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Paper 59
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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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VOLKSWAGEN GROUP OF AMERICA, INC.,
Petitioner,

v.

EMERACHEM HOLDINGS, LLC,
Patent Owner.

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Case IPR2014-01558
Patent 5,599,758

Before FRED E. McKELVEY, JAMES T. MOORE, and SHERIDAN K. SNEDDEN, *Administrative Patent Judges*.

McKELVEY, *Administrative Patent Judge*.

DECISION
Final Written Decision
*35 U.S.C. 318(a)*

## I. Introduction

Pending before the Board is entry of a Final Written Decision.

A Petition was filed on 30 September 2014. Paper 3.

An *inter partes* review trial was ordered on 16 March 2015. Paper 19, *reh'g denied*, Paper 22 (7 April 2015).

Patent Owner timely filed an Opposition. Paper 29.

Petitioner timely filed a Reply. Paper 40.

Patent Owner timely filed a motion to exclude. Paper 45.

Petitioner timely opposed. Paper 50.

Petitioner timely filed a motion to exclude. Paper 47. Patent Owner has opposed. Paper 52. Petitioner has replied. Paper 54.

## II. Background

### A. The Parties

Petitioner is Volkswagen Group of America, Inc. Paper 3, page 1.

Patent Owner is EmeraChem Holdings, LLC. Paper 6, page 2.

### B. Involved Patent

The involved patent is expired U.S. Patent 5,599,758 ("the '758 patent") issued 4 February 1997, based on an application filed 23 December 1994. Ex. 1001A.

A description of the '758 patent is set out below.

### C. Litigation

The '758 patent is involved in litigation, *viz.*, *EmeraChem Holdings, LLC v. Volkswagen Group of America, Inc., Volkswagen AG, and Volkswagen Group of America Chattanooga Operations, LLC,* No. 14-cv-132-PLR-HBG (E.D. Tenn. filed Mar. 31, 2014). Paper 3, page 1; Paper 14, page 1.

An amended complaint was served on defendant Volkswagen Group of America Chattanooga Operations, LLC, on 6 November 2014. Paper 14, page 2.

An amended complaint was served on defendant Volkswagen Group of America, Inc., on 6 November 2014. Paper 14, page 1.

An amended complaint was served on defendant Volkswagen AG on 8 January 2015. *Id*.

D. Evidence Relied Upon

Patent Owner relies on the following prior art, listed in numerical order by exhibit number:

| **Name** | **Exhibit No.** | **Description** | **Date** |
|---|---|---|---|
| Campbell et al. "Campbell" | 1003A | U.S. Patent 5,451,558[1] | 10 Sept. 1995 filed 4 Feb. 1994 |
| Hirota et al. "Hirota" | 1006A | U.S. Patent 5,406,790 | 18 Apr. 1995 filed 2 Dec. 1993 |
| Takeshima et al. "Takeshima" | 1007A | European Patent Application 0 560 991 A1 | 22 Sept. 1993 |
| Saito et al. "Saito" | 1008B | Japanese Patent Application 62-106826 | 18 May 1987 |
| Stiles et al. "Stiles" | 1009A | U.S. Patent No. 5,362,463 | 8 Nov. 1994 |

Takeshima and Saito are prior art under 35 U.S.C. § 102(b).

Campbell and Hirota are prior art under 35 U.S.C. § 102(e).

Stiles is prior art under 35 U.S.C. § 102(a).

As will become apparent, Patent Owner attempts to remove Campbell as prior art, but not Hirota or Stiles.

E. Grounds

Claims 1–20 appear in the '758 patent.

[1] Campbell is the patent involved in IPR2014-01555.

An *inter partes* review trial was instituted on the following claims and prior art (I means instituted).

| Claim | Hirota § 102(e) Ground 1 | Takeshima § 102(b) Ground 2 | Saito § 102(b) Ground 3 | Campbell Hirota Saito Stiles § 103(a) Ground 4 |
|---|---|---|---|---|
| 1 | I | I | I | I |
| 2 | I | I | I | I |
| 3 | | | I | I |
| 4 | I | I | I | I |
| 5 | I | | I | I |
| 6 | I | | I | I |
| 7 | | | I | I |
| 8 | | | I | I |
| 9 | I | I | I | I |
| 10 | | | | I |
| 11 | I | I | I | I |
| 12 | I | I | I | I |
| 13 | | | I | I |
| 14 | | | I | I |
| 16 | | | I | I |
| 17 | | | | I |
| 18 | | | | I |
| 19 | | | | I |
| 20 | | | I | I |

Petitioner has not challenged claim 15 of the ’758 patent.

F. Oral Argument

Oral argument was held on 23 November 2015.

Prior to oral argument, and based on the Petition, Opposition, and Reply, the Board invited the parties to address specific issues at oral argument. Paper 53, pages 6–8.

A transcript of oral argument has been placed in the record. Paper 58.

Some of the oral argument presented by both parties was not consistent with oral argument procedure applicable before the Board. In particular, arguments were made that were not based on arguments in the Petition, Opposition, or Reply. In addition, explanations were proffered that are not supported by evidence in the record or arguments previously made in the Petition, Opposition, or Reply. *See, e.g.*, Transcript of Oral Argument, Paper 58, page 14:5–22.

Oral argument is governed in part by 37 C.F.R. § 42.70(a) (first sentence) (italics added):

> (a) A party may request oral argument *on an issue raised in a paper* at a time set by the Board.

The Trial Practice Guidelines advise as follows:

> A party may rely upon evidence that has been previously submitted in the proceeding and *may only present arguments relied upon in the papers previously submitted*. *No new evidence or arguments may be presented at the oral argument*.

Office Patent Trial Practice Guide, 77 Fed. Reg. 48756, 48768 (col. 2) (Aug. 14, 2012) (italics added).

The rationale in support of the Rule and Guideline is fundamental fairness to an opponent. 37 C.F.R. § 42.1(b) (Part 42 "shall be construed to secure the just, speedy, and inexpensive resolution of every proceeding.") It is not just to an opponent for a party to raise an argument not based on the Petition, Opposition, or Reply, or to discuss evidence not in the record. Why? There is no meaningful opportunity for the opponent to rebut the argument or address the evidence. Likewise, the Board is at a disadvantage

because judges do not prepare for oral argument based on arguments and evidence not present in the record.

To the extent that arguments and discussions took place at oral argument in this case contrary to the principles set out above, those arguments and discussions have not been considered in rendering a decision on the merits and are not considered to be properly in the record.

## G. The '758 Patent

### 1. Claim 1

The invention is generally understood from claim 1 of the '758 patent, which reads [some indentation and matter in brackets added]:

> A method of regenerating a devitalized absorber having nitrogen oxides absorbed therein or thereon, said method comprising the steps of:
>
> [A] providing a stream of regenerating gas comprising [A1] a reducing gas, said reducing gas having an effective amount for removing said nitrogen oxides from said devitalized absorber, and [A2] an inert carrier gas; and
>
> [B] passing said stream of regenerating gas comprising [B1] an inert carrier gas and [B2] a component selected from the group consisting of hydrogen, carbon monoxide and mixtures thereof over said devitalized absorber comprising
>
> [1] an alumina support with
>
> [2] a platinum coating thereon and having nitrogen oxides absorbed therein or thereon for
>
> [C1] an effective time,
>
> [C2] at an effective temperature and

[C3] at an effective space velocity

[D] to remove said nitrogen oxides from said devitalized absorber to form a regenerated absorber.

Ex. 1001A, 9:28–44.

2. Details of the Invention

According to the '758 patent, "[t]he principal component of the gaseous stream is an inert carrier gas such as nitrogen, helium, argon, or steam." Ex. 1001A, 2:60–62.

Further according to the '758 patent:

> The regeneration gas comprises a reactant gas or mixture of reactant gases along with a carrier gas or carrier gas mixture. The reactant gases are reactive reducing agents to convert the oxidized forms of the absorber made in the absorption step. The preferred reactants gases are carbon monoxide or hydrogen or combinations of carbon monoxide and hydrogen. The reactant gases make up about 500 ppm to 10 percent of the regeneration gas; the remainder of the regeneration gas is the carrier gas mixture.

Ex. 1001A, 2:66–3:7.

III. Analysis—Ground 1 (Hirota)

The principal issue with respect to Ground 1 is whether Hirota describes an inert carrier gas. Petitioner says "yes" and Patent Owner says "no."

The '758 patent contains the following discussion:

> The regeneration gas comprises a reactant gas or mixture of reactant gases along with a carrier gas or carrier gas mixture. The reactant gases are reactive reducing agents to convert the oxidized forms of the absorber made in the

> absorption step. The preferred reactants gases are carbon monoxide or hydrogen or combinations of carbon monoxide and hydrogen. The reactant gases make up about 500 ppm to 10 percent of the regeneration gas; the remainder of the regeneration gas is the carrier gas mixture.
>
> The carrier gas may comprise principally nitrogen or steam, for example, preferred 50 percent or more nitrogen and may have smaller concentrations of carbon dioxide and steam or 50 percent or more steam and may have smaller concentrations of nitrogen and carbon dioxide. Nitrogen in high concentrations of about 50% to about 80% provides an excellent carrier for the reductants. Steam is also a good carrier in concentrations of 30% to 98% with the balance being nitrogen.
>
> *The regeneration gas is substantially oxygen free, although up to one percent oxygen may be present without significant negative effects*.

