

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

BASF CORPORATION,
Petitioner,

v.

INGEVITY SOUTH CAROLINA, LLC,
Patent Owner.

PGR2020-00037
Patent 10,323,553 B2

Before CHRISTOPHER L. CRUMBLEY, CHRISTOPHER M. KAISER,
and JULIA HEANEY, *Administrative Patent Judges*.

HEANEY, *Administrative Patent Judge*.

DECISION
Granting Institution of Post-Grant Review
35 U.S.C. § 324

I. INTRODUCTION

BASF Corporation (“Petitioner”) filed a Petition to institute a post-grant review of claims 1–10, 14–28, 32–38, 51, 52, 55–57, 59, 64–72, and 76–82 of U.S. Patent No. 10,323,553 B2 (Ex. 1001, “the ’553 patent”). Paper 3 (“Petition” or “Pet.”). Petitioner filed Reasons for Parallel Petitions and Petition Ranking in this proceeding (“’37 PGR”) and PGR2020-00035 (“’35 PGR”). Paper 2 (“Petition Ranking”). In that paper, Petitioner ranks the ’35 PGR Petition first, and argues that material differences between the petitions justify instituting review in both proceedings. Paper 3. Petitioner filed the same Petition Ranking in the ’35 PGR. Ingevity South Carolina, LLC (“Patent Owner”) filed a Preliminary Response. Paper 7 (“Prelim. Resp.”). Patent Owner argues that we should exercise discretion to limit Petitioner to one petition. Prelim. Resp. 5.

We authorized additional briefing for the parties to address (1) the applicability of *McRO, Inc. v. Bandai Namco Games America Inc.*, 959 F.3d 1091 (Fed. Cir. 2020) to eligibility of the ’553 patent for post-grant review, and (2) a confidential internal memo in Patent Owner’s possession (Ex. 1041) that allegedly contradicts Patent Owner’s position in the Preliminary Response on Petitioner’s indefiniteness challenge under 35 U.S.C. § 112(b). Paper 9. Petitioner filed a Reply (Paper 13, “Pet. Reply”) and Patent Owner filed a Sur-Reply (Paper 16, “PO Sur-Reply”).

Institution of a post-grant review is authorized by statute when “the information presented in the petition . . . would demonstrate that it is more likely than not that at least 1 of the claims challenged in the petition is unpatentable.” 35 U.S.C. § 324(a) (2018). Upon consideration of the parties’ submissions and the evidence of record, we determine that Petitioner

has demonstrated that it is more likely than not that at least one claim challenged in the Petition is unpatentable. Further, Patent Owner has not persuaded us that it is appropriate to exercise our discretion not to institute review. Accordingly, we institute a post-grant review of all claims and all grounds asserted in the Petition.¹

A. Related Proceedings

The parties identify the '35 PGR as a related proceeding involving the '553 patent. Pet. 101; Paper 5, 2. The parties state they are not aware of any other judicial or administrative proceeding involving the '553 patent. *Id.*

In our Decision on Institution in the '35 PGR, which is issuing concurrently with this Decision, we deny institution because we determine that Petitioner has not demonstrated it is more likely than not that the challenged claims are unpatentable under 35 U.S.C. § 112(a) for nonenablement or lack of written description. Although the Petition Ranking ranked the '35 PGR Petition first, having denied institution of the '35 PGR Petition, and in view of the distinct theories of unpatentability in the '37 PGR Petition, we also consider the challenges of the '37 PGR Petition as set forth below.

B. The '553 Patent

The '553 patent, titled “Evaporative Fuel Vapor Emission Control Systems,” describes canister systems that employ activated carbon to adsorb fuel vapor emitted from motor vehicle fuel systems and reduce hydrocarbon

¹ *Guidance on the Impact of SAS on AIA Trial Proceedings* (Apr. 26, 2018), <https://www.uspto.gov/patents-application-process/patent-trial-and-appeal-board/trials/guidance-impact-sas-aia-trial>; *see also SAS Inst., Inc. v. Iancu*, 138 S. Ct. 1348, 1359–60 (2018).

air pollution. Ex. 1001, code (54), 1:29–33. The adsorbed fuel vapor can be “periodically removed from the activated carbon by purging the canister systems with ambient air [while the engine is turned on] to desorb the fuel vapor from the activated carbon,” after which the “regenerated carbon is then ready to adsorb additional fuel vapor.” *Id.* at 1:33–38; 53–58.

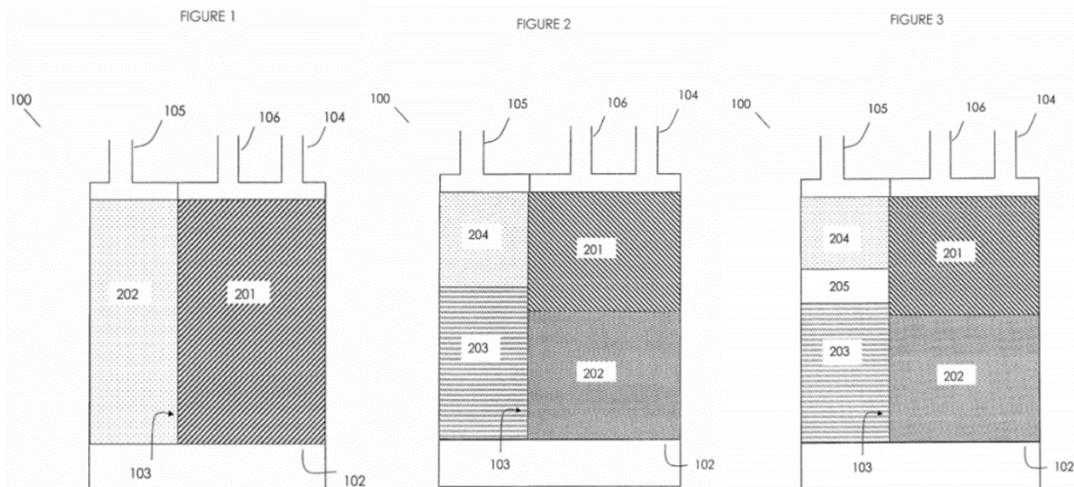
According to the ’553 patent, however, “[t]he purge air does not desorb the entire fuel vapor adsorbed on the adsorbent volume, resulting in a residue hydrocarbon (‘heel’) that may be emitted to the atmosphere.” *Id.* at 1:58–61.

The ’553 patent states “[a]n increase in environmental concerns has continued to drive strict regulations of the hydrocarbon emissions from motor vehicles even when the vehicles are not operating.” *Id.* at 1:39–41. “When a vehicle is parked in a warm environment during the daytime heating (i.e., diurnal heating), the temperature in the fuel tank increases resulting in an increased vapor pressure in the fuel tank.” *Id.* at 1:42–45. The ’553 patent explains that the “heel in local equilibrium with the gas phase also permits fuel vapors from the fuel tank to migrate through the canister system as emissions,” and “[s]uch emissions typically occur when a vehicle has been parked and subjected to diurnal temperature changes over a period of several days, commonly called ‘diurnal breathing losses’ [“DBL”].” *Id.* at 1:61–67. The ’553 patent further states that the “California Low Emission Vehicle Regulation (LEV-III) requires canister DBL emissions not to exceed 20 mg.” *Id.* at 2:6–8.

The ’553 patent explains that DBL emissions may be “more severe for a hybrid vehicle that includes both an internal combustion engine and an electric motor,” because, in such vehicles, “the internal combustion engine is turned off nearly half of the time during vehicle operation.” *Id.* at 2:46–51.

“Since the adsorbed fuel vapor on the adsorbents is purged only when the internal combustion engine is on, the adsorbents in the canister of a hybrid vehicle is purged with fresh air less than half of the time compared to conventional vehicles.” *Id.* at 2:51–55. Yet, “[a] hybrid vehicle generates nearly the same amount of evaporative fuel vapor as the conventional vehicles.” *Id.* at 55–57. The ’553 patent explains “[t]he lower purge frequency of the hybrid vehicle can be insufficient to clean the residue hydrocarbon heel from the adsorbents in the canister, resulting in high diurnal breathing loss (DBL) emissions.” *Id.* at 57–60. Therefore, according to the ’553 patent, “it is desirable to have an evaporative emission control system with low diurnal breathing loss (DBL) emissions even when a low level of purge air is used, or when the adsorbents in the canister are purged less frequently such as in the case of hybrid vehicles, or both.” *Id.* at 2:61–65.

The ’553 patent describes several example embodiments of evaporative emission control canister systems to address the above problems. *Id.* at 4:10–20. Figures 1–3 of the ’553 patent, reproduced below, depict a first group of canister system embodiments.



