

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 IPR2023-00539

Patent No. 9,981,673

PATENT OWNER'S REVISED MOTION TO AMEND

Submitted Electronically via P-TACTS

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Ex #	Exhibit Description
2001	Expert Declaration of Dr. Michael Shamos in support of Patent Owner’s Preliminary Response
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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) (“District Court Claim Construction Chart”)
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2155	Boomerang_Fall21_InfoSheet
2156	Hum Company Overview_Feb21
2157	Exhibit 15 to Declaration of Ryan Miller ISO Opposition to Motion to Stay Pending IPR - Hum's Preliminary Counter-Infringement Contentions dated December 9, 2022

2158	Expert Declaration of Dr. Michael Shamos in support of Patent Owner's Motion to Amend
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2160	Declaration of Andrew Martin REDACTED Public version of Exhibit 2013
2161	Expert Declaration of Dr. Michael Shamos in support of Patent Owner's Response REDACTED Public version of Exhibit 2010
2162	Redlined Corrected Patent Owner's Response
2163	Expert Declaration of Dr. Michael Shamos in support of Patent Owner's Revised Motion to Amend

I. INTRODUCTION

Patent Owner, Amsted Rail Company, Inc. (“PO”), respectfully submits this Revised Motion to Amend (“RMTA”) as authorized by Board in its Scheduling Order, Paper 11 at 4-6, contingent upon a finding of unpatentability with respect to the original challenged claims 1-18 and 20-22 (the “Challenged Claims”) of U.S. Patent No. 9,981,673 (the “’673 Patent”) (EX1001). The Board issued Preliminary Guidance (“PG”) (Paper 29) on PO’s initial Motion to Amend (“MTA”) (Paper 17) on January 26, 2024. This RMTA in response to the Board’s PG¹.

PO attaches the proposed substitute claims as Appendix A. PO proposes to substitute claims 1-18 and 20-22 with claims 23 through 43, respectively. Substitute claims 23 through 43 include additional limitations not found in the prior art. The substitute claims are presented on a contingent basis in the event the Board finds that the original claims are unpatentable.

As this motion and the Declaration of Michael Ian Shamos, PhD in support of Patent Owner’s Revised Motion to Amend (EX2163) ¶¶20-59 demonstrate, the substitute claims meet the requirements of 35 U.S.C. §316(d) and 37 C.F.R. §42.121. Each amendment is responsive to a ground of unpatentability raised in this proceeding; none of the amendments seek to enlarge the scope of the claims or to

¹ Pursuant to the Board’s February 7, 2024 email, this RMTA has a 35 page limit.

introduce new subject matter; the amendment proposes a reasonable number of substitute claims; and the motion shows the changes that are sought and the support in the original disclosure of the patent for each substitute claim.

Although the burden of persuasion with regard to the patentability of the substitute claims is on Petitioner, *see Aqua Prods. v. Matal*, 872 F.3d 1290, 1296 (Fed. Cir. 2017) (*en banc*); *Bosch Automotive Serv. Solutions LLC v. Matal*, 878 F.3d 1027, 1040 (Fed. Cir. 2017), this motion and EX2163 demonstrate that PO has met its burden to produce evidence showing the substitute claims are patentable over the references of record.

II. STATEMENT OF RELIEF REQUESTED

PO hereby moves to amend the '673 Patent contingent upon whether the Challenged Claims are found unpatentable in the present IPR proceeding. *See* 37 C.F.R. §42.121. If all Challenged Claims are found to be unpatentable, Patent Owner requests the Board order the following:

- The replacement of independent claim 1 with substitute claim 23;
- The replacement of dependent claims 2-9 and 13 with substitute claims 24-32;
- The replacement of independent claim 10 with substitute claim 33;
- The replacement of dependent claims 11-12 with substitute claims 34-35;
- The replacement of independent claim 14 with substitute claim 36;
- The replacement of dependent claims 15-18 with substitute claims 37-40;

- The replacement of dependent claim 20 with substitute claim 41;
- The replacement of independent claim 21 with substitute claim 42; and
- The replacement of dependent claim 22 with substitute claim 43.

If any Challenged Claim is found to be patentable, PO requests that the Board not substitute for any such claim, but order substitution of any of claims 1-18 or 20-22 found to be unpatentable. No other changes are proposed. *See* 37 C.F.R. §42.22(a)(1); 35 U.S.C. §316(d).

III. ALL THE REQUIREMENTS OF 37 C.F.R. § 42.121 ARE MET

While PO must establish that the RMTA complies with applicable statutory and regulatory requirements, the burden to persuade the Board that the substitute claims are unpatentable falls only on Petitioner. *See* 35 U.S.C. §316(e); *Aqua Prods. Inc.*, 872 F.3d 1290, 1315; *Lectrosonics, Inc. v. Zaxcom, Inc.*, IPR2018-01129, Paper 15 at 4-5 (PTAB Feb. 25, 2019) (precedential).

A. Reasonable Number of Substitute Claims

The Board found that the MTA proposed a reasonable number of claims. *See* Paper 29 at 3. Petitioner did not challenge the number of claims in its Opposition. This RMTA proposes the same number of claims.

B. The Proposed Claims Are Responsive to the Instituted Grounds

The Board found that the MTA responded to the grounds of unpatentability. *See* Paper 29 at 4. Petitioner did not challenge this requirement in its Opposition.

This RMTA responds to the same grounds of unpatentability. *See* §IV, *supra*. (incorporated here).

C. The Proposed Claims Do Not Enlarge Claim Scope

The Board found that the MTA did not seek to enlarge claim scope. *See* Paper 29 at 4. Petitioner did not challenge this requirement in its Opposition. The amendments presented in this RMTA do not broaden the issued claims and thus do not enlarge claim scope.

IV. THE SUBSTITUTE CLAIMS DO NOT INTRODUCE NEW MATTER

The originally filed disclosure of the '673 Patent supports each proposed substitute claim. *See* 37 C.F.R. §42.121 (b)(1)-(2). The '673 patent claims the benefit of U.S. App. No. 13/842,427, filed on March 15, 2013 (“the '427 Application”), and claims priority to U.S. Provisional App. No. 61/661,661, filed on June 19, 2012 (“the '661 Prov. Application”). *See* EX1001 at 1; EX1013.

PO first notes that its burden under Rule 121(d)(1) is merely to show the motion complies with the requirements of that rule. PO only “bears a ***burden of production***” in this RMTA. *Aqua Prod.*, 872 F.3d at 1340-41 (en banc).² PO’s burden ***is not*** and ***can never be*** to persuade the Board that the substitute claims are

² Unless noted otherwise, all emphasis is added.

patentable under any statutory requirement, including §112.³ *See id.* at 1325 (“[T]he burden of proving the unpatentability of all claims in an IPR—both original and amended—is on the petitioner.”); *Bosch*, 878 F.3d at 1040 (“petitioner bears the burden of proving that the proposed amended claims are unpatentable” for all “questions of patentability”); *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1375 (Fed. Cir. 2016) (“that burden never shifts to the patentee”). Petitioner carries the burden of persuasion on **any** question of patentability, whether raised by Petitioner or Board. *See* 35 U.S.C. §316(e) (“In an [IPR,] petitioner shall have the burden of proving a proposition of unpatentability.”).

While PO has no statutory burden to meet them, the standards for showing that a patent claim meets the requirements of §112 are well established. “[T]he test for sufficiency is whether the disclosure of the application relied upon reasonably conveys to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date.” *Ariad Pharms., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010) (en banc). This inquiry is a question of fact and “the

³ To the extent Petitioner or Board seek to impose **any** burden of persuasion regarding patentability on PO based on the text of Rule 42.121(d)(1), that assertion conflicts with the unambiguous text of 35 U.S.C. 316(e) and with established Federal Circuit precedent, cited *supra*.

level of detail required to satisfy the written description requirement varies depending on the nature and scope of the claims and on the complexity and predictability of the relevant technology.” *Id.*

To the extent Petitioner raises any arguments regarding compliance with §112, PO reserves the right to respond to them in its Reply.