Ex. 1001A, col. 2:66–col. 3:18 (italics added).

The patent involved in IPR2014-01556, U.S. Patent 5,953,911, ("the '911 patent") contains a similar discussion. IPR2014-01556, Ex. 1001A, col. 3:6–30.

In our Final Written Decision in IPR2014-01556, we interpreted similar language based on a similar specification to limit the amount of oxygen in the regeneration gas to no more than one percent. IPR2014-01556, Paper 57, pages 15–16.

Based on arguments made in IPR2014-01556, that are essentially the same arguments made in this IPR, we held that Petitioner had not established that Hirota's corresponding regeneration gas had an oxygen amount of no more than up to one percent oxygen.

We see no need to repeat that discussion here, and adopt it as written therein.

Petitioner has failed to establish that Hirota describes a regeneration gas falling within the scope of the regeneration gas of claim 1 of the '758 patent.

Accordingly, Petitioner has failed to satisfy its burden of proving by a preponderance of the evidence that the subject matter of claim 1 of the '758 patent is anticipated by Hirota.

Claims 2, 4–6, 9, 11, and 12 depend from claim 1 and therefore likewise are not anticipated.

## IV. Analysis—Ground 2 (Takeshima)

### A. Background

Petitioner maintains that Takeshima (Ex. 1007A) anticipates independent claim 1 and dependent claims 2, 4, 9, 11, and 12 of the '758 patent. Paper 3, pages 12 and 28–37.

Patent Owner disagrees. Paper 29, pages 12–14.[2]

In IPR2014-01555, we found that Petitioner failed to establish that claims involved in that IPR were anticipated by Takeshima. In particular, we found that Petitioner failed to establish by a preponderance of the evidence that Takeshima describes a

[2] In support of its argument, Patent Owner refers to an Inui reference. Ex. 1007B in IPR2014-01555. The Inui reference was not made of record in this IPR. Inui is not addressed in Petitioner's Reply. Incorporation by reference in a first IPR to evidence is a second IPR is not permitted. Accordingly, neither the Inui reference nor the argument on page13:6 through page 14:8 of Patent Owner's Opposition have been considered.

"component being *intimately and entirely coated* with an absorber selected from a hydroxide, carbonate, bicarbonate or mixtures thereof of an alkali or alkaline earth or mixtures thereof" as required by claim 1 of the patent involved in the IPR. IPR2014-01555, Paper 50, page 12.

B. Facts

The challenged claims of the involved '758 patent in this IPR do not contain an "intimately and entirely coated" limitation.

Hence, the evaluation here of anticipation is on a different basis than that in IPR2014-01555, i.e., whether Takeshima describes, in the words of claim 1, "an alumina support with a platinum coating."

According to Patent Owner, "Takeshima does not disclose a method involving a material including an alumina support with a platinum *coating* thereon." Paper 29, page 12:13–14 (italics added). Patent Owner therefore maintains that Petitioner has not established that Takeshima describes the limitation:

> [1] an alumina support with
>
> [2] a platinum *coating thereon* and having nitrogen oxides absorbed therein or thereon

as set out in Part [B] of claim 1 as reproduced above.

In its claim chart, Petitioner explains how the limitation is said to be described by Takeshima:

| **Claim 1 coating limitation** | **Takeshima** |
|---|---|
| passing . . . [a] stream of regenerating gas . . . over . . . [a] devitalized absorber comprising an alumina support with a platinum *coating* thereon . . . . | A method of regenerating a devitalized catalytic $NO_x$ absorbent comprising platinum and barium oxide *disposed* on an alumina carrier. See Ex.1007[A] at col. 2, ln. 10-14; col. 5, ln. 1-9, 24-30; col. 5, ln. 45 - col. 6, ln. 1; col. 6, ln. 24-42. |

Paper 3, page 34 (italics added).

We have not been directed to any discussion in the '758 patent describing what is meant by "a platinum coating thereon." In fact the '758 patent itself talks in terms of platinum being "disposed" on the alumina support:

> In commonly assigned [Campbell] U.S. Pat. No. 5,451,558 [Ex. 1003A], *which is incorporated herein in its entirety*, a catalyst/absorber is described and consists of a support with an alumina washcoat *disposed* thereover, a platinum catalyst *disposed* on the washcoat, and with an alkali or alkaline earth carbonate or bicarbonate coating thereon, the carbonate coating being lithium, sodium, potassium or calcium carbonate.

Ex. 1001A, col. 1:55–2:3 (italics added).

Figure 1 of the incorporated by reference Campbell '558 patent is reproduced below:

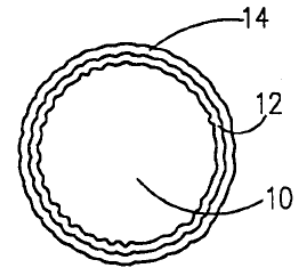


FIG. 1A

Depicted in Figure 1A of Campbell is a schematic drawing of a catalyst absorber sphere for use in a process for making the novel catalyst absorber of a preferred embodiment.

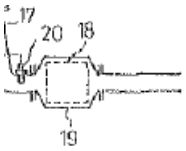
Ex. 1003A, col. 3:36–37.

According to Campbell '558, "FIG. **l**a shows a spherical catalyst absorber made up of an alumina sphere **10** with a platinum coating **12** and a carbonate coating **14** thereon." Ex. 1003A, col. 4:67–col. 5:1. Campbell '558 also mentions "platinum coated spheres." Ex. 1003A, col. 5:30–31.

We turn to Takeshima.

The relevant information as outlined in Petitioner's claim chart, appears to be as follows (italics added):

| **Takeshima** | **Description in Takeshima** |
|---|---|
| Col. 2:10-14 | An object of the . . . invention is to provide an exhaust purification device which can efficiently absorb $NO_x$ without a complex construction of the exhaust system and can release the absorbed $NO_x$ according to need. |
| Col. 5:1-9 | The NOx absorbent 18 in the casing 19 uses, for example, alumina as a *carrier*. On this carrier, at least one substance selected from alkali metals, for example, potassium K, sodium Na, lithium Li, and Cesium Cs; alkali earth metals, for example barium |

| | |
|---|---|
| | Ba and Calcium Ca; rare earth metals, for example lanthanum La and yttrium Y; and precious metals such as platinum Pt, is *carried*.<br><br>Note: Absorbent 18 and casing 19 are shown in a portion of Takeshima Fig. 1:<br><br>  |

Petitioner's witness, Dr. Robert J. Farrauto, in discussing Takeshima, does not address "coating" in his direct declaration testimony. Ex. 1010A, ¶¶ 27–32.

In the Reply, Petitioner notes that the opposition is limited to arguing a lack of a description of a platinum coating. Paper 40, page 7.

Patent Owner's witness, Dr. Mark Crocker, was of the opinion that "[w]hen a reference refers to a carrier, this does not indicate that the carrier is coated with the carried material." Ex. 2004, ¶ 17.

Petitioner observes that the underlying basis for Dr. Crocker's ¶ 17 testimony is not identified. Paper 40, page 8.

Nevertheless, Dr. Crocker was cross-examined on the matter:

> Q. Okay. So you just don't coat the whole thing with platinum? The -- I'm sorry. *You just don't coat the alumina support entirely with platinum? It's the platinum atoms are dispersed?*
>
> A. *Correct.*

Q. And how widely are they dispersed on the alumina support?

A. Obviously, that depends on a number of factors. It depends on the platinum loading, it depends on the efficacy of the catalyst preparation method, and it depends upon the history of the catalyst, i.e., to the conditions to which its being exposed.

Q. Okay. And one of ordinary skill in the art can take all of those factors into account and determine the dispersion that should be used?

A. Well, one -- one aims for the highest dispersion possible when preparing the catalyst.

Q. Why is that?

A. In that way one makes the most efficient use of the supported platinum.

Q. Because platinum's expensive?

A. Platinum is expensive.

Q. So you want to use –

A. You want to use it as efficiently as possible.

Q. Is there some measure of dispersion or efficiency so that you can compare one dispersion rate, I guess would be the proper term, to another dispersion rate so that your bosses will make sure that you're making the most effective use of the expensive platinum?

A. Yes. As part of the standards procedure for characterizing a catalyst, one typically performs hydrogen chem esorption in which one essentially titrates the surface platinum atoms with hydrogen, and by measuring the

> amount of hydrogen taken up one gains an accurate measure of the number of exposed platinum atoms, and from that and knowing the platinum loading, one can calculate the dispersion.
>
> Q. *So when you use the phrase that the "alumina support is coated with platinum," that doesn't mean that the entirety of the alumina is covered by platinum atoms, correct?*
>
> A. *Exactly. In fact, as a chemist, I would typically not use the term "coated," but that is the language which is typically used in many patents*.
>
> Q. And what is your understanding of the meaning of the word "coated" as it is used in those patents that you were referring to?
>
> A. It depends on the context. If one is talking about coating a wash coat onto a monolithic substrate, then I take that to mean covering the entirety of the monolith. *When it's talking about coating a catalyst wash coat with platinum, then I take that to mean depositing a certain amount of platinum on that wash coat*.

Ex. 1056, page 13:2 to page 15:2 (italics added).

