

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

AXIOMA METERING UAB,
Petitioner,

v.

KAMSTRUP A/S,
Patent Owner.

IPR2019-01640
Patent 8,806,957 B2

Before MICHELLE N. ANKENBRAND, SCOTT B. HOWARD, and
AARON W. MOORE, *Administrative Patent Judges*.

ANKENBRAND, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

This is a Final Written Decision in an *inter partes* review challenging the patentability of claims 1–15 (collectively, the “challenged claims”) of U.S. Patent No. 8,806,957 B2 (“the ’957 patent,” Ex. 1001). We have jurisdiction under 35 U.S.C. § 6. We issue this Final Written Decision under

35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons that follow, we determine that Petitioner demonstrates, by a preponderance of the evidence, that the challenged claims are unpatentable.

A. Procedural History

Axioma Metering UAB (“Petitioner”) filed a Petition (Paper 1, “Pet.”) requesting an *inter partes* review under 35 U.S.C. § 311. Kamstrup A/S (“Patent Owner”) filed a Preliminary Response. Paper 6 (“Prelim. Resp.”). On April 8, 2020, we instituted an *inter partes* review of the challenged claims. Paper 10 (“Institution Decision” or “DI”).

Following institution, Patent Owner filed a Response (Paper 14, “Resp.”), Petitioner filed a Reply (Paper 18, “Reply”), and Patent Owner filed a Sur-reply (Paper 23, “Sur-reply”).

Petitioner relies on the Declaration of Michael C. Johnson, Ph.D., P.E. (Ex. 1021), and submitted a Supplemental Declaration (Ex. 1035) from Dr. Johnson with its Reply. Patent Owner took cross-examination testimony of Dr. Johnson via deposition and filed the transcripts (Ex. 2021; Ex. 2024).

Patent Owner relies on the Expert Declarations of Darran Robert Cairns, Ph.D. (Ex. 2002; Ex. 2010) and the Expert Declarations of Steven Barfuss (Ex. 2004; Ex. 2011) in its Response. Petitioner took cross-examination testimony of Dr. Cairns and Steven Barfuss via deposition and filed the transcripts (Ex. 1026; Ex. 1027; Ex. 1028; Ex. 1029).

We heard oral argument on January 5, 2021, and the record includes a transcript of the argument. Paper 31 (“Tr.”).

B. Related Matters

The parties identify the following district court proceeding related to the ’957 patent: *Kamstrup A/S v. Axioma Metering UAB*, No. 1:19-cv-01669-WJM-SKC (D. Colo. June 10, 2019). Pet. vii; Paper 4, 1.

C. The '957 Patent

The '957 patent, titled “Ultrasonic Flow Meter Housing Formed by a Monolithic Polymer Structure,” issued on August 19, 2014. Ex. 1001, at [45], [54]. The '957 patent matured from a U.S. National Phase Application of PCT International Application Number PCT/DK2010/050339 (the “PCT application”). *Id.* at 1:8–12. The PCT application claims priority to European Patent Application No. 09179317.4 (the “European patent application”). *Id.* at 1:12–14.

The '957 patent relates to an ultrasonic flow meter housing and an ultrasonic flow meter comprising a housing that can be produced and assembled in fewer steps. *Id.* at 1:20–23, 1:55–57. The written description explains that ultrasonic consumption meters for calculating a consumed quantity of water, heat, cooling, gas or the like typically have a metal flow passage and a housing with a cavity around the flow passage. *Id.* at 1:27–32. The housing protects electronic components. *Id.* at 1:30–38. Fabricating these ultrasonic flow meters typically requires multiple production steps. *Id.* at 1:39–51. The '957 patent purportedly reduces the number of production steps and the production cost by providing a monolithic polymer housing structure that may be cast in one piece. *Id.* at 1:39–42, 1:55–60. The monolithic polymer housing structure includes a straight flow tube separated from a cavity such that the straight flow tube and the cavity share a wall. *Id.* at 1:58–67, 2:1–15. According to the written description, this particular housing structure enables the flow meter housing to be cast in a single step. *Id.* at 2:6–15.

D. Illustrative Claim

Of the challenged claims, claims 1 and 11 are independent. Claim 1 is illustrative of the claimed subject matter and recites:

1. An ultrasonic flow meter housing comprising:
 - (a) 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
 - (b) wherein the cavity is arranged for housing
 - (i) at least one ultrasonic transducer, at the shared wall area; and
 - (ii) a measurement circuit operationally connected to the at least one ultrasonic transducer so as to allow measurement of a flow rate of the fluid.

Ex. 1001, 6:41–55.

E. The Instituted Grounds of Patentability

We instituted an *inter partes* review of the challenged claims on the following grounds of unpatentability:

| Claim(s) Challenged | 35 U.S.C. §¹ | Reference(s) |
|--------------------------------|--------------------------------|---------------------|
| 1–5, 7, 9–13 | 102(b) | Will ² |

¹ Because the claims at issue have an effective filing date before March 16, 2013, the effective date of the applicable provisions of the Leahy Smith America Invents Act, Pub. L. No. 112–29, 125 Stat. 284 (2011) (“AIA”), we apply the pre-AIA version of 35 U.S.C. §§ 102 and 103 in this decision.

² WO 2009/129885 A1, published Oct. 29, 2009 (Ex. 1002). In this decision, we rely on the certified English translation of Will that Petitioner provides as Exhibit 1003.

| Claim(s) Challenged | 35 U.S.C. §¹ | Reference(s) |
|--------------------------------|--------------------------------|-------------------------------------------------------------------------------------------------|
| 1–5, 7, 9–13 | 103(a) | Will, Hiss, ³ Ueki, ⁴ Buckberry, ⁵ and/or Bignell ⁶ |
| 6, 8 | 103(a) | Will, Elson, ⁷ and/or Barker ⁸ |
| 14 | 103(a) | Will, Drachmann ⁹ |
| 15 | 103(a) | Will, Drachmann, and/or Goertz ¹⁰ |
| 1–5, 7, 9, 11–13 | 102(b) | Hiss |
| 6 | 103(a) | Hiss, Buckberry |
| 6, 8 | 103(a) | Hiss, Elson and/or Barker |
| 10 | 103(a) | Hiss, Will, and/or Buckberry |
| 14 | 103(a) | Hiss, Drachmann |
| 15 | 103(a) | Hiss, Drachmann, and/or Goertz |
| 1–2, 5, 7, 9, 11–13 | 102(b) | Ueki |
| 3, 4 | 103(a) | Ueki, with or without Will |
| 6, 8 | 103(a) | Ueki, Elson and/or Barker |
| 10 | 103(a) | Ueki, Will and/or Buckberry |
| 14 | 103(a) | Ueki, Drachmann |
| 15 | 103(a) | Ueki, Drachmann and/or Goertz |
| 1–7, 9–13, 15 | 102(b) | Buckberry |
| 8 | 103(a) | Buckberry, Elson and/or Barker |
| 14 | 103(a) | Buckberry, Drachmann |

³ DE 100 51 534 A1, published Apr. 25, 2002 (Ex. 1004). In this decision, we rely on the certified English translation of Hiss that Petitioner provides as Exhibit 1005.

⁴ EP 1 482 284 A1, published Dec. 1, 2004 (Ex. 1006).

⁵ WO 2008/053193 A1, published May 8, 2008 (Ex. 1007).

⁶ WO 94/20822, published Sept. 15, 2004 (Ex. 1008).

⁷ US 6,248,077 B1, issued June 19, 2001 (Ex. 1012).

⁸ US 4,476,877, issued Oct. 16, 1984 (Ex. 1013).

⁹ EP 2 083 250 A1, published July 29, 2009 (Ex. 1009).

¹⁰ EP 0 972 171 B1, issued Oct. 29, 2003 (Ex. 1010). In this decision, we rely on the certified English translation of Goertz that Petitioner provides as Exhibit 1011.

II. ANALYSIS

A. Legal Standards

To prevail in its challenge, Petitioner must demonstrate by a preponderance of the evidence that the claims are unpatentable. 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d) (2019). To establish anticipation, each limitation in a claim must be found in a single prior art reference, arranged as recited in the claim. *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1369 (Fed. Cir. 2008). Although the elements must be arranged or combined in the same way as in the claim, “the reference need not satisfy an *ipsissimis verbis* test.” *In re Gleave*, 560 F.3d 1331, 1334 (Fed. Cir. 2009).

A claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time of the invention to a person having ordinary skill in the art. *KSR Int’l Co. v. Teleflex, Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) objective evidence of nonobviousness, i.e., secondary considerations.¹¹ See *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). Subsumed within the *Graham* factors is the requirement that the skilled artisan would have had a reasonable expectation of success in combining the prior art references to achieve the claimed invention. *Pfizer, Inc. v. Apotex, Inc.*, 480 F.3d 1348, 1361 (Fed. Cir. 2007). “Obviousness does not require absolute predictability of success

¹¹ The record does not contain evidence or argument regarding objective evidence of nonobviousness.

. . . all that is required is a reasonable expectation of success.” *In re O’Farrell*, 853 F.2d 894, 903–4 (Fed. Cir. 1988).

Moreover, “[t]he combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.” *KSR*, 550 U.S. at 416. “If a person of ordinary skill can implement a predictable variation, § 103 likely bars its patentability.” *Id.* at 417.

B. Level of Ordinary Skill in the Art

In the Institution Decision, we determined that a person of ordinary skill in the art “would have had a Bachelor of Science degree in a field of engineering or a closely related discipline, and one year of practical academic or industrial experience designing, testing, and/or manufacturing flowmeters” because that description was consistent with the object of the ’957 patent and the level of skill reflected in the prior art. DI 11–12 (generally adopting Dr. Johnson’s description of the level of ordinary skill in the art aside from the qualifier “at least” as to the amount of practical experience).

In its trial briefing, Patent Owner challenges our description as to only one year of experience and also asserts that a person of ordinary skill in the art also would have had “one year of practical, academic or industrial experience designing and/or molding molded polymer structures.” Resp. 9–10. Patent Owner explains that polymer molding experience is necessary to appreciate the ’957 patent’s contribution to the art of reducing the complexity of manufacture. *Id.*; see Sur-reply 1–4. Patent Owner references a number of prior art references to support its position and additionally argues that Dr. Johnson lacks sufficient molding and casting knowledge required to be a person of ordinary skill in the art with respect to the ’957

patent (i.e., to appreciate the inventors' contribution to the art). Sur-reply 4–12 (citing Ex. 1031; Ex. 1032; Ex. 2010 ¶¶ 48–55; Ex. 2012–Ex. 2020).

