

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ASETEK DANMARK A/S,
Petitioner,

v.

COOLIT SYSTEMS, INC.,
Patent Owner.

Case IPR2015-01276
Patent 8,746,330 B2

Before MICHELLE R. OSINSKI, MITCHELL G. WEATHERLY, and
TIMOTHY J. GOODSON, *Administrative Patent Judges*.

OSINSKI, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
35 U.S.C. § 318(a) and 37 C.F.R. § 42.72

I. INTRODUCTION

A. Background

Asetek Danmark A/S (“Petitioner”) filed a Petition (Paper 1, “Pet.”) requesting an *inter partes* review of claims 1–28 of U.S. Patent No. 8,746,330 B2 (Ex. 1001, “the ’330 patent”). CoolIT Systems, Inc. (“Patent Owner”) did not file a Preliminary Response to the Petition. On December 9, 2015, pursuant to 35 U.S.C. § 314(a), we instituted an *inter partes* review of claims 1–4, 6–8, 12, 14, 15, and 18–28 on the following grounds of unpatentability asserted by Petitioner:

Reference	Basis	Claims
Kang ¹ , with or without Bonde ²	§ 103(a)	1–4, 6–8, 21, 24, and 26
Kang and Bhatti ³	§ 103(a)	12, 14, 15, 18–20, 22, 23, 25, 27, and 28

Decision on Institution (Paper 6, “Dec. Inst.”), 2, 29.

Patent Owner filed a Patent Owner Response (Paper 8, “PO Resp.”), and Petitioner filed a Reply (Paper 9, “Pet. Reply”).

Petitioner relies on a declaration of Dr. Donald E. Tilton in support of its Petition (Ex. 1002).

An oral hearing was held on September 14, 2016. A transcript is entered in the record as Paper 16 (“Tr.”).

We have jurisdiction under 35 U.S.C. § 6(c). This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons that follow, we determine that Petitioner has not shown by a

¹ Kang, US 2006/0096738 A1 (published May 11, 2006) (Ex. 1004).

² Bonde, US 5,099,311 (issued Mar. 24, 1992) (Ex. 1005).

³ Bhatti, US 2007/0163750 A1 (published July 19, 2007) (Ex. 1007).

preponderance of the evidence that claims 1–4, 6–8, 12, 14, 15, and 18–28 of the '330 patent are unpatentable under 35 U.S.C. § 103(a).

B. Related Proceedings

The parties represent that the '330 patent is the subject of the following federal district court proceeding: *CoolIT Systems, Inc. v. Asetek Holdings, Inc.*, No. 1:14-cv-00725-RGA (D. Del., filed June 10, 2014). Pet. 2; Patent Owner's Mandatory Notices, Paper 5, 2.

C. The '330 Patent

The '330 patent relates to fluid heat exchangers “used to cool electronic devices by accepting and dissipating thermal energy therefrom.” Ex. 1001, 1:6–8. Figures 1–3 of the '330 patent are reproduced below.

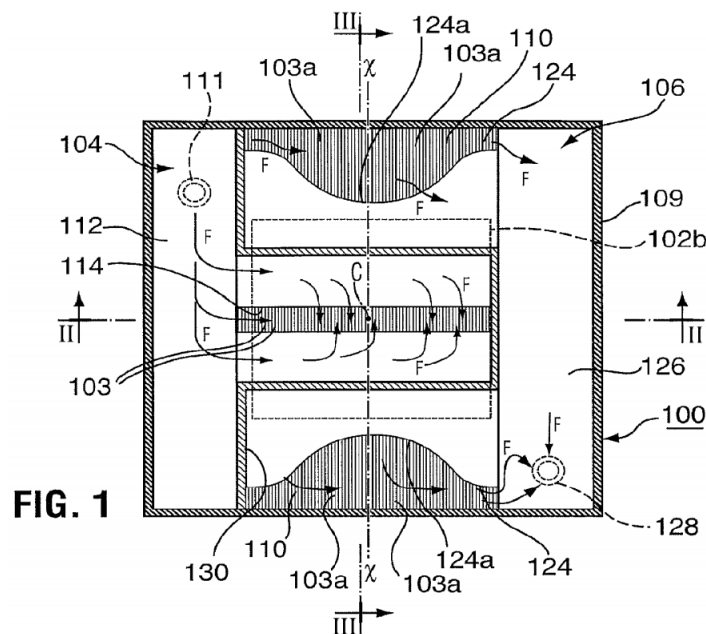


Figure 1 depicts a top plan view of an exemplary fluid heat exchanger, with a top cap cut away to allow viewing of the internal components of the fluid heat exchanger. *Id.* at 2:20–22.

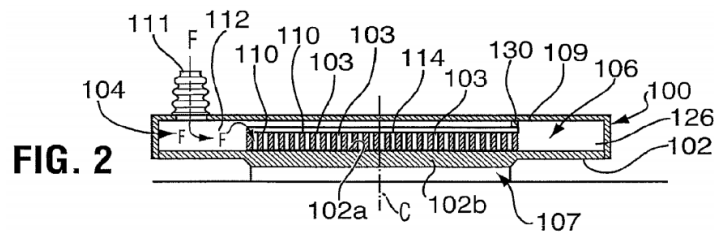


Figure 2 depicts a sectional view along line II-II of Figure 1. *Id.* at 2:23.

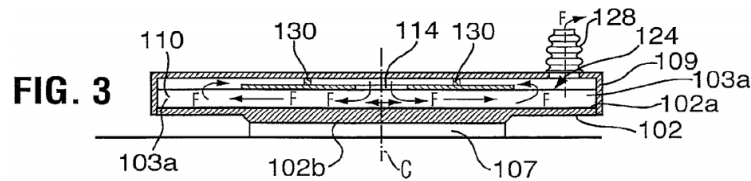


Figure 3 depicts a sectional view along line III-III of Figure 1. *Id.* at 2:24. Referring to Figures 1–3, fluid heat exchanger 100 includes heat spreader plate 102 having contact region 102b that is in contact with heat source (e.g., electronic device) 107. *Id.* at 2:57–61. Heat spreader plate 102 further includes an inner facing, upper surface 102a from which a plurality of walls 110 extend upwardly in a parallel configuration to define microchannels 103. *Id.* at 3:7–14, 31–32. Microchannels 103 facilitate flow of heat exchanging fluid so that heat spreader plate 102 and walls 110 can accept and dissipate thermal energy from heat source 107. *Id.* at 2:49–50, 3:4–7.

