

**United States Court of Appeals
for the Federal Circuit**

KAMSTRUP A/S,
Appellant

v.

AXIOMA METERING UAB,
Appellee

2021-1923

Appeal from the United States Patent and Trademark Office, Patent Trial and Appeal Board in No. IPR2019-01640.

Decided: August 12, 2022

MARK JOHNSON, Renner Otto, Cleveland, OH, for appellant. Also represented by SARAH LOUISE BOONE, KYLE BRADFORD FLEMING.

DAVID W. ALDRICH, Forge IP, PLLC, Shelton, CT, for appellee. Also represented by TODD M. OBERDICK.

Before REYNA, MAYER, and CUNNINGHAM, *Circuit Judges*.
REYNA, *Circuit Judge*.

Kamstrup A/S appeals a final written decision of the Patent Trial and Appeal Board. The Board found claims 1–15 of Kamstrup’s U.S. Patent No. 8,806,957 unpatentable as obvious or anticipated. On appeal, Kamstrup challenges the Board’s claim constructions. In addition, Kamstrup challenges the Board’s anticipation and obviousness determinations largely on the basis that the Board erred in rejecting Kamstrup’s claim construction arguments. We affirm.

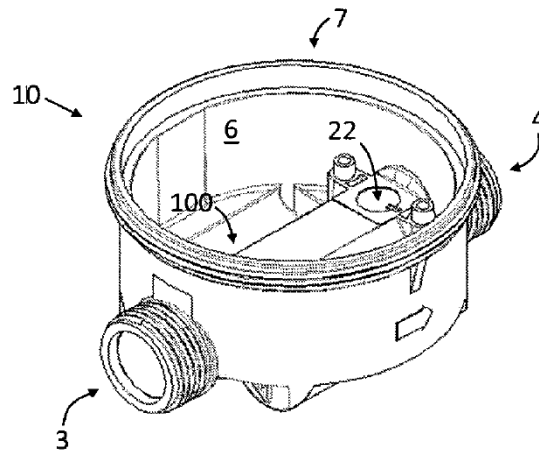
BACKGROUND

The ’957 Patent

Kamstrup owns U.S. Patent No. 8,806,957 (the “’957 patent”). The ’957 patent describes ultrasonic flow meters and housings. ’957 patent abstract. The specification discloses that the meters are used for “calculating a consumed quantity of water, heat, cooling, gas or the like.” *Id.* at 1:27–30. Ultrasonic flow meters include “housing” to protect electronic components, such as a display or battery. *Id.* at 1:32–38.

The ’957 patent is directed to “an ultrasonic flow meter housing in the form of a monolithic polymer structure being cast in one piece.” *Id.* at 1:58–60. It explains that “the present invention can be fabricated with a reduced number of steps compared to existing meters, since only a single step

is used to form the monolithic polymer structure.” *Id.* at 2:6–9. Figure 1A shows an embodying flow meter housing:



Independent claim 1 states:

An ultrasonic flow meter housing comprising:

a monolithic polymer structure *being cast in one piece, the monolithic structure includes a flow tube and a cavity separated from the flow tube*, wherein the flow tube defines a through-going straight flow section arranged for passage of a fluid between an inlet and an outlet, wherein a part of a wall of the flow section is part of an inside surface of the cavity, *so that the flow section and the cavity has a shared wall area*; and

wherein the cavity is arranged for housing at least one ultrasonic transducer, at the shared wall area; and

a measurement circuit operationally connected to the at least one ultrasonic transducer so as to allow measurement of a flow rate of the fluid.

Id. at 6:40–55 (emphasis added).

