Filed: March 29, 2019

Filed on behalf of:
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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TOYOTA MOTOR CORP. and AISIN SEIKI CO., LTD.,

Petitioners,

v.

INTELLECTUAL VENTURES II LLC,

Patent Owner.

Case No. IPR2017-01495
U.S. Patent No. 7,928,348

PATENT OWNER INTELLECTUAL VENTURES II LLC'S NOTICE OF APPEAL TO THE U.S. COURT OF APPEALS FOR THE FEDERAL CIRCUIT

Pursuant to 28 U.S.C. § 1295(a)(4)(A); 35 U.S.C. §§ 141(c), 142, and 319; 37 C.F.R. §§ 90.2(a) and 90.3; and Rule 4(a) of the Federal Rules of Appellate Procedure, notice is hereby given that Patent Owner Intellectual Ventures II LLC ("Patent Owner") hereby appeals to the United States Court of Appeals for the Federal Circuit from the Final Written Decision of the Patent Trial and Appeal Board ("Board") entered on December 12, 2018 (Paper 36), and from all underlying orders, decisions, rulings, and opinions that are adverse to Patent Owner related thereto and included therein, including those within the Decision on Institution of *Inter Partes* Review entered on December 13, 2017 (Paper 12). A copy of the Final Written Decision (Paper 36) is attached hereto as **Attachment A**.

For the limited purpose of providing the information requested in 37 C.F.R. § 90.2 (a)(3)(ii), Patent Owner identifies that the issues on appeal include, but are not limited to: (1) the Board's judgment that claims 24–27 of U.S. Patent No. 7,928,348 are unpatentable; (2) the Board's claim constructions; and (3) all other decisions or findings of the Board that are adverse to Patent Owner.

Simultaneous with this submission, Patent Owner is electronically filing a copy of this Notice of Appeal and its Attachment A with the Patent Trial and Appeal Board. In addition, Patent Owner is electronically filing a copy of this Notice of Appeal and its Attachment A with the Clerk's Office for the United States Court of Appeals for the Federal Circuit, together with the required fees.

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

Dated: March 29, 2019

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ATTACHMENT A

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Paper No. 36
Entered: December 12, 2018

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TOYOTA MOTOR CORP. and AISIN SEIKI CO., LTD.,
Petitioner,

v.

INTELLECTUAL VENTURES II LLC,
Patent Owner.

Case IPR2017-01495
Patent 7,928,348 B2

Before KRISTEN L. DROESCH, JOHN A. HUDALLA, and AMANDA F. WIEKER, *Administrative Patent Judges*.

WIEKER, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

I. INTRODUCTION

A. Background

Toyota Motor Corporation and Aisin Seiki Co., Ltd. ("Petitioner") filed a Corrected Petition requesting an *inter partes* review of claims 24–27 ("challenged claims") of U.S. Patent No. 7,928,348 B2 (Ex. 1001, "the '348 patent"). Paper 7 ("Pet."). Intellectual Ventures II LLC ("Patent Owner") filed a Preliminary Response. Paper 8 ("Prelim. Resp."). We instituted an *inter partes* review of challenged claims 24–27 on two grounds of unpatentability, pursuant to 35 U.S.C. § 314. Paper 12 ("Dec. on Inst.").

After institution, Patent Owner filed a Response (Paper 19, "PO Resp.") to the Petition, and Petitioner filed a Reply (Paper 25, "Reply"). An oral hearing was held on September 18, 2018, and a transcript of the hearing is included in the record. Paper 35 ("Tr.").

We issue this Final Written Decision pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons set forth below, Petitioner has shown by a preponderance of the evidence that challenged claims 24–27 of the '348 patent are unpatentable.

B. Related Proceedings

The parties identify the following matters related to the '348 patent (Pet. 57; Paper 5, 2; Paper 10, 2; Paper 11, 2):

> *In the Matter of Certain Thermoplastic Encapsulated Electric Motors, Components Thereof, and Products and Vehicles Containing Same*, ITC Inv. No. 337-TA-1052;
>
> *In the Matter of Certain Thermoplastic-Encapsulated Electric Motors, Components Thereof, and Products and Vehicles Containing Same II*, ITC Inv. No. 337-TA-1073;
>
> *In the Matter of Certain Thermoplastic-Encapsulated Electric Motors, Components Thereof, and Products and*

Vehicles Containing Same, ITC Docket No. 3243 (complaint filed Aug. 11, 2017; withdrawn Sept. 5, 2017);

Intellectual Ventures II LLC v. Honda Motor Co., Case No. 1:17-cv-00294-LPS-CJB (D. Del.);

Intellectual Ventures II LLC v. Aisin Seiki Co., Case No. 1:17-cv-00295-LPS-CJB (D. Del.);

Intellectual Ventures II LLC v. Toyota Motor Corp., Case No. 1:17-cv-00300-LPS-CJB (D. Del.);

Intellectual Ventures II v. Toyota Motor Corp., Case No. 2:17-cv-07681 (C.D. Cal.); and

Intellectual Ventures II v. Aisin Seiki Co., Ltd., Case No. 2:17-cv-13551 (E.D. Mich.).

According to Patent Owner, the ’348 patent is also at issue in PTAB proceeding IPR2017-01538. Paper 5, 2.

C. The ’348 Patent

The ’348 patent, titled “Electromagnetic Device with Integrated Fluid Flow Path,” issued on April 19, 2011. Ex. 1001, (45), (54). The ’348 patent explains that “[e]lectromagnetic devices used in electrical products may need to be cooled to remove heat generated by operation of the device. It is well known that a fluid in the environment of the device can be used to aid cooling.” *Id.* at 1:54–57. Accordingly, the ’348 patent purports to solve the need “for an improved motor that includes an effective and practical way of using a liquid to carry heat away from the motor.” *Id.* at 2:1–3, 2:29–30.

Figure 14 of the ’348 patent is reproduced below.

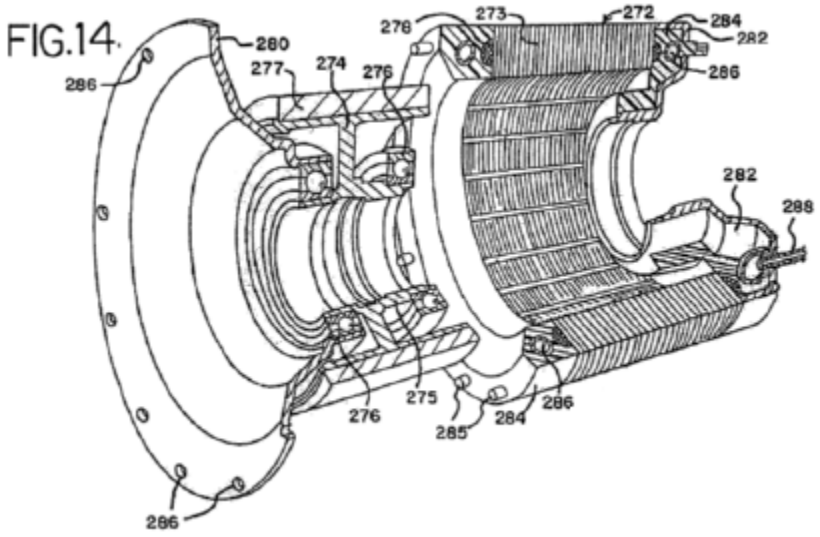


Figure 14 depicts a cross-sectional view of a motor/generator. *Id.* at 4:45–46. As shown, the motor includes rotor 274 and stator 272, which includes core 273 and conductive windings 278. *Id.* at 15:63–16:7. The ’348 patent explains that the core and windings “are substantially encapsulated by a body 284 of phase change material.” *Id.* at 16:11–13. Additionally, “[t]wo liquid-tight coolant channels 286 are also substantially encapsulated in the body 284 of phase change material,” with fittings 288 provided at the ends of the channels. *Id.* at 16:27–46.

D. Illustrative Claim

Of the challenged claims, claim 24 is independent. Claim 24 is illustrative and is reproduced below.

> 24. A fluid conveying mechanism comprising:
>
> a) an electromagnetic field-functioning device having a magnetically inducible core and at least one electrical conductor that creates a magnetic field in the core when electrical current is conducted through the conductor;

> b) a monolithic body of injection molded thermoplastic material substantially encapsulating the at least one conductor; and
>
> c) a fluid pathway at least partially embedded in and integral with the monolithic body, with at least one of a fluid inlet into the pathway and a fluid outlet from the pathway being formed in the body of injection molded thermoplastic, and the pathway through the body being confined within the body.

Ex. 1001, 25:3–26:3.

E. Applied References

Petitioner relies upon the following references (Pet. 19–29):

Zimmerman, U.S. Patent No. 3,117,526, filed Nov. 21, 1962, issued Jan. 14, 1964 (Ex. 1103, "Zimmerman");

Neal, U.S. Patent No. 6,362,554 B1, filed Dec. 22, 1999, issued Mar. 26, 2002 (Ex. 1104, "Neal");

Gould, U.S. Patent No. 2,951,650, filed Aug. 30, 1956, issued Sept. 6, 1960 (Ex. 1105, "Gould"); and

Stephan, DE 10307696 A1, filed Feb. 21, 2003, published Oct. 2, 2003 (Ex. 1109,[1] "Stephan").

Petitioner also relies upon the Declaration of David L. Trumper, Ph.D. ("Trumper Declaration," Ex. 1132), and Patent Owner relies upon the Declaration of Charles A. Garris, Jr., Ph.D. ("Garris Declaration," Ex. 2009). Additionally, the parties filed transcripts of the March 16, 2018, deposition of Dr. Trumper (Ex. 2007) and the June 13, 2018, deposition of Dr. Garris (Ex. 1138).

[1] Stephan is a German-language publication, filed with a Certificate of Translation (Ex. 1109, 33), an English-language translation (*id.* at 15–32), and the original German-language publication (*id.* at 1–14).

F. Asserted Grounds of Unpatentability

We instituted an *inter partes* review based on the following grounds. Dec. on Inst. 20–21.

References	Basis	Claims Challenged
Zimmerman, Stephan, and Neal	§ 103	24–27
Gould and Neal	§ 103	24–27

II. DISCUSSION

A. Claim Construction

In an *inter partes* review, claim terms in an unexpired patent are given their broadest reasonable interpretation in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b) (2016); *Cuozzo Speed Tech., LLC v. Lee*, 136 S. Ct. 2131, 2144–46 (2016). "Under a broadest reasonable interpretation, words of the claim must be given their plain meaning, unless such meaning is inconsistent with the specification and prosecution history." *Trivascular, Inc. v. Samuels*, 812 F.3d 1056, 1062 (Fed. Cir. 2016).

1. "monolithic body"

In our Decision on Institution, we preliminarily construed "monolithic body" as "'a body formed as a single piece,' which does not exclude a body formed by unitizing multiple pieces." Dec. on Inst. 6. We determined that the '348 patent specification provides an express definition of "monolithic": "Monolithic is defined as being formed as a single piece." *Id.* at 7 (quoting Ex. 1001, 6:5–6). We also determined that the specification's express definition did not limit the method of formation of the monolithic body, other than to require it result in "a single piece." Moreover, the '348 patent specification also describes the monolithic body as a "single unitized body," in contrast to prior art devices with "multiple parts" that resulted in "stack up

tolerances" between those parts. Ex. 1001, 11:2–9 (emphasis added); *see also* Ex. 2001 (dictionary defining "unitize" as "to form or convert into a unit"). This portion of the specification is consistent with the express definition.

In the Decision on Institution, we were not persuaded by Petitioner's contention that the '348 patent "distinguishes a 'monolithic body' from one in which multiple pieces are bonded together with glue." Pet. 17 (citing Ex. 1001, 11:53–55). The cited portion of the specification describes a first embodiment in which a monolithic body encapsulates a stator and heat pipes. Ex. 1001, 11:2–55. In this embodiment, the encapsulation achieved by the monolithic body avoids the need for glue between the stator and heat pipes. *Id.* However, that this embodiment does not utilize glue between encapsulated components has no bearing on whether glue may be used to unitize a monolithic body generally. *Compare* Ex. 1001, 11:34–41, *with id.* at 1:27–28; *see also Liebel-Flarsheim Co. v. Medrad, Inc.*, 358 F.3d 898, 906 (Fed. Cir. 2004) (citation omitted) ("Even when the specification describes only a single embodiment, the claims of the patent will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using 'words or expressions of manifest exclusion or restriction.'").

In post-institution briefing, neither party presents further evidence or argument regarding the proper construction of this phrase. PO Resp. 28 ("IV uses this construction in this IPR."); *see generally* Reply. Accordingly, we maintain our determination that "'a body formed as a single piece,' which does not exclude a body formed by unitizing multiple pieces," is the broadest reasonable interpretation of "monolithic body."

2. *"a fluid pathway at least partially embedded in and integral with the monolithic body"*

In our Decision on Institution, we preliminarily construed this limitation as "a fluid pathway at least partially (i) fixed within and formed by the material of the monolithic body or (ii) formed by a conduit fixed within and integrally surrounded by the material of the monolithic body." Dec. on Inst. 8. We determined that the '348 patent describes fluid pathways or channels formed within the monolithic body, either by removing portions of the monolithic body to create a channel, or by forming the monolithic body around a conduit, which thereafter becomes a channel. *Id.* at 8 (citing Ex. 1001, 17:40–44 ("[F]luid channels could be formed by molding channels, or machining channels after the molding."), 16:30–31 ("[A] conduit that is put in place before the body 284 is solidified."), 20:57–61 ("The flow path through the plastic could be formed by either injecting gas into the molten plastic in the mold so as to produce channels, or by molding around a plurality of conduits filled with ice or wax which could later be removed to leave an integrated flow path.")).

