21 and lower cover 225). (see Ex. 1005 at [0023].)

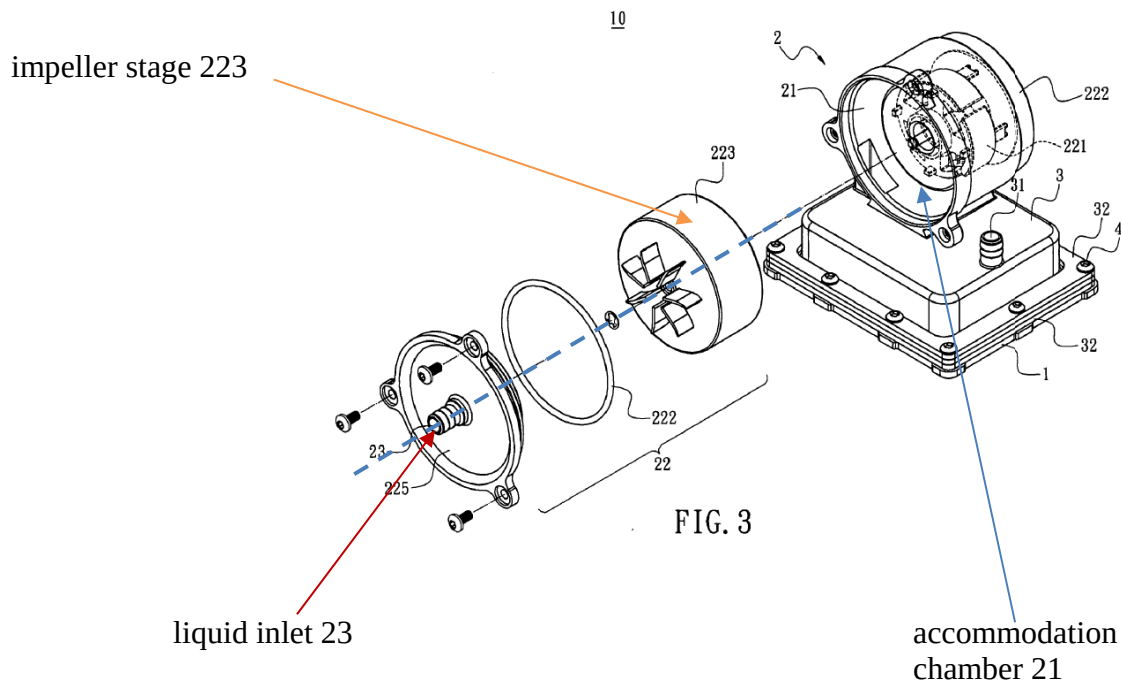
[1g-i] “an inlet positioned below the center of the impeller configured to enable the cooling liquid to flow into the center of the pump chamber;” (Ex. 1003 at ¶¶ 140-143.)

Duan discloses an inlet (e.g., an opening below the impeller that receives liquid from liquid inlet 23) positioned below the center of the impeller (e.g., impeller stage 223) configured to enable the cooling liquid to flow into the center of the pump chamber (e.g., accommodation chamber 21 and lower cover 225). As shown below, FIG. 7 of Duan (left) is virtually identical to FIG. 20 of the '681 patent (right) with respect to this element.



(comparing Ex. 1005 at FIG. 7 with Ex. 1001 at FIG. 20.)

In addition, as shown in FIG. 3 liquid inlet 23 is positioned near a center of impeller stage 223 along the axis (blue) around which the impeller rotates:



(Ex. 1005 at FIG. 3.) Duan further discloses that liquid inlet 23 is configured to enable the cooling liquid to flow into the center of accommodation chamber 21: “during operation of the present invention, the cool liquid in the water tank 20 is conveyed to the accommodation chamber 21 through the duct 6 and the liquid inlet 23 of the cooling plate module 10 and driven by the liquid driving unit 22.” (Ex. 1005 at [0027].)

[1g-ii] “an outlet that fluidly couples the pump chamber to the thermal exchange chamber via a first passage, the outlet is positioned along an outer circumference of the pump chamber and is configured to direct the cooling liquid driven by the impeller through the first passage to the thermal exchange chamber;” (Ex. 1003 at ¶¶ 144-147.)

As shown its FIG. 8 (reproduced and annotated below), Duan discloses an outlet (e.g., part of the first liquid outlet 24 (colored in dark red below)) that fluidly couples the pump chamber (e.g., accommodation chamber 21 and lower cover 225) to the thermal exchange chamber (e.g., cap 3 and cooling plate 1) via a first passage (part of the first liquid outlet 24, colored in dark blue below), the outlet (part of the first liquid outlet 24, colored in dark red) is positioned along an outer circumference of the pump chamber (e.g., accommodation chamber 21, of which the outer circumference is colored in green), and lower cover 225) and is configured to direct the cooling liquid driven by the impeller (e.g., the impeller stage 223) through the first passage (colored in dark blue) to the thermal exchange chamber (e.g., cap 3 and cooling plate 1).

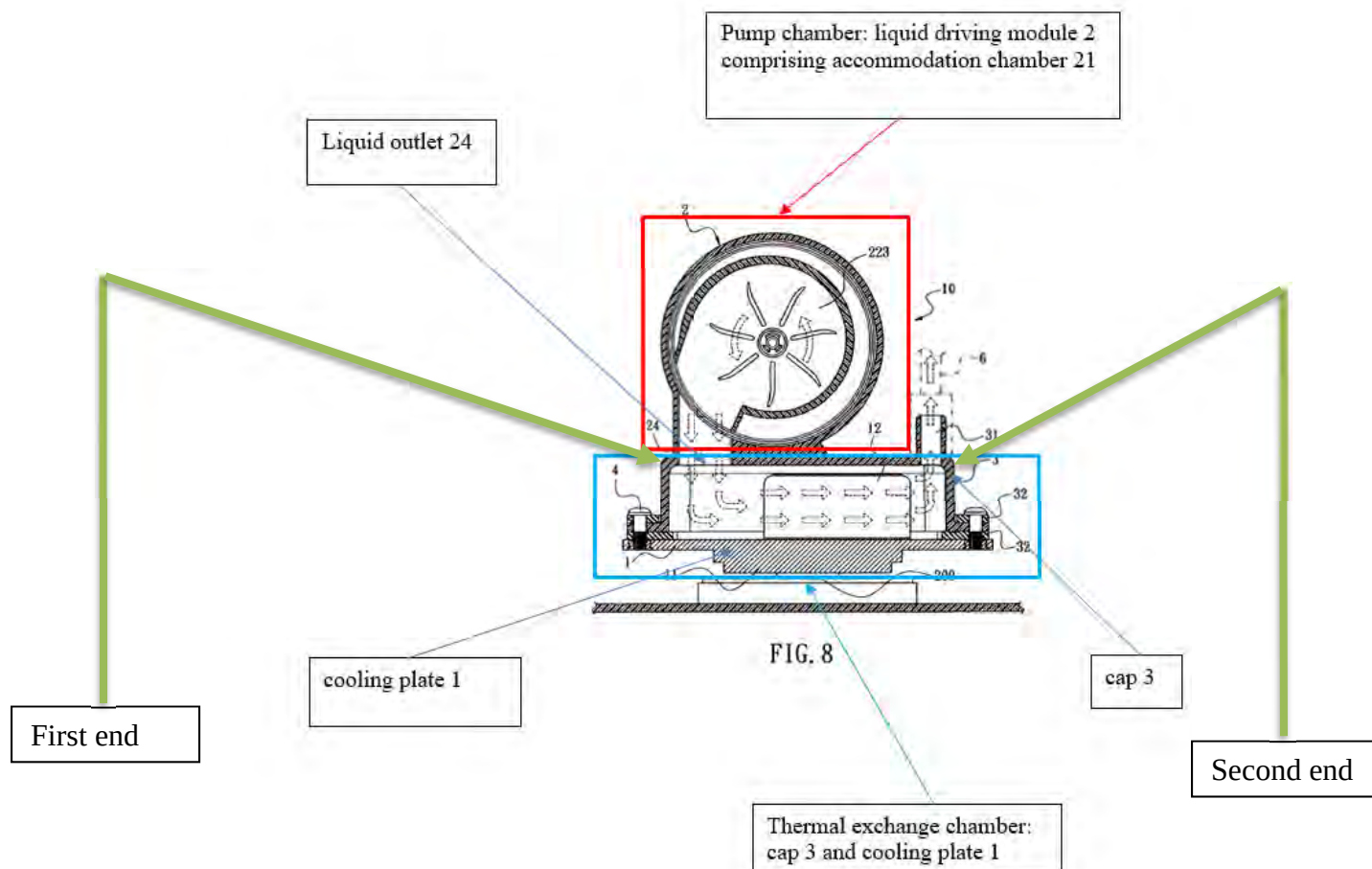


the liquid driving module 2 comprises an accommodation chamber 21 and a liquid driving unit 22 located in the accommodation chamber 21 and used to driving the cool liquid. The liquid driving unit 22 comprises ... ***an impeller stage 223...*** [D]uring operation ... ***the cool liquid ... is conveyed to the accommodation chamber 21 ... and driven by the liquid driving unit 22. The cool liquid then flows to the cap 3 through the first liquid outlet 24 for heat dissipating...***

55

[1g-iii] “wherein the first passage directs the cooling liquid into the thermal exchange chamber between a first end and a second end of the thermal exchange chamber;” (Ex. 1003 at ¶¶ 148-149.)

Regarding FIG. 8, Duan discloses a first passage (e.g., part of the first liquid outlet 24, referring to also the FIG. 8 reproduced and annotated above, in which the first passage is colored in dark red) that directs the cooling liquid into the thermal exchange chamber (e.g., cap 3 and cooling plate 1) between a first end and a second end of the thermal exchange chamber (e.g., cap 3 and cooling plate 1), highlighted below with the green arrows:



(Ex. 1005 at FIG. 8.)

[1g-iv] “wherein the thermal exchange chamber includes at least one second passage configured to direct the cooling liquid out of the thermal exchange chamber, the at least one second passage is positioned at either the first end or the second end of the thermal exchange chamber.” (Ex. 1003 at ¶¶ 150-155.)

A POSITA would have understood that Duan discloses a thermal exchange chamber (e.g., cap 3 and cooling plate 1) that includes at least one second passage (e.g., second liquid outlet 31) configured to direct the cooling liquid out of the thermal exchange chamber, the at least one second passage being positioned at the second end of the thermal exchange chamber (cap 3 and cooling plate 1). Specifically, Duan teaches:

“In the present invention, during the assembling of the liquid cooling cycle mechanism 100, the liquid inlet 23 of the cooling plate module 10 is communicated to the liquid outlet 521 of the liquid exit region 52 of the water tank 20 through duct 6. ***Moreover, the second liquid outlet 31 of the cooling plate module 10 is communicated to the liquid inlet 511 of the liquid entrance region 51 of the water tank 120 through duct 6,*** thus forming the liquid cooling cycle mechanism 100 with continuous cycles. Thereafter, the liquid cooling cyclic mechanism 100 is assembled to the CPU 200 with the heat absorbing face 11 being in contact with the CPU 200 for heat dissipating the CPU 200.”