Fluid heat exchanger 100 further includes fluid inlet passage 104, comprising port 111, header 112, fluid inlet opening 114, and microchannels 103. *Id.* at 3:66–4:3. Port 111 and header 112 are of a larger cross-sectional area than fluid inlet opening 114 “so that a mass flow of fluid can be communicated substantially without restriction to [fluid inlet] opening 114.” *Id.* at 4:7–10. Fluid inlet opening 114 is positioned adjacent contact region 102b of heat spreader plate 102 in order “to introduce fresh heat exchanging fluid first and directly to the hottest region of the heat exchanger.” *Id.* at 4:35–37. Fluid flows through fluid inlet opening 114 down into

microchannels 103 “in a direction orthogonal relative to the plane of surface 102a and toward surface 102a and then change[s] direction to pass along the lengths of channels 103 substantially parallel to surface 102a.” *Id.* at 4:22–28. Fluid inlet opening 114 generally is positioned so as to introduce fluid to a middle region of microchannel 103 where the “flow splits into two sub flows to pass outwardly from the inlet toward a pair of outlets.” *Id.* at 5:44–49, 6:1–6. Splitting the fluid flow “creates less back pressure and less flow resistance, allows faster fluid flow through the channels and lessens the pump force required to move the fluid through the heat exchanger.” *Id.* at 6:6–12.

Fluid heat exchanger 100 further includes fluid outlet passage 106, comprising one or more fluid outlet openings 124 from microchannels 103, header 126, and outlet port 128. *Id.* at 5:1–5. Fluid outlet openings 124 are positioned at the ends of microchannels 103 and are spaced from fluid inlet opening 114, “so that fluid is forced to pass through at least a portion of the length of channels 103 where heat exchange occurs before exiting the microchannels” and flowing through fluid outlet openings 124. *Id.* at 5:13–14, 23–29. Central region 124a of fluid outlet openings 124 are scalloped so as to “offer an enlarged outlet region from the centrally located channels, relative to those on the edges,” helping to ensure “that fluid flowing through the more centrally located channels encounters less resistance to flow therethrough, again facilitating flow past the central mounting region 102b on heat spreader plate 102.” *Id.* at 6:42–51. Heated fluid from microchannels 103 passes out of fluid outlet openings 124, into header 126, and through port 128. *Id.* at 6:32–33. Fluid heat exchanger 100 further

includes seal 130 that separates fluid inlet passage 104 from fluid outlet passage 106. *Id.* at 6:52–55.

Figures 4 and 5 of the '330 patent are reproduced below.

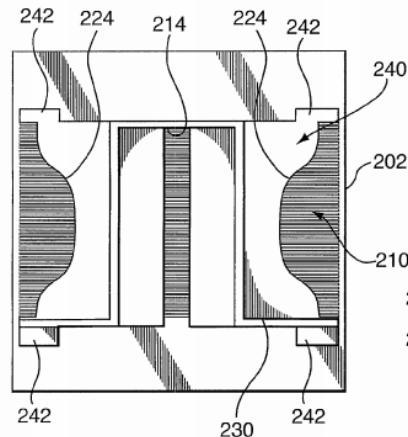


FIG. 4

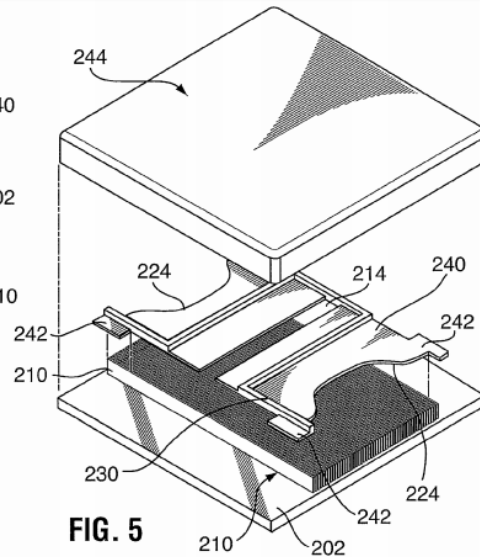


FIG. 5

Figure 4 depicts a top plan view of a fluid heat exchanger with its top cap removed, and Figure 5 depicts an exploded, perspective view of the fluid heat exchanger of Figure 4. *Id.* at 2:25–29. As illustrated, plate 240 may be installed over walls 210 forming the microchannels on a surface of heat spreader plate 202. *Id.* at 6:56–66. Portions of plate 240 may be removed to create fluid inlet opening 214 and fluid outlet openings 224. *Id.* at 6:66–7:1. Seal 230 may be part of plate 240 or a separate installation. *Id.* at 7:5–6.

D. Illustrative Claims

Independent claims 1, 12, and 14 are illustrative of the claimed subject matter, and are reproduced below.

1. A fluid heat exchanger comprising:
 - a heat spreader plate defining an upper surface;
 - a plurality of fins extending from respective proximal ends positioned adjacent the upper surface of the heat spreader plate to respective distal ends positioned distally from the upper surface of the heat transfer plate, wherein the plurality of fins

defines a corresponding plurality of microchannels configured to direct a heat transfer fluid over the heat spreader plate, wherein each microchannel in the plurality of microchannels has a first end and an opposite end, wherein each microchannel in the plurality of microchannels extends substantially parallel with each other microchannel in the plurality of microchannels and has a continuous channel flow path between its respective first end and its respective opposite end;

a plate positioned over the distal ends of the plurality of fins and the corresponding plurality of microchannels to close off the plurality of microchannels adjacent the distal ends of the plurality of fins, wherein the plate positioned over the plurality of distal fin ends defines an elongate fluid inlet opening overlying and extending transversely relative to the plurality of microchannels between the plurality of microchannel first ends and opposite ends, wherein the plate is so positioned over the plurality of fins as to define a first fluid outlet opening from each microchannel in the plurality of microchannels at each of the microchannel first ends and an opposite fluid outlet opening from each microchannel in the plurality of microchannels at each of the microchannel opposite ends;

a housing spaced from the plate positioned over the plurality of distal fin ends, wherein the housing defines an inlet and an outlet, wherein the inlet defined by the housing opens to an inlet header and at least the first fluid outlet opening from each microchannel in the plurality of microchannels opens to an outlet header, wherein the outlet defined by the housing opens from the outlet header; and

a seal extending between the housing and the plate positioned over the plurality of distal fin ends, wherein the elongate fluid inlet opening defined by the plate extends between a proximal end and a distal end, wherein a region of the inlet header is positioned adjacent a first side of the fins and a region of the outlet header is positioned adjacent the second side of the fins, and wherein the fins, the plate, the housing, and the seal are arranged such that the heat transfer fluid is directed from the inlet opening to the inlet header, through the elongate fluid inlet opening defined by the plate and into the microchannels, from

the microchannels to the outlet header, and from the outlet header to the outlet defined by the housing.