We agree with Patent Owner that a person of skill in the art would have knowledge and experience designing and/or molding polymer structures. Resp. 10. The '957 patent is directed to a flow meter housing that is a monolithic polymer structure. *See, e.g.*, Ex. 1001, at [54], [57], 1:20–23 (describing the field of invention), 6:40–55 (claim 1). The prior art also discloses injection molded plastic or polymer flow meters and flow measurement tubes. *See, e.g.*, Ex. 1003, 2–3; Ex. 1005 ¶ 6; Ex. 1006 ¶¶ 85, 87, 96, Fig. 10. Thus, we determine that a person of ordinary skill in the art at the time of the invention would have had a Bachelor of Science degree in a field of engineering or a closely related discipline, one year of practical, academic, or industrial experience designing, testing, and/or manufacturing flowmeters, and one year of practical, academic, or industrial experience in designing and/or molding polymer structures.

Patent Owner couples its argument about the level of skill in art with an assertion that Dr. Johnson lacks experience in molding and casting.¹² Resp. 9–10; Sur-reply 1–4. But we do not require a perfect match between an expert's experience and the relevant field. *See* Patent Trial & Appeal Board Consolidated Trial Practice Guide November 2019¹³ at 34 (citing *SEB S.A. v. Montgomery Ward & Co.*, 594 F.3d 1360, 1373 (Fed. Cir. 2010)). A person need not be a person of ordinary skill in the art to testify as an expert under Federal Rule of Evidence 702, but rather must be “qualified in the pertinent art.” *Sundance, Inc. v. DeMonte Fabricating Ltd.*, 550 F.3d 1356,

¹² Patent Owner does not move to exclude Dr. Johnson's testimony.

¹³ Available at <https://www.uspto.gov/TrialPracticeGuideConsolidated>.

1363–64 (Fed. Cir. 2008). Here, Dr. Johnson is qualified in the pertinent art of flow meters. *See* Tr. 30:12–24; Ex. 1021 ¶¶ 1–3 (Dr. Johnson’s qualifications); Ex. 1022 (Dr. Johnson’s curriculum vitae). To the extent that Dr. Johnson is not as experienced in casting and molding polymer structures, we are able to consider the value of his opinions and give them appropriate weight. *See Perreira v. Sec’y of the Dept. of HHS*, 33 F.3d 1375, 1377 n. 6 (Fed. Cir. 1994).

C. Claim Construction

In an *inter partes* review, we construe claim terms according to the standard set forth in *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–17 (Fed. Cir. 2005) (en banc). 37 C.F.R. § 42.100(b). Under that standard, we construe claims “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.” *Id.* Furthermore, we expressly construe the claims only to the extent necessary to resolve the parties’ dispute. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co. Ltd.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (“[W]e need only construe terms ‘that are in controversy, and only to the extent necessary to resolve the controversy.’” (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).

In the Petition, Petitioner proposed a construction for the term “structure being cast in one piece” as recited in claims 1 and 11. Pet. 9–10. Patent Owner’s Preliminary Response addressed the terms “monolithic polymer structure being cast in one piece” and “through-going straight flow section.” Prelim. Resp. 14–18.

In our Institution Decision, we construed the terms “cast in one piece” and “through-going straight flow section.” Regarding “cast in one piece,”

we determined Patent Owner’s arguments did not persuade us that “cast in one piece” means “cast in a single mold,” and instead agreed with Petitioner’s construction of a “structure being cast in one piece” as a “molded one-piece structure.” DI 14. We further noted that even if we were to read the “cast in one piece” limitation as “cast in a single mold,” the limitation appeared to us to be a process limitation not entitled to patentable weight. *Id.* at 15–16. Because neither Petitioner nor Patent Owner had addressed whether “cast in one piece” is a product-by-process limitation, or whether a monolithic polymer structure cast in a single mold has structural or functional differences from a monolithic polymer structure that is integrally formed, but not cast in a single mold, we did not take a position on whether “cast in one piece” is a limitation that imparts patentable weight and we invited the parties to further brief the issue during trial, if they so desired. *Id.* at 16.

Turning to the term “through-going straight flow section,” we agreed with Patent Owner’s construction as a “straight section of a flow tube that traverses the monolithic polymer structure.” *Id.* Petitioner did not expressly address the term “through-going straight flow section.”

In its trial briefing, Patent Owner further addresses both claim construction issues, arguing that “cast in one piece” is a structural limitation that is limiting to structures that can be formed in a single mold and reinforcing its initial construction of “through-going straight flow section.” Resp. 12–20; Sur-reply 14–19. Patent Owner also proposes that we construe the terms “cavity separated from the flow tube,” “shared wall area,” “cavity only has a single opening,” “measurement tube element,” and “at the inside of the flow section serving to engage with.” Resp. 23–26; Sur-reply 20–23.

Petitioner also addresses both claim construction issues we invited the parties to address in its Reply. Reply 3–12. Petitioner additionally proposes constructions for the terms “cavity separated from the flow tube,” “shared wall area,” “cavity only has a single opening,” “measurement tube element,” and “at the inside of the flow section serving to engage with.” *Id.* at 12–20. For purposes of this section, only the following claim terms merit discussion: (1) “cast in one piece,” and (2) “cavity separated from the flow tube.” *See Nidec*, 868 F.3d at 1017. We also discuss the terms “measurement tube element” and “at the inside of the flow section serving to engage with” in addressing some of Petitioner’s asserted grounds, but do not specifically discuss those terms in this section.

1. “*cast in one piece*”

Patent Owner argues that the proper construction of the phrase “monolithic polymer structure being cast in one piece” as “monolithic polymer structure cast in a single mold” does not result in a process limitation, but is a structural limitation “that limits the scope of the invention to structures that can be formed in a single mold.” Sur-reply 14, 17 (citing e.g., *In re Nordt Dev. Co.*, 881 F.3d 1371, 1375–76 (Fed. Cir. 2008); *SmithKline Beecham Corp. v. Apotex Corp.*, 439 F.3d 1312, 1322 (Fed. Cir. 2006)). Patent Owner asserts that its construction “is consistent with the plain and ordinary meaning and both the intrinsic and extrinsic evidence.” Resp. 13.

Patent Owner first contrasts the plain and ordinary meaning of “cast *in* one piece” against “cast *into* [or cast to] one piece,” asserting Petitioner and Dr. Johnson have ignored any difference between the two. *Id.* (citing Ex. 2010 ¶¶ 42–43); Sur-reply 15. Patent Owner attributes a lack of understanding of any distinction between the two to Dr. Johnson “having no

experience in molding and only a rudimentary understanding of molding processes.” Resp. 13; Sur-reply 18 (citing Ex. 2010 ¶ 38). Patent Owner argues the difference between “in” and “into [or to]” is evident when looking to the state of the art. Sur-reply 15–18. Specifically, Patent Owner directs us to WO 03/041895, published May 11, 2003 (“the ’895 application,” Ex. 1032), and asserts the ’895 publication uses the phrase “cast in one piece” or “cast in one united piece” for a product of two materials in a single mold, but uses “cast to one piece” for casting to an existing structure. *Id.* (citing Ex. 2024, 78:11–80:2); *see also* Resp. 16–20 (citing Ex. 2012–2020, as “numerous prior art patents and patent application[s] across various technological fields have used ‘cast in one piece’ in the exact same manner as the ’957 Patent”).

Patent Owner further argues that amendments made during prosecution in the European Patent Office (“EPO”) are not relevant to patentability over references Petitioner relies upon in this proceeding, i.e., Will and Ueki. Resp. 14–15; Sur-reply 14–15. In that regard, Patent Owner asserts the EPO determined during the PCT application prosecution that the phrase “‘cast in one piece’ . . . was both novel and nonobvious . . . over Will and Ueki.” Resp. 14 (citing Ex. 1014; Ex. 1018, 5; Ex. 1019, 319–21; Ex. 2006, 12:58–13:20; Ex. 2007, 11; Ex. 2018, 5) (emphasis omitted).

Petitioner replies that Patent Owner fails to support the assertion that one of ordinary skill in the art would understand the term “cast in one piece” to mean “cast in a single mold,” and that Patent Owner fails to establish that such a process limitation is entitled to patentable weight. Reply 3–4.

Petitioner first argues that the extrinsic evidence on which Patent Owner relies does not support Patent Owner’s narrow construction of “cast in one piece” as “cast in a single mold,” but instead supports a more

expansive interpretation, such as the “molded one-piece structure” we adopted in the Institution Decision. *Id.* at 4–5. As an example, Petitioner cites U.S. Patent No. 6,730,004 (Ex. 2012), asserting that instead of contrasting “‘cast in one piece’ with a structure that can be ‘*cast in a single mold,*’” the reference “contrasts a structure that cannot be ‘cast in one piece’ with ‘*a single unitary piece of molded plastic.*’” *Id.* (citing Ex. 1035 ¶¶ 9–10; Ex. 2012, 8:47–51). Petitioner asserts that most of the remaining cited references “distinguish welding versus molding, not single-mold versus non-single mold.” *Id.* at 5 (citing Ex. 1035 ¶¶ 11–21).

Petitioner further argues even if Patent Owner establishes that a person of ordinary skill in the art would understand the limitation “cast in one piece” to mean “cast in a single mold,” Patent Owner fails to establish that casting in a single mold results in any structural or functional differences as compared to a resulting “molded one-piece housing cast with other molding processes such as . . . two-step overmolding process[es].” Reply 6–7. In other words, Petitioner contends that the phrase “cast in one piece” is a process limitation that is not entitled to patentable weight. *Id.*

After having reviewed claims 1 and 11, the arguments, and the evidence, we determine that the phrase “cast in one piece” is a product-by-process limitation that does not impart patentable weight to the claim. Even if we determined that the phrase “cast in one piece” is entitled to patentable weight, however, we would construe the phrase to mean “a molded one-piece structure,” as we did in the Institution Decision.

Turning first to the claim language, we explained in the Institution Decision that the limitation “cast in one piece” appears to be a process limitation that does not impart patentable weight to the claim unless the resulting product (i.e., the claimed product) has “structural and functional

differences” that distinguish the claimed product from the prior art. DI 16 (citing *Greenliant Sys., Inc. v. Xicor LLC*, 692 F.3d 1261, 1268 (Fed. Cir. 2012) (explaining that “the process by which a product is made is irrelevant[,]” unless the process “imparts ‘structural and functional differences’” that distinguish the product from the prior art); *In re Thorpe*, 777 F.2d 695, 697 (Fed. Cir. 1985) (“The patentability of a product does not depend on its method of production.”)). Patent Owner argues, and Dr. Cairns testifies, that our decision was wrong because “cast in one piece” denotes a structural limitation. Sur-reply 14, 18; Ex. 2010 ¶ 38. Patent Owner, however, does not identify any structural or functional features that casting in a single mold imparts, except for asserting that the structure is limited to a type of structure that can be made in a single mold. *Id.* at 14; *see also* Tr. 25:14–24 (Judge Ankenbrand: . . . “cast in one piece to me appears to be a process. So, what’s the difference . . . functionally and structurally . . . ? Patent Owner’s Counsel: “. . . the structure of [the prior art] . . . cannot be cast in a single mold.”). Nor are we aware of any distinct structural or functional differences between a monolithic polymer that is cast in a single mold and one that is not. Rather, Petitioner persuades us that distinguishing “cast in one piece” by being able to be cast in a single mold is a circular argument that does not identify any structural or functional differences that casting in one piece imparts to the monolithic polymer housing. *See* Tr. 13:7–13, 26:1–19.

