

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

HUM INDUSTRIAL TECHNOLOGY, INC.

Petitioner

v.

AMSTED RAIL COMPANY, INC.

Patent Owner

Case IPR2023-00540

Patent No. 10,137,915

PATENT OWNER'S RESPONSE

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EX #	Exhibit Description
2001	Expert Declaration of Dr. Michael Shamos
2002	<i>Curriculum Vitae</i> for Dr. Michael Shamos
2003	Joint Claim Construction Chart - Amsted Rail Company, Inc., v. Hum Industrial Technology, Inc., et al., Civil Action No. 4:22-cv-00445-AGF (E.D. Mo. March 31, 2023)
2004	U.S. Pat. Pub. No. 2009/0001226 to Haygood (“Haygood”)
2005	U.S. Pat. No. 7,336,156 to Arita et al. (“Arita”)
2006	Expert Declaration of Dr. Michael Shamos
2007	Ricca Declaration - Amsted Rail Company, Inc., v. Hum Industrial Technology, Inc., et al., Civil Action No. 4:22-cv-00445-AGF (E.D. Mo. March 31, 2023)
2008	Expert Declaration of Dr. Michael Shamos In Support of Patent Owner’s Motion to Amend

Patent Owner Amsted Rail Company, Inc. (“PO”) submits this Patent Owner Response to the Petition for *Inter Partes* Review (“IPR”) challenging U.S. Patent No. 10,137,915 (“the ‘915 Patent”). Petitioner has failed to establish by a preponderance of the evidence that any claim of the ‘915 Patent is unpatentable.

I. OVERVIEW OF THE ‘915 PATENT AND ITS FILE HISTORY

The ‘915 patent issued on November 27, 2018, and was filed as U.S. Patent App. No. 15/108,065 (“the ‘065 Application”), which was filed on December 24, 2014. EX. 1001 at 1. The ‘065 Application claims priority to U.S. Provisional Application No. 61/920,700, filed on December 23, 2013. *Id.*

II. LEVEL OF ORDINARY SKILL IN THE ART

A person of ordinary skill in the art (“POSA”) is a person with at least a B.S. degree in electrical engineering, in computer science, or in a related field with at least two years’ experience analyzing, designing, and/or building sensor and monitoring systems for railcars or similar industrial equipment and who has a familiarity with wireless networks. *See* EX. 2006 ¶30. Less work experience could be compensated by a higher level of education, such as a master’s degree or doctorate degree, and vice versa. *Id.*

III. CLAIM CONSTRUCTION

Claims are to be construed “in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art.” 37 C.F.R. §42.100(b); *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (en banc). Ordinary and customary meaning is determined “in the context of the entire patent, including the specification” and prosecution history. *Phillips*, 415 F.3d at 1313. Extrinsic evidence may also be useful in construing claim terms under the Phillips standard but “should be considered in the context of the intrinsic evidence.” *HubSpot, Inc. v. Trident Holdings, Inc.*, IPR2022-00907, Paper 6 at 8 (PTAB Oct. 27, 2022) (citing *Phillips*, 415 F.3d at 1317-19). The Board stated that no formal claim construction is necessary in this proceeding. Institution decision at 13. Patent Owner agrees with the Board that no formal claim construction should be necessary for this proceeding. However, Petitioner has applied certain teachings of the prior art against select claim elements that are not in keeping with the plain and ordinary meaning. *See, e.g.*, Petition page 37 (limitation 25(d) *citing back* to §§ X.A.2.d, X.A.5.c; EX. 1003 ¶106) and Petition page 38 (Claims 27-28). It is with this background that PO is compelled to point out the proposed constructions of key claim elements that Petitioner submitted in the underlying district court litigation. Importantly, by applying Petitioner’s proposed constructions from the underlying district court litigation, it is immediately apparent that Petitioner has applied the

teachings of the prior art against select claim elements in a way that is inconsistent with Petitioner's very own proposed claim constructions. *See* EX. 2006 ¶¶31-37 (explaining a proper construction in view of Petitioner's constructions from the underlying district court case).

A. one or more digital filters

In the underlying district court litigation, Petitioner believed that this claim term should be construed by a plain and ordinary meaning. EX. 2003¹ page 26. Mr. Ricca explained that "a PHOSITA would understand a 'digital filter' is a filter used in data collection and processing systems to decrease noise from unwanted digital

¹ Petitioner objected to Exhibit 2003 on the basis that "it is a filing from the related District Court litigation, and is not relevant to the current matter." Paper 13 at 2. This is nonsensical. It is Petitioner's own admission of how it believes certain claim terms should be construed. It is highly relevant, and if it is prejudicial, it is only prejudicial because Petitioner is now taking an inconsistent position. *See Google Inc. v. Intellectual Ventures II LLC*, IPR2014-01031, Paper 41 at 11 (PTAB Dec. 7, 2015) (finding a claim construction brief from a related district court proceeding is "relevant because it sheds light on whether [the party] is being consistent on the claim construct positions it is taking in two different forums").

signals and increase signals from *digital signals* of interest. A PHOSITA would understand a digital filter filters digital signals – *not analog signals*. EX. 2007² page 57 at ¶146 (emphasis added). PO does not endorse Mr. Ricca’s full opinion, but PO does agree that a digital filter “filters digital signals – *not analog signals*.” *Id.*; see also EX. 2006 ¶32-35.

B. one or more software filters configured to isolate one or more types of accelerations

In the underlying district court litigation, Petitioner explained that the claim term “one or more software filters configured to isolate one or more types of accelerations” means “a software program executed by a processor programmed to decrease noise from unwanted acceleration frequencies and increase signals from acceleration frequencies of interest.” EX. 2003 at 22. Likewise, in the underlying

² In anticipation of Petitioner’s objection to Exhibit 2007, the law is clear that an expert’s inconsistent statements from a district court proceeding are admissible in an IPR. See *Ultratec, Inc. v. CaptionCall, LLC*, 872 F.3d 1267, 1275 (Fed. Cir. 2017) (ordering that the Board “shall admit” an expert’s sworn district court testimony and “shall consider the impact on the specific patents at issue in the trial testimony *as well* as on his credibility as a whole.”) (emphasis in original)

district court litigation Mr. Ricca stated, “In my opinion, a PHOSITA would understand the claimed “software filters configured to isolate one or more types of accelerations” means “*a software program* executed by a processor programmed to decrease noise from unwanted acceleration frequencies and increase signals from acceleration frequencies of interest.” EX. 2007 page 51 at ¶124. PO does not endorse Mr. Ricca’s full opinion, but PO does agree that a software filter necessarily requires a software program. *See also*, EX. 2006 ¶¶36-37.