12. A fluid heat exchanger comprising:

- a plurality of juxtaposed fins defining a corresponding plurality of juxtaposed microchannels, wherein each microchannel extends between a first end and a second end;

- a plate positioned over the juxtaposed fins and the corresponding plurality of juxtaposed microchannels, wherein the plate defines an elongate aperture extending transversely relative to each of the plurality of juxtaposed microchannels, wherein the elongate aperture is positioned between the first ends and the second ends of the plurality of juxtaposed microchannels;

- a housing spaced apart from the plate, wherein the housing has an inlet aperture and an outlet aperture, wherein the inlet aperture opens to an inlet header region positioned adjacent a first side of the plurality of juxtaposed fins and the outlet aperture opens from an outlet header region positioned adjacent a second side of the plurality of juxtaposed fins opposite the first side of the plurality of fins, and wherein the elongate aperture of the plate extends away from the inlet header region transversely relative to the plurality of juxtaposed fins; and

- a seal extending between the plate and the housing such that a flow of fluid from the inlet aperture of the housing to the inlet header region must pass through the elongate aperture of the plate and into the plurality of juxtaposed microchannels before the flow of the fluid passes through the outlet header region and the outlet aperture of the housing.

14. A fluid heat exchanger comprising:

- a plurality of juxtaposed fins defining a corresponding plurality of juxtaposed microchannels, wherein each microchannel extends between a respective first end and a respective second end;

- an apertured plate overlying the microchannels and defining an inlet to the microchannels and an outlet from the microchannels;

- a housing having an inlet and an outlet, wherein the inlet opens to an inlet header region juxtaposed with a first side of the

plurality of juxtaposed fins, and wherein the outlet opens from an outlet header region juxtaposed with a second side of the plurality of juxtaposed fins, wherein the first side and the second side are positioned opposite relative to each other and wherein the inlet to the microchannels defined by the apertured plate extends between the first side and the second side at a position between the first ends and the second ends; and

a seal extending between the housing and the apertured plate, wherein the inlet to the microchannels is separated from the outlet from the microchannels by the seal such that a fluid flow from the inlet header region is directed through the inlet to the microchannels and into one or more of the microchannels before the fluid passes from the microchannels into the outlet header region and through the housing outlet.

II. DISCUSSION

A. Claim Construction

In an *inter partes* review, we interpret claims in an unexpired patent according to the broadest reasonable construction in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b); *In re Cuozzo Speed Techs., LLC*, 793 F.3d 1268, 1278–80 (Fed. Cir. 2015) (“Congress implicitly approved the broadest reasonable interpretation standard in enacting the AIA,” and “the standard was properly adopted by PTO regulation.”), *aff’d sub nom. Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2144 (2016) (upholding the use of the broadest reasonable interpretation standard). Under the broadest reasonable construction standard, claim terms are given their ordinary and customary meaning, as would be understood by one of ordinary skill in the art in the context of the entire disclosure. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). Any special definition for a claim term must be set forth in the

specification with “reasonable clarity, deliberateness, and precision.” *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994).

In the Decision on Institution, we interpreted various claim terms of the ’330 patent as follows:

Term	Interpretation
“fluid inlet opening,” “aperture,” and “inlet to the microchannels”	“one or more passages on the plate that provide fluid flow from the inlet header into the plurality of microchannels”
“fluid outlet opening” and “outlet to the microchannels”	“one or more passages on the plate that provide fluid flow from the plurality of microchannels to the outlet header”

Dec. Inst. 10.

The parties do not dispute these interpretations in the Patent Owner Response or in the Petitioner Reply. *See* PO Resp. 2–3; *see* Pet. Reply 1–4. Based on our review of the complete record, we do not perceive any reason or evidence that now compels deviation from these interpretations. In addition to the terms construed above, we address the construction of “adjacent.”

Petitioner asserts that “adjacent” means “close to or nearby, and without anything of the same kind in between.” Pet. Reply 4; *see also id.* at 3–4 (citing *Centennial Molding, LLC v. Carlson*, 401 F. Supp. 2d 985, 991 (D. Neb. 2005), *IBG Automotive Ltd. v. Gentherm GmbH*, IPR2014-00668, Paper 25 at 8 (PTAB Oct. 21, 2005), *Ex Parte Appeldorn & Gilkerson*, 159 USPQ 791 (BPAI 1967), and *Ex Parte Hadsel*, 109 USPQ 509, 510 (BPAI 1956)). Petitioner relies on a usage note in the Merriam-Webster Collegiate Dictionary, 10th edition, stating that: “ADJACENT may or may not imply contact but always implies absence of anything of the same kind in

between.” *Id.* at 2–3 (quoting Ex. 1013, 3). Petitioner takes the position that construing “adjacent” as “next to” is unreasonably narrow. *Id.*

In contrast, Patent Owner asserts that the term “adjacent” means “next to.” PO Resp. 3 (citing *MBO Laboratories, Inc. v. Becton, Dickinson & Co.*, 474 F.3d 1323, 1333 (Fed. Cir. 2007)). Patent Owner takes the position that any and all elements of the claimed fluid heat exchanger could be deemed close to each other considering the small size of such thin heat exchanger devices, making Petitioner’s proposed construction unworkable. *See* Tr. 23:25–24:2.