A. Claim 23 (Substitute for claim 1, if found unpatentable)

Claim Limitation	Support
23 Preamble	EX1001 at 1:16-22; 2:15-22, 26-60; 3:56-67 (“a novel means for monitoring the performance and operation of a railcar is provided.”); EX1013 at ¶1.
23 a.	EX1001 at 2:50-60; 3:56-62 (“In broad terms, a novel means for monitoring the performance and operation of a railcar is provided. This includes a system for monitoring the railcar and sensors mounted on the railcars for use with the system.... The sensors monitor and/or collect data on particular parameters and conditions of the railcar.”); Fig. 3; 4:48-56 (“As one of ordinary skill would recognize, the configuration of the motes 10 with respect to the sensor 20 is dependent upon the type of sensor and the type of data desired . Sensor 20 can be any type of sensor , including... a vibration sensor, an accelerometer... ”); 5:10-18; 5:23-35; 5:42-59 (“The individual motes 10 are mounted on the areas of interest on a railcar 38. As an example , FIGS. 3 and 3A show a temperature sensing mote ... mounted to a bearing adapter.”); 8:16-19; Table spanning cols. 7-12, specifically col. 9 “ adapter mounted accelerometer ”); 15:55-60 (“Various embodiments of the invention have been described in the context of various examples, however, the invention is not meant to be limited in any way . As one of skill in the art recognizes there may be many implementations that are within the scope of the invention....”); EX1013 at ¶¶109-119, specifically ¶109 (“... many different types of sensors could be utilized by the mote,

	for example,... <i>acceleration</i> , etc. [T]he invention is <i>not meant to be limited by the exemplary implementation.</i> "); ¶115 ("The self-contained units are mounted on the areas of interest on a railcar. As an example, Figure 9 shows a temperature sensing unit mounted to a bearing adapter to measure the temperature of a wheel bearing of a railcar."); FIGs. 9, 10a
23 b.	EX1001 at 2:66-3:1 ("heuristics may be applied to determine potential failures based on statistical models and empirical data..."); 8:14-19; Table spanning cols. 7-12. (in particular "Bearing Temp: Adapter temperature is correlated to bearing cup temperature using empirical data."; "Bearing Fault Indicator: An adapter mounted accelerometer can be used to sample dynamic bearing data. An FFT can be used on data sets and plotted over time to isolate dominant modes and any shifting or relative amplification. Amplification at rolling frequency indicates a likely fault."; "Bearing Fault: An adapter mounted accelerometer can be used to sample dynamic bearing data. Kurtosis can be computed as an indicator of bearing damage. Kurtosis is measured in the time domain and requires computation of a probability density function."; 11:51-58 ("Data collected from motes 10 may be sent to base station 44 for analysis and further action. The heuristics shown in the chart above may be performed by either mobile base station 42 or land-based base station 44."); 12:48-65; EX1013 at ¶¶64-76; 129-131; <i>see also</i> Claim 23 step a, <i>supra</i> .
23 c.	EX1001 at 11:59-12:65 ("alert messages are selected such that only actionable messages are sent to the locomotive 46, meaning that only those alarm <i>levels</i> that require the crew to take action are typically transmitted to the locomotive crew. For example, speed restrictions can be placed on the operation of the train at <i>tiered alarm levels</i> so that the train would be allowed to proceed to a siding or other appropriate stoppage point, allowing other traffic to continue on the mainline without inordinate delays or costs"); 13:30-14:3; <i>see also</i> Table spanning cols. 7-12; Claim 23 step b, <i>supra</i> (incorporated here); EX1013 at ¶¶121-122
23 d.	EX1001 at 3:15-20; 3:56-67 ("If a problem is detected, alarms can be forwarded for further action."); 11:59-14:3, in particular

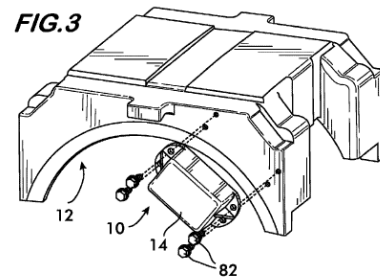
	11:65-12:47 (“Each type of alert is accompanied by a recommended practice that the locomotive driver should take when an alert appears.... The action required to be taken by the locomotive driver varies based on the severity of the alert.”); 12:48-61 (“As such, alert messages are selected such that only actionable messages are sent to the locomotive 46, meaning that only those alarm levels that require the crew to take action are typically transmitted to the locomotive crew. In addition, rather than requiring the train to be stopped on the mainline, some alerts could be addressed by putting operating restrictions in place. For example, speed restrictions can be placed on the operation of the train at tiered alarm levels so that the train would be allowed to proceed to a siding or other appropriate stoppage point, allowing other traffic to continue on the mainline without inordinate delays or costs.”); 13:31-14:3 (“These are examples of various levels of alarms, based on severity, and the appropriate response.”); EX1013 at ¶¶121-122.
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1. **“sensing units... mounted on a sidewall of a bearing adapter”**

Except for “mounted on a sidewall”, none of the terms identified by Petitioner in its Opposition are present, in their same form, in revised claim 23; thus all of Petitioner’s arguments regarding compliance with §112 in the Opposition are moot. Petitioner did not challenge written description support for the unamended elements of claim 23. Support for these claim limitations is present in the specification of both the ’673 patent and the ’661 Provisional, to which it claims priority. *See* EX1001 at 3:56-62; Fig. 3; 4:48-56; 5:23-35; 5:42-59; Table spanning cols. 7-12; 15:55-60; EX1013 at ¶¶109-119; FIGs. 9, 10a.

Regarding a sensing unit “mounted on a sidewall of a bearing adapter,” FIG.

3 (reproduced right) discloses a mote **10** mounted to the sidewall of a bearing adapter. See EX2163, ¶21-22; *Vas-Cath Inc. v. Mahurkar*, 935 F.2d 1555, 1566 (Fed. Cir. 1991) (drawings can provide independent



written description support for claimed elements); *Cooper Cameron Corp. v. Kvaerner Oilfield Prod., Inc.*, 291 F.3d 1317, 1322 (Fed. Cir. 2002) (“Drawings constitute an adequate description if they describe what is claimed and convey to those of skill in the art that the patentee actually invented what is claimed.”).

2. **“wherein the heuristic correlates one or more numeric values derived from the data or processed information to the condition of the bearing”**

As noted above, there can be no serious dispute that the specification describes a system that monitors the condition of a bearing at a bearing adapter to identify and predict various operational characteristics of the bearing. See §IV.A.1, *supra* (incorporated here). Generally speaking, the specification is clear that the described motes “can include a sensor, a power source, circuitry to read the sensor and convert the readings to a digital form” and describes the circuitry that may be included to accomplish this conversion. EX1001 at 2:50-60; 5:10-18. More specifically, a table of example heuristics that spans columns 7-12 provides a POSITA with ample disclosure to understand the “one or more numeric values” can be “derived from the data or processed information.” See EX2163, ¶23. For example, the example

heuristic provided above uses a fast-Fourier transform (“FFT”), a frequency domain technique, to generate an array of numeric values. *Id.* Another example heuristic computes kurtosis, a time domain technique typically used along with a probability density function, as an indicator of bearing condition. *Id.* These are expressly disclosed as “examples” and the inventors explained that, while “embodiments of the invention have been described in the context of various examples,... the invention is not meant to be limited in any way,” except as limited by the claims. EX1001 at 8:16-19; 15:55-57. Thus, POSITA would “recognize[] there may be many implementations” of numeric values derived from the data or processed information “that are within the scope of the invention....” *Id.* at 15:57-60.