IV. ARGUMENT

A. **Ground One: Petitioner Fails to Show Any Claim is unpatentable under 35 U.S.C. § 103(a) over Armitage in view of Barone**

Petitioner has failed to show that any claim—including Claims 1, 22, 24-25, 27-30, 36, or 37—are unpatentable under 35 U.S.C. § 103(a) as obvious over Armitage in view of Barone.

1. **Claim 1**

Armitage in view of Barone fails to disclose, teach, or suggest every limitation of claim 1. *See* EX. 2006 ¶¶38-59. Independent claim 1 requires that “one or more filters [are] configured to filter at least a portion of the accelerations,” which are measured by a sensor. Petitioner incorrectly relies on Armitage’s purported teaching of sampling or ignoring data as allegedly showing the claimed filtering. Petition at 20-21, 25-29; *see also* EX. 2006 ¶¶40-41. Additionally, Petitioner has failed to provide a valid motivation to combine Armitage and Barone. EX. 2006 ¶¶53-59.

a. Petitioner Has Not Shown Armitage Teaches or Discloses the Claimed Filtering

Petitioner has failed to establish that Armitage explicitly discloses any filtering at all and, in fact, acknowledges that “Armitage does not explicitly disclose a filter.” *See* Petition at 21. As an initial matter, and to the extent Petitioner is arguing that Armitage inherently discloses filtering, Petitioner does not identify what type of filter a POSA would understand to be inherently disclosed by Armitage, nor does Petitioner provide any evidence that a filter is “necessarily present” in Armitage. *See* Petition at 10, 21-30; *see also* EX. 2006 ¶¶47-50. Petitioner does not identify any text portion or element of Armitage within which a “filter” is inherently disclosed either. *See* Petition at 10, 21-30. Petitioner’s showing is insufficient. *See HTC Corp. v. Cellular Commc’ns Equip., LLC*, 877 F.3d 1361, 1368 (Fed. Cir. 2017) (“The mere fact that a certain thing may result from a given set of circumstances is not sufficient.”).

Further, Petitioner and its expert are simply wrong to equate sampling, which Petitioner admits occurs only “for a portion of a wheel rotation,” with filtering. *See* Petition at 20, 25-26; EX. 2006 ¶¶47-50. A POSA would recognize that acceleration data is constantly being generated and the term “sampling” as used in cited paragraph 45 of Armitage does not **filter** out acceleration data but is rather referring to how often this available data is collected for subsequent processing. EX. 2006 ¶49. That

is, a POSA would interpret the terms “sampling” and “sampled” in paragraph 45 of Armitage as referring to an action that was performed by the accelerometer during the acquisition of the data, i.e., at a given time to obtain the vibration reading. *Id.* Obtaining data though sampling—at different intervals—is a distinct concept from filtering data. *Id.* ¶¶44-49. This interpretation is consistent with the plain and ordinary meaning of “sampling” (i.e., a small part selected as a sample for inspection or analysis. *See, e.g., id.* ¶48 (explaining other examples of sampling—videos sampling at various frames per second does not filter any data)). In contrast, “filter[ing] a portion of the accelerations” within the context of claim 1 occurs at some point after the data is collected, i.e., after there is some acceleration data to filter. *Id.* ¶44; *see also* EX. 1001 at 13:15-20 (disclosing that the signal that “originates with accelerometer hardware ... is passed to one or more sensor sections [that] select the data to be analyzed using a digital data filter ..., and passes this data on to a feature detector ...”).

“Filtering” means removing portions of data that exhibit a certain property, which is not true of sampling. *See* EX. 2006 ¶42. Thus, Petitioner incorrectly conflates “ignoring” data with “filtering” data. *See* Petition at 26 (arguing that during sampling “data could be ignored”); EX. 2006 at ¶49. Armitage states that, as a result of the sampling period only capturing data for a portion of a single wheel rotation, the radial accelerations are “ignored” i.e., are not filtered, but simply not gathered at

all. *See* EX. 1006 ¶45 (stating that for sampling of the accelerometer, “the sampling ***only occurs for a portion of a wheel rotation***, and ***radial*** acceleration or vibration (x-axis or y-axis) data could be ignored”); EX. 2006 ¶¶47-52 (explaining parallels between ignoring and sampling and distinction to filtering).

Petitioner also relies on Armitage’s disclosure of “amplifiers, analog-to-digital-converters, [and] microcontrollers” and claims—without analysis—that these devices necessarily “would mean the sensor is capable of filtering at least a portion of accelerations.” Petition at 26 (*citing* EX. 1006 ¶56). Petitioner does not explain how these structures purportedly contain any filters nor why they would necessarily be configured to perform any “filtering” of accelerations data, much less cite to any support therefore. *See id.*; *see also* EX. 2006 ¶50. Petitioner also fails to explain how a POSA would understand that these structures necessarily perform any filtering. *See id.*

Petitioner does not point to any disclosure in Armitage showing that any filtering of the acceleration data is performed either before the acceleration data reaches the accelerometer or after the acceleration data has been obtained. *See* Petition at 26; EX. 2006 ¶50. The process in Armitage is not the same process as the claimed “filtering” and Petitioner does not argue that Armitage filters “at least a portion of the accelerations” ***after*** the acceleration data has been obtained by the sensors. *See id.*

b. The reasoning of the institution decision

The Board noted that claim 1 “appears to be broad enough to include ‘mechanical filters’” and pointed to claim 26 and the disclosure of mechanical filters in the ’915 patent as evidence that a POSA would understand Barone’s disclosure to fall within the scope of claim 1. *See* Institution Decision at 26-27. However, this is an apples to oranges comparison. Any accelerations removed by the mechanical filter of claim 26 are necessarily removed *before* they are detected by the accelerometer because that is how a mechanical filter works. EX. 2006 ¶51. Therefore, such accelerations filtered by the mechanical filter are not measured “accelerations of the railcar” and therefore are not within the scope of claim 1. *Id.*

A POSA would also recognize that claim 26 language “wherein the one or more filters comprise one or more mechanical filters” is a draftsman error that should have stated “further comprising one or more mechanical filters.” *Id.* ¶ 52. Again, a POSA would recognize this claiming error because a mechanical filter removes accelerations before they are sensed by an accelerometer. *Id.* ¶¶51-52. In any case, the mechanical filter in the ’915 specification “serve[s] to mechanically filter *high and low frequency types* of accelerations that are considered noise and which are preferably removed from the signal of interest.” EX. 1001 at 5:23-37. Therefore, a POSA would understand that the scope of claim 1 should not be broadened in view of the draftsman error of claim 26. *See* EX. 2006 ¶¶51-52.