Inter Partes Review

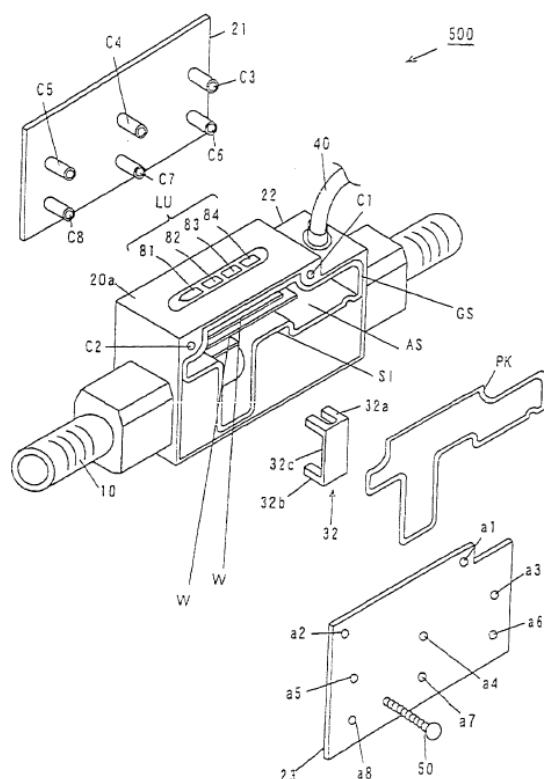
On September 23, 2019, Axioma petitioned for inter partes review of all 15 claims of the '957 patent. The Patent Trial and Appeal Board instituted review. In its final written decision, the Board found the challenged claims unpatentable as obvious or anticipated. *Axioma Metering UAB v. Kamstrup A/S*, No. IPR2019-01640, 2021 WL 1235790 (P.T.A.B. Apr. 1, 2021).

In reaching its final written determination, the Board construed elements of the claims. In particular, it construed “cast in one piece” as a product-by-process claim element. *Id.* at *5–9. The Board explained that the claim language describes the process of “casting” the polymer housing and does not describe the housing’s structure. *Id.* at *6. After construing the claim element, the Board concluded that it does not impart patentable weight to the claims and thus should not be considered as part of any anticipation or obviousness analysis. *Id.* at *5–9. The Board explained that Kamstrup did not present any evidence showing that the claim element provided structural and functional differences distinguishing it from the prior art. *Id.* (citing *Greenliant Sys., Inc. v. Xicor LLC*, 692 F.3d 1261, 1268 (Fed. Cir. 2012)). Thus, it concluded that the claim element was not entitled to patentable weight. *Id.*

The Board also construed the phrase “cavity separated from the flow tube” to require that the interior of the flow tube is separated from the surrounding cavity by the shared wall. *Id.* at *9–10. In doing so, the Board rejected Kamstrup’s argument that the cavity cannot surround the flow tube. *Id.* The Board explained that Kamstrup’s proposed construction was at odds with the claim language, which merely requires that “the flow tube cannot be so separated from the cavity that no part of the flow section shares a wall with the cavity.” *Id.* at *10. The Board also pointed to similar disclosure in the specification. *Id.*

Based on its construction of the above terms, the Board found that European Patent Application EP 1 482 284 A1 (“Ueki”) anticipates independent claims 1 and 11 and dependent claims 2, 5, 7, 9, 12, and 13 of the ’957 patent. *Id.* at *20.

Ueki is titled “Flow sensor” and “relates to a flow sensor for detecting the flow quantity of a fluid.” Ueki ¶ 1. Figure 11 “is an exploded perspective view of the detection section of the flow sensor.” *Id.* at ¶ 86.



Id. at Fig. 11.

The detection section (500) includes casing members (21, 22, and 23) and a through water pipe line (10). *Id.* at ¶ 87. Ueki further discloses that the water pipe line is “formed integrally” with casing member 22. *Id.*

The Board explained that the parties' dispute concerning Ueki centered on the "cast in one piece" and "cavity separated from the flow tube" claim elements of claims 1 and 11. *Axioma*, 2021 WL 1235790, at *13. The Board rejected Kamstrup's argument that Ueki did not disclose the "cast in one piece" claim element. *Id.* The Board explained that because "cast in one piece" is a product-by-process claim element that does not impart patentable weight to the claims, it cannot be considered as part of the anticipation/obviousness analysis. *Id.*

Next, the Board explained that Ueki disclosed the "cavity separated from flow tube" limitation. *Id.* at *14. Specifically, the Board explained that Kamstrup's arguments were conditioned on its rejected claim construction that the limitation precluded the cavity surrounding the flow tube. *Id.* The Board found the limitation disclosed because Ueki's through water pipe line runs through a circuit/sensor housing area and is separated from the circuit/sensor housing area by the outer surface of the through water pipe line. *Id.* Finally, the Board found that Ueki disclosed the remaining limitations of claims 1 and 11. *Id.* at *14–15.