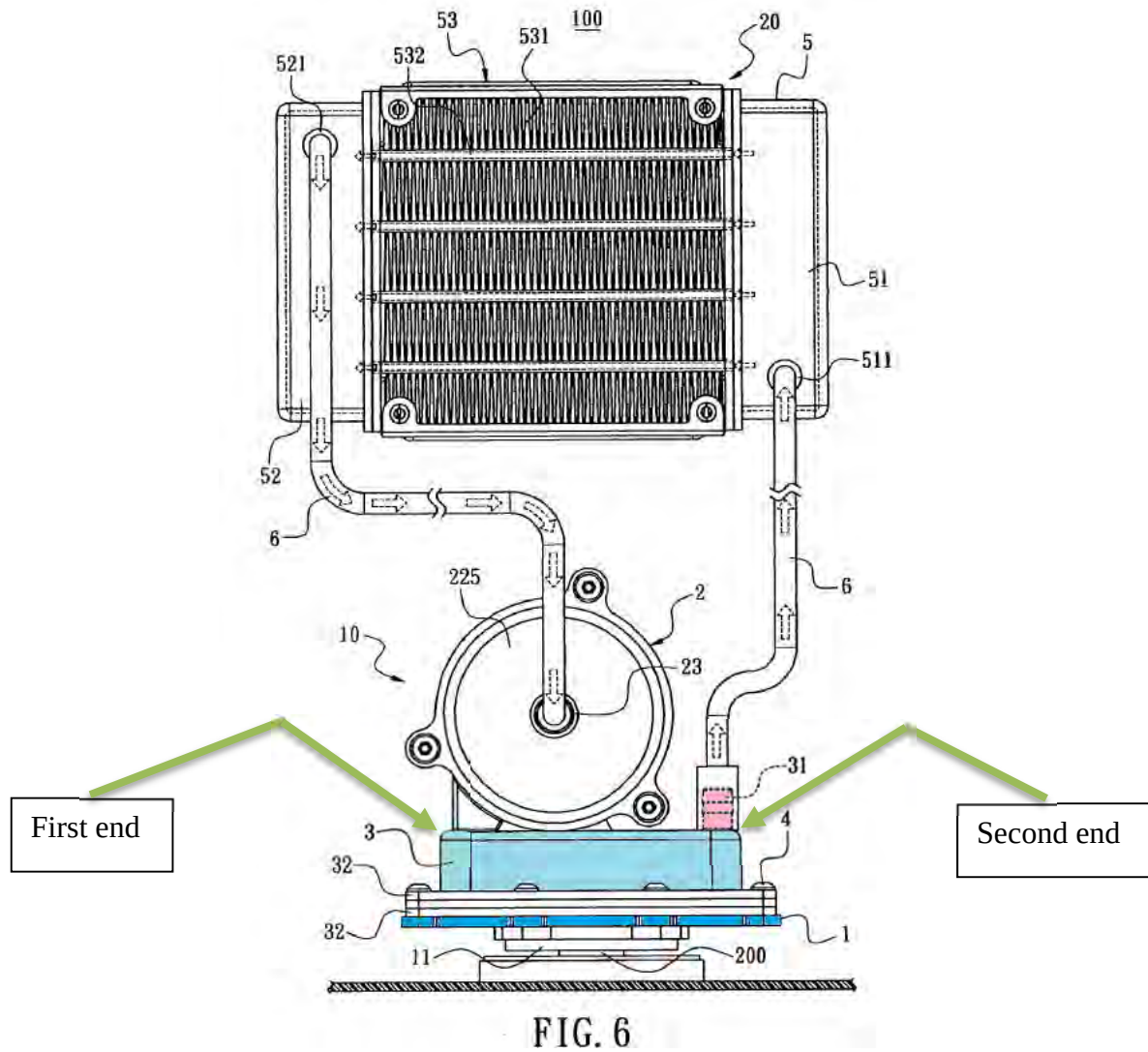
(Ex. 1005 at [0026] (emphasis added).) Duan further teaches:

“More particularly, the cool liquid is heat exchanged with the heat-dissipating plates 12 into hot liquid. The hot liquid then flows to the

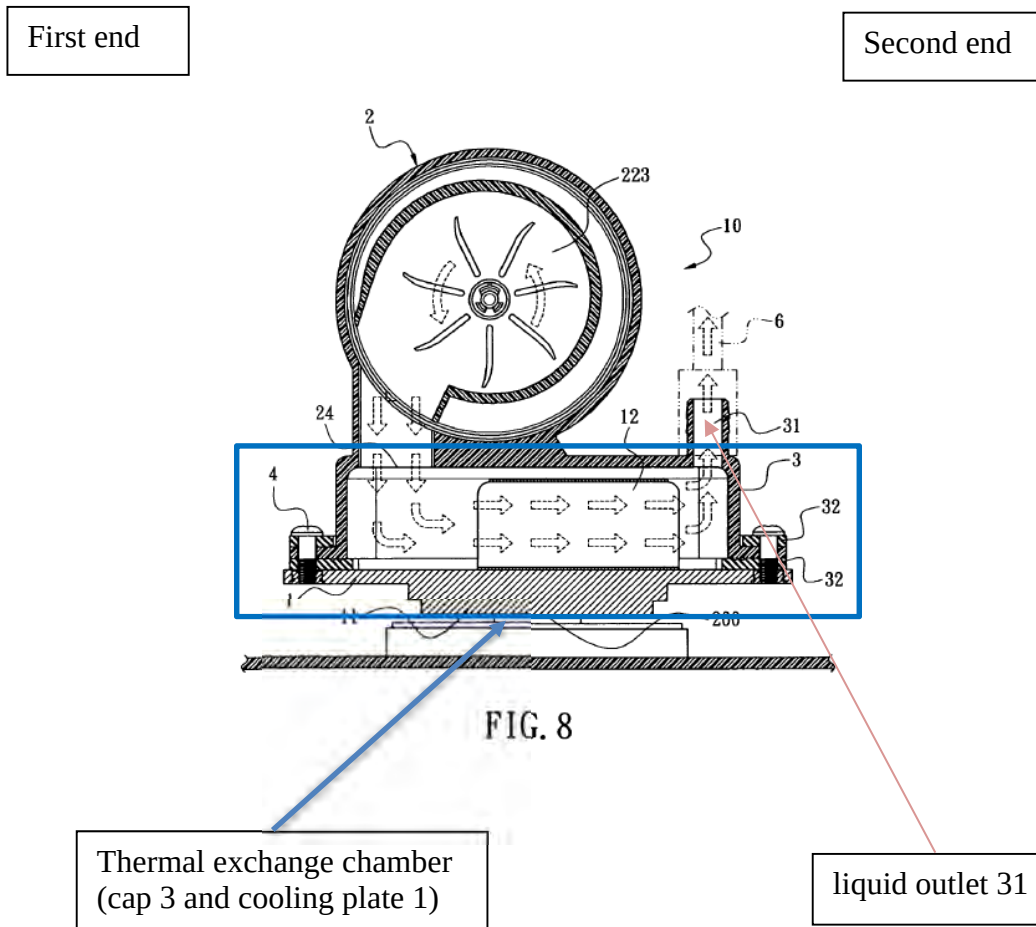
liquid entrance region 51 of the water tank 20 through the second liquid outlet 31 of the cooling plate module 10 and another duct 6.”

(Ex. 1005 at [0025].) These teachings are also illustrated in the following annotated version of FIG. 6 with the below color coding scheme:

Color	Duan Element
Pink	second liquid outlet 31
Light blue	cap 3
Dark blue	cooling plate 1



(Ex. 1005 at FIG. 6.) These teachings are also shown in FIG. 8:



(Ex. 1005 at FIG. 8.) For at least these reasons, the combination of Duan, Shin, and Cheon discloses each limitation of claim 1.

2. Motivation/Rationale to Combine the Teachings of Duan, Shin, and Cheon

Duan describes: “As downsize of form factor and increasing processing speed, the heat dissipation for central processing unit (CPU) is also an important issue to solve.” (Ex. 1005 at [0004].) Duan further states that a problem to be solved is that prior art liquid-cooling dissipation systems are “**bulky and hard to**

assemble. This is adverse to the **compact** trend of computer.” (*Id.* at [0006] (emphasis added).) The invention in Duan, therefore, “provides a cooling plate module wherein the cooling plate is integrally formed with the liquid driving module ***such that the layout of the cooling plate module can be minimized to reduce space.***” (*Id.* at [0007] (emphasis added).)

Shin similarly discloses:

“The present invention pertains to a cooling structure for liquid cooling of heat generating electronic circuit components ... relating in particular to a cooling structure for compactly mounting a liquid cooled heat sink and pump. ... ***In recent years, the amount of heat generated by electronic equipment, as represented by computers, communication equipment, multimedia equipment, etc., has tended to increase markedly.*** In particular, ***the cooling of CPUs,*** which perform centralized computation processing, image processing LSI chips, power amplifiers and the like, ***has become a very important problem.***”

(Ex. 1007 at [0001] – [0002] (emphasis added).) Shin also discloses: “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.***” (*Id.* at [0006] (emphasis added); *see also id.* at [Abstract] (the invention “can be compactly installed in an electronic equipment case without

major changes to the case structure of conventional air cooled electronic equipment”).)

Cheon, in turn, describes a similar problem and solution: “The cooling system of the invention has a number of advantages. ... The system may be installed either as part of original equipment or retrofitted into existing computers.” Ex. 1008 at 2:44-50 (“... the system provides reliable and low cost cooling” and “may be installed).

Duan, Shin, and Cheon therefore attempt to solve similar issues—how to cool, with liquids, increasingly powerful semiconductor devices. Further, as shown above, these references also attempt to disclose compact solutions that will be compatible with then-existing cooling solutions. (*Id.*) A POSITA would have been motivated to combine the teachings of Duan, Shin, and Cheon because they have a similar overall approach to solving the same problems. (Ex. 1003-Hodes at ¶__.) See *KSR Int’l Co. v. Teleflex, Inc.*, 550 U.S. 398, 401, 419-21 (2007).

In addition, because all three references disclose inventions that can readily be used with then-existing liquid cooling devices, they generally teach the use of similar components in a liquid cooling system for a computer system, including without limitation a heat-generating processing unit, a pump, cooling liquid, heat-exchanging elements or surfaces, and conduits for circulating cooling liquid. (Ex. 1003 at ¶__.) A POSITA would have been motivated to combine the teachings of

Cheon and Duan with the teachings of other liquid cooling systems that use air fans to disperse accumulated heat. (Ex. 1003 at ¶ __.) The '681 patent, for example, admits that then-existing liquid cooling systems containing fans are prior art: "FIG. 3 shows an embodiment of "the typical components in a liquid-cooling type CPU cooling arrangement." (Ex. 1001 at 7:7-9, 8:1-18; FIG. 3 (air fan 10).) Prior art admissions made in the specification of a patent application are binding on a Patent Owner, and may be used as prior art against the patent. *PharmaStem Therapeutics, Inc. v. ViaCell, Inc.*, 491 F.3d 1342, 1362 (Fed. Cir. 2007) ("Admissions in the specification regarding the prior art are binding on the patentee for purposes of a later inquiry into obviousness."). *See also In re Cohen*, 767 Fed. Appx. 985, 987-89 (Fed. Cir. 2019) (affirming an examiner's reliance on the disclosure of a "typical" technique in the "Background" section of a patent as applicant-admitted prior art). (*See also* Ex. 1003-Hodes at ¶ __.) Shin, moreover, also teaches the use of an air fan in the liquid cooling systems disclosed therein. (Ex. 1007 at [0025].) In other words, using an air fan in a liquid cooling system, with a known air cooling effect and potential associated noise, would have represented nothing more than the use of a known feature, used in an entirely predictable and conventional fashion (to achieve desired air cooling of components) and in the same way that is used in the prior art to improve conventional liquid cooling systems for computer systems. *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.”). (Ex. 1003 at ¶.)