Dr. Crocker further testified on cross-examination:

> Q. Okay. What do you understand the phrase "an alumina support with a platinum *coating* thereon" to mean?
>
> A. I take that to mean an alumina support material onto which platinum has been *deposited*, but to my mind that does not imply that the platinum forms a *continuous* monolayer.

Ex. 1056, page 80:22 – page 81:1.

Dr. Crocker still further testified:

> Q. Okay. So with respect to Claim 1, when you're interpreting Claim 1 of the '758 patent to that effect, do you then apply the same meaning when looking at a prior art reference that has platinum deposited on a carrier?
>
> A. Yes, I do, because my chemical intuition tells me that one is never going to want to completely coat the surface of a carrier with a monolayer of platinum.

Ex. 1056, page 83:3–9.

On cross-examination, Dr. Crocker agreed that "carried" (the term used by Takeshima) would be understood as not wanting to completely coat the surface of a carrier with a monolayer of platinum.

C. Discussion

According to the Campbell patent, incorporated by reference into the involved '758 patent, Figure 1a of the Campbell patent describes a "preferred embodiment." Ex. 1003A, col. 3:36–37.

Claim 1 of the '758 patent calls for "an alumina support with a platinum coating thereon." Ex. 1001A, col. 9:39.

An embodiment described in the Campbell patent, incorporated by reference into the involved '758 patent, is "an alumina sphere **10** with a platinum coating **12** . . . thereon." Ex. 1003A, col. 4:68 through col. 5:1.[3]

Given that the language of claim 1 of the '758 is the same as the language describing the mentioned embodiment, we hold that the

[3] We note that the '758 patent refers to other applications, said to be incorporated by reference. These other applications, however, have not been made of record in this IPR.

language "an alumina sphere with a platinum coating thereon" is best defined as one in which the platinum is intimately and entirely coating the alumina support, as shown in Figure 1a of the '758 patent.

There is tension between Dr. Crocker's cross-examination testimony and the description of "coating thereon" in the '758 patent when considered in light of the incorporated by reference Campbell '558 patent. So, at first blush, our claim interpretation may appear to be at odds with Dr. Crocker's cross-examination. Dr. Crocker nowhere explains his position vis-à-vis Figure 1 of the Campbell patent. Nor does Dr. Crocker meaningfully address the use of the word "disposed" as it appears in unchallenged claim 13 of the '758 patent. Ex. 1001A, col. 10:28.

Takeshima describes the platinum as "carried" on the alumina support. Ex. 1007A, col. 5:8–9. Dr. Crocker is of the opinion that carried does not mean forming a continuous layer, such as that shown in Figure 1a of the Campbell patent: "I take that to mean an alumina support material onto which platinum has been *deposited*, but to my mind that does not imply that the platinum forms a *continuous* monolayer." Ex. 1056, page 80:24 – page 81:1.

Takeshima does not explicitly describe an alumina support with a continuous layer of platinum coated thereon. Rather, Takeshima describes an alumina support with platinum carried thereon. We credit that part of Dr. Crocker's testimony discussing why a continuous layer of platinum is not described by Takeshima.

We also note that in its claim chart, Petitioner uses the word "disposed" which is the same word used in unchallenged claim 13 of

the ’758 patent. In our view, “disposed thereon” is broader than “coating thereon.”

For the reasons given, we find that Petitioner has failed to establish by a preponderance of the evidence that Takeshima describes “an alumina support with a platinum coating thereon” as recited in claim 1 of the ’758 patent. The platinum carried on an alumina support of Takeshima may be (1) coated thereon in a continuous form or (2) disposed thereon in a non-continuous form. Since the record does not establish which of possibilities (1) or (2) is described by Takeshima, we find that Takeshima cannot anticipate.

Takeshima therefore does not anticipate claim 1 of the ’758 patent.

Since the remaining challenged claims depend from claim 1, Petitioner has failed to establish anticipation with respect to those dependent claims.

## V. Analysis—Ground 3 (Saito)

### A. Background

Petitioner maintains that Saito (Ex. 1008B) anticipates claim 1–9, 11–14, 16 and 20 of the ’758 patent. Paper 3, pages 12 and 37–44.

Patent Owner disagrees. Paper 29, pages 14–24.

### B. Petition

According to Petitioner’s claim chart (Paper 3, pages 40–41), reproduced in part below, claim 1 of the ’758 patent is anticipated by Saito.

| Claim Limitation | Saito |
|---|---|
| A method of regenerating a devitalized absorber having nitrogen oxides absorbed therein or thereon, said method comprising the steps of: | "A method of … reducing and removing the nitrogen oxide accumulated on the catalyst using a gaseous reducing agent, so as to regenerate the oxidative absorption capacity of the catalyst." Ex. 1008[B] at p. 1. "1-a and 1-b are catalysts that oxidize and absorb $NO_x$…." (p. 3). |
| providing a stream of regenerating gas comprising a reducing gas, said reducing gas having an effective amount for removing said nitrogen oxides from said devitalized absorber, and an inert carrier gas; and | "Ordinary reducing agents such as hydrogen, … carbon monoxide, … and the like can be used…." Ex. 1008[B] at p. 4. The reducing gas can be "diluted in an inert gas such as nitrogen." (p. 4). |

| Claim Limitation | Saito |
|---|---|
| passing said stream of regenerating gas comprising an inert carrier gas and a component selected from the group consisting of hydrogen, carbon monoxide and mixtures thereof over said devitalized absorber comprising an alumina support with a platinum coating thereon and having nitrogen oxides absorbed therein or thereon for an effective time, at an effective temperature and at an effective space velocity to remove said nitrogen oxides from said devitalized absorber to form a regenerated absorber. | "[O]rdinary reducing agents such as hydrogen, … carbon monoxide, … and the like can be used…." Ex. 1008[B] at p. 4. The reducing gas can be "diluted in an inert gas such as nitrogen." (p. 4).<br><br>Devitalized catalyst comprises platinum.<br><br>This catalyst may be disposed on an alumina carrier. (pp. 3-4).<br><br>When the $NO_x$ absorption efficiency of the catalyst has decreased, the $NO_x$ that had already accumulated on the catalyst is reduced and removed using the gaseous reducing agent so as to regenerate the oxidative absorption capacity of the catalyst. (p. 3). "[T]he reducing temperature is preferably 150 to 800° C, and in particular 200 to 700° C, the space velocity is a function of the concentration of the reducing agent, but the range of 10 to 100,000 $Hr^{-1}$is suitable. There are no particular limits on the processing time, but in the range of 1 minute to 1 hour is preferred." (p. 4). |

The relevant part of the cited portion of Saito (Ex. 1008B) is as follows:

> [A] catalyst . . . [comprising] a metal, oxide or complex oxide of at least one element selected from the group of

> manganese, iron, cobalt, nickel, copper, silver, zinc, chromium, molybdenum, tungsten, vanadium, niobium, tantalum, cerium, lanthanum, titanium, zirconium, aluminum, silicon, tin, lead, phosphorus, sulfur, alkaline earth metals comprising calcium, magnesium, strontium, and *barium*, alkali metals comprising lithium, sodium, potassium, rubidium, and cesium and precious metals comprising *platinum*, palladium, rhodium and ruthenium.

Ex. 1008B, renumbered page 1, col. 1 (emphasis added).

According to Petitioner:

> Saito discloses that the catalyst can comprise platinum and barium oxide.
>
> [S]aid catalyst comprises ***a metal, oxide or complex oxide of at least one element selected from the group of*** manganese, iron, cobalt, nickel, copper, silver, zinc, chromium, molybdenum, tungsten, vanadium, niobium, tantalum, cerium, lanthanum, titanium, zirconium, aluminum, silicon, tin, lead, phosphorus, sulfur, alkaline earth metals comprising calcium, magnesium, strontium, and ***barium,*** alkali metals comprising lithium, sodium, potassium, rubidium, and cesium and precious metals comprising ***platinum,*** palladium, rhodium and ruthenium.

Paper 3, pages 37–38 (emphasis in original); Ex. 1008B, page 1, col. 1.

As noted by Patent Owner, Dr. Farrauto does not appear to discuss Saito. Paper 29, page 16.

C. Opposition

In opposition, Patent Owner relies on the direct Declaration testimony of Dr. Crocker:

> Saito does not specifically disclose a Pt-BaO absorbent ([Paper 3] . . ., p. 39). Saito cites a catalyst comprising a metal, oxide or complex oxide of at least one element selected from a list of thirty-six elements (of which thirty-

> four are metals or metalloids and two are non-metals) ([Ex. 1008B,] Saito, p. 1). Thus, thousands of different element combinations are possible (even when combining only two elements in the elemental or oxide form). The example given cites the use of a lanthanum-cobalt complex oxide ([Ex. 1008B,] Saito, p. 4).

Ex. 2004, ¶ 21.

No cross-examination relative to Dr. Crocker's ¶ 21 direct testimony has been called to our attention.

Patent Owner argues in its Opposition that there are too many possibilities described by Saito to establish anticipation. Accordingly, says Patent Owner, Saito does not describe a specific combination of platinum and barium oxide. Paper 29, pages 18–19. In effect, Patent Owner says there are too many "selections" needed to come up with the combination set out in claim 1. *Id*. at 18.

D. Reply

Petitioner claims precedent is against Patent Owner's "selections" argument, citing *In re Petering*, 301 F.2d 676 (CCPA 1962) and *In re Schaumann*, 572 F.2d 312 (CCPA 1978), both of which held that anticipation was justified based on the number of options described in prior art references. Paper 40, page 13.