Accordingly, Petitioner has not established that independent claim 1 is unpatentable over Armitage in view of Barone. Further, because each of claims 22, 24-25, and 27-29 depend from independent claim 1, each is allowable by virtue of depending from an otherwise patentable claim. EX. 2001 ¶59.

c. Armitage in view of Barone is an unworkable combination

Petitioner alleges “a PHOSITA would have been motivated to include the filter taught by Barone with Armitage because the advantage of filtering is to remove unwanted data and/or amplify particularly relevant data, and the purpose of both systems is to analyze data in a train monitoring system to accurately predict anomalous conditions and avoid false or inaccurate data processing.” Petition at 21 *citing* EX. 1003 ¶67. Petitioner does not cite to any evidence to support this motivation other than the declaration of Mr. Ricca. *Id.* Mr. Ricca’s declaration is a 1:1 verbatim statement of the Petition and it too fails to cite to any evidence to support the alleged motivation. *Compare* Petition at 57 *with* EX 1003 ¶162. Here, Petitioner appears to have gleaned the motivation to make the purported combination directly from the ’915 specification. EX. 1001 at 5:40-42 (“The software filter used is a digital filter to decrease noise from unwanted acceleration frequencies and increase signals from acceleration frequencies of interest.”). This is improper hindsight analysis. *See In re Dow Chem. Co.*, 837 F.2d 469, 473 (Fed. Cir. 1988)

(“[t]here must be a reason or suggestion in the art for selecting the procedure used, other than the knowledge learned from the applicant’s disclosure”); *Cardiac Pacemakers, Inc. v. St. Jude Medical, Inc.*, 381 F.3d 1371 (Fed. Cir. 2004) (“the suggestion to combine references must not be derived by hindsight from knowledge of the invention itself”); *Purdue Pharma L.P. v. DepoMed, Inc.*, 643 F. App’x 960, 11 (Fed. Cir. 2016) (“[Petitioner must demonstrate to the Board that the problem was known in the art or that [] the problem was derived directly from the prior art, ***rather than from the challenged claims.***”). Moreover, as will be shown below, Petitioner is incorrect that combining the filters of Barone with Armitage would lead to a system that can “accurately predict anomalous conditions and avoid false or inaccurate data processing.” *See* Petition at 21; *see also* EX. 2006 ¶¶ 53-59.

A POSA would not be motivated to combine the filters of Barone with Armitage because doing so would frustrate the principle of operation of Armitage and render the Armitage invention unsatisfactory for its intended purpose (accurately identifying outlier sensor data). EX. 2006 ¶53; *see also In re Ratti*, 270 F.2d 810, 813, 123 USPQ 349, 352 (CCPA 1959) and *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984). A POSA, familiar with the full disclosure of Armitage, would understand that incorporating the filters of Barone would exclude portions of accelerations data that are relied upon by Armitage to identify outlier sensors that are indicative of a failure. *See* EX. 2003 ¶53 (“Barone’s filters would remove the

very signal artifacts that Armitage is looking for.”). Additionally, filtering of accelerometer data would prevent Armitage from quantifying the severity of outlier sensor data. *See* EX. 1006 ¶¶40,43-44. Hence, modifying Armitage to include the filters disclosed by Barone would fundamentally change the principle of operation of Armitage and doing so would render the Armitage invention unsatisfactory for its intended purpose. EX. 2006 ¶53.

Armitage does not disclose any filtering steps at all. EX. 2006 ¶53. Rather, Armitage intentionally passes all of the accelerometer data from a plurality of sensors on to a Data Correlation Unit (DCU) for analysis. *See* EX. 1006 ¶¶30,41-43; EX. 2006 ¶¶54-58. Armitage relies on a specific type of analysis that requires using all of the raw data from the accelerometers. *See* EX. 2006 ¶¶54-58. In an embodiment, Armitage explains that an entire population of sensor nodes transmits the sensor data to establish a “moving average” of the population. EX. 1006 ¶30; EX. 2006 ¶55. Then Armitage compares the individual sensor data against the moving average to identify outliers. *Id.* Armitage explains “When one or more of the sensor nodes begin to deviate from the others in the population, then a failure condition could be determined.” EX. 1006 ¶30. A POSA would recognize that this embodiment requires that all of the sensor data from each respective sensor be passed along to the DCU to establish the “moving average” and identify outlier sensors. EX. 2006 ¶54. A POSA would recognize that including the filters taught by Barone

would (a) remove important sensor data and thus impact the moving average analysis (thereby altering the principle of operation of Armitage), and (b) potentially remove sensor data that should have served as the basis for identification of an outlier (thereby rendering Armitage unsatisfactory for the intended purpose of accurately identifying outlier sensors). EX. 2006 ¶55; *see also In re Ratti*, 270 F.2d 810, 813, 123 USPQ 349, 352 (CCPA 1959) and *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984).

In another embodiment operating on the same basic principle, Armitage explains “In some examples, a standard deviation metric is employed to determine when data from one or more sensor nodes becomes an outlier from a main cluster of sensor node data, such as when data from a sensor node deviates by more than three standard deviations, among other examples.” EX. 1006 ¶41. Armitage also explains “when only one of sensor nodes 320-327 indicates outlier data as shown in FIG. 4, it could be determined that a wheel bearing or hotbox condition for a single wheel has occurred. A single wheel sensor anomaly might also indicate a ‘wheel out of round’ or ‘flat spot’ condition, where a non-round geometry of a wheel can cause vibrations or shocks at a certain portion of each rotation of a wheel. Taking sensor node 325 as an outlier in this example, then the right wheel of wheel assembly 314 could have a failure.” EX. 1006 ¶42. A POSA would recognize that this embodiment requires that all of the sensor data from each respective sensor be

passed along to the DCU to establish the standard deviation and identify outlier sensor(s). EX. 2006 ¶56. A POSA would recognize that including the filters taught by Barone would remove some sensor data and (a) impact the standard deviation metric (thereby altering the principle of operation), and (b) potentially remove sensor data that should have served as the basis for identification of an outlier (thereby rendering Armitage unsatisfactory for the intended purpose of accurately identifying outlier sensors). EX. 2006 ¶57.