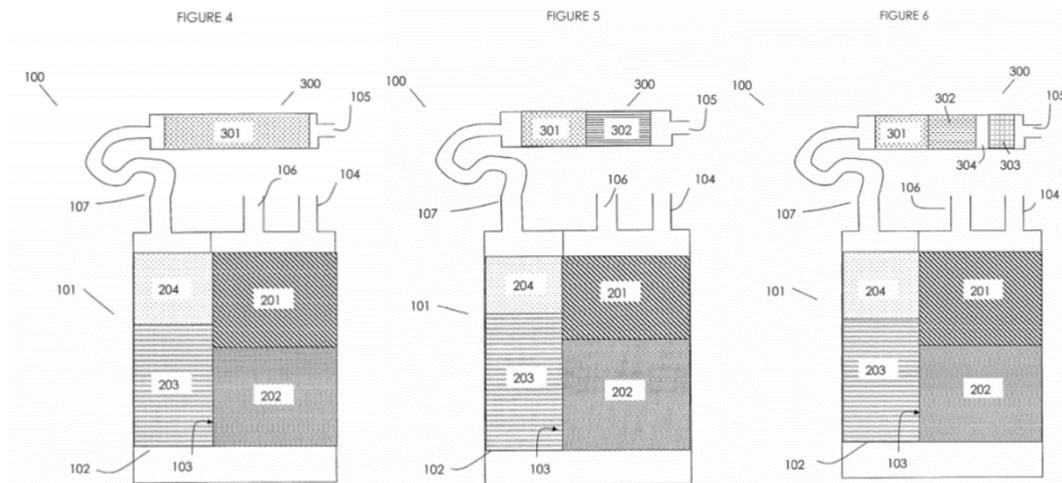
Figures 1–3 are evaporative emission control canister systems having “an initial adsorbent volume and subsequent adsorbent volume(s) ... located within a single canister.” *Id.* at 4:10–14. An “adsorbent volume” refers to “an adsorbent material or adsorbent containing material along vapor flow path, and may consist of a bed of particulate material, a monolith, honeycomb, sheet or other material.” *Id.* at 6:32–36. Figure 1 illustrates “[c]anister system 100 includ[ing] a support screen 102, a dividing wall 103, a fuel vapor inlet 104 from a fuel tank, a vent port 105 opening to an atmosphere, a purge outlet 106 to an engine, an initial adsorbent volume 201, and a subsequent adsorbent volume 202.” *Id.* at 4:24–28. The ’553 patent explains the operation of canister system 100 as follows:

When an engine is off, the fuel vapor from a fuel tank enters the canister system 100 through the fuel vapor inlet 104. The fuel vapor diffuses into the initial adsorbent volume 201, and then the subsequent adsorbent volume 202 before being released to the atmosphere through the vent port 105 of the canister system. Once the engine is turned on, ambient air is drawn into the canister system 100 through the vent port 105. The purge air flows through the subsequent adsorbent volume 202 and then the initial adsorbent volume 201, and desorbs the fuel vapor adsorbed on the adsorbent volumes 202, 201 before entering an internal combustion engine through the purge outlet 106.

Id. at 4:29–40.

The embodiment of Figure 2 includes additional subsequent adsorbent volumes 203 and 204, and the embodiment of Figure 3 adds empty volume 205 between subsequent adsorbent volumes 203 and 204. *Id.* at 4:41–57.

Figures 4–6 of the ’553 patent, reproduced below, depict a second group of canister system embodiments.



Figures 4–6 are evaporative emission control canister systems that include more than one canister, “wherein an initial adsorbent volume and at least one subsequent adsorbent volume are located in separate canisters that are connected to permit sequential contact by fuel vapor.” *Id.* at 4:14–20.

Figure 4 depicts main canister 101 having similar elements as shown in Figure 2, along with supplemental canister 300 including conduit 107 connected to main canister 101, subsequent adsorbent volume 301, and vent port 105. *Id.* at 4:61–5:3. Main canister 101 and supplemental canister 300 operate similarly to the embodiments of Figures 1–3: when the engine is off, fuel vapor enters main canister 101 through inlet 104, diffuses through the adsorbent volumes 201–204, and then enters adsorbent volume 301 before releasing to the atmosphere at vent port 105. *Id.* at 5:4–14. Once the engine is turned on, ambient air is drawn into the canister system through vent port 105, the purge air flows through the adsorbent volumes in supplemental canister 300 and main canister 101 to desorb the fuel vapor adsorbed on the adsorbent volumes, before entering the internal combustion engine through purge outlet 106. *Id.* at 5:14–23. The embodiment of Figure 5 includes additional subsequent adsorbent volume 302, and the embodiment of Figure

6 adds empty volume 304 between subsequent adsorbent volumes 302 and 303. *Id.* at 5:24–38.

The '553 patent further discloses “the evaporative emission control system may include a heat unit for heating the purge air, at least one subsequent adsorbent volume, or both,” in order to enhance the purge efficiency. *Id.* at 12:29–34. “The heat input units may include, but are not limited to, internal resistive elements, external resistive elements, or heat input units associated with the adsorbent.” *Id.* at 13:29–31.

The '553 patent describes adsorbent volumes in terms of three adsorptive characteristics: “incremental adsorption capacity,” “butane working capacity (BWC),” and “g-total BWC.” *Id.* at 6:10–22. These properties are described as “nominal,” which includes adsorbent component volumes but excludes conduits, gaps, or other non-adsorbent volumes, and “effective,” which includes all volumes of the system both adsorbent and non-adsorbent. *Id.* at 6:37–42; 10:26–34. Nominal incremental adsorption capacity of an adsorbent component is a function of the difference between the gram mass of adsorbed butane at 50 vol. % butane concentration and 5 vol. % butane concentration, multiplied by the “nominal volume apparent density” (defined as the mass of adsorbent material divided by the nominal volume of adsorbent material). *Id.* at 6:56–64; 9:6–25. Nominal volume BWC is determined by placing the adsorbent component in a test system that loads the adsorbent material with butane and then purges it with air, and measuring the difference in mass of the adsorbent component before and after the purge. *Id.* at 9:26–10:24. The g-total BWC is defined as the total gram amount of butane purged during the test. *Id.* at 10:24–25. The “effective” property of each characteristic (i.e., effective incremental

adsorption capacity, effective butane working capacity (BWC), and effective g-total BWC) is a function of each respective nominal property that takes into account the total effective volume of the system. *Id.* at 10:25–62.

The '553 patent provides an exemplary embodiment of an evaporative emission control canister system with specified adsorbent material properties, comprising:

an initial adsorbent volume having an effective incremental adsorption capacity at 25° C. of greater than 35 grams n-butane/L between vapor concentration of 5 vol % and 50 vol % n-butane; and at least one subsequent adsorbent volume having an effective incremental adsorption capacity at 25° C. of less than 35 grams n-butane/L between vapor concentration of 5 vol% and 50 vol% n-butane, an effective butane working capacity (BWC) of less than 3 g/dL, and a g-total BWC of between 2 grams and 6 grams. . . .

The evaporative emission control canister system has a two-day diurnal breathing loss (DBL) emissions of no more than 20 mg at no more than about 210 liters of purge applied after the 40 g/hr butane loading step.

Id. at 3:56–67; 4:5–9.

The '553 patent provides further examples of evaporative emission control canister systems, and lists specific characteristics for each example. *Id.* at 13:60–20:12; *see also* col. 19–col. 24, Tables 1–5.

C. The Challenged Claims

Petitioner challenges claims 1–10, 14–28, 32–38, 51, 52, 55–57, 59, 64–72, and 76–82 of the '553 patent (“the challenged claims”). Pet. 1. Claims 2–10 and 14–20 depend from claim 1; claims 22–28 and 32–38 depend from claim 21; claim 52 depends from claim 51; claims 56, 57, and 59 depend from claim 55; and claims 65–72 and 76–82 depend from claim 64.

Claim 1, reproduced below, is illustrative of the subject matter of the challenged claims:

1. An evaporative emission control canister system, including one or more canisters and comprising:

a fuel-side adsorbent volume having an effective incremental adsorption capacity at 25° C. of greater than 35 grams n-butane/L between vapor concentration of 5 vol % and 50 vol % n-butane; and

at least one subsequent adsorbent volume having an effective incremental adsorption capacity at 25° C. of less than 35 grams n-butane/L between vapor concentration of 5 vol % and 50 vol % n-butane, an effective butane working capacity (BWC) of less than 3 g/dL, and a g-total BWC of ≤ 6 grams,

wherein the fuel-side adsorbent volume having an effective incremental adsorption capacity at 25° C. of greater than 35 grams n-butane/L between vapor concentration of 5 vol % and 50 vol % n-butane, and the at least one subsequent adsorbent volume are located within a single canister, or in separate canisters that are connected to permit sequential contact by fuel vapor, and wherein the canister system has a two-day diurnal breathing loss (DBL) of no more than 20 mg at no more than 100 BV of purge applied after a 40 g/hr butane loading step.

Id. at 23:18–40.

D. Asserted Grounds of Unpatentability

Petitioner asserts the following grounds of unpatentability:

Claims Challenged	35 U.S.C. ²	Reference(s)/Basis
1–10, 14–28, 32–38, 51, 52, 55–57, 59, 64–72, and 76–82	§ 112(b)	Indefiniteness

² The Leahy-Smith America Invents Act (“AIA”) included revisions to 35 U.S.C. § 103 that became effective on March 16, 2013. As discussed below (II.C), we determine at this stage of the proceeding that the ’553 patent issued from an application that has an effective filing date after March 16,

Claims Challenged	35 U.S.C. ²	Reference(s)/Basis
1–10, 14–28, 32–38, 51, 52, 55–57, 59, 64–72, and 76–82	§ 103(a)	Hiltzik, ³ Clontz WIPO, ⁴ and Clontz SAE ⁵

Pet. 3. Petitioner relies on the Declaration of James M. Lyons (Ex. 1003) (“Lyons Declaration”).