Ultimately, a POSITA would have recognized that hot air will build up around a radiator such as, for example, the components of box 5 of Duan. This is because the purpose of Duan’s heat-dissipating fins 531 is to remove heat from one system and transfer it to the air. (Ex. 1005 at [0025].) The solution of using a fan to disperse heat build-up is an obvious one because it was well known prior to the time of invention (Ex. 1001 at FIG. 3) and a fan’s primary purpose is to move air. Moreover, because Duan’s radiator is positioned away from the liquid driving module 2 (Ex. 1005 at [0023] and FIG. 6), the fan would be driven by a motor separate from the motor of the pump. Consequently, a POSITA, when reading these references together, would have been motivated to combine Duan, Shin, and Cheon in a manner that arrives at the claims. (Ex. 1003 at ¶__.)

3. Claim 3

[3a] “The cooling system of claim 1, wherein the heat exchanging interface includes a first side and a second side opposite the first side, and” (Ex. 1003 at ¶¶ 156-163.)

Duan discloses a heat-exchanging interface (e.g., cooling plate 1) that includes a first side (e.g., top surface of cooling plate 1) and a second side opposite the first side (e.g., heat absorbing face 11). (see Ex. 1005 at [0022].) These

elements are shown in FIGS. 2 and 4, of Duan which depict these elements from opposite views revealing a first and second surface:

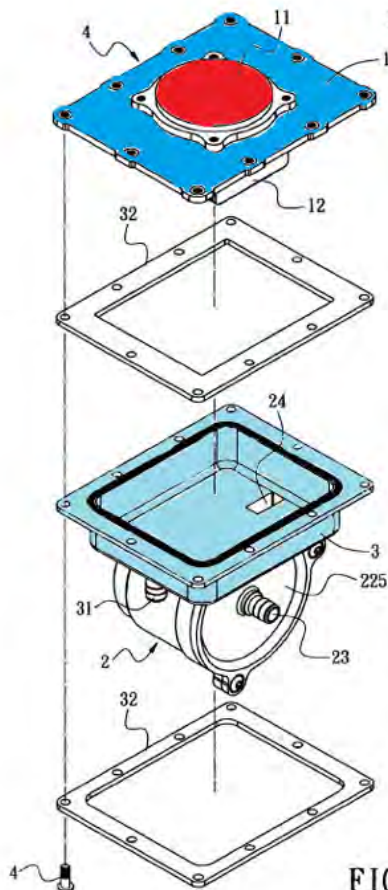


FIG. 4

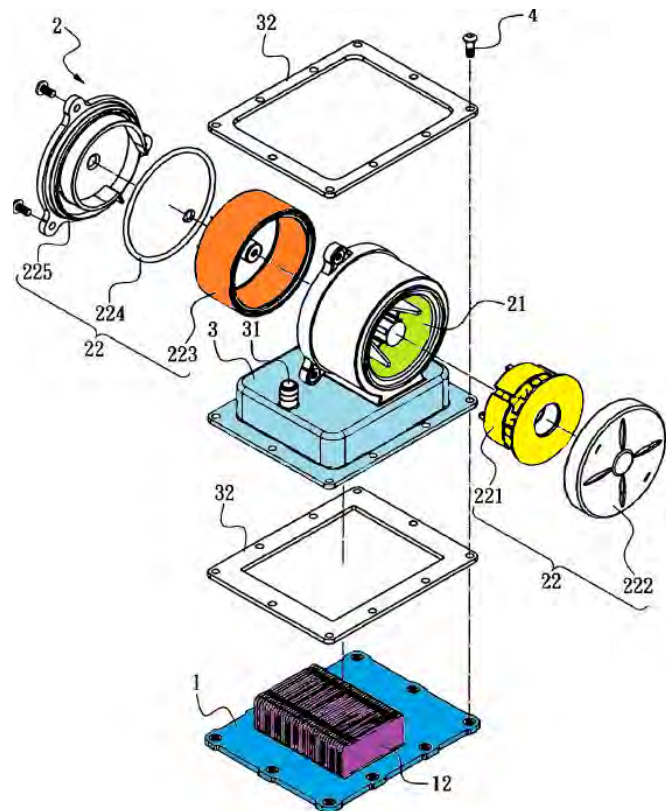


FIG. 2

(*Id.* at FIGS. 2, 4; see also *id.* at [0026] (stating “Thereafter, the liquid cooling cyclic mechanism 100 is assembled to the CPU 200 with the heat absorbing face 11 being in contact with the CPU 200 for heat dissipating the CPU 200”).)

[3b] “wherein the heat-exchanging interface contacts the cooling liquid in the thermal exchange chamber on the first side and the heat-exchanging interface is configured to be in thermal contact with the surface of the heat-generating component on the second side.” (Ex. 1003 at ¶¶ 156-163.)

Duan discloses a heat-exchanging interface that contacts the cooling liquid in the thermal exchange chamber (e.g., cap 3 and cooling plate 1) on the first side and where the heat-exchanging interface (e.g., cooling plate 1) is configured to be in thermal contact with the surface of the heat-generating component (e.g., CPU 200) on the second side (heat absorbing face 11). (Ex. 1005 at [0031]; *see also* FIGS. 2 and 4 reproduced and annotated in Section [3a] above.) Specifically, Duan states that “the cool liquid can directly flush the heat-dissipating plates 12 for enhancing heat dissipation efficiency.” (*Id.*). Therefore, the combination of Duan, Shin, and Cheon renders claim 3 obvious for these reasons and the reasons discussed above with respect to claim 1.

4. Claim 4

[Claim 4] “The cooling system of claim 3, wherein the first side of the heat-exchanging interface includes features that are adapted to increase heat transfer from the heat-exchanging interface to the cooling liquid in the thermal exchange chamber.” (Ex. 1003 at ¶¶ 156-163.)

Duan discloses a first side of the heat-exchanging interface (e.g., cooling plate 1) that includes features (e.g., heat-dissipating plates 12) that are adapted to increase heat transfer from the heat-exchanging interface (e.g., cooling plate 1) to the cooling liquid in the thermal exchange chamber (e.g., cap 3 and cooling plate

1). (Ex. 1003 at ¶____.) For example, Duan discloses, “[a] plurality of heat-dissipating plates 12 are formed on top face of the cooling plate 1 and can be arranged in longitudinal or transverse manner.” (Ex. 1005 at [0022]; *see also id.* at [0031] (“the cool liquid can directly flush the heat-dissipating plates 12 for enhanced heat dissipation efficiency.”).) The heat-dissipating plates 12 are colored in purple in the following reproduction of FIG. 2:

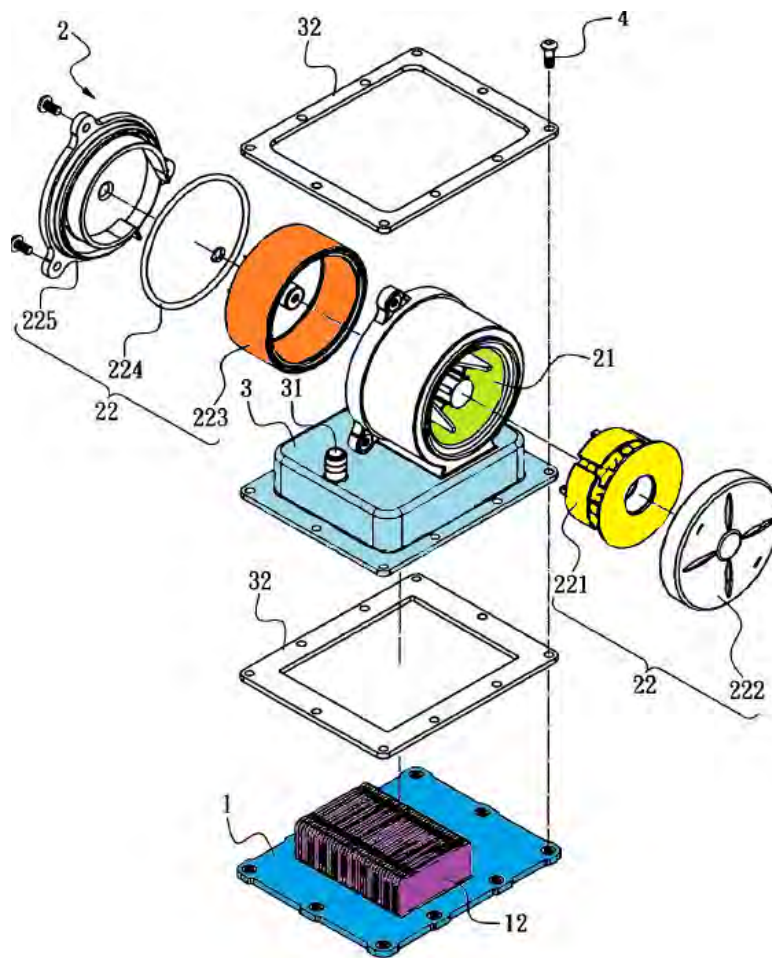


FIG. 2

(Ex. 1005 at FIG. 2.) A POSITA would have understood that the shape and orientation of Duan's plates 12 increase heat transfer by increasing the surface area contact between the liquid and the plates. A larger surface area can draw away more heat from the liquid as it comes into contact with the plates 12. (*Id.*). Therefore, the combination of Duan, Shin, and Cheon renders claim 4 obvious for these reasons and the reasons discussed above with respect to claims 1 and 3.

B. GROUND 2: Claims 8, 11, 15, and 16 are anticipated by Duan

1. Claim 8

[8-PRE] "A liquid cooling system for cooling a heat-generating component of a computer, comprising:" (Ex. 1003 at ¶ 166.)

Duan discloses the preamble, regardless of whether it is a limitation. Duan discloses a liquid cooling system (e.g., liquid cooling cyclic mechanism 100) for cooling a heat generating component of a computer (e.g., CPU 200). (*Ex. 1005* at Abstract and [0025].) For these reasons and as explained below with respect to the remaining limitations, Duan discloses the preamble.

[8a] "a pump chamber housing an impeller, the pump chamber being defined by an intermediate member and a double-sided chassis housing, the impeller being part of a pump that includes a motor, a rotor, and a stator configured to circulate a cooling liquid, the impeller being positioned on one side of the double-sided chassis housing and the stator being positioned on an opposite side of the double-sided chassis housing and isolated from the cooling liquid;" (Ex. 1003 at ¶¶ 167-170.)

Duan discloses a pump chamber (e.g., accommodation chamber 21 and lower cover 225) housing an impeller (e.g., an impeller of the impeller stage 223).

(See Ex. 1005 at [0023].) This is also explained above with reference to limitation [1b-i]. Duan also discloses the pump chamber being defined by an intermediate member (e.g., cap 3) and a double-sided chassis housing (e.g., accommodation chamber 21). This can be seen in FIG. 7 reproduced and annotated below, the pump chamber (colored in light green) is partially defined by the intermediate member (e.g., cap 3, color in cyan blue) and partially defined by the double-sided chassis (e.g., part of the accommodation chamber 21, colored in dark red).