Patent Owner relies on several cases to support its position that we should interpret “cast in one piece” as a structural limitation and not a process limitation. Sur-reply 17–18 (citing *Nordt*, 881 F.3d at 1375–76; *3M Innovative Props. Co. v. Avery Dennison Corp.*, 350 F.3d 1365, 1371–72 (Fed. Cir. 2003); *In re Garnero*, 412 F.2d 276, 279 (CCPA 1969);

SmithKline Beecham, 439 F.3d at 1322; *Vanguard Prods. Corp. v. Parker Hannifin Corp.*, 234 F.3d 1370, 1372 (Fed. Cir. 2000); *Hazani v. U.S. Int'l Trade Comm'n*, 126 F.3d 1473, 1479 (Fed. Cir. 1997)). But Patent Owner's cases are distinguishable. For example, in *Nordt*, where the claim limitation "injection molded" was at issue, the patent applicant asserted "that 'there are clear structural differences' between a knee brace made with fabric components and a knee brace made with injection-molded components," and the court found that the specification conveyed a structural meaning to "injection molded." 881 F.3d at 1375; *see also Vanguard*, 234 F.3d at 1372 (the specification used the term "integral" "to describe the product and not as a designation of a specific manufacturing process," and the prosecution history showed the examiner and the applicant "treated the product claims as directed to the product itself"); *Hazani*, 126 F.3d at 1479 (determining that the limitation "chemically engraved," when read in context, "describes the product more by its structure than by the process used to obtain it."). Here, in contrast, the limitation "cast in one piece" does not appear to connote a structure, the specification does not convey any structural meaning to the limitation, and Patent Owner fails to direct us to any structural differences that casting in one piece imparts to the monolithic polymer housing. Thus, Patent Owner's cited cases are distinguishable.¹⁴

¹⁴ Although Patent Owner relies on the dissent from *SmithKline Beecham* to support its argument, Sur-reply 17, the majority opinion in *SmithKline Beecham* is consistent with our determination that "cast in one piece" is a process limitation. Specifically, the court explains that "[r]egardless of how broadly or narrowly one construes a product-by-process claim, it is clear that such claims are always to a product, not a process," and that "one cannot avoid anticipation by an earlier product disclosure by claiming the same product . . . as produced by a particular process." 439 F.3d at 1317.

Accordingly, we conclude that the limitation “cast in one piece” is a process limitation that does not impart patentable weight to the claim. That is, as long as the prior art discloses a monolithic polymer structure, it satisfies the claim limitation regardless of the process used to produce it.

In any event, even if we determined that “cast in one piece” is not a process limitation, we would construe the limitation to mean “a molded one-piece structure,” as we did in the Institution Decision. We note first that independent claims 1 and 11 are apparatus claims, not method claims. *Compare* Ex. 1001, 6:41–55 (claim 1, reciting “An ultrasonic flow meter housing comprising”), *with* Sur-reply 14 (arguing that “the invention of the ’957 Patent is directed to a *design for manufacture*” (emphasis added)). Further, although Patent Owner’s counsel argued during the oral hearing that Patent Owner equates the limitation “cast in one-piece” “to a ‘capable of,’ configured for,’ ‘adapted for’ type analogy,” Tr. 16:20–21, the claims do not use any of those terms, which typically describe how a structure or product is going to be used, *not* how the structure or product is designed (or what the structure is). The phrase “cast in one piece” also does not define the number of steps in the molding process or the type of mold used during the molding process. *See* Ex. 1001, 6:41–55 (claim 1). Indeed, the claim language does not provide a connection between the number of steps and the resulting one-piece apparatus. Thus, the claim language supports the construction we adopted in the Institution Decision.

Turning to the written description, the ’957 patent’s background states that the prior art’s purported shortcoming is the number of molding steps required to produce an ultrasonic assembly, Ex. 1001, 1:39–51, but nothing in this discussion requires the claimed invention to be cast in a single mold. Indeed, the written description focuses on reducing the number of steps

required to fabricate the flow meter housing, not on casting in a single mold. *See id.* at 1:55–57 (“It may be seen as an object of the invention to provide an ultrasonic flow meter which can be produced and assembled with a limited number of steps.”), 2:6–9 (“A flow meter with a housing in accordance with 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.”). Moreover, the single mold that the written description of the ’957 patent discloses with respect to Figures 5A and 5B is narrower than the claim language “cast in one piece.” Accordingly, we decline to read the narrower “cast in a single mold” from an embodiment of the written description into the broader language “cast in one piece” that is used in the claims. *See SuperGuide Corp. v. DirecTV Enters., Inc.*, 358 F.3d 870, 875 (Fed. Cir. 2004) (“[A] particular embodiment appearing in the written description may not be read into a claim when the claim language is broader than the embodiment.” (citing *Electro Med. Sys., S.A. v. Cooper Life Scis., Inc.*, 34 F.3d 1048, 1054 (Fed. Cir. 1994))).

In addition, as noted above, Patent Owner contends that the invention of the ’957 patent is a design for manufacture that requires a housing structure made in a single mold. Sur-reply 14. Patent Owner’s counsel explained during oral argument that the European and PCT applications “shed[] light” on how the EPO and U.S. Examiner viewed the invention and amendments to the claims. Specifically, Patent Owner argues that the patent applicant amended the European patent application to “get around” the Will reference by adding “a through-going straight flow section” limitation and to “[get] around” the Ueki reference “by adding the limitation that . . . the flow tube has to be separated from the cavity.” Tr. 31:12–25. Patent Owner also

argues that the applicant did not amend “cast in one piece” to “cast in a single step” in the PCT application to overcome Will or Ueki. Resp. 14–15.

The European prosecution history filed in this proceeding, however, does not indicate why the patent applicant amended the claim language in the EPO, or that the EPO definitively determined that the claim at issue was patentable over Will and/or Ueki. As Patent Owner acknowledges, the record from the European prosecution includes only the European patent application, a search report for the original claims, the PCT application, which amended much of the claim language from the European patent application, an International Search Report, and the amendment to the PCT application. Resp. 14 n.31. The International Search Report cites to Will as a reference relevant as technical background (i.e., an A reference) and does not cite to Ueki. But that does not shed light on why the patent applicant amended the claim language from the European patent application. And the ’957 patent issued as the result of a first action allowance, so there is no record of how the Examiner viewed the invention or the European prosecution history. Accordingly, we do not find the European prosecution history particularly helpful in determining the meaning of “cast in one piece.”¹⁵

¹⁵ To the extent that the European and PCT patent applications also shed light on what the patent applicant viewed as the invention, we note that claim 1 of the European patent application did not include the limitations “cast in one piece,” “cast in one step,” or “cast in a single mold.” Instead, the claim recited “a monolithic polymer structure” “having a through-going opening . . . arranged for passage of a fluid.” Ex. 2006, 11:58–12:20. Thus, Patent Owner’s argument that the inventive aspect of the ’957 patent requires casting in a single mold appears to be inconsistent with how the patent applicant viewed its invention in the European application.

Patent Owner's cited prior art references also do not persuade us that "cast in one piece" means "cast in a single mold." In the Sur-reply, Patent Owner focuses on a distinction between "cast in one piece" and "cast into [or to] one piece," which Patent Owner argues is the parties' primary dispute. Sur-reply 15–17. Patent Owner argues the two terms create a clear distinction, which the '895 publication and the disclosure of the '957 patent illustrate. *Id.* (citing Ex. 1001, 5:42–46; Ex. 2024, 78:11–80:2); Ex. 1032. Specifically, Patent Owner contends the '895 publication "uses the phrase 'cast in one piece' or 'cast in one united piece' exclusively to refer to a product made of two materials in a single mold, but uses the phrase 'cast to one piece' exclusively to refer to a product formed by casting material to an existing structure." *Id.* at 15–16. The '895 publication does not appear to differentiate between or limit the use of "casting in" and "casting into [or to]" as Patent Owner argues, but rather uses the terms interchangeably. For example, the '895 publication describes casting a tool with an interface zone between the functional part and the tool body, which occurs in one mold, where the functional part is formed first by casting material *into* gate 23 of the mold and allowing the functional part to sufficiently cool, then the tool body is formed by *casting on* a second material. Ex. 1032, 7:27–30, 8:4–6, 5:34–6:3. Thus, the '895 publication uses the terms "cast into" and "cast on" to describe a casting process that occurs in a single mold. Patent Owner correctly points out that the '895 publication uses the phrase "cast to one piece" to describe a second process in which a separately cast or recycled functional part is inserted into a single mold and the "additional tool part is cast on [that existing tool part]." *Id.* at 5:26–29; *see also* Sur-reply 16 (citing Ex. 2024, 78:11–80:2). However, Patent Owner's assertion that the phrases "cast in one piece" or "cast in one united piece" are used exclusively

to refer to a product made of two materials cast in a single mold does not comport with the language the '895 publication uses to describe such a process. *See* Sur-reply at 15–16.

Similarly, the additional prior art patents and patent applications that Patent Owner asserts use the phrase “‘cast in one piece’ in the exact same manner as the '957 Patent” do not persuade us that “cast in one piece” means “cast in a single mold.” *See* Resp. 16–20. Some of the cited prior art patents and applications appear to support Patent Owner’s assertion. *See, e.g.*, Ex. 2012, 8:44–61 (describing a prior art structure that could not be “cast in one piece” because it was a single unitary piece of molded plastic material formed from gluing together separately produced injection molded halves); Ex. 2017, 5:52–56, 3:27–32 (contrasting pieces “formed as one-piece castings” with pieces “formed as welded and/or bolted steel plate constructions”). Other references do not. *See, e.g.*, Ex. 2014, 7:31–38 (describing forming a lever by casting together different structures that result in a molded one-piece structure); Ex. 2016, 22:42–46, 24:48–50 (describing a manifold as a one-piece casting, i.e., cast in one piece, where all of the features of the manifold are included within the resultant structure regardless of whether it was cast in a single mold). Thus, we decline to construe “cast in one piece” to mean “cast in a single mold” based on Patent Owner’s extrinsic evidence. Instead, we construe the term to mean “a molded one-piece structure” based on the intrinsic record we discuss above.

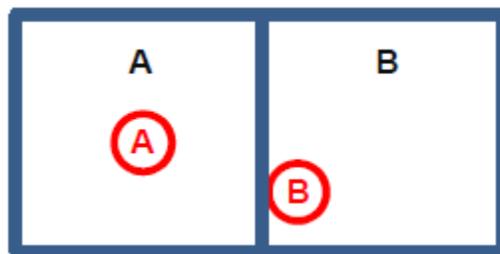
For the foregoing reasons, we determine that the limitation “cast in one piece” is a process limitation that is not entitled to patentable weight. Even if “cast in one piece” were entitled to patentable weight, however, we would construe the limitation to mean “a molded one-piece structure.”