Although the parties' proposed constructions at the time of institution appeared to encompass the '348 patent's disclosure in this regard,[2] they also introduced additional ambiguity by ignoring the antecedent basis of "the

[2] Petitioner's proposed construction of this phrase is "a monolithic body either forms at least part of a length of a fluid pathway itself or encapsulates at least part of a length of a conduit that forms a fluid pathway." Pet. 17–18. Patent Owner's proposed construction of this phrase is "a fluid pathway that is at least partially (i) fixed within and formed by a substantial mass of the monolithic body, or (ii) a conduit fixed within, and integrally surrounded by, a substantial mass of the monolithic body." Prelim. Resp. 6–10.

monolithic body" (as in Petitioner's proposal) and by introducing imprecise language regarding "a substantial mass" (as in Patent Owner's proposal). Dec. on Inst. 9–10. As such, we declined to adopt either party's proposed construction. *Id.* at 10.

In post-institution briefing, neither party presents further evidence or argument regarding the proper construction of this phrase. PO Resp. 31 ("IV applies this construction in this IPR."); Reply 18 ("Petitioner[] agree[s] with this construction."). Accordingly, we maintain our determination that "a fluid pathway at least partially (i) fixed within and formed by the material of the monolithic body or (ii) formed by a conduit fixed within and integrally surrounded by the material of the monolithic body" is the broadest reasonable interpretation of the fluid pathway limitation.

3. "substantially encapsulating"

In its post-institution briefing, Patent Owner contends that the broadest reasonable interpretation of "substantially encapsulating," which appears in challenged independent claim 24, "includes the requirement of 'either entirely surrounding or surrounding almost all except for minor areas that might be exposed.'" PO Resp. 28–30 (citing Ex. 1001, 6:6–10, 6:53–55, Fig. 4); Ex. 2009 ¶¶ 29–32. Patent Owner notes that the Board previously construed a similar phrase, "substantially encapsulated," which appears in the claims of a different patent (U.S. Patent No. 7,154,200 B2), also owned by Patent Owner and challenged by Petitioner in IPR2017-01537. Specifically, we construed "substantially encapsulated" as including Patent Owner's proposal and also requiring that "the body of thermoplastic material and the stator are rigidly fixed together and behave as a single component with respect to harmonic oscillation motion." PO Resp. 29 n.1.

However, Patent Owner contends that the "harmonic oscillation motion" portion of the Board's construction is "not relevant to the issues at dispute in this IPR." *Id.*

Petitioner does not dispute Patent Owner's position that the broadest reasonable construction of this phrase includes the requirement of "either entirely surrounding or surrounding almost all except for minor areas that might be exposed." Tr. 58:4–13; *see also* Ex. 2006, 2 (joint claim construction positions in ITC Inv. No. 337-TA-1073). However, in applying the prior art to this limitation, Petitioner also discusses whether the prior art components are rigidly fixed together and behave as a single component with respect to harmonic oscillation vibration. Pet. 32, 47.

The '348 patent defines this term as follows:

> Substantial encapsulation means that the body 14 either entirely surrounds the stator 20, or surrounds significant areas of the stator that may be exposed. However, substantial encapsulation means that the body 14 and stator 20 are rigidly fixed together, and behave as a single component with respect to harmonic oscillation vibration.

Ex. 1001, 6:7–13. Additionally, the '348 patent describes that, in the embodiment shown in Figure 4, "heat pipe 62 is substantially encapsulated in the body 14, as the body 14 surrounds almost all of the heat pipe 62 except for the minor exposed face, and the body 14 and heat pipe 62 are rigidly fixed together, and behave as a single component with respect to harmonic oscillation vibration." *Id.* at 6:53–58.

In this case, both parties agree that "substantially encapsulating" includes "entirely surrounding or surrounding almost all except for minor areas that might be exposed." This understanding is consistent with the lexicographic definition and the cited example provided in the '348 patent.

Ex. 1001, 6:7–13, 6:53–58. However, the lexicographic definition also defines this phrase as including the concept of "rigidly fixing together, and behav[ing] as a single component with respect to harmonic oscillation vibration." *Id.* at 6:7–13. The cited example similarly reflects this concept. *Id.* at 6:53–58. Patent Owner argues that this portion of the definition is "not relevant" to the disputed issues in this proceeding. PO Resp. 29 n.1. However, that the parties do not dispute this aspect of the phrase's meaning does not alter the proper construction of the phrase. Additionally, Patent Owner provides no persuasive reasoning or evidence to support this bare attorney argument.

Thus, we construe "substantially encapsulating" in accordance with its lexicographic definition and cited example in the '348 patent specification as "either entirely surrounding or surrounding almost all except for minor areas that might be exposed, such that the elements are rigidly fixed together and behave as a single component with respect to harmonic oscillation vibration."

B. Principles of Law

A claim is unpatentable under 35 U.S.C. § 103(a) if "the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains." *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 non-

obviousness, when in evidence.[3] *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). When evaluating a combination of teachings, we must also "determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue." *KSR*, 550 U.S. at 418 (citing *In re Kahn*, 441, F.3d 977, 988 (Fed. Cir. 2006)). Whether a combination of elements produced a predictable result weighs in the ultimate determination of obviousness. *Id.* at 416–417.

"In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable." *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016). The burden of persuasion never shifts to Patent Owner. *Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015). To prevail, Petitioner must support its challenge by a preponderance of the evidence. 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d).

We analyze the challenges presented in the Petition in accordance with the above-stated principles.

C. Level of Ordinary Skill in the Art

In determining whether an invention would have been obvious at the time it was made, we consider the level of ordinary skill in the pertinent art at the time of the invention. *Graham*, 383 U.S. at 17.

Petitioner contends that a person of ordinary skill in the art ("POSITA") would have "a bachelor's degree in mechanical or electrical engineering, or an equivalent degree, and at least two years of experience in

[3] Patent Owner does not present objective evidence of non-obviousness. *See generally* PO Resp.

the design of electric motors." Pet. 14–15. Further, such a person "would be familiar with the fundamentals of electric motor design and operation, the concept of encapsulating various components in an electric motor, the types of materials that could be used for encapsulation and their thermal and dimensional properties (e.g., CLTE), and thermofluid concepts," as well as "various techniques for manufacturing encapsulated motors, including by the use of injection molding." *Id.* at 15 (citing Ex. 1132 ¶¶ 30–31).

In its Response, Patent Owner contends that a POSITA would have "a Bachelor's degree in mechanical or chemical engineering, or an equivalent degree, and at least two years of experience in the use and design of electromagnetic devices that include heat exchange mechanisms, including devices for the control of fluids." PO Resp. 32. Further, such a person "would have been familiar with the conventional types of materials used to manufacture components for such devices, and the conventional fabrication processes used in manufacturing them." *Id.* (citing Ex. 1001, 1:6–7; Ex. 2009 ¶ 23).

In its Reply, Petitioner argues that Patent Owner's instant assessment of the level of skill in the art is inconsistent with that proffered by Patent Owner at the U.S. International Trade Commission ("ITC"). Reply 2. In the ITC, Patent Owner and its expert, Dr. Hamid Toliyat, asserted that "a skilled artisan 'would have a degree in <u>electrical engineering</u>, mechanical engineering, materials engineering, manufacturing engineering and/or a related field.'" *Id.* (citing Ex. 1136 ¶¶ 26–27) (emphasis added by Petitioner); *see also id.* at 2–3 (citing, e.g., Ex. 1138, 22:12–17, 23:14–21, 24:18–22 (Dr. Garris testifying that a person with an electrical engineering degree could be a POSITA, if they had appropriate experience)).

Based upon our review of the '348 patent and the types of problems and solutions described in the '348 patent and applied prior art, we determine that an ordinarily skilled artisan would have a bachelor's degree in mechanical engineering, electrical engineering, chemical engineering, or an equivalent degree, and two years of experience in the design of electric motors and electromagnetic devices, including familiarity with the design, operation, materials, and fabrication of such devices, including their thermal and fluid characteristics.[4] Although Patent Owner disputes whether an electrical engineering degree is sufficient educational experience for a POSITA, the cited testimony does not present any persuasive or specific basis upon which to determine that an electrical engineering degree, coupled with the cited experience, would be insufficient, as compared to a mechanical or chemical engineering degree. *See* Ex. 1132 ¶¶ 30–31 (Dr. Trumper opining that a POSITA may possess an electrical engineering degree); Ex. 2009 ¶ 23 (Dr. Garris disputing only whether Dr. Trumper considered that the claims concern "electrically controlled fluid control devices," but not discussing whether an electrical engineering degree would be sufficient); Ex. 1136 ¶¶ 26–27 (Dr. Toliyat opining that a POSITA of the '348 patent may have "a degree in electrical engineering"); Ex. 1138, 22:12–17, 23:14–21, 24:18–22 (opining that a POSITA could have an electrical engineering degree).

[4] Although the parties present different characterization of the areas of subject matter familiarity of a POSITA, we determine their content to be substantially the same. *Compare* Pet. 14–15, *with* PO Resp. 32.

D. Obviousness over the Combined Teachings of Zimmerman, Stephan, and Neal

Petitioner contends that claims 24–27 of the '348 patent are unpatentable as obvious over Zimmerman, Stephan, and Neal. Pet. 29–42. For reasons that follow, we determine Petitioner has demonstrated that the challenged claims are unpatentable by a preponderance of the evidence.

1. Overview of Zimmerman (Ex. 1103)

Zimmerman is a U.S. patent titled "Portable Electric Immersion Liquid Pump." Ex. 1103, 1:3. Zimmerman's Figure 7 is reproduced below.

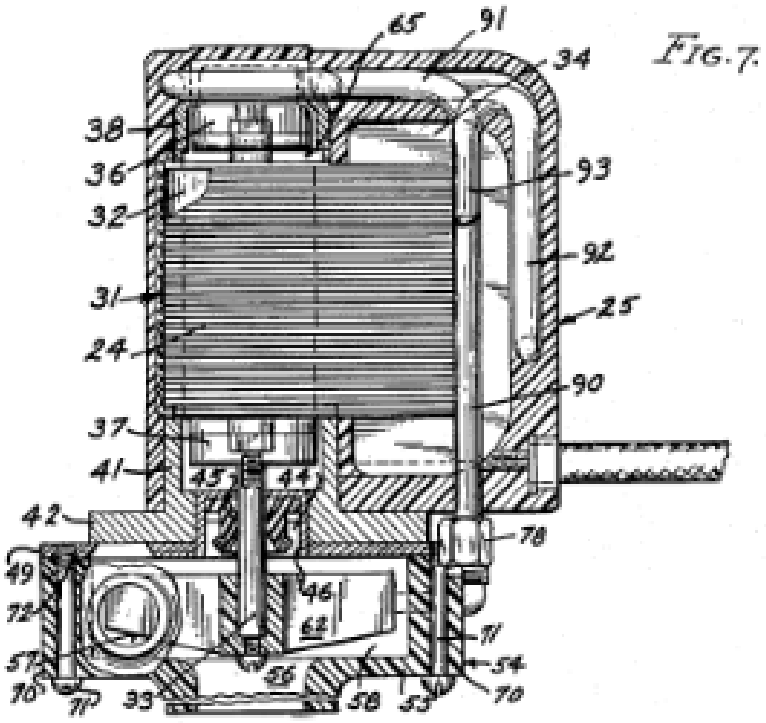


Figure 7 is a sectional view of a pumping unit. *Id.* at 2:23–28. Zimmerman's pumping unit 25 includes housing 54 and motor 31, which includes rotor 32, laminated iron field 24, and coil 34. *Id.* at 2:65–72. The pumping unit also includes serpentine cooling coil 80 (including portions 90, 91, 92), through which "a coolant fluid [flows] and absorbs the heat from adjacent bodies." *Id.* at 3:62–74; *see also id.* at Fig. 6. Zimmerman explains

that motor 31 and cooling coil 80 are "substantially covered with epoxy resin . . . [to] enclose the cooling coil 80 except for the two depending free ends," to which fittings are attached. *Id.* at 4:11–21. According to Zimmerman, "[t]he epoxy resin coating covers the non-insulated parts," which "prevent[s] moisture and liquid from contacting vital metal and moving parts." *Id.* at 4:33–35.

2. *Overview of Stephan (Ex. 1109)*

Stephan is a German patent publication titled "Feed Pump and Adjustable Feed-, Flow Control- and Shutoff Element for Fluids." Ex. 1109, (54). Stephan's Figure 2 is reproduced below.

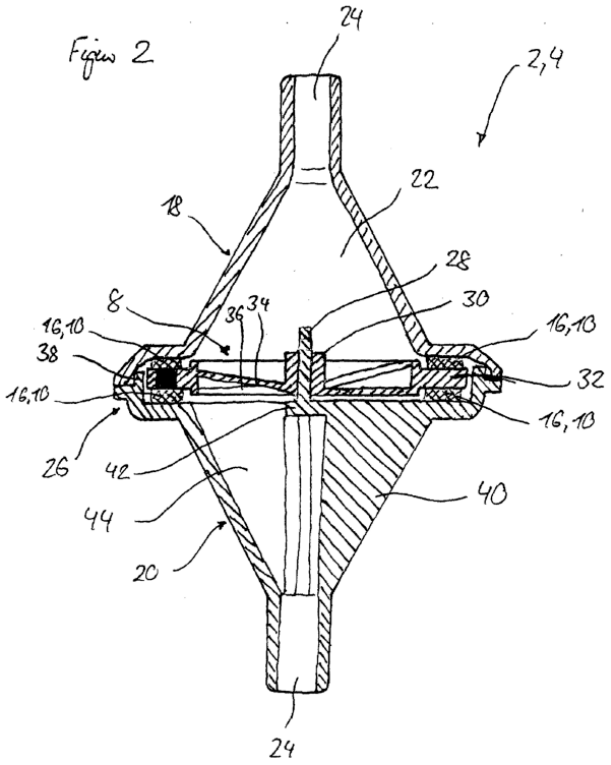


Figure 2 depicts a longitudinal section of a feed pump. *Id.* ¶¶ 15–16. As shown, pump 2 includes housing 6 (with halves 18, 20), rotor 8, and drive coils 10. *Id.* ¶¶ 21–25. Stephan explains that rotor 8 and housing halves 18, 20 may be made of injection molded synthetic material, with drive coils 10

encapsulated therein. *Id.* ¶¶ 8, 38–39, 41 (thermoplastics). Rotor speed and the feed direction of the pump are controlled by electronic activation of the drive coils 10. *Id.* ¶ 29.