II. ANALYSIS

A. *Level of Ordinary Skill in the Art*

Factors pertinent to a determination of the level of ordinary skill in the art include “(1) educational level of the inventor; (2) type of problems encountered in the art; (3) prior art solutions to those problems; (4) rapidity with which innovations are made; (5) sophistication of the technology; and (6) educational level of workers active in the field.” *Envtl. Designs, Ltd. v. Union Oil Co.*, 713 F.2d 693, 696–697 (Fed. Cir. 1983) (citing *Orthopedic Equip. Co. v. All Orthopedic Appliances, Inc.*, 707 F.2d 1376, 1381–82 (Fed. Cir. 1983)). Not all such factors may be present in every case, and one or more of these or other factors may predominate in a particular case. *Id.*

Petitioner argues a person of ordinary skill in the art at the time of the invention “would possess at least a B.S. in chemistry or chemical or mechanical engineering and would have at least one year of experience

2013, and, thus, we apply the AIA versions of the statutory bases for unpatentability.

³ US Patent No. RE38,844 E to Hiltzik et al., issued Oct. 25, 2005 (Ex. 1007).

⁴ WO 2009/061533 A1 to Clontz et al., published May 14, 2009 (Ex. 1009).

⁵ “Effects of Low-Purge Vehicle Applications and Ethanol-Containing Fuels on Evaporative Emissions Canister Performance,” by Clontz et al., July 2007 International Fuels and Lubricants Meeting, Society of Automotive Engineers of Japan (JSAE) (Ex. 1010).

working on control of automotive evaporative emissions,” and “would also understand the chemistry and physics associated with the phenomena of fuel vapor adsorption, desorption, and diffusion.” Pet. 28 (citing Ex. 1003 ¶ 17). Patent Owner does not dispute the level of ordinary skill in the art. For purposes of this decision, we adopt Petitioner’s definition of the level of ordinary skill in the art because it is consistent with the ’553 patent and the asserted prior art.

B. Principles of Law

“[A] patent is invalid for indefiniteness if its claims, read in light of the specification . . . and the prosecution history, fail to inform, with reasonable certainty, those skilled in the art about the scope of the invention.” *Nautilus, Inc. v. Biosig Instruments, Inc.*, 572 U.S. 898, 901 (2014); *In re Packard*, 751 F.3d 1307, 1311 (Fed. Cir. 2014) (holding a claim is indefinite when it contains words or phrases whose meaning is “unclear in describing and defining the claimed invention”); *see also Tinnus Enterprises, LLC v. Telebrands Corp.*, 733 F. App’x 1011, 1018 (Fed. Cir. 2018) (declining to decide whether the *Nautilus* or *Packard* standard governs PGRs). “The claims, when read in light of the specification and the prosecution history, must provide objective boundaries for those of skill in the art.” *Interval Licensing, LLC v. AOL, Inc.*, 766 F.3d 1364, 1371 (Fed. Cir. 2014).

A claim is unpatentable under 35 U.S.C. § 103 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 ordinary skill in the art; and (4) when available, evidence such as commercial success, long felt but unsolved needs, and failure of others. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966); *see KSR*, 550 U.S. at 407 (“While the sequence of these questions might be reordered in any particular case, the [Graham] factors continue to define the inquiry that controls.”).

The Supreme Court made clear that we apply “an expansive and flexible approach” to the question of obviousness. *KSR*, 550 U.S. at 415. Whether a patent claiming the combination of prior art elements would have been obvious is determined by whether the improvement is more than the predictable use of prior art elements according to their established functions. *Id.* at 417. Reaching this conclusion, however, requires more than merely showing that the prior art includes separate references covering each separate limitation in a challenged claim. *Unigene Labs., Inc. v. Apotex, Inc.*, 655 F.3d 1352, 1360 (Fed. Cir. 2011). Rather, obviousness additionally requires that a person of ordinary skill at the time of the invention “would have selected and combined those prior art elements in the normal course of research and development to yield the claimed invention.” *Id.*

C. *Post-Grant Review Eligibility of the ’553 Patent*

We first determine whether the ’553 patent is eligible for post-grant review. The post-grant review provisions set forth in section 6(d) of the Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284

(September 16, 2011) (“AIA”), apply only to patents subject to the first-inventor-to-file provisions of the AIA. *See* AIA § 6(f)(2)(A) (The provisions of Section 6(d) “shall apply only to patents described in section 3(n)(1)”). Patents subject to the first-inventor-to-file provisions are those that issue from applications “that contain[] or contained at any time . . . a claim to a claimed invention that has an effective filing date as defined in section 100(i) of title 35, United States Code, that is on or after” March 16, 2013. AIA § 3(n)(1). Additionally, “[a] petition for a post-grant review may only be filed not later than the date that is 9 months after the date of the grant of the patent or of the issuance of a reissue patent (as the case may be).” 35 U.S.C. § 321(c).

The effective filing date of an application for a patent on an invention is “the filing date of the earliest application for which the . . . application is entitled, as to such invention, to a right of priority under section 119, 365(a), 365(b), 386(a), or 386(b) or to the benefit of an earlier filing date under section 120, 121, 365(c), or 386(c).” 35 U.S.C. § 100(i)(1)(B). In the event that the application is not entitled to any earlier filing date or right of priority, the effective filing date is “the actual filing date of . . . the application for the patent containing a claim to the invention.” 35 U.S.C. § 100(i)(1)(A).

The ’553 patent issued on June 18, 2019 from U.S. Application No. 15/676,734 (“the ’734 application,” filed Aug. 14, 2017), which is a continuation of U.S. Application No. 14/434,690 (“the ’690 application,” filed Apr. 9, 2015), which claims the benefit of U.S. National Entry of International Application No. PCT/US2013/064407 (“the ’407 PCT application,” filed Oct. 10, 2013), which claims the benefit of U.S.

Provisional Application No. 61/712,244 (“the ’244 provisional,” filed Oct. 10, 2012). Ex. 1001, codes (21), (22), (45), (60), (63), 1:7–18. Although the ’553 patent claims priority to the ’244 provisional, Petitioner argues at least claim 1 of the ’553 patent lacks enablement and written description support in the ’244 provisional. Pet. 29–41. Thus, Petitioner contends that the ’553 patent is eligible for post-grant review because at least claim 1 is not entitled to an effective filing date earlier than the October 10, 2013 filing date of the ’407 PCT application. *Id.* at 29.

In a post-grant review, Petitioner bears the ultimate burden of persuasion regarding unpatentability, which never shifts to Patent Owner. *See Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1379 (Fed. Cir. 2015) (discussing petitioner’s burden of proving unpatentability in *inter partes* review); *RetailMeNot, Inc. v. Honey Science Corp.*, PGR2019-00060, Paper 17 at 7–8 (PTAB Mar. 10, 2020) (petitioner has the burden of demonstrating eligibility for post-grant review). At institution, the Board has applied a similar burden-shifting approach with respect to the effective filing date of challenged claims. *See Polaris Wireless, Inc. v. TruePosition, Inc.*, IPR2013-00323, Paper 9 (PTAB Nov. 15, 2013) (discussing burden-shifting approach at institution of *inter partes* review):

With respect to entitlement to earlier effective filing dates, the Patent Owner is not presumed to be entitled to the earlier filing dates of ancestral applications which do not share the same disclosure. But, the issue first has to be raised by Petitioner in its petition, by identifying, specifically, the features, claims, and ancestral applications allegedly lacking § 112, first paragraph, written description and enabling disclosure support for the claims based on the identified features. Then, the Patent Owner has to make a sufficient showing of entitlement to earlier filing

date or dates, in a manner that is commensurate in scope with the specific points and contentions raised by Petitioner.

Id. In other words, because the '244 provisional does not have the same disclosure as the '553 patent, we do not presume the '553 patent is entitled to the benefit of the '244 provisional's filing date. But because Petitioner has the burden to show it is more likely than not that at least one claim of the '553 patent is unpatentable, Petitioner must first identify *with specificity* the limitations of the '553 patent claims that it asserts lack written description and enabling support in the '244 provisional. The burden of production then shifts to Patent Owner to respond to Petitioner's specific arguments to show sufficiently that the '553 patent claims are entitled to the earlier filing date of the '244 provisional. We apply this framework when considering whether the parties have met their respective burdens at this stage of the proceeding.

*1. Written Description Support
Petitioner's Contentions*

Petitioner argues the '244 provisional does not provide written description support for "a g-total BWC of ≤ 6 grams" in canister systems achieving low emissions at low purge. Pet. 31–35. Specifically, Petitioner argues that the '244 provisional lacks written description support for the lower end of the claimed range of g-total BWC in the '553 patent (0.0g to 0.8g) because it repeatedly limits its disclosure to systems with vent-side volumes having g-total BWC greater than 0.8g. *Id.* at 31–32 (citing Ex. 1006, Abstract, ¶¶ 10–11, 23–25, 61, 63, claims 1, 16, 21). Petitioner further argues that none of the examples in the '244 provisional provide written description support for g-total BWC less than 0.8g because the lowest g-total BWC of Examples 4–7 of the '244 provisional, which are the only examples

having two-day DBL within the '533 patent's claimed range of no more than 20mg, is either 2.4g or 4.0g. *Id.* at 32–33 (citing Ex. 1006, 19).