The Specification does not provide an explicit definition of the claim term “adjacent.” *See* Tr. 37:20–21. Petitioner argues that the Specification does use the term “adjacent” to describe something more than simply “next to.” *Id.* at 7:14–26 (citing Ex. 1001, 4:38–43). In the ’330 patent, “[f]luid inlet opening 114 [is described as] be[ing] positioned adjacent . . . contact region 102*b*” (Ex. 1001, 4:31–33), even though fluid inlet opening 114 is separated from contact region 102*b* by walls 110 that extend upwardly from upper surface 102*a* of heat spreader plate 102 (*id.* at 3:7–15). We are not persuaded that this use of the term “adjacent” in the ’330 patent necessitates a broader construction than “next to.” This is because fluid inlet opening 114 is next to contact region 102*b* in that nearly the entirety of fluid inlet opening 114 overlies contact region 102*b*, as depicted by the dashed lines of Figure 1. Figure 2 shows that microchannel walls 110 define corresponding microchannels through which contact region 102*b* is positioned immediately below fluid inlet opening 114.

Because all elements of thin fluid heat exchangers can be considered relatively close to each other due to the small size of these devices, we

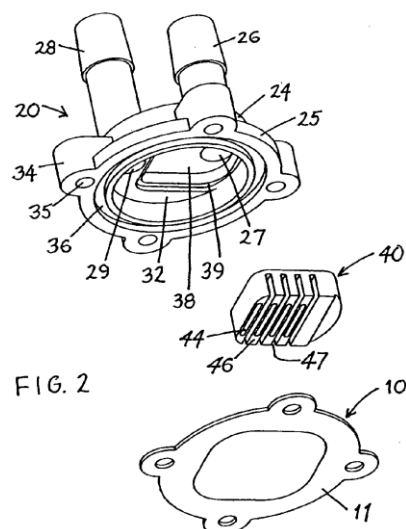
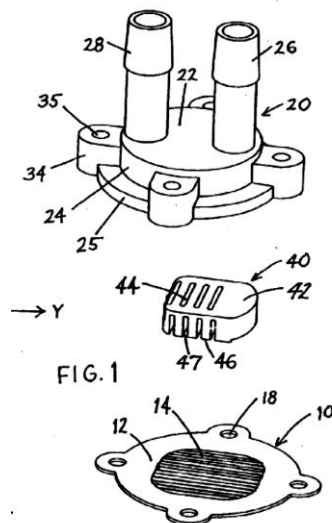
determine that “adjacent” in the ’330 patent must mean something more than “close to or nearby,” as asserted by Petitioner. *See Stumbo v. Eastman Outdoors, Inc.*, 508 F.3d 1358, 1362 (Fed. Cir. 2007) (explaining that a claim interpretation that renders a claim term or phrase superfluous is disfavored). We also are not persuaded that the absence of any intervening structure of the same kind therebetween is sufficient to consider two objects as adjacent to each other in the ’330 patent, as asserted by Petitioner. For example, we would not consider inlet header 112 to be adjacent outlet header 126 in the ’330 patent simply because there are no other elements labeled as “headers” between them.

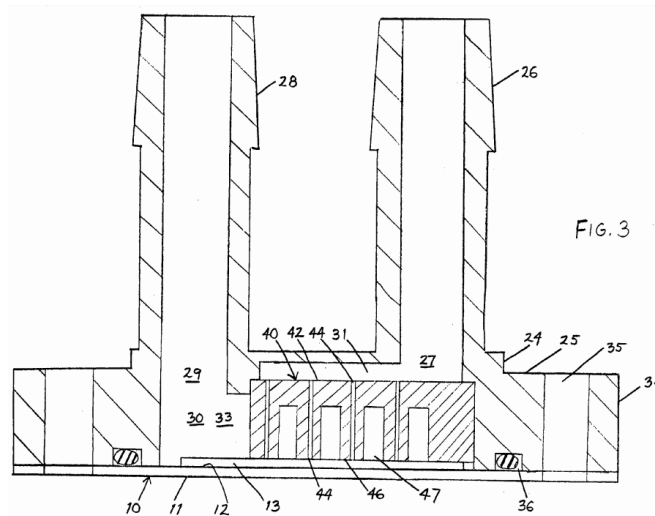
For the foregoing reasons, we construe “adjacent” as “next to” and determine this is the broadest reasonable construction of this term in light of the specification of the ’330 patent.

B. Obviousness of Claims 1–4, 6–8, 21, 24, and 26 Over Kang, With or Without Bonde

1. Overview of Kang

Kang discloses multiple embodiments of a heat exchanger. Ex. 1004 ¶ 3. Figures 1–3 of Kang are reproduced below.





Figures 1 and 2 depict an exploded top and bottom perspective view, respectively, of a first embodiment of a heat exchanger, and Figure 3 depicts a section view of the heat exchanger of Figure 1. *Id.* ¶¶ 19, 21, 22. Kang's first embodiment includes cooling plate 10 having heat collection surface 11 for placing against an object to be cooled and opposing heat transfer surface 12. *Id.* ¶ 28. Heat transfer surface 12 includes an array of parallel microfins 14 upstanding from surface 12. *Id.*

Cover 20 fits over cooling plate 10 and includes inlet nipple 26, outlet nipple 28, and recesses 32, 38 for receiving flow distributor 40. *Id.* Inlet nipple 26 communicates with inlet port 27, and outlet nipple 28 communicates with outlet port 29. *Id.* When flow distributor 40 is received in the recesses of cover 20 and fitted over cooling plate 10, inlet section 31 and outlet section 33 are formed. *Id.* Flow distributor 40 includes parallel slots 44 (inlet channels) extending between inlet section 31 and outlet section 33. *Id.* ¶ 29. Flow distributor 40 further includes outlet channels 47 that separate a plurality of coplanar lands 46 spaced from heat transfer surface 12 by gaps 48. *Id.* Fluid travels downward through slots 44, through gaps 48, and through outlet channels 47. *Id.* ¶ 30.

Figure 4 of Kang is reproduced below.