3. *Overview of Neal (Ex. 1104)*

Neal is a U.S. patent titled "Stator Assembly." Ex. 1104, (54). Neal's Figure 4 is reproduced below.

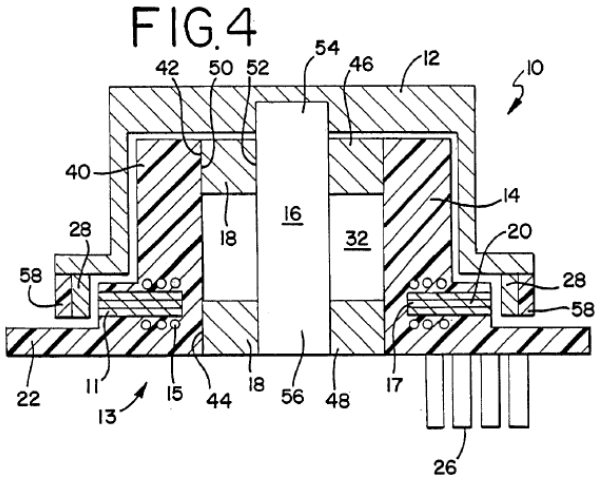


Figure 4 depicts a cross-sectional view of a motor. *Id*. at 4:8–12. As shown, stator 20 of motor 10 includes magnetically inducible core 17, with wire windings 15 on poles 21 (reference number not shown in Figure 4), which serve as conductors. *Id.* at 4:3–10, 5:5–8. Neal discloses that motor 10 includes monolithic body 14 of phase change material, for example, injection-molded thermoplastics, that substantially encapsulates the stator. *Id.* at 5:17–49, 21:24–45 (disclosing benefits of reduced costs, longer tool life, easier customization). Neal explains that the material of body 14 may "facilitate heat dissipation." *Id.* at 9:5–8. Further, "heat sinks may be conveniently encapsulated within the body 14 during the molding process." *Id.* at 9:12–20.

4. Analysis

Petitioner contends that the combined teachings of Zimmerman, Stephan, and Neal would have rendered obvious the subject matter of claims 24–27. Pet. 29–42. Patent Owner disputes Petitioner's contentions. PO Resp. 32–46.

a. Independent Claim 24

After considering the parties' arguments and evidence, we determine Petitioner has demonstrated that challenged claim 24 is unpatentable by a preponderance of the evidence.

i. "A fluid conveying mechanism"

Petitioner contends that Zimmerman discloses this limitation by disclosing "a pump including an impeller 62 that," *inter alia*, "draws liquid through an inlet 56 and . . . out through outlet pipe 57." Pet. 29–30 (citing Ex. 1103, 3:46–53, 3:59–69, Figs. 1, 7; Ex. 1132 ¶¶ 64, 65). Patent Owner does not dispute this contention. PO Resp. 29–42.

We are persuaded by Petitioner's contention, and find that Zimmerman discloses a "liquid pumping unit." Ex. 1103, 2:51. Based on Petitioner's arguments and evidence, summarized above, we find that Zimmerman teaches the subject matter of the preamble of claim 24.

ii. "an electromagnetic field-functioning device having a magnetically inducible core and at least one electrical conductor that creates a magnetic field in the core when electrical current is conducted through the conductor"

Petitioner contends that Zimmerman discloses this limitation by disclosing "an electric pump including a motor 31 with a laminated iron field 24 (core) and a field coil 34 (conductor) connected to a source of electrical current that in[t]eracts with iron magnetic material 24 to create a

magnetic field acting on the rotor 32." Pet. 30 (citing Ex. 1132 ¶ 66; Ex. 1103, 2:69–72, 4:8–24, 5:60–61, Figs. 6–7). Petitioner also contends that a POSITA would have understood this motor to be an electromagnetic field-functioning device and "that field coil 34 (conductor) necessarily creates a magnetic field in the core when electrical current is conducted through the field coil." *Id.* at 31 (citing, e.g., Ex. 1132 ¶¶ 67–70; Ex. 1124; Ex. 1125). Patent Owner does not dispute this contention. PO Resp. 29–46.

We are persuaded by Petitioner's contentions, and find that Zimmerman discloses pump unit 25 including motor 31, wherein motor 31 has laminated iron field 24 with field coil 34. Ex. 1103, 2:66–72, 5:63 ("a field of magnetic material"). Additionally, we are persuaded by Dr. Trumper's unrebutted testimony that coil 34 creates a magnetic field in the laminated iron field core when current is conducted through the coil. Ex. 1132 ¶¶ 67–70. Based on Petitioner's arguments and evidence, summarized above, we find that Zimmerman teaches this limitation of claim 24.

iii. "a monolithic body of injection molded thermoplastic material substantially encapsulating the at least one conductor"

Zimmerman

Petitioner contends that Zimmerman discloses nearly all of this limitation. Pet. 29, 31–32. Specifically, Petitioner contends that Zimmerman discloses "a monolithic body . . . substantially encapsulating the at least one conductor" because Zimmerman states that field coil 34 "is completely encapsulated in a resin sheath," and that a POSITA would have understood that the sheath and coil 34 are rigidly fixed together and behave as a single component with respect to harmonic oscillation vibration.

Pet. 31–32 (quoting Ex. 1103, 1:39–42; citing Ex. 1103, Fig. 7; Ex. 1132 ¶¶ 71–74). Patent Owner does not dispute this contention. PO Resp. 29–42.

We are persuaded by Petitioner's contentions, and find that Zimmerman discloses that laminated iron field 24 and field coil 34 "are completely encapsulated in a resin sheath." Ex. 1103, 1:13, 1:40–42. Zimmerman explains that this resin sheath "encapsulates the entire electric motor." *Id.* at 4:11–21, Fig. 2. Thus, we find that Zimmerman's sheath entirely surrounds the conductor, i.e., coil 34, or at least surrounds almost all except for minor areas that might be exposed, as required by our claim construction. *See, e.g.*, Ex. 1103, 1:40–42, Figs. 1, 2, 7; *see supra* Section II.A.3. Moreover, we are also persuaded by Dr. Trumper's unrebutted testimony that the resin sheath and coil 34 are rigidly fixed together and behave as a single component with respect to harmonic oscillation vibration. Ex. 1132 ¶¶ 71–73; *see also* Ex. 1103, Figs. 1, 2, 7.

Stephan and Neal

Petitioner acknowledges that Zimmerman does not disclose that the monolithic body comprises "injection molded thermoplastic material." Pet. 29, 32. Rather, Petitioner contends that Stephan discloses a pump housing made of "any injection-moldable thermoplastic," which may also encapsulate carrier rings 16 and drive coils 10, to avoid contact with the pumped fluid. *Id.* at 32 (citing Ex. 1109 ¶¶ 8, 39, 41; Ex. 1132 ¶ 75). Petitioner also contends that Neal discloses "a motor with a monolithic body (14 or 214) made of injection molded thermoplastic encapsulating both a conductor (wire windings 15) and a means for cooling the motor (i.e., by using heat sinks within the monolithic body)." *Id.* at 32–33. According to Petitioner, Neal explains that thermoplastic is a preferred material for

forming the monolithic body, and that injection molding is a preferred manufacturing method, because this sufficiently seals the motor components and allows for sufficient heat transfer. *Id.* at 33.

Although Patent Owner disputes the rationale for combining Stephan and Neal, Patent Owner does not dispute Petitioner's contentions regarding what Stephan and Neal disclose. *See* PO Resp. 29–42; *infra* pages 22–31.

We are persuaded by Petitioner's contentions regarding Stephan's teachings, and find that Stephan discloses a feed pump comprising housing 6, wherein the housing comprises upper and lower halves 18, 20. Ex. 1109 ¶ 22. Stephan explains that the rotor and housing halves 18, 20 may be made of "injection-molded synthetic material," and that permanent magnets of the rotor can be encapsulated by that material to avoid contact with the feed medium. *Id.* ¶¶ 8, 39. Stephan explains that a "suitable synthetic material is basically any injection-molded thermoplastic," or, alternatively, the components may be produced by "thermosetting synthetic material in a molding process." *Id.* ¶ 41.

We also are persuaded by Petitioner's contentions regarding Neal's teachings, and find that Neal discloses a spindle motor with monolithic body 14 that "substantially encapsulates the stator 20." Ex. 1104, 5:14–26. Neal explains that "body 14 is preferably formed of a phase change material," which may be either a temperature-activated material, like injection-molded thermoplastic, or a chemically-activated material, like epoxy. *Id.* at 5:27–49. Neal discloses that the ability of a particular material to dissipate heat is a factor in material selection. *Id.* at 9:5–8; *see also id.* at 6:26–49 (identifying examples of thermoplastic resins having sufficient thermal conductivity), 17:53–55 (desire for high thermal conductivity). Neal

also explains that encapsulation of the stator reduces outgassing because the stator assembly is hermetically sealed. *Id.* at 18:4–10.

Accordingly, for the reasons given above, we determine that the combined teachings of Zimmerman, Stephan, and Neal teach "a monolithic body of injection molded thermoplastic material substantially encapsulating the at least one conductor," as recited in claim 24.

Reason to Combine

In light of these teachings, Petitioner contends that it would have been obvious to form Zimmerman's monolithic body from injection-molded thermoplastic material, as taught by Stephan, based on Neal's teachings. Pet. 32 (citing Ex. 1132 ¶ 76). Specifically, Petitioner contends that Zimmerman's monolithic body seeks to provide good heat conductivity and to seal the motor components from liquid. *Id.* at 33 (citing Ex. 1103, 4:33–38). Thus, according to Petitioner, "a POSITA would be motivated to use injection molded thermoplastic . . . because *Neal '554* expresses a preference for that material to achieve the same goals that *Zimmermann* sought to achieve, i.e., heat transfer and sealing." *Id.*; *see also id.* at 33–34 (citing Ex. 1132 ¶ 79; Exs. 1112, 1126, 1127). Moreover, Petitioner argues that using injection-molded thermoplastic instead of Zimmerman's epoxy "would have required only ordinary skill and would have provided a predictable result in the eyes of a POSITA." *Id.* at 34 (citing Ex. 1132 ¶ 78).

In response, Patent Owner argues that it would not have been obvious to modify Zimmerman to utilize injection-molded thermoplastics, for three reasons. PO Resp. 32–39. First, Patent Owner argues that Zimmerman teaches a simple, gentle, gravity-fed mold casting process, which takes place at low pressure. *Id.* at 32–33. According to Patent Owner, Zimmerman's

focus on this gentle, low-pressure process would discourage and "teach[] away from injection molding," which takes place at high pressure and requires "rigidly support[ing pump components] during the molding process to avoid irreparable internal damage." *Id.* at 33–34. Second, Patent Owner argues that injection molding is more expensive than cast molding, yet would not provide advantages over cast molding. *Id.* at 34. Third, Patent Owner argues that injection molding would work poorly, because Zimmerman's sheath includes thick portions susceptible to defects during fabrication. *Id.* at 34–35.

We have considered the parties' contentions and evidence, and we are persuaded by Petitioner. Zimmerman discloses that, *inter alia*, field coil 34 is "completely encapsulated in a resin sheath." Ex. 1103, 1:39–42. According to Zimmerman, the motor components are "substantially covered with epoxy resin in fluid condition," and the epoxy resin is activated by "chemical action" between the resin and a hardener. *Id.* at 4:11–14, 4:38–43. Thus, we agree with Patent Owner that Zimmerman teaches using a thermoset—a chemically-activated epoxy resin—in a mold casting process to encapsulate the conductor. PO Resp. 32–33 (citing Ex. 2009 ¶ 98).

Stephan and Neal, however, explicitly teach that their housing and monolithic body, respectively, may be made from *either* a thermoset *or* an injection-molded thermoplastic material. *See* Ex. 1109 ¶ 41 (utilizing "any injection-molded thermoplastic," or a "thermosetting synthetic material in a molding process"); Ex. 1104, 5:27–49 ("There are two types of phase change materials that will be most useful in practicing the invention: temperature activated and chemically activated. . . . The most preferred temperature activated phase change materials are thermoplastics. The

preferred thermoplastic will become molten at a temperature at which it is injection-moldable. . . . An example of a phase change material that changes phases due to a chemical reaction, and which could be used to form the body 14, is an epoxy. Other suitable phase change materials may be classified as thermosetting materials."). Thus, the cited prior art explicitly teaches that injection-molded thermoplastic materials are known alternatives to the chemically-activated epoxy resin disclosed by Zimmerman.

Additionally, Neal explains that using injection-molded thermoplastic as an encapsulating material allows for appropriate thermal conductivity, as well as hermetic sealing. Ex. 1104, 6:26–46 (examples of thermally conductive thermoplastic resins), 9:5–20 (facilitating heat dissipation), 18:4–10 (hermetically sealed). These are the same properties sought to be realized by Zimmerman's epoxy resin sheath. Ex. 1103, 4:33–38 (explaining that the resin sheath "covers the non-insulated parts preventing moisture and liquid from contacting vital metal and moving parts . . . [and] is a liquid protector and heat transfer agent or heat conductive medium combined"); *see also* Ex. 1132 ¶ 78 (Dr. Trumper opining that a POSITA would have been motivated to use injection molded thermoplastic to form Zimmerman's body to achieve the goals articulated by Zimmerman).

Neal also identifies additional benefits associated with injection-molded thermoplastic. For example, Neal explains that "tools used to injection mold thermoplastics have a longer tool life than those used in die casting," which results in "lower costs because plastic molding tools produce more parts per hour than aluminum die casting tools" and "require less post mold machining." Ex. 1104, 21:24–45 (also explaining the process is "faster," utilizes "fewer parts," and is "modular in nature[,] . . . allow[ing]

tooling to be easily customized"). Thus, in this case, the prior art itself provides additional motivation to combine the references as proposed by Petitioner. *See, e.g.*, *WMS Gaming, Inc. v. Int'l Game Tech.*, 184 F.3d 1339, 1355 (Fed. Cir. 1999) ("The suggestion to combine [references] may be found in explicit or implicit teachings within the references themselves.").