Petitioner further argues the '244 provisional lacks written description support for the claimed upper limit of 6g because it does not include any example limiting g-total BWC to an upper limit of 6g to achieve low emissions at low purge. *Id.* at 33. Petitioner points to Examples 2–6 of the '553 patent as the basis for the claimed upper limit of 6g, and asserts that the '244 provisional does not disclose these examples. *Id.* at 34 (citing Ex. 1001, 19:19–23, Table 5; Ex. 1003 ¶¶ 90–92). Petitioner further argues that Example 3 of the '244 provisional “does not provide support for a 6g upper limit of g-total BWC because it does not inform a POSITA that the volume's g-total BWC was the reason the experiment failed to achieve low emissions.” *Id.* (citing Ex. 1003 ¶ 91). Petitioner argues that a person of ordinary skill in the art would have understood that Example 3's fewer number of volumes (i.e., three volumes as compared to four volumes in Examples 4–7) would have been “much more significant in explaining the emissions difference between the failed experiments and the successful experiments” because “the extra adsorbent volume in the successful experiments of the '244 provisional results in a longer vapor flow path that significantly reduces bleed emissions.” *Id.* at 34–35 (citing Ex. 1003 ¶ 91).

Patent Owner's Contentions

Patent Owner responds that the '244 provisional does not limit its disclosure to systems having a g-total BWC greater than 0.8g, but merely describes embodiments without expressing any limit on the disclosure as a whole. Prelim. Resp. 15. Patent Owner further argues that Examples 4–7 of the '244 provisional provide support for the '533 patent's claimed range of

g-total BWC \leq 6 grams because the examples are a species of “the claimed genus [of] canister systems with 2-day DBL emissions of no more than 20mg at 100BV of purge including ‘at least one subsequent adsorbent volume’ having ‘a gram total of \leq 6 grams’” (*id.* at 16) as required by *Ariad Pharm., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1350 (Fed. Cir. 2010) (en banc)). Patent Owner further argues the record indicates a person of ordinary skill in the art would have recognized that Examples 4–7 are representative of the claimed genus, because of existing knowledge in the field, the extent and content of the prior art, the maturity of the technology (including Petitioner’s assertion that prior art canister systems met the LEV-III requirement more than 5 years before the ’553 patent), and the predictability of the aspect at issue. Prelim. Resp. 16–17 (citing Pet. 56). Patent Owner relies on Clontz SAE as evidence that a person of ordinary skill in the art would have understood how to use Examples 4–7 of the ’244 provisional as a blueprint to modify a canister system having g-total BWC below 0.8g while still maintaining 2-day DBL emissions below the 20 mg threshold at 100 BV, because it shows that purge volume was a “tunable parameter at a POSITA’s disposal” along with increasing the flow path for vapors diffusing out of the main canister. *Id.* at 17–18 (citing Ex. 1010, 1717).

As to the claimed upper limit of 6g, Patent Owner argues that there is no requirement that the ’244 provisional disclose an example corresponding exactly to the upper limit recited in the claims. *Id.* at 18–19. Patent Owner argues that the ’244 provisional discloses “blaze marks” directing a person of ordinary skill in the art to the 6g upper limit because the ’244 provisional “clearly discloses that the g-total BWC of the subsequent adsorbent volumes

is ‘an important defining quality’” used to characterize the adsorbent volumes of Examples 4–7. *Id.* at 19–20 (citing Ex. 1006, 19, Table 2; *Purdue Pharma L.P. v. Faulding Inc.*, 230 F.3d 1320 (Fed. Cir. 2000)). Patent Owner further argues that Examples 3 and 4 of the ’244 provisional provide a blaze mark for the 6g upper limit because they “would have shown a POSITA that adding a subsequent adsorbent volume with a g-total less than 6.28 g results in a significant reduction of 2-day DBL emissions.” *Id.* at 20. Patent Owner also disputes Petitioner’s assertion as to the significance of g-total BWC in Example 3 of the ’244 provisional; Patent Owner asserts that the ’244 provisional “repeatedly describes g-total BWC as an important defining quality.” *Id.* at 21.

Discussion

The written description inquiry under 35 U.S.C. § 112(a) is a question of fact, is context-specific, and must be determined on a case-by-case basis. *Ariad Pharms., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010) (en banc). To satisfy the written description requirement, the disclosure must reasonably convey to skilled artisans that the inventor had possession at that time of the later claimed subject matter. *Id.* The exact level of detail required in the disclosure depends upon “the nature and scope of the claims and on the complexity and predictability of the relevant technology.” *Id.*

On this record, we find that Petitioner’s arguments are sufficient for making a threshold showing that the claim limitation “a g-total BWC of ≤ 6 grams” lacks written description support in the ’244 provisional. Petitioner provides specific analysis, supported by Dr. Lyons’s testimony, as to why a person of ordinary skill in the art would have concluded from the ’244 provisional that the inventors did not have possession of the entire g-total

BWC range of ≤ 6 grams. For example, none of the disclosure in the '244 provisional describes any range of g-total BWC other than “more than 0.8 grams.” On the other hand, Patent Owner’s response that a person of ordinary skill in the art would have recognized Examples 4–7 of the '244 provisional as representative of the '533 patent’s claimed range of ≤ 6 grams may have persuasive merit, but Patent Owner does not offer evidence in support of its arguments. Taking into account the burden-shifting framework, Patent Owner’s arguments alone are not sufficient to rebut Petitioner’s identification of the g-total BWC limitation as lacking written description support in the '244 provisional. Our determination of this disputed factual issue at this stage of the proceeding is preliminary, and we invite the parties to present arguments and evidence on this issue during trial.

2. *Enablement*

The Parties’ Contentions

Petitioner further argues the '244 provisional does not enable the full range of g-total BWC for canister systems achieving low emissions at low purge. Pet. 35–41. Specifically, Petitioner contends none of the experiments described in the '244 provisional included an adsorbent volume having g-total BWC less than 0.8g, and that Example 13 of the '553 patent shows that the inventors failed to achieve the LEV-III emissions requirement with an adsorbent volume having g-total BWC of 1.6g. *Id.* at 36–37 (citing Ex. 1001, Table 4; Ex. 1003 ¶¶ 96–97; Ex. 1006, Tables 1–2). Petitioner argues that because Example 13 is inoperative at 1.6g, the '244 provisional does not enable a g-total BWC of less than 2g. *Id.* at 37. Petitioner also argues the '553 patent specification limits g-total BWC to a range between

2g and 6g for LEV-III-compliant systems (Ex. 1001, 19:19–23), and contends this is evidence that the system of the '244 provisional would have been inoperative at g-total BWC less than 2g. *Id.* Petitioner sets forth an analysis of the *Wands* factors and asserts that all eight factors weigh against enablement of the claimed g-total BWC range in the '244 Provisional. *Id.* at 37–41.

Patent Owner responds that Petitioner does not adequately support its lack of enablement assertion because it “does not concretely identify a species of claim 1 of the '553 Patent that lacks enablement support in the '244 Provisional,” as required by *McRO, Inc. v. Bandai Namco Games America Inc.*, 959 F.3d 1091, 1100 (Fed. Cir. 2020). Prelim. Resp. 23. Patent Owner argues that Petitioner’s assertion that Example 13 of the '553 patent lacks enablement support is insufficient, because Petitioner fails to analyze what experimentation a person of ordinary skill in the art would have undertaken with Example 13 to achieve LEV-III compliance, and Petitioner’s *Wands* factors analysis is divorced from Example 13. *Id.* at 24. Patent Owner also disputes Petitioner’s assertion that the '244 provisional would have discouraged a person of ordinary skill in the art from attempting to use an adsorbent volume with g-total BWC below 0.8g. *Id.* at 25 (citing Ex. 1001, Table 4).

Discussion

Having determined above that Petitioner has sufficiently shown for this stage of the proceeding that claim 1 of the '553 patent lacks written description support in the '244 provisional, we need not address whether Petitioner has also shown that the '553 claims are not entitled to the filing date of the '244 provisional because of lack of enablement. In the event that

the parties further address eligibility for post-grant review at trial, however, we note that we find persuasive merit in Patent Owner’s argument that Petitioner fails to identify with particularity a system within the scope of claim 1 of the ’553 patent that is not enabled in the ’244 provisional, as required by *McRO*. See PO Sur-Reply 3. Rather than identifying an embodiment within the scope of claim 1 and explaining why a person of ordinary skill in the art would need to unduly experiment to make it, the Petition argues that the ’244 provisional would have discouraged a person of ordinary skill from any experimentation with an adsorbent volume having g-total BWC below 0.8g, because Example 13 of the ’553 patent does not meet the LEV-III emissions requirement. See Pet. 25, 40. Under *McRO*, 959 F.3d at 1101, because Example 13 is not within the scope of claim 1, it cannot support a nonenablement determination as to that claim.