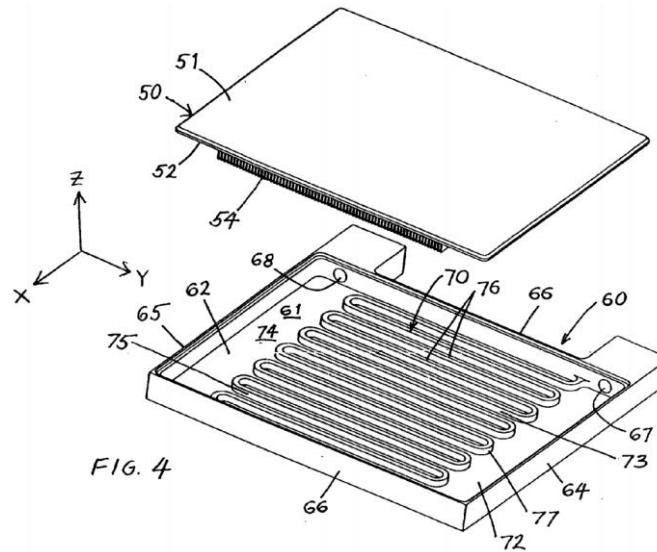


Figure 4 depicts a second embodiment of a heat exchanger. *Id.* ¶ 23. In the second embodiment, cooling plate 50 includes heat collection surface 51 and heat transfer surface 52 having a plurality of microfins 54. *Id.* ¶ 31. Cover 60 is fitted to cooling plate 50. *Id.* Serpentine wall 70 forms a flow distributor that is fixed to base 62 of cover 66, and defines inlet section 72 and outlet section 74. *Id.* ¶ 32. Inlet port 67 supplies inlet section 72, and outlet section 74 supplies outlet port 68. *Id.* Serpentine wall 70 forms inlet channels 73 and outlet channels 75. *Id.* The tips of microfins 54 directly contact the top of serpentine wall 70, forming gaps between heat transfer surface 52 and tops of wall sections 76 through which fluid may flow. *Id.* ¶ 33. Fluid enters inlet port 67 in the X-direction, enters inlet channels 73 in the Y-direction, passes through gaps 79 in the X-direction, moves through outlet channels 75 in the Y-direction, and exits outlet port 68 in the X-direction. *Id.*

2. Overview of Bonde

Bonde discloses a microchannel heat sink. Ex. 1005, Abstr. Figures 6 and 7 of Bonde are reproduced below.

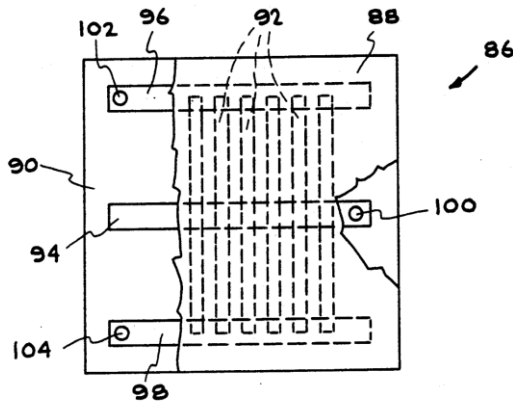


FIG. 6

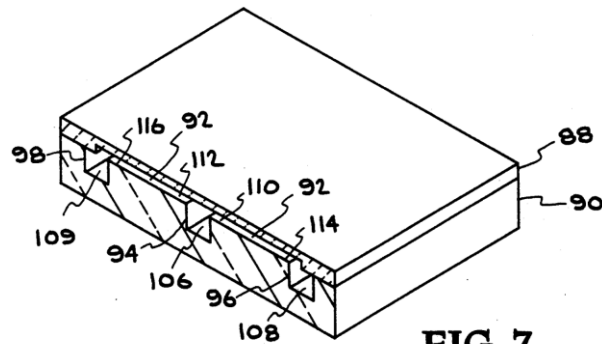


FIG. 7

Figure 6 depicts a top view of an exemplary microchannel heat sink “with the microchannel layer removed on both sides to reveal the inlet and outlet holes and manifolds,” and Figure 7 depicts a perspective, cross-sectional view of the exemplary heat sink of Figure 6. *Id.* at 4:20–25. Heat sink 86 includes microchannel layer 88 and manifold layer 90. *Id.* at 6:65–68. Microchannel layer 88 includes a plurality of microchannels 92. *Id.* at 6:68–7:1. Manifold layer 90 includes inlet groove 94, outlet grooves 96, 98, inlet hole 100 extending from a bottom side to inlet groove 94, outlet hole 102 extending from the bottom side to outlet groove 96, and outlet hole 104 extending from the bottom side to outlet groove 98. *Id.* at 7:7–23.

When microchannel layer 88 is bonded to manifold layer 90 as shown in Figure 7, inlet manifold 106 is formed by inlet groove 94 and a portion of microchannel layer 88, first outlet manifold 108 is formed by outlet groove 96 and portion of microchannel layer 88, and second outlet manifold 109 is formed by outlet groove 98 and a portion of microchannel layer 88. *Id.* at 7:24–34. In operation, coolant enters inlet hole 100 to inlet manifold 106,

which delivers coolant to inlet ends 110, 112 of microchannels 92. *Id.* at 7:44–47. Coolant flowing from first inlet end 110 exits from first outlet end 114 of microchannels 92, and coolant flowing from second inlet end 112 exits from second outlet end 116 of microchannels 92. *Id.* at 7:49–53. The coolant then flows into either outlet manifold 108, 109 and through either outlet hole 102, 104, respectively. *Id.* at 7:53–55.

3. Obviousness of claims 1–4, 6–8, 21, 24, and 26

In our Decision on Institution, we instituted trial for claims 1–4, 6–8, 21, 24, and 26 under 35 U.S.C. § 103(a) as obvious over Kang, with or without Bonde. *See* Dec. Inst. 29. After considering the evidence and arguments developed over the full course of this proceeding, we are not persuaded that Petitioner has sufficiently explained how Kang, with or without Bonde, renders obvious the subject matter of these claims.

Claim 1 recites that “a region of the inlet header is positioned adjacent a first side of the fins and a region of the outlet header is positioned adjacent the second side of the fins.” Ex. 1001, 8:15–18. Each of claims 2–4, 6–8, 21, 24, and 26 include this limitation as well, by virtue of their dependency from claim 1. With respect to this limitation, Petitioner’s initial position is that Kang’s “inlet section 31 is positioned adjacent a ‘first side’ of the microfins (the topside) and outlet section 33 is positioned adjacent a ‘second side’ of the microfins (the lateral side).” Pet. 16 (citing Ex. 1002 ¶¶ 132–33).

