

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

AMAZON.COM, INC.; AMAZON.COM LLC; AMAZON WEB
SERVICES, INC.; A2Z DEVELOPMENT CENTER, INC. D/B/A LAB126;
RAWLES LLC; AMZN MOBILE LLC; AMZN MOBILE 2 LLC;
AMAZON.COM SERVICES, INC. F/K/A AMAZON FULFILLMENT
SERVICES, INC.; and AMAZON.COM SERVICES LLC (formerly
AMAZON DIGITAL SERVICES LLC),
Petitioners,

v.

VB ASSETS, LLC,
Patent Owner.

Case IPR2020-01367
Patent No. 8,073,681

**PATENT OWNER'S RESPONSE
PURSUANT TO 37 C.F.R. § 42.120**

I.	INTRODUCTION	1
II.	PERSON OF ORDINARY SKILL IN THE ART	3
III.	GROUND 1: CLAIMS 1-2, 9, 13-14, 21, 25-26, AND 33 ARE NOT RENDERED OBVIOUS BY KENNEWICK	4
A.	The petition fails to establish that Kennewick renders obvious “the utterance includes one or more words that have different meanings in different contexts”	4
B.	The petition fails to establish that Kennewick renders obvious “short-term shared knowledge”	7
	1. Automated speech recognition (“ASR”), Natural Language Understanding (“NLU”), and User Modeling (“UM”)	8
	2. Kennewick’s tagged recognized words are not short-term shared knowledge	12
IV.	FOUNDATIONS 2 THROUGH 6: CLAIMS 3-8, 10-12, 15-20, 22-24, 27- 32, AND 34-36 ARE NOT OBVIOUS	18
V.	CONCLUSION.....	19

I. INTRODUCTION

Amazon.com, Inc., *et al.* (“Petitioners”) filed a petition for *inter partes* review of claims 1-42 of U.S. Patent No. 8,073,681 (the “’681 patent,” EX1001). The Board issued its decision instituting trial (“Decision,” Paper 7) on February 4, 2021, finding that Petitioners had established a reasonable likelihood of success on only claims 37, 39, and 41. VB Assets, LLC (“Patent Owner”) hereby requests that the Board now issue a final written decision rejecting all grounds of challenge that are not moot and to confirm that claims 1-36 are not unpatentable.¹

As already recognized by the Board, the petition’s arguments with respect to the three remaining independent claims 1, 13, and 25 are flawed at least because the petition fails to identify prior art disclosure of interpreting one or more words that have “different meanings in different contexts.” Petitioners rely on two disclosures in the Kennewick application. In the first, Kennewick teaches that the word “temperature” within *different dialogs* can indicate *different contexts*—*e.g.* the context of weather or temperature. Kennewick never says there is an

¹ Patent Owner disclaimed claims 37-42 by filing a Statutory Disclaimer under 37 C.F.R. § 1.321(a) on May 17, 2021, a copy of which is submitted as Exhibit 2005. This response addresses the grounds of unpatentability not rendered moot by Patent Owner’s disclaimer.

ambiguity in the word “temperature” within a single utterance. Moreover, as the Board already recognized, the word “temperature” has the same meaning whether referring to body temperature or outdoor temperature—the “measurement of warmth or coolness.” Decision, 14. Similarly, as the Board also understood in the institution decision, Petitioners’ reliance on Kennewick’s discussion of the term “flight one hundred and twenty t[w]o” is misplaced because that term is only disclosed in a single context. *Id.*, 14-15. This shortcoming is fatal to Petitioners’ challenge to all claims remaining in the ’681 patent.