D. Alleged Obviousness Based on Hiltzik, Clontz WIPO, and Clontz SAE

1. Overview of the Asserted References

Hiltzik (Ex. 1007)

Hiltzik relates to “a method for reducing emissions from evaporative control systems including activated carbon particulate-filled canisters and adsorptive monolith-containing canisters.” Ex. 1007, 1:14–19. Hiltzik describes “the use of multiple beds (or layers, stages, or chambers) of adsorbent materials, which, in combination, significantly reduce [diurnal breathing loss] emissions while maintaining the high working capacity and low flow restriction properties of the canister system.” *Id.* at 4:9–13.

Figure 2 of Hiltzik is reproduced below.

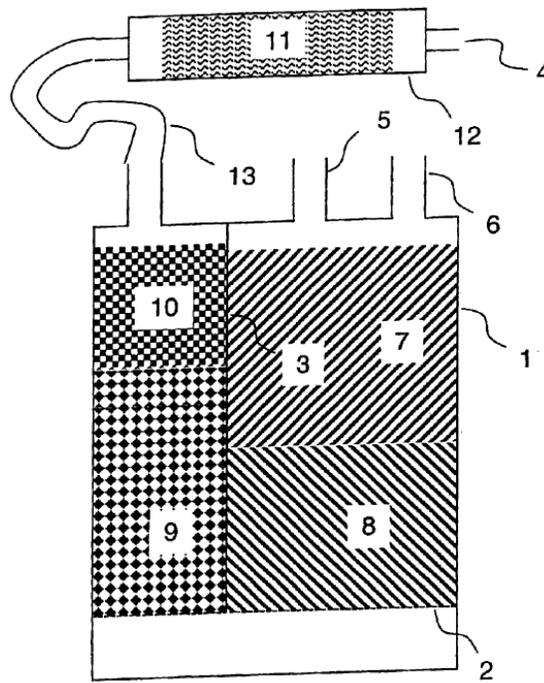


FIGURE 2

Figure 2 depicts an exemplary embodiment of a canister system with multiple adsorbents. *Id.* at 6:31–32. The canister system comprises primary canister body 1, support screen 2, dividing wall 3, vent port 4 to the atmosphere, vapor source connection 5, vacuum purge connection 6, fuel source-side region 7, vent-side canister regions 8–11 of varying low-capacities, supplemental canister body 12, and connecting hose 13 permitting fluid stream flow from primary canister body 1 to supplemental canister body 12. *Id.* at 6:33–40. Hiltzik describes several examples of the canister system (“Example 1”, “Example 2,” and “Example 3”), including a system using a honeycomb structure as the adsorbent bed in the supplemental canister body 12. *Id.* at 6:55–57; 7:6–67. Hiltzik describes measuring the diurnal breathing loss (DBL) emissions for each example, and provides the emission performance results. *Id.* at 6:50–7:5; col. 8, Table. In one specific embodiment, Hiltzik describes a canister system comprising:

the initial volume of vapor adsorbent material is characterized by an incremental adsorption capacity at 25° C. of greater than 35 g n-butane/L between vapor concentrations of 5 vol % and 50 vol % n-butane before routing the fluid stream through at least one subsequent volume of vapor adsorbent material[, and] wherein the subsequent volume of vapor adsorbent material is characterized by an incremental adsorption capacity at 25° C. of less than 35 g n-butane/L between vapor concentrations of 5 vol % and 50 vol % n-butane.

Id. at 9:33–42.

Hiltzik also discloses example butane working capacities (BWC) for the system of about 6 g/dL or less (*id.* at 5:2–5, 8:49) and a two-day DBL of 10–29 mg (*id.* at 8:33–35).

Clontz WIPO (Ex. 1009)

Clontz WIPO relates to “a hydrocarbon emissions scrubber, and to using the scrubber to remove volatile organic compounds, and other chemical agents from fluid streams.” Ex. 1009 ¶ 1. Clontz WIPO refers to Hiltzik (Ex. 1007) in the Description of Related Art section, and notes

[a]lthough the adsorbents-in-series as taught in [Hiltzik] are effective for substantial reductions in bleed emissions for typical vehicle designs and engine operation, recent designs of [hybrid] vehicle engines for improved fuel efficiency . . . do not achieve comparable reductions in emissions in some instances even with adsorbents-in-series in the evaporative emission control system.” *Id.* ¶ 6. Clontz WIPO explains “[t]hese [hybrid] engine designs do not provide enough volume of purge during carbon regeneration in order to sufficiently reduce the amount or alter the distribution of residual hydrocarbon heel in the carbon bed for the needed low levels of emissions during subsequent diurnal breathing conditions.

Id. ¶ 6. Clontz WIPO discloses “the use of multiple stages or chambers of electrically heatable adsorbent monoliths or honeycombs, which, in combination with conventional evaporative emission control canisters,

significantly reduces DBL emissions under low purge flow conditions while maintaining the high working capacity and low flow restriction properties of the canister system.” *Id.* ¶ 17. Figure 3 of Clontz WIPO is reproduced below.

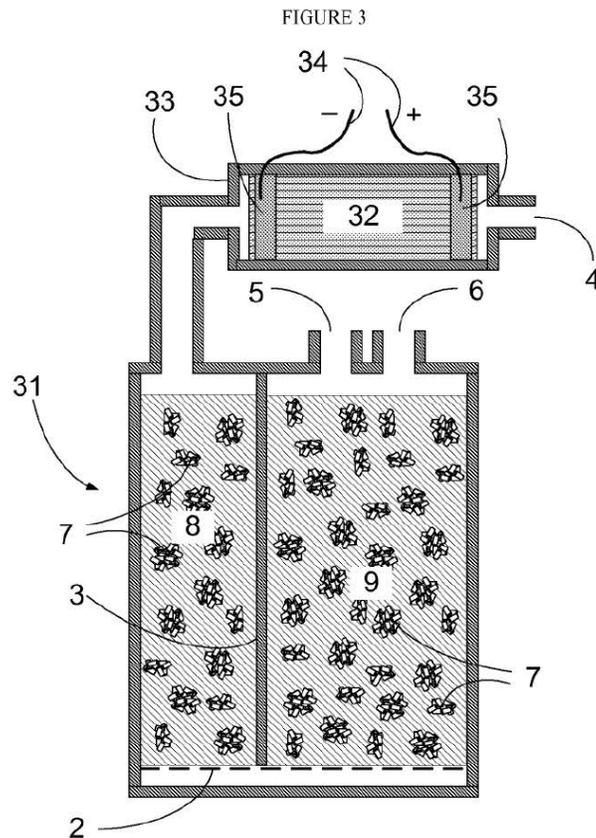


Figure 3 depicts an exemplary embodiment of a canister with multiple adsorbents. *Id.* ¶ 18. “The vapor flow path has an emission control system canister 31 in-line with an auxiliary canister 33 containing a bleed emission adsorbent scrubber 32 with desirable resistivity properties.” *Id.* Canister 31 includes

support screen 2, dividing wall 3, a vent port 4 to the atmosphere (the location of the purge inlet for the canister), a vapor source connection 5 (from the fuel tank), a vacuum purge connection 6 (the location of the purge outlet for when the engine is running),

and adsorbent material fill 7 in the purge inlet volume 8 and in the purge outlet volume 9.

Id. ¶¶ 3, 18.

Clontz WIPO further explains:

In order to avoid excessive flow restriction for vapor flow, such as during a refueling operation for an on-board refueling vapor recovery control system when vapor loading is high volume and rapid, the adsorbent scrubber 32 might be an activated carbon honeycomb with moderate electrical resistivity and a large open area with low resistance to bulk fluid flow. Electrical leads 34 are attached to conductive contacts, such as metal bands on the scrubber external surface 35, for applying electrical current for heating the scrubber before and/or during purge for enhanced vapor removal from the scrubber and from the adsorbent downstream in the purge flow vapor path.

Id. ¶ 18.

Clontz WIPO discloses several examples of the canister system (“Example 1”, “Example 2,” and “Example 3”) using an electrically conductive carbon honeycomb structure. *Id.* ¶¶ 21–26. Clontz WIPO describes measuring the diurnal breathing loss (DBL) emissions for each example, and provides the emission performance results. *Id.* at Table I, Table II.

Clontz SAE (Ex. 1010)

Clontz SAE is titled “Effects of Low-Purge Vehicle Applications and Ethanol-Containing Fuels on Evaporative Emissions Canister Performance,” and is directed to “optimiz[ing] the use of the activated carbon honeycomb [in evaporative emissions canisters] under reduced purge conditions and under conditions of exposure to fuels of different volatility and ethanol content.” Ex. 1010, Title, 1713–14. Clontz SAE analyzes the effect of several factors on diurnal emissions, including canister purge volume,

activated carbon honeycomb configuration, and resistive heating of a honeycomb. *Id.* at 1713. Regarding the activated carbon honeycomb configuration, Figure 4 of Clontz SAE is reproduced below.

