

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
US Patent No. 10,137,915

Before JAMES P. CALVE, KEVIN W. CHERRY, and MICHAEL L. WOODS,
Administrative Patent Judges.

**PETITIONER'S SUR-REPLY IN OPPOSITION TO
PATENT OWNER'S REVISED MOTION TO AMEND**

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EXHIBIT LIST

Ex #	Exhibit Description
1001	U.S. Patent No. 10,137,915 (“the ’915 Patent”)
1002	Prosecution History of the ’915 Patent
1003	Expert Declaration of Steven Ricca
1004	<i>Curriculum Vitae</i> for Steven Ricca
1005	U.S. Patent Publication No. 2007/0152107 A1 to LeFebvre et al. (“LeFebvre”)
1006	U.S. Patent Publication No. 2011/0282540 A1 to Armitage et al. (“Armitage”)
1007	U.S. Patent Publication No. 2007/0208841 A1 to Barone et al. (“Barone”)
1008	U.S. Patent No. 7,706,213 to Winfree et al. (“Winfree”)
1009	Bonnie Baker, <u>Filtering? Before or After?</u> , EDN (February 20, 2003), https://www.edn.com/filtering-before-or-after/
1010	Potting and Encapsulation, Master Bond Inc., https://www.masterbond.com/applications/potting-and-encapsulation
1011	Amsted Rail Company, Inc.’s Complaint filed against Hum Industrial Technology, Inc. (ECF No. 1) filed on April 18, 2022
1012	Waiver of the Service of Summons upon Hum Industrial Technology, Inc. (ECF No. 4) dated June 14, 2022
1013	<i>Intentionally Omitted</i>
1014	<i>Intentionally Omitted</i>
1015	<i>Intentionally Omitted</i>
1016	Third Generation On-Board Monitoring and Control System Based on Controller Area Network Technology Dr. John Donelson III, et al.
1017	Defendants' Stipulation of Invalidity Contentions
1018	<i>Intentionally Omitted</i>
1019	<i>Intentionally Omitted</i>
1020	Transcript of Conference Call Before James P. Calve, Kevin W. Cherry, and Michael L. Woods (June 8, 2023)

Ex #	Exhibit Description
1021	International Heavy Haul Association Order Confirmation for Electronic Copy of 2007 Conference Proceedings (<i>Not Filed</i>)
1022	International Heavy Haul Association 2007 Conference Proceedings (<i>Not Filed</i>)
1023	June 18, 2011 Wayback Machine Web Capture of “Past Conferences” page on International Heavy Haul Association website (<i>Not Filed</i>)
1024	Declaration of Steven Ricca in support of Exhibits 1009-1010 (<i>Not Filed</i>)
1025	Expert Declaration of Steven Ricca in Support of Petitioner’s Reply
1026	MSP430F1611 Manual (Texas Instruments)
1027	MSP430FG4618 Manual (Texas Instruments)
1028	Expert Declaration of Steven Ricca in Support of Petitioner’s Opposition to Motion to Amend
1029	U.S. Patent Publication No. 2011/0231039 A1 to Leitel et al. (“Leitel”)
1030	Expert Declaration of Steven Ricca in Support of Petitioner’s Opposition to Revised Motion to Amend

Petitioner submits this Sur-Reply in response to Patent Owner’s Reply (Paper 31 (“Reply”) and in opposition to Patent Owner’s Revised Motion to Amend (Paper 23 (“Motion”)).

I. THE SUBSTITUTE CLAIMS DO NOT SATISFY THE REQUIREMENTS OF 35 U.S.C. §§ 112(a) AND (b)

A. Claim 43 Lacks Written Description

Patent Owner argues “Petitioner fails to meet its burden to show that any of the substitute claims do not comply with § 112.” Rule 42.121(d)(1), however, “assigns the burden of persuasion to the patent owner to show, by a preponderance of the evidence, that a motion to amend complies with certain statutory and regulatory requirements for a motion to amend,” including that the substitute claims comply with the written description requirement. Rules of Practice To Allocate the Burden of Persuasion on Motions To Amend, 85 FR 82923, 82924 (Dec. 21, 2020). Similarly, 35 U.S.C. § 316(d) requires a “threshold showing” that the amendment does not introduce new matter. *Aqua Prods., Inc. v. Matal*, 872 F.3d 1290, 1304 (Fed. Cir 2017). Thus, 37 C.F.R. § 42.121(d)(1) requires a patent owner to show, by a preponderance of the evidence, that a motion to amend complies with threshold requirements of § 316(d), and if it does not, the Board must deny the motion. *Aqua Prods.*, 872 F.3d at 1305-1306.