The Board also relied on Ueki as the primary reference to find the remaining claims obvious. Relevant here is the Board's finding that U.S. Patent Nos. 6,248,077 ("Elson") and/or 4,476,877 ("Barker") in combination with Ueki rendered claims 6 and 8 obvious.¹

¹ Claim 6 recites: "The flow meter housing according to claim 1, wherein the flow section has one or more *protrusions or indentions* at the inside of the flow section serving to engage with an associated *measurement tube element* or an ultrasonic reflector arrangement." '957 patent at 7:3–7 (emphasis added). Claim 8 recites: "The flow meter housing according claim 1, further comprising a metal pocket cast into the flow tube." *Id.* at 7:11–12.

Elson is titled “System for Sensing a Characteristic of Fluid Flowing to or from a Body.” The system includes a conduit with two ends and a flow passage between them. Elson 1:63–67. Elson’s system includes a probe for sensing a desired characteristic, such as temperature or pressure or characteristics that can be determined by an optical scan. *Id.* at 1:56–2:2.

Barker is titled “Fluid Temperature Sensor.” Barker’s system has a flow-through housing. Barker 1:52–55. The system also has a through lumen for conducting fluid. *Id.* at 1:64–66. Further, an enclosure projects transversely into the lumen. *Id.* at 1:66–68. A sensor may be installed in the enclosure to measure temperature. *Id.* at 2:2–5.

The Board made an initial finding that Elson and Barker were analogous art to the ’957 patent, rejecting Kamstrup’s argument to the contrary. *Axioma*, 2021 WL 1235790, at *19. The Board explained that they were at least in the same field of endeavor as the ’957 patent because they were directed to fluid flow and fluid flow characteristics. *Id.* Additionally, the Board found that Elson and/or Barker disclosed the claim scope introduced in claims 6 and 8. *Id.* at *16–19.

Kamstrup argued that Elson and Barker did not disclose the “measurement tube element” of claim 6 because the limitation was restricted to elements measuring flow, whereas Elson and Barker disclosed other types of sensors. *Id.* at *17–18. The Board rejected this argument, explaining that the ’957 patent did not limit the measurement tube element to a particular type of sensor. *Id.*

Kamstrup also argued that Elson and Barker did not disclose the protrusions or indentions that claim 6 requires. *Id.* at *18. Kamstrup argued that the protrusions or indentions must be on or part of the flow section wall and integral with the wall’s inside surface. *Id.*

The Board disagreed, explaining that—according to the plain language of claim 6—the limitations are satisfied if the protrusions or indentions are within the bounds of the flow section and can engage with the measurement tube element. *Id.* The Board found that Elson discloses a receiver (a protrusion) attached to a tube section (a flow tube). *Id.* The Board also explained that the receiver is located inside the tube section and accommodates a probe (a measurement tube element). *Id.*

Finally, the Board found that a person of ordinary skill in the art would have been motivated to modify Ueki with Elson and/or Barker. *Id.* at *19. Specifically, the Board credited Axioma’s expert testimony that it was common to measure temperature when measuring flow. *Id.*

Kamstrup appealed the Board’s claim constructions and patentability determinations. We have jurisdiction under 28 U.S.C. § 1295(a)(4)(A).

STANDARD OF REVIEW

We review the Board’s legal conclusions de novo and its factual findings for substantial evidence. *See ACCO Brands Corp. v. Fellowes, Inc.*, 813 F.3d 1361, 1365 (Fed. Cir. 2016). Substantial evidence is “such relevant evidence as a reasonable mind might accept as adequate to support a conclusion.” *In re Gartside*, 203 F.3d 1305, 1312 (Fed. Cir. 2000) (citations omitted).

Claim construction is ultimately a question of law that may be based on underlying factual findings. *Teva Pharms. U.S.A., Inc. v. Sandoz, Inc.*, 574 U.S. 318, 332–33 (2015). Thus, we review the Board’s claim constructions de novo and review any underlying factual determinations for substantial evidence. *Wasica Fin. GmbH v. Cont’l Auto. Sys., Inc.*, 853 F.3d 1272, 1278 (Fed. Cir. 2017).

Anticipation is a question of fact that we review for substantial evidence. *Blue Calypso, LLC v. Groupon, Inc.*, 815 F.3d 1331, 1341 (Fed. Cir. 2016). The Board’s ultimate

obviousness determination is a legal conclusion reviewed de novo. See *In re Cuozzo Speed Techs., LLC*, 793 F.3d 1268, 1280 (Fed. Cir. 2015). The Board’s factual findings underlying its obviousness determination are reviewed for substantial evidence. *Id.* (citing *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966)).