Patent Owner counters that “[e]ven if the distal ends of Kang’s fins could be considered as a ‘top side,’ . . . Kang’s inlet section 31 is not positioned adjacent those fins, but rather is spaced from those fins with an

intervening flow distributor 40 positioned between the inlet section 31 and the fins 14.” PO Resp. 7 (citing Ex. 1004, ¶¶28–29, Fig. 3).

Petitioner responds that “inlet section 31 and microfins 14 have a close position, and there is no intervening structure of the same kind (i.e., there [are] no other fins or headers) therebetween.” Pet. Reply 5. Petitioner also asserts that “Kang’s inlet section 31 and microfins 14 have [a] ‘similar functional relationship’ as inlet header 104 and fins 110 of the ’330 patent, and therefore, the term ‘adjacent’ as properly used applies to Kang’s device.” *Id.* (citing *Ex Parte Hadsel*, 109 USPQ at 510).

Although Petitioner asserts that Kang’s inlet section 31 and microfins 14 have a “close position” and have “no other fins or headers” therebetween (Pet. Reply 5), Petitioner has not asserted, nor provided explanation or evidence in support thereof, that Kang’s inlet section 31 is “next to” the top side of microfins 14 as required in accordance with our claim construction. Accordingly, Petitioner has failed to demonstrate by a preponderance of the evidence that Kang’s inlet section 31 is adjacent microfins 14 when the term “adjacent” is given its broadest reasonable interpretation of “next to.”

Petitioner alternatively points to Kang’s second embodiment illustrated in Figures 4 and 5 as teaching “an inlet section 72 and an outlet section 74 that are positioned on opposite sides of microfins 54.” Pet. 17 (citing Kang, Fig. 5; Ex. 1002 ¶¶ 135–37). According to the testimony of Petitioner’s expert, Dr. Tilton, Kang’s second embodiment illustrated in Figures 4 and 5 “has significant overlap with the structure and function of the heat exchanger shown in [F]igures 1–3.” Ex. 1002 ¶ 135. Also according to Dr. Tilton, features such as the inlet/outlet headers can be rearranged in a predictable manner, and “[t]he rearranged elements . . . *do not*

enhance the heat removal efficiency/performance of the microchannel heat exchanger in any way. The rearrangement is simply a matter of design choice.” Ex. 1002 ¶ 49.

More specifically, Petitioner states that “a person of ordinary skill in the art would be easily able to modify Kang’s device to place inlet section 31 on a lateral side of microfins 14 (i.e., in contact with the microfins) and have inlet openings 44 on the corresponding lateral side of flow distributor 40.” Pet. Reply 5 (citing Ex. 1002 ¶ 49). In other words, Petitioner appears to rely on Kang’s second embodiment to support the contention that placing an inlet section on a lateral side of the microfins (as opposed to opposite a topside of the microfins) was well-known, and such a modification to Kang’s first embodiment illustrated in Figures 1-3 would be a design choice.

Patent Owner argues that “Petitioner provides no articulated reasoning with any rational underpinning to conclude [why] one of ordinary skill in the art would have combined those distinct and very different embodiments in Kang to arrive at some undisclosed, third embodiment arranged according to claim 1 in the ’330 Patent.” PO Resp. 8.

The principle that a rearrangement of parts is a mere design choice finds its roots in *In re Japikse*, 181 F.2d 1019, 1023 (CCPA 1950). In *Japikse*, claims were held unpatentable because rearranging the position of a starting switch would not have modified the operation of the device. *Id.* Petitioner provides no evidence or persuasive technical reasoning that rearrangement of the inlet header so as to be next to a lateral side of Kang’s microfins (as opposed to opposite a topside of Kang’s microfins) would not have modified operation of the heat exchanger device. At most, Petitioner has provided conclusory expert testimony that rearrangement of the inlet

header in Kang so that it would satisfy the requirements of claim 1 would not “enhance” the heat removal efficiency/performance of Kang’s heat exchanger device. Ex. 1002 ¶ 49. However, Petitioner has provided no expert testimony as to whether or not rearrangement of the inlet header might otherwise modify (e.g., reduce) the heat removal efficiency/performance of the heat exchanger device.

When modifying Kang’s device to place inlet section 31 on a lateral side of microfins 14 (i.e., in contact with the microfins) and to place inlet openings 44 on the corresponding lateral side of flow distributor 40 (Pet. Reply 5), at least a portion of fluid is able to enter directly the microchannels formed by microfins 14 and, thus, bypass flow distributor 40. This is because inlet section 31 is placed next to a side of the fins that corresponds with the ends of the microchannels. Petitioner has not persuaded us that bypassing Kang’s flow distributor 40 would not modify the heat removal/efficiency performance of Kang’s heat exchanger device such that modified Kang would perform as equally well as the embodiment illustrated in Figures 1–3.⁴ Rather, we determine that bypassing flow distributor 40 would avoid “caus[ing] the fluid to change directions several times” (Ex. 1004 ¶ 30), which would affect mixing, which would, in turn, affect heat transfer (*id.* at Abstr.). Thus, we are not persuaded that modifying Kang’s

⁴ We note that when discussing the opposing outlet header (which is already asserted to be next to a lateral side of the microfins in Kang), Petitioner asserts that having fluid flow through the microchannels directly, as opposed to through the flow distributor as intended, would not matter because heat exchange happens in the microchannels. See Tr. 15:13–16:2. Although we do not disagree that heat exchange would take place in the microchannels even if fluid bypasses the flow distributor, we are not persuaded that this means that there would be no modification in the operation of the device.

embodiment of Figures 1–3 so as to place inlet section 31 on a lateral side of microfins 14 is a mere design choice that would not affect operation of the device.

For the foregoing reasons, we determine that Petitioner has not provided sufficient underlying reasoning or analysis to support a conclusion that it would have been obvious to modify Kang’s embodiment of Figures 1–3 in the manner proposed by the Petitioner as a matter of mere design choice. Accordingly, Petitioner has not established, by a preponderance of the evidence, that any of claims 1–4, 6–8, 21, 24, and 26 would have been obvious over Kang, with or without Bonde.⁵

C. Obviousness of Claims 12, 14, 15, 18–20, 22, 23, 25, 27, and 28 Over Kang and Bhatti

1. Overview of Bhatti

Bhatti discloses a microchannel heat sink. Ex. 1007, Abstr. Figures 2 and 3 of Bhatti are reproduced below.