The Board need look no further than the deficiency already recognized in the institution decision to reject Petitioners’ challenge at this stage as well. Nevertheless, the petition suffers from an additional significant flaw. Petitioners argue that Kennewick’s tagged recognized words constitute short-term shared knowledge. Yet this collection of recognized words tagged with the user’s identity *has not been interpreted* by the system. This is fatal to Petitioners’ case because the ’681 patent discloses short-term shared knowledge is accumulated using recognized words as *input* and then interpreting those words to extract shared expectations and assumptions in order to determine a user’s intent. The limitations of mere recognized words preclude them from being short-term shared knowledge since they impart no meaning on the utterances—limitations that Petitioners’ own expert, Dr. Smyth, acknowledged in both his declaration and at his deposition.

EX1002, ¶42 (Recognized words alone are “not sufficient for an algorithm to understand the user’s goals and intent.”); EX2003, 88:16-24 (“Q: Does Kennewick’s dialog history keep track of the user’s goals and preferences? A: In the sense that the dialog history is a tagged set of recognized words and phrases that the user spoke earlier in the conversation, then, no.”).

Accordingly, the Board should reject the grounds of challenge not mooted by Patent Owner’s disclaimer and, consistent with the preliminary finding in the institution decision, conclude that claims 1-36 have not been shown to be unpatentable.

II. PERSON OF ORDINARY SKILL IN THE ART

Petitioners define the level of a person of ordinary skill in the art (“POSA”) at the time of the invention of the ’681 patent as someone who “would have at least a Bachelor-level degree in computer science, computer engineering, electrical engineering, or a related field in computing technology, and two years of experience with automatic speech recognition and natural language understanding, or equivalent education, research experience, or knowledge.” Pet., 4-5; EX1002, ¶30. Patent Owner and its expert, Dr. Gershman, have also applied the same definition this response. EX2001, ¶¶19-20.

III. GROUND 1: CLAIMS 1-2, 9, 13-14, 21, 25-26, AND 33 ARE NOT RENDERED OBVIOUS BY KENNEWICK

The petition fails to establish that claims 1-2, 9, 13-14, 21, 25-26, and 33 are rendered obvious by Kennewick alone or in combination with the knowledge of a POSA. EX2001, ¶¶21-54. First, as the Board has already recognized, the petition fails to establish that Kennewick discloses an utterance containing one or more words that have different meanings in different contexts. EX2001, ¶¶22-31. Second, the petition fails to establish that Kennewick discloses short-term shared knowledge. EX2001, ¶¶32-54.

A. The petition fails to establish that Kennewick renders obvious “the utterance includes one or more words that have different meanings in different contexts”

The petition fails to show that Kennewick discloses limitation 1.a. of the ’681 patent, which recites “receiving an utterance at a voice input device during a current conversation with a user, wherein the utterance includes one or more words that have different meanings in different contexts.” EX2001, ¶22. This limitation recites a specific type of ambiguity where “one or more words ... have *different meanings in different contexts*.” EX2001, ¶23. However, as noted in the institution decision, the petition cites to no disclosure in Kennewick describing this specific type of ambiguity. *Id.*; Decision, 14. Instead, Petitioners cite a “temperature” example that does not have two different meanings, and a “flight”

example that relates to determining which of two different words that sound the same is the correct word *in a single context*. EX2001, ¶¶24-30.

The petition first relies on Kennewick’s teachings that an utterance containing “temperature” can “impl[y] a context value of *weather* for the question” and that “*within a different dialog*, the keyword ‘temperature’ can imply a context for a *measurement*.” Pet., 16 (quoting EX1003, ¶160); EX2001, ¶24. At the outset, this disclosure in Kennewick is not talking about a single utterance containing one or more words that have different meanings in different contexts. EX2001, ¶25. Instead, Kennewick explicitly says that the keyword “temperature” can imply a different context within *different dialogs*. EX1003, ¶160. Kennewick never says it recognizes different meanings for the word “temperature,” and even when it says “temperature” can indicate different contexts, it explicitly says that is for “different dialog[s]”—that is, expressly *not* a single utterance. *Id.*; EX2001, ¶25. Thus, the petition’s assertion that Kennewick teaches that “‘temperature’ could be interpreted as an outdoor temperature or as a body temperature” is not true. Pet., 16; EX2001, ¶25.