In its Opposition to Patent Owner’s Revised Motion to Amend, Petitioner

explained that the specification does not teach a single embodiment comprising two sets of detectors as claimed in claim 43—one that “is always enabled when the railcar is moving” and a second that “is enabled when the railcar is traveling faster than a specific speed and is disabled when the railcar is traveling slower than the specific speed.” Paper 27, 1-2. In reply, Patent Owner cites several portions of the specification that it did *not* identify in its Motion to allegedly show written description support for claim 43. Paper 31, p. 2 (citing EX1001, 5:33-35, 14:51-56, and Fig. 11 for the first time).

However, even these newly cited portions of the specification do not establish written description support for claim 43. To the contrary, the newly cited portions describe a *temperature* sensor that is enabled only when the railcar is moving. *Id.* Claim 43, however, depends from claim 38, which requires “a plurality of sensor sections” comprising “a plurality of filters that are each configured to filter at least a portion of the *accelerations* by receiving an output signal directly from *the tri-axis sensor ...*” and “a *plurality of detectors* respectively coupled to the plurality of filters, each one of the detectors being configured to detect a respective one of a plurality of different railcar conditions *based on ones of the accelerations that are associated with only the respective axis of the plurality of axes.*” Paper 23, 6-7 (emphasis added). Notwithstanding the fact that several of the foregoing limitations are indefinite, claims 38 and 43 require detectors that process accelerations from tri-

axis sensors, ***not*** temperature measurements from a temperature sensor. Even if the claims were not so limited, the newly cited portions of the specification do not teach a single embodiment comprising detectors that are enabled when the railcar is in motion *and* detectors that are enabled only when the railcar has reached a specific speed. Further, Patent Owner’s suggestion that WSN 104 always includes an accelerometer 404 and a temperature sensor 406 is simply false—the ’915 patent explains that some embodiments of WSN 104 do not include a temperature sensor 406 and some embodiments do not include an accelerometer 404. EX1001, 7:2-15.

B. Claims 38, 46, and 47 are Indefinite

Substitute claims 38, 46, and 47 include two indefinite terms. The first is “***ones*** of the accelerations.” Patent Owner, however, argues the term “***one*** of the accelerations” is not indefinite because “[*o*]***ne*** of the accelerations’ refers to ***one*** of the acceleration measurements taken with the tri-axis sensor for ***one*** axis.”¹ Paper 31, 3 (emphasis added). But “***one*** of the accelerations” is not the claim language and Patent Owner fails to explain what “***ones*** of the accelerations” means. In fact, Patent Owner’s argument regarding the meaning of “***one*** of the accelerations” is nonsensical as applied to the actual proposed claim language and illustrates the

¹ Patent Owner was granted leave to correct typographical errors in the claims listing, but “***ones*** of the accelerations” was not an identified typographical error.

term's indefiniteness. How could “**ones** of the accelerations” means “**one** of the accelerations measurements taken with the tri-axes sensor for **one** axis”? Moreover, Patent Owner's argument that Petitioner's expert, Mr. Ricca, “only opines as to what is ‘unclear’ to him, not what a PHOSITA would understand” is directly contradicted by Mr. Ricca's declaration where he explicitly states “ones of the accelerations” “is not a term of art reasonably understood to a PHOSITA.” EX1030 at ¶ 16.

The second indefinite term in claims 38(c)(ii), 46, and 47(c) does not reasonably convey to a PHOSITA the relationships between the “plurality of detectors,” “the plurality of filters,” the “plurality of different railcar conditions,” and the “ones of the accelerations associated with only the respective axis of the plurality of axes.” For instance, does “each one of the detectors being configured to detect a respective one of a plurality of different railcar conditions” mean each detector only detects one railcar condition? Does “based on ones of the accelerations that are associated with only the respective axis of the plurality of axes” mean that each detected railcar condition can only be based on a single axis? These questions, which Patent Owner did not answer, illustrate the uncertainty of the scope of the claims, and Figures 12-14 do not provide these answers either. *See* Paper 31, 4.