C. Discussion

There is precedent supporting Patent Owner's "selection" argument. *In re Arkley*, 455 F.2d 586, 587 (CCPA 1972). A concurring opinion disagreed with what was there referred to as a "picking" and "choosing" analysis; rather it maintained that anticipation should be determined on the basis of the prior art

disclosure is "sufficient to put the public in possession of the [claimed] invention." 455 F.2d at 590. In one sense the concurrence has a point, because it can be said that it was Patent Owner's inventors who selected from various options described in the prior art.

A recent decision of our appellate reviewing court clarifies the anticipation test as follows:

> A [claim in a] patent is . . . [unpatentable] if "the [claimed] invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.". . . A prior art reference can only anticipate a claim if it discloses all the claimed limitations "arranged or combined in the same way as in the claim.". . . However, a reference can anticipate a claim even if it "d[oes] not expressly spell out" all the limitations arranged or combined as in the claim, if a person of skill in the art, reading the reference, would "at once envisage" the claimed arrangement or combination. *In re Petering*, 49 CCPA 993, 301 F.2d 676, 681 (1962).

*Kennametal, Inc. v. Ingersoll Cutting Tool Co.*, 780 F.3d 1376, 1381 (Fed. Cir. 2015).

Consistent with *Petering* and *Kennametal*, what we have to factually determine on the record before us is: Has Petitioner established by a preponderance of the evidence that one skilled in the art would "at once envisage" a platinum/barium oxide combination based on the description set out in Saito as quoted above?

In our view, whether a particular embodiment or sub-genus of embodiments is "at once envisaged" can be a function of the number of possible combinations set out in the prior art. If the number is small, then it is possible that a claimed combination may be

envisaged. On the other hand, if the possible combination is large, then there is less likelihood that a claimed combination would be envisaged. What is certain is that there is no *per se* rule on the point.

The burden of proof is on Petitioner to prove that one skilled in the art would have "envisaged" the catalyst/absorber combination claimed by Patent Owner.

Petitioner suggests that the cited portion of Saito describes the claimed combination of catalyst and absorbent. However, we have found no persuasive reasoning backing up the suggestion. On the other hand Patent Owner, based on Dr. Crocker's direct Declaration testimony, notes that there are "thousands of different element combinations are possible (even when combining only two elements in the elemental or oxide form)." Paper 29, page 17; Ex. 2004, ¶ 21.

In the face of Dr. Crocker's testimony, Petitioner has not satisfactorily explained why one skilled in the art would "envisage" Patent Owner's claimed catalyst/absorber combination from the thousands of combinations described by Saito.

Accordingly, we are unable—on this record—to find that Petitioner has established by a preponderance of the evidence that Saito describes the claimed combination.

We therefore find that Saito does not anticipate the subject matter of claim 1 of the '758 patent.

It follows that Saito likewise does not anticipate any challenged claim depending from claim 1.

Patent Owner argues an "intimate and entirely coated" limitation appearing in independent claim 13. Paper 29, page 19. We

have not found where Petitioner addresses the "intimate and entirely coated" limitation. Accordingly, Petitioner has not established how Saito meets the "intimate and entirely coated" limitation of claim 13.

Patent Owner also argues the separate patentability of other claims apart from claims 1 and 13. We do not find it necessary to consider or decide any argument directed to other dependent claims given that independent claims 1 and 13 have not been shown to be anticipated.

## VI. Analysis—Ground 4 (Obviousness)

### A. Issues

Ground 4 raises two issues.

A first issue is whether Patent Owner has sustained its burden of production to demonstrate that Campbell is not prior art under § 102(e).

Assuming Campbell is prior art, a second issue is whether Petitioner has established by a preponderance of the evidence that the subject matter of claims 1–14 and 16–20 would have been obvious under 35 U.S.C. § 103(a) over (1) Campbell, (2) Hirota or Saito, and (3) Stiles.

Based on Petitioner's reliance on "Hirota or Saito," we note that the second issue in fact raises two issues:

(1) patentability based on Campbell, Hirota, and Stiles and

(2) patentability based on Campbell, Saito, and Stiles.

We have determined that neither Hirota nor Saito anticipates claim 1 of the '758 patent. However, this does not mean that teachings in Hirota and/or Saito necessarily are irrelevant to

obviousness. *Arkley*, 455 F.2d at 589 ("It may well be that [the claim on appeal] is unpatentable because obvious under § 103 in view of Flynn, but no such rejection is before us.").

Patent Owner has attempted to incorporate by reference an explanation said to appear in its Opposition in IPR2014-01555. Paper 29, paragraph bridging pages 29–30. Incorporation by reference is not permitted. 37 C.F.R. § 42.6(a)(3). *See also* Final Rule, Rules of Practice for Trials Before the Patent Trial and Appeal Board and Judicial Review of Patent Trial and Appeal Board Decisions, 77 Fed. Reg. 48612, 48617 (Aug. 14, 2012):

> The prohibition against incorporation by reference minimizes the chance that an argument would be overlooked and eliminates abuses that arise from incorporation and combination. In *DeSilva* v. *DiLeonardi*, 181 F.3d 865, 866–67 (7th Cir. 1999), the court rejected "adoption by reference" as a self-help increase in the length of the brief and noted that incorporation is a pointless imposition on the court's time as it requires the judges to play archeologist with the record. The same rationale applies to Board proceedings.

We decline to consider any argument or other material incorporated by reference and relating to the Stiles reference.

B. Is Campbell Prior Art?

The involved '758 patent names (1) Eugene D. Guth and (2) Larry E. Campbell as inventors. Ex. 1001A, page 1.

The Campbell patent names (1) Larry E. Campbell, (2) Robert Danziger, (3) Eugene D. Guth, and (4) Sally Padron as inventors. Ex. 1003A, page 1.

Prima facie Campbell is prior art under § 102(e).

According to Patent Owner, Campbell is not prior art. Why? Because any relevant discussion in Campbell is said to be a description of an invention made by the inventors named in the involved '758 patent, i.e., Larry E. Campbell and Eugene D. Guth.

Eugene D. Guth is deceased. Ex. 2005, ¶ 3.

According to a direct Declaration testimony of Larry E. Campbell: "Eugene D. Guth and I are the sole inventors of all inventions claimed in the involved '758 patent [Ex. 1001A]." Ex. 2005, ¶ 1.

An inventor's Declaration [i.e., the "oath" required by 35 U.S.C. § 116(a); Ex. 1002A, renumbered page 22] in the application that matured into the '758 patent prima facie establishes that Larry E. Campbell and Eugene D. Guth are the inventors of the subject matter claimed in the involved '758 patent.

According to the Campbell testimony:

> 4. Eugene D. Guth and I solely conceived of and invented the following subject matter disclosed in U.S. Patent No. 5,451,558 [Ex. 1003A]:
>
> A. The "catalyst absorber, preferably made of alumina/platinum/carbonate salt, is used to oxidize the pollutant oxides and absorb them" as disclosed in the abstract [Ex.1003, page 1].
>
> B. "A material for removing gaseous pollutants from combustion exhaust comprising an oxidation catalyst specie selected from platinum, palladium, rhodium, cobalt, nickel, iron, copper, molybdenum or combination thereof disposed on a high surface area support, said catalytic component being intimately and entirely coated with an absorber selected from a hydroxide, carbonate,

> bicarbonate or mixture thereof of an alkali or alkaline earth or mixtures thereof" as disclosed and claimed in claim l [Ex. 1003A, col. 12:30–38].
>
> C. "After the catalyst absorber is spent or partially spent, it can be reactivated. Reactivation is accomplished by removing and replacing the spent absorber and disposing of the removed spent absorber" as disclosed [in Ex. 1003A] at column 4, lines 44-47.

Ex. 2005.

Patent Owner did not call Robert Danziger or Sally Padron as a witnesses. Nor did Patent Owner offer any contemporaneous documentary evidence in support of the Campbell testimony.

Petitioner did not cross-examine. We draw no adverse inference from Petitioner's election not to cross-examine. If a party believes that an opponent has not made out a case with its testimony, the party is under no obligation to cross-examine. *Cabilly v. Boss*, 55 USPQ2d 1238, 1249 (BPAI 1998).

According to Patent Owner, the Campbell testimony establishes that all the material in the Campbell patent relied upon by Petitioner is an invention conceived by Campbell and Guth. Paper 29, page 26.

In support of Ground 4, the Petition cites at least the following portions of Campbell:

(1) claim 1 (Paper 3, page 45, page 51—claim chart, page 55—claim chart, page 57—claim chart);

(2) Abstract (Paper 3, page 49—claim chart);

(3) col. 2:16–32 (Paper 3, page 47:5–7);

(4) col. 2:59–col. 3:22 (Paper 3, page 46:14–15);

(5) col. 4:24–31 (Paper 3, page 55—claim chart);

(6) col. 4:28–31 (Paper 3, page 47:11 and page 55—claim chart, and page 59—claim chart);

(7) col. 4:36–41 (Paper 3, page 55—claim chart);

(8) col. 4:44–47 (Paper 3, page 47:5; page 50—claim chart, and page 56—claim chart); and

(9) col. 5:60–61 (Paper 3, page 46:17).