3. **“said severity level is one of a plurality of defined severity levels that are each assignable based on respective possible values for a magnitude of the deviations of at the one or more numeric values from nominal operating conditions for the bearing during operation of the railcar”**

The specification explicitly describes the “severity levels” as “tiered alarm levels.” EX1001 at 12:57-58. The specification also states that “[t]he action required to be taken by the locomotive driver varies based on the severity of the” detected condition. *Id.* at 12:44-47. Among the heuristics identified in the Table spanning columns 7-12 is a “Bearing Fault Indicator” which is explicitly described as measuring “relative amplification.” A POSITA would understand from this

disclosure that a severity level for such a bearing fault indicator would necessarily be based on “a magnitude of the deviation[] of one or more numeric values from nominal operating conditions for the bearing during operation of the railcar.” EX2163, ¶24.

4. **“wherein the operational characteristic is a condition of a bearing proximate to the bearing adapter”**

The specification generally describes “a real-time monitoring and analysis system for railcars” which “gathers data regarding various operating parameters and conditions from remote sensors....” EX1001 at 1:16-19; 2:15-22, 26-60; 3:56-67. Petitioner did not challenge this support for these elements. In addition to the temperature sensor embodiment Petitioner acknowledges, for example, the specification unambiguously describes a condition of a bearing as an operational characteristic that is monitored using accelerometers at a bearing adapter. *See* Table at col. 9 (reproduced at right); EX2163, ¶25.

Parameter Sensed	Sensor Type	Output	Heuristic
Adapter Acc.	Accelerometer	Bearing Fault Indicator	An adapter mounted accelerometer can be used to sample dynamic bearing data. An FFT can be used on data sets and plotted over time to isolate dominant modes and any shifting or relative amplification. Amplification at rolling frequency indicates a likely fault.
Adapter Acc.	Accelerometer	Bearing Fault	An adapter mounted accelerometer can be used to sample dynamic bearing data. Kurtosis can be computed as an indicator of bearing damage. Kurtosis is measured in the time domain and requires computation of a probability density function.

B. **Claim 24 (Substitute for claim 13, if found unpatentable)**

Claim Limitation	Support
24	EX1001 at 3:9-14 (“The analysis of the data collected can be carried out at any of the different event engines distributed

	among the various components in the present invention, including the sensor units, CMU, and mobile or land base stations.”); EX1013 at ¶¶117-118.
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C. Claim 25 (Substitute for claim 2, if found unpatentable)

Claim Limitation	Support
25	EX1001 at 2:61-64; EX1013 at ¶117.

D. Claim 26 (Substitute for claim 3, if found unpatentable)

Claim Limitation	Support
26	EX1001 at 5:24-28; EX1013 at ¶117.

E. Claim 27 (Substitute for claim 4, if found unpatentable)

Claim Limitation	Support
27	EX1001 at 2:61-64; 8:14-17; 14:10-15:45; 15:57-60; EX1013 at ¶¶117-118; <i>see also</i> §IV.A, <i>supra</i> ; §IV.H, <i>infra</i> (both incorporated here)

1. “one or more numeric values based on data obtained by an accelerometer in said sensing unit at the bearing adapter”

As noted above, there can be no serious dispute that the specification describes a system that monitors vibrations at a bearing adapter to identify and predict various operational characteristics of the bearing. *See* §IV.A, *supra*; §IV.H, *infra* (both incorporated here). A POSITA would “recognize[] there may be many implementations that are within the scope of the invention” as recited in the claims. *Id.* at 15:57-60.

The specification also mentions a number of other operations which have wide applicability in distributed sensor signal processing, such as average and standard deviation. *See, e.g.*, EX1001 at 14:10-15:45; EX2163, ¶26. A POSITA would immediately understand that a number of standard techniques known in the field could be applied to the data that can be used in a heuristic. *See* EX2163, ¶26. These include, for example, time domain parameters such as RMS, peak, crest factor, clearance factor, impulse factor, and shape factor, just to name a few. *Id.* Any of these techniques would have been known to a POSITA at the time of the invention and can be used to generate “one or more numeric values based on data obtained by an accelerometer in said sensing unit at the bearing adapter.” *Id.*

F. Claim 28 (Substitute for claim 5, if found unpatentable)

Claim Limitation	Support
28	EX1001 at 5:24-28; EX1013 at ¶116.

G. Claim 29 (Substitute for claim 6, if found unpatentable)

Claim Limitation	Support
29	EX1001 at 11:40-44; EX1013 at ¶¶118-119.

H. Claim 30 (Substitute for claim 7, if found unpatentable)

Claim Limitation	Support
30	EX1001 at 2:50-60; 3:4-14; 3:56-62; Fig. 3; 4:48-56 (“As one of ordinary skill would recognize, the <i>configuration of the notes 10</i> with respect to the sensor 20 <i>is dependent upon the</i>

	<i>type of sensor and the type of data desired</i> . Sensor 20 can be <i>any type of sensor</i> , including... <i>a vibration sensor, an accelerometer...</i> ”); 5:10-18; 5:23-35; 5:42-59; 8:3-13; 8:16-19; 11:40-58; Table spanning cols. 7-12, specifically col. 9 “ <i>adapter mounted accelerometer</i> ”); 15:55-60; EX1013 at ¶¶109-121; specifically ¶109 (“... many different types of sensors could be utilized by the mote, for example,... <i>acceleration</i> , etc. [T]he invention is <i>not meant to be limited by the exemplary implementation</i> .”); Figs. 9, 10a, 11. <i>See</i> §IV.A, <i>supra</i> . (incorporated here)
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1. **“performing steps b-d at said location remote from said railcar”**

Petitioner argued in its Opposition that “performing steps b-d at said location remote from said railcar” is not disclosed in the specification because there is no embodiment in which steps b-d are performed at a remote location. Paper 25 at 6. Yet the specification explicitly notes that “[d]ata collected from motes 10 may be sent to [land-based] base station 44 for analysis and further action” and that “heuristics shown in the chart above may be performed by... land-based base station 44.” EX1001 at 11:51-54. This is not “boilerplate language” but an explicit recitation that *any* of the analysis disclosed in the specification can be performed at a location remote from the railcar. *See* EX2163, ¶27.

2. **“one or more sensing units includes one or more numeric values based on data obtained by an accelerometer in said sensing unit at the bearing adapter”**

Petitioner also argued in its Opposition that “one or more sensing units” having an accelerometer and “mounted on a sidewall of the bearing adapter” is not

disclosed in the specification. *See* Paper 25 at 3; *see also* Paper 29 at 5 (Board agreeing that PO “has not explained” how the specification “provides a description” of this element). Sensing units mounted on a sidewall of the bearing adapter are fully described. *See* §IV.A, *supra*; §IV.E, *supra* (both incorporated here). The specification, into which EX1013 is incorporated by reference, provides unambiguous support for the claimed sensing unit (referred to as a “mote”), including one with an accelerometer. *See* EX2163, ¶¶28-29. The specification states that a POSITA “would recognize [that] the configuration of the motes 10 with respect to the sensor 20 is dependent upon the type of sensor... desired” and that “[s]ensor 20 *can be any type of sensor*, including... *a vibration sensor* [or] *an accelerometer*.” EX1001 at 4:48-56. The specification also unambiguously states that “many different types of sensors could be utilized by the mote, for example,... *acceleration*” and that “the invention is *not meant to be limited by the exemplary implementation*.” EX1013 at ¶109 (incorporated by reference at EX1001 at 1:6-12); *see* EX1001 at 15:55-60 (notwithstanding the descriptions of specific embodiments “the invention is not meant to be limited in any way” and a POSITA “recognizes there may be many implementations that are within the scope of the invention” as recited in the claims).