2. “cavity separated from the flow tube”

Claim 1 recites “the monolithic structure includes a flow tube and a cavity separated from the flow tube.” Ex. 1001, 6:42–44. We did not address this claim limitation in the Institution Decision because the parties did not propose that we construe the limitation, and the limitation was not germane to the parties’ dispute.

In its trial briefing, Patent Owner argues that one of ordinary skill in the art would understand the phrase “cavity separated from the flow tube” to mean “the flow tube does not reside in or run through the cavity.” Resp. 21–22. Patent Owner asserts that its construction “is consistent with the plain and ordinary meaning and both the intrinsic and extrinsic evidence.” *Id.* at 21.

Patent Owner first argues that the plain meaning of “separated from” prevents the flow tube from running through or being within the cavity. *Id.* To support this construction, Patent Owner relies on an example image from Dr. Cairns’ declaration that we reproduce below. *Id.* (citing Ex. 2010 ¶¶ 60–63).



The example image above depicts a top plan view of an analogous structure of two rooms (i.e., cavities) and two columns (i.e., flow tubes) within the two rooms. Ex. 2010 ¶ 60. Patent Owner argues that although the “interior of column A is separated from the room A cavity,” column A itself is not separated from the room A cavity, because column A runs through room A.

Resp. 21–22. Patent Owner continues that column B is “separate from” the room A cavity via the side wall that separates rooms A and B, thus, exemplifying a flow tube (column B) “separated from” the cavity (room A cavity). *Id.* at 22.

Patent Owner further argues that one of ordinary skill in the art, who is familiar with casting processes, “would understand that the cavity and flow tube must be ‘separated from’ one another in a way that enables the flow tube and the cavity to be cast in a single mold.” *Id.* (citing Ex. 2010 ¶ 63). Thus, Patent Owner predicates its construction of “separated from” upon its proposed construction of “cast in one piece.” *See supra* § II.C.1.

Petitioner replies that Patent Owner misconstrues the phrase because Patent Owner reverses the order of “cavity” and “flow tube” in the phrase, which results in Patent Owner adding a limitation to the claim. Reply 12–13. Petitioner elaborates, noting that the claim first introduces the flow tube, then recites the cavity as being separate from the flow tube. Petitioner emphasizes the “separated from” claim language as describing the cavity, not the flow tube, and introducing “the cavity as a cavity that *is not part of the flow tube.*” *Id.* at 13. In other words, Petitioner asserts that the order of the recited structures matters and rearranging them produces an incorrect construction.

Petitioner also replies to Patent Owner’s room-and-column example with a modified illustration that we reproduce below.

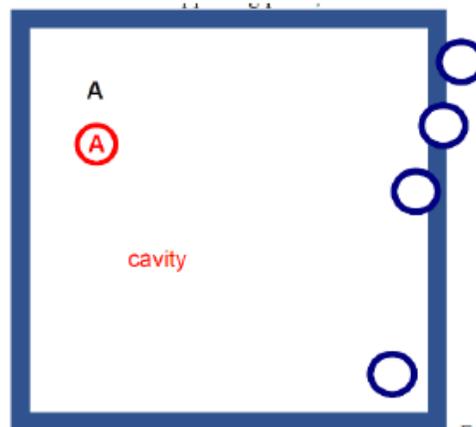


Illustration 1

Ex. 1026. Petitioner’s Illustration 1 depicts a cavity, column A, and four blue tubes or columns. Reply 13–14. Petitioner contends that although Patent Owner argues that column A is not a cavity “separated from” the flow tube, Dr. Cairns had “trouble explaining why this [column A] is different from other tubes running through the housing [the upper three blue tubes above] that *are* ‘separated from’ the cavity.” *Id.* at 13–14 (citing Ex. 1024, 32:5–19, 33:14–34:9, 34:16–35:8). Petitioner asserts that Dr. Cairns identified the upper three blue columns or tubes as separated from the cavity, but identified the bottom blue column, which is enclosed within the cavity, as not separated from the cavity. *Id.* at 14–15. According to Petitioner, Dr. Cairns testified that he would not consider a wholly enclosed tube or column to be separated from the cavity because “you really can’t make it easy.” *Id.* at 15 (citing Ex. 1024, 34:16–35:8).

We begin with the claim language. Claim 1 recites “the monolithic structure includes a flow tube and a cavity separated from the flow tube wherein the flow tube defines a . . . flow section . . . 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.” Ex. 1001, 6:42–49. As the

claim language itself suggests, the wall of the flow tube's flow section is shared with the cavity. Thus, the flow tube cannot be so separated from the cavity that no part of the flow section shares a wall with the cavity. As Petitioner points out, the order of the claim language matters. Claim 1 first "introduces a flow tube, and then 'a cavity separated from the flow tube.'" Reply 13. We agree with Petitioner that the phrase "separated from the flow tube" "describes the cavity, not the flow tube, and . . . introduces the cavity as a cavity that *is not part of the flow tube.*" *Id.* We also agree with Petitioner that Patent Owner's proposed construction "reverses the order of the terms 'cavity' and 'flow tube'" such that the claim would require that the flow tube does not reside or run through the cavity. Patent Owner's construction is contrary to the plain language of the claim.

We determine that a "cavity separated from the flow tube" requires the interior of the flow tube to be separated from the surrounding cavity by the shared wall. We determine that this construction is not so narrow as to exclude a flow tube that a cavity wholly surrounds. The flow tube is "separated from" the cavity by simply sharing an exterior wall of the flow tube with the interior surface of the cavity. Thus, a flow tube that is wholly surrounded by, yet shares the exterior wall with, a cavity is "separated from" the surrounding cavity.

Like the claim language, the Specification explains that the flow meter housing has a "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." Ex. 1001, 2:9–15. As we explain above, an outside portion of the wall of the flow tube is the same structure as an inside wall of the cavity, forming the shared wall section. The Specification, therefore, also does not support Patent Owner's construction.

We also disagree with Patent Owner’s argument that “[t]he cavity and flow tube must be ‘separated from’ one another in a way that enables the flow tube and the cavity to be cast in a single mold.” Resp. 22 (citing Ex. 2010 ¶ 63). That argument is based upon Patent Owner’s construction of “cast in one piece,” which we do not adopt.

For the foregoing reasons, we conclude that the flow tube need not be “separated from” the cavity to the extent that Patent Owner argues, i.e., that the flow tube does not reside in or run through the cavity. It is not necessary to construe the limitation “cavity separated from the flow tube” further to resolve the parties’ dispute.

D. Asserted Prior Art

Before considering the asserted grounds of unpatentability, we provide a brief overview of the asserted references.

1. Will (Ex. 1003)

Will relates to an ultrasonic measuring assembly that “can be easily and economically produced” and “avoids the disadvantages of components of the assembly that have to be joined subsequently.” Ex. 1003, 2.¹⁶ Figure 3 depicts the ultrasonic measuring assembly, which we reproduce below.

¹⁶ The parties cite to the page and line number of the reference, but we cite to the page number displayed at the bottom center of the page.

of high production costs and requiring different seals. *Id.* ¶¶ 2, 4. Figure 3 depicts the sensor structure, which we reproduce below.

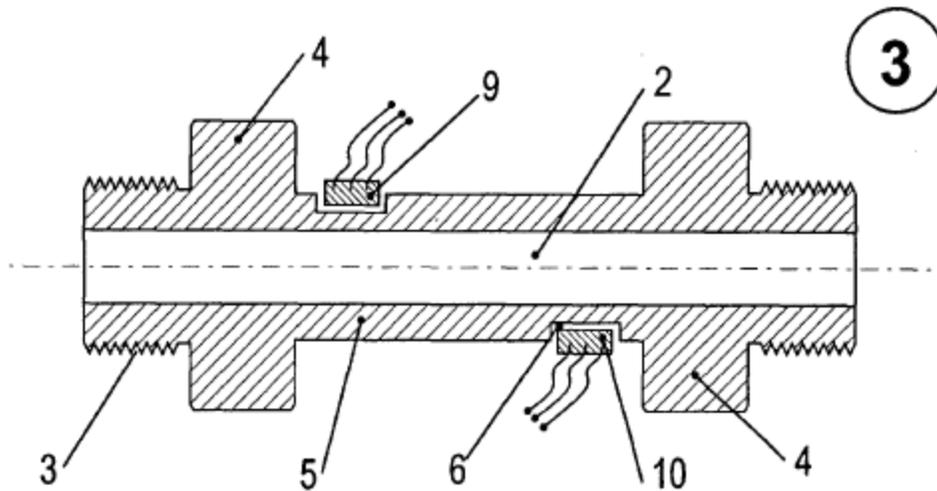


Figure 3 shows a sensor structure with bore 2, intermediate component 5, and key parts 4. *Id.* ¶¶ 11, 13. Acoustic transducers 9 and 10 are placed next to key parts 4. *Id.* ¶¶ 8, 13. The sensor structure is made of homogenous material and has an integral, barbell-shaped design without any penetrations or welds. *Id.* ¶ 6. The sensor structure is “produced integrally and preferably in a single work process.” *Id.* ¶ 4.

A two-part housing (not shown) surrounds the sensor structure to accommodate evaluation electronics and protect the interior of the sensor structure from environmental effects. *Id.* ¶ 8. The sensor structure may be made from “materials that are difficult to weld, comprising plastics or mineral-based materials such as ceramics in particular.” *Id.* ¶ 6.

3. Ueki (Ex. 1006)

Ueki relates to a fluid flow sensor. Ex. 1006 ¶¶ 1–2. Figure 11 depicts the fluid flow sensor, which we reproduce below.

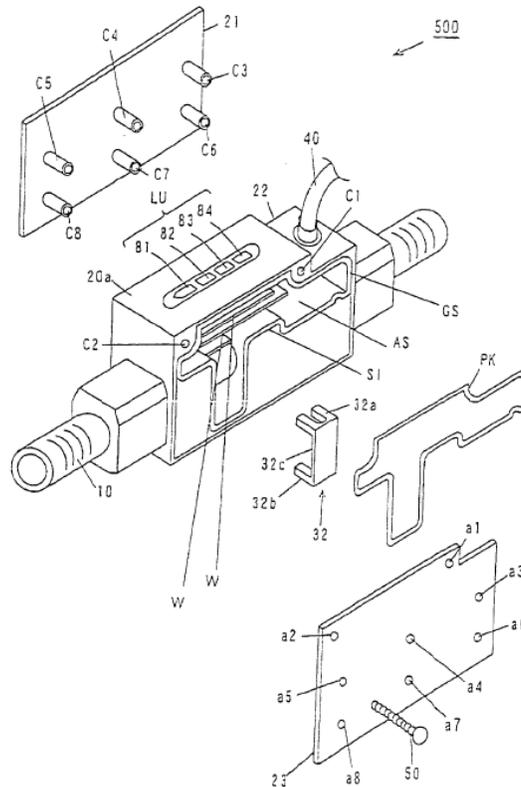


Figure 11 shows a flow sensor with detection section 500. *Id.* ¶¶ 86–87. Detection section 500 is made up of casing members 21, 22, and 23 and through water pipe line 10, in addition to other features. *Id.* Casing member 22 has internal circuit/sensor housing area AS. *Id.* ¶ 88.