Moreover, the petition still fails to establish two different meanings of “temperature.” EX2001, ¶¶26-27. The petition asserts that “‘temperature’ could be interpreted as an outdoor temperature or as a body temperature depending on the context.” Pet., 16; *see also* EX1002, ¶69. But “outdoor temperature” and

“body temperature” do not involve different meanings of “temperature.” EX2001, ¶26. The additional qualifiers “outdoor” and “body” do not change the meaning of “temperature,” that is, the degree of hotness or coldness. EX2001, ¶27. Instead, they simply indicate the object whose temperature is being measured. *Id.* As the Board correctly concluded in the institution decision, “the word ‘temperature’ has the same meaning in both of these examples” because “the word ‘temperature’ refers to a measurement of warmth or coolness.” Decision, 14.

The second example Petitioners rely on relates to the question “what about flight one hundred and twenty too.” Pet., 16–17 (citing EX1003, ¶163); EX2001, ¶28. Kennewick explains: “The parser and domain agent use flight information in the database and network information along with context to determine the most plausible interpretation among; flight 100 and flight 20 also, flight 100 and flight 22, flight 122, etc.” EX1003, ¶163. The petition asserts that this teaches one context “in which ‘flight 122’ exists” and a different context “where the system just listed several flight options including ‘flight 100’ and ‘flight 20.’” Pet., 16-17. However, Kennewick does not say that there are multiple contexts. EX2001, ¶29. At most, Kennewick indicates interpreting “flight one hundred and twenty too” in a single flight information context. *Id.* As the Board correctly noted in finding no reasonable likelihood of unpatentability, “Dr. Smyth does not provide any support

for his assertion that these hypothetical situations would constitute different contexts.” Decision, 15; EX2001, ¶29.

Notably, this passage of Kennewick describes formulating a question or command after the context has already been determined and the appropriate agent has been invoked. EX2001, ¶30. The preceding paragraph indicates “the context for the question or command *has been determined*” (EX1003, ¶162 (emphasis added)) and the following disclosure relates to formulating a question or command for processing by the agent (EX1003, ¶¶162-63). EX2001, ¶30. In other words, Kennewick teaches that it disambiguates the phrase “flight one hundred and twenty too” after a single context has already been established. Thus, to the extent there are multiple meanings of the phrase “flight one hundred and twenty too,” they are multiple meanings *within the same context*. *Id.* Accordingly, Petitioners have failed to show that “flight one hundred and twenty too” has different meanings in different contexts. *Id.*

Thus, the petition fails to establish that Kennewick discloses this element or renders it obvious. EX2001, ¶31.

B. The petition fails to establish that Kennewick renders obvious “short-term shared knowledge”

While, as noted in the institution decision, Petitioners’ failure to demonstrate Kennewick discloses the “different meanings in different contexts” limitation is enough on its own to reject the ground of challenge, the petition also falls short in

another respect. Petitioners’ theory that Kennewick’s tagged recognized words are “short-term shared knowledge [that] includes knowledge about the utterance received during the current conversation” is flawed because both experts agree that mere recognized words alone are not sufficient for a system to understand a user’s preferences, goals, or intent. EX2001, ¶¶32-54.

In order to understand the flaws in the petition’s case, some background is provided below. EX2001, ¶33. As acknowledged in Dr. Smyth’s declaration, natural language conversational systems typically have multiple, distinct components, including an automatic speech recognition (ASR) component, a natural language understanding (NLU) component, and a user modeling (UM) component. EX1002, ¶¶39-42; *see also* EX2001, ¶¶34-40. Because Kennewick discloses that its tagged recognized words are generated by an ASR component, and because the ’681 patent discloses that short-term shared knowledge is generated by an NLU component, it is important to understand the differences between ASR and NLU. EX2001, ¶33. With that understanding in mind, it becomes evident that Kennewick’s tagged recognized words fail to meet the recited short-term shared knowledge. *Id.*