Principles applicable to the antedating issue before us include those discussed in *In re DeBaun*, 687 F.2d 459 (CCPA 1982).

*DeBaun* involved an antedating effort in the context of *ex parte* patent examination where there is no adverse party.

The *DeBaun* facts are similar to those here in that the reference patent (U.S. Patent 3,842,678) named two inventors (DeBaun and Noll), whereas the reissue application on appeal named one inventor (DeBaun). Here, the relied upon Campbell patent names four inventors, whereas the involved '758 patent names two inventors—inventors common to the inventors named in the Campbell patent.

In ex parte Rule 132 testimony, DeBaun explained why he was the inventor of the relevant subject matter described in the reference patent. To corroborate his testimony, DeBaun relied on a drawing. *DeBaun*, 687 F.2d at 461 (citing DeBaun Declaration ¶¶ (a) and (b)). Specifically, in paragraph (a), reference is made to drawing 73-315 [not reproduced in the CCPA's opinion], "which . . . [the CCPA found illustrated] a velocity profile development of an apparatus having open-ended honeycomb velocity equalizing sections." *Id.* In a

paragraph (c), DeBaun further alleged that "[i]nsofar as the invention . . . [of the DeBaun application pending on appeal before the CCPA] is suggested by drawing No. 73-315, or by anything contained . . . [in the reference DeBaun and Noll patent], it was originally conceived by me and described to patent counsel. . . ." *Id.* at 461–462.

The CCPA stated that the "specific issue raised by this appeal is an evidentiary one." *Id*. at 462. The CCPA also stated that "[t]he only question raised by the rejection is whether appellant invented the relevant disclosure in . . . [the DeBaun and Noll reference] patent." *Id.* at 463.

The CCPA made at least two observations in holding that the evidence was sufficient. *First*, the CCPA concluded that "[o]n the basis of the record here, which includes appellant's unequivocal declaration that he conceived anything in the . . . [DeBaun and Noll] patent disclosure which suggests the invention claimed in his . . . application [on appeal], that question has been satisfactorily answered." *Id. Second*, the CCPA concluded that the Board had erred "in view of appellant's showing that the basic equalizer honeycomb section is appellant's own invention." *Id*. We have observed that there is a tendency in citing *DeBaun* for parties to read too much into the *DeBaun* opinion by relying just on the first observation without taking into account the second observation and the precise facts of the case. As discussed below, *DeBaun* is limited to its facts; a significant fact being the presence of contemporaneous documents. Limiting precedent to its facts is a long-standing principle

of law in the jurisprudence of the United States. *See, e.g., Armour & Co. v. Wantock,* 323 U.S. 126, 132-133 (1944) ("It is timely again to remind counsel that words of our opinions are to be read in the light of the facts of the case under discussion.").

The case before us differs from *DeBaun* in at least two significant ways. *First*, the Campbell testimony does not contain a paragraph corresponding to DeBaun's paragraph (c) (*DeBaun*, 687 F.2d at 461–462). Hence, the unequivocal statement to which the *DeBaun* court may have been referring is not present in the case before us. *Second*, while DeBaun's "story" was corroborated with contemporaneous documentation, i.e., the DeBaun drawing, Campbell's "story" is not supported by any contemporaneous documentation. According to Petitioner, "the Campbell Declaration (Ex. 2005) is insufficient because there is no accompanying evidence explaining the inventorship assertions in that declaration." Paper 40, page 17. We agree. What we have here is 2015 *uncorroborated* testimony by an *interested* witness about events occurring prior to 1995—a period of at least *twenty years*.

In assessing the weight to give testimony in a case before us, we believe three relevant factors include (1) the time period between events and trial, (2) the interest of the witness, and (3) the absence of contemporary documentary evidence. *Cf. Woodland Trust v. Flowertree Nursery, Inc.*, 148 F.3d 1368, 1371 (Fed. Cir. 1998) (citing *In re Reuter*, 670 F.2d 1015, 1021 n.9 (CCPA 1981)); *Sandt Tech., Ltd. v. Resco Metal and Plastics Corp.*, 264 F.3d 1344, 1351 (Fed. Cir. 2001). The *Sandt* court noted that "[b]ecause documentary

or physical evidence is created at the time of conception . . ., the risk of litigation-inspired . . . exaggeration is eliminated." 264 F.3d at 1351. The court further noted that "[i]n contrast to contemporaneous documentary evidence, however, post-invention oral testimony is more suspect, as there is more of a risk that the witness may have litigation-inspired motive to corroborate the inventor's testimony." *Id*. At the end of the day, "'all pertinent evidence' is examined in order to determine whether the 'inventor's story' is credible." *Id.* at 1350.

We also will note that the Campbell testimony sets out specific subject matter said to be the invention of Larry E. Campbell and Eugene D. Guth. However, no explanation appears in Patent Owner's opposition, or in the Campbell testimony, addressing all of the subject matter of the Campbell patent upon which Petitioner relies—that material being identified in paragraphs (1) through (9), *supra*. Insofar as we can tell, the Campbell testimony addresses only the subject matter identified in paragraphs (1), (2), and (8).

We decline to credit the Campbell testimony, principally because there is *no contemporaneous documentary evidence* confirming *events taking place a long time ago* reported to us via a witness having an *interest* in the case.

Because we decline to credit the Campbell testimony, Patent Owner has failed to carry its burden of production. We therefore hold that the Campbell patent is prior art under 35 U.S.C. § 102(e).

At oral argument, counsel for Patent Owner called to our attention an ex parte decision of our Board, *Ex parte Griffin*, Appeal

No. 2013-000201 (PTAB Sept. 28, 2015). Transcript of Oral Argument, Paper 58, page 36:16–page 38:15. The *Griffin* panel opinion, Dr. Griffin's Rule 132 declaration, the first and last page of Dr. Griffin's curriculum vitae, and the Mosnier reference relied upon by the Examiner are made of record in this IPR as Ex. 3002.

According to counsel, the *Griffin* panel held that a reference was not prior art based exclusively on an assertion by an inventor that the subject matter described in the reference was his own invention.

*Griffin* is not a precedential opinion of our Board. In any event, and more importantly, there are significant differences between the ex parte *Griffin* proceeding and an *inter partes* review proceeding. In an ex parte proceeding the PTO may accept an unequivocal statement of an application. MPEP § 716.10. An ex parte proceeding is not adversarial. On the other hand, an *inter partes* review trial is by definition an *inter partes* adversarial proceeding in which a petitioner does not have to accept a non-corroborated allegation of inventorship.

Harkening back to the Supreme Court's admonition in *Armour*, the *Griffin* panel found that the reference sought to be eliminated stated "[w]e thank Dr. Andy Gale (Scripps Research Institute) for providing S360A-APC . . . Stimulating discussions with Dr. Gale and Dr. Berilav Zlokovic are gratefully acknowledged." *See* Ex. 3002, *Griffin* at page 5 (finding of fact 8) and Mosnier (the reference), page 69, near bottom of column 1. The acknowledgment of Mosnier was not lost on the *Griffin* panel. Ex. 3002, *Griffin* at page 8:4–7. The acknowledgement statement is consistent with Dr. Gale having not invented subject matter described by Mosnier. No corresponding acknowledgment is present in this case.

C. Prima Facie Obviousness

1. Scope and Content of the Prior Art

(a) Campbell

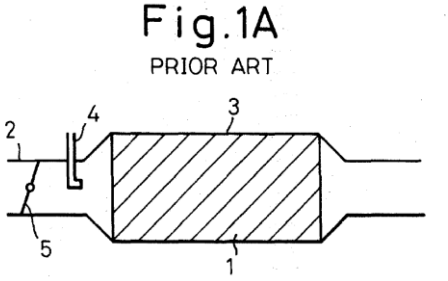
Campbell states:

> After the catalyst absorber is spent or partially spent, it can be reactivated. Reactivation is accomplished by removing and replacing the spent absorber and disposing of the removed spent absorber.

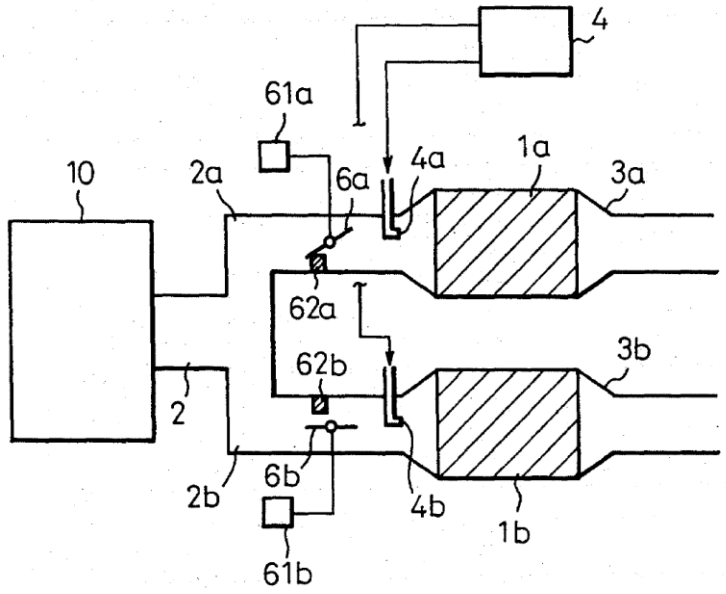
Ex. 1003[A], col. 4:44–47.