In another embodiment operating on the same basic principles, Armitage explains: “Some examples describe a dynamic normalization, where the application of a sensor network on each railway car is employed to dynamically define norms of operation for each of the critical mechanical components. In the example shown in graph 400, the cluster of data from sensor nodes 320-324 and 326-327 could be considered the norm, while the data for sensor 325 could be considered a deviation or outlier.” EX. 1006 ¶43. A POSA would recognize that this embodiment requires that all of the sensor data from each respective sensor be passed along to the DCU to establish the “dynamic normalization” metric and identify outlier sensor(s). EX. 2006 ¶58. Accordingly, the Board should find that the motivation to modify Armitage in view of Barone fails because the reasoning provided by Petitioner lacks substantial evidence to support a working combination. EX. 2006 ¶59.

d. A POSA would not have been motivated to modify Armitage in view of Barone for power saving purposes

Petitioner does not provide any evidence to support its assertion that a POSA “would have been motivated to include the filtering taught by Barone” beyond the conclusory, mirror image statements of its expert. *See* Petition at 29, EX. 1003 ¶ 82. In fact, the paragraph on page 29 of the Petition is *identical* to paragraph 82 of Mr. Ricca’s declaration, with the exception of the declaration citations in the Petition. *Compare* Petition at 29 with EX. 1003 at ¶ 82. Mr. Ricca does not cite to any record evidence to support his opinion. This is plainly insufficient. *Samsung Electric*, IPR2022-00251, Paper 17 at 25 (dismissing petition and affording little to no weight to expert testimony that mirrored petition). The Petition confusingly alleges that (i) a POSA might have recognized that filtering *could* take place “in either the CMU or sensor” and (ii) Barone emphasizes the importance of a low power system that somehow a POSA would arrive at the claimed invention. *See* Petition at 28. This is an erroneous motivation to combine Barone with Armitage and/or modify Barone because “power consumption” alone does not motivate a POSA to alter the analog signal processing of Barone (i.e., electronic filters as explained in detail above) to be digital filters and/or software filters. EX. 2006 ¶ 75. It is entirely unclear and unstated by the Petition why power consumption would even impact where filtering takes place, let alone why the alleged emphasis on power consumption would

motivate a POSA to arrive at the claimed invention. *See* Petition at 28. Here, all Petitioner has done is identify a purported benefit in Barone (low power consumption) in an attempt to establish motivation to combine Barone with Armitage. *Id.* Yet, this motivation is entirely unrelated to the types of claimed filtering and such a purported benefit would not motivate a POSA to arrive at the claimed invention. Ex. 2006 ¶ 80 (“Even assuming that a POSITA would have found it desirable to modify Armitage to reduce its power usage, adding filtering to Armitage (a function not present at all in Armitage) would not achieve that goal, so the purported reason for the combination fails.”). A POSA would recognize that Armitage does not disclose any filters nor does Armitage suggest any are needed. *Id.* As such, including the filters disclosed by Barone, no matter where they are included, would actually increase the total power consumption of the Armitage invention. *Id.* Hence, Petitioner’s alleged motivation is nonsensical because doing precisely what Petitioner alleges actually undermines the purported advantages identified by Petitioner. *Id.*

2. Claim 25

Claim 25 is patentable because it claims unique features not found in the Armitage and Barone combination, e.g., a software filter. EX. 2006 ¶60. As its name implies, a software filter “is a type of filter that utilizes a processor capable of

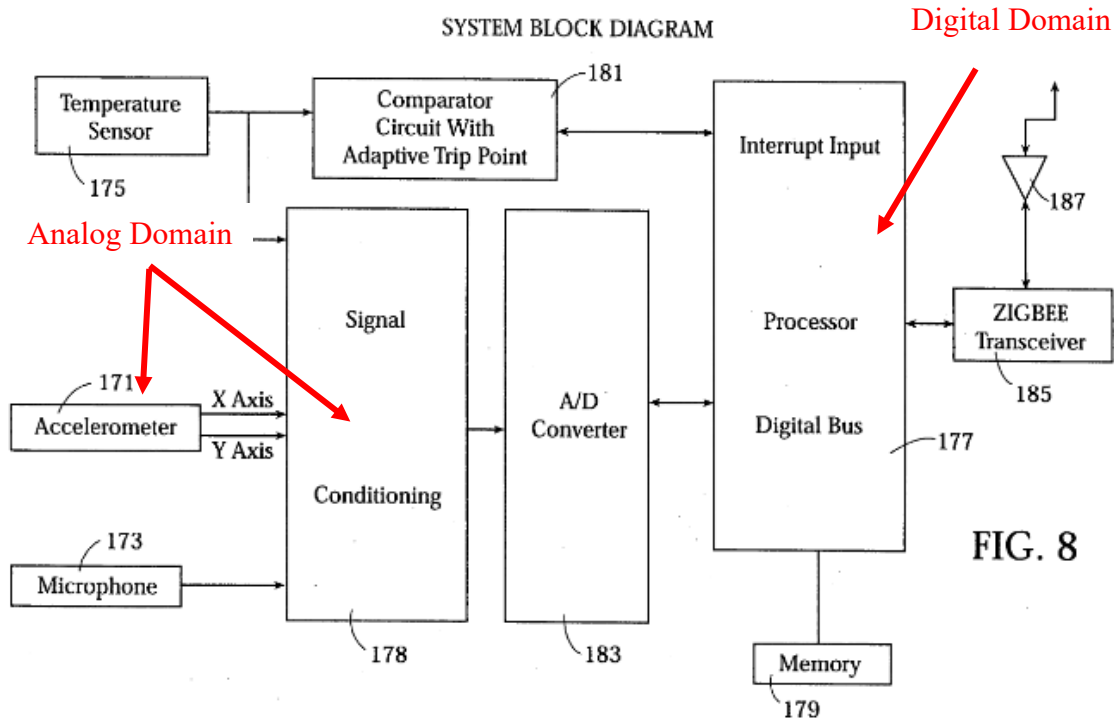
executing a computer program that is capable of processing and passing selected data.” *See* EX. 2006 ¶62.

In the context of claim 25, a software filter utilizes computer executable code (i.e., software) that acts on digitized data which is representative of one or more types of accelerations of a railcar. *See* EX. 2006 ¶62. As explained by the ’915 patent, a purpose of a software filter is “to decrease noise from unwanted acceleration frequencies and increase signals from acceleration frequencies of interest.” EX. 1001 5:40-42.

Petitioner alleges that “A PHOSITA would understand Armitage’s teachings of sampling and ignoring certain data points equates to filtering data.” Petition at 27. However, as established above, a POSA would understand that the principles of sampling and filtering are entirely different methods. *See supra* §IV.A.1 (incorporated here); EX. 2006 ¶¶40-50, 63. As an alternative to Armitage, Petitioner relies on Barone at FIG. 8, ¶¶114-115, 150, and 172-185 in attacking claim 25. Petition 37-38 (limitation 25(d) *citing back* to Petition §§X.A.2.d and X.A.5.c). At the outset of the argument, Petitioner summarily concludes “combining the sampling of data (i.e., filtering) in Armitage and the electronic and digital filtering taught in Barone would have predictably resulted in the filtering of accelerations data.” Petition 27. However, as will be shown below in more detail, there is absolutely no disclosure in Barone that corresponds to a digital filter or a software filter. EX. 2006

¶¶64-75. Rather, Barone merely discloses conventional electronic, *analog* filters, e.g., high pass and low pass filters that rely on circuitry to perform filtering. EX. 1007 ¶¶109-112, 114, 138, 158, 167, 171, 173, 175, 177; EX. 2006 ¶67. “Electronic filtering is a type of filtering which utilizes electrical circuits to process signals (i.e., analog signals).” Petition at 26: see also EX 2006 ¶35.