Figure 12B, also reproduced below, shows a side view of the flow sensor of Figure 11.

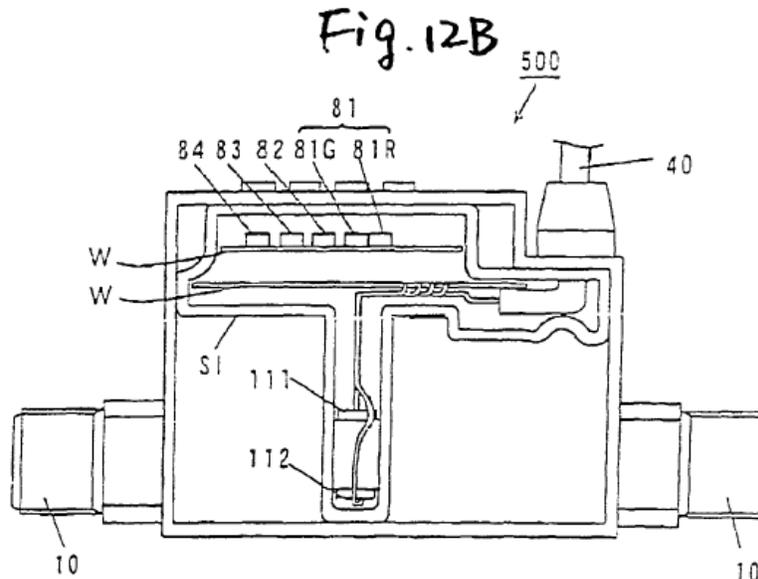


Figure 12B shows a side view of detection section 500. *Id.* ¶ 86. The side view includes a view of cavity AS from Figure 11 above. *Id.* ¶ 86, 88. Transmitter 111 and receiver 112 are attached to through water pipe line 10 inside cavity AS. *Id.* ¶ 90. Casing member 22 and through water pipe line 10 are integrally formed and can be molded of the same material in one piece. *Id.* ¶¶ 87, 96.

4. Buckberry (Ex. 1007)

Buckberry relates to an ultrasonic flow-rate measurement device that can be simply and economically manufactured and assembled. Ex. 1007, 1:2-3, 1:29-30. Figure 4 shows ultrasonic flow-rate measurement device 10, which we reproduce below.

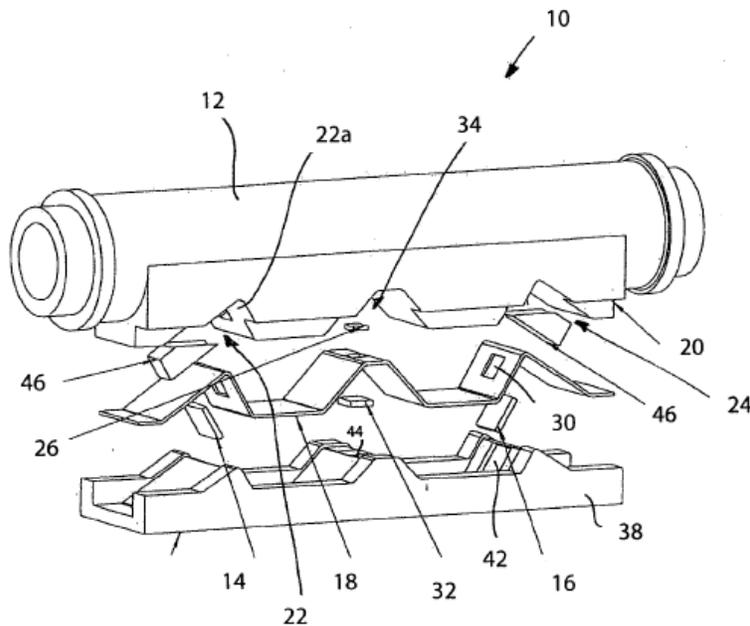


Fig 4

Figure 4 shows measurement device 10 with measurement conduit 12 and transducer housing 20. *Id.* at 13:18–20. The transducer housing is preferably integrally formed with the external wall of the measurement conduit. *Id.* at 6:8–9. Transducer housing 20 has recesses 22 and 24 with external recesses 22a and 24a. *Id.* at 13:20–26. At external recesses 22a and 24a are ultrasonic transducers 14 and 16. *Id.* at 13:10–11, 14:1–2. Flexible PCB (printed circuit board) 18 is shaped to conform with and be located over the lowermost face of transducer housing 20. *Id.* at 14:23–25.

5. Bignell (Ex. 1008)

Bignell relates to the construction of electronic fluid flow meters for measuring liquids and gases, and in particular a housing for the meter. Ex. 1008, 1:3–5, 6:12–13. The fluid flow meter uses ultrasonic transducers. *Id.* at 1:10–15. Figure 3 shows the housing of the fluid flow meter, which we reproduce below.

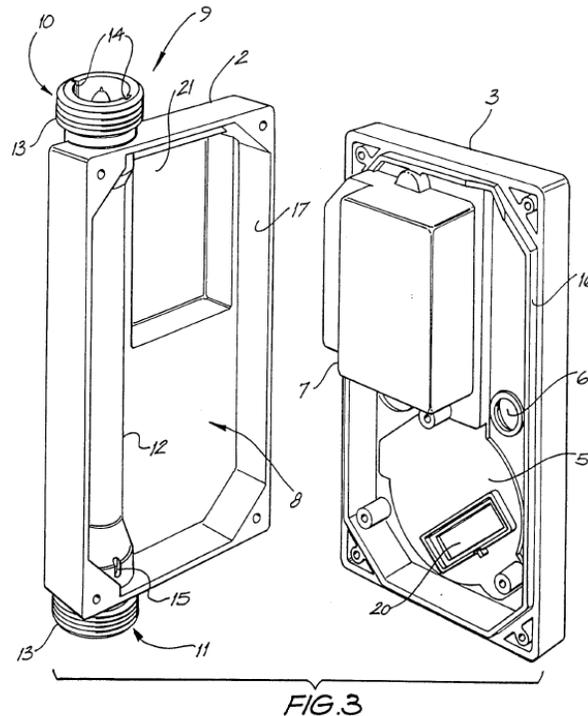


Figure 3 shows a meter with casing base 2 and casing lid 3. *Id.* at 7:13–14. Measuring tube 9 is integrally formed in base 2. *Id.* at 7:28–31. Measuring tube 9 has two ends 10 and 11, and intermediate portion 12, which permits flow. *Id.* at 7:28–31. Base 2 also includes void 8, which provides a space for an electronics module. *Id.* at 7:21–24.

6. *Elson (Ex. 1012)*

Elson relates to a system for sensing a characteristic of fluid flowing to or from the body of a human or animal. Ex. 1012, Abstract, 1:52–56. The system includes a conduit having two ends with a flow passage between the two ends. *Id.* at 1:63–67. The system also includes a probe for sensing a desired characteristic. *Id.* at 1:67–2:2. The sensed characteristic may be temperature, pressure, or any characteristic that can be determined by an optical scan. *Id.* at 1:56–59.

7. *Barker (Ex. 1013)*

Barker relates to a fluid temperature sensor. Ex. 1013, 1:6–8. The temperature sensor has a flow-through housing and reusable temperature sensing means. *Id.* at 1:52–55. The temperature sensor has a through lumen for conducting fluid through. *Id.* at 1:64–66. A thermally conductive enclosure projects transversely into the lumen. *Id.* at 1:66–68. A reusable temperature sensor may be removably installed into the enclosure to measure temperature through the lumen. *Id.* at 2:2–5.

8. *Drachmann (Ex. 1009)*

Drachmann relates to a consumption meter for measuring the value of a consumed quality. Ex. 1009 ¶ 2. The consumption meter has a transparent cover that is impermeable to water. *Id.* ¶ 11. The transparent cover protects electronic parts from being exposed to moisture while permitting a display to be visible. *Id.* ¶ 12. The consumption meter is cost efficient, simple to fabricate, and capable of being used in different environments. *Id.* ¶¶ 7, 12.

9. *Goertz (Ex. 1011)*

Goertz relates to an ultrasonic flow meter that measures a flowing fluid. Ex. 1011 ¶ 1. The ultrasonic flow meter includes housing assembly 1, which is comprised of housing structure 2, housing neck 3, and housing head 4 covered by cap 5. *Id.* ¶ 23; Ex. 1010, Fig. 1. Housing structure 2 forms a measurement tube with its inner surfaces. Ex. 1011 ¶ 24; Ex. 1010, Fig. 1. Transducers may be placed in the inner surface of the measurement tube. *Id.*

E. Anticipation by Ueki

Petitioner asserts that Ueki anticipates claims 1, 2, 5, 7, 9, and 11–13 of the '957 patent. Pet. 47–54 (citing Ex. 1006 ¶¶ 1, 22, 36, 49, 66, 81, 85, 87–90, 92, 96, Fig. 9, Fig. 10, Fig. 11, Fig. 12B). Patent Owner disagrees, arguing that Ueki does not disclose a cavity separated from the flow tube, or

a monolithic polymer structure cast in one piece, wherein the monolithic structure includes a flow tube and a cavity that houses, or is arranged to house, at least one ultrasonic transducer and a measurement circuit. Resp. 51–55 (citing Ex. 1006 ¶¶ 85, 87, 96, Figs. 11, 12B; Ex. 2010 ¶¶ 59–64, 92–99).

The nub of the parties’ dispute centers on the “cast in one piece” and “cavity separated from the flow tube” limitations of claims 1 and 11. Accordingly, we focus our discussion on those limitations first and then turn to the remaining limitations of claims 1 and 11 and to claims 2, 5, 7, 9, 12, and 13, which Patent Owner does not contest separately. *See generally* Resp.

1. Claims 1 and 11

a) “cast in one piece”

As we explain above, we determine that “cast in one piece” is a process limitation that does not impart patentable weight to the claims, but even if we concluded that “cast in one piece” was entitled to patentable weight we would construe the limitation to mean “a molded one-piece structure.” *See supra* § II.C.1. Thus, Petitioner need not establish that Ueki discloses the housing as cast in a single mold in order to show that Ueki teaches the “cast in one piece” limitation.

Petitioner asserts that Ueki discloses a monolithic polymer structure cast in one piece because Ueki discloses a molded one-piece structure. Pet. 48–49. In particular, Petitioner asserts that Ueki discloses through water pipe line 10 that is formed integrally with central casing member 22. *Id.* at 48 (citing Ex. 1006 ¶ 87). Petitioner also asserts that Ueki provides a sensor with detection section 500 that can be molded of the same material in one piece. *Id.* (citing Ex. 1006 ¶ 96, Fig. 10).