Further, Duan discloses the impeller (e.g., impeller stage 223) being part of a pump (e.g., the liquid driving unit 22) that includes a motor (e.g., the combination of the impeller stage 223 and the coil stage 221), a rotor (e.g., the impeller stage 223), and a stator (the coil stage 221) configured to circulate a cooling liquid, (Ex. 1005 at [0023] (“The liquid driving unit 22 comprises a coil stage 221, an upper cover 222, an impeller stage 223, a sealing washer 224 and a lower cover 225.”); *see also* analysis of limitation [1a] describing a double-sided chassis; *see also* Ex. 1003 at ¶____.) As explained above with respect to limitation [1a], A POSITA would have understood that the coil stage 221 can be part of the stator of a motor.

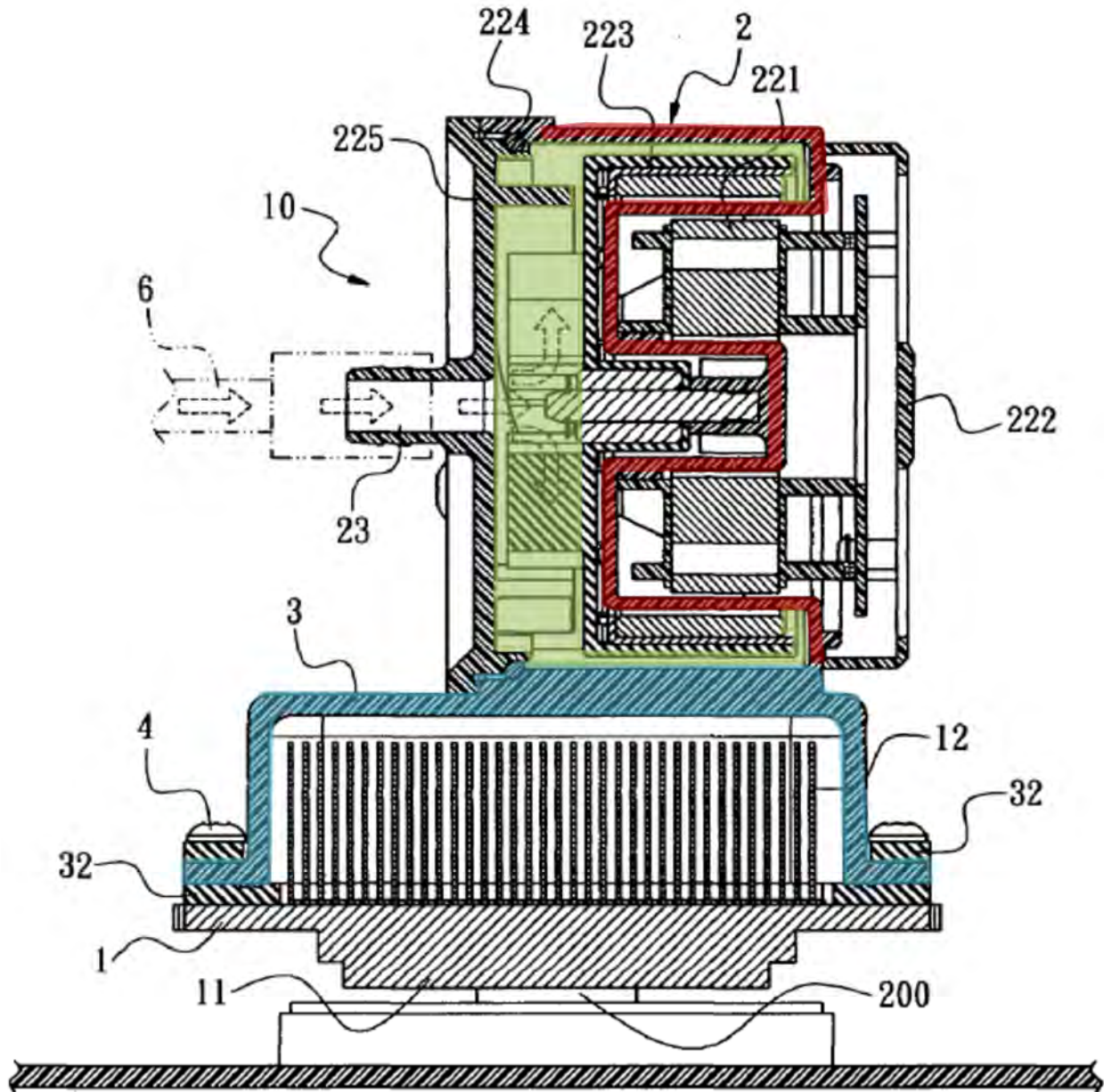


FIG. 7

As can be seen above, the impeller (e.g., the impeller stage 223) is on one side of the chassis (part of the accommodation chamber 21, colored in dark red) and the

stator (e.g., the coil stage 221) is on the opposite side of the double-sided chassis and isolated from the cooling liquid:

“The liquid driving unit 22 comprises a coil stage 221, an **upper cover** 222, an impeller stage 223, a sealing washer 224 and a **lower cover** 225. The lower cover 225 comprises a liquid inlet 23 communicated with the accommodation chamber 21. A first liquid outlet 24 is communicated to the **bottom of the accommodation chamber 21** and is enclosed by a cap 3. A second liquid outlet 31 is defined on the cap 3. The cooling plate 1 is assembled with the cap 3 to define a **closed space therein** and the first liquid outlet 24 is corresponding to the heat-dissipating plates 12. ... To assemble the cooling plate module 10, the coil stage 221, the upper cover 222, the impeller stage 223, the sealing washer 224 and the lower cover 225 are assembled to the accommodation chamber 21 in turn.”

(Ex. 1005 at [0023]-[0024] (emphasis added); see also Ex. 1003 at ¶__.) This is also explained above with respect to limitation [1a].

As stated above, the term “intermediate member” should be construed to be element 47 of the ’681 patent. When applying this construction, Duan’s cap 3 has the same structure and it performs the same functions of partially defining the pump chamber, for coupling to the heat-exchanging interface, and for defining a second passage, as can be seen below:

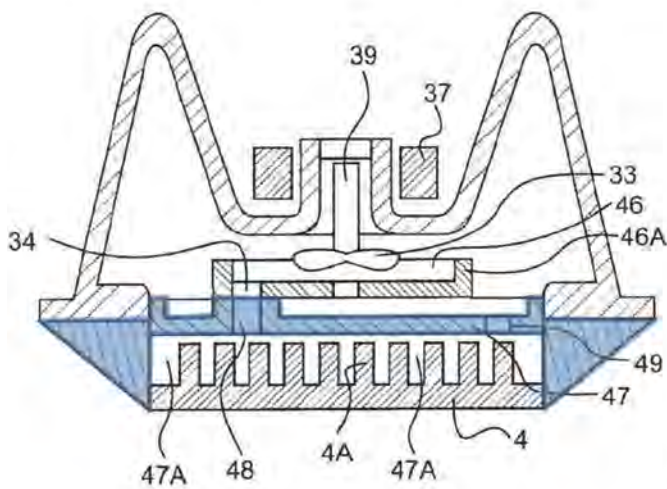


FIG. 20

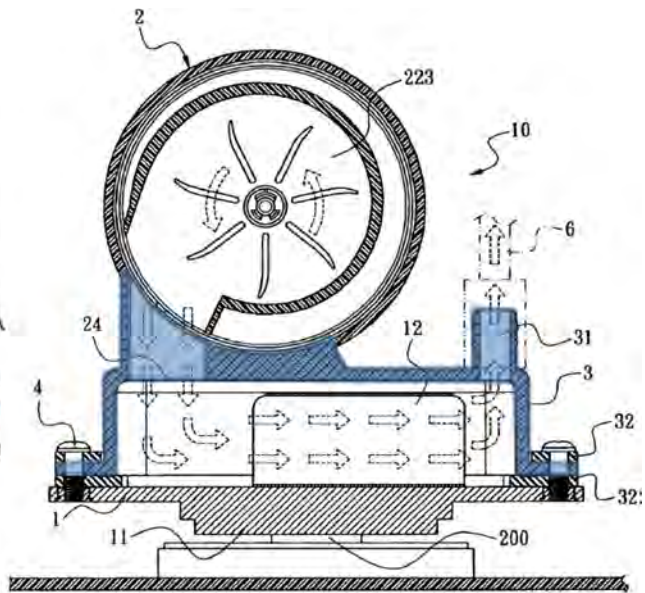


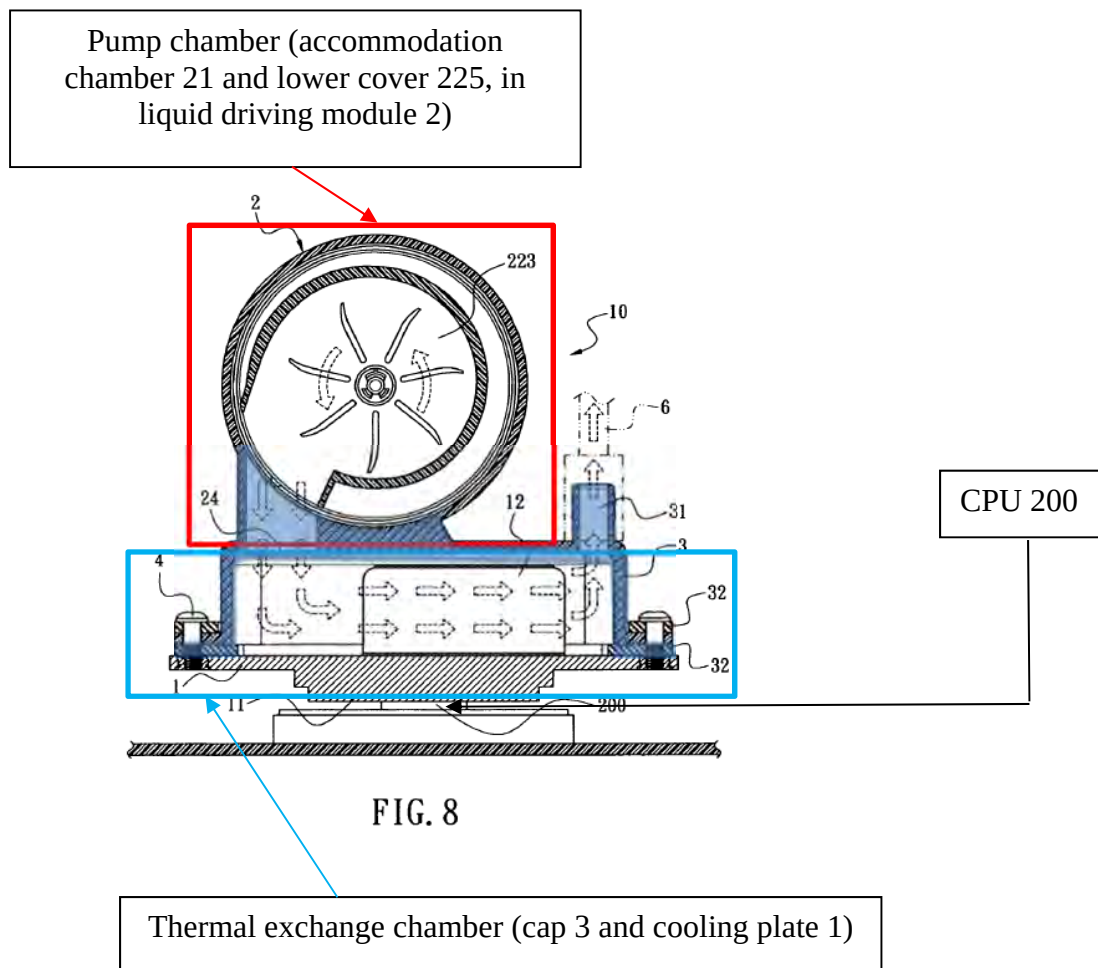
FIG. 8

(intermediate member 47 in FIG. 20 of the '681 patent (left) and cap 3 in FIG. 8 of Duan (right) (both colored in blue)). Intermediate member 47 of the '681 patent has a first passage 48 and a second passage 49. Cap 3 of Duan has a first passage 24 and a second passage 31. They both partially define the pump chamber above them, are both coupled to the heat exchange interface, and both define a second passage. So, their functions are the same, too. Thus, cap 3 of Duan meets the intermediate member limitation.