II. THE SUBSTITUTE CLAIMS ARE INVALID AS OBVIOUS UNDER 35 U.S.C. § 103

A. Winfree is Analogous Art

Petitioner has not conceded Winfree is not in the same field of endeavor as the other prior art references. Indeed, each asserted prior art reference relates to improvements to condition sensing using accelerometers. EX1030, ¶¶ 20-23. Winfree is also pertinent to a problem the '915 patent purports to address, i.e., filtering waves from an accelerometer entering a sensor “to selectively transmit, attenuate, or amplify various frequencies of incident elastic waves that would otherwise propagate from the environment and into the sensor.” EX1008, 2:24-29; EX1030, ¶ 22. Patent Owner is incorrect that the '915 patent and Winfree use mechanical filters for different purposes. Paper 31, 5. Winfree only criticizes certain bulky, elastomeric mechanical filters, and it is unclear why this is relevant because the '915 patent does not teach these prior art sensors. EX1008, 1:24-2:20. *Both* the '915 patent and Winfree explicitly state one of the purposes of mechanical filtering is to remove undesirable accelerations and amplify desirable accelerations. *Compare* EX1001, 5:23-32 *with* EX1008, 2:24-45, 4:54-63. And *both* patents also teach mechanical filters can protect sensors from damage. *Compare* EX1001, 5:56-67 *with* EX1008, 1:19-22, 2:30-33.

B. Petitioner Sets Forth Ample Evidence of Motivation to Combine the Asserted References

Patent Owner's criticism of Petitioner's evidence of motivation to combine neglects to address a significant amount of evidence presented in the Opposition, that when viewed together, demonstrates sufficient motivation to combine in every asserted ground of unpatentability. Moreover, Patent Owner repeatedly suggests that expert testimony regarding motivation to combine and the knowledge of a PHOSITA at a given time is somehow *not* evidence. This is incorrect—expert testimony is weighed like any other evidence. *Alza Corp. v. Mylan Lab'ys, Inc.*, 464 F.3d 1286, 1294 (Fed. Cir. 2006) (contemporaneous documentary evidence is not required to corroborate expert's testimony).

Claim 38(b), Grounds 5 and 6: Patent Owner's argument regarding Petitioner's evidence that a PHOSITA would have been motivated to use a triaxial accelerometer instead of three separate single-axis accelerometers due to cost and installation benefits is premised on its faulty position regarding the alleged lack of weight given to expert testimony that is not supported by additional documentary evidence. Patent Owner also overlooks a significant amount of testimony from Mr. Ricca establishing motivation to use a triaxial accelerometer in LeFebvre's system set forth in the Opposition. *See* Paper 27, 7-8.

Claim 38(c)(i), Grounds 1 and 2: Patent Owner's argument that using a

plurality of filters is not the mere duplication of parts “because each axis detects different events” (Paper 31, 8) confuses the claimed “plurality of filters” with the claimed “plurality of detectors.” The ’915 patent teaches the filters simply isolate data from a particular axis while the detectors detect different railcar events. *See* EX1001, 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.”); 12:11-13:9 (discussion of different events detected by the detectors after filters isolate data from one of three axes). Thus, the claimed “plurality of filters” is a mere duplication of parts because each filter merely isolates acceleration data from a particular axis. EX1030, ¶ 41.

In any event, Armitage teaches multiple filters. *See* Paper 27, 8-10. A PHOSITA would understand that Armitage does not only isolate acceleration data along z-axis, but also the x- and y-axes measured by the triaxial accelerometer.² *Id.* Further, by merely providing “examples” of railcar events detected by monitoring accelerations along the z-axis does not disparage or otherwise teach away from the

² Patent Owner also claims, without support, that “[i]gnoring complete sets of data is not the same thing as filtering in claim 38,” but that is exactly what the ’915 patent teaches. *See* Paper 27, 9-10; EX1001, 13:17-24, 13:36-14:9, Figs. 12-14; EX1030, ¶ 37.

detection of other identified railcar conditions based on accelerations along the other two measured axes. *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004). Nor does Armitage's discussion of one advantage of monitoring vibrations only along the z-axis to detect wheel flat conditions amount to teaching away. Indeed, as explained by Mr. Ricca, a PHOSITA would have understood the benefits of monitoring only accelerations along the other two axes to detect different railcar conditions described in Armitage. *See* Paper 27, 9-10; EX1030, ¶¶ 37-42.