The disclosure of FIG. 3 does not in any way indicate to a POSITA that the mote **10** is only a temperature sensor. EX2163, ¶21, 29. The specification

unambiguously states that the sensor “*can be any type of sensor*” and expressly describes “[a]n *adapter mounted accelerometer*.” EX1001 at 4:51-52; Table col. 9. The linkage between the broad disclosure the type of sensors that can be used with the non-limiting disclosure of FIG. 3 provides adequate support for a mote, including one with an accelerometer, mounted to a sidewall of the bearing adapter as shown. *See* EX2163, ¶¶25, 29; *Cooper Cameron Corp.*, 291 F.3d at 1322 (“the invention shown in the drawing is the invention claimed” even though “the specification also describes an arrangement that may be claimed in another way”).

I. Claim 31 (Substitute for claim 8, if found unpatentable)

Claim Limitation	Support
31	<i>See</i> §IV.A <i>supra</i> (incorporated by reference here)

J. Claim 32 (Substitute for claim 9, if found unpatentable)

Claim Limitation	Support
32	EX1001 at 13:31-32; 11:59-12:40; EX1013 at ¶121.

K. Claim 33 (Substitute for claim 10, if found unpatentable)

Claim Limitation	Support
33 preamble	EX1001 at 3:56-57 (“a novel means for monitoring the performance and operation of a railcar is provided.”); EX1013 at ¶68.
33 a	EX1001 at 4:35-48 (“FIGS. 1 and 2 show a temperature sensor 20 a, which is thermally coupled to heat transfer element 22. ... In this embodiment, the mote 10 will be mounted to place the brass plug 22 in thermal communication with the portion

	of the railcar for which a temperature reading is desired.”); 5:42-53; EX1013 at ¶¶110-112; <i>see also</i> §IV.A, <i>supra</i> (incorporated here)
33 b	EX1001 at 5:59-6:4 (“the device is calibrated so that the temperature reading is indicative of the bearing temperature. This calibration takes into account the temperature of the bearing adapter at the point measured (see FIG. 3a), the ambient temperature as measured by the second temperature sensor mote mounted elsewhere on the rail car so as to sense ambient temperature (see FIG. 4), and information about the type of bearing adapter (different models have different sizes and configurations).”); EX1013 at ¶116, FIGs. 9, 10a; <i>see also</i> §IV.A, <i>supra</i> (incorporated here)
33 c	EX1001 at 4:64-65; 5:10-22; 6:15-18; 6:51-54; Table spanning cols. 7-12; 11:51-58; 13:5-21; 13:30-14:58; EX1013 at ¶¶64-76, 116; <i>see also</i> §IV.A, <i>supra</i> (incorporated here)
33 d	EX1001 at 11:59-64 (“When an alert is detected, it is preferably sent to a display unit in the locomotive 46 or at the land-based base station 44.”); EX1013 at ¶¶118-119; <i>see also</i> §IV.A, <i>supra</i> (incorporated here)

1. “acceptable range of temperatures”

It has long been held that “exact terms appearing in the claim need not be used *in haec verba*” when “the figures of the patent, the specification, and the claim language” provide sufficient context to allow a POSITA to find the claimed invention properly supported. *Blue Calypso, LLC v. Groupon, Inc.*, 815 F.3d 1331, 1345-46 (Fed. Cir. 2016). Here, limitation 33(c) defines an “acceptable range of temperatures” as “a defined range of temperatures expected during normal operation of the railcar.” Initially, originally filed claim 47 of Serial No. 13/842,427 provides literal support for “determining if said temperature of the desired part is outside an

acceptable range of temperatures.” EX2004 at 36; EX2163, ¶30. And the specification broadly references temperature thresholds when discussing alerts and alarms. *See* EX1001 at 5:10-22, 6:15-18, 6:51-54, 13:49-51 (“a temperature a predetermined amount above ambient”); 14:1-2 (“a predetermined bearing temperature”). Further, the specification discusses “alarm thresholds” and “tiered alarm levels” that indicate ranges of acceptable and unacceptable levels. *See id.* at 12:49-65. This disclosure demonstrates to a POSITA that the inventors had possession of the claimed invention and would be enabled to make and use the invention with ordinary skill in the art. EX2163, ¶31.

L. Claim 34 (Substitute for claim 11, if found unpatentable)

Claim Limitation	Support
34	EX1001 at 5:53-58; EX1013 at ¶¶116-117.

M. Claim 35 (Substitute for claim 12, if found unpatentable)

Claim Limitation	Support
35	EX1001 at 2:61-64; 8:14-17; EX1013 at ¶¶118-119.

N. Claim 36 (Substitute for claim 14, if found unpatentable)

Claim Limitation	Support
36	EX1001 at 2:61-3:3 (“The CMU is capable of wirelessly collecting data from each of the motes and performing higher-level analysis of the data to detect imminent or actual failures. ... The CMU is also capable of communicating both the data and the results of any analysis to a receiver remote from the

	railcar.”); 3:56-57 (“a novel means for monitoring the performance and operation of a railcar is provided.”); EX1013 at ¶¶1, 118-119.
36 a	EX1001 at 5:23-42, Fig. 3, Table spanning cols. 7-12 (“An adapter mounted accelerometer can be used to sample dynamic bearing data.”); EX1013 at ¶¶44-45, FIGs. 9, 10a; <i>see also</i> §IV.A, <i>supra</i> (incorporated here)
36 b(i)	EX1001 at Table spanning cols. 7-12 (“An FFT can be used on data sets and plotted over time to isolate dominant modes and any shifting or relative amplification. Amplification at rolling frequency indicates a likely fault.” ... “Kurtosis can be computed as an indicator of bearing damage. Kurtosis is measured in the time domain and requires computation of a probability density function.”); 11:51-58; EX1013 at ¶¶64-76; 129-131; <i>see also</i> §IV.A, <i>supra</i> (incorporated here)
36 b(ii)	EX1001 at 1:16-21; 2:3-22; 2:59-3:3 (“The CMU is capable of wirelessly collecting data from each of the motes and performing higher-level analysis of the data to detect imminent or actual failures.”); 3:15-20 (It is therefore an objective of this invention to provide a comprehensive system which allows the wireless collections of data and the analysis of that data to predict operational failures and to provide adequate warning of those failures to allow for human intervention before a catastrophic failure occurs.”) ; 3:56-64; 11:54-56 (“In addition, either station 42, 44 may utilize train-wide heuristics to predict train-wide failures, or to spot train-wide trends...”); 12:61-65 (“Low level (Level 1/Stage 1) alerts, however, can still be monitored at base station 44 to make determinations about repeat temperature offenders and/or trending events that would signify an impending problem, although not imminent.”); EX1013 at ¶¶129-130; <i>see also</i> Table spanning cols. 7-12; Claim 36 step b, <i>supra</i> (incorporated here)
<u>36 b(iii)</u>	EX1001 at 12:40-61; 13:31-14:3 (“These are examples of various levels of alarms, based on severity.”); EX1013 at ¶¶121-122; <i>see also</i> §IV.A, <i>supra</i> (incorporated here)

36 c	EX1001 at 11:59-14:3, in particular 12:40-47 (“The action required to be taken by the locomotive driver varies based on the severity of the alert.”); 13:31-14:3 (“These are examples of various levels of alarms, based on severity, and the appropriate response.”); EX1013 at ¶¶121-122; <i>see also</i> §IV.A, <i>supra</i> (incorporated here).
36 d	EX1001 at 11:59-64 (“When an alert is detected, it is preferably sent to a display unit in the locomotive 46 or at the land-based base station 44.”); EX1013 at ¶¶118-119.

1. **“one or more sensors disposed on a sidewall of a bearing adapter”**

See §IV.A.1, *supra* (incorporated here).