[8b] “a thermal exchange chamber disposed between the pump chamber and the heat-generating component when the system is installed on the heat-generating component;” (Ex. 1003 at ¶¶ 171-173.)

A POSITA would have understood that Duan discloses a thermal exchange chamber (e.g., cap 3 and cooling plate 1) disposed between the pump chamber (e.g., accommodation chamber 21 and lower cover 225) and the heat-generating

component (e.g., CPU 200) when the system is installed on the heat-generating component. (Ex. 1003 at ¶____.) This is illustrated below in FIG. 8 of Duan.

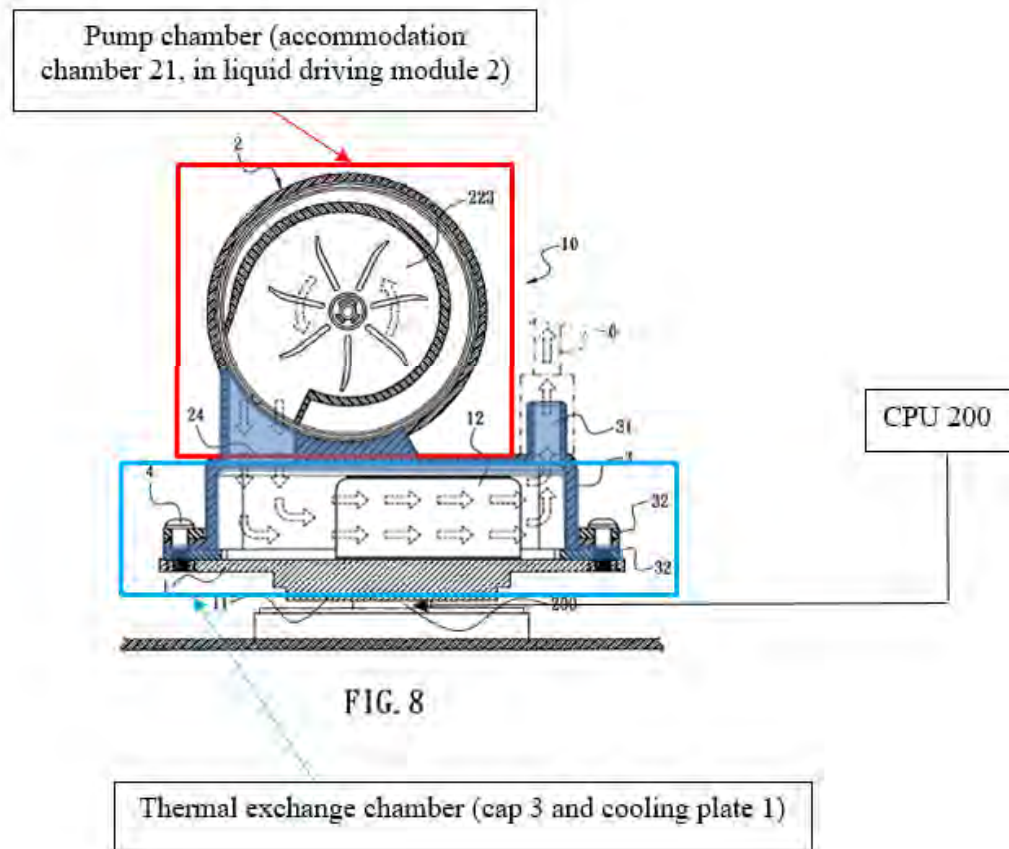


[8c] “a heat-exchanging interface coupled to the intermediate member, the heat-exchanging interface forming a boundary wall of the thermal exchange chamber, the heat-exchanging interface has a plane outer surface configured to be placed in thermal contact with a surface of the heat-generating component and an inner surface that defines a network of (channels that direct the flow of the cooling liquid within the thermal exchange chamber;”
(Ex. 1003 at ¶¶ 174-175.)

Duan discloses a heat-exchanging interface (e.g., cooling plate 1) coupled to the intermediate member (e.g., cap 3), the heat-exchanging interface (e.g., cooling plate 1) forming a boundary wall of the thermal exchange chamber (e.g., cap 3 and cooling plate 1), the heat-exchanging interface (e.g., cooling plate 1) has a plane outer surface (e.g., heat-absorbing face 11) configured to be placed in thermal contact with a surface of the heat-generating component (e.g., CPU 200) and an inner surface that defines a network of channels (e.g., heat-dissipating plates 12) that direct the flow of the cool liquid within the thermal exchange chamber (cap 3 and cooling plate 1). (see analysis of limitation [1c].)

For example, Duan states, “The cool liquid then flows to the cap 3 through the first liquid outlet 24 for heat dissipating the heat-dissipating plates 12 in the cap 3. More particularly, the cool liquid is heat exchanged with the heat-dissipating plates 12 into hot liquid. The hot liquid then flows to the liquid entrance region 51 of the water tank 20 through the second liquid outlet 31 of the cooling plate module 10 and another duct 6.” (Ex. 1005 at [0027]; *see also id.* at [0024] (“Thereafter, sealing pads 32 are provided between the cap 3 and the cooling plate

1 and provided atop the cap 3, and are retained by bolt units 4. The cooling plate 1 is fixed to bottom of cap 3 and the heat-dissipating plates 12 are located in the cap 3 and corresponding to the first liquid outlet 24”).) These elements are also illustrated in FIG. 8:



(*Id.* at FIG. 8.) As shown above, and as shown in FIG. 6, Duan's plates 12 form a network of channels that direct the flow of the cooling liquid within the thermal exchange chamber, where the plates increase surface area contact with the liquid for increasing heat dissipation. (See analysis of claim 4).

[8d] “a heat radiator adapted to pass the cooling liquid there-through, the heat radiator being fluidly coupled to the pump chamber and the thermal exchange chamber via fluid conduits and positioned at a location remote from the heat-generating component, the heat radiator being configured to dissipate heat from the cooling liquid;” (Ex. 1003 at ¶¶ 176-179.)

Duan discloses a heat radiator (e.g., cooling stage 53, heat-dissipating fins 531, and runners 532) adapted to pass the cooling liquid there-through (duct 6, liquid inlet 511, and liquid outlet 521), fluidly coupled to the reservoir (e.g., accommodation chamber 21, cap 3, and cooling plate 1) via conduits (e.g., ducts 6), positioned at a location remote from the heat-generating component (e.g., CPU 200), and configured to dissipate heat from the cooling liquid (duct 6, liquid inlet 511, and liquid outlet 521). (see Ex. 1005 at [0025] and [0027].) This is also illustrated in FIG. 6 of Duan:

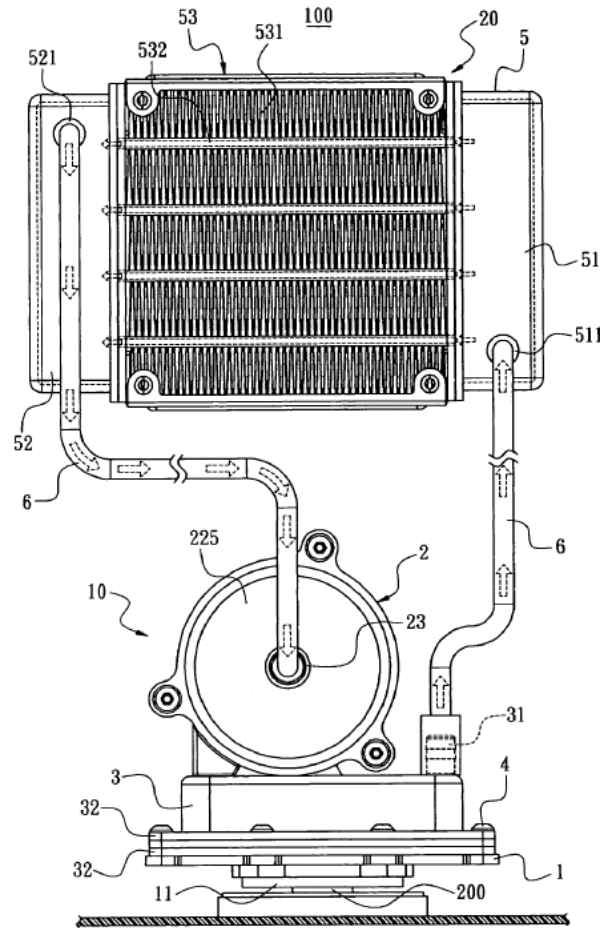


FIG. 6

(*Id.* at FIG. 6; *see also* analysis of limitation [1d].)

[8e] “wherein the pump chamber includes:” (Ex. 1003 at ¶¶ 180-181.)