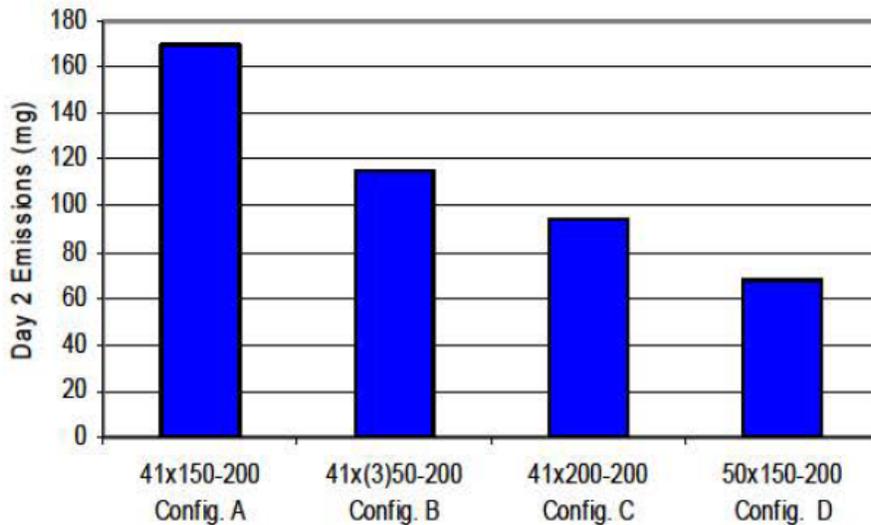


Figure 4 of Clontz SAE

Figure 4 is a chart illustrating the results of two-day diurnal emissions tests for four different activated carbon honeycomb configurations. *Id.* at 1716. The four configurations are: Config. A (single honeycomb of 41 mm diameter x 150 mm length), Config. B (three honeycombs of 41 mm diameter x 50 mm length in series), Config. C (single honeycomb of 41 mm diameter x 200 length), and Config. D (single honeycomb of 50 mm diameter x 150 length). *Id.* Clontz SAE explains “[t]he emissions data show that the developmental honeycomb Configurations (B-D) reduced emissions as compared to the baseline Configuration A (41 x150). These improvements ranged from 32% to 60% depending on honeycomb geometry and size.” *Id.* at 1716. Clontz SAE further discloses “[h]oneycomb Configurations C (41x200) and D (50x150) showed approximately 45% and 60% improvement as compared to the baseline Configuration A,” and

“[b]oth of these honeycomb configurations have more total working capacity due to their larger size as compared to the baseline honeycomb.” *Id.* at 1717.

Clontz SAE also discloses the effect of resistive heating of an activated carbon honeycomb on diurnal emissions, as shown in Figure 6, reproduced below. *Id.*

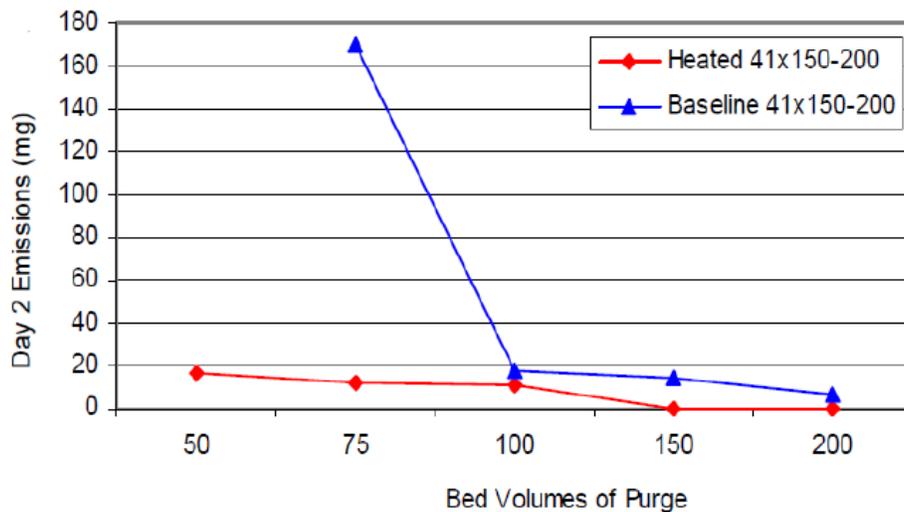


Figure 6 of Clontz SAE

Figure 6 is a graph illustrating emissions measured with the heated activated carbon honeycomb were lower as compared to the non-heated honeycomb. *Id.* Clontz SAE explains that “[t]he improvement in performance was most dramatic at lower purge volumes,” and “[r]esistively heating the honeycomb allowed emissions of less than 20 mg for all levels of purge evaluated.” *Id.*

2. Analysis

Petitioner argues claims 1–10, 14–28, 32–38, 51, 52, 55–57, 59, 64–72, and 76–82 of the ’553 patent would have been obvious over the combination of Hiltzik, Clontz WIPO, and Clontz SAE. Pet. 56–101.

Claim 1

Petitioner's Contentions

Petitioner provides analysis setting forth how the disclosures of Hiltzik, Clontz WIPO, and Clontz SAE allegedly meet each limitation of claim 1, and supports its analysis with the Lyons Declaration. Pet. 67–88. Patent Owner contests most of Petitioner's allegations. Prelim. Resp. 72–87. We summarize below Petitioner's analysis and support for each limitation, as well as Patent Owner's counterarguments, where appropriate. Based on this record, we determine Petitioner's showing of obviousness is sufficient at this stage of the proceeding.

An evaporative emission control canister system, including one or more canisters and comprising:

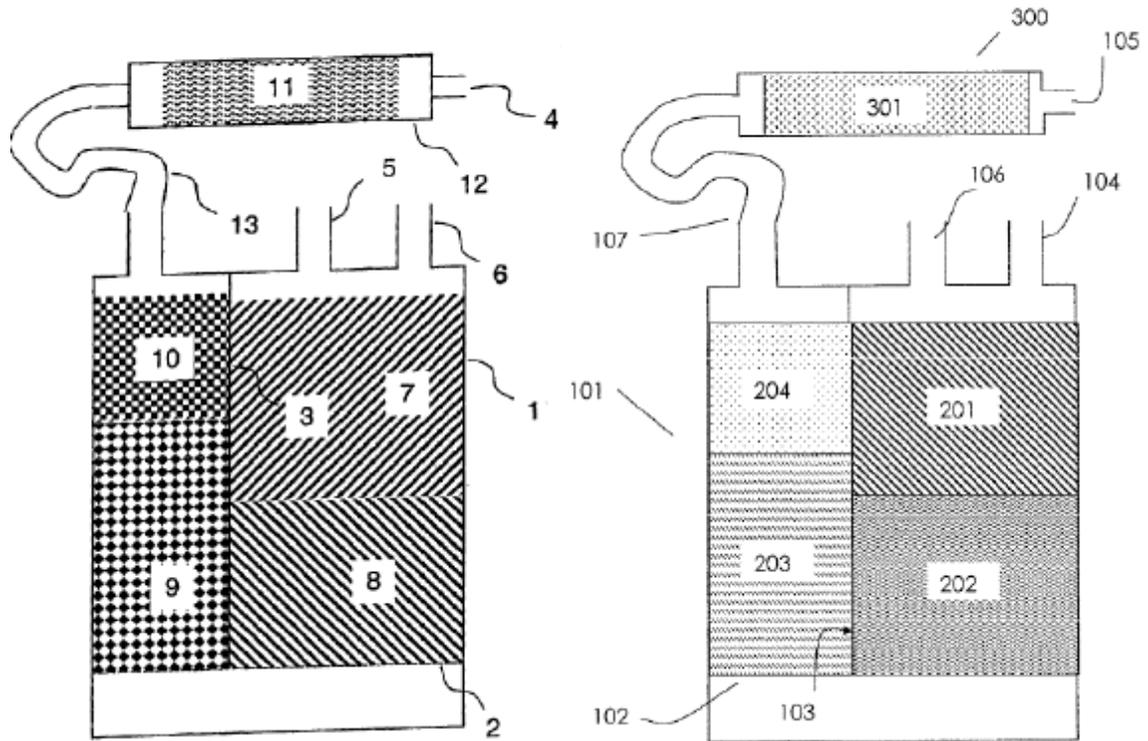
Petitioner contends each of Hiltzik, Clontz WIPO, and Clontz SAE teach an evaporative emission control canister system including one or more canisters. Pet. 67–69 (citing Ex. 1007, Abstract, Fig. 2; Ex. 1009, Abstract, Fig. 3; Ex. 1010, Title).

a fuel-side adsorbent volume having an effective incremental adsorption capacity at 25° C. of greater than 35 grams n-butane/L between vapor concentration of 5 vol % and 50 vol % n-butane

at least one subsequent adsorbent volume having an effective incremental adsorption capacity at 25° C. of less than 35 grams n-butane/L between vapor concentration of 5 vol % and 50 vol % n-butane

Petitioner contends Hiltzik discloses an initial volume of vapor adsorbent material having the recited properties. Pet. 70–71 (citing Ex. 1007; Ex. 1003 ¶¶ 160–164.) Petitioner contends that Hiltzik's initial adsorbent volume is a fuel-side adsorbent volume, as illustrated in side-by-side figures from Hiltzik and the '553 patent:

FIGURE 2



The figure above shows Figure 2 of Hiltzik on the left and Figure 4 of the '553 patent on the right. Hiltzik's initial adsorbent volume 7 is in the same position as fuel-side adsorbent volume 201 of Figure 4. Pet. 70 (citing Ex. 1001, 4:29–34; Ex. 1007, 6:34–35). Petitioner contends that Hiltzik's examples 1–3 include a fuel-side layer of BX 1500 pellets having an IAC of 80 g/L, which is within the claimed range for effective IAC. *Id.* (citing Ex. 1007, 6:52; Ex. 1003 ¶ 163).