Patent Owner argues that Ueki's water pipe line 10 and casing 20 are not cast in one piece because Ueki does not disclose how water pipe line 10 and casing 20 could be integrated, or that the parts may be cast in the same mold. Resp. 53. Patent Owner asserts that Petitioner improperly merges Ueki's disclosure of water pipe line 10 and casing 20, Ex. 1006 ¶¶ 85–87, with Ueki's disclosure that detection section 500 can be molded in one piece, *id.* ¶ 96, to infer a nondisclosed structure. Resp. 53–54 (citing Ex. 2010 ¶¶ 96–99). Thus, Patent Owner asserts Ueki does not disclose water pipe line 10 being “cast in one piece” with casing member 22 and back cover 21 to satisfy the housing cavity (i.e., cavity formed by casing members 21 and 22) being “cast in one piece” with a flow tube (i.e., water pipe line 10). *Id.* Supporting Patent Owner's arguments, Dr. Cairns testifies that one of ordinary skill in the art would understand that Ueki's casing and water pipe 10 could not be “cast in one piece” in any commercially viable way, if at all, i.e., they could not be cast in a single mold. Ex. 2010 ¶¶ 96–99.

As we explain above, we determine that “cast in one piece” is not a structural limitation, but rather a process limitation that does not impart patentable weight to the claim. In addition, we do not adopt Patent Owner's construction of “cast in one piece,” which would require that the housing be cast in a single mold. Therefore, the question of whether Ueki discloses that the housing cavity and flow tube are cast, or capable of being cast, in a single mold has no bearing on the question of anticipation. *See* Reply 25 (pointing out that Patent Owner's arguments are based on its claim construction). In other words, Petitioner need only show that Ueki teaches a housing comprising a monolithic polymer structure that includes the other limitations of claims 1 and 11.

Petitioner establishes that Ueki teaches a monolithic polymer structure. *See* Pet. 49 (citing Ex. 1006 ¶¶ 85, 87, 96, Fig. 10). In particular, Ueki discloses detection section 500 of a flow sensor that includes casing members 21, 22, 23, and through water pipe line 10. Ex. 1006 ¶ 87. Ueki further discloses that “water pipe line 10 is formed integrally with the casing member 22.” *Id.* Ueki explains that detection section 500 “can be molded of the same material in one piece and can be easily manufactured” for cost reduction. *Id.* ¶ 96. Thus, Ueki teaches a flow meter housing comprising a monolithic polymer structure, which reads on the structure in claims 1 and 11 regardless of how it was cast. Even if we were to determine that “cast in one piece” is entitled to patentable weight, Petitioner establishes that Ueki’s above-discussed disclosure teaches a molded one-piece structure.

Patent Owner’s assertion that Petitioner improperly combines Ueki’s embodiments because integral forming of through water pipe line 10 with central casing 22 only applies to the embodiment depicted in Ueki’s Figure 11, whereas the one-piece molding of detection section 500 only applies to a separate embodiment depicted in Ueki’s Figure 12 is not persuasive. Ueki discusses both of these teachings in reference to a “Second embodiment” disclosed in paragraphs 82–96. Moreover, Ueki states that Figures 10, 11, 12A, and 12B all depict the flow sensor “*according to the second embodiment of the invention.*” Ex. 1006 ¶¶ 83, 86 (emphasis added); *see also id.* ¶ 31 (describing Figures 10, 11, 12A, and 12B as all pertaining to the second embodiment). Therefore, assuming that “cast in one piece” is entitled to patentable weight, Ueki teaches a flow meter housing that is a molded one-piece structure, i.e. cast in one piece.

b) “cavity separated from flow tube”

Petitioner asserts that Ueki teaches “the monolithic structure includes a flow tube and a cavity separated from the flow tube.” Pet. 49–50 (citing Ex. 1006 ¶¶ 49, 81, 87–88, Fig. 11). Specifically, Petitioner asserts circuit/sensor housing area AS within casing member 22 is separate from through water pipe line 10. *Id.*

Patent Owner argues that one of ordinary skill in the art would not have recognized Ueki’s flow tube as being separated from the surrounding cavity. Resp. 51–52 (citing Ex. 2010 ¶¶ 59–64, 92–95). Patent Owner’s argument is based on its proposed construction of “cavity separated from the flow tube,” i.e., such that a flow tube that runs through a cavity is not one that is separated from the cavity. *Id.* at 52.

As we explain above, we determine that the phrase “cavity separated from the flow tube” does not require the flow tube to be separated from the cavity via a separate wall as Patent Owner argues. As Petitioner contends, Ueki discloses a “detection section 500 [has casing 20 that] is made up of casing members 21, 22, and 23” and additionally includes a through water pipe line 10 “formed integrally with” and molded of the same resin fluoride material as the casing member 22.” Pet. 49–50; Ex. 1006 ¶¶ 49, 81, 85, 87, Figs. 10–11. Ueki also discloses that “[t]he casing member 22 has a circuit/sensor housing area AS in an internal portion” of the casing member. Ex. 1006 ¶ 88, Fig. 11. Through water pipe line 10 runs through circuit/sensor housing area AS and is separated from circuit/sensor housing area AS by the outer surface of through water pipe line 10. *Id.* ¶ 31, Figs. 11, 12B. Therefore, Ueki teaches the monolithic structure including a flow tube and a cavity separated from the flow tube.

c) Remaining limitations

Petitioner explains how Ueki discloses the remaining limitations of claims 1 and 11. For example, Petitioner explains that Ueki discloses “[a]n ultrasonic flow meter housing comprising a monolithic structure . . . includ[ing] a flow tube and a cavity . . . wherein the flow tube defines a through-going straight flow section arranged for passage of a fluid between an inlet and an outlet.” Pet. 49–50 (citing Ex. 1006 ¶¶ 1, 49, 81, 85, 87–88, Figs. 10, 11). Petitioner also explains that Ueki discloses “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.” *Id.* at 50 (citing Ex. 1006, Fig. 11). Petitioner further explains that Ueki discloses “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 50–51 (citing Ex. 1006 ¶¶ 36, 66, 88–90, Fig. 9).¹⁷

Patent Owner does not address these assertions and, therefore, has forfeited any arguments for patentability based on these uncontested limitations. *See Resp.*; *see also* Paper 11, 8 (Scheduling Order cautioning Patent Owner that “any arguments for patentability not raised in the response may be deemed waived”); *cf. In re NuVasive*, 842 F.3d 1376, 1381 (Fed. Cir.

¹⁷ Claim 11 uses slightly different language than claim 1 for the limitations directed to the at least one transducer and the measurement circuit. *Compare* Ex. 1001, 6:50–55, *with id.* at 7:28–3. Petitioner relies on its analysis for claims 1 and 5 to establish that Ueki teaches these limitations. Pet. 53; *see id.* at 51–52 (citing Ex. 1006 ¶¶ 66, 90). Neither party points to any meaningful difference between claims 1 and 11, nor does Patent Owner respond to Petitioner’s assertions that Ueki teaches the transducer and measurement circuit limitations.

2016) (explaining that a patent owner waives an argument presented in the preliminary response if it fails to renew that argument in the patent owner response during the instituted trial). Because a preponderance of the evidence supports Petitioner's arguments relating to Ueki's teachings, we adopt Petitioner's arguments as our own. *See* Pet. 47–51 (and evidence cited therein); *see also In re NuVasive*, 841 F.3d 966, 974 (Fed. Cir. 2016) (explaining that the Board need not make specific findings as to claim limitations that a patent owner fails to dispute the prior art discloses). Accordingly, Petitioner establishes by a preponderance of the evidence that Ueki anticipates claims 1 and 11.

2. *Additional Claims*

Claims 2, 5, 7, and 9 depend from claim 1, and claims 12 and 13 depend from claim 11. Ex. 1001, 6:56–58, 6:65–7:2, 7:8–10, 7:13–15, 8:4–11. Petitioner explains how Ueki discloses the additional limitations of these claims. Pet. 51–54 (citing Ex. 1006 ¶¶ 22, 36, 66, 87, 90, 92, Figs. 10, 11, 12B). Patent Owner does not contest Petitioner's arguments or evidence as to the additional limitations of claims 2, 5, 7, 9, 12, and 13 and, again, has forfeited any arguments as to the patentability of these claims, besides the arguments presented for claims 1 and 11. *See generally* Resp.; Paper 11, 8. Because a preponderance of the evidence supports Petitioner's arguments relating to Ueki's teachings, we adopt Petitioner's arguments as our own. *See* Pet. 51–54 (and evidence cited therein); *NuVasive*, 841 F.3d at 974. Accordingly, Petitioner establishes by a preponderance of the evidence that Ueki anticipates claims 2, 5, 7, 9, 12, and 13.

F. *Obviousness Grounds Based on Ueki*

Petitioner asserts five obviousness grounds against the remaining dependent claims: (1) Ueki, with or without Will, for claims 3 and 4,

Pet. 54–55; (2) Ueki, Elson, and/or Barker for claims 6 and 8, *id.* at 55–56; (3) Ueki, Will, and/or Buckberry for claim 10, *id.* at 56; (4) Ueki and Drachmann for claim 14, *id.* at 57; and (5) Ueki, Drachmann, and/or Goertz for claim 15, *id.* at 58.

Patent Owner argues that the subject matter of claims 3 and 4 would not have been obvious over Ueki. Resp. 55–57. Patent Owner also contends that the subject matter of claims 6 and 8 would not have been obvious over Ueki in view of Elson and/or Barker. *Id.* at 57–61. Patent Owner does not separately contest Petitioner’s arguments or evidence as to the obviousness of claims 10, 14, and 15. *See generally* Resp. Rather, Patent Owner contends Petitioner fails to establish that claims 10, 14, and 15 are unpatentable because Petitioner’s arguments “do not address or redress the various deficiencies in Ueki” regarding the limitations “a monolithic polymer structure being cast in one piece” and “a cavity separated from the flow tube.” *Id.* at 61.

1. Contested grounds and claims

We begin our analysis with the contested grounds and claims. We first address claims 3 and 4, and then turn to claims 6 and 8.

a) Claims 3 and 4 – Obviousness over Ueki, with or without Will

Claim 3 depends from claim 1 and further recites “wherein the cavity only has a single opening.” Ex. 1001, 6:59–60. Claim 4 depends from claim 3 and further recites “wherein a rim of the cavity is arranged for sealed connection with a cover, so that the cover and the cavity define an enclosure with only a single sealing area.” Ex. 1001, 6:61–64. Petitioner asserts that the subject matter of claims 3 and 4 would have been obvious over Ueki. Pet. 54–55.

Petitioner acknowledges that Ueki teaches a casing with an opening on each side as depicted in Figure 11 (i.e., two openings), or alternatively, discloses the entire housing, i.e., detection section 500 can be molded in one piece such that there are no openings to the cavity AS. Pet. 54–55 (citing Ex. 1006 ¶¶ 92, 96, Fig. 11). In view of these alternate disclosures, Petitioner argues, and Dr. Johnson testifies, that a person of ordinary skill in the art would have modified Ueki “such that the housing has an opening on only one side,” as a matter of design choice, thereby resulting in one casing side 21 integrally molded with central casing 22 and flow tube 10 “to simplify assembly and reduce leaking, while still permitting access to internal housing area AS with one coverable opening (defined by the perimeter of seal face GS).” *Id.* at 55 (citing Ex. 1021 ¶¶ 133–35). Petitioner further argues that even though an ordinarily skilled artisan would have had reason to modify Ueki alone to have only one cavity opening, Will’s teaching that “one cavity opening is sufficient to access the electronic components in the cavity” evidences and supports such a modification. *Id.* (citing Ex. 1002, Fig. 3; Ex. 1003, 8:14–18; Ex. 1021 ¶ 135).