We also credit the testimony of Petitioner's declarant, Dr. Trumper, who opines that using injection-molded thermoplastic "would have required only ordinary skill and would have provided a predictable result in the eyes of a person of ordinary skill in the art." Ex. 1132 ¶¶ 78–79. This testimony is supported by the disclosures of Stephan and Neal, which demonstrate that epoxy resin and injection-molded thermoplastics were known alternatives. Ex. 1109 ¶ 41; Ex. 1104, 5:27–49. "[W]hen a patent claims a structure already known in the prior art that is altered by the mere substitution of one element for another known in the field, the combination must do more than yield a predictable result." *KSR*, 550 U.S. at 416. Additionally, other references cited by Dr. Trumper support his testimony that injection-molded thermoplastics offered known and predictable benefits when used to form the exterior of submersible pumps. Ex. 1132 ¶¶ 78–79; Ex. 1112, 17 (explaining that injection-molding avoids separation of components); Ex. 1126, 3:56–67 (explaining that injection-molded thermoplastic material "forms a herd and essentially fuel-impervious protective shell"); Ex. 1127, 4:50–5:3 (explaining that forming the pump housing by extrusion or injection molding creates an "inexpensive housing of exceedingly high quality" and "avoids subsequent adhering or welding of components to each other").

We have considered Patent Owner's argument that Zimmerman teaches away from injection molding, but we disagree. PO Resp. 32–34. A prior art reference is said to teach away from an invention "when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant." *In re Gurley*, 27 F.3d 551, 553 (Fed. Cir. 1994). That is not the case here. Zimmerman explains that the resin sheath "harden[s] at room temperature" and "cures itself without pressure of any kind." Ex. 1103, 1:56–57, 4:18–19; Ex. 2009 ¶ 76. Thus, although Zimmerman explains that its curing process does not employ pressure, Zimmerman does *not* discourage the use of high pressure molding in any manner. *See, e.g.*, Ex. 1138, 31:19–32:19 (Dr. Garris agreeing that Zimmerman neither discusses injection molding nor states that it should not be used). Nor does Zimmerman highlight "the importance of a gentle low pressure curing process." Ex. 2009 ¶ 100. Zimmerman's factual explanation of its process, without reference to any disadvantages or concerns associated with any other process, does not teach away from other processes. *See, e.g.*, *Baxter Int'l, Inc. v. McGaw, Inc.*, 149 F.3d, 1321, 1328 (Fed. Cir. 1998) ("Baxter apparently misapprehends what it means to 'teach away' . . . . There is nothing in the [prior art device] to suggest to one of skill in the art that a similar device under radial compression with a pre-slit septum was unlikely to work. While the [prior art device] does not teach that a pre-slit septum is likely to succeed in overcoming the coring and leakage problems of the prior art, it certainly does nothing to teach away from the use of a pre-slit septum.").

Nor do we agree with Patent Owner's arguments regarding the purported lack of benefit to injection molding over cast molding. PO Resp. 34, 38. Even if injection molding may be more expensive than cast molding, as Patent Owner argues, Neal identifies numerous advantages associated with the use of injection-molded thermoplastics, including the material's thermal conductivity (Ex. 1104, 6:26–46) and ability to hermetically seal components (*id.* at 18:4–10), and the process's longer tool life, ability to produce more parts per hour, reduced post-mold machining (*id.* at 21:29–35), and modular nature that allows easy customization (*id.* at 21:40–42). Thus, even if more expensive initially, the benefits, both lost and gained, must be weighed against one another. *See* Ex. 1138, 33:7–37:7 (Dr. Garris agreeing that injection molding "absolutely" has certain benefits over cast molding in certain applications, even if "the capital cost, the up-front cost is – is very high"); Ex. 2005, 34 (identifying benefits of injection molding); *Winner Int'l Royalty Corp. v. Wang*, 202 F.3d 1340, 1349 n.8 (Fed. Cir. 2000); *In re Urbanski*, 809 F.3d 1237, 1244 (Fed. Cir. 2016). "[A] given course of action often has simultaneous advantages and disadvantages, and this does not necessarily obviate motivation to combine." *Medichem, S.A. v. Rolabo, S.L.*, 437 F.3d 1157, 1165 (Fed. Cir. 2006) (citation omitted). In light of Neal's disclosure of numerous benefits associated with the use of injection-molded thermoplastics, we do not agree that any increased cost associated with such a technique, as identified by Patent Owner, would have discouraged a POSITA from modifying Zimmerman as Petitioner proposes.

We also disagree with Patent Owner's argument that Zimmerman's sheath is not well suited for injection molding, due to its "thick portions."

PO Resp. 34–37. Patent Owner contends that a POSITA would avoid injection molding when forming thick walled components "because the molten plastic shrinks as it cools," and, as a result, "thick walls create dimples and internal voids." *Id.* at 2, 18. To support this argument, Patent Owner and Dr. Garris cite a book titled "Plastics, Materials and Processing" (Ex. 2005, hereinafter the "Plastics Book"). *Id.* at 18; Ex. 2009 ¶ 72. Patent Owner cites to Figure 12.19 of the Plastics Book, and its accompanying description, which explains that dimples may occur in thick sections of an injection-molded part, because thick sections shrink more than surrounding areas. Ex. 2005, 64. "To prevent this from occurring," the Plastics Book explains, "all sections of the part should be the same size and should be as thin as possible." *Id.* (also explaining that ribs can provide advantages over thick sections).

Notably, however, the cited pages of the Plastics Book do not indicate any specific dimensions of thickness at which dimpling becomes a problem. *See* Ex. 2005, 64–65. Rather, the Plastics Book explains that the appropriate thickness for a part "usually depends on the type of resin used," wherein "[h]igh-viscosity resins would have higher minimum thicknesses than would low-viscosity resins." *Id.* at 65. This disclosure suggests that the resin appropriate for the part's desired thickness may be chosen to avoid or mitigate the dimpling problem.

Figure 12.20 of the Plastics Book is reproduced below.

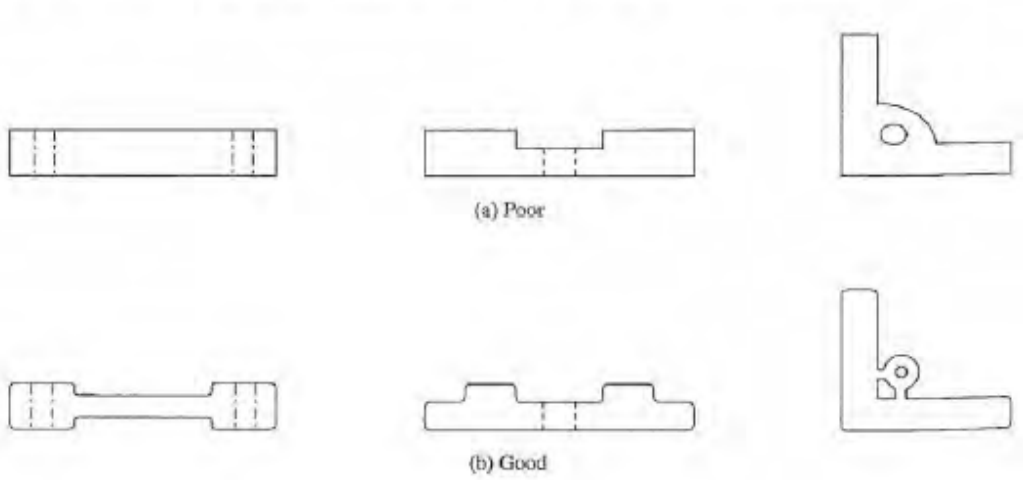


Figure 12.20 Elimination of sharp corners and redesign to make thicknesses more uniform in injection molded parts.

Figure 12.20 depicts several examples of injection-molded parts; row (a) depicts parts with a "Poor" configuration, and row (b) depicts parts with a "Good" configuration, in which sharp corners are eliminated and thicknesses are more uniform. Ex. 2005, 65. At least two of the disclosed examples deemed "Good"—the left and center examples of row (b)—depict parts in which there are relatively thinner *and thicker* portions. Thus, we disagree with Patent Owner's position that the mere presence of some thicker portions of a part renders the part unsuitable for injection molding. This is not supported by Patent Owner's cited evidence.

As related to Zimmerman, Patent Owner does not provide sufficient evidence to conclude that the relative dimensions of Zimmerman's sheath, including the portions identified by Patent Owner as "thick," are of sufficient thickness to be unsuitable for injection molding. PO Resp. 35 (providing indications of "regions of thick epoxy" in Zimmerman's Figure 6). Zimmerman does not state that its Figures are drawn to scale, and Patent Owner does not identify the dimensions of the "regions of thick epoxy" in Zimmerman's sheath. Nor does Patent Owner compare those

relative dimensions to the encapsulating bodies in, e.g., the '348 patent or Neal, in which injection molding apparently was suitable. *Compare* PO Resp. 35 (annotations to Zimmerman's Figure 6), *with* Reply 9–11 (annotations to Stephan's Figure 2, Neal's Figure 7, and the '348 patent's Figure 7, showing portions of relatively thicker thermoplastic). "[P]atent drawings do not define the precise proportions of the elements and may not be relied on to show particular sizes if the specification is completely silent on the issue." *Hockerson-Halberstadt, Inc. v. Avia Grp. Int'l., Inc.*, 222 F.3d 951, 956 (Fed. Cir. 2000).

Finally, Patent Owner generally argues that Petitioner and Dr. Trumper fail to appreciate the distinctions between thermoset materials and thermoplastic materials, or between injection molding, cast molding, and extrusion molding, including their respective benefits and the applications to which they are suited. PO Resp. 37–39. During the oral hearing, Patent Owner's counsel argued that this is fatal to Petitioner's case. *See, e.g.*, Tr. 67:10–68:2, 68:16–69:2, 71:3–73:2.

We disagree. Patent Owner has not articulated sufficiently how purported differences between these materials or fabrication methods relate to the claimed invention, and has not reconciled its arguments against the remainder of the evidence of record. For example, Patent Owner argues that "[b]ecause thermoplastics lose their strength upon reheating, a POSITA will generally avoid using a thermoplastic material for a component in an engineering application that will expose the component to significant heating." PO Resp. 13; Ex. 2009 ¶¶ 60–61. However, neither Patent Owner nor Dr. Garris tie this general principle to the specific materials, temperatures, or uses at issue in the proposed combination. Thus, there is

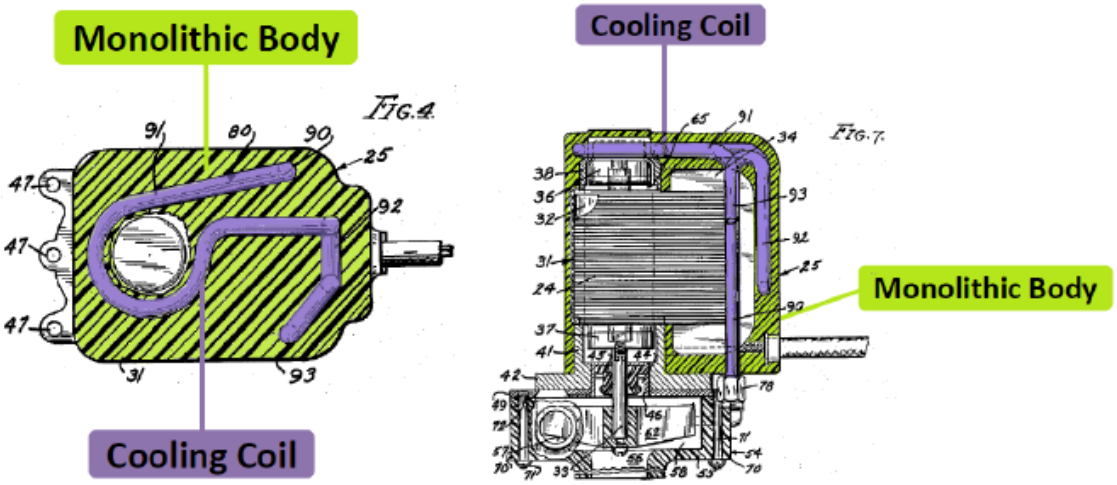
insufficient evidence in the record before us that, e.g., Zimmerman's pump operates at a temperature detrimental to the thermoplastic materials taught by Stephan and Neal. Likewise, Patent Owner and Dr. Garris fail to account for other evidence of record that shows thermoplastic materials to be beneficial at high temperature, due to their thermal conductivity, and that thermoplastics and thermosets were known to be alternative materials for certain applications. Ex. 1104, 5:27–49, 6:26–46; Ex. 1109 ¶ 41.[5]

For the foregoing reasons, having considered the parties' arguments and evidence, Petitioner has shown that a person of ordinary skill in the art would have had reason to combine Zimmerman, Stephan, and Neal, in the manner proposed, to reach the recited "monolithic body of injection molded thermoplastic material substantially encapsulating the at least one conductor."

iv. "a fluid pathway at least partially embedded in and integral with the monolithic body"

Petitioner contends that Zimmerman discloses this limitation because Zimmerman discloses that "cooling coil 80 is embedded in and integral with the monolithic body," and that "the monolithic body encapsulates at least part of a length of conduit that forms a fluid pathway." Pet. 34 (citing, e.g., Ex. 1103, 1:22–29, 1:42–46, 5:1–6; Ex. 1132 ¶ 81). Petitioner also explains that the coil is "embedded within the resin sheathed coating," and that a coolant fluid passes therethrough. *Id.* at 35 (citing, e.g., Ex. 1103, 3:67–69; Ex. 1132 ¶ 82). Petitioner provides annotated versions of Figures 4 and 7 of Zimmerman, which are reproduced below. Pet. 35.

[5] As discussed above, we disagree with the arguments that injection molding is expensive and unsuitable for thick portions. PO Resp. 16–18, 37–39.



Zimmerman's Figure 4 depicts a top view of the pumping unit, and Figure 7 depicts a vertical sectional view. Ex. 1103, 2:34–35, 2:45–46. The annotations reproduced above indicate, through green shading, the resin that forms the monolithic body, in which cooling coil 80 is encapsulated, shaded in purple. *Id.*; *see also* Tr. 49:12–13 ("The fluid pathway in Zimmerman is in the form of copper tubing that's embedded or encapsulated in the resin body."). Patent Owner does not dispute this contention. PO Resp. 29–46.