DISCUSSION

Product-by-Process

Kamstrup argues that the Board erred in construing “cast in one piece” as a product-by-process claim element. A product-by-process claim is one in which a product is claimed, at least in part, by the “process by which it is made.” *In re Thorpe*, 777 F.2d 695, 697 (Fed. Cir. 1985).

Product-by-process claims “enable an applicant to claim an otherwise patentable product that resists definition by other than the process by which it is made.” *Id.* “In determining validity of a product-by-process claim, the focus is on the product and not the process of making it. That is because of the . . . long-standing rule that an old product is not patentable even if it is made by a new process.” *Greenliant Sys.*, 692 F.3d at 1268 (citations omitted).

“As we recognized in *Amgen*, if the process by which a product is made imparts ‘structural and functional differences’ distinguishing the claimed product from the prior art, then those differences ‘are relevant as evidence of no anticipation’ although they ‘are not explicitly part of the claim.’” *Id.* (quoting *Amgen Inc. v. F. Hoffman-La Roche Ltd.*, 580 F.3d 1340, 1365–67 (Fed. Cir. 2009)). The specification, the prosecution history, and any extrinsic evidence may enlighten whether structural and functional differences exist. *Amgen*, 580 F.3d at 1365–67; *Purdue Pharma L.P. v. Epic Pharma, LLC*, 811 F.3d 1345, 1353–54 (Fed. Cir. 2016).

For example, in *Amgen*, we determined that a district court correctly granted JMOL that a prior art reference did

not anticipate a product-by-process claim. 580 F.3d at 1365–67. The claim was directed to a chemical compound “purified from mammalian cells grown in culture.” *Id.* The prior art, however, was a similar chemical compound but purified from urine. *Id.*

We held that the district court correctly found no anticipation because the evidence showed that the chemical compound “purified from mammalian cells grown in culture” had different structural and functional differences from the prior art. *Id.* at 1367. The district court correctly considered that “the specification and prosecution history of the [] patent . . . refer to studies indicating that [the claimed chemical compound] had a higher molecular weight and different charge than [the prior art] due to differences in carbohydrate composition.” *Id.* The district court also properly considered an expert declaration in the prosecution history and trial expert testimony that similarly evidenced the structural and functional differences between the claimed product and prior art. *Id.*; *see also Purdue Pharma*, 811 F.3d at 1353–54 (finding that the district court did not err in disregarding a product-by-process limitation for an obviousness determination where the specification and the patentee’s expert testimony evidenced that the process “imparts no structural or functional differences in the [claimed product] as compared to the prior art products”); *Greenliant Sys.*, 692 F.3d at 1271 (“[The patentee’s] arguments clearly and unmistakably represented to the examiner and the Board that [the process] . . . imparted the distinct structural characteristics upon [the patentee’s] claimed [product].”).

Turning to this case, the first question is whether the Board correctly determined that “cast in one piece” is a product-by-process claim element. Here, the claim language confirms that it is. *See Amgen*, 580 F.3d at 1367 (“[B]y its plain terms, claim 1 of the [] patent claims a product with a [process] limitation.”). The claim describes “a monolithic polymer structure being cast in one piece.” ’957

patent at 6:40–42. On its face, the claim element claims a process because it describes the structure “being” cast in a particular way. See *Greenliant Sys.*, 692 F.3d at 1264–65 (product-by-process claim elements recited a product “being formed” a certain way).

Kamstrup argues that “[t]he mere mention of a process in a claim limitation does not automatically convert that limitation into a process limitation.” Appellant’s Br. 31. While that may be true, Kamstrup does not explain why we should disregard the fact that the claims recite a process here. Nor does Kamstrup point to disclosure in the specification that describes structure for the term. Instead, Kamstrup relies on disclosure discussing the fabrication process for the device—further support that this is a product-by-process claim element. *Id.* at 21–23 (quoting ’957 patent at 2:6–15) (emphasis added) (The “flow meter . . . can be fabricated with a reduced number of steps compared to existing meters, since only a single step is used to form the monolithic polymer structure [A] flow meter housing which has a straight flow section separated from a cavity in a manner where a part of the wall of the flow section is part of the inside of the cavity [] can . . . be cast in a single step . . .”). We therefore conclude that the Board did not err in finding that “cast in one piece” is a product-by-process claim element.

The second question is whether the product-by-process claim element imparts patentable weight to the claims. *Greenliant Sys.*, 692 F.3d at 1268. We conclude that it does not.