(b) Hirota

Figures 1A and 3 of Hirota are reproduced below.




Depicted in Figure 1A is a prior art regenerating apparatus.




Hirota Fig. 3

Depicted in Figure 3 is a schematic drawing of a Hirota regenerating apparatus.

According to Hirota:

> a [prior art] regenerating process is carried out by introducing the reducing agent while the exhaust gas flowing into the vessel is cut off.
>
> By cutting off the exhaust gas flowing into the vessel, it is theoretically considered that, in the above method, the amount of the reducing agent required for the regenerating process can be reduced to a sum of the amount required to consume the oxygen content in the exhaust gas remaining in the vessel and the amount required for reducing the $NO_x$ released from the $NO_x$ absorbent.
>
> However, the amount actually required for the regenerating process in the above method becomes much larger than the above theoretical value. This problem is explained with reference to FIGS. 1A and 1B. . . . In FIG. 1A, reference numeral 2 represents an exhaust passage of

> the diesel engine, and 3 represents a vessel containing a $NO_x$ absorbent 1 connected to the exhaust passage 2. Numeral 5 represents an exhaust shutter valve disposed in the exhaust passage 2 upstream of the vessel 3 to cut off the exhaust gas flowing into the vessel, and 4 represents a nozzle of the reducing agent supply device for supplying a reducing agent to the $NO_x$ absorbent 1 during the regenerating process.
>
> As explained above, the exhaust shutter valve 5 is closed during the regenerating process in this method, and the reducing agent is supplied from the nozzle 4 under the condition in which no exhaust gas flow exists in the vessel 3. Because of the absence of the gas flow carrying the reducing agent, the reducing agent supplied from the nozzle 4 stays in the region near the nozzle 4 and forms a mass of a high concentration reduction agent. This reduction agent progressively diffuses in the vessel, and as time passes, a uniform mixture of the exhaust gas remains in the vessel and the reducing agent is formed. However, in the absence of the gas flow in the vessel, it takes a long time for the reducing agent to diffuse over the entire volume of the vessel. This causes an increase in the time required for the regenerating process to a level not practically acceptable.

Ex. 1006A, col. 2:1–45.

The prior art apparatus described by Hirota, like Campbell, must shut off exhaust in order to regenerate. Ex. 1003A, col. 5:60–61 ("After the catalyst absorber is exhausted or saturated, it can be regenerated.").

To overcome its identified problem, Hirota describes its Figure 3 embodiment:

> FIG. 3 schematically illustrates . . . [an] embodiment of the exhaust gas purification device

> according to the [Hirota] present invention. In FIG. 3, reference numeral 10 designates an internal combustion engine which is operated on a lean air-fuel ratio, and 2 designates an exhaust passage of the engine 10. In this embodiment, the exhaust passage 2 diverges into two branch exhaust passages 2a and 2b, and exhaust shutter valves 6a and 6b are disposed on the branch exhaust passages 2a and 2b, respectively. Also, vessels 3a and 3b containing $NO_x$ absorbents 1a and 1b are disposed on the branch exhaust passages 2a and 2b downstream of the exhaust shutter valves 6a and 6b. Further, on the branch exhaust passages 2a and 2b between the exhaust shutter valves 6a, 6b and the vessels 3a, 3b, nozzles 4a and 4b of the reducing agent supply device 4 are provided for supplying reducing agent to the $NO_x$ absorbents 1a and 1b.
>
> The $NO_x$ absorbents 1a and 1b contained in the vessels 3a and 3b use, for example, alumina as a carrier, and on this carrier, precious metals such as platinum, and at least one substance selected from alkali metals such as potassium K, sodium Na, lithium Li and cesium Cs; alkali-earth metals such as barium Ba and calcium Ca; and rare-earth metals such as lanthanum La and yttrium Y are carried. The $NO_x$ absorbents 1a and 1b absorb $NO_x$ in the inflowing exhaust gas when the air-fuel ratio of the inflowing exhaust gas is lean, and release the absorbed $NO_x$ when the oxygen concentration of the exhaust gas in the vessels 3a and 3b becomes lower.

Ex. 1006A, col. 5:1–29.

With respect to the operation of the Hirota Figure 3 embodiment, Hirota teaches:

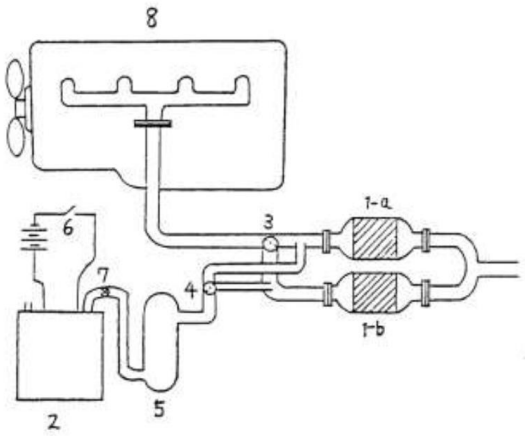
> Next, the operation of the exhaust gas purification device in FIG. 3 will be explained.
>
> In this embodiment, the regeneration of the $NO_x$ absorbents 1a and 1b is carried out alternately. Namely,

> in the normal operation, one of the exhaust shutter valves 6a and 6b (for example, 6a) is fully opened and the exhaust gas from the engine 10 passes through the $NO_x$ absorbent 1a, and the $NO_x$ in the exhaust gas is absorbed in the $NO_x$ absorbent 1a. After absorbing the $NO_x$ in the exhaust gas for a predetermined time, the exhaust shutter valve 6a is closed and the exhaust shutter valve 6b is fully opened so that the exhaust gas from the engine 10 passes through the $NO_x$ absorbent 1b, thus the $NO_x$ in the exhaust gas is absorbed in the $NO_x$ absorbent 1b. At the same time, a predetermined amount of the reducing agent is injected into the branch exhaust passage 2a upstream of the $NO_x$ absorbent 1a from the nozzle 4a of the reducing agent supply device 4 to regenerate the $NO_x$ absorbent 1a.

Ex. 1006A, col. 7:18–36.

(c) Saito

Figure 1 of Saito is reproduced below.




Saito Fig. 1

Depicted in Figure 1 is an example of the Saito invention

> A specific usage example is shown in FIG. 1.
>
> 1-a and 1-b are catalysts that oxidize and absorb $NO_X$, which are arranged in parallel; and 3 is a switching

> valve, which guides the exhaust gas from the engine to either catalyst bed 1-a or 1-b.
>
> After [the exhaust gas] has been introduced to one of the catalyst beds for a fixed period of time, [the exhaust gas] is introduced to the other catalyst bed by way of the switching valve. In cases where hydrogen has been selected as the gaseous reducing agent, hydrogen generated by a hydrogen generation device 2 is introduced to the catalyst bed through which exhaust gas is not flowing.
>
> The hydrogen that is output from the hydrogen generation device 2 is sent to a hydrogen reservoir 5, and introduced to the target catalyst bed by way of a switching valve 4.
>
> It is preferable that the hydrogen reservoir 5 be packed with a substance having the capacity to retain hydrogen such as a hydrogen storage metal. When the hydrogen is to be output, the heat of the exhaust gas can be used, or heating by way of electric heating can be used. Furthermore, a check valve 7 is provided to prevent backflow of the hydrogen from the hydrogen reservoir 5 to the electrolysis tank 2.

Ex. 1008A, page 3, col. 1:60–col. 2:20.

(d) Stiles

Stiles describes an adsorbent regenerated *in situ*:

> The adsorbed nitrogen oxides, after a period of adsorption, are removed from the adsorbent by regeneration for reuse of the adsorbent. The adsorbent will remove the nitrogen oxides to the extent of 100% at a space velocity exceeding 15,000 and a temperature in the range of 150°–300° C. or above. The nitrogen oxides can be quickly reduced in situ or be evolved from the adsorbent as a concentrated stream by passing a gas containing $N_2$ plus 0.5 to 10% hydrogen

> at a temperature of 300° to 350° C. over the saturated adsorbent. The nitrogen oxides in the concentrated stream are reduced to nitrogen and water at this temperature.

Ex. 1009A, col. 4:18–30.

Stiles further teaches:

> The adsorbent now containing more than 0.2% $NO_x$ by weight . . . [can be] regenerated for reuse by passing a gas containing from .05 to 10% hydrogen in nitrogen; both carbon dioxide and water vapor can also be present.

Ex. 1009A, col. 5:52–55.

Stiles still further teaches that "the adsorbent can be utilized repeatedly in the adsorption-desorption cycle without loss of effectiveness." Ex. 1009A, col. 4:34–36.

(b) Differences

We noted, in instituting an *inter partes* trial, that the Petition and Dr. Farrauto do not identify in the clearest of terms the differences between the subject matter of '758 patent claim 1 and Campbell. Paper 19, page 11.

Dr. Farrauto testified that "Campbell need[s] improvement, because once the absorbent becomes $NO_x$–saturated, it is discarded." Ex. 1010A, ¶ 35. *See also* Petition, page 47:1–7.