We are persuaded by Petitioner's contentions, and find that Zimmerman discloses "a serpentine type copper cooling coil embedded within the resin sheathed coating." Ex. 1103, 1:24–27, 3:67–69 ("coolant fluid"). Thus, we find that Zimmerman's copper coil 80 is "a fluid pathway at least partially . . . formed by a conduit that is fixed within and integrally surrounded by the material of the monolithic body," and through which fluid flows. *See* Pet. 35 (purple annotations identifying a conduit fixed within and surrounded by the material of the monolithic body); *see also* Ex. 1103, 1:42–45, 4:14–18, Figs. 4, 6, 7; *see supra* Section II.A.2. Based on Petitioner's contentions and evidence, summarized above, we find that Zimmerman teaches this limitation of claim 24.

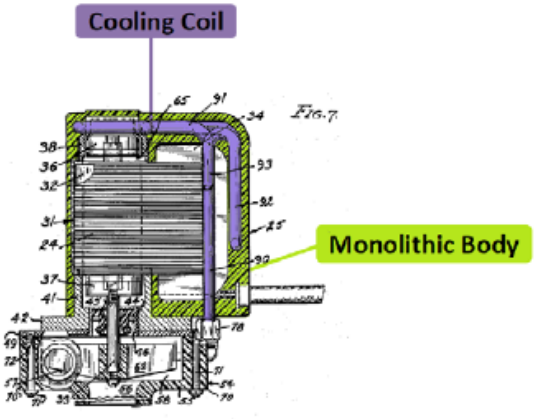
v. "*at least one of a fluid inlet into the pathway and a fluid outlet from the pathway being formed in the body of injection molded thermoplastic*"

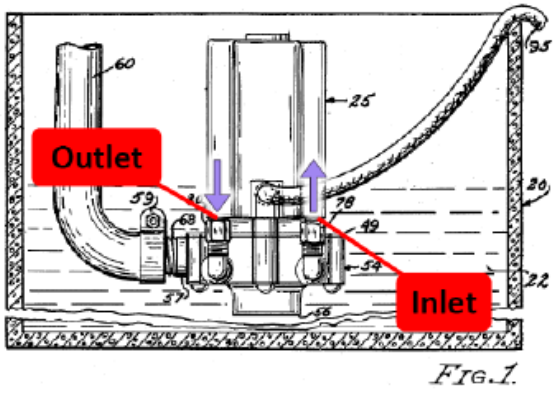
Petitioner provides alternative contentions regarding this limitation, arguing, first, that Zimmerman discloses this limitation (Pet. 36), or, alternatively, that this limitation would have been obvious over Zimmerman and Stephan (*id.* at 36–37). We address these contentions in turn.

Zimmerman

Petitioner contends that Zimmerman discloses that "the monolithic body includes openings for an inlet and an outlet of cooling coil 80," such that liquid is forced "into coil 80 which is embedded in the monolithic body, and then back out of coil 80 through passageway 77." Pet. 36 (citing Ex. 1103, 3:59–67). Thus, according to Petitioner, "the monolithic body necessarily includes within it an inlet and an outlet where fluid enters and exits the embedded fluid channel." *Id.* (citing Ex. 1132 ¶ 84).

Petitioner provides annotated versions of Figures 1 and 7 of Zimmerman (Pet. 36), which are reproduced below.





Zimmerman's Figure 1 depicts a side elevation of the pumping unit, and Figure 7 depicts a vertical sectional view. Ex. 1103, 2:23–24, 2:45–46. Annotated Figure 7 indicates, through green shading, the resin that forms the

monolithic body, in which cooling coil 80, through purple shading, is encapsulated; annotated Figure 1 indicates, in red, the inlet and outlet formed in the monolithic body, through which the cooling coil—and the liquid inside it—pass (purple). *Id.*

Patent Owner argues that Zimmerman's cooling coil 80 does not include an inlet and outlet "formed in" the monolithic body because coil 80 is "a separate structure made of copper; it is not made of the resin that forms the epoxy sheath." PO Resp. 39 (citing Ex. 2009 ¶ 109), 42. Patent Owner cites Zimmerman's disclosure that the free ends of Zimmerman's coil extend out of the monolithic body; thus, Patent Owner contends that the inlet and outlet are not "formed in" that body. *Id.* at 43. Additionally, Patent Owner argues that "the fluid inside the copper coil does not contact the epoxy covering." *Id.* (citing Ex. 2007, 47:15–16).

We have considered the parties' arguments and cited evidence, and we agree with Patent Owner. Petitioner argues that coil 80 is the claimed pathway, and that the encapsulating resin sheath is the claimed body. Zimmerman explains that coil 80 is embedded within the encapsulating resin sheath, "except for the two depending free ends thereof, later assembled with the tube fittings 78 and 81 screw threaded in exterior ends of passageways 76 and 77." Ex. 1103, 1:24–26, 4:14–18, Fig. 6. Thus, the two ends 90, 93 of cooling coil 80 extend out of the encapsulating resin sheath, and are attached to two tube fittings 78, 81. *Id.*; *see also* PO Resp. 42. Those fittings 78, 81 then connect to passageways 76, 77, which connect to pump housing 54 and impeller cavity 56. *Id.* at 3:46–74, 4:14–18, Figs. 5–6.

Thus, Zimmerman makes clear that the coil's ends "extend out of the epoxy resin." Although Petitioner may be correct that "the monolithic body

necessarily includes within it an inlet and an outlet where fluid enters and exits the embedded fluid channel," that is not what is required by the claim. Pet. 36. Rather, the claim limitation requires that an inlet "into the pathway," and a fluid outlet "from the pathway," be "formed in the body of injection molded thermoplastic." The noted portions of Zimmerman's sheath do not form an inlet *into*, or an outlet *from*, coil 80.

Accordingly, Petitioner has not shown that Zimmerman alone teaches or suggests "at least one of a fluid inlet into the pathway and a fluid outlet from the pathway being formed in the body of injection molded thermoplastic," as recited in claim 24.

Zimmerman and Stephan

Petitioner alternatively contends that it would have been obvious "to manufacture the inlet and outlet out of the monolithic body material based on the teachings of *Stephan*," namely, Stephan's teaching of line connections 24, which are formed from the same thermoplastic material that forms housing 18, 20. Pet. 36–37 (citing Ex. 1109 ¶ 23, Fig. 2; Ex. 1132 ¶ 85). In light of these teachings, Petitioner alleges that a "POSITA would have used the injection molded thermoplastic material to form a connection between the ends of cooling coil 80 and tube fittings 78 and 81." *Id.* at 37. According to Petitioner, this would "provide a monolithic construction with captive fasteners, which would provide the benefit of easier assembly and create a flush connection to the cooling coil 80." *Id.* Petitioner also contends that this "would result in a simpler construction with fewer parts and with easier manufacturing and assembly" and would be a well-known substitution. *Id.* at 38 (citing Ex. 1132 ¶ 85).

With respect to this argument, Patent Owner contends that "a POSITA would have recognized that forming the inlet and outlet in the sheath, instead of using coil 80, would significantly increase the difficulty of fabricating the monolithic body," because this would require modifying Zimmerman's casting mold to include a more complex shape with a conduit-shaped inlet and outlet. PO Resp. 44–45 (citing Ex. 2009 ¶ 119).[6] Patent Owner also argues that Zimmerman already discloses a coil that effectively directs fluid within the sheath, and that having a "flush connection to the cooling coil 80," as proposed by Petitioner, "is not superior to *Zimmerman's* design." *Id.* at 45 (also arguing that Petitioner does not identify advantages) (citing Ex. 2009 ¶ 120). Finally, Patent Owner argues that this would not be a simple substitution. *Id.* (citing Ex. 2009 ¶¶ 121–122).

We have considered the parties' arguments and cited evidence regarding Petitioner's alternative contention, and we are persuaded by Petitioner's arguments and supporting evidence. As discussed above, Zimmerman explains that the "epoxy resin will enclose the cooling coil 80 except for the two depending free ends thereof, later assembled with the tube fittings 78 and 81 screw threaded in exterior ends of passageways 76 and 77." Ex. 1103, 4:14–18, Fig. 6. Thus, prior to the currently-proposed modification, the ends 90, 93 of coil 80 extend out of Zimmerman's resin

[6] We do not address again Patent Owner's arguments that it would not have been obvious to modify Zimmerman to include injection-molded thermoplastic (PO Resp. 43), or that Stephan's housing varies from Zimmerman in that it performs a different function and includes thinner walls than Zimmerman's encapsulating sheath (*id.* at 44). *See supra* Section II.D.4.a.iii.

sheath. As also discussed above, coil 80 is a "fluid pathway," as properly construed.

Stephan teaches that the thermoplastic material forming external pump housing 18, 20 extends in opposite directions, and directly forms line connections 24, from the top and bottom of the housing halves. Ex. 1109 ¶ 23, Fig. 2. Stephan explains that line connections 24 "can have a design such as, for example, also as a connecting flange or as a hose connection or the like." *Id.*

In light of this teaching of Stephan and Dr. Trumper's testimony, we are persuaded that it would have been obvious to modify Zimmerman such that the injection-molded, thermoplastic, encapsulating sheath connects free ends 90, 93 of cooling coil 80 to the tube fittings 78, 81, rather than having the free ends 90, 93 of cooling coil 80 extend out of the encapsulating sheath before being connected to the fittings. As Dr. Trumper testifies, this "would provide a monolithic construction with captive fasteners, which would provide the benefit of easier assembly, . . . create a flush connection to the cooling coil 80," and "result in a simpler construction with fewer parts and with easier manufacturing and assembly." Ex. 1132 ¶ 85. Dr. Trumper's testimony is credible, and the benefits about which he opines appear predictable, when the free ends of coil 80 are moved into the monolithic body, instead of protruding therefrom. For example, we credit Dr. Trumper's testimony that manufacturing and assembly would be easier, for example, when fittings 78, 81 are connected to the encapsulating resin body, as proposed, rather than being connected to exposed free ends 90, 93 of the coil, extending from the body. In this modification, the inlet to, and

outlet from, the pathway (i.e., coil 80) are formed in the body of injection molded thermoplastic.

We have considered Dr. Garris's competing testimony that "[h]aving a flush connection to the cooling coil 80 is not superior to *Zimmerman's* design, and Dr. Trumper identifies no such advantages." Ex. 2009 ¶ 120; *see also* PO Resp. 45. However, Dr. Garris does not explain the basis for his opinion. For example, Dr. Garris neither explains *why* Zimmerman's existing design is preferable to a flush connection, nor weighs the numerous advantages offered by Dr. Trumper: "easier assembly," "simpler construction," "fewer parts," or "easier manufacturing and assembly." As such, weighing the competing testimony of both declarants, we find Dr. Trumper to be more persuasive, given the lack of supporting basis for Dr. Garris's opinion.

We disagree with Patent Owner's argument that the proposed modification would not have been obvious to a POSITA because it would require modifying Zimmerman's casting mold to include a more complex shape with a conduit-shaped inlet and outlet. PO Resp. 45 (citing Ex. 2009 ¶ 119). This argument ignores the fact that, under Petitioner's proposed modification, Zimmerman's resin sheath would be formed of *injection-molded* thermoplastic—casting molds would not be used. *See supra* Section II.D.4.iii. As such, this argument is not responsive to the proposed ground of unpatentability. Moreover, the evidence of record suggests that injection molding is well-suited to the formation of complex shapes. Ex. 2005, 34 (explaining that "injection molding makes discrete parts that can have [a] complex and variable cross section").

Finally, we disagree with Patent Owner's argument that this would not be a simple substitution. PO Resp. 45 (citing Ex. 2009 ¶¶ 121–122). In paragraph 121 of his declaration, Dr. Garris states that "[s]imply because an engineering design or process is known, that does not mean that the design or process is a satisfactory 'substitute' for another design or another process. Whether two elements may qualify as substitutes depends on their suitability to address the specific design problem being addressed." Ex. 2009 ¶ 121. Although this statement may be true, Dr. Garris does not address the facts of Petitioner's proposed modification. For example, Dr. Garris does not dispute that connecting Zimmerman's coil 80 to tube fittings 78, 81 with the resin sheath, rather than through Zimmerman's existing structure, would suitably solve the design problem. Nor does Dr. Garris explain why these would not be simple substitutes. By contrast, Dr. Trumper identifies a similarly formed line connection in the prior art (Ex. 1132 ¶ 85), and explains why such an arrangement would be a desirable and obvious substitute if employed in Zimmerman's sheath (*id.*).[7] As such, on the record before us, we determine Dr. Garris's testimony in this regard is conclusory and entitled to little weight. 37 C.F.R. § 42.65(a).

For the reasons given above, Petitioner has demonstrated that the recited "at least one of a fluid inlet into the pathway and a fluid outlet from the pathway being formed in the body of injection molded thermoplastic" would have been obvious over Zimmerman and Stephan.

[7] Likewise, in paragraph 122 of his declaration, Dr. Garris concludes that "[i]t is my opinion that a POSITA would not find it obvious" to modify Zimmerman as proposed, but again, does not explain any basis for that opinion. Ex. 2009 ¶ 122.

vi. "the pathway through the body being confined within the body"

Petitioner contends that Zimmerman discloses this limitation because "cooling coil 80 is embedded in and confined within the monolithic body," and "the monolithic body encapsulates at least part of a length of a conduit that forms a fluid pathway." Pet. 37. Patent Owner does not dispute this contention. PO Resp. 29–46.

We are persuaded by Petitioner's contention. In the modification proposed by Petitioner (Pet. 36–37), wherein the thermoplastic material of Zimmerman's (modified) monolithic body is used to form an internal connection between the ends of cooling coil 80 and tube fittings 78 and 81, the cooling coil 80 would have been confined within the monolithic body.

b. Claim 25

Claim 25 recites that "the device is operable to power fluid conveyance through the mechanism and at least a portion of the fluid conveyed by the mechanism passes through the fluid pathway in the monolithic body." Ex. 1001, 26:5–8. Petitioner contends that Zimmerman teaches the limitations of claim 25. Pet. 39–40. Patent Owner does not dispute Petitioner's contentions. *See generally* PO Resp.