Kamstrup argues that the Board erred in finding that there are no functional or structural differences between polymer structures cast in a single mold versus multiple molds. Appellant’s Br. 32–34. Kamstrup states that “various structures . . . cannot be cast in a single **mold** using conventional die cast injection molding technologies.” *Id.* at 34 (emphasis added); Reply 24–26.

First, even if true, Kamstrup has not identified functional and structural differences between a structure “cast in one piece” and a structure manufactured using another method. Rather, the argument is merely that the claim element describes a manufacturing method with some inherent restrictions. Further, Kamstrup has not identified disclosure in the specification or prosecution history or extrinsic evidence evidencing structural and functional differences.

Second, the alleged structural and functional difference that Kamstrup identifies is detached from the claims. The claims state that the structure should be “cast in *one piece*,” not cast in *one mold*. ’957 patent at 6:40–42 (emphasis added). The Board correctly found that the written description “focuses on reducing the number of steps required to fabricate the flow meter housing, not on casting in a single mold.” *Axioma*, 2021 WL 1235790, at *7 (citing ’957 patent at 1:55–57, 2:6–9). While certain figures of the written description, namely Figures 5A and 5B, depict a single mold, the Board correctly found that those embodiments are narrower than the claims—which do not require use of a single mold—and correctly declined to import narrower limitations from the specification to the claims. *Id.* Substantial evidence also supports the Board’s finding that the extrinsic evidence does not exclusively show that “cast in one piece” means “cast in one mold.” *Id.* at *8.

Consequently, we hold that because Kamstrup fails to show that the process claimed imparts “structural and functional differences” distinguished from the prior art, it is not entitled patentable weight. *Greenliant Sys.*, 692 F.3d at 1268.

Other Claim Elements

Kamstrup argues that the Board erred in construing “cavity separated from the flow tube.” In particular, Kamstrup argues that this term means that the cavity cannot surround the flow tube.

Kamstrup has three main arguments for this term. First, Kamstrup argues that the plain meaning of “separated from” does not encompass “surrounding.” Appellant’s Br. 17–18; Reply 1–2. Second, Kamstrup argues that no embodiment discloses the cavity completely surrounding the flow tube. Appellant’s Br. 19; Reply 11–16. Finally, Kamstrup argues that the claim limitation would not be enabled if it included a cavity that surrounds the flow tube. Appellant’s Br. 19–20; Reply 8.

Kamstrup’s proposed construction reads in a negative limitation that is at odds with the claim language. The claims state that the flow section, defined by the flow tube, and the cavity “ha[ve] a shared wall area.” ’957 patent at 6:48–49. We see nothing in the claim language that prohibits the cavity from surrounding the flow tube.

The specification also does not otherwise limit the claim language, even if no embodiment discloses the cavity completely surrounding the flow tube. We reject Kamstrup’s argument because it reads in a limitation from non-limiting embodiments. *See Phillips v. AWH Corp.*, 415 F.3d 1303, 1323 (Fed. Cir. 2005) (en banc) (“[A]lthough the specification often describes very specific embodiments of the invention, we have repeatedly warned against confining the claims to those embodiments.”).

Finally, we disagree with Kamstrup that the claim construction is incorrect because a design where the cavity surrounds the flow tube would require the flow tube to be manufactured separately from the housing. This is irrelevant because it assumes that the claims require the housing “being cast in one piece.” As discussed above, this claim

element does not impart patentable weight and is therefore not a basis for limiting “cavity separated from the flow tube.” Thus, we find that the Board did not err in construing “cavity separated from the flow tube.”

Kamstrup argues that the Board erred in rejecting two proposed constructions concerning claim 6. Both arguments fail for reasons similar to those discussed above.

First, Kamstrup asserts that the protrusions and indentions of claim 6 must be integral with the flow section and made of polymer. Appellant’s Br. 45; Reply 32–35. This construction is incorrect because dependent claim 6 states that the “flow section *has* one or more protrusions or indentions at the inside of the flow section.” ’957 patent at 7:3–7 (emphasis added). It does not require Kamstrup’s additional limitation that they be made of the polymer.

Kamstrup has not identified disclosure that supports its proposed limitation. Kamstrup does point to the specification that states that the “housing may be provided with one or more protrusions or indentions.” Reply 34 (quoting ’957 patent at 5:24–30). But, this does not state that the housing “must be” formed with the claimed monolithic polymer structure. *Id.*; see also Appellant’s Br. 45.