Barone does not teach “wherein the firmware comprises one or more *software filters* configured to isolate one or more types of accelerations,” and instead merely discloses signal conditioning of analog signals from an analog sensor using analog circuitry. EX. 2006 ¶66. There are no filtering steps disclosed by Barone that are performed by software in the digital domain and there is no such hardware that corresponds to a digital filter. EX. 2006 ¶66. With reference to FIG. 8 of Barone [below], it is clear that the signal conditioning steps are performed solely in the analog domain because signal conditioning 178 occurs prior to the conversion from the analog domain to the digital domain by an analog to digital converter, i.e., A/D converter 183. EX. 2006 ¶66.



In Barone, the disclosed accelerometer 171, microphone 173, and temperature sensor 175 are each analog devices that only output analog signals. EX. 1007 ¶¶109-112, 114, 138, 158, 167, 171, 173, 175, and 177; *see also* EX. 2006 ¶67. Regarding the accelerometer, Barone explains “The output of the accelerometers is preferably *analog signals*, and these are processed to *enhance the quality of data derived*. To take advantage of the resonance frequencies of the truck as being particularly meaningful in terms of output of the accelerometers, the outputs of the accelerometers (both x (or axial) and y (or radial) axes) are passed through a preprocessing circuit, i.e., signal conditioner 178 of FIG. 8, *before the accelerometer outputs are analyzed by the microprocessor of the node.*” EX 1007

¶175 (emphasis added). Regarding the microphone 173, Barone explains “To process the ultrasonic sound, the output of the microphone is passed through a preprocessing circuit, i.e., signal conditioner 178 of FIG. 8, before the microphone output is converted to digital and analyzed by the microprocessor of the node. In the preferred embodiment, the microphone analog signal conditioning comprises passing the output to a high-pass filter allowing passage of frequencies of 19.5 KHz (or about 19.5 KHz, e.g., 20 kHz) and above, which obtains the ultrasonic sound of the axle.” EX. 1007 ¶167. A POSA would recognize that all of the various types of filter related hardware disclosed by Barone, e.g., the signal conditioner, high-pass, low-pass, and/or band-pass filters, are electronic filters that rely on circuitry to process analog signals. EX. 2006 ¶65. Mr. Ricca has also explained that “Electronic filtering is a type of filtering which utilizes electrical circuits to process signals (i.e., analog signals), and includes a number of different types of filters.” EX. 1003 ¶158.

Petitioner attempts to thread the needle by linking Barone’s electronic filtering steps, that occur in the analog domain, to the subsequent data analysis and sampling steps that are performed in the digital domain. Petition 27-29. For example, Petitioner alleges that “Barone explicitly teaches output of an ‘accelerometer 171’ being transmitted to ‘signal conditioning 178’, where the analog signals are amplified and/or filtered as appropriate (electronic filter), and then routed to analog to digital (A/D) converters for wide bandwidth calculations and data manipulations

(digital filter).” *See* Petition 27 *citing* EX. 1007 (*sic*) ¶¶114-115 and FIG. 8. Petitioner is incorrect that an A/D converter is a digital filter. EX. 2006 ¶68. Petitioner cites to no evidence in Barone (or otherwise) showing that an A/D converter performs any filtering steps. *See* Petition 36-38 (addressing claim 25 and *citing* back to Petition §§ X.A.2.d and X.A.5.c); *see also* EX. 2006 ¶69. Additionally, a POSA would recognize the performance of wide bandwidth calculations and data manipulation is not necessarily a form of digital filtering (let alone software filtering) but rather is a type of data analysis that does not necessarily filter out data. EX. 2006 ¶69.

Petitioner mistakenly relies on ¶¶114-115 of Barone as a foundation to support the flawed argument that an A/D converter performs filtering. *See* Petition 27; *see also* EX. 2006 ¶69. Barone discloses “the fast A/D converters 183 coupled with the high-speed processor 183 allow all high speed, wide bandwidth calculations and data manipulations to occur on the node, thus eliminating the need for wide bandwidth wireless communication.” EX. 1007 ¶¶114-115. A POSA would recognize that this disclosure does not suggest a processor is embodied in or upstream of the A/D converter that performs digital filtering or software filtering. *See* EX. 2006 ¶¶69-70. Rather, “high-speed processor 183” is an obvious typographical error in which the specification should have referred to processor 177 (which is downstream of the A/D

converter).³ *See* EX. 1007 FIG. 8; EX. 2006 ¶¶69-70. Moreover, merely because a processor performs data manipulations such manipulations are insufficient to show filtering. EX. 2006 ¶¶69-70.

The analysis that processor 177 performs to the digitized signal downstream of the A/D converter is disclosed in detail by Barone in ¶¶192-237. A POSA, having read these paragraphs, would readily understand that all Barone is doing is performing an analysis method by sampling of data to identify defect frequencies that may be indicative of bearing degradation. EX. 2006 ¶70. A POSA would also understand that although Barone analyzes the data with a software program, this software program merely applies a Fourier transform to a digitized signal that was already filtered by an analog method. *Id.* Accordingly, there is no need to filter the digitized signal and Barone explicitly acknowledges the same. *See* EX 1007 ¶ 234; EX. 2006 ¶70.

Barone discloses that the application of the Fourier transform is performed to identify 16 defect frequencies. EX. 1007 ¶¶202-222. Thereafter, “An array of data

³ High-speed processor 183 is used one time in the specification; whereas processor 177 (or microcontroller 177) is used seven times and diagrammed in FIG. 8. *See* EX. 2007 ¶ 69.

values is loaded with a magnitude value for each of the frequencies pulled out of the sample data by the Fourier transform.” *Id.* ¶231. Barone then goes on to explain that “Detection of defects is accomplished by screening the Fourier data for peaks that are characteristic of the various types of defects and degrees of bearing degradation according to the methods described above.” *Id.* ¶236. In view of this disclosure, a POSA would readily understand that even though Barone performs data analysis in the digital domain by software this data analysis merely involves the translation of signal data into a time-based domain (Fourier transform) for the identification of peaks that are indicative of bearing degradation. EX. 2006 ¶ 70. A POSA would readily understand this analysis methodology does not perform any filtering of digital data and therefore does not correspond to a digital filter or a software filter. *See* EX. 2006 ¶70 (discussing how the Fourier transform in Barone is invertible and if this data were filtered it would not be invertible).