Petitioner further contends each of Hiltzik, Clontz WIPO, and Clontz SAE teach a subsequent adsorbent volume in the form of a honeycomb monolith, and the combination of Hiltzik, Clontz WIPO, and Clontz SAE teaches the use of a subsequent adsorbent volume having the recited properties of effective IAC, effective BWC, and g-total BWC. Pet. 71–72

(citing Ex. 1003 ¶¶ 166–68). Petitioner acknowledges that none of the references explicitly discloses the “effective IAC” value for its honeycomb, but contends a person of ordinary skill in the art would have been motivated by Hiltzik’s teaching of nominal IAC less than 35 g/L to use honeycomb adsorbent having effective IAC in the recited range. *Id.* at 65–66, 73–74 (citing Ex. 1003 ¶¶ 154-55, 170). Petitioner contends a person of ordinary skill in the art would have understood the relationship of nominal IAC (as disclosed in Hiltzik) to effective IAC (as recited in claim 1) when the boundaries of the fuel-side adsorbent volume encompass only Hiltzik’s initial adsorbent volume. *Id.* at 70–71 (citing Ex. 1003 ¶¶ 163–164).

an effective butane working capacity (BWC) of less than 3 g/dL

Petitioner contends Hiltzik teaches nominal BWC of 4g/dL for its honeycomb and that “lower capacity adsorbents have BWC values preferably below 8 g/dL.” Pet. 75 (citing Ex. 1006, 6:2–8, 8:49). Petitioner acknowledges that none of the references explicitly discloses the “effective BWC” value for its honeycomb, but contends a person of ordinary skill in the art would have been motivated by Hiltzik’s teaching to use honeycomb having effective BWC in the recited range and would have understood the relationship of nominal BWC (as disclosed in Hiltzik) and effective BWC (as recited in claim 1) for the reason discussed above. *Id.* (citing Ex. 1003 ¶¶ 154-55, 176–77). Petitioner further contends a person of ordinary skill in the art would have been motivated to reduce BWC by (1) Hiltzik’s teaching to use a honeycomb with a lower nominal BWC than 4g/dL by including significant empty space in the subsequent adsorbent volume and diluting the vent-side adsorbent as much as possible (*id.* at 76–77, 80–82 (citing Ex. 1003 ¶¶ 178, 186; Ex. 1007, 4:61–63, 6:23–26)); (2) Clontz WIPO’s

teaching that reducing resistance of the honeycomb achieves lower emissions (*id.* at 77–78 (citing Ex. 1003 ¶ 179; Ex. 1009 ¶ 17, Table 2)); and (3) the knowledge of a person of ordinary skill in the art relating to honeycomb design and the relationship between void percentage and dilution (*id.* at 78–79 (citing Ex. 1003 ¶¶ 181–84; Ex. 1007, 7:28–40; Ex. 1009 ¶ 21; Ex. 1023; Ex. 1024, 7:15–18)).

a g-total BWC of ≤ 6 grams

Petitioner contends a person of ordinary skill in the art would have understood, from Hiltzik’s teaching of nominal BWC of its honeycomb as discussed above, how to reduce g-total BWC below 6g, because g-total BWC of an adsorbent volume is the sum of the product of nominal BWC and nominal volume for each adsorbent component in an adsorbent volume. *Id.* at 83–84 (citing Ex. 1003 ¶ 196–197). Petitioner explains how a person of ordinary skill would have been motivated to use the teaching of Hiltzik’s Example 2 honeycomb with Clontz SAE’s teachings that honeycombs with higher g-total BWC perform better at low purge, to achieve a 200 ml honeycomb having g-total BWC of 5.4g. *Id.* at 84 (citing Ex. 1003 ¶ 197; Ex. 1007, 8:21; Ex. 1010, 1717). Petitioner further contends, as with effective BWC discussed above, that a person of ordinary skill in the art would have been motivated to combine Clontz WIPO’s teaching of a smaller honeycomb to reduce g-total BWC to 2.6g. *Id.*

wherein the fuel-side adsorbent volume . . . and the at least one subsequent adsorbent volume are located within a single canister, or in separate canisters that are connected to permit sequential contact by fuel vapor

Petitioner contends Hiltzik and Clontz WIPO teach a configuration having the honeycomb adsorbent arranged outside of the main canister but

connected to the initial adsorbent volume to permit sequential contact by the fuel vapor. *Id.* at 85–86 (citing Ex. 1003 ¶¶ 199–204; Ex. 1007, 9:43–47, Fig. 2, claim 6; Ex. 1009, Fig. 4).

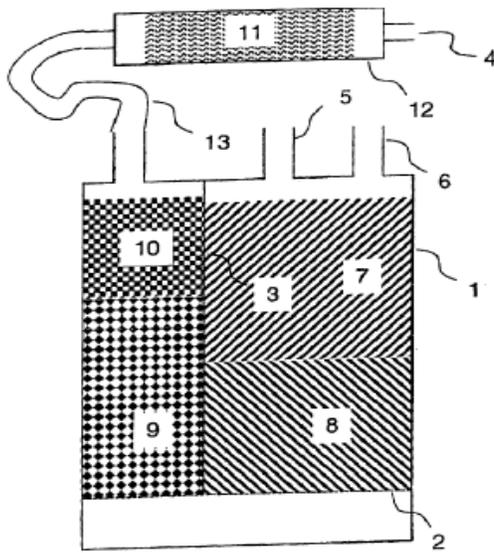


Figure 2 of Hiltzik

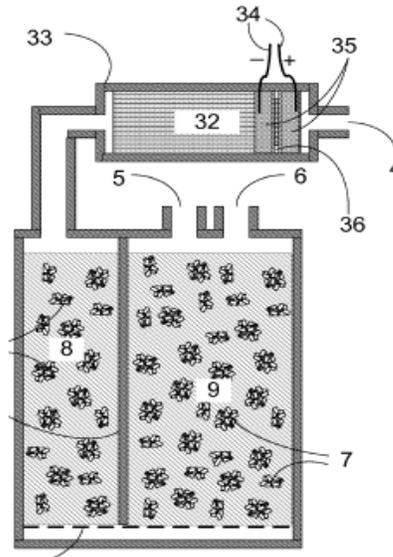


Figure 4 of Clontz WIPO

The figure above shows Figure 2 of Hiltzik on the left and Figure 4 of Clontz WIPO on the right.

wherein the canister system has a two-day diurnal breathing loss (DBL) of no more than 20 mg at no more than 100 BV of purge applied after a 40 g/hr butane loading step.

Petitioner contends Clontz WIPO teaches that canister systems with 66mL honeycomb adsorbents meet this performance limitation when a heating element is applied to the honeycomb. Pet. 87–88 (citing Ex. 1009, Table II). Petitioner further contends Clontz SAE confirms that heating elements drastically reduce the 2-day DBL emissions. *Id.* (citing Ex. 1010, Fig. 6). Petitioner contends a person of ordinary skill would have been motivated to apply a heating element as taught by Clontz SAE to the

honeycomb adsorbent, resulting in emissions within the recited range below 20mg at no more than 100BV of purge. *Id.*

Reason to Combine or Modify the References

In addition to the reasons set forth for combining or modifying the references as applied to each limitation above, Petitioner contends a person of ordinary skill in the art would have been motivated to combine Hiltzik, Clontz WIPO, and Clontz SAE because each reference relates to a canister system having the same basic configuration, and discloses that the use of honeycomb significantly reduces DBL emissions. Pet. 65. Petitioner further contends Clontz WIPO and Clontz SAE demonstrate a need to control DBL emissions in low-purge vehicles, and provide different data sets a person of ordinary skill in the art would have consulted for low-purge emissions levels for two sizes of honeycombs, although neither reference discloses IAC or BWC of the honeycombs tested. *Id.* at 66. Petitioner contends a person of ordinary skill in the art would have understood that Hiltzik's nominal IAC and BWC values could be used with Clontz WIPO and Clontz SAE, in part because Clontz WIPO references Hiltzik's discussion of honeycomb properties and discloses that its honeycomb were created using the same method as Hiltzik's honeycomb. *Id.*

We find that Petitioner's reasons for the proposed combination are supported by specific reasoning based on the evidence of record, sufficient to support the conclusion of obviousness at this stage of the proceeding. For example, we are persuaded by Petitioner's argument that a person of ordinary skill in the art would have understood the relationship between Hiltzik's teaching of nominal IAC and BWC, as compared to effective IAC and BWC recited in claim 1, and would have been motivated to further

dilute Hiltzik's honeycomb based on the teachings of the Clontz references, in order to achieve lower emissions.