Second, Kamstrup argues that the “measurement tube element” of claim 6 must be an ultrasonic measurement element and cannot be a temperature sensor. Appellant’s Br. 46–49; Reply 32 n.80. Again, we reject Kamstrup’s argument because it limits the claim to a non-limiting embodiment that describes ultrasonic reflectors. In fact, the specification does disclose implementing temperature sensors into the flow meter. See ’957 patent at 5:38–46. In addition, the claim language itself distinguishes the “measurement tube element” and the “ultrasonic reflector arrangement.” ’957 patent at 7:3–7 (“[The] protrusions or indentions . . . serv[e] to engage with an associated measurement tube element or an ultrasonic reflector

arrangement.”). This indicates that the claim covers different measurement devices and is not limited to one or more ultrasonic reflectors as Kamstrup argues. We therefore find that the Board did not err in its claim construction concerning claim 6.

Patentability

We next review whether the Board erred in its determination that the claims are anticipated or obvious. First, we address Kamstrup’s threshold argument that the Board erred in determining that Elson and Barker are analogous art because they relate to “medical devices for thermodilution.” Appellant’s Br. IV(C)(2). In support, Kamstrup cites disclosure in the ’957 patent explaining that it relates to ultrasonic flow meter housing. *Id.* at 40–41.

The Board determined that Elson and Barker are analogous art because they are directed to sensing or measuring fluid flow and fluid flow characteristics such as temperature. *Axioma*, 2021 WL 1235790, at *19. As discussed, the ’957 patent is directed to flow meters that include different types of sensors. *See generally* ’957 patent at 1:25–57, 2:51–58, 5:38–46. Elson discloses a “system for sensing a characteristic of fluid flowing” and includes a probe for sensing a desired characteristic, such as temperature. Elson abstract, 1:56–2:2. Barker is directed to a fluid temperature sensor, having a through lumen for conducting fluid. Barker abstract, 1:64–66. Thus, substantial evidence supports the Board’s determination that Elson and Barker are analogous art because they are at least in the same field of endeavor as the ’957 patent. *See In re Bigio*, 381 F.3d 1320, 1325 (Fed. Cir. 2004) (citation omitted) (“The identification of analogous prior art is a factual question.”).

Kamstrup’s remaining challenges to the Board’s patentability determinations rise and fall with Kamstrup’s proposed claim constructions. Specifically, Kamstrup asserts that the Board’s erroneous claim constructions

caused the Board to find incorrectly that the references disclosed the disputed claim elements.² We conclude that Kamstrup’s patentability challenges necessarily fail as they rely on the court accepting its proposed claim constructions.

As discussed above, after properly construing the claims, the Board found claims 1, 2, 5, 7, 9, and 11–13 anticipated by Ueki because it disclosed every limitation. The Board properly rejected Kamstrup’s arguments that Ueki did not disclose certain limitations as Kamstrup’s arguments were premised on its incorrect claim constructions. Thus, we hold that the Board’s decision that Ueki anticipates those claims is supported by substantial evidence.

The Board also found claims 3, 4, 6, 8, 10, 14, and 15 obvious over Ueki and various secondary references. The Board found that a person of ordinary skill in the art would have been motivated to modify the references, crediting Ax- ioma’s expert testimony. Again, the Board correctly re- jected Kamstrup’s arguments that are conditioned on incorrect claim constructions. Kamstrup does not further challenge, and we therefore do not consider, whether the

² See, e.g., Appellant’s Br. 35–36 (asserting that Ueki does not disclose the limitation of a “cavity separated from the flow tube” because Ueki’s cavity “completely sur- rounds” its flow tube section); *id.* at 37–38 (arguing that Ueki does not disclose the “being cast in one piece” claim element); *id.* at 44–46 (asserting that Elson and Barker do not disclose the “protrusions or indentions” of claim 6 be- cause Elson’s and Barker’s protrusions or indentions are not integral with the flow section and made of polymer); *id.* at 46–49 (stating that Elson and Barker do not render claim 6 obvious because it requires a “measurement tube element” and the references only disclose temperature sen- sors); *id.* 49–50 (“[The Board’s] conclusion[s] [are] premised on the erroneous claim constructions . . .”).

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Board correctly identified the references or found a motivation to combine.

CONCLUSION

For the foregoing reasons, we affirm the Board's final written decision. We have considered Kamstrup's remaining arguments and find them unpersuasive.

AFFIRMED

COSTS

No costs.