Patent Owner argues that if the housing of Ueki were modified according to Petitioner’s arguments, such a housing “**could not be made** in a single mold using standard technologies.” Resp. 55–56 (citing Ex. 2010 ¶¶ 103–06). Thus, Patent Owner argues that one of ordinary skill in the art would not have been motivated to modify Ueki as Petitioner asserts, because the internal pipe would trap the resulting structure of the mold part within the housing. *Id.* at 56 (citing Ex. 2010 ¶¶ 103–06).

Patent Owner’s arguments against Ueki’s modification depend on casting the housing within a single mold. As discussed in § II.C.1 above,

however, we do not construe the limitation “cast in one piece” to require the housing to be cast in a single mold.

Turning to Petitioner’s arguments, we agree with Petitioner that it was known to make a housing with one opening as providing sufficient means “to access the electronic components in the cavity.” Pet. 55 (citing Ex. 1002, Fig. 3; Ex. 1003, 8:14–18; Ex. 1021 ¶ 135). Will teaches that the interior of the housing forms a trough that has rim 14 and lip 16 of the rim around the perimeter of the trough to provide a connection area for a lid and to define an enclosure. Ex. 1003, 4:10–14. We credit Dr. Johnson’s un rebutted testimony that the ordinary artisan would have formed the housing of Ueki with a single opening that had a rim arranged for sealed connection with a cover “in order to simplify assembly and reduce leaking, while still permitting access to the internal housing area AS with one coverable opening (defined by the perimeter of seal face GS).” Ex. 1021 ¶ 134.

Accordingly, Petitioner establishes by a preponderance of the evidence that the subject matter of claims 3 and 4 would have been obvious over Ueki and Will.

b) Claims 6 and 8 – Obviousness over Ueki in view of Elson and/or Barker

Claim 6 depends from claim 1 and further recites “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.” Ex. 1001, 7:3–7. Claim 8 depends from claim 1 and recites “further comprising a metal pocket cast into the flow tube.” *Id.* at 7:11–12. Petitioner asserts that the subject matter of claims 6 and 8 would have been obvious over Ueki in view of Elson and/or Barker. Pet. 24–27, 55–56.

For the additional limitations of both claims, Petitioner points to Elson's metal receiver 95 mounted in polymeric tube 87 with fluid flow passage 89. Pet. 25, 55–56 (citing Ex. 1012, 4:62–66; Fig. 4). Petitioner asserts that Elson discloses receiver 95 attached to tube section 87 by insert molding. *Id.* at 25 (citing Ex. 1012, 5:15–17). Petitioner further asserts that receiver 95 accommodates thermistor 115. *Id.* (citing Ex. 1012, 4:62–66). Alternatively, Petitioner points to Barker's thermally conductive enclosure 28 within housing 22 for accommodating temperature sensor 32. *Id.* at 26, 55–56 (citing Ex. 1013, 3:37–53). Petitioner asserts that Elson's receiver 95 and/or Barker's thermally conductive enclosure 28, both metal pockets, are protrusions at the inside of the flow section to engage with a temperature sensor, i.e., an associated measurement tube element. Pet. 26–27, 55–56. Petitioner argues, and Dr. Johnson testifies, that an ordinarily skilled artisan would have modified Ueki's flow meter to cast “a metal pocket, such as a thermowell, in the wall of” Ueki's flow tube, as “a well-known way of measuring the temperature of the fluid at that time.” *Id.* at 55–56 (citing Ex. 1021 ¶¶ 61, 137–38); Reply 26 (citing Ex. 1021 ¶¶ 61, 137–38).

Patent Owner responds that one of ordinary skill in the art would not have had a reason to combine the teachings of Elson or Barker with Ueki. Resp. 57. In particular, Patent Owner argues that Ueki is silent as to measuring temperature, and thus, there would have been no specific reason to modify Ueki with Elson or Barker. *Id.* at 57–58 (citing Pet. 26, 55). Patent Owner continues that Petitioner relies generally upon the arguments Petitioner presents as to the Will reference, specifically Will's “disclosed objective of measuring temperature as providing motivation for combination with Elson or Barker.” *Id.* (citing Pet. 26). Patent Owner also argues that one of ordinary skill in the art would not have had a reason to combine the

teachings of Elson or Barker with Ueki, because Elson and Barker are directed to the unrelated field of measuring blood in a human body and have “completely different design considerations.” *Id.* at 58 (citing Ex. 2011 ¶¶ 72–77¹⁸). Patent Owner further asserts that one of ordinary skill in the art would not have recognized a benefit or reason to include a measurement tube element or reflector arrangement in Ueki’s sensor due to the positioning of Ueki’s transducers. *Id.* (citing Ex. 2011 ¶ 76; Ex. 1007, 13:19–20).

Patent Owner further argues that even if an ordinarily skilled artisan would have modified Ueki as Petitioner proposes, neither Elson nor Barker discloses “protrusions or indentations on the interior surface of the flow section and engaging with a structure inserted into the inlet or outlet of the flow tube,” as claim 6 requires. *Id.* at 57, 59–61 (citing Ex. 2011 ¶¶ 73–75). Patent Owner contends that the temperature sensor and thermowell Dr. Johnson identifies do not satisfy this limitation because those structures do not measure fluid flow rate. *Id.* at 59 (citing Ex. 2011 ¶¶ 73–75). Patent Owner further asserts the flow meter resulting from the combination would not have a “measurement tube element,” because the measurement tube element of claim 6 is different from a temperature sensor. *Id.* at 59–61 (citing Ex. 1012; Ex. 1013; Ex. 2011 ¶¶ 73–75). More particularly, Patent Owner, citing Mr. Barfuss’s testimony, asserts that Elson’s and Barker’s thermowells are designed to engage a sensor supported in a separate body outside the flow tube that is then inserted into the flow tube. *Id.* at 60 (citing

¹⁸ Patent Owner’s citations to Mr. Barfuss’s declaration are to paragraphs addressing Petitioner’s grounds associated with the prior art reference Buckberry. It appears that Patent Owner intended to cite paragraphs 72–77 of Mr. Barufss’s declaration, which address Ueki and claims 3 and 4, so we instead cite those paragraphs.

Ex. 2011 ¶¶ 91–92). Thus, argues Patent Owner, “[n]either Elson nor Barker discloses [a] measurement tube element or an ultrasonic reflector arrangement inserted into the inlet or outlet of the flow tube.” *Id.* at 61 (citing Ex. 2011 ¶¶ 93, 95).

Having considered the arguments and evidence, we determine that Petitioner has the better position. We first address how both Elson and Barker disclose protrusions at the inside of the flow section serving to engage with an associated measurement tube element or an ultrasonic reflector arrangement, as claim 6 requires.

Patent Owner’s arguments to the contrary center on its constructions of claim 6’s limitations “measurement tube element” and “at the inside of the flow section serving to engage with.” Resp. 24–26, 57, 59–61. Patent Owner argues that a “measurement tube element” is “an element that is used to measure fluid flow,” and is not a temperature sensor or “anything other than [an] element used to measure . . . flow.” *Id.* at 24–25. To support this position, Patent Owner asserts the ’957 patent references a “measurement tube element” only with respect to an exemplary ultrasonic reflector arrangement that is used to measure flow. *Id.* (citing Ex. 1001, 5:12–23, Fig. 4). Patent Owner further asserts that the ’957 patent distinguishes temperature sensors from a “measurement tube element” because it discloses a temperature sensor “in the form of a metal pocket cast into the monolithic polymer structure.” *Id.* (citing Ex. 1001, 5:38–46).

Petitioner replies that “measurement tube element” is not so narrow as to be limited to an element for measuring flow or flow rate, and instead is a “flow tube element for taking a measurement.” Reply 18–19 (citing Ex. 1035 ¶¶ 49–50). According to Petitioner, “measurement tube element” is not limited to the exemplary ultrasonic reflector arrangement because

claim 6's language itself differentiates between "an associated measurement tube element *or* an ultrasonic reflector arrangement." *Id.* at 18 (citing Ex. 1001, 7:4–7). Petitioner further argues that, contrary to Patent Owner's argument, the '957 patent does not distinguish a "measurement tube element" from a temperature sensor. *Id.* at 19. Petitioner directs us to the '957 patent's disclosure that temperature sensors may be in the form of a metal pocket, but also may be provided by "other suitable means." *Id.* (citing Ex. 1001, 5:42–46). Regardless, Petitioner asserts that it is unclear how having a temperature sensor as a metal pocket distinguishes it from a measurement tube element. *Id.*

As Petitioner asserts, the language of claim 6 distinguishes between a measurement tube element and an ultrasonic reflector arrangement. Ex. 1001, 7:3–7 ("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." (emphasis added)). The written description of the '957 patent does not limit the measurement tube element to any particular device or arrangement. *See id.* at 5:12–14, 24–25, Fig. 4. And the '957 patent discusses measuring temperature using a temperature sensor mounted as "a metal pocket cast into the monolithic polymer, or by other suitable means." *Id.* at 5:38–46. Accordingly, we conclude that claim 6's "measurement tube element" is not limited to an ultrasonic reflector arrangement or an element to measure only fluid flow and can include a temperature sensor.

Next, we turn to Patent Owner's proposed construction of the phrase "at the inside of the flow section serving to engage with" as "on the interior surface of the flow section and engaging with a structure inserted into the

inlet or outlet of the flow tube.” Resp. 25 (citing Ex. 2011 ¶¶ 42–45).

Patent Owner asserts that a protrusion or indentation at the inside of the flow section must be on or part of the wall of the flow section and integral with the inside surface of the wall because the flow section is part of the flow tube, which is itself part of the monolithic polymer housing. *Id.* at 25–26.

Patent Owner also contends that the protrusions or [indentions] must “engage with a separate structure inserted into the flow section.” *Id.*

Specifically, Patent Owner argues that the claimed protrusions or indentions cannot be “structures inserted into the flow tube, nor can they be structures that are inside the flow tube wall but do not form an indentation or protrusion on the inside surface of the flow section.” *Id.* at 26.

Petitioner replies that Patent Owner is attempting to incorporate a narrowing limitation into a broader claim. Reply 20. Petitioner further argues that Patent Owner provides “no rationale, and cites no evidence, to support the assertion that the[] protrusions/indentations are limited to protrusions/indentations that engage with a structure inserted into the inlet or outlet of the flow tube.” *Id.*

According to claim 6, the protrusions or indentions are located “at the inside of the flow section,” or within the bounds of flow section. Ex. 1001, 7:4–7. Further, the protrusions or indentions “*serv[e]* to engage with an associated measurement tube element.” *Id.* (emphasis added). Thus, according to the plain language of claim 6, the limitations are satisfied as long as the protrusions or indentions are within the bounds of the flow section and are capable of engaging with a measurement tube element.