- 1. Automated speech recognition (“ASR”), Natural Language Understanding (“NLU”), and User Modeling (“UM”)**

To understand the flaws with the petition’s mapping of the claim elements, it is important to understand the key components of natural language conversational

systems at the time of the '681 patent. EX2001, ¶34. As explained below, and as both experts agree, these components include automatic speech recognition (“ASR”) (which converts a user’s utterance into recognized words), natural language understanding (“NLU”) (which interprets the recognized words), and user modeling (“UM”) (which uses the interpreted words to create representations of knowledge about the user). *Id.*

Petitioners’ expert Dr. Smyth devotes several pages to describing how automated speech recognition (ASR) and natural language understanding (NLU) are distinct components. EX1002, ¶¶39-42; EX2001, ¶¶34-38. According to Dr. Smyth, “ASR involves recognizing words from spoken audio for each user utterance” whereas “NLU is the process of determining the meaning of the recognized words in the utterance.” EX1002, ¶39. Since “recognized words alone are typically not sufficient for an algorithm to understand the user’s goals and intent,” it is up to the NLU component to “interpret the meaning of the recognized words.” *Id.*, ¶42; *see also* EX2003, 18:11-13 (“If a speech recognition engine produces recognized words, then NLU can be used to try to understand what those words mean.”). As Dr. Smyth testified, ASR can “recognize the word Portland” but is not capable of determining the meaning of the word—it is “the role of the NLU component” to derive meaning. EX2003, 32:7-14; *see also* 34:9-12 (“ASR broadly refers to technologies that take acoustic waveforms and map them to

words, and NLU broadly refers to technologies that try to infer meaning from those words.”).

Dr. Smyth also testifies that the NLU component extracts knowledge out of the interpreted words. EX2001, ¶37. For example, Dr. Smyth notes that the NLU component interprets the phrase “I would like to fly to New York” to extract such knowledge like the request being one “to find a flight” and “that the flight is for the individual who is speaking.” EX1002, ¶42. Furthermore, Dr. Smyth notes that the NLU component “would need to *understand* that ‘New York’ is the name of a location, and that it is not the name of specific airport but is a city with multiple airports associated with it.” *Id.* (emphasis added). Dr. Smyth makes clear that it is “NLU technologies” which “handle such situations,” and not the ASR component. *Id.*; EX2001, ¶37.

The distinction between ASR and NLU further extends to the fact that they are often used separately. EX2001, ¶¶35, 38. For example, ASR components can be used on their own for speech dictation applications such as assisting disabled persons in transcribing messages. *Id.*, ¶38. Similarly, NLU systems are used to interpret written text, in which case an ASR component is not necessary. *Id.*; *see also* EX2003, 19:3-4 (“It’s fair to say NLU can be used outside the scope of speech recognition.”); 26:12-15 (“[I]f you’re focusing on an NLU research project, it doesn’t make sense to design an ASR system from scratch.”).

Another component that Petitioners' expert Dr. Smyth discusses is the User Modeling (UM) component, which allows a system to have "access to specific knowledge about a user (such as their travel preferences)" by UM methods that "build an internal representation of a user." EX1002, ¶44; *see also* EX2003, 40:23-24 ("[A] user model is ... some representation of information or knowledge about a user."); EX2001, ¶39. As Dr. Smyth acknowledges, the user model can be built from previous user utterances such as "a user's travel preferences from words in past conversations that a user has had with the system, or inferences from words in earlier utterances in the current conversation." EX1002, ¶44. In order to represent knowledge about a user extracted from an utterance, it would require extracting meaning from the user's utterances as performed by the NLU component, not the ASR component. EX2001, ¶39; *see* EX1002, ¶42 ("[R]ecognized words alone are typically not sufficient for an algorithm to understand the user's goals and intent."). Once the knowledge about the user's travel preferences is extracted by the NLU, the UM component can use it to build a user model. EX2001, ¶39.