Finally, Patent Owner argues that because Armitage post-dates Barone by only four years that there is no motivation to combine the filtering of Barone with Armitage. But this is nonsensical—there is no requirement in patent law that to prove obviousness a petitioner must explain why a prior art reference does not expressly describe a feature that petitioner argues would have been *obvious* to combine with the prior art reference. And, as explained in the Opposition, the combination of Armitage and Barone would result in two different types of data filtering, *not* that Barone's filtering would replace Armitage's filtering. Paper 27, 11-12.

Claim 38(c)(i), Grounds 5 and 6: Equally unavailing are Patent Owner's arguments that because LeFebvre precedes the '915 patent by eight years, a PHOSITA would not have modified LeFebvre in view of any of the other asserted references. Paper 31, 8-10 (*citing* *Leo Pharm. Prods., Ltd. v. Rea*, 726 F.3d 1346, 1359 (Fed. Cir. 2013), and *Volvo Penta of the Ams., LLC v. Brunswick Corp.*, 81

F.4th 1202, 1215 (Fed. Cir. 2023)). Patent Owner’s argument is incorrect as a matter of law. “The mere age of the references is not persuasive of the unobviousness of the combination of their teachings, absent evidence that, notwithstanding knowledge of the references, the art tried and failed to solve the problem.” *In re Wright*, 569 F.2d 1124, 1127 (CCPA 1977); *see also In re Ethicon*, 844 F.3d 1344, 1352 (Fed. Cir. 2017) (same); *Iron Grip Barbell Co., Inc. v. USA Sports, Inc.*, 392 F.3d 1317, 1325 (Fed. Cir. 2004) (“Absent a showing of long-felt need or the failure of others, the mere passage of time without the claimed invention is not evidence of nonobviousness.”). Patent Owner has presented no evidence of long felt need or failure of others.

Leo Pharm. and *Volvo Penta* do not hold to the contrary. In *Leo Pharm.*, there was considerable evidence that the prior art, which predated the challenged patent by 22 years, did not even recognize the problem addressed by the challenged patent, let alone solve it. *Leo Pharm.*, 726 F.3d at 1353. There was also ample evidence of long-felt but unsolved need, unexpected results, and teaching away. *Id.* at 1355, 1358-59; *see also Nike, Inc. v. Adidas AG*, 812 F.3d 1326, 1338 (Fed. Cir. 2016) (clarifying that *Leo Pharm.* “hinged on the fact that nothing in the cited prior art appreciated the problem the invention recognized and then solved” and that the age of the prior art references alone is not persuasive of unobviousness). Similarly, in *Volvo Penta*, the Federal Circuit acknowledged that the mere age of a reference does

not indicate nonobvious, but found the Board in that case erred by ignoring the date of the reference when there was a showing of long felt but unresolved need for the patented product, the prior art reference pre-dated the challenged patent by *50 years*, and the prior art was owned by the *petitioner*, not the patent owner.

Even if Patent Owner had objective evidence of unobviousness, it would have to prove a nexus to the claimed invention, which it has not even attempted to do. *Simmons Fastener Corp. v. Illinois Tool Works, Inc.*, 739 F.2d 1573, 1575 (Fed. Cir. 1984) (“A nexus between the merits of the claimed invention and the evidence of secondary considerations is required in order for the evidence to be given substantial weight in an obviousness decision.”); *see also Arlington Indus., Inc. v. Bridgeport Fittings, Inc.*, 581 F. App’x 859, 866 (Fed. Cir. 2014) (rejecting evidence of commercial success and long felt but unresolved need in absence of evidence of nexus to claimed invention). Patent Owner’s arguments regarding the 8-year difference between LeFebvre and the ‘915 patent should be disregarded.

Claim 38(c)(ii), Grounds 2 and 6: Patent Owner again misrepresents Petitioner’s Opposition arguments by insinuating the only motivation to combine Leitell with Armitage and LeFebvre provided by Petitioner is that the references are analogous art. As explained in the Opposition and by Mr. Ricca, a PHOSITA would have been motivated to use particular modes of detecting certain conditions based on particular axes more accurately and effectively, to reduce redundant processing

of data, and to preprocess data at the detectors in the sensor nodes of Leitel so only the output of the detectors would need to be transmitted to the CMU or user. EX1030, ¶¶ 65-66, 68.