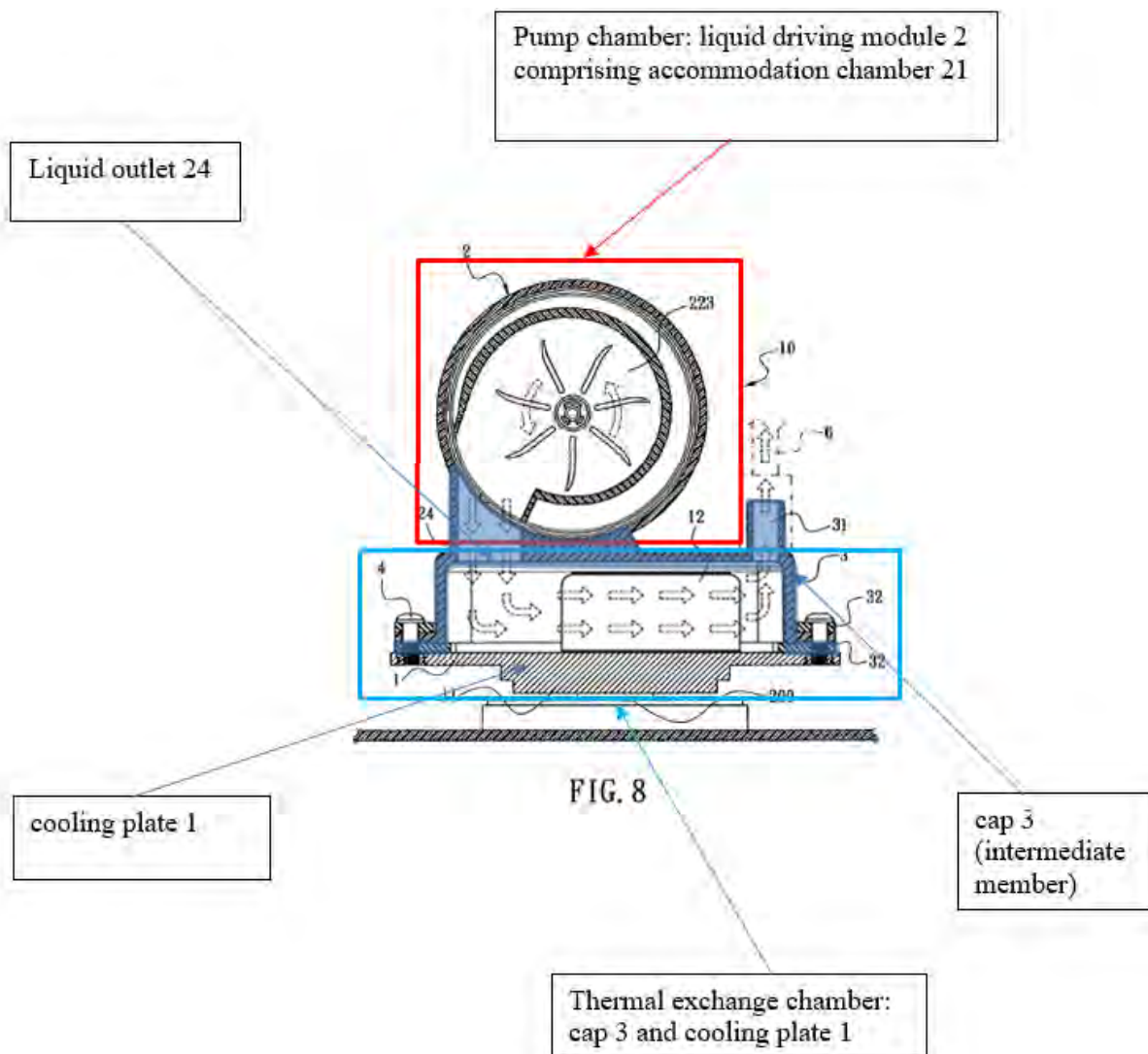
Duan discloses a pump chamber, notably accommodation chamber 21, which is part of the liquid driving module 2. (Ex. 1005 at [0023] and FIG. 3.)

[8e-i] “an inlet positioned below the center of the impeller configured to enable the cooling liquid to flow into the center of the pump chamber;” (Ex. 1003 at ¶ 182.)

Duan discloses this limitation for reasons discussed above with respect to limitation [1g-i].

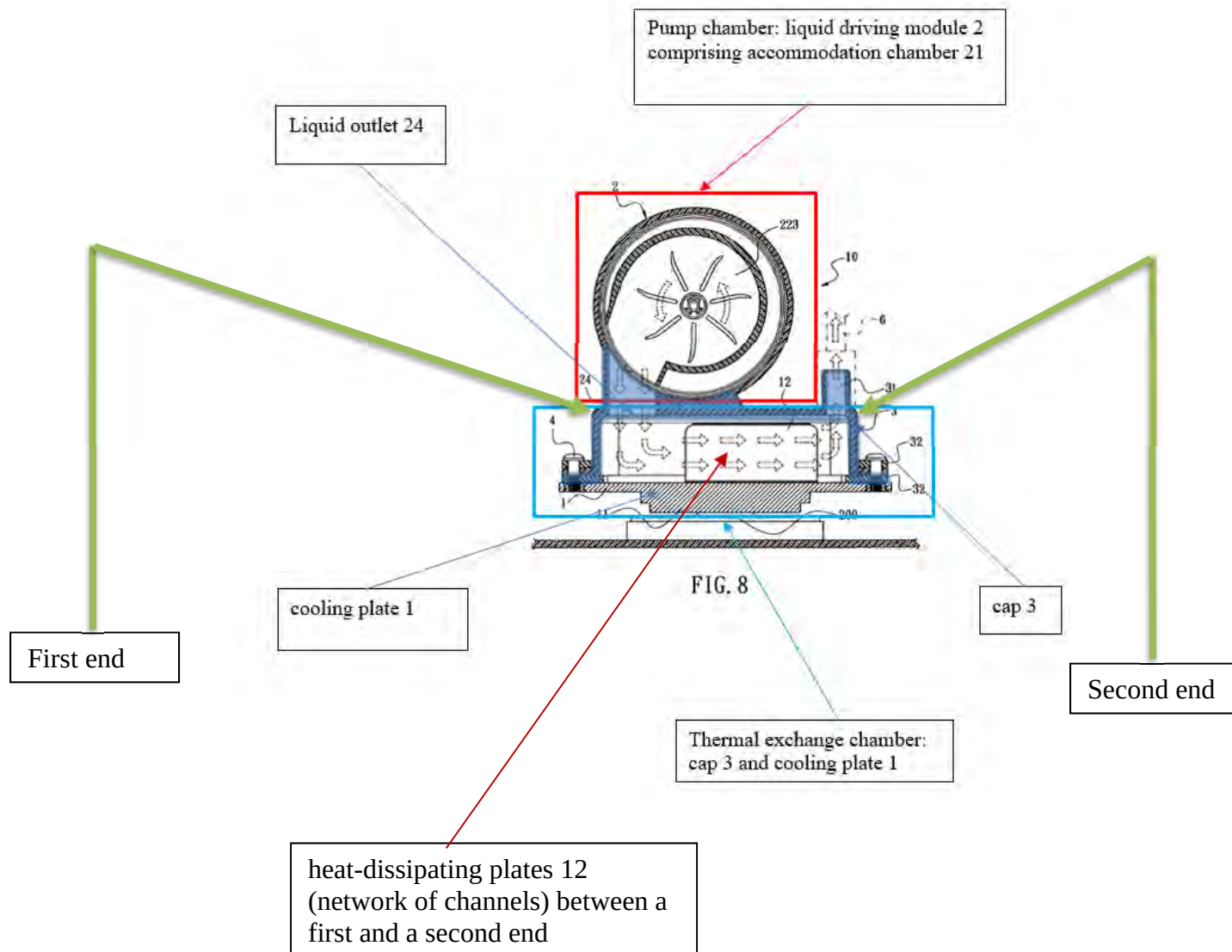
[8e-ii] “an outlet that fluidly couples the pump chamber to the thermal exchange chamber via a first passage defined by the intermediate member, the outlet is positioned along an outer circumference of the pump chamber and is configured to direct the cooling liquid driven by the impeller through the first passage to the thermal exchange chamber;” (Ex. 1003 at ¶¶ 183-187.)

Duan discloses this limitation for reasons discussed above with respect to limitation [1g-ii]. In addition, Duan discloses that the first passage (first liquid outlet 24) is defined by the intermediate member (*e.g.*, cap 3). This is best shown by the following colored and annotated version of Duan FIG. 8:



[8f] “wherein the first passage directs the cooling liquid into the thermal exchange chamber and into the network of channels between a first end and a second end of the thermal exchange chamber;” (Ex. 1003 at ¶¶ 188-189.)

As shown in the following colored and annotated version of FIG. 8, Duan discloses a first passage (e.g., first liquid outlet 24) that directs the cooling liquid into the thermal exchange chamber (e.g., cap 3 and cooling plate 1) and into the network of channels (e.g., heat-dissipating plates 12) between a first end and a second end of the thermal exchange chamber (e.g., cap 3 and cooling plate 1), which ends are shown below with the green arrows:



(Ex. 1005 at FIG. 8; see also Ex. 1003-Hodes at ¶____.) In addition, Duan states, “[t]he cool liquid then flows to the cap 3 through the first liquid outlet 24 for heat dissipating the heat-dissipating plates 12 in the cap 3. More particularly, the cool liquid is heat exchanged with the heat-dissipating plates 12 into hot liquid. The hot liquid then flows to the liquid entrance region 51 of the water tank 20

through the second liquid outlet 31 of the cooling plate module 10 and another duct 6.” (Ex. 1005 at [0027] (emphasis added).)

Regarding the limitation of “between a first end and a second end of the thermal exchange chamber,” Duan discloses this limitation as explained below. To the extent the limitation is interpreted to mean the “first passage directs the cooling liquid ... between a first end and a second end of the thermal exchange chamber,” it can be seen above that at least a (right) portion of the first liquid outlet 24 is located between the first and second ends of the thermal exchange chamber (e.g., cap 3 and cooling plate 1), thus directing the fluid as claimed. On the other hand, to the extent the limitation is interpreted to mean “the network of channels [is] between a first end and a second end of the thermal exchange chamber,” Duan’s heat dissipating plates are located between the first and second ends of the thermal exchange chamber (e.g., cap 3 and cooling plate 1), as shown above. Thus, Duan discloses this limitation under either interpretation. (See Ex. 1003 at ____.)

[8g] “wherein the intermediate member defines at least one second passage configured to direct the cooling liquid out of the thermal exchange chamber, the at least one second passage is positioned at either the first end or the second end of the thermal exchange chamber.” (Ex. 1003 at ¶¶ 190-194.)

Duan discloses an intermediate member (e.g., cap 3) that defines at least one second passage (e.g., second liquid outlet 31) configured to direct the cooling liquid out of the thermal exchange chamber (e.g., cap 3 and cooling plate 1), the at least one second passage positioned at the second end of the thermal exchange

chamber (e.g., cap 3 and cooling plate 1). (Ex. 1005 at [0026]) Duan's teachings are also illustrated in the following annotated version of FIG. 6 with the below color coding scheme:

Color	Duan Element
Pink	second liquid outlet 31
Light blue	cap 3
Dark blue	cooling plate 1