As discussed below, Dr. Smyth admits that Kennewick's dialog history, which consists of tagged recognized words, is created by an ASR component. However, the '681 patent's description of short-term shared knowledge necessitates interpretation of the words, which would be performed by an NLU

component using the recognized words as input. EX2001, ¶40. This distinction proves fatal to the petition's theory.

2. Kennewick's tagged recognized words are not short-term shared knowledge

The petition fails to establish that Kennewick discloses or renders obvious "short-term shared knowledge" because Kennewick's tagged recognized words are not interpreted and therefore do not constitute short-term shared knowledge.

EX2001, ¶¶41-54.

The petition begins its analysis of this limitation by discussing Kennewick's disclosure of "recognize[d] words and phrases" of a user's utterance that are tagged "with [the user's] identity in all further processing." Pet., 17 (quoting EX1003, ¶155); EX2001, ¶42. Specifically, Kennewick discloses that "speech recognition engine 120 may recognize words and phrases" and then adds the user identity tags. EX1003, ¶155. The petition asserts that "Kennewick's system of tagging recognized words and phrases of each utterance with a user identity allows the system to build a dialog history of words and phrases uttered by that user during the conversation." Pet., 18. The petition thus asserts that this dialog history containing the tagged recognized words is the claimed accumulation of "short-term shared knowledge about the current conversation." *Id.*

As an initial matter, the petition fails to explain how tagged recognized words would constitute any sort of knowledge about the utterance received.

EX2001, ¶43. Indeed, the petition does not have any discussion as to what “knowledge about the utterance” the Petitioners believe are reflected in Kennewick’s tagged recognized words. *Id.* Nor does Dr. Smyth, whose analysis is identical to the petition’s. *See* EX1002, ¶¶71-73; EX2001, ¶43.

Indeed, tagged recognized words do not constitute short-term shared knowledge about the received utterance as described and claimed in the ’681 patent and as understood by ordinary artisans. EX2001, ¶¶44-46. Instead, the ’681 patent explains that short-term shared knowledge is built by the Session Input Accumulator using recognized words as an *input*, whereupon assumptions and expectations are extracted from the utterances to build short-term knowledge. *Id.* In other words, the Session Input Accumulator is part of an NLU component, not an ASR component, and therefore mere recognized words do not constitute short-term shared knowledge. *Id.* While the ’681 patent does acknowledge that short-term shared knowledge can include “conversation history,” as explained below, unlike Kennewick’s tagged recognized words, the ’681 patent’s “conversation history” is a history of *interpreted* utterances. *Id.*

Specifically, the ’681 patent explains that “shared knowledge,” which includes “both short-term and long-term knowledge,” “may enable a user and a voice user interface to *share assumptions and expectations* ... that facilitate a cooperative conversation between human users and a system.” EX1001, 4:51-53,

5:25-30; EX2001, ¶46. Shared knowledge is built by the Session Input Accumulator. EX2001, ¶48; EX1001, 13:44, 15:39-40 (“Intelligent Hypothesis Builder 310 may use short-term shared knowledge from the Session Input Accumulator.”). The Session Input Accumulator accumulates a number of inputs upon which the short-term shared knowledge is built, including “*recognition text for each utterance*, a recorded speech file for each utterance, a list-item selection history, a graphical user interface manipulation history, or other input data.” EX1001, 13:47-49. The Session Input Accumulator uses the extracted knowledge to “build shared knowledge models.” *Id.*, 13:44; EX2001, ¶48. The Session Input Accumulator then passes the shared knowledge to the “Intelligent Hypothesis Builder 310” which “may use *short-term knowledge* to generate one or more implicit hypotheses of *a user's intent* when an utterance may be missing required qualifiers or other information needed to complete a request or task.” EX1001, 15:65-16:2 (emphasis added); EX2001, ¶48. These hypotheses about a user’s intent are graded and used by the Adaptive Response Builder 315 to generate an adapted natural language response. EX2001, ¶48; EX1001, 16:60-17:20. To summarize, the Session Input Accumulator receives input such as recognized words of an utterance, interprets those words to build shared knowledge, and passes such knowledge to the Intelligent Hypothesis Builder for building hypotheses about user intent that is used to form adapted responses. EX2001, ¶48.