Patent Owner's Contentions

Patent Owner contends a person of ordinary skill in the art would not have been motivated to combine the references for several reasons. Prelim. Resp. 68–71. For example, Patent Owner contends the teaching of heating in Clontz SAE and Clontz WIPO is contrary to the non-heated passive approach of the challenged claims. *Id.* at 68–69. Patent Owner further contends Clontz SAE and Clontz WIPO do not disclose nominal BWC or IAC of the honeycombs they tested, and that Petitioner mischaracterizes Hiltzik's disclosure of BWC and IAC for typical honeycomb adsorbents. *Id.* at 70. Patent Owner further contends that Petitioner fails to explain why a person of ordinary skill would have been motivated to combine the references, which were publications by Patent Owner's predecessor, while Patent Owner's predecessor had access to the information for years and never combined the teachings. *Id.* at 71.

As to the specific limitations of claim 1, Patent Owner contends none of the references disclose effective IAC or effective BWC as defined in the '553 specification, and that Petitioner does not sufficiently explain why or how a person of ordinary skill in the art would modify the references in order to achieve the claimed IAC and BWC limits. Prelim. Resp. 71–74, 82–84. Patent Owner disputes Petitioner's assertion that a person of ordinary skill in the art would have been motivated by Hiltzik's teaching to dilute the honeycomb to achieve IAC below the limit recited in the claims, because Hiltzik does not also disclose the low purge requirements recited in the claims. *Id.* at 75. Patent Owner contends Clontz WIPO's teachings as to

honeycomb dilution are inapposite because its disclosure is in the context of a heated honeycomb. *Id.* at 76. Patent Owner also contends Petitioner is unlikely to succeed in demonstrating obviousness because it improperly relies on several references that are not part of the purported ground. *Id.* at 76–77, 79–80. Patent Owner also disputes Petitioner’s showing as to the relationship between IAC and BWC. *Id.* at 80–81.

Discussion

Patent Owner’s arguments that the Clontz references are contrary to the claimed, non-heated approach are not persuasive because the references may be relied upon for all that they would have reasonably suggested, and claim 1 does not exclude canister systems that use heating elements. Furthermore, Patent Owner’s contentions regarding the lack of nominal BWC or IAC in the Clontz references is not persuasive, because the values of BWC and IAC for Hiltzik’s Example 2, shown in Hiltzik’s Table, are consistent with the values Petitioner relies on, as discussed above. *See Ex. 1007, 7:26–8:52.* And Patent Owner’s argument concerning the fact that its predecessor did not combine for itself the references that Petitioner now relies on for obviousness, raises a factual dispute that does not persuade us to deny institution. *See Prelim. Resp. 71.*

Regarding Patent Owner’s arguments that Hiltzik does not disclose the low purge requirements of the claims, we do not find this persuasive because it addresses Hiltzik individually, rather than in combination with Clontz SAE and Clontz WIPO on which Petitioner relies for teaching low-purge emissions levels. Finally, Patent Owner’s arguments that Petitioner relies on references that are not part of the grounds of unpatentability is not persuasive because, as discussed above, the Petition adequately supports the

obviousness challenge by identifying how the disclosure of each reference or combination of references corresponds to the claim limitations.

Based on the current record, we are persuaded that Petitioner demonstrates it is more likely than not to prevail with respect to its challenge to claim 1.

Claim 21

Petitioner contends the primary differences between claim 1 and 21 are (1) claim 21 does not recite any limits on the “effective” BWC of the “subsequent adsorbent volume” and (2) claim 21 sets the maximum purge at 210 liters compared to claim 1’s 100 BV purge; the first distinction removes a limitation, making claim 21 broader than claim 1. Pet. 88–89. Petitioner further contends the combination of Clontz WIPO and Clontz SAE discloses achieving the 2-day DBL emissions limit at a maximum purge of 210 liters, because Clontz WIPO teaches when a small notch is carved into the honeycomb, the emissions drop to 4mg at 75BV of purge (*id.* at 89–90 (citing Ex. 1003 ¶ 206)), and Clontz SAE achieved low emissions at 50 BV and 75 BV of purge. *Id.* at 90 (citing Ex. 1003 ¶ 207; Ex.1010, Fig. 6).

Patent Owner responds that Clontz WIPO and Clontz SAE use heating elements to reduce their 2-day DBL emissions, and therefore their canister systems are different from the canister systems in the challenged claims. Prelim Resp. 84–87. We do not find this argument persuasive because, as discussed above, the challenged claims do not exclude heated canister systems. We have reviewed the information provided by Petitioner, and are persuaded based on the current record that Petitioner has shown it is more likely than not it will prevail with respect to its challenge of claim 21.

Claims 51, 55, and 64

Petitioner argues independent claims 51, 55, and 64 are broader than claim 1, and, therefore, are obvious for the same reasons as presented for claim 1. Pet. 90–91. Patent Owner does not present argument for these claims. Prelim. Resp. 87. Having found that Petitioner has established it is more likely than not it will prevail with respect to claims 1 and 21 of the '553 patent, we also institute review with respect to claims 51, 55, and 64. Consolidated Trial Practice Guide 5 (Nov. 2019) (“Trial Practice Guide”), <http://www.uspto.gov/TrialPracticeGuideConsolidated> (“In instituting a trial, the Board will either (1) institute as to all claims challenged in the petition and on all grounds in the petition, or (2) institute on no claims and deny institution.”).

Dependent Claims

Petitioner presents argument in support of its obviousness challenge as to several groups of dependent claims. Pet. 91–101. Patent Owner does not present argument for any dependent claims. Prelim. Resp. 87–88. In accordance with the Trial Practice Guide, we institute post-grant review as to the challenged dependent claims. Trial Practice Guide 5.

E. Alleged Indefiniteness of the Challenged Claims

Petitioner argues that claims 1–10, 14–28, 32–38, 51, 52, 55–57, 59, 64–72, and 76–82 are indefinite under 35 U.S.C. § 112(b). Pet. 41–56.

Petitioner argues the term “effective incremental adsorption capacity (IAC)” in the challenged claims is indefinite, because the '553 patent discloses two different methods for calculating effective IAC, McBain, and ASAP 2020, which Petitioner contends result in substantially different

values for IAC, and a person of ordinary skill in the art would not know which approach to select. Pet. 43–44 (citing *Dow Chem. Co. v. Nova Chems. Corp.*, 803 F.3d 620 (Fed. Cir. 2015)). Petitioner presents argument and evidence concerning testing by a third party of three different adsorbent materials under both methods, and asserts that the methods produce a potential 12–14% difference in effective IAC. Pet. 47–48, 52 (citing Ex. 1003 ¶¶ 112–17; Ex. 1020; Ex. 1035 ¶¶ 4–13).

Patent Owner responds that IAC is a physical parameter that is fixed for a given adsorbate-adsorbent system, so long as the adsorbate identity, concentration, and temperature are fixed, i.e. “there is a real adsorption capacity for a given set of conditions.” Prelim. Resp. 43–44. Patent Owner thus argues that unlike the claimed parameter in *Dow* – the slope of a multi-sloped curve – effective IAC as recited in the ’553 patent claims can be accurately measured so long as the variables of adsorbate identity, concentration, and temperature are specified, and the term IAC does not render the claims indefinite merely because the ’553 patent describes two different ways of measuring IAC. *Id.* at 44. Patent Owner also disputes Petitioner’s assertion that the McBain and ASAP 2020 methods provide fundamentally different measurements. *Id.* at 32–33, 46–52. At best, however, this raises a factual dispute that we must view in the light most favorable to the Petitioner, solely for the purposes of deciding whether to institute trial. 37 C.F.R. § 42.208(c).

Given the arguments of both parties and the incomplete state of the record at this stage of the proceeding, we cannot say at this time that Petitioner has shown that it is more likely than not that the challenged claims are indefinite. That said, Petitioner has raised at least a colorable argument

that finds some support in the record. Moreover, having decided to institute trial on Petitioner's obviousness challenge, at this stage of the proceeding we need not determine if it is more likely than not that the challenged claims are unpatentable as indefinite. In accordance with the Trial Practice Guide, we institute post-grant review on this ground. Trial Practice Guide 5. We look forward to further development of the record as to the alleged indefiniteness of the challenged claims at trial.

III. CONCLUSION

Based on the arguments in the Petition and the evidence of record, we determine that Petitioner has demonstrated that it is more likely than not that claims 1–10, 14–28, 32–38, 51, 52, 55–57, 59, 64–72, and 76–82 of the '553 patent are unpatentable.

Our factual findings, conclusions of law, and determinations at this stage of the proceeding are preliminary, and based on the evidentiary record developed thus far. This is not a final decision as to the patentability of claims for which post-grant review is instituted. Our final decision will be based on the record as fully developed during trial.

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that a post-grant review of all challenged claims of the '553 patent is instituted with respect to all grounds set forth in the Petition; and

FURTHER ORDERED that pursuant to 35 U.S.C. § 324(a), post-grant review of the '553 patent is hereby instituted commencing on the entry

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date of this Decision, and pursuant to 35 U.S.C. § 324(d) and 37 C.F.R.
§ 42.4, notice is hereby given of the institution of a trial.

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