Petitioner states, without evidence, that “Barone further teaches the use of a high-pass, low-pass, and/or band-pass filters, all of which can utilize both electronic and digital filters.” Petition at 28. Petitioner is incorrect. A POSA would recognize that the high-pass, low-pass, and/or band pass filters disclosed in Barone do not contain digital filters. EX. 2006 ¶¶65, 68, 73. Additionally, a POSA would recognize that high-pass, low-pass, and/or band-pass filters do not utilize digital filters or software filters. *Id.*

Finally, as recognized by the Board, Petitioner does not cite to any evidence to support the concept that a POSA might consider modifying these types of electronic filters to include a digital filter nor does Petitioner argue that the filtering in Barone could be modified in further view of some other evidence to be a digital filter or software filter (other than impliedly alleging so by improper hindsight and flawed analysis). *See* Petition 36-38 (addressing claim 25 and *citing* back to Petition §§ X.A.2.d and X.A.5.c); *see also* Institution Decision at 31 (“First, the combination seeks to improve the operation of Armitage by incorporating Barone’s filter, not altering Barone.”); *see also* EX. 2006 ¶74. Rather, Petitioner boldly states that “a PHOSITA would be motivated to include the filtering taught by Barone to remove unwanted data and/or amplify particularly relevant accelerations data. Again, filtering could occur at various points within the system.” Petition at 28.

As shown herein, merely incorporating the “filtering taught by Barone” with Armitage is wholly insufficient to arrive at the claimed invention. Likewise, an allegation that a POSA might recognize that filtering “could occur” at various points within the system does not articulate why or how a POSA might modify Barone’s analog filtering to perform at a different point within the system that is even relevant to software and digital filtering. *See* EX. 2006 ¶74-75. Accordingly, claim 25 is patentable because Petitioner has not established valid substantial evidence showing software or digital filtering nor has Petitioner established valid substantial evidence

supporting a motivation to modify Barone’s electronic filters and to incorporate modified Barone into Armitage (or any other reference relied upon by Petitioner). *See* EX. 2006 ¶¶ 60-75.

3. Claim 28

Claim 28 is patentable because it claims unique features not found in the Armitage and Barone combination, e.g., a digital filter. EX. 2006 ¶76. As its name implies, a digital filter operates on digital data, and such digital data is often obtained from analog signals through an analog-to-digital conversion process. EX. 2006 ¶¶43-44, 61. In the context of claim 28, a digital filter refers to a hardware component that performs the filtering of digitized data – not analog signals. *Id.* Another way to understand a digital filter is that it is a genus to the species software filter in that both analyze digital signals and/or digital data. *See* EX. 2006 ¶61. A distinguishing feature of the claimed digital filters and software filters over the cited art is that both types operate on digital, rather than analog, inputs and each produces a digital output. EX. 2006 ¶¶43-44, 61. As such, claim 28 is patentable for the same reasons explained above with respect to claim 25. *See supra* §§ IV.A.1; IV.A.2 (both incorporated here by reference).

Barone does not teach “wherein the one or more filters comprise one or more digital filters.” Ex. 2006 ¶76. Instead, Barone discloses: “The output of the accelerometers is preferably analog signals, and these are processed to enhance the

quality of data derived.” EX. 1007 ¶175. As seen in FIG. 8 of Barone (*see supra* § IV.A.2), Barone discloses the signal conditioning step 178 occurring *prior* to the conversion from analog to digital. *See* EX. 1006 at FIG. 8; EX. 2006 ¶66. That is to say that the signal conditioning of Barone is necessarily performed in the analog domain because such signal conditioning is performed upstream of the A/D converter. EX. 2006 ¶66. Barone **does not** disclose any filtering of data that occurs in the digital domain. *See* EX. 1006 at FIG. 8; EX. 2006 ¶66.

Petitioner proclaims that “digital filtering uses software to manipulate and filter data.” Petition at 27. This is not strictly correct because software filters are a genus of digital filters and not all digital filters are software filters. EX. 2006 ¶ 43-44. Even taking Petitioner’s characterization at face value,⁴ Barone still does not use any software to filter digital data as explained extensively above. *See supra* §II.A.2. At most, Barone merely uses software to **analyze** data and time the specific sampling rate from which to acquire data. EX. 2006 ¶¶69-75; *see also supra* §IV.A.2 (incorporated here). Barone discloses:

In one embodiment, the data sample analyzed is two seconds of
accelerometer data readings that are taken and analyzed as a time

⁴ PO does not endorse Petitioner’s characterization.

record, which allows 0.5 Hz frequency resolution, which is an appropriate resolution to optimize the resolution versus time required for data acquisition. The highest frequency of interest is 833 Hz, as will be discussed below, and in order to acquire 4 samples on an 833 Hz signal the sample rate should be 3332 samples per second. Thus, 6664 data points are acquired during the two-second interval for post-processing to determine the 144 frequency amplitudes.

According to the preferred embodiment, **the accelerometer data is sampled in a set of readings over ten revolutions of the wheel**, and is processed by the microcontroller operating according to software causing it to perform another algorithm on the accelerometer data, as will be discussed below, that takes advantage of the fact that the defect frequencies are directly related to the rate of rotation of the wheel, and operates using samples taken over a period dependent on the rate of rotation of the wheel, and at frequent enough intervals to pick up the highest frequency of interest.

These processes result in improved power efficiency relative to more computation intensive algorithms used in the prior art, where power is not a significant concern.

EX. 1007, ¶¶149-151. As explained above, “sampling” is not the same process as “filtering” and a POSA would instantly recognize material differences in these two terms. *See supra* § IV.A.1.a. Accordingly, claim 28 is patentable over Armitage and Barone. Claim 28 is also patentable for the specific reasons established above with respect to claim 25 and that discussion is incorporated herein by reference in entirety. *See supra* §§ II.A.2.

4. Claim 30

Petitioner does not provide any analysis at all to support its assertion that claim 30 is unpatentable beyond cross referencing to the limitations of Claim 1. Petition at 38-39. This is a fatal deficiency. *See* EX. 2006 at ¶77.

Regardless, the combination of Armitage and Barone fails to disclose, teach, or suggest at least limitation 30(c): “filtering, by one or more filters, at least a portion of the accelerations.” *See, supra* §§IV.A.1; IV.A.2 (incorporated here). Petitioner’s only argument to limitation 30(c) is a cross reference to limitation 1(d). Petition at 39. However, Petitioner’s reliance on Armitage is deficient because, as described *supra*, the “sampling” and “ignoring” disclosed in Armitage is not the same as the claimed requirement for “filtering.” *Id.*; EX. 2006 ¶¶40-50. Similarly, Petitioner’s reliance on incorporating the electronic filters as taught by Barone is flawed because Barone and Armitage are unworkable in combination as set forth in detail above. *See, supra* §IV.A.1.c; IV.A.1.d.