2. **“determine a condition of a bearing proximate to the bearing adapter based on correlations between the data and a plurality of possible values indicative of the condition of the bearing”**

As with the similar recitation in Claim 23 explained above, a table of example heuristics that spans columns 7-12 provides a POSITA with ample written description for the “correlations between the data and a plurality of possible values indicative of the condition of the bearing.” Specifically, the example heuristic shown in the image reproduced in §IV.A.1 uses a fast-Fourier transform (“FFT”), a frequency domain technique, to calculate an array of numeric values which are correlated with bearing faults (e.g. “any shifting or relative amplification”). *See* §IV.A.1, *supra* (incorporated here); EX1001, Table, Col. 9; EX2163, ¶¶25, 33. Another example heuristic computes kurtosis, a time domain technique typically

used along with a probability density function to calculate numeric values based on accelerometer data, as an indicator of bearing condition. *Id.*, ¶23. To function as indicators of bearing condition, a POSITA would understand that these calculated numeric values must necessarily be correlated with bearing condition to have any meaning as a heuristic. *Id.*, ¶33. These are expressly disclosed as “examples” and inventors explained that, while “embodiments of the invention have been described in the context of various examples,... the invention is not meant to be limited” by the description of those specific examples. EX1001 at 8:16-19; 15:55-57. A POSITA would “recognize[] there may be many implementations that are within the scope of the invention” as recited in the claims. *Id.* at 15:57-60. As with the “numeric values” limitation in Claim 23, a POSITA would immediately understand that a number of standard techniques known in the field could be applied to the data that can be used in a heuristic. *See* EX2163, ¶26; §IV.E, *supra* (incorporated here).

3. **“determine if an actual failure exists on said railcar or predict potential or imminent failures based on a statistical analysis of said received data”**

As noted above, the table of heuristics spanning cols. 7-12 of EX1001 explicitly discloses that FFT analysis can be used to determine “likely faults” and kurtosis analysis can be used “as an indicator of bearing damage.” EX1001 at p. 13. *See* EX2163, ¶¶23, 34; §IV.A, *supra*; §IV.H, *supra*; §IV.N.2, *supra* (all incorporated here).

O. Claim 37 (Substitute for claim 15, if found unpatentable)

Claim Limitation	Support for Substitute Claim 37
37	EX1001 at 2:50-3:3 (“In some instances, a mote may also have the capability to perform low-level analysis of the data to determine if an alarm needs to be raised, and the ability to communicate the alarm to an external receiver. ... The CMU is capable of wirelessly collecting data from each of the motes and ... communicating both the data and the results of any analysis to a receiver remote from the railcar.”); EX1013 at ¶¶117-119.

P. Claim 38 (Substitute for claim 16, if found unpatentable)

Claim Limitation	Support for Substitute Claim 38
38	EX1001 at 2:61-3:3 (“Each railcar also can be equipped with a communication management unit (CMU) which communicates with each of the motes deployed on the railcar. The CMU is capable of wirelessly collecting data from each of the motes and performing higher-level analysis of the data to detect imminent or actual failures.”) 8:14-20 (“CMU 32 is capable of performing advanced data analysis, using data collected from multiple motes 10, and may apply heuristics to draw conclusions based on the analysis.”); EX1013 at ¶¶118-119.

Q. Claim 39 (Substitute for claim 17, if found unpatentable)

Claim Limitation	Support for Substitute Claim 39
39	EX1001 at 5:36-42 (“Mote 10 also includes a long-term power source 34, preferably a military grade lithium-thionyl chloride battery. Daughter board 30 includes power conditioning and management circuitry and may include a feature to conserve battery life which keeps mote 10 in a standby state and periodically wakes mote 10 to deliver readings from sensor 20.”); EX1013 at ¶¶44-45.

R. Claim 40 (Substitute for claim 18, if found unpatentable)

Claim Limitation	Support for Substitute Claim 40
40	EX1001 at 5:23-35 (“The main board 28 also includes circuitry for wireless communications. Preferably, each mote 10 on a railcar is formed into an ad-hoc mesh network with other motes 10 on the same railcar. ... The ad-hoc mesh network is preferably formed using the Time Synchronized Mesh Protocol, a communications protocol for self organizing networks of wireless devices.”); EX1013 at ¶116.

S. Claim 41 (Substitute for claim 20, if found unpatentable)

Claim Limitation	Support for Substitute Claim 41
41	EX1001 at 2:3-16 (“The current systems, however, lack the ability to apply heuristics to act on data gathered from more than one sensor or to detect operational deviations or trends which show deviations from nominal operating parameters. ... Therefore, it would be desirable to have a system which addresses these current deficiencies.”); 8:7-19 (“CMU 32 is preferably a single unit that would ... have its own circuitry, CPUs, processors, memory, power source, etc. ... CMU 32 is capable of performing advanced data analysis, using data collected from multiple motes 10, and may apply heuristics to draw conclusions based on the analysis.”); EX1013 at ¶¶128-131.

T. Claim 42 (Substitute for claim 21, if found unpatentable)

Claim Limitation	Support for Substitute Claim 43
42 preamble	EX1001 at 3:56-57 (“a novel means for monitoring the performance and operation of a railcar is provided.”); EX1013 at ¶1.

42 a	EX1001 at Table spanning cols. 7-12 (multiple references to “sampled data”); 14:11-14 (“The Level 2 algorithms use temperature data that had been collected every minute while the railcar had been moving during a period of days directly preceding this analysis.”); 14:60-62 (“The Level [3] algorithms use temperature data that has been collected every minute while the railcar is moving for the previous 30 days directly preceding this analysis.”); Fig. 3; EX1013 at ¶¶44-45, 70, 97, 130, 131, FIGs. 9, 10a.
42 b	EX1001 at 7:14-18, 8:1-6 (“To communicate data collected by the motes 10, each mote is in two-way communication with a CMU 32 mounted on the railcar 38, which collects data from each mote.”); EX1013 at ¶¶116-117.
42 c	EX1001 at 1:16-21; 2:15-22; 2:59-3:3; 3:56-64, specifically, 2:61-3:1 (“The CMU is capable of wirelessly collecting data from each of the motes and performing higher-level analysis of the data to detect imminent or actual failures. During such data analysis, heuristics may be applied to determine potential failures based on statistical models and empirical data.”); EX1013 at ¶¶118-119.
42 d	EX1001 at Table spanning cols. 7-12.; 11:51-58; EX1013 at ¶¶64-76.; <i>see also</i> §IV.A (Claim 23 step b), <i>supra</i> (incorporated here)
42 e	EX1001 at 2:3-16 (“The current systems, however, lack the ability to apply heuristics to act on data gathered from more than one sensor or to detect operational deviations or trends which show deviations from nominal operating parameters... Therefore, it would be desirable to have a system which addresses these current deficiencies.”); EX1013 at ¶¶118-122; <i>see also</i> §IV.A (Claim 23 step c), <i>supra</i> (incorporated here)

1. **“one or more sensor units provided on a sidewall of a bearing adapter”**

See §IV.A, *supra*; §IV.H, *supra* (both incorporated here).

U. Claim 43 (Substitute for claim 22, if found unpatentable)

Claim Limitation	Support for Substitute Claim 43
43	EX1001 at 5:15-22 (“Main board 28 may also include intelligence sufficient to perform low-level analysis of the data, and may accept parameters from outside sources regarding when alarms should be raised. For example, for the mote 10 shown in FIGS. 1 and 2, with a temperature sensor 20, may be programmed to raise an alarm when the sensed temperature exceeds a certain threshold for several consecutive readings.... Preferably, each mote 10 on a railcar is formed into an ad-hoc mesh network with other motes 10 on the same railcar and with a Communication Management Unit (CMU) 32”); EX1013 at ¶¶117-119.