We are persuaded by Petitioner's contention, and find that Zimmerman discloses pump 20 with impeller 62 that powers fluid conveyance through the mechanism, as claimed. Pet. 39–40; Ex. 1103, 3:46–53, 3:59–69; Ex. 1132 ¶¶ 91–94. Zimmerman also explains that a portion of the liquid conveyed by the pump passes through the fluid pathway. Ex. 1103, 3:59–69 ("[A] minor portion of the liquid is forced out the outlet passage 76, through the tube fitting 78, through a serpentine duct, or coil of tubing 80, through the tube fitting 81 and through the passageway

77 where it is again within the impeller cavity 56."). In this manner, the liquid passes through coil 80, which is embedded in the encapsulating resin sheath. Based on Petitioner's contentions and evidence, summarized above, we find that Zimmerman teaches this limitation of claim 25.

c. Claim 26

Claim 26 recites that "the mechanism is selected from the group consisting of valves, pumps and blowers." Ex. 1001, 26:9–11. Petitioner contends that Zimmerman teaches this limitation. Pet. 40. Patent Owner does not dispute Petitioner's contentions. *See generally* PO Resp.

We are persuaded by Petitioner's argument. Zimmerman discloses pump 20, as claimed. Pet. 40; Ex. 1103, 1:11–12; Ex. 1132 ¶ 96. Based on Petitioner's contentions and evidence, summarized above, we find that Zimmerman teaches this limitation of claim 26.

d. Claim 27

Claim 27 recites that "said at least one of a fluid inlet and a fluid outlet is in the form of a plumbing fitting." Ex. 1001, 26:12–14. Petitioner contends, *inter alia*, that the combined teachings of Zimmerman and Stephan render obvious the limitations of claim 27. Pet. 40–42. Patent Owner does not dispute Petitioner's contentions. *See generally* PO Resp.

Petitioner contends that, based on Stephan's teaching regarding line connections 24 (*see supra* Section II.D.4.a.v.), "a POSITA would have found it obvious to manufacture the inlet and outlet out of the monolithic body material," and "to extend the injection molded thermoplastic material over the ends of cooling coil 80 such that the thermoplastic material extensions would form line connections to connect with tube fittings 78 and 81, or directly with [coil] 80." Pet. 41–42. Petitioner contends that, in such

a configuration, a POSITA would understand that these connectors are plumbing fittings, including threaded connections, "to be a standard way of providing inlets and outlets to the fluid pathway." *Id.* at 42.

We are persuaded by Petitioner's arguments. As discussed above in Section II.D.4.a.v., Petitioner has shown that it would have been obvious to modify Zimmerman's encapsulating sheath to connect free ends 90, 93 of cooling coil 80 to the tube fittings 78, 81, based on Stephan's teaching regarding line connections 24 integrally formed of the same material as the pump housing. We determine that, in such a modification, the connections, as taught by Stephan, are "plumbing fittings," because they would engage with the threads of Zimmerman's tube fittings 78, 81. Ex. 1103, 4:14–18 (noting that tube fittings 78, 81 are "screw threaded"); Ex. 1109 ¶ 23 (nothing that line connections may have "a connecting flange" or "a hose connection"); Ex. 1132 ¶ 99.

5. Summary

Upon consideration of the parties' arguments and cited evidence, we determine that Petitioner has shown, by a preponderance of the evidence, that the subject matter of claims 24–27 would have been obvious over the combined teachings of Zimmerman, Stephan, and Neal.

E. Obviousness over the Combined Teachings of Gould and Neal

Petitioner contends that claims 24–27 of the '348 patent are unpatentable as obvious over Gould and Neal. Pet. 43–56. For reasons that follow, we determine Petitioner has demonstrated that the challenged claims are unpatentable by a preponderance of the evidence.

1. Overview of Gould (Ex. 1105)

Gould is a U.S. patent titled "Garbage Grinder." Ex. 1105, 1:5. Gould's Figure 1 is reproduced below.

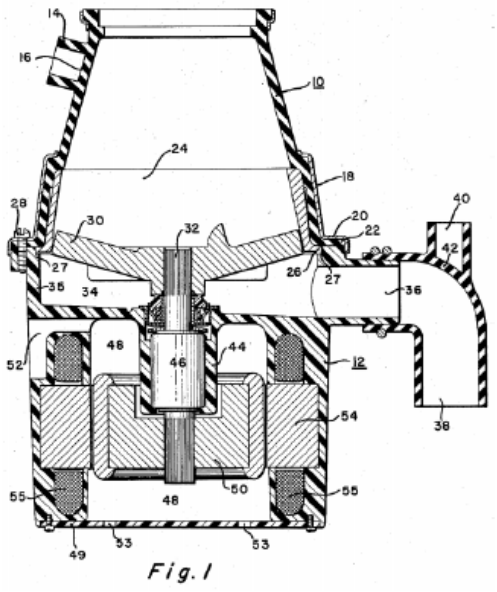


Fig. 1

Figure 1 depicts a waste disposal unit. *Id.* at 1:44–45. Gould discloses a waste disposal unit including upper and lower housings 10, 12. *Id.* at 1:55–58. Gould explains that lower housing 12 is a "moldable plastic or resilient material having the property of withstanding the heat generated in operation of the disposal." *Id.* at 2:14–22. Gould also discloses that "rotor 50 of an electric motor" is housed in lower housing 12 and "stator [54] of the electric motor," with windings 55, "is embedded in the moldable plastic material of lower housing 12." *Id.* at 2:35–45.

2. Analysis

Petitioner contends that the combined teachings of Gould and Neal would have rendered obvious the subject matter of claims 24–27. Pet. 43–56. Patent Owner disputes Petitioner's contentions. PO Resp. 46–56.

a. Independent Claim 24

After considering the parties' arguments and evidence, we determine Petitioner has demonstrated that challenged claim 24 is unpatentable by a preponderance of the evidence.

i. "A fluid conveying mechanism"

Petitioner contends that Gould discloses this limitation by disclosing "a garbage grinder for conveying waste material from a sink and/or a dishwasher to a sewer line." Pet. 43–44 (citing Ex. 1105, 1:15–17, 1:57–60, 2:2–13, 2:23–39, 2:48–51; Ex. 1132 ¶ 102). Patent Owner does not dispute this contention. PO Resp. 46–56.

We are persuaded by Petitioner's contention. Gould discloses a "waste disposal unit," having lower housing 12 connectable to a drain connection and sewer line. Ex. 1105, 1:16, 2:23–28.

ii. "an electromagnetic field-functioning device having a magnetically inducible core and at least one electrical conductor that creates a magnetic field in the core when electrical current is conducted through the conductor"

Petitioner contends that Gould discloses this limitation by disclosing "a motor with stator 54 (core) including windings 55 (conductor)." Pet. 44 (citing Ex. 1105, 2:36–46). Petitioner also contends that a POSITA would have understood this motor to be an electromagnetic field-functioning device and "that windings 55 (conductor) necessarily create[] a magnetic field in the core during motor operation, as a result of electricity being supplied to the windings 55." *Id.* at 45 (citing, e.g., Ex. 1132 ¶¶ 105–107; Ex. 1130). Patent Owner does not dispute this contention. PO Resp. 46–56.

We are persuaded by Petitioner's contention, and find that Gould discloses that the waste disposal unit includes upper and lower housings 10,

12, wherein lower housing 12 includes, *inter alia*, a "stator of the electric motor [54] . . . having windings 55." Ex. 1103, 1:53–57, 2:40–45. Additionally, we are persuaded by Dr. Trumper's unrebutted testimony that windings 55 create a magnetic field in the core during operation. Ex. 1132 ¶¶ 105–106. Based on Petitioner's contentions and evidence, summarized above, we find that Gould teaches this limitation of claim 24.

iii. "a monolithic body of injection molded thermoplastic material"

Petitioner contends that Gould discloses "a monolithic body of . . . molded thermoplastic material" because Gould discloses that lower housing 12 (the "monolithic body," as claimed) may be molded from polyethylene, a thermoplastic material. Pet. 46 (citing Ex. 1105, 2:14–19, 2:43–46; Ex. 1131, 1–56; Ex. 1001, 7:36–55). Moreover, Petitioner contends that although Gould does not specify that the monolithic body is *injection* molded, this would have been obvious in light of Neal's teachings of an injection-molded monolithic body that encapsulates a conductor and the means for cooling the motor. Pet. 48. According to Petitioner, a POSITA would have made such a modification because Neal expresses a preference for injection molding, and the modification simply would have applied "a known technique to improve a similar device in the same way, to achieve the same goals, with predictable results." *Id.* at 48–49 (citing Ex. 1104, 5:5–26, 5:27–48, 6:26–59, 9:5–20, 14:27–30, 17:53–58, 21:24–46; Ex. 1128 ¶¶ 11, 27, 28, 30, 32; Ex. 1129; Ex. 1132 ¶¶ 112–115). Patent Owner does not dispute Petitioner's contentions. PO Resp. 46–56.

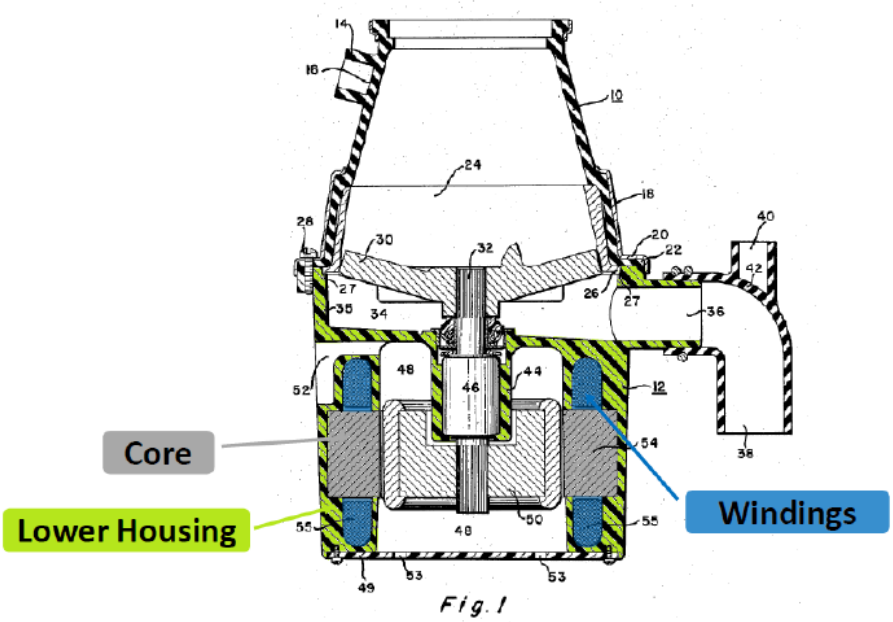
We are persuaded by Petitioner's contentions, and find that Gould discloses that lower housing 12 "is preferably formed of any suitable moldable plastic or resilient material having the property of withstanding the

heat generated in operation of the disposal." Ex. 1105, 2:14–17. Gould lists polyethylene, a known thermoplastic, as an exemplary material. *Id.* at 2:17–19; Ex. 1131, 16 (explaining that polyethylene was discovered in 1933, and the first commercial plant began operation in 1939).

Moreover, although Gould does not disclose that this material is injection molded, we determine that such a modification would have been obvious to a POSITA. As discussed above, *see supra* Section II.D.4.iii., Neal discloses a spindle motor with a monolithic body 14 that "substantially encapsulates the stator 20." Ex. 1104, 5:14–26. Neal explains that the body may be formed by injection-molded thermoplastic. *Id.* at 5:27–49. Neal explains that this material dissipates heat and forms a hermetic seal. *Id.* at 9:5–8, 18:4–10. In light of these teachings, we credit Dr. Trumper's unrebutted testimony that it would have been obvious to a POSITA to injection mold the thermoplastic material of Gould's lower housing, because this was a well-known molding technique and would have improved Gould's similar device in the same way as Neal's, to achieve predictable results, i.e., heat dissipation and hermetic sealing. Ex. 1132 ¶¶ 112–115. Accordingly, for the foregoing reasons, Petitioner has shown that this limitation of claim 24 would have been obvious over the combined teachings of Gould and Neal.

iv. "a monolithic body . . . substantially encapsulating the at least one conductor"

Petitioner contends that Gould discloses this limitation. Pet. 46–47. Petitioner provides an annotated version of Figure 1 of Gould (Annotated Figure 1-A), which is reproduced below.



Pet. 46–47. According to Petitioner, Annotated Figure 1-A shows that windings 55 are "fully encapsulated" by lower housing 12. *Id.* at 46. Petitioner also contends that a POSITA would recognize that Gould's "lower housing 12 and windings 55 are rigidly fixed together and would behave as a single component with respect to harmonic oscillation vibration." *Id.* at 47 (citing Ex. 1132 ¶ 108).