Whenever a ground based on obviousness is involved, the preferred manner of setting out differences is to state "the subject matter of claim x differs from the reference in that (1) …, (2) …., and (n) …." Vague statements or hints of differences not only burdens the Board, but puts a patent owner at somewhat of a disadvantage with having to guess what any differences a petitioner believes may exit. Reluctance on the part of counsel to "admit" to and identify a difference is hard to understand, given the fact

that a difference does not mean the subject matter claimed is non-obvious. *Dann v. Johnston*, 425 U.S. 219, 230 (1976) (mere existence of differences between the prior art and an invention does not establish the invention's non-obviousness).[4]

Campbell appears to differ from the subject matter of claim 1 of the '758 patent in that Campbell does not describe an *in situ* regeneration.

3. Level of Skill in the Art

In our view, the prior art reveals the level of skill in the art.

4. Discussion

While Campbell does not describe *in situ* regeneration, and assuming *arguendo* that claim 1 of the '758 patent requires *in situ* regeneration, *in situ* regeneration is a well-known technique described by Saito and Stiles.

An *in situ* regeneration in Campbell makes sense because it eliminates a need to discard spent catalyst and permits one skilled in the art to reuse catalytic material. The reuse of catalytic material would have been recognized as significant due to the expense of platinum. Ex. 1056, page 13:20–23.

Patent Owner maintains that the catalytic material of Saito and Stiles "is very different from that of the '758 patent." Paper 29,

[4] Petitioner's failure to clearly identify differences is not consistent with 37 C.F.R. § 42.104(b)(4) and 42.104(b)(5), as well as 35 U.S.C. § 312(a)(3), which require identifying the grounds "with particularity." The Petition must specify where each element of a challenged claim is found in the prior art patents or printed publications. 37 C.F.R. § 42.104(b)(2).

page 29. "There is nothing in either Saito or Stiles to suggest . . . that the regeneration methods of these two references might be succesfully used for regenerating the catalyst/absorber of Campbell." *Id*. at page 30.

Patent Owner's argument amounts to individual attacks on each of the prior art references. *In re Keller*, 642 F.2d 413 (CCPA 1981). By attacking each reference individually, Patent Owner runs head-on into an admonition in *KSR* that a person having ordinary skill in the art is not an automaton. *KSR*, 550 U.S. at 421. Unexplained by Patent Owner, is why one skilled in the art, in the face of Saito and Stiles, would not have found it obvious to use an *in situ* regeneration process in a Campbell environment to avoid discarding spent catalyst.

Assuming *arguendo* that the catalysts of Saito and Stiles are different from those described by Campbell, one skilled in the art would have appreciated that the regeneration technique described by those references, i.e., the device illustrated in Figure 1 of Saito, would have been equally applicable for regenerating in the Campbell environment.

We therefore agree with Petitioner that:

> [Campbell, Saito and Stiles] establish that . . . challenged . . . [claim 1] cover[s] a process in which all ingredients are known and being used for their intended purpose in a known manner to achieve an entirely expected result -- regeneration of a spent catalyst absorber. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007).

Paper 40, page 21.

Patent Owner addresses other arguments related to claim 1, as well as the separate patentability of several claims apart from claim 1.

Claim 1

Patent Owner maintains that the combination of Campbell and Hirota do not support a finding that the combination describes an inert carrier gas. Paper 29, page 32. We agree, principally because as we held earlier in this opinion, Hirota has not been shown to describe an inert carrier gas. Hirota need not be relied upon when analyzing obviousness vis-à-vis the prior art combination of Campbell, Saito, and Stiles.

According to Patent Owner, the combination of Campbell and Saito fails to provide a necessary reason for using the *in situ* regeneration of Saito in a Campbell environment. Paper 29, page 32. We disagree. For the reasons given above, one skilled in the art would have recognized the value of *in situ* regeneration in a Campbell environment apart from the catalyst/absorber described by Saito.

Claim 2

Patent Owner notes that claim 2 also requires a carrier gas and that Hirota does not describe a carrier gas. We need not analyze Hirota to resolve obviousness based on the prior art combination of Campbell, Saito, and Stiles.

Patent Owner also notes that claim 2 calls for a temperature in the range of 250 ºC – 750 ºC. Patent Owner calls our attention to the fact that Saito describes "a temperature range that overlaps with, but far exceeds the range of claim 2." Paper 29, page 32. In support of its argument, Patent Owner does not state the temperature ranges. We note that Saito describes a temperature range of from 150 ºC – 800 ºC, and in particular, 200 ºC – 700 ºC. Ex. 1008B, page 4:15–16 and 38–39. We view Patent Owner's "far

exceeds" to be somewhat of an overstatement. In any event, Patent Owner has failed to establish that the difference in ranges is significant. Overlapping ranges generally support a prima facie case of obviousness. *In re Peterson*, 315 F.3d 1325, 1329 (Fed. Cir. 2003) (a prima facie case of obviousness typically exists when the ranges of a claimed composition overlap the ranges disclosed in the prior art).

Claim 3

Claim 3 calls for a regenerating gas comprising up to 10% carbon dioxide. According to Patent Owner, Saito describes the presence of carbon dioxide in the exhaust gas, but not the regeneration gas. Paper 29, page 33; Saito, Ex. 1008B, page 4:17. Overlooked, and not addressed by Patent Owner, is a description of the use of carbon dioxide in a reducing gas described by Stiles. Ex. 1009A, col. 5:52–55 ("[t]he absorbent . . . is regenerated for reuse by passing a gas containing . . . hydrogen in nitrogen; both carbon dioxide and water vapor can also be present").

Claim 13

Patent Owner argues that Saito is defective because Saito is not concerned with restoring a carbonate form of the absorber. Paper 29, page 33. Patent Owner's argument overlooks the fact that it is the Campbell catalyst that is to be regenerated using the *in situ* regeneration technique taught by Saito. The fact that Saito's catalyst is different is not controlling. It is the combination of using Saito's known *in situ* regeneration technique in the Campbell environment that renders regeneration of the carbonate form obvious to one skilled in the art.

According to Patent Owner, "Saito . . . fails to teach the addition of CO [carbon monoxide] or CO2 [carbon dioxide] if hydrogen, the preferred

reducing agent . . . is used as the reducing agent." Paper 29, pages 33–34. Saito teaches the use of "ordinary reducing agents such as hydrogen, ammonia, carbon monoxide, hydrocarbons, such as methane, and the like . . . [with] hydrogen is the most preferred." Ex. 1008B, page 4: col. 1:27–31. Claim 13 calls for the use, *inter alia*, of a reducing agent selected from carbon monoxide and hydrogen gas. A reference is not limited to its preferred embodiment. Saito manifestly teaches the use of carbon monoxide. *See also* Stiles, Ex. 1009A, col. 5:52-55 (teaching the use of hydrogen where carbon dioxide can also be present).

Claims 16 and 20

Claims 16 and 20 require steam to be present in the carrier gas. Paper 29, pages 34–35. While agreeing that Saito describes the use of steam in the exhaust gas, Patent Owner maintains that Saito does not describe the presence of steam in the regeneration gas. *Id*. Overlooked by Patent Owner is a teaching in Stiles that the regeneration gas can contain "water vapor." Ex. 1009A, col. 5:55. What is clear from the record is that the regeneration gas can contain hydrogen, nitrogen, carbon dioxide, and water vapor per Stiles and hydrogen, ammonia, carbon monoxide, and hydrocarbons per Saito. Selection of a particular gas has not been shown to be beyond the skill in this art. In fact, we note that selection of a particular gas appears to be a function of the reduction process undertaken. Ex. 1009A, col. 1:58–63 (discussing use of ammonia in an SCR process).

Claim 17

Claim 17 calls for an inert reducing gas comprising about 500 ppm to 10% hydrogen. Stiles describes the use of a reducing gas having 0.05 to 10% hydrogen. Ex. 1009A, col. 5:54. Patent Owner thus is using a known

amount of hydrogen in a reducing gas to achieve an expected and intended result.

D. Other Considerations

According to Patent Owner, evidence of a long-felt need and commercial success trumps any prima facie case of obviousness. Paper 28, pages 35–42.

A long-felt need and post-invention commercial success can tip the balance in favor of non-obviousness, both in the courts and the PTO. *Eibel Process Co. v. Minnesota & Ontario Paper Co.*, 261 U.S. 45 (1923); *Carnegie Steel Co. v. Cambria Iron Co.*, 185 U.S. 403 (1902); *The Barbed Wire Patent*, 143 U.S. 275 (1892); *Webster Loom v. Higgins*, 105 U.S. 580 (1881); *Ex parte Artsana USA, Inc.*, Appeal 2014-004116, 2014 WL 4090808 (PTAB Aug. 18, 2014); *Murata Mfg. Co. v. Synqor, Inc.*, Appeal 2014-001167, 2014 WL 1397381 (PTAB Apr. 10, 2014); *Ex parte Whirlpool Corp.*, Appeal 2013-008232, 2013 WL 5866602 (PTAB Oct. 30, 2013). However, in this case, we are unable to credit much, if any, weight, to Patent Owner's evidence of long-felt need and commercial success. For long-felt need and commercial success to be convincing, there must be a "nexus" between (1) the long-felt need/commercial success and (2) the claimed subject matter. *In re Fielder*, 471 F.2d 640, 646 (CCPA 1973).

Patent Owner's evidence is bottomed on Patent Owner's experience with what is referred to as a "SCONOx catalytic absorption system." Ex. 2006A ¶ 4 (direct Declaration testimony of Thomas Girdlestone).