“includes one or more numeric values based on data obtained at the bearing adapter”

See §IV.E, *supra*; §IV.H, *supra*; §IV.N.2, *supra* (both incorporated here).

V. SUBSTITUTE CLAIMS 23 THROUGH 43 ARE PATENT-ELIGIBLE

An invention is patent-eligible if it claims a “new and useful process, machine, manufacture, or composition of matter.” 35 U.S.C. § 101. There is no question that the revised substitute claims fall within the scope of statutory subject matter under §101 as they are directed to a process, or a series of steps or acts, for use with a rail car sensor network and monitoring system. The PG does not challenge this. This broad definition of patent eligible subject matter includes three judicially imposed exceptions: “[l]aws of nature, natural phenomena, and abstract ideas.” *See Alice Corp. v. CLS Bank Int’l*, 573 U.S. 208, 216 (2014). The *Alice* Court set out a two-

part framework, known as the *Mayo-Alice* test. *Id.* at 217–18 (citing *Mayo Collaborative Servs. v. Prometheus Labs., Inc.*, 566 U.S. 66, 75–77 (2012)). *Mayo-Alice* first requires the Board to consider what concept the claim is “directed to.” *Alice*, 573 U.S. at 219. Only if the claim is “directed to” an abstract idea, the analysis turns to the second part of *Mayo-Alice*, where the Board “must examine the elements of the claim to determine whether it contains an ‘inventive concept’ sufficient to ‘transform’ the claimed abstract idea into a patent-eligible application.” *Alice*, 573 U.S. at 221 (cleaned up).

In January 2019, the U.S. Patent and Trademark Office (“USPTO”) published revised guidance on the application of § 101. 2019 Revised Patent Subject Matter Eligibility Guidance, 84 Fed. Reg. 50 (Jan. 7, 2019) (“Guidance”). Under this Guidance, the Board first looks to whether the claim recites (1) any judicial exceptions, including certain groupings of abstract ideas (i.e., mathematical concepts, certain methods of organizing human activity such as a fundamental economic practice, or mental processes) (referred to in the Guidance as Step 2A); and (2) additional elements that integrate the judicial exception into a practical application (Step 2B). Guidance at 52–55.

The Board preliminarily found, under Step 2A, the substitute claims of the MTA to be directed to “mathematical concepts” and thus recited a judicially excluded “abstract idea.” *See* Paper 29 at 18. The Board also preliminarily found

that the limitations in the substitute claims were insufficient for patent eligibility under Step 2B. *Id.* PO disagrees. First, this RMTA submits revised substitute claims that have different elements, and which render the analysis of the prior substitute claims moot. Second, the claims are not merely directed to abstract mathematical concepts but include specific limitations that transform the claim into a concrete method that improves the operation and effectiveness of the railcar monitoring system. Third, even if the claims were found to be directed to an abstract idea, the claims include ample limitations that integrate that idea into a concrete, specific application of those concepts “to a new and useful end” that is “eligible for patent protection.” *Alice*, 573 U.S. at 217.

A. The Claims Are Not Directed to Mathematical Concepts

The substitute claims, taken as a whole, are directed to a practical application of using sensing units to monitor operational characteristics of a railcar, determining deviations from expected operating conditions, and assigning severity levels based on the deviations. When viewed as a whole, the eligibility is self-evident. Regarding Step 2A, the *Alice* Court warned that “[a]t some level, all inventions embody, use, reflect, rest upon, or apply laws of nature, natural phenomena, or abstract ideas,” and has cautioned “to tread carefully in construing this exclusionary principle lest it swallow all of patent law.” *Id.* Step 2A “cannot simply ask whether the claims *involve* a patent-ineligible concept” but rather asks whether, “in light of the

specification,... their character *as a whole* is directed to excluded subject matter.”
Enfish, LLC v. Microsoft Corp., 822 F.3d 1327, 1335 (Fed. Cir. 2016).

Unlike the cases cited in the PG, the revised substitute claims are directed to a specific improvement in the field of railcar monitoring, specifically the detection and prediction of operational deficiencies and the determination of a severity of those operational deficiencies for raising alarms “to facilitate human intervention.” EX1001 at 2:18-22. Contrary to the Board’s assertion on page 18 of the PG, the claims have ample “technical implementation details.” The substitute claims recite sensing units that are attached at specific locations (the “sidewall of a bearing adapter”) to monitor specific operational characteristics of the rail car (“a condition of a bearing proximate to the bearing adapter”) and to make determinations about the condition of a bearing based on the monitored characteristics (“applying” and “assigning” steps) which lead to a new and useful end (“a specific action to be taken with regard to the bearing”). Thus, the claims are rooted in the technological field of imbedded sensor networks and monitoring systems and the claims solve a specific problem central to that field: identifying and communicating bearing faults and instructions for intervention. *See SRI Int’l, Inc. v. Cisco Systems, Inc.*, 930 F.3d 1295, 1303 (Fed. Cir. 2019) (holding claims directed to the use of network monitors that each analyze specific types of data to identify actual and potential intruders into the network patent eligible); *Thales Visionix Inc. v. United States*, 850 F.3d 1343, 1349

(Fed. Cir. 2017) (holding claims that “specify a particular configuration of inertial sensors and a particular method of using the raw data from the sensors in order to more accurately calculate the position and orientation of an object on a moving platform” patent eligible).

B. The Claims Are Significantly More Than An Abstract Idea

Even though the claims are patent eligible under Step 2A as a clear improvement to existing technology, the substitute claims recite sufficient additional elements that they amount to significantly more than any judicial exception. Contrary to the assertions made in the PG, the claim limitations of the substitute claims firmly limit the subject matter to a specific method in the field of railcar monitoring. Claim 23, for example, recites a specific method requiring a sensing unit mounted on a sidewall of a bearing adapter monitoring the condition of a bearing proximate to the bearing adapter. That specific method receives data from the sensing unit, applies a heuristic which correlates the received data with the monitored bearing condition, assigns the condition of the bearing to one of multiple severity levels based on how far the monitored data is from the data that is expected, and determines an alarm condition for the bearing condition which defines one or more recommended actions to be taken with regard to the detected deviation. Thus, claim 23 recites a specific method and an inventive concept that provides actionable information because of the use of the monitoring system and amounts to significantly

more than just “collecting data... and performing mathematical calculations,” contrary to the Board’s preliminary finding. PG at 18.

VI. SUBSTITUTE CLAIMS 23 THROUGH 43 ARE PATENTABLE OVER LEFEBVRE, ARMITAGE, OR BARONE, ALONE OR IN COMBINATION

No prior art of record known to Patent Owner anticipates or renders obvious proposed substitute claims 23 through 43. For purposes of this Motion to Amend, PO claims, and provides support for, a priority date of June 19, 2012, the effective filing date of the provisional application to which the ’673 patent claims priority.

A. Independent substitute claim 23

Independent substitute claim 23 (corresponding to claim 1 of the Challenged Claims) limits the applied heuristic to one that correlates one or more numeric values derived from the data or processed information to the condition of the bearing to determine a condition of the bearing. Claim 23 also assigns one of a plurality of defined severity levels that are each assignable based on respective possible values for a magnitude of the deviations of one or more numeric values from nominal operating conditions for the bearing during operation of the railcar and determines an alarm condition that defines an action to be taken with regard to the detected deviation from nominal operating conditions. These features are patentable over the cited art of record. EX2163, ¶38-44.

Petitioners assert that LeFebvre’s use of “inference engine techniques”

teaches the claimed application of a heuristic. Petition at 21; EX2163 at ¶¶45-46. In support, Petitioners cite portions of LeFebvre that disclose a data control unit programmed to compare information aggregated from all the trucks on the railcar and using “inference engine techniques to identify unsatisfactory behavior such as swaying, bouncing or even partial derailment.” LeFebvre at ¶¶36, 56. The cited portions disclose monitoring relative changes in temperature of a bearing against other bearings to infer well-being of the bearing. *Id.* at ¶¶58-59; EX2163 at ¶46.