⁵ We note that Petitioner has not relied on Bonde for teaching an inlet header adjacent a first side of the fins and an outlet header adjacent a second side of the fins. See, e.g., Pet. 16, 19, 20, 21 (Petitioner instead relying on Bonde for its teachings related to (i) a plurality of parallel microchannels, (ii) inlet and outlet openings from and into each of the plurality of microchannels, and (iii) providing fluid outlet openings from each microchannel that are positioned at opposite ends of the microchannels).

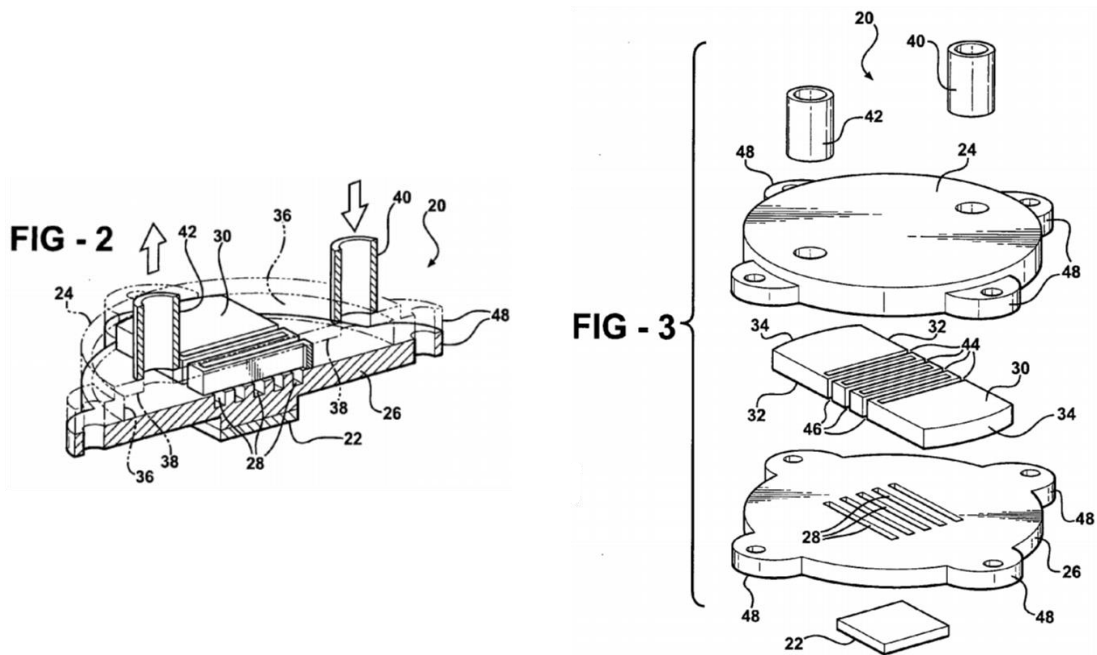


Figure 2 depicts a perspective view, partially cut away and in cross-section, of an exemplary heat sink, and Figure 3 depicts an exploded view of the heat sink of Figure 2. *Id.* ¶¶ 10–11. Heat sink 20 includes a housing comprised of lid 24, having inlet conduit 40 and outlet conduit 42 extending therein, and base 26 having parallel microchannels 28. *Id.* ¶¶ 16–17. Heat sink 20 further includes manifold plate 30 having inlet manifold channels 44 and outlet manifold channels 46 that extend transversely across microchannels 28 of base 26. *Id.* ¶¶ 17–18, 20. Edges 32 of manifold plate 30 are spaced from shoulder 36 of lid 24 to define an inlet plenum and an outlet plenum, respectively. *Id.* ¶ 17. Coolant flows from inlet conduit 40, into the inlet plenum, and into inlet manifold channels 44 where the flow is forced downward into microchannels 28. *Id.* Coolant is then re-directed up into outlet manifold channels 46 into the outlet plenum and out of outlet conduit 42. *Id.*

2. Obviousness of claims 12, 14, 15, 18–20, 22, 23, 25, 27, and 28

In our Decision on Institution, we also instituted trial for claims 12, 14, 15, 18–20, 22, 23, 25, 27, and 28 under 35 U.S.C. § 103(a) as obvious over Kang and Bhatti. *See* Dec. Inst. 29. After considering the evidence and arguments developed over the full course of this proceeding, we are not persuaded that Petitioner has sufficiently explained how Kang and Bhatti render obvious the subject matter of these claims.

Independent claim 12 recites an “inlet aperture [that] opens to an inlet header region positioned adjacent a first side of the plurality of juxtaposed fins and [an] outlet aperture [that] opens from an outlet header region positioned adjacent a second side of the plurality of juxtaposed fins opposite the first side.” Ex. 1001, 9:30–34. Independent claim 14 recites “an inlet and an outlet, wherein the inlet opens to an inlet header region juxtaposed with a first side of the plurality of juxtaposed fins, and wherein the outlet opens from an outlet header region juxtaposed with a second side of the plurality of juxtaposed fins, wherein the first side and the second side are positioned opposite relative to each other.” *Id.* at 9:56–62. Each of claims 15, 18–20, 22, 23, 25, 27, and 28 include one of these limitations as well, by virtue of their dependency from independent claim 12 or 14.

Petitioner’s expert acknowledges that Kang does not teach these limitations. Ex. 1002 ¶¶ 211, 238. Petitioner instead turns to Bhatti which teaches “an inlet plenum (defined between a shoulder 36 of the lid and the inlet edge 32 of manifold plate 30) (the ‘inlet header’)” and also teaches “an outlet plenum (defined between shoulder 36 and the outlet edge 32 of manifold plate 30) (the ‘outlet header’).” Pet. 42 (citing Ex. 1007, Figs. 1–2,

¶ 17); *see also id.* at 47, 50–51. Petitioner asserts that Bhatti’s inlet plenum “is positioned on one side of microchannels 28 and manifold plate 30, while the outlet plenum is positioned on the opposite side of the plate and microchannels.” *Id.* at 42. Petitioner’s expert asserts that “[t]he inlet plenum and the outlet plenum of the *Bhatti* device serve as the ‘inlet header’ and the ‘outlet header’” of claim 12 and “as the ‘inlet header region’ and the ‘outlet header region’” of claim 14. Ex. 1002 ¶¶ 212, 239.