The fact that recognized words are used as an input for building shared knowledge is supported by the '681 patent's explanation that shared knowledge consists of "*assumptions and expectations* such as topic knowledge, conversation history, word usage, jargon, tone (e.g., formal, humorous, terse, etc.), or other assumptions and/or expectations that facilitate interaction at a Human-to-Machine interface." EX1001, 14:26-30 (emphasis added); EX2001, ¶¶44-46. In other words, shared knowledge allows participants in a conversation to determine each other's intent and provide meaningful responses. EX2001, ¶¶46-47. For example, if a speaker says, "I had a burger last night, and it was so good, I left a big tip," there is at least shared knowledge between the two speakers that the presence of a "tip" indicates that the burger was consumed at a sit-down restaurant (as opposed to a fast-food establishment or a home-made meal). *Id.* Thus, the assumption/expectation of a sit-down restaurant could result in the other speaker asking, "Which restaurant was it?" or "How was the service?" *Id.* However, without such shared, tacit knowledge about restaurants, the dialog would be incomprehensible. *Id.* The shared knowledge is an integral part of the conversation. *Id.*

Thus, because shared knowledge consists of shared assumptions and expectations, and because the building of shared knowledge is performed by an NLU component that uses recognized words as *input*, Kennewick's tagged

recognized words are not shared knowledge. EX2001, ¶49. Dr. Smyth’s own testimony confirms that mere tagged recognized words do not constitute short-term shared knowledge about a conversation. *Id.* As he explains it, recognized words are “not sufficient for an algorithm to understand the user’s goals and intent.” EX1002, ¶42; *see also* EX2003, 68:16-24 (“Q: Does Kennewick’s dialog history keep track of the user’s goals and preferences? A: In the sense that the dialog history is a tagged set of recognized words and phrases that the user spoke earlier in the conversation, then, no.”); *cf.* EX1001, 14:25-30 (“[A] user and a voice user interface may share assumptions and expectations such as topic knowledge ...”). Since Kennewick’s tagged recognized words do not provide the system with understanding of the user’s goals, intent, or preferences, they do not provide the system with short-term shared knowledge about the conversation (*i.e.* assumptions and expectations about the conversation). EX2001, ¶49. Indeed, Kennewick’s tagged recognized words do not reflect any meaning of the user’s utterance. *Id.*; EX2003, 34:9-12 (“ASR broadly refers to technologies that take acoustic waveforms and map them to words, and NLU broadly refers to technologies that try to infer meaning from those words.”).²

² Kennewick’s tagged recognized words are not strictly the recognized words from the ASR component, as the recognized words are also tagged with the user

The petition argues that “Kennewick’s description of building dialog history by tagging dialog utterances is consistent with the ’681 patent’s disclosure of ‘short-term knowledge’ including a ‘history of the conversation’ built ‘as the conversation progresses.’” Pet., 18 (quoting EX1001, 15:65-16:7, 15:38-42); EX2001, ¶¶51-52. However, the ’681 patent’s “conversation history,” which is built by an *NLU* component, is clearly not the same as Kennewick’s tagged recognized words, which is built by an *ASR* component. EX2001, ¶52. Kennewick’s tagged recognized words are built by its speech recognition engine, an ASR component. EX1003, ¶155; EX2003, 55:3-6 (“[A]s described by Kennewick, speech recognition engine has the characteristics of an ASR component in its conversational interface system.”). But as the petition acknowledges, the ’681 patent teaches that it is the “Session Input Accumulator”

identity. EX1003, ¶155; EX2001, ¶50. However, the tags do not change the fact that the words are not interpreted and therefore the system has not obtained any knowledge about, *e.g.*, a user’s goals, preferences, intents, or assumptions from the utterances. EX2001, ¶50; *see also* EX2003, 88:17-24 (“Q: Does Kennewick’s dialogue history keep track of the user’s goals and preferences? A: In the sense that the dialogue history is a tagged set of recognized words and phrases that the user spoke earlier in the conversation, then, no.”).