5. Claims 36 and 37

Petitioner does not provide any analysis at all to support its assertion that claim 36 is unpatentable beyond a cross reference to limitation 1(d); this is a fatal deficiency. *See* EX. 2006 ¶¶78-80.

Regardless, the combination of Armitage and Barone fails to disclose, teach, or suggest limitation 36(d): “one or more filters configured to filter at least a portion of the accelerations.” As with limitation 1(d), Petitioner’s reliance on Armitage is deficient because the “sampling” disclosed in Armitage is not the claimed “filtering.” *See supra* §IV.A.1 (incorporated here); *see also* EX. 2006 ¶¶40-52. Similarly, Petitioner’s reliance on incorporating the electronic filters as taught by Barone is flawed because Barone and Armitage are unworkable in combination as set forth in detail above. *See, supra* §§II.A.1.c; II.A.1.d.

Claim 37 depends from independent claim 36 and is therefore patentable by virtue of depending from an otherwise patentable claim. EX. 2006 ¶ 78.

B. Ground Two: Petitioner has failed to show that Claim 21 is unpatentable under 35 U.S.C. § 103(a) in view of Armitage, Barone, and LeFebvre

Claim 21 depends from independent claim 1 and is therefore patentable by virtue of depending from a patentable independent claim. *See supra* §IV.A.1, (incorporated here); *see also* EX. 2006 at ¶¶81-83.

C. Ground Three: Petitioner has failed to show that Claims 23 and 26 are unpatentable under 35 U.S.C. § 103(a) in view of Armitage, Barone, and Winfree

Each of Claims 23 and 26 depend from independent claim 1 and are therefore patentable by virtue of depending from a patentable independent claim. *See supra* §IV.A.1, (incorporated here); *see also* EX. 2006 at ¶¶84-85.

D. Ground Four: Petitioner has failed to show that Claims 1, 21-22, 25, 27-30, 36, and 37 are unpatentable under 35 U.S.C. § 103(a) in view of LeFebvre and Barone

1. Claim 1

The combination of LeFebvre and Barone fails to disclose, teach, or suggest at least limitation 1(d): “one or more filters configured to filter at least a portion of the accelerations.” As an initial matter, the argument that LeFebvre does not disclose filtering was already presented to the Examiner and the prosecution history makes clear that the Examiner understood LeFebvre failed to disclose, teach, or suggest the “filtering” requirements of independent claim 1. *See* EX. 1002 at 496-518. Even assuming *arguendo*, the Examiner did not consider and reject this argument, Petitioner has failed to show that LeFebvre teaches or suggests this limitation. EX. 2006 ¶¶86-90.

Petitioner acknowledges that LeFebvre does not disclose the claimed filtering. *See* Petition at 55 (“LeFebvre does not explicitly require a ‘filter’ . . .”). Further, and similar to Armitage, LeFebvre discloses “sampling” which a POSA would [and the

Examiner did] understand to be a different process from “filtering.” *See* EX. 2006 ¶¶48-49, 63, 86-89; *see also* EX. 1002 at 496-518.

Contrary to Petitioner’s argument, LeFebvre’s disclosure of sending only “essential indicative information” does not disclose the claimed filtering. *See* Petition at 54 (citing LeFebvre ¶53). A POSA would understand from Petitioner’s cited disclosure that LeFebvre is referring to post-processing logical decisions about whether or not to send data. *See* EX. 2006 ¶88. In fact, the cited passage discusses it as a “burden” to transmit “all the data that might be sampled” and thus envisions procedures to “reduce the radio traffic to manageable portions.” *See id.*; EX. 1005 at ¶53. A POSA would not consider the post-processing selective transmission of data disclosed in LeFebvre to be equivalent to a filter. *See* EX. 2006 at ¶88 (explaining this down-sampling for data reduction purposes is not filtering of acceleration data).

Petitioner also argues that LeFebvre’s “preliminary analysis” discloses the claimed filter. *See* Petition 54 (*citing* EX. 1005 ¶¶34-46). Petitioner’s cited disclosure, however, is directed to power management and — yet again — sampling periodicities. *See* EX. 1005 at ¶¶34-36; EX. 2006 ¶89. For example, the instrumented pad of LeFebvre, which is “normally in a passive, low power state,” periodically turns on to conduct a preliminary analysis to “activate the [pad’s] microprocessor” and conduct additional readings if there is a problem detected by the preliminary

analysis. EX. 1005 at ¶34; EX. 2006 ¶89. A POSA would understand that such a power management protocol does not teach the claimed filtering. *Id.*

a. LeFebvre in view of Barone is an unworkable combination

Acknowledging the weakness of LeFebvre, Petitioner relies on Barone to supplement LeFebvre. *See* Petition at 55. The combination of LeFebvre and Barone is an unworkable combination for similar reasons explained above with respect to the combination of Armitage and Barone. *See supra* IV.A.1 (incorporated here). Petitioner alleges “a PHOSITA would have been motivated to include the filter taught by Barone with LeFebvre because the advantage of filtering is to remove unwanted data and/or amplify particularly relevant data, and the purpose of both systems is to analyze data in a train monitoring system to accurately predict anomalous conditions and avoid false or inaccurate data processing.” Petition at 57 *citing* EX 1003 ¶162. Petitioner does not cite to any evidence to support this motivation other than the declaration of Mr. Ricca. *Id.* Mr. Ricca’s declaration is a 1:1 verbatim statement of the Petition and also fails to cite to any evidence to support the alleged motivation. *Compare* Petition 57 *with* EX 1003 ¶162. Here, Petitioner appears to have reproduced the motivation to make the purported combination directly from the ’915 specification. “The software filter used is a digital filter to decrease noise from unwanted acceleration frequencies and increase signals from

acceleration frequencies of interest.” EX. 1001 at 5:40-42. This is improper hindsight analysis. *See In re Dow Chem. Co.*, 837 F.2d 469, 473 (Fed. Cir. 1988) (“[t]here must be a reason or suggestion in the art for selecting the procedure used, other than the knowledge learned from the applicant’s disclosure”); *Cardiac Pacemakers, Inc. v. St. Jude Medical, Inc.*, 381 F.3d 1371 (Fed. Cir. 2004) (“the suggestion to combine references must not be derived by hindsight from knowledge of the invention itself”); *Purdue Pharma L.P. v. DepoMed, Inc.*, 643 F. App’x 960, 11 (Fed. Cir. 2016) (“[Petitioner must demonstrate to the Board that the problem was known in the art or that [] the problem was derived directly from the prior art, ***rather than from the challenged claims.***”). Moreover, as will be shown below, Petitioner is incorrect that combining the filters of Barone with LeFebvre would lead to a system that can “accurately predict anomalous conditions and avoid false or inaccurate data processing.” *See* Petition at 21; EX. 2006 ¶¶ 90-91.