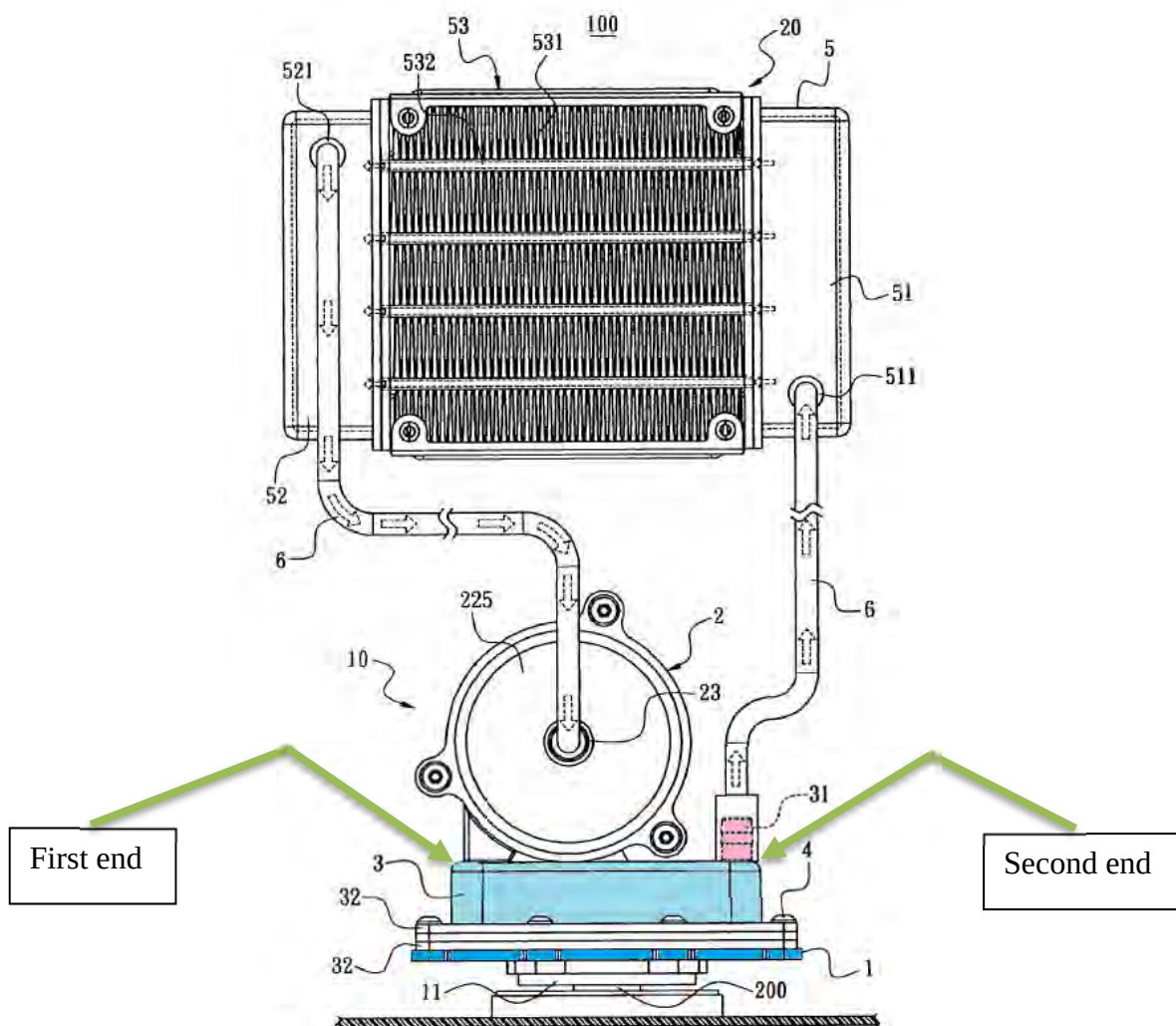
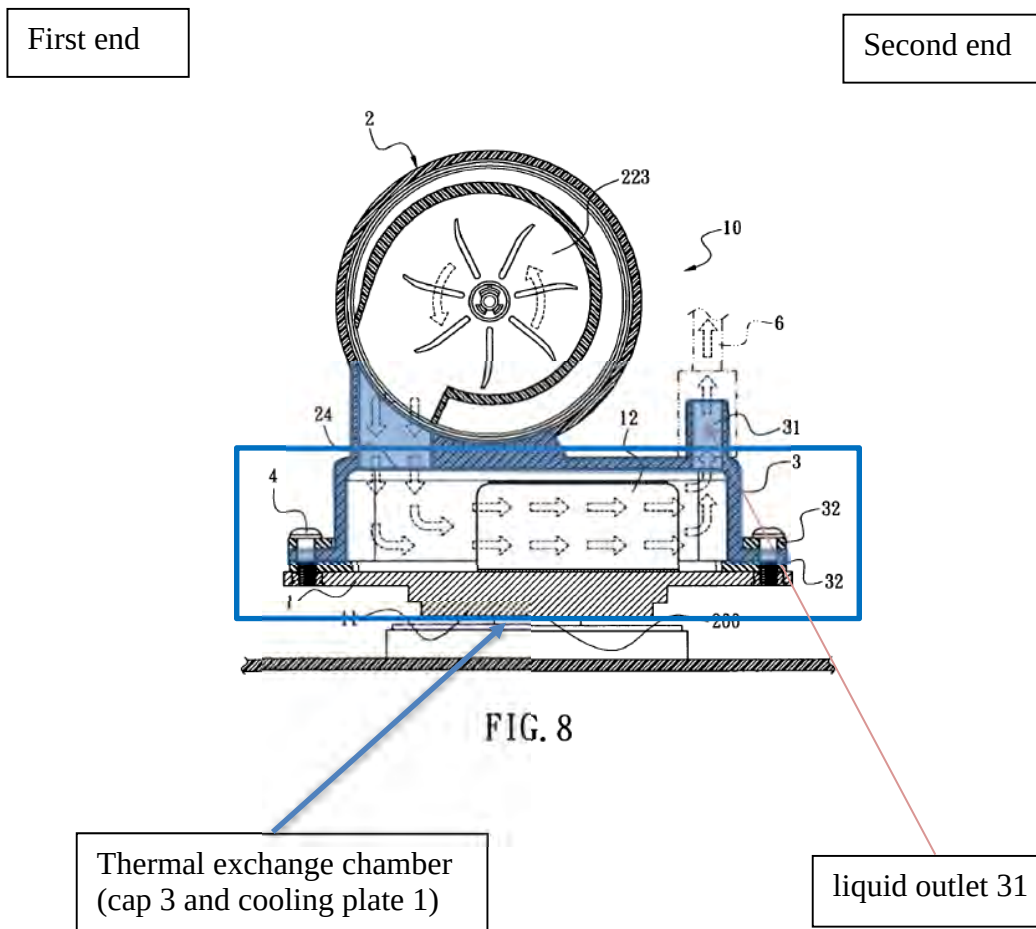


FIG. 6

(Ex. 1005 at FIG. 6.) These teachings are also shown in FIG. 8:



Because Duan discloses all limitations of Claim 8 and the specific arrangement of these limitations, Duan anticipates Claim 8.

2. Claim 11

[Claim 11] “The liquid cooling system of claim 8, wherein the double-sided chassis housing defines a recess configured to house the stator.” (Ex. 1003 at ¶¶ 195-196.)

As explained above, Duan discloses a double-sided chassis housing (e.g., accommodation chamber 21). This chassis defines a recess (e.g., on the top side of

accommodation chamber 21) configured to house the stator (e.g., coil stage 221).
(see Ex. 1005 at [0023] (“With reference to FIGS. 2, 3, and 4, the liquid driving module 2 comprises an accommodation chamber 21 and **a liquid driving unit 22 located in the accommodation chamber 21 ... The liquid driving unit 22 comprises a coil stage 221**”) (emphasis added).) These elements are best shown in FIG. 3, where the stator (e.g., a portion of coil stage 221) is in yellow:

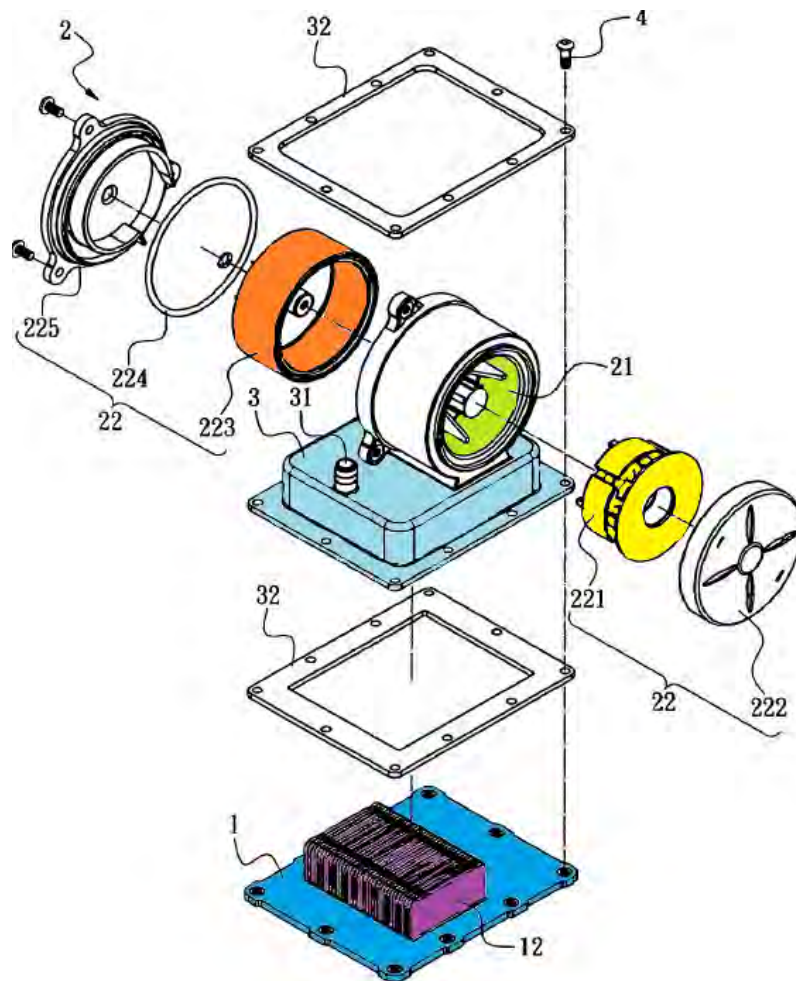


FIG. 2

(Ex. 1005 at FIG. 2; *see also* FIG. 3.) FIG. 7 of Duan also shows a recess configured to house the stator:

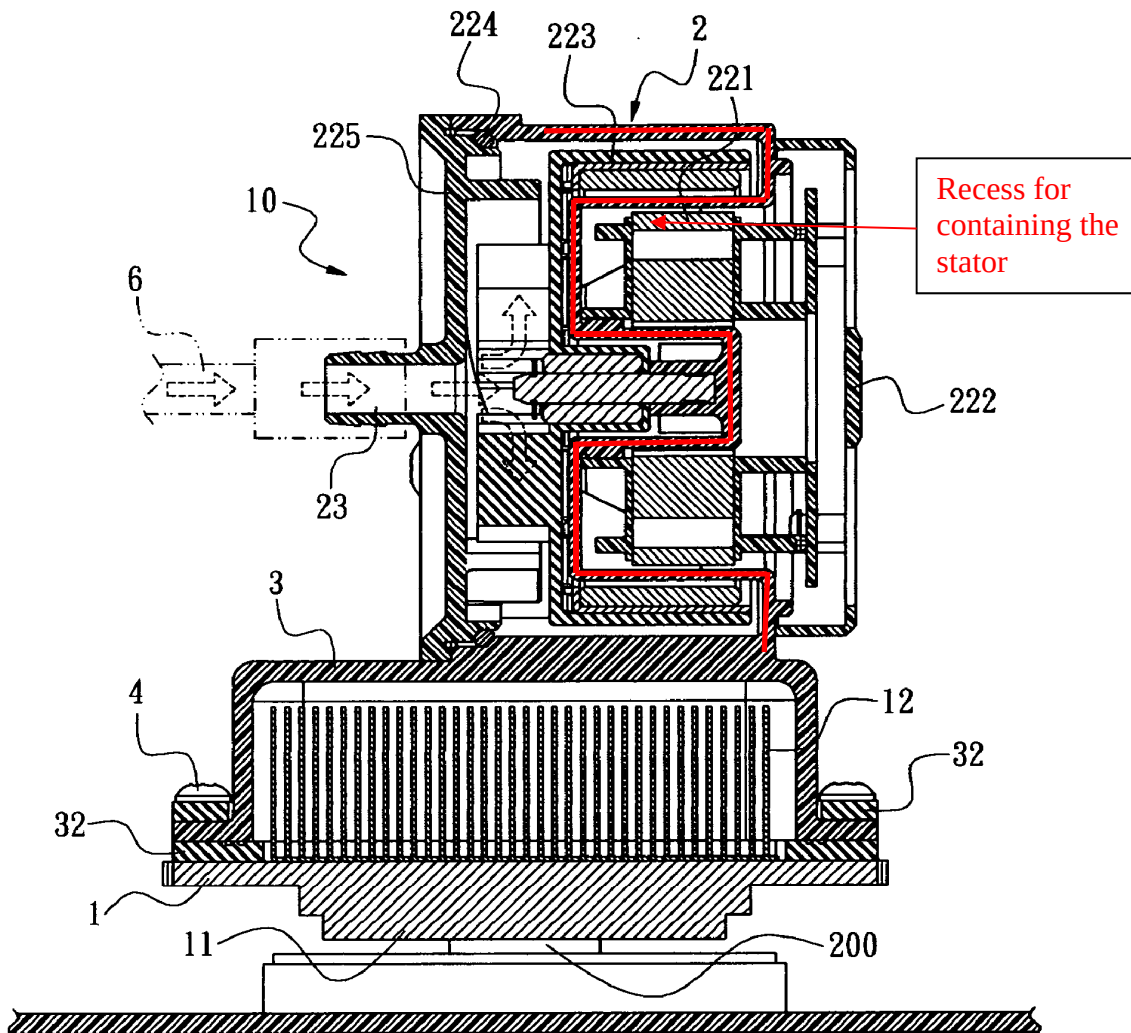


FIG. 7

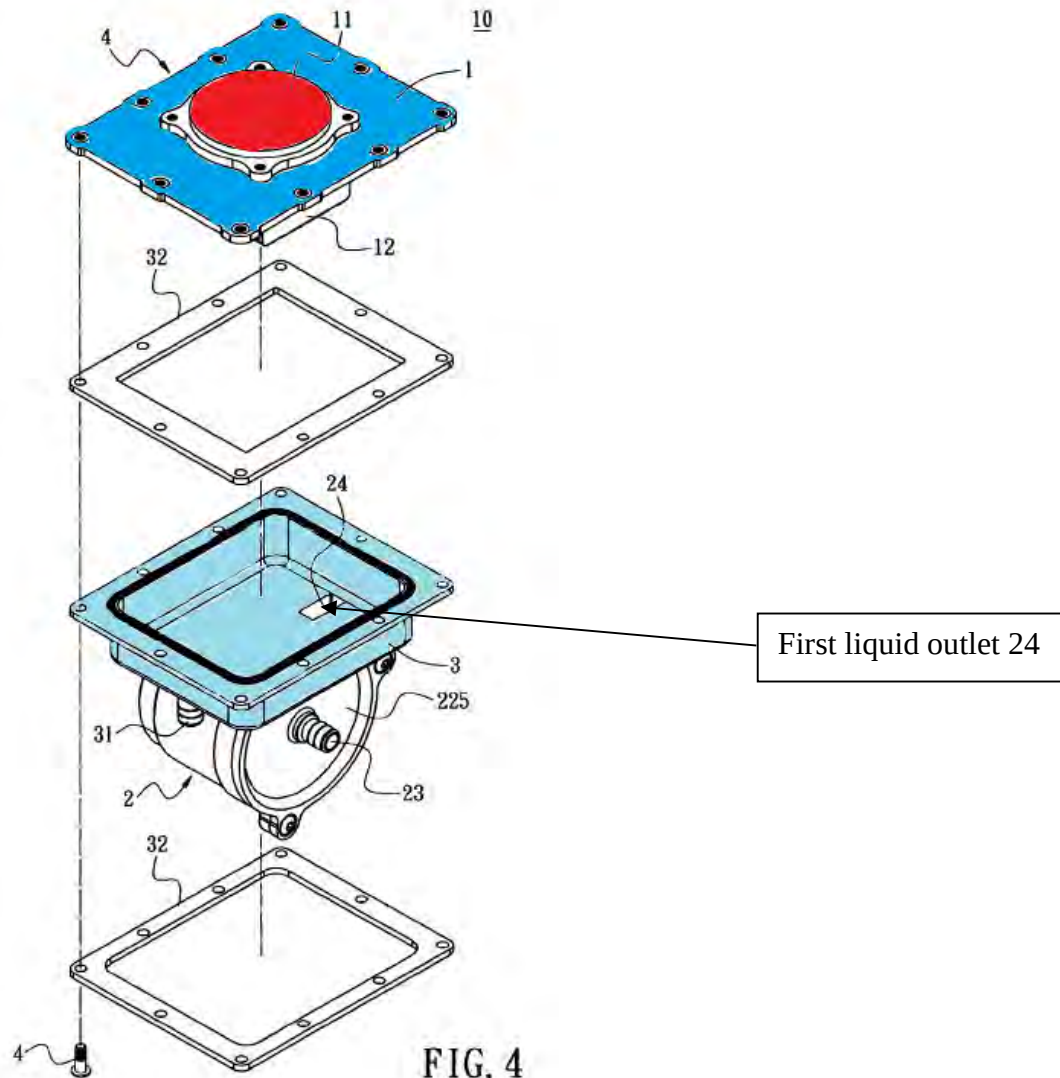
(Ex. 1005 at FIG. 7 (emphasis added).) For at least these reasons, Duan anticipates claim 11.

3. Claim 15

[Claim 15] “The liquid cooling system of claim 8, wherein the first passage directs the cooling liquid into a middle of the thermal exchange chamber.”
(Ex. 1003 at ¶¶ 197-199.)

Duan discloses a first passage (e.g., first liquid outlet 24) that directs the cooling liquid into a middle (e.g., of the width of cap 3) of the thermal exchange chamber (e.g., cap 3 and cooling plate 1). (*See also* Ex. 1005 at [0027] (“The cool liquid then flows to the cap 3 through the first liquid outlet 24 for heat dissipating the heat-dissipating plates 12 in the cap 3.”); (Ex. 1003 at ¶____.) Reproduced below is a colored version of FIG. 4 of Duan that uses the following color coding scheme and illustrates the disclosure of this limitation:

Color	Duan Element
Red	Heat-absorbing face 11
Light blue	cap 3
Dark blue	cooling plate 1



As shown above, the heat absorbing face (shown in red as item 11) is at the middle of the cap and interfaces with the cooling liquid. For at least these reasons, Duan anticipates claim 15.

4. Claim 16

[Claim 16] “The liquid cooling system of claim 8, wherein the heat-exchanging interface is removably coupled to the intermediate member.” (Ex. 1003 at ¶¶ 200-202.)

Duan discloses a heat-exchanging interface (cooling plate 1) that is removably coupled (via bolt units 4) to the intermediate member (cap 3). (see Ex. 1005 at [0024] (stating “Thereafter, sealing pads 32 are provided between the cap 3 and the cooling plate 1 and provided atop the cap 3, and are retained by *bolt units 4.*”) (emphasis added).) A POSITA would have understood that the use of bolt units 4 to secure the heat exchanging interface indicates it is removable. Thus, it is removably coupled to cap 3. Reproduced below is a colored version of FIG. 2 of Duan that uses the following color coding scheme and illustrates the disclosure of this limitation:

Color	Duan Element
Purple	heat-dissipating plates 12
Light blue	cap 3
Dark blue	cooling plate 1



C. **GROUND 3:** Claims 8, 11, 15, and 16 are rendered obvious by Duan

89

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.*)

Duan does not directly use the word “radiator,” but a POSITA would have understood to the extent Duan does not expressly disclose a “heat radiator,” Duan teaches this limitation with its teaching as described in Sections [1d] and [8d] above. Thus, this limitation is obvious from a POSITA’s point of view.

As to the stator, Duan does not directly use the word, but a POSITA would find the presence of a stator obvious based on the teachings of the coil stage 221, as explained in Sections [1a] and [8a] above.

VII. THE BOARD SHOULD EXERCISE ITS DISCRETION TO INSTITUTE TRIAL

The Board should exercise its discretion under 35 U.S.C. § 314 to institute trial. First, the challenged patent is part of a patent family that has been subject to several litigation matters including without limitation *Asetek Holdings, Inc et al v. CoolIT Systems Inc.*, Case No. 3:12-cv-04498-EMC (N.D. Cal. (filed: 08/27/2012; terminated: 02/09/2015); *Asetek Danmark A/S v. CMI USA, Inc.*, Case No.: 3:13-cv-00457-JST (N.D. Cal. (filed 1/31/2013; terminated 06/01/2015); *Asetek Danmark A/S v. Newegg Inc. et al.*, Case No. 4:16-cv-07068-JST (N.D. Cal. (filed: 12/09/2016; terminated 10/23/2017)); *Asia Vital Components Co., Ltd. v. Asetek Danmark A/S*, Case No. 4:16-cv-07160-JST (N.D. Cal. (filed 12/16/2016;

terminated 04/17/2019); and *Asetek Danmark A/S v. CoolIT Systems, Inc.*, Case No. 3:19-cv-00410-EMC (N.D. Cal. (filed 01/23/2019; currently pending). In addition, the patent family includes pending Patent Application No. 15/991,384 that can potentially be used in Patent Owner's continued litigation efforts. Given the history of this patent family, instituting trial to evaluate the patentability could preserve judicial resources that may otherwise be used in future litigation matters. Moreover, should the Board ultimately rule that the claims are unpatentable, such guidance could lead to narrower claims in pending, related applications that do not encompass the prior art.

Second, the primary reference, Duan (Ex. 1005) was not cited during the prosecution of the challenged patent. Therefore, the arguments raised in the Petition were not considered by the Examiner when the patent was allowed.

Third, Petitioner notes that it filed an *inter partes* reexamination request (Application No. 95/002,386) with respect to U.S. Pat. No. 8,245,764 (the '764 Patent) which is related to the challenged patent. Not only does the '764 patent recite different claim elements, Duan (Ex. 1005) was not included in this *inter*

partes reexamination request. Therefore, the Patent Office has not considered the arguments presented herein.²

Fourth, the concurrent litigation is not in advanced stages. At the time of filing, no trial date or expert discovery cut-off deadlines have been set. And oral argument for claim construction is set for May 22, 2020, if requested. For these reasons, the Board should exercise its discretion to institute trial.

VIII. SECONDARY CONSIDERATIONS

Petitioner is not aware of any secondary considerations that would overcome the strong showing of obviousness provided by the Petition. Further, any attempt by Patent Owner to rely on alleged secondary considerations cannot overcome the showing of obviousness detailed above. *Tokai Corp. v. Easton Enters., Inc.*, 632 F.3d 1358, 1370 (Fed. Cir. 2011).

IX. CONCLUSION

For the foregoing reasons, Petitioner respectfully request that the *inter partes* review of the '681 patent be instituted as the Petition establishes a reasonable likelihood of prevailing with respect to the Challenged Claims. Petitioner further respectfully requests that claims 1, 4, 8, 11, 15 and 16 be cancelled as unpatentable.

² Application No. 95/002,386 cited to Patent No. 7,325,591 (the '591 patent) which was referred to Duan, but the '591 patent is substantively different than Ex. 1005.

Patent No. 9,733,681
IPR2020-00524

Petition Requesting *Inter Partes* Review

Respectfully submitted,
GREENBERG TRAURIG, LLP

Date: February 7, 2020

By: /Vivek Ganti/
Vivek Ganti (Reg. No. 71,368)
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 12,985 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, have been served on the Patent Owner via Priority Mail Express or by means at least as fast and reliable as Priority Mail Express on the below date, at the following addresses:

FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER LLP
901 NEW YORK AVENUE, NW
WASHINGTON DC 20001-4413

Respectfully submitted,
GREENBERG TRAURIG, LLP

Date: February 7, 2020

By: /Vivek Ganti/
Vivek Ganti (Reg. No. 71,368)
Counsel for Petitioner