Patent Owner characterizes the claimed method as embodying a SCONOx system. Paper 29, page 37:3–4.

According to Mr. Girdlestone, the effectiveness of reducing NOx in a SCONOx system was tested at a turbine facility run at EmeraChem's then-affiliate Sunlaw Energy in California. Ex. 2006A, ¶ 5.

Further according to Mr. Girdlestone, both the EPA and the Cal EPA found impressive a reduction of NOx pollutants from 5–9 ppm to 1–2 ppm. Ex. 2006A, ¶¶ 5–10.

Without getting into specific confidential commercial numbers, Mr. Girdlestone testified that Patent Owner received considerable revenue from licensing agreements to various entities. However, missing from Patent Owner's story is any market share information. We therefore cannot meaningfully assess the weight to be given to Patent Owner's revenues.

Petitioner argues that Patent Owner has not established a necessary nexus between Patent Owner's commercial activities and the claimed invention. Paper 40, pages 21–22 ("Patent Owner has not shown . . . how its SCONOx regeneration process embodies each and every limitation of claim 1" of the '758 patent).

We have not been directed to testimony comparing the SCONOx process performed at Sunlaw Energy in California vis-à-vis the subject matter of the claims of the '758 patent.

On cross-examination, Mr. Girdlestone testified:

> Q. [by counsel for Petitioner] Did you review these patents during your preparation of the Declaration [Ex. 2006A]?
>
> A. No, I did not.
>
> Q. Do you consider yourself qualified to determine whether the use of a catalyst absorber satisfies all the limitations of a claim in the . . . 911 patent?

> A. Probably no.
>
> Q. Why do you say that?
>
> A. Well, when it comes to the -- these are based on a lot of science and chemistry. I understand the inputs and the outputs, but everything in between the inputs and outputs as to the fundamental drivers of the chemistry, I'm not an expert in that. And as for the administration prosecution -- legal prosecution, I'm not an attorney. I'm not an expert on that. My job is to make sure this work was done, it was done on time, it was done on budget. And to assess value to it as compared to the application that we want to apply this technology to on the commercial set. I'm mostly on the commercial side of business.

Ex. 1057, page 17:4–25.

Insofar as we are aware, Dr. Crocker did not testify on whether any SCONOx testing was consistent with the claims of the '758 patent.

We have not been told which claim, if any, is limited to the alleged commercially successful embodiment tested at Sunlaw Energy in California. *In re Tiffin*, 448 F.2d 791 (CCPA 1971) (on rehearing, CCPA held that evidence of commercial success must be commensurate in scope with the breadth of the claims); *In re Law*, 303 F.2d 951, 954 (CCPA 1962) (same).

We also find Patent Owner's long-felt need analysis unconvincing. *First*, we have not been told when a need first arose to reduce NOx emissions. *Second*, assuming it arose sometime not too long before 1997, it does not appear that it took long to solve the problem. *Third*, no evidence has been directed to our attention confirming that those trying to solve the problem were aware of either Saito or Stiles. *In re Allen*, 324 F.2d 993, 997

(CCPA 1963) (while appellant's arguments imply that there may have been an unsolved problem in the art, an allegation to this effect is not evidence of unobviousness unless it is shown, as was not done here, that [1] the widespread efforts of [2] skilled workers [3] having knowledge of the prior art [4] had failed to find a solution to the problem (citing *Toledo Pressed Steel Co. v. Standard Parts, Inc.*, 307 U.S. 350, 356 (1939) (it does not appear that those trying to solve the problem were familiar with the relevant prior art))).

E. Prima facie Obviousness vis-à-vis Secondary Consideration

For reasons given above, in this case we decline to accord much, if any, weight to Patent Owner's evidence of long-felt need and commercial success.

When the secondary consideration evidence is weighed vis-à-vis the prima facie case of obviousness, we believe the balance favors the prima facie case.

Accordingly, we hold that Petitioner's evidence establishes by a preponderance that the subject matter of claims 1–14 and 16–20 of the '758 patent would have been obvious within the meaning of § 103.

## VII. Motions to Exclude

### A. Patent Owner's Motion to Exclude

Patent Owner "moves to exclude portions of Petitioner's Reply (Paper Nos. 39, 40) as presenting new issues for the time in a Reply." Paper 45, page 1.

Petitioner has opposed. Paper 52.

A motion to exclude should be limited to seeking to exclude "evidence," not arguments in a reply.

We therefore treat Patent Owner's motion to exclude as a motion to expunge part or all of Petitioner's Reply.

According to Patent Owner, Petitioner has raised new arguments in its Reply related to the issue of whether Saito anticipates challenged claims of the '758 patent.

We have determined that Petitioner has failed to establish that Saito anticipates any challenged claim, even if the entire Reply is considered.

Because Patent Owner has prevailed on the issue of whether Saito anticipates any challenged claims, the issue raised in Patent Owner's Motion to Exclude need not be decided.

Patent Owner's Motion to Exclude is dismissed as *moot*.

B. Petitioner's Motion to Exclude

Petitioner moves to exclude Exhibit 3 forming part of the direct declaration testimony of Thomas Girdlestone (Ex. 2006). Paper 47.

Patent Owner has opposed. Paper 52.

Petitioner has replied. Paper 54.

1.

In view of our analysis for not crediting Patent Owner's commercial success evidence, we have not found it necessary in this opinion to identify specific sales figures.

As to Exhibit 3, the Motion to Exclude is *dismissed* as moot.

2.

Petitioner objects to certain Girdlestone testimony as hearsay (Paper 47, page 4) and for lack of authentication (Paper 47, page 7).

In view of the basis upon which we have declined to credit Patent Owner's evidence of commercial success, we have not found it necessary to consider the objected to testimony.

As to the objected to testimony, the Motion to Exclude is *dismissed* as moot.

C.

We will also note that, to a large extent, the Motion to Exclude amounts to supplementing argument on the merits, thereby impermissibly extending page limits for other documents.

## VIII. Sealed Documents

In reaching our decisions, we have not found it necessary to rely on any redacted portion of the public documents.

The parties should promptly move to expunge all documents filed under seal.

## IX. Large Documents

The parties have filed several large documents, i.e., documents containing many pages.

An example is the prosecution history of the involved '758 patent (Ex. 1002).

At oral argument, the following discussion took place emphasizing why merely placing a large document in the record without citing to specific pages of the documents, only to later rely for the first time on a non-cited portion of the document at oral argument or on appeal, is not appropriate.

> [Mr. Bradford, counsel for Patent Owner] Now, the '758 patent, if you turn to exhibit -- or slide 5 of our demonstrative, the file history for '758 shows that when it was filed there was a

regeneration method, and, it says 10 months later, this is very soon thereafter, the slide 5 shows claim 1, and then very specifically the same dependent claim, almost exact dependent -- or very similar dependent claims were included. Claim 9 says explicitly there is an alkali or alkaline earth carbonate.

JUDGE McKELVEY: Now, were these arguments made in the opposition?

MR. BRADFORD: Well, they are in the record.

JUDGE McKELVEY: So I'm trying to figure out how -- you put your proofs in and then they are supposed to respond to it -- I'm trying to figure out how they respond to what you are just addressing right now?

MR. BRADFORD: Well, this is evidence that they have had in the record.

JUDGE McKELVEY: Well, but it is not their job to go looking through the record to make your case out, nor is it ours. So if you come to oral argument and you lay out these options, how are they supposed to have answered that?

MR. BRADFORD: Well, Your Honor, I mean, this is clear on the face that these are just the inventors of the two patents. They said they invented this. And this corroborates -- the claims in the '758 patent corroborate that they invented it. They include the specific catalyst as dependent claims in the claims. I mean, it is evident whenever they are saying we invented this that it is included in both patents. I mean, we didn't make this explicit citation to the record, but they did. It is clear, just by looking at the claims, they said they invented them.

JUDGE McKELVEY: See, this is one of the problems of putting in a file wrapper and not identifying specific pages, because you will find at the end of our decision when it comes out that pages not cited to us in the documents are excluded from evidence,

> because what happens is somebody goes on appeal and starts making a new argument based on evidence that neither the Petitioner had an opportunity to look at and comment on the reply or we did. And the court doesn't particularly like that sort of thing.

*See* Transcript of Oral Argument, Paper 58, page 32:15 through page 34:6.

We decline to consider an argument made for the first time at oral argument based on portions of a large document not cited in the Petition, Opposition, or Reply.

With respect to these large documents, we have considered only the pages called to our attention by the parties or mentioned in our opinion. All other pages were not considered and are deemed not to have been admitted into evidence.

## X. Order

Upon consideration of the Petition (Paper 3), Opposition (Paper 29), and Reply (Paper 40), and for the reasons given, it is

ORDERED that based on Ground 1 (Hirota), the evidence does not establish by a preponderance of the evidence that any challenged claim is unpatentable;

FURTHER ORDERED that based on Ground 2 (Takeshima), the evidence does not establish by a preponderance of the evidence that any challenged claim is unpatentable;

FURTHER ORDERED that based on Ground 3 (Saito), the evidence does not establish by a preponderance of the evidence that any challenged claim is unpatentable;

FURTHER ORDERED that based on Ground 4 (obviousness), the evidence establishes by a preponderance of the evidence that claims 1–14 and 16–20 of the '758 patent are unpatentable under 35 U.S.C. § 103(a).

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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