Thus, LeFebvre discloses comparing relative temperatures (at different instrumented pads) to infer well-being of a bearing, and LeFebvre discloses spectral analysis of load measurements from a single instrumented pad to identify a failing bearing. EX2163 at ¶46. In both of these cases, however, LeFebvre does not disclose applying correlations between one or more numeric values derived from the instrumented-pad information to the condition of the bearing. *Id.* Thus, LeFebvre fails to teach or suggest at least that any alleged heuristic the heuristic correlates one or more numeric values derived from the data or processed information to the condition of the bearing to determine the condition of the bearing. *Id.*

Furthermore, LeFebvre does not disclose any severity levels for a bearing, much less “a plurality of defined severity levels that are each assignable based on respective possible values for a magnitude of the deviations of one or more numeric values from nominal operating conditions for the bearing during operation of the

railcar”. At best, LeFebvre discloses a simple threshold alarm consisting of two results: (a) “all’s well” or (b) something is amiss (alternatively described as unsatisfactory behavior or impending failure). LeFebvre at ¶¶35-36, 95. It is common sense that a bearing operating within nominal expectations is ***not assigned a severity level***. EX2163 at ¶48. This is also indicated in the claims where the severity level is assigned to the “deviations from nominal operating conditions.” Because alarm conditions are only determined based on the severity level, which in turn are assigned to the deviations from nominal operating conditions, the ***lack*** of any alert indicating bearings are not actually or potentially defective is, by definition, not a severity level. *Id.* Thus, LeFebvre also fails to teach or suggest at least assigning a severity level to said deviations as recited in claim 23. *Id.*

Petitioner also asserts that Armitage’s statistical methods teach the claimed application of a heuristic. Petition at 55. In support of this assertion, Petitioner cites portions of Armitage that disclose that “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,” and “outliers for sensor nodes on an entire side of railway car 310 could indicate cornering failure, or an off-track condition.” Armitage at ¶¶42, 44. This dynamic normalization results in a change of the range of operational values for an undercarriage element in real time. EX2163 at ¶49.

However, like LeFebvre, Armitage fails to teach or suggest applying correlations between one or more numeric values derived from the data or processed information to the condition of [one single] bearing. Petitioner characterizes Barone similar to LeFebvre and relies on it solely for disclosing a plurality of rail cars. Thus, Armitage and/or Barone fail to cure the deficiencies of LeFebvre. *Id.*, ¶¶49, 51.

Claim 23 recites an “alarm condition” that “defines one or more recommended actions to be taken with regard to the detected deviation from nominal operating conditions.” None of the art of record discloses this limitation. EX2163 at ¶50.

B. Independent substitute claim 33

Independent substitute claim 33 (corresponding to claim 10 of the Challenged Claims) limits step (b) by using calibrated correlations between a plurality of temperature values for the desired part and a plurality of temperatures that are expected for the part during standard operations of the railcar; limits the recited “determining if said temperature of the desired part is outside an acceptable range ” to determining if said temperature of the desired part is outside an acceptable range of temperatures indicating operating conditions expected for the desired part during the operation of the railcar by comparing the temperature of the desired part determined in step (b) and at least one defined temperature value associated with the desired part, wherein an acceptable range of temperatures is a defined range of temperatures expected during normal operation of the railcar; and limits step (d) by

requiring the alarm condition to define one or more recommended actions to be taken with regard to the detected condition of the desired part and including severity level determinations by a deviation of said temperature from a predetermined reference temperature value, wherein said deviation indicates a severity of a detected condition of the desired part. Thus, similar to independent substitute claim 23, substitute claim 33 is using calibrated correlations to determine deviations from expected operating conditions. *See* §VI.A, *supra* (incorporated here). Thus, the limitations of claim 33 are also not taught by Lefebvre, Armitage, or Barone. EX2163 at ¶¶52-54.

Claim 33 recites an “alarm condition” that “defines one or more recommended actions to be taken with regard to the detected condition of the desired part.” None of the art of record discloses this limitation. EX2163 at ¶50.

C. Independent substitute claims 36 and 42

Independent substitute claims 36 and 42 (corresponding to Challenged Claims 14 and 21) limit the heuristic analysis to determining a condition of a bearing based on correlations between received data and a plurality of different values indicative of the condition of the bearing. Similar to independent substitute claim 23, the heuristic analysis of claims 36 and 42 is limited to specific objects and correlations that are not taught by Lefebvre or Armitage. EX2163, ¶¶55-57; *see* §VI.A, *supra* (incorporated here). Claims 36 and 42 recite an “alarm condition” that “defines a

specific action to be taken with regard to the bearing.” None of the art of record discloses this limitation. EX2163, ¶55.

In each such case, the aforementioned proposed substitute claims have been narrowed to specifically include limitations not taught by Lefebvre, Armitage, or Barone, alone or in combination. EX2163, ¶58-59. Substitute claims 23 through 43 are patentable over Lefebvre, Armitage, or Barone, alone or in combination.

VII. CONCLUSION

Patent Owner has satisfied the requirements of 37 C.F.R. §42.121, and thus, the substitute claims should be entered into the record in this matter contingent upon a finding of unpatentability with respect to the Challenged Claims. The Board should grant this Revised Motion to Amend.

Respectfully submitted,

Dated: February 22, 2024

By: /Ryan N. Miller/
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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. § 42.6(e), the undersigned certifies that on the 22nd day of February 2024 a complete and entire copy of “PATENT OWNER’S REVISED MOTION TO AMEND” was provided via email to the Petitioner by serving the following email addresses:

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Electronic service was used with Petitioner’s consent (*See* Petition, Paper 1 at 2; Patent Owner’s Mandatory Notice, Paper 5 at 5).

Dated: February 22, 2024

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CLAIMS APPENDIX A

Proposed substitute claims are shown in marked-up form below beginning with claim 23. Modifications to the corresponding original claim are shown in the substitute claim by underlining (added material), strikethrough (deleted material), and double bracketing (deleted material).

Claim 23 (Substitute for claim 1, if found unpatentable)

~~1.~~23. A method of monitoring operational characteristics of a railcar comprising the steps of:

a. receiving data or processed information regarding ~~said~~ an operational characteristic of a railcar from one or more sensing units, each mounted on a sidewall of a bearing adapter on said railcar at the bearing adapter, said sensing units monitoring ~~an~~ said operational characteristic of said railcar, wherein the operational characteristic is a condition of a bearing proximate to the bearing adapter;

b. determining the condition of the bearing by applying a heuristic to said received data to determine deviations from nominal operating conditions, wherein the heuristic correlates one or more numeric values derived from the data or processed information to the condition of the bearing;

c. assigning a severity level to said deviations from nominal operating conditions, wherein said severity level is one of a plurality of defined severity levels that are each assignable based on respective possible values for a magnitude of the

deviations of one or more numeric values from nominal operating conditions for the bearing during operation of the railcar; and

d. determining an alarm condition based on said assigned severity level, wherein said alarm condition defines one or more recommended actions to be taken with regard to the detected deviation from nominal operating conditions.

Claim 24 (Substitute for claim 13, if found unpatentable)

~~13-24.~~ The method of ~~claim 1~~claim 23, wherein steps (a) through (d) can be carried out at different event engines distributed among at least two of said ~~sensors~~sensing units, a communication management unit, and a mobile or land base station.

Claim 25 (Substitute for claim 2, if found unpatentable)

~~2-25.~~ The method of ~~claim 1~~claim 23, further comprising the initial step of establishing wireless communication with said one or more remote sensing units.

Claim 26 (Substitute for claim 3, if found unpatentable)

~~3-26.~~ The method of ~~claim 2~~claim 25, wherein said one or more remote sensing units form a mesh network.