A POSA would not be motivated to combine the filters of Barone with LeFebvre because doing so would frustrate the principle of operation of LeFebvre and render the LeFebvre invention unsatisfactory for its intended purpose (accurately identifying sensor data with a magnitude indicating an alarm condition). EX. 2006 ¶90; *see also* EX 1005 ¶52, 55. A POSA, familiar with the full disclosure of LeFebvre, would understand that LeFebvre predominantly uses accelerometer data “for triggering certain analysis modes or verifying readings made by the pad

and providing information on a variety of car body motions.” EX 1005 ¶37. That is to say that LeFebvre relies on an accelerometer to validate the identification of defects by other types of sensors rather than using the accelerometer data to make independent decision making. *See* EX. 2006 ¶ 90. LeFebvre does not disclose any filtering of accelerometer data at all nor does LeFebvre suggest doing so would be advantageous. *Id.*

Arguendo, assuming that LeFebvre does rely on accelerometer data to determine an alarm condition, LeFebvre would do so only if the magnitude of the accelerometer data exceeds a predetermined threshold. EX. 1005 ¶¶55, 58. Therefore, a POSA would recognize that incorporating the high pass, low pass, and/or band pass filters of Barone would exclude portions of accelerations data that are relied upon by LeFebvre to identify conditions that warrant the sending of an alarm. EX. 2006 ¶91. Stated another way, filtering out the upper and lower portions of accelerometer data as taught by Barone would prevent LeFebvre from identifying the accelerometer data having a magnitude sufficient to warrant an alarm. *Id.* Hence, modifying LeFebvre to include the filters disclosed by Barone would fundamentally change the principle of operation of LeFebvre and doing so would render the LeFebvre invention unsatisfactory for its intended purpose. *Id.*

Accordingly, the Board should find that the motivation to modify LeFebvre in view of Barone is lacking because the reasoning provided by Petitioner lacks

substantial evidence. Claim 1 is independent. Claims 21-22, 25, and 27-29 depend from claim 1 and are therefore allowable by virtue of depending from a patentable claim. EX. 2006 ¶¶ 92-93.

2. Claim 25

Claim 25 is patentable because it claims unique features not found in the LeFebvre and Barone combination, e.g., a software filter. As shown above, LeFebvre fails to disclose, teach, or suggest any type of filtering. *See supra* §IV.D.1. As also shown above, Barone fails to disclose, teach, or suggest a “software filter.” *See supra* §IV.A.2 (incorporated here by reference). Accordingly, Claim 25 is patentable.

3. Claim 28

Claim 28 is patentable because it claims unique features not found in the LeFebvre and Barone combination, e.g., a digital filter. As shown above, LeFebvre fails to disclose, teach, or suggest any type of filtering. *See supra* §IV.D.1. As also shown above, Barone fails to disclose, teach, or suggest a “digital filter.” *See supra* §§IV.A.2; IV.A.3 (incorporated here by reference). Accordingly, claim 28 is patentable.

4. Claim 30

Petitioner does not provide any analysis at all to support its assertion that claim 30 is unpatentable beyond a solitary cross reference to limitation 1(d); this is a fatal deficiency. *See* EX. 2006 at ¶¶94-95.

Regardless, the combination of LeFebvre and Barone fails to disclose, teach, or suggest limitation 30(c): “filtering, by one or more filters, at least a portion of the accelerations.” As with limitation 1(d), Petitioner’s reliance on LeFebvre is deficient because the “sampling” disclosed in LeFebvre is not filtering. *See supra* §IV.D.1 (incorporated here); *see also* EX. 2006 at ¶¶86-89. Similarly, Petitioner’s reliance on incorporating the electronic filters as taught by Barone is flawed because Barone and LeFebvre are unworkable in combination as set forth in detail above. *See, supra* §IV.D.1.

5. Claims 36 and 37

Petitioner does not provide any analysis at all to support its assertion that claim 36 is unpatentable beyond a solitary cross reference to limitation 1(d). This is a fatal deficiency. *See* EX. 2006 ¶¶76-80, 85-88.

Regardless, the combination of LeFebvre and Barone fails to disclose, teach, or suggest limitation 36(d): “one or more filters configured to filter at least a portion of the accelerations.” As with limitation 1(d), Petitioner’s reliance on LeFebvre is deficient because the power management and selective post-processing transmission

of data is not a filter (as required in limitation 36(d)). *See supra* §IV.D.1 (incorporated here by reference); *see also* EX. 2006 ¶¶86-89. Similarly, Petitioner's reliance on incorporating the electronic filters as taught by Barone is flawed because Barone and LeFebvre are unworkable in combination as set forth in detail above. *See, supra* §IV.D.1.

Claim 37 depends from independent claim 36 and is therefore patentable by virtue of depending from an otherwise allowable claim.

E. Ground Five: Petitioner has failed to show that Claims 24 and 37 are unpatentable under 35 U.S.C. § 103(a) over LeFebvre in view of Barone and Armitage.

1. Claim 24

Claim 24 depends from independent claim 1 and is patentable by virtue of depending from a patentable independent claim. *See supra* §§IV.A.1; IV.D.1 (both incorporated here); *see also* EX. 2006 ¶98.

2. Claim 37

Claim 37 depends from independent claim 36 and is patentable by virtue of depending from a patentable independent claim. *See supra* §§IV.A.1; IV.D.1 (incorporated here by reference); *see also* EX. 2006 ¶98.

F. Ground Six: Petitioner has failed to show that Claims 23 and 26 are unpatentable under 35 U.S.C. § 103(a) over LeFebvre in view of Barone and Winfree.

Claims 23 depends from independent claim 1 and is patentable by virtue of depending from a patentable independent claim. *See* §§ V.A.1; V.D.1, *supra* (incorporated here by reference); *see also* EX. 2006 ¶¶101-102.

V. CONCLUSION

For the reasons described above, the Board should not find that any claim is unpatentable.

Respectfully submitted,

Dated: November 3, 2023

By: / Jeff E. Schwartz /
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CERTIFICATION

Patent Owner's Response, excluding the caption, Table of Contents, Table of Authorities, Table of Exhibits, and this Certification contains 8,484 words as measured by the word processing software used to prepare the document, in compliance with 37 C.F.R. § 42.24(d).

Respectfully submitted,

Dated: November 3, 2023

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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. §42.6(e), I certify that on this 3rd day of November, 2023, a copy of PATENT OWNER'S RESPONSE under 37 C.F.R. §42.107 was served by electronic mail on Petitioner's counsel, lead and back-up, as follows:

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