Patent Owner disputes Petitioner's contentions. PO Resp. 46–49. Patent Owner argues that "*Gould* does not disclose precisely how much of the windings 55 are covered by the material of the lower housing 12," and that a POSITA would understand that "significant portions of the windings are uncovered." *Id.* at 46 (citing Ex. 2009 ¶ 124). Patent Owner relies on Dr. Garris's testimony that "[m]uch of the surface area of the windings disappears within the hollow interior of stator core 54. *Gould* does not teach that the lower housing material extends within the interior of the stator core." Ex. 2009 ¶ 125; PO Resp. 47–48. To support this statement, Dr. Garris explains that although Gould does not disclose the type of electric

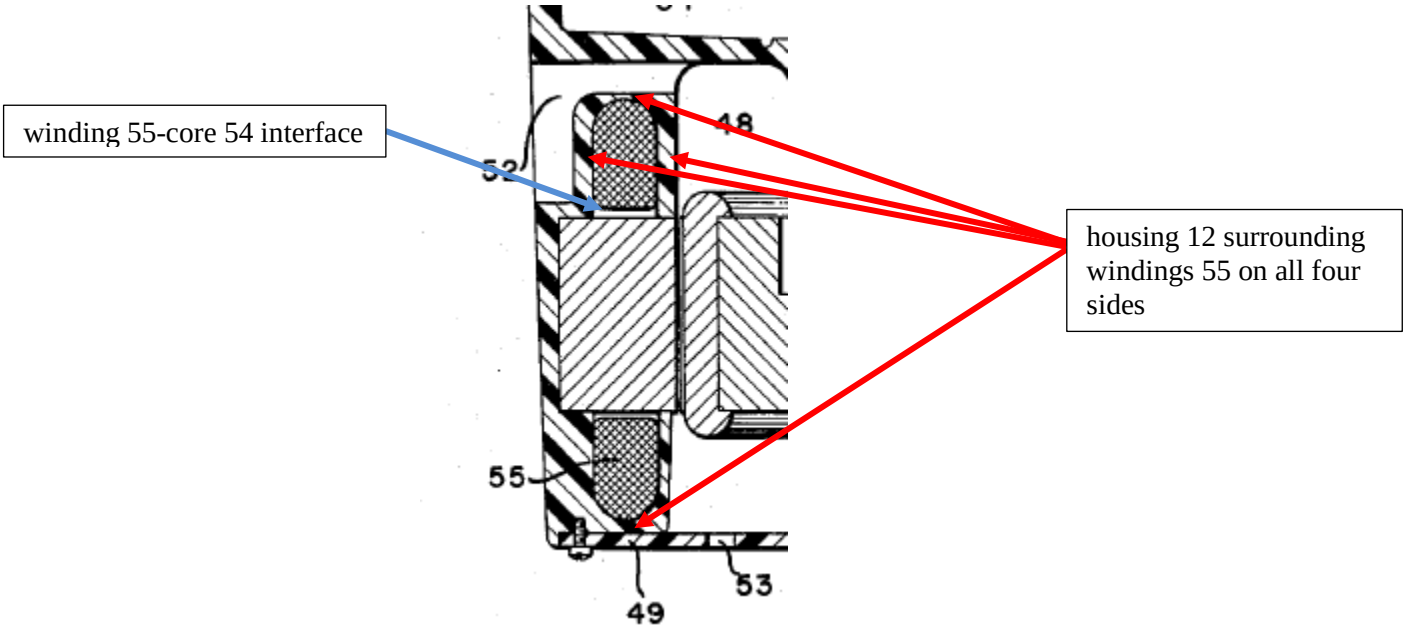
motor used, a POSITA would recognize that an induction motor is the most common type of motor used in garbage disposals. Ex. 2009 ¶ 126. Dr. Garris explains that such a motor has a stator in which "windings are coiled around holes in the core, which creates a radially inward magnetic flux that is directed by the core towards the magnets on the axially-located core." *Id.* ¶ 127.

Dr. Garris and Patent Owner also contend that

> *Gould* teaches one or more air passages 53 that provide a path for air to the rotor chamber 48 "which serves to cool the stator winding of the electric motor." This conveyed to a POSITA that the windings 55 within the stator core 54 in *Gould* may be exposed to the air of the rotor chamber, not blocked from the air by the lower housing 12 or any other structure.

Ex. 2009 ¶ 128 (citing Ex. 1105, 2:45–47); PO Resp. 48–49. Neither Patent Owner nor Dr. Garris dispute Dr. Trumper's contentions regarding harmonic oscillation vibration. PO Resp. 26–29; Ex. 2009 ¶¶ 124–128.

We have considered the parties' arguments and cited evidence, and we are persuaded by Petitioner's arguments and evidence. Gould discloses that "windings 55 [are] embedded in the moldable plastic material of lower housing 12." Ex. 1105, 2:42–45. As shown in Gould's Figure 1, the material of lower housing 12 surrounds windings 55, and directly contacts the windings on three sides. Although one of the sides of winding 55 interfaces with stator core 54, the material of housing 12 surrounds the windings, nonetheless, as explained in relation to a cropped and annotated version of Figure 1 (Annotated Figure 1-B), shown below.



Annotated Figure 1-B includes annotations made by the panel, wherein a blue arrow on the left indicates an example of where windings 55 interface with core 54, and wherein four red arrows on the right indicate that the material of housing 12 entirely surrounds the winding. *See* Ex. 1105, Fig. 1.

More specifically, Annotated Figure 1-B shows that the material of lower housing 12 (depicted with thick, downward, left-to-right, cross-hashing) does not fill the interface region between windings 55 and stator core 54. Nonetheless, as depicted with the four red arrows, the housing material entirely surrounds the winding, covering each of the left, top, right, and bottom sides, consistent with our construction of "substantially encapsulating." *See supra* Section II.A.3. The construction of "substantially encapsulating" proposed by Patent Owner, which has been incorporated into the Board's construction, neither requires *direct* contact between the winding and body, nor precludes space between the winding and the encapsulating material that surrounds the winding—it just requires that the body "either entirely surround or surround almost all" of it. PO

Resp. 28–29. Thus, it is immaterial that stator core 54 and the lower portion of winding 55 are located between the material of housing 12 at the bottom of the figure, and the portion of the winding at the top. Indeed, as Patent Owner's counsel stated during the hearing, the monolithic body need not *directly* contact the windings, and space may exist between the body and the windings. Tr. 76:14–78:11 (discussing Figure 20 of the challenged '348 patent, in which bobbin 456 is located between conductors 454 and monolithic body 458, precluding direct contact between the conductors and body, on at least three sides, and noting that "[t]hat little cross-section [depicting bobbin 456] doesn't preclude [conductors 454] from being surrounded by even though it's not touching"), 83:6–86:11 (Patent Owner's counsel failing to identify any portion of the claim language or the proposed construction that requires a certain level of proximity between the body and the conductor); Ex. 1001, 19:16–34, Fig. 20.

In light of the foregoing, we find that Gould's lower housing 14 substantially encapsulates windings 55, as that term has been construed, because the housing entirely surrounds the windings. We are also persuaded by Dr. Trumper's unrebutted testimony that lower housing 12 and windings 55 are rigidly fixed together and behave as a single component with respect to harmonic oscillation vibration. Ex. 1132 ¶ 108.

We give little weight to Dr. Garris's testimony that "[m]uch of the surface area of the windings disappears within the hollow interior of stator core 54. *Gould* does not teach that the lower housing material extends within the interior of the stator core." Ex. 2009 ¶ 125; PO Resp. 47–48. Dr. Garris's testimony does not appreciate that Gould's lower housing 12 nonetheless surrounds the windings, as discussed in the preceding

paragraphs, even if the lower housing material does not extend into the interior of the stator core. Likewise, whether Gould's motor is an induction motor, as Dr. Garris speculates, does not alter this conclusion. Ex. 2009 ¶¶ 126–127.[8]

We also disagree with Patent Owner's argument that, because Gould teaches "one or more air passages 53 that provide a path for air to the rotor chamber 48," a POSITA would have understood "that the windings 55 within the stator core 54 in *Gould* may be exposed to the air of the rotor chamber, not blocked from the air by the lower housing 12 or any other structure." Ex. 2009 ¶ 128; PO Resp. 48–49. Gould explains that "rotor chamber 48 communicates with the atmosphere by means of one or more passages 52 formed in the lower housing 12 and by passages 53 formed in plastic cap 49," wherein "passages 52 . . . serve[] to cool the stator winding of the electric motor." Ex. 1105, 2:40–42, 2:45–47. This is apparent in Figure 1 of Gould, which shows that air may enter rotor chamber 48 through passages 52, 53. Nothing in the cited portions of Gould, however, indicates

[8] Dr. Garris provides no basis to support his conclusion that a POSITA would understand Gould to employ a common induction motor. Ex. 2009 ¶ 126. As such, we give this testimony little weight. 37 C.F.R. § 42.65(a). Nor does Dr. Garris explain the pertinence of such a motor construction to Gould. Ex. 2009 ¶ 127. In other words, even if Gould includes an induction motor, and even if that motor has the arrangement discussed in Dr. Garris's declaration, Dr. Garris has not explained how the windings being "coiled around holes in the core, which creates a radially inward magnetic flux" demonstrates that the windings are not substantially encapsulated. *Id.* We disagree that coiled windings cannot be substantially encapsulated in the manner shown in annotated Figure 1. *See also* Reply 17 (arguing that Patent Owner has not established that the cited induction motor is one intended to be embedded in thermoplastic, as taught by Gould).

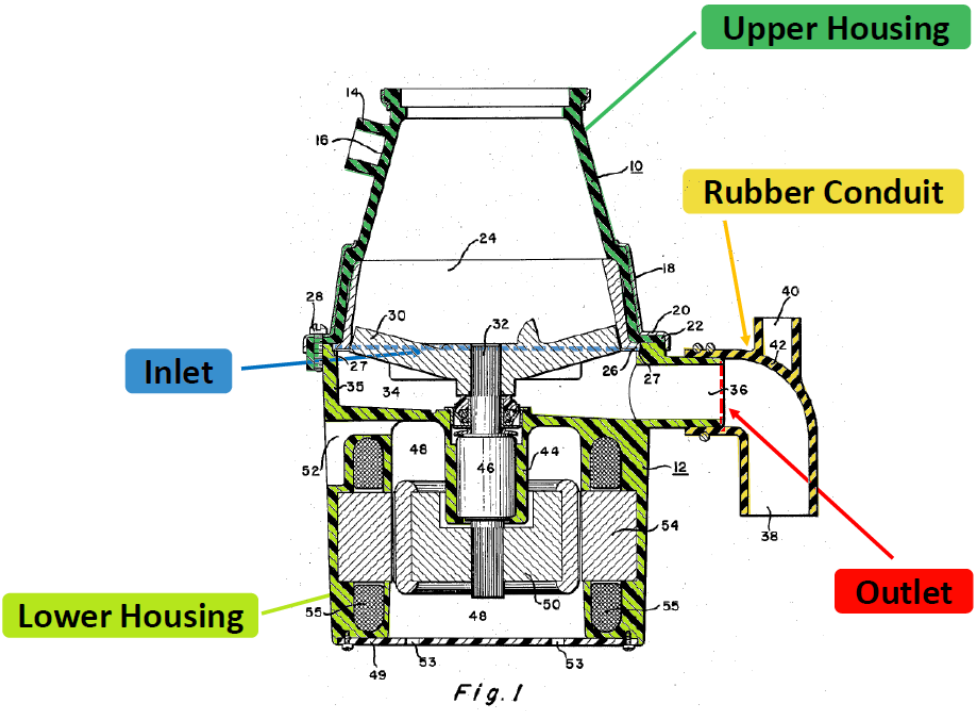
that windings 55 are exposed directly to the air of rotor chamber 48. By contrast, Annotated Figure 1-B, shown above, depicts that the material of lower housing 12 isolates rotor chamber 48 from windings 55. Ex. 1105, Fig. 1 (housing 12 abutting stator core 54, with no space through which air within chamber 48 could pass to contact windings 55). In light of Figure 1, we understand Gould's disclosure to mean that the windings are cooled through the material of lower housing 12. *See, e.g.*, *id.* at 2:14–17 (noting that lower housing 12 is formed of material that withstands heat).[9] Based on Petitioner's contentions and evidence, summarized above, we find that Gould teaches this limitation of claim 24.

v. "a fluid pathway at least partially embedded in and integral with the monolithic body"

Petitioner contends that Gould discloses this limitation because Gould's lower housing 12 (the claimed "monolithic body") "includes an upper impeller chamber 34 defined in part by a side wall, and this impeller chamber constitutes a fluid pathway." Pet. 49 (citing Ex. 1105, 2:23–25).

Petitioner provides an annotated version of Figure 1 (Annotated Figure 1-C), reproduced below.

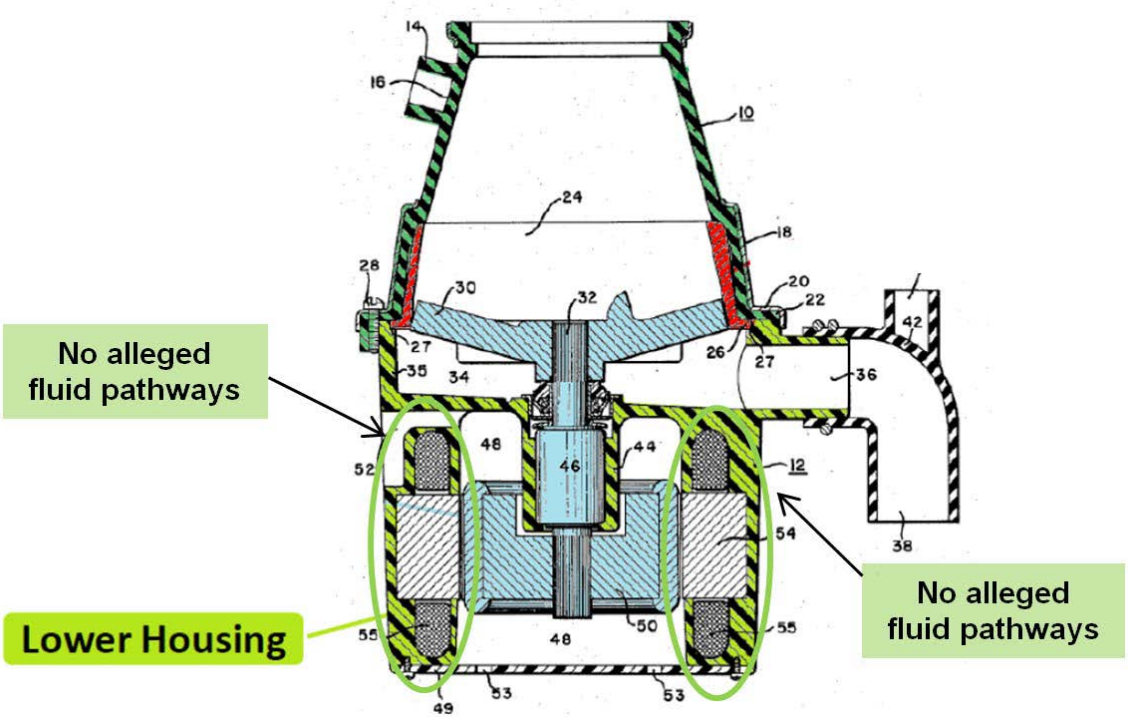
[9] In the Reply, Petitioner further contends that "[a]ccording to *Neal '554*, injection molding would result in the conductors being encapsulated along the length of the stator core." Reply 17. We consider this to be a new argument made improperly in the Reply. The Petition solely relied upon Gould with respect to the substantial encapsulation limitation. Pet. 46–47. The Petition relied upon Neal for its disclosure of an injection molded body, but did not propose modifying Gould's body to further encapsulate the conductor. *Id.* at 48–49.