Petitioner’s challenge is based on “develop[ing] a heat exchanger, as taught by *Kang*, and . . . provid[ing] microchannels and a housing arrangement as taught by *Bhatti*.” *Id.* ¶ 188. Petitioner asserts that a person of ordinary skill in the art “would have been motivated, with a reasonable expectation of success, to modify the system of *Kang* to add . . . header regions that are on ‘opposite’ sides of the microchannels.” Pet. 43–44 (citing Ex. 1002 ¶ 188). Petitioner additionally asserts that “placement of the header regions is simply a matter of design choice, and a person of ordinary skill would be easily able to modify the inlet and outlet regions of the *Kang* heat exchanger without undue experimentation.” *Id.* at 44. Petitioner provides expert testimony that “[a] person of ordinary skill in the art would have expected such a combination [of the structural elements of *Kang* and *Bhatti*] to . . . not alter the heat exchange functionality of the *Kang* device. Ex. 1002 ¶ 189.

Although Petitioner has pointed to certain teachings of *Kang* and certain teachings of *Bhatti*, Petitioner has not adequately explained specifically how *Kang* would be modified in view of *Bhatti*’s teachings. In particular, although Petitioner has asserted that a person of ordinary skill in the art would add header regions that are on opposite sides of the

microchannels (Pet. 43–44 (citing Ex. 1002 ¶ 188)), Petitioner has not clarified to which sides of the microchannels the headers would be added. It is unclear whether the header regions of modified Kang would be positioned on the sides of microfins 14 corresponding to the ends of the microchannels (i.e., outlet section 33 would remain on the same side of microfins 14 as illustrated in Figure 3 of Kang, with inlet section 31 placed on the opposing side) or whether the header regions of modified Kang would be positioned on the sides of microfins 14 that run parallel to the microchannels (i.e., inlet section 31 and outlet section 33 would be positioned relative to microfins 14 in the same way that Bhatti's inlet plenum and outlet plenum are positioned relative to microchannels 28).

Because Petitioner has not specified the orientation of the header regions to the microfins and microchannels in connection with its proposed modification of Kang, we determine that it is unclear if the rearrangement of the header regions proposed by Petitioner is merely a design choice that does not affect the heat removal efficiency/performance of the heat exchanger device. If the header regions of modified Kang are positioned on the sides of microfins 14 corresponding to the ends of the microchannels, at least a portion of fluid could directly enter the microchannels formed by microfins 14, and thus, bypass flow distributor 40 and affect operation of the device. Because the exact configuration of the inlet and outlet header regions in modified Kang has not been set forth with clarity in Petitioner's challenge, we are not persuaded that the proposed modification to the header regions is merely a design choice, as alleged by Petitioner, that would not affect operation of the device.

Similarly, although Petitioner has asserted that “a person of ordinary skill in the art would be easily able to modify Kang’s device to . . . have inlet openings 44 on the corresponding lateral side of flow distributor 40” and that Bhatti teaches this configuration (Pet. Reply 5 (citing Ex. 1002 ¶¶ 49, 212, 213; Ex. 1007, Figs. 1, 2); Tr. 38:13–21), Petitioner has not clarified the specific configuration and orientation of lateral side inlet openings in modified Kang. For example, it is unclear if Petitioner proposes to alter Kang to re-orient inlet channels 44 to extend from a first lateral side to an opposing second lateral side of flow distributor 40 (instead of extending from a top side to a bottom side) or to extend Kang’s inlet channels 44 to only one lateral side, and if so, whether modified inlet channels would extend from the top to bottom of the flow distributor on that one lateral side or only along a portion of the lateral side.

Because Petitioner has not specified the exact manner in which Kang’s flow distributor 40 would include inlet channels 44 on a lateral side of flow distributor 40 in connection with its proposed modification of Kang, we determine that it is unclear if the modification of inlet channels 44 proposed by Petitioner is merely a design choice that does not affect the heat removal efficiency/performance of the heat exchanger device. If inlet channels 44 extend from a first lateral side to an opposing second lateral side, at least a portion of fluid would be able to bypass the microchannels and, thus, affect operation of the device. Because the exact configuration of inlet channels 44 in modified Kang has not been set forth with clarity in Petitioner’s challenge, we are not persuaded that the proposed modification to inlet channels 44 is merely a design choice, as alleged by Petitioner, that would not affect operation of the device.

For the foregoing reasons, we determine that Petitioner has not provided sufficient detail in its challenge to support a conclusion that modifying Kang in light of the teachings of Bhatti would be a mere design choice that would not modify the heat exchange functionality of the device.

Accordingly, Petitioner has not established, by a preponderance of the evidence, that any of claims 12, 14, 15, 18–20, 22, 23, 25, 27, and 28 would have been obvious over Kang and Bhatti.

III. CONCLUSION

Taking account of the arguments and evidence presented during the trial, we determine that Petitioner does not establish by a preponderance of the evidence that claims 1–4, 6–8, 21, 24, and 26 of the '330 patent are unpatentable under 35 U.S.C. § 103(a) as obvious over Kang, with or without Bonde. We also determine that Petitioner does not establish by a preponderance of the evidence that claims 12, 14, 15, 18–20, 22, 23, 25, 27, and 28 of the '330 patent are unpatentable under 35 U.S.C. § 103(a) as obvious over Kang and Bhatti.

IV. ORDER

For the reasons given, it is

ORDERED that claims 1–4, 6–8, 12, 14, 15, and 18–28 of the '330 patent have not been established by a preponderance of the evidence as unpatentable; and

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

IPR2015-01276
Patent 8,746,330 B2

FOR PETITIONER:

Eric P. Raciti
Arpita Bhattacharyya
FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER, LLP
eric.raciti@finnegan.com
arpita.bhattacharyya@finnegan.com
Asetek-IPR-Service@finnegan.com

FOR PATENT OWNER:

Lloyd L. Pollard II
Bradley M. Ganz
GANZ POLLARD LLC
lloyd@ganzlaw.com
brad@ganzlaw.com
mail@ganzlaw.com