which “build[s] a history of the conversation.” EX1001, 16:6-7. Yet as explained above, the Session Input Accumulator *receives as input* “recognition text for each utterance” in order to build the conversation history. *Id.*, 13:47-51; EX2001, ¶52. Moreover, the ’681 patent makes clear that “shared knowledge 305” includes “*share[d] assumptions and expectations* such as ... conversation history.” EX1001, 14:24-27 (emphasis added). In other words, just like a typical NLU component, the Session Input Accumulator receives recognized text as input, interprets the text, and builds shared assumptions and expectations (*i.e.* shared knowledge), which includes the conversation history. EX2001, ¶52. Mere recognized words generated by an ASR component are insufficient to constitute shared assumptions and expectations. EX2001, ¶¶52-53; EX1002, ¶42; *see also* EX2003, 88:17-24. Thus, the petition is wrong to equate the building of Kennewick’s tagged recognized words by an ASR component with the building of the ’681 patent’s conversation history by an NLU component. EX2001, ¶¶52-53.

For these reasons, Kennewick’s tagged recognized words are not “short-term shared knowledge.” EX2001, ¶54. Accordingly, the petition fails to establish that this limitation is disclosed or rendered obvious by Kennewick.

IV. GROUNDS 2 THROUGH 6: CLAIMS 3-8, 10-12, 15-20, 22-24, 27-32, AND 34-36 ARE NOT OBVIOUS

The claims (that were not disclaimed) challenged in Grounds 2 through 6 of the petition are all dependent of claims 1, 13, and 25. The petition’s analysis for

all the challenged claims in Grounds 2 through 6 rely on its analysis of claims 1, 13, and 25 in Ground 1. *See, e.g.,* Pet., 32 (“As described in Section IX.A, Kennewick renders obvious independent claims 1, 13, and 25 ... This section identifies additional disclosures of Huang that render these dependent claims obvious.”). Thus, these grounds of challenge fail for the same reasons discussed above. EX2001, ¶55.

V. CONCLUSION

For at least the reasons set forth above, as well as those noted in the Board’s institution decision, Petitioners have failed to meet their burden and the challenged claims should be found *not unpatentable*.

Respectfully submitted,

Date: May 21, 2021

/ Matthew A. Argenti /
Matthew A. Argenti, Lead Counsel
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CERTIFICATE OF COMPLIANCE

Pursuant to §42.24(d), the undersigned certifies that this paper contains no more than 14,000 words, not including the portions of the paper exempted by §42.24(b). According to the word-processing system used to prepare this paper, the paper contains 4,096 words.

Respectfully submitted,

Date: May 21, 2021

/ Matthew A. Argenti /
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LIST OF EXHIBITS

Exhibit No.	Description
2001	Declaration of Anatole Gershman
2002	<i>Curriculum Vitae</i> of Anatole Gershman
2003	Transcript of May 4, 2021 deposition of Padhraic Smyth, Ph.D.
2004	<i>Intentionally Left Blank</i>
2005	Disclaimer in Patent Under 37 C.F.R. 1.32(a), filed May 17, 2021 for U.S. Patent No. 8,073,681

CERTIFICATE OF SERVICE

I certify that the foregoing Patent Owner's Response Pursuant to 37 C.F.R. § 42.120 and Exhibits 2001-2005 were served on this 21st day of May, 2021, on the Petitioners at the correspondence address of the Petitioners as follows:

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