As Petitioner argues, Elson discloses receiver 95, i.e., a protrusion or metal pocket, attached to tube section 87, i.e. a flow tube. Ex. 1012, 5:15–17. Elson’s receiver 95 “extends diametrically completely across the [flow]

passage 89 of the tube section and, therefore, is located at the inside of the flow section. *Id.* at 5:5–6. Receiver 95 accommodates probe 23, which may be thermistor 115. *Id.* at 4:61–66, 5:26–28, 6:1–5. Thus, Elson’s receiver serves to engage with a measurement tube element. Mr. Barfuss acknowledges as much, testifying that Elson’s receiver can be molded into the polymeric tube section and that the receiver “protrudes inside the flow section of that tube.” Ex. 1023, 31:20–32:12. Additionally, Barker discloses thermally conductive enclosure 28, i.e., a protrusion or metal pocket, within housing 22, i.e. a flow tube, for accommodating temperature sensor 32. Ex. 1013, 3:37–53, 3:59–62. Again, Mr. Barfuss acknowledges that the “enclosure 28 protrudes inside the flow section of the tube 22.” Ex. 1023, 30:14–31:11. Accordingly, Petitioner establishes that Elson’s and Barker’s protrusions are “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.”

We now turn to Petitioner’s rationale to modify Ueki with Elson’s and/or Barker’s protrusions. We determine that Petitioner articulates sufficient reasoning with a rational underpinning to support the modification. *See KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007) (quoting *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)). Specifically, we credit Dr. Johnson’s un rebutted testimony that one of ordinary skill in the art would have appreciated that “it was very common at the time [i.e., prior to December 2009,] to also measure temperature when measuring flow.” Ex. 1021 ¶ 138; *see id.* ¶¶ 59–61 (Dr. Johnson’s testimony that Will is evidence of the desire to measure temperature when measuring flow and “[t]hough this is explicitly disclosed in Will, it is not unique to Will, as it was very common at that time to also measure temperature when measuring

flow”); *see also* Ex. 1003, 1:1–6 (Will teaching an ultrasonic measuring assembly “for measuring the flow, speed of sound, density, viscosity and/or *temperature* of flowing media” (emphasis added)); Ex. 1001, 5:38–46 (acknowledging that energy meters are a type of flow meter that measures temperature). Thus, Patent Owner’s argument about Ueki’s “silen[ce] with respect to measuring temperature” is unavailing because the art teaches that it was known to measure temperature when measuring flow.

Patent Owner’s arguments that Elson and Barker are directed to unrelated fields, i.e., nonanalogous, and that an ordinarily skilled artisan would not have considered them in modifying a flow meter are also unavailing. Resp. 58. Patent Owner admits that “Elson is *a system for sensing a characteristic of fluid flowing* to or from the body of a human” and “Barker is a fluid temperature sensor for use in a cardiovascular *flow measuring system.*” *Id.* at 40 (emphasis added). Therefore, Patent Owner admits that Elson and Barker are directed to sensing or measuring fluid flow and fluid flow characteristics such as temperature. Accordingly, we find that Elson and Barker are at least in the same field of endeavor as the ’957 patent, i.e., fluid flow measuring systems. *See In re Bigio*, 381 F.3d 1320, 1325 (Fed. Cir. 2004) (setting forth the tests that define the scope of analogous prior art).

Patent Owner also asserts, and Mr. Barfuss testifies, that one of ordinary skill in the art would not have had a reason to add a measurement tube or reflector to Ueki because Ueki’s transducers are positioned directly opposite one another on opposing sides of the flow tube, so no modification or reflection would be necessary or desired. Resp. 58 (citing Ex. 2011 ¶ 76). This argument and Mr. Barfuss’s testimony, which appear to be based on Patent Owner’s claim construction, do not explain why the positions of the

transducers would have affected the ordinarily skilled artisan's desire to include a temperature sensor. Additionally, some of Patent Owner's argument appears to be based on bodily incorporation because Petitioner does not rely on Elson and Barker as teaching adding a reflector. *See* Pet. 26–27, 55–56. The test for obviousness “is not whether the features of a secondary reference can be bodily incorporated into the structure of the primary reference.” *MCM Portfolio LLC v. Hewlett-Packard Co.*, 812 F.3d 1284, 1294 (Fed. Cir. 2015) (quoting *In re Keller*, 642 F.2d 413, 425 (CCPA 1981)).

Accordingly, Petitioner establishes the subject matter of claims 6 and 8 would have been obvious over Ueki and Elson and/or Barker.

2. *Additional grounds and claims*

As noted above, Petitioner argues that the subject matter of claims 10, 14, and 15 would have been obvious over Ueki and additional prior art references. Claim 10 depends from claim 1, and claims 14 and 15 depend from claim 11. Ex. 1001, 7:16–17, 8:12–30. Petitioner explains how Ueki, Will, and/or Buckberry teach the additional limitations of claim 10. Pet. 56 (citing Ex. 1002, Fig. 3; Ex. 1003, 8:5–7; Ex. 1007, Fig. 4; Ex. 1021 ¶¶ 141–43). Petitioner explains how Ueki and Drachmann teach the additional limitations of claim 14. *Id.* at 57 (citing *id.* at 54–55; Ex. 1006 ¶¶ 88–89; Ex. 1009 ¶¶ 15–16, claim 2; Ex. 1021 ¶¶ 133–35, 148). And Petitioner explains how Ueki and Drachmann and/or Goertz teach the limitations of claim 15. *Id.* at 58 (citing *id.* at 28–32; Ex. 1006 ¶¶ 88–89; Ex. 1010; Ex. 1021 ¶ 152). Petitioner also provides reasons why a person of ordinary skill in the art would have modified Ueki with each of the additional references to arrive at the inventions of claims 10, 14, and 15. *Id.* at 56–58.

Patent Owner does not contest Petitioner’s arguments or evidence as to the additional limitations of claims 10, 14, and 15 apart from arguments we already address as to other challenged claims¹⁹ and, again, has forfeited any additional arguments as to the patentability of these claims. *See generally* Resp.; Paper 11, 8. Because a preponderance of the evidence supports Petitioner’s arguments relating to Ueki’s, Will’s, Buckberry’s, Drachmann’s, and Goertz’s teachings, we adopt Petitioner’s arguments as our own. *See* Pet. 56–58 (and evidence cited therein); *NuVasive*, 841 F.3d at 974. Accordingly, Petitioner establishes by a preponderance of the evidence that the subject matter of claim 10 would have been obvious over the combination of Ueki, Will, and/or Buckberry, the subject matter of claim 14 would have been obvious over the combination of Ueki and Drachmann, and the subject matter of claim 15 would have been obvious over Ueki, Drachmann and/or Goertz.

G. Remaining Grounds

Having determined that Petitioner establishes by a preponderance of the evidence that Ueki anticipates claims 1, 2, 5, 7, 9, and 11–13, and that the subject matter of claims 3, 4, 6, 8, 10, 14, and 15 would have been obvious over Ueki alone or with additional references, we do not address Petitioner’s additional grounds challenging claims 1–15. *See SAS Inst. Inc. v. Iancu*, 138 S. Ct. 1348, 1359 (2018) (holding a petitioner “is entitled to a final written decision addressing all of the claims it has challenged”); *Boston Sci. Scimed, Inc. v. Cook Grp. Inc.*, 809 F. App’x 984, 990 (Fed. Cir.

¹⁹ Claim 14 recites “the cavity only has a single opening which has been covered in a sealed manner by a cover.” As discussed in § II.F.1.a above, the combination of Ueki and Will would have rendered this limitation obvious.

2020) (nonprecedential) (“We agree that the Board need not address [alternative grounds] that are not necessary to the resolution of the proceeding.”).

III. CONCLUSION

Based on the evidence and arguments, Petitioner establishes by a preponderance of the evidence that claims 1–15 of the ’957 patent are unpatentable.²⁰

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that Petitioner establishes by a preponderance of the evidence that claims 1–15 of the ’957 patent are 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.

In summary:

| Claim(s) | 35 U.S.C. § | Reference(s)/Basis | Claim(s) shown unpatentable | Claim(s) Not shown unpatentable |
|----------------------|--------------------|----------------------------|------------------------------------|----------------------------------------|
| 1, 2, 5, 7, 9, 11–13 | 102(b) | Ueki | 1, 2, 5, 7, 9, 11–13 | |
| 3, 4 | 103(a) | Ueki, with or without Will | 3, 4 | |

²⁰ Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner’s attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding*. See 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. See 37 C.F.R. § 42.8(a)(3), (b)(2).

| Claim(s) | 35 U.S.C. § | Reference(s)/Basis | Claim(s) shown unpatentable | Claim(s) Not shown unpatentable |
|------------------|--------------------|---------------------------------------------|------------------------------------|----------------------------------------|
| 6, 8 | 103(a) | Ueki, Elson and/or Barker | 6, 8 | |
| 10 | 103(a) | Ueki, Will and/or Buckberry | 10 | |
| 14 | 103(a) | Ueki, Drachmann | 14 | |
| 15 | 103(a) | Ueki, Drachmann and/or Goertz | 15 | |
| 1–5, 7, 9–13 | 102(b) | Will ²¹ | | |
| 1–5, 7, 9–13 | 103(a) | Will, Hiss, Ueki, Buckberry, and/or Bignell | | |
| 6, 8 | 103(a) | Will, Elson and/or Barker | | |
| 14 | 103(a) | Will, Drachmann | | |
| 15 | 103(a) | Will, Drachmann and/or Goertz | | |
| 1–5, 7, 9, 11–13 | 102(b) | Hiss ²² | | |
| 6 | 103(a) | Hiss, Buckberry | | |
| 6, 8 | 103(a) | Hiss, Elson and/or Barker | | |
| 10 | 103(a) | Hiss, Will and/or Buckberry | | |
| 14 | 103(a) | Hiss, Drachmann | | |
| 15 | 103(a) | Hiss, Drachmann and/or Goertz | | |
| 1–7, 9–13, 15 | 102(b) | Buckberry ²³ | | |

²¹ As discussed in § II.G, we do not reach the grounds asserting Will as the only or the primary reference.

²² As discussed in § II.G, we do not reach the grounds asserting Hiss as the only or the primary reference.

²³ As discussed in § II.G, we do not reach the grounds asserting Buckberry as the only or the primary reference.

| Claim(s) | 35 U.S.C. § | Reference(s)/Basis | Claim(s) shown unpatentable | Claim(s) Not shown unpatentable |
|----------------------------|----------------------------|-----------------------------------|--------------------------------------------|------------------------------------------------|
| 8 | 103(a) | Buckberry, Elson and/or Barker | | |
| 14 | 103(a) | Buckberry, Drachmann | | |
| Overall Outcome | | | 1–15 | |

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