Pet. 50. Annotated Figure 1-C identifies, *inter alia*, the monolithic body with light green shading. *Id.* In accordance with annotated Figure 1–C, shown above, Petitioner contends that waste material and waste water enter impeller chamber 34, through the area marked "Inlet," pass into outlet conduit 36 and then into rubber conduit 38, at the juncture marked "Outlet." *Id.* at 49–50. In this manner, "the monolithic body itself forms the fluid pathway," as claimed. *Id.* at 49.

Patent Owner disputes Petitioner's contention. PO Resp. 49–53. According to Patent Owner, "[t]o be fixed within the material of the alleged monolithic body, the fluid pathway must be formed within the walls of the monolithic body." *Id.* at 50–51 (citing Ex. 1001, Figs. 4, 20; Ex. 2009 ¶¶ 131–132).

Consistent with this argument, Patent Owner provides its own annotated version of Figure 1 (Annotated Figure 1-D), which is reproduced below.



PO Resp. 52. In Annotated Figure 1-D, Patent Owner circles the portions of the lower housing in which windings 55 are embedded and notes that "[n]o alleged fluid pathways" are located in those regions. *Id.* According to Patent Owner,

> impeller chamber 34 and outlet conduit 36 are not . . . fixed within the material in the walls of the lower housing that allegedly encapsulate *Gould's* conductors. The only pathway in *Gould* arguably fixed within the material of the lower housing is an air passage 52 that Petitioner[] and [its] expert do not rely upon.

Id. (citing Ex. 2009 ¶¶ 134–135).

We have considered the parties' arguments and cited evidence, and we are persuaded by Petitioner. As discussed in Section II.A.2., we construe

this limitation as "a fluid pathway at least partially (i) fixed within and formed by the material of the monolithic body or (ii) formed by a conduit fixed within and integrally surrounded by the material of the monolithic body." Petitioner has shown persuasively that Gould discloses a fluid pathway fixed within and formed by the material of lower housing 12. Namely, as shown in Annotated Figure 1-C, the pathway begins at an inlet opening, continues through impeller chamber 34 and outlet conduit 36, and then terminates at an outlet connected to rubber conduit 38. Ex. 1105, Fig. 1; *see also id.* at 2:22–27 ("The housing 12 has an upper impeller chamber 34 defined in part by a side wall 35, the impeller chamber communicating with an outlet conduit 36. The outlet pipe 36 is provided with a rubber conduit 38 that is connectable with a drain connection.").

We disagree with Patent Owner's argument because it reads into the claim a requirement that the pathway be (1) "formed within the walls of the monolithic body," and (2) be formed in the region of the body in which the conductor is encapsulated. PO Resp. 50–51. The plain language of claim 24 does not support Patent Owner's argument. Rather, claim 24 requires a "monolithic body . . . substantially encapsulating the at least one conductor," and "a fluid pathway at least partially embedded in and integral with the monolithic body" that is "confined within the body," but is otherwise silent as to where the fluid pathway is located. *See* Ex. 1001, 25:3–26:3; *see also* Ex. 1138, 41:3–9 (Dr. Garris agreeing that the claims do not specify that the pathway be in a certain location, or near the conductor), 43:19–46:5 (Dr. Garris annotating the path that fluid takes through Gould's device); Ex. 1137 (Dr. Garris's annotation).

During the oral argument, Patent Owner's counsel argued that the claim requires that the pathway is within the walls of the monolithic body, not simply within the device and confined by the walls of the monolithic body. *See, e.g.*, Tr. 20:13–21:11 (analogizing to cannons within a fort wall), 26:15–27:14 (arguing that placing pathways within the wall allows fluids to pass through without interacting with the device). These arguments, however, are not commensurate with the claim scope. Had the '348 patent inventors intended to claim that the pathway was entirely formed within the walls of the monolithic body, they could have done so. Rather, the claim was drafted more broadly to require that the pathway is "at least partially embedded in and integral with the monolithic body." As discussed above, Patent Owner does not dispute that this limitation is construed properly as "a fluid pathway at least partially (i) fixed within and formed by the material of the monolithic body . . . ." Gould's pathway, as discussed above, is "fixed within and formed by" the material of lower housing 12. This is apparent from Gould's figures. No part of the claim language or this construction limits the pathway to being located within "walls" of the monolithic body.

Based on Petitioner's contentions and evidence, summarized above, we find that Gould teaches this limitation of claim 24.

vi. "at least one of a fluid inlet into the pathway and a fluid outlet from the pathway being formed in the body of injection molded thermoplastic"

Petitioner contends that Gould discloses this limitation, relying again on the same Annotated Figure 1-C, reproduced above (Pet. 50, 52), which depicts a pathway, including an inlet and an outlet formed in Gould's lower housing 12. Patent Owner does not dispute Petitioner's contention. PO Resp. 46–56.

We are persuaded by Petitioner's contentions. As shown in Annotated Figure 1-C, Gould's pathway includes an inlet and outlet formed in the body of thermoplastic. Ex. 1105, 2:22–27, Fig. 1. Based on Petitioner's contentions and evidence, summarized above, we find that Gould teaches this limitation of claim 24.

vii. "the pathway through the body being confined within the body"

Petitioner contends that Gould discloses this limitation, relying again on the same Annotated Figure 1-C, reproduced above (Pet. 50, 53). Pet. 52–53. Petitioner contends that because the pathway is formed by the body, it is confined within the body. *Id.*

Patent Owner disputes Petitioner's contention, arguing that the pathway is not confined because "impeller chamber 34 has an open top that constitutes an *unconfined* pathway," from which water could splash out. PO Resp. 53–54 (citing Ex. 2009 ¶ 136; Ex. 2007, 51:12–56:8).

We are persuaded by Petitioner's contention. As shown above in Annotated Figure 1-C, Gould's pathway is confined entirely within the body of thermoplastic. Ex. 1105, 2:22–27, Fig. 1. Specifically, material enters the area marked "Inlet," continues through impeller chamber 34 and outlet conduit 36, and then terminates at an "Outlet," connected to rubber conduit 38—the entirety of this pathway is confined within the body.

We disagree with Patent Owner's argument that the open top of impeller chamber 34 makes Gould's pathway "unconfined." PO Resp. 54. Rather, the open top of impeller chamber 34 constitutes the claimed "at least one of a fluid inlet," as required by the claim. Moreover, claim 24 does not preclude material from splashing out of the pathway, as Patent Owner's

argument presumes. Based on Petitioner's contentions and evidence, summarized above, we find that Konishi teaches this limitation of claim 24.

b. Claim 25

Claim 25 recites that "the device is operable to power fluid conveyance through the mechanism and at least a portion of the fluid conveyed by the mechanism passes through the fluid pathway in the monolithic body." Ex. 1001, 26:5–8. Petitioner contends that Gould teaches the limitations of claim 25. Pet. 54. Specifically, Petitioner contends that "rotation of [Gould's] impeller 30 is used to grind waste material and waste water deposited within upper housing 10 and then pump the fluid through impeller chamber and out of outlet conduit 36," both of which are in monolithic body 14. *Id.* (citing Ex. 1105, 2:7–13; Ex. 1132 ¶¶ 124–127).

Patent Owner argues that Gould's device maintains waste material "in the vicinity of the grinder for a sufficient length of time to enable the grinding of the material into pieces sufficiently small to pass through the drainage system[, which] . . . retards the flow of fluid and allows passage only after sufficient grinding has taken place." PO Resp. 54. Patent Owner also argues that the device operates through the action of gravity. *Id.* at 55 (citing Ex. 2009 ¶¶ 138–140).

We have considered the parties' arguments and evidence, and we are persuaded by Petitioner's contentions and supporting evidence. Gould discloses a waste disposal unit that includes an impeller, which grinds waste material "in accordance with conventional practice," wherein the waste material is then passed through a drain connection to a sewer line. Ex. 1105, 1:15–17, 2:7–13, 2:25–28. Thus, Gould discloses that the device is operable to power fluid conveyance, i.e., it is operable to convey the ground waste

material through the mechanism and through at least a portion of the fluid pathway, as required by claim 25.

We disagree with Patent Owner's argument. The claim does not preclude the device from maintaining waste material in the impeller chamber to ensure that it is sufficiently ground before powering fluid conveyance. PO Resp. 54. Indeed, claim 25 is silent to when or how fluid conveyance is achieved. Ex. 1001, 26:4–8. Similarly, that gravity aids the movement of fluid through the device is immaterial to the claim language; fluid conveyance is nonetheless achieved through operation of the impeller. Based on Petitioner's contentions and evidence, summarized above, we find that Gould teaches this limitation of claim 25.

c. Claim 26

Claim 26 recites that "the mechanism is selected from the group consisting of valves, pumps and blowers." Ex. 1001, 26:9–11. Petitioner contends that Gould teaches this limitation. Pet. 55. Petitioner contends that Gould's garbage disposal "grind[s] a slurry of water and waste material . . . and then pump[s] the fluid through impeller chamber and out of outlet conduit 36." *Id.* (citing Ex. 1105, 7–13; Ex. 1132 ¶ 129).

Patent Owner argues that Gould does not refer to the device as a "pump," and that a POSITA would not understand the device to be a pump. PO Resp. 56. Similar to its argument regarding claim 25, Patent Owner argues that the device retards the flow of fluid until sufficient grinding has taken place, and operates through the action of gravity. *Id.* (citing Ex. 2009 ¶¶ 142–145).

We have considered the parties' arguments and evidence, and we are persuaded by Petitioner's contentions and evidence. As an initial matter, we

note that neither party proposes an express construction of the term "pump." Accordingly, we treat it in accordance with its plain and ordinary meaning. *See* Ex. 3001, 954 (Webster's Ninth New Collegiate Dictionary, 1985) (defining "pump" as "a device that raises, transfers, or compresses fluids . . . esp. by suction or pressure or both"). Gould discloses a waste disposal unit that includes an impeller, which grinds waste material "in accordance with conventional practice," wherein the waste material is then passed through a drain connection to a sewer line. Ex. 1105, 1:15–17, 2:7–13, 2:25–28.

We disagree with Patent Owner's argument that Gould does not use the term "pump" in describing this operation. *See In re Bode*, 550 F.2d 656, 660 (CCPA 1977) ("The specific limitation need not be disclosed *in haec verba* in the reference."). We also disagree with Patent Owner's argument that Gould's device retards the flow of fluid until sufficient grinding has taken place, and operates through the action of gravity. These characteristics of operation do not preclude understanding Gould's device to operate as a pump. For example, that the material remains in impeller chamber 34 before being pumped out through the drain connection, or that gravity aids in movement of the material, is not dispositive. Rather, when operating in this manner, Gould's device serves to use pressure, e.g., that imparted by the impeller, and gravity, to move liquids through the pathway and into the drain connection. *See, e.g.*, Ex. 1139, 623 (defining impeller as "a rotor located in a conduit to impart motion to a fluid"); Ex. 1142 (explaining that the SkySight Engineering DIY Macerator Pump Kit causes the garbage disposal unit itself to operate as a pump); Ex. 2007, 52:20–21 ("[T]he impeller acts as a centrifugal pump and drives fluid out and down from the system."). Based

on Petitioner's contentions and evidence, summarized above, we find that Gould teaches this limitation of claim 26.

d. Claim 27

Claim 27 recites that "said at least one of a fluid inlet and a fluid outlet is in the form of a plumbing fitting." Ex. 1001, 26:12–14. Petitioner contends that Gould teaches the limitations of claim 27. Pet. 55–56. Patent Owner does not dispute Petitioner's contentions. *See generally* PO Resp.

We are persuaded by Petitioner's contention, and find that Gould discloses that at least one of the fluid inlet and the fluid outlet from the pathway are in the form of a plumbing fitting. We credit Dr. Trumper's unrebutted testimony a POSITA "would understand that outlet conduit 36 is a plumbing fitting because it is configured to be fitted with rubber conduit 38 . . . [and the] flange at the top of lower housing 12 constitutes a plumbing fitting because it is configured to be fitted with upper housing 10." Ex. 1132 ¶ 131. Based on Petitioner's contentions and evidence, summarized above, we find that Gould teaches this limitation of claim 27.

3. Summary

Upon consideration of the parties' arguments and cited evidence, we are persuaded that Petitioner has shown, by a preponderance of the evidence, that the subject matter of claims 24–27 would have been obvious over the combined teachings of Gould and Neal.

III. CONCLUSION

For the foregoing reasons, we determine Petitioner has demonstrated that the challenged claims of the '348 patent are unpatentable by a preponderance of the evidence.

IV. ORDER

Upon consideration of the record before us, it is:

ORDERED that claims 24–27 of the ’348 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.

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CERTIFICATE OF SERVICE

I hereby certify that this **PATENT OWNER INTELLECTUAL VENTURES II LLC'S NOTICE OF APPEAL TO THE U.S. COURT OF APPEALS FOR THE FEDERAL CIRCUIT** was filed via U.S.P.S. Priority Mail Express on March 29, 2019 with the Director of the United States Patent and Trademark Office at the address below:

Office of the General Counsel, Mail Stop 8
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P.O. Box 1450
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A copy of this Notice of Appeal is being filed and served on March 29, 2019 as follows:

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To the U.S. Court of Appeals for the Federal Circuit:
Clerk of Court
U.S. Court of Appeals for the Federal Circuit
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IPR2017-01495
Toyota Motor v. Intellectual Ventures II

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