Claim 27 (Substitute for claim 4, if found unpatentable)

~~4-27.~~ The method of ~~claim 2~~claim 25, wherein the received data or processed information includes one or more numeric values based on data obtained by an accelerometer in said sensing unit at the bearing adapter and wherein steps a-d are executed by a processing unit located on said railcar.

Claim 28 (Substitute for claim 5, if found unpatentable)

~~5.28.~~ The method of ~~claim 4~~claim 27, wherein said processing unit located on said railcar is a part of ~~said~~ a mesh network.

Claim 29 (Substitute for claim 6, if found unpatentable)

~~6.29.~~ The method of ~~claim 2~~claim 25, further comprising the step of transmitting said alarm condition to a location remote from said railcar.

Claim 30 (Substitute for claim 7, if found unpatentable)

~~7.30.~~ The method of ~~claim 2~~claim 25, further comprising the step of transmitting said data or processed information received from said one or more sensing units to a location remote from said railcar and performing steps b-d at said location remote from said railcar, wherein said data or processed information received from said one or more sensing units includes one or more numeric values based on data obtained by an accelerometer in said sensing unit at the bearing adapter.

Claim 31 (Substitute for claim 8, if found unpatentable)

~~8.31.~~ The method of ~~claim 2~~claim 25, further comprising the steps of:

- a. receiving acceleration data from a plurality of railcars;
 - b. applying ~~a~~the heuristic to said received acceleration data to determine the deviations from nominal operating conditions;
 - c. assigning ~~a~~the severity level to said deviations from nominal operating conditions;
 - d. determining ~~an~~ the alarm condition based on said assigned severity level;
- and

e. transmitting ~~said~~ a raised alarm to a display unit on a train of which said plurality of railcars are a part, said raised alarm comprising the specific action to be taken with regard to the bearing based on the assigned severity level.

Claim 32 (Substitute for claim 9, if found unpatentable)

~~9.32.~~ The method of ~~claim 6~~ claim 29, further comprising the steps of

a. determining a recommended course of action based on said alarm condition; and

b. transmitting said recommended course of action to a display unit on a train of which said railcar is a part.

Claim 33 (Substitute for claim 10, if found unpatentable)

~~10.33.~~ A method of monitoring a temperature of a desired part of a railcar, comprising:

(a) sensing the temperature of a part of the railcar other than the desired part by use of a temperature sensor in thermal communication with said other part;

(b) determining the temperature of the desired part by use of the temperature of the part sensed in step (a) and calibrated correlations between a plurality of temperature values for the desired part and a plurality of temperatures that are expected for the part during standard operations of the railcar;

(c) determining if said temperature of the desired part is outside an acceptable range of temperatures indicating operating conditions expected for the desired part during the operation of the railcar by comparing the temperature of the desired part determined in step (b) and at least one defined temperature value associated with the desired part, wherein an acceptable range of temperatures is a defined range of temperatures expected during normal operation of the railcar; and

(d) transmitting an alarm if in step (c) it is determined that the temperature of the desired part is outside ~~an~~ the acceptable range of temperatures and transmitting an alarm if in step (c) it is determined that the temperature of the desired part is outside the acceptable range of temperatures and is within one of a plurality of severity levels defined by a deviation of said temperature from a predetermined reference temperature value, wherein said deviation indicates a severity of a detected condition of the desired part, wherein said alarm condition defines one or more recommended actions to be taken with regard to the detected condition of the desired part.

Claim 34 (Substitute for claim 11, if found unpatentable)

~~11.34.~~ A method of monitoring a temperature and condition of a desired part of a railcar in accordance with ~~claim 10~~ claim 33, further comprising the step of determining ~~a~~ the temperature of the ambient air, which temperature is used in the determination of step (b).

Claim 35 (Substitute for claim 12, if found unpatentable)

~~12.35.~~ A method of monitoring a temperature and condition of a desired part of a railcar in accordance with ~~claim 10~~ claim 33, wherein steps (a) through (d) are carried out by a single unit attached to said railcar.

Claim 36 (Substitute for claim 14, if found unpatentable)

~~14.36.~~ A method for monitoring the operation of a railcar performed by a communication management unit disposed on said railcar comprising the steps of:

a. wirelessly receiving data from one or more sensing units which periodically collect readings from one or more sensors disposed on a sidewall of a bearing adapter on said railcar;

b. heuristically analyzing said received data to:

(i) determine a condition of a bearing proximate to the bearing adapter based on correlations between the data and a plurality of possible values indicative of the condition of the bearing;

(ii) determine if an actual failure exists on said railcar or to predict potential or imminent failures based on a statistical analysis of said received data; and

(iii) assign a severity level to said determined actual failure or said predicted potential or imminent failures, wherein the severity level is based on deviations of the condition of the bearing from an expected condition of the bearing; and

c. determine an alarm condition based on data collected by the one or more sensing units, wherein said alarm condition defines a specific action to be taken with regard to the bearing based on said assigned severity level;

d. communicating the results of said analysis performed in step (b) to an off-railcar location.

Claim 37 (Substitute for claim 15, if found unpatentable)

~~15-37.~~ The method of ~~claim 14~~ claim 36, wherein each of said sensing units can make a said determination of an alarm condition based on data collected by the sensing unit, said method further comprising ~~the step of:~~

~~a-~~ wirelessly receiving notice of said alarm condition from said sensing unit;
~~and~~

~~b. communicating said alarm condition to an off-railcar location.~~

Claim 38 (Substitute for claim 16, if found unpatentable)

~~16.38.~~ The method of ~~claim 14~~claim 36, further comprising the steps of:

a. making a said determination of an alarm condition based on data received from two or more of said sensing units; and

b. communicating said alarm condition to an off-railcar location.

Claim 39 (Substitute for claim 17, if found unpatentable)

~~17.39.~~ The method of ~~claim 14~~claim 36, further comprising the step of placing said one or more sensing units in a stand-by state when said one or more sensing units is not reading data from any of said sensors or transmitting data.

Claim 40 (Substitute for claim 18, if found unpatentable)

~~18.40.~~ The method of ~~claim 14~~claim 36, further comprising the step of joining a mesh network consisting of one or more sensing units located on said railcar.

Claim 41 (Substitute for claim 20, if found unpatentable)

~~20.41.~~ The ~~system~~method of ~~claim 14~~claim 36, further comprising the steps of:

a. saving data received from said one or more sensing units in memory; and
b. comparing data received with said saved data to identify trends or deviations from normal readings of said data stored in memory.

Claim 42 (Substitute for claim 21, if found unpatentable)

~~21.42.~~ A method for monitoring the operation of a railcar comprising:

- a. collecting data at periodic intervals about one or more operating parameters of said railcar using one or more sensor units provided on a sidewall of a bearing adapter on said railcar, wherein the one or more operating parameters comprise a condition of a bearing proximate to the bearing adapter;
- b. communicating said collected data to a communication management unit;
- c. analyzing said collected data by applying heuristics thereto to (i) determine if an actual failure exists and (ii) ~~to~~ predict potential or imminent failures based on a statistical analysis of said collected data, wherein application of the heuristics correlates the data to the condition of the bearing;
- d. assigning a severity level to the condition of the bearing, wherein said severity level is one of three or more defined severity levels based on the one or more numeric values; and
- e. determining an alarm condition, wherein said alarm condition defines a specific action to be taken with regard to the bearing based on said assigned severity level.

Claim 43 (Substitute for claim 22, if found unpatentable)

~~22.43.~~ The method of ~~claim 21~~ claim 42, wherein the collected data includes one or more numeric values based on data obtained at the bearing adapter, further comprising the steps of:

- assessing the ~~collected data~~ one or more numeric values to determine if an alarm condition exists; and
- wirelessly communicating said alarm condition to an off railcar location.