C. Petitioner’s Expert Testimony Regarding the Knowledge of a PHOSITA is Not Merely Speculation

As discussed above, Patent Owner’s arguments that Mr. Ricca’s opinions should only be considered if supported by documentary evidence is contrary to the law, as are Patent Owner’s arguments that the eight-year difference between LeFebvre and the ’915 patent is relevant in the absence of any showing of nexus and long felt but unresolved need or failure of others. *See Alza*, 464 F.3d at 1294; *Iron Grip*, 392 F.3d at 1325. Patent Owner is also incorrect that “Petitioner’s expert acknowledges that LeFebvre does not mention a triaxial accelerometer.” Paper 31, 10. Petitioner and Mr. Ricca explained that LeFebvre teaches a triaxial accelerometer in its CMU, and that it would have been obvious to use the same triaxial accelerometer in the sensor node, especially when the specification does not specify what type of accelerometer is used in the sensor node and in view of the benefits of a triaxial accelerometer. EX1030, ¶¶ 31-34.

Regarding claim 43, Armitage, Barone, and Leitel each disclose enabling sensors only when the railcar is in motion, so Patent Owner’s argument about another mechanism having to always provide power to detect motion is irrelevant.

Moreover, Patent Owner ignores ample testimony from Mr. Ricca with respect to motivation to include a second sensor that is only enabled at a certain speed, including examples of certain measurements that are meaningless except at higher speeds. *See* EX1030, ¶ 72.

D. The Remaining Independent and Dependent Claims are Invalid

With respect to independent claims 46 and 47, Patent Owner argues that some unidentified differences between these claims and claim 38 exist, which directly contradicts its Motion. In the Motion, and as pointed out in the Opposition, Patent Owner stated that claims 46 and 47 are “limited in a manner similar to independent substitute claim 38. Therefore, claim 46 is not taught by LeFebvre, Armitage, Barone, Winfree or Leitel for the reasons set forth above in relation to claim 38.” Paper 23, 23-24. Petitioner explained that in view of this, its “discussion of Claim 38 in Sections III.B.i-iii, *supra* applies equally to claims 46 and 47.” *Id.* Further, none of the minor differences between the new or original claim language of claims 47(d)-(f) requires a different analysis of the prior art than that for the corresponding limitations 38(d)9i)-(iii). Additionally, each proposed substitute dependent claim was addressed in the Opposition. *See* Paper 27, 23-25.

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Respectfully submitted,

Dated: May 31, 2024

By: /Daisy Manning/
Eric J. Rakestraw, Reg. No. 68,740
Daisy Manning, Reg. No. 66,369
HUSCH BLACKWELL LLP
8001 Forsyth Boulevard, Suite 1500
St. Louis, MO 63105
(314) 480-1500 Telephone
(314) 480-1505 Facsimile
PTAB-ERakestraw@huschblackwell.com
PTAB-DManning@huschblackwell.com

Attorneys for Petitioner

CERTIFICATE OF SERVICE

I hereby certify that on this 31st day of May 2024, the foregoing was served
via electronic mail to the attorneys of record for the '915 Patent at the following:

Jeff E. Schwartz Reg. No. 39,019 Fox Rothschild LLP 2020 K Street N.W., Suite 500 Washington, DC 20006 Tel: 202.696.1470 Fax: 202.461.3102 Email: jeschwartz@foxrothschild.com	Gary A. Hecht Reg. No. 36,826 Fox Rothschild LLP 2000 Market Street, 20th Floor Philadelphia, PA 19103-3222 Tel: 215.299.2416 Fax: 215.299.2150 Email: ghecht@foxrothschild.com
P. Marshall Ticer Reg. No. 74,653 Fox Rothschild LLP 2020 K Street N.W., Suite 500 Washington, DC 20006 Tel: 202.794.1237 Fax: 202.461.3102 Email: mticer@foxrothschild.com	Ryan North Miller Reg. No. 68,262 Fox Rothschild LLP 2000 Market Street, 20th Floor Philadelphia, PA 19103-3222 Tel: 215.299.2901 Fax: 215.299.2150 Email: rmiller@foxrothschild.com

By: /Daisy Manning/
Daisy Manning, Reg. No. 66,369
Counsel for Petitioner

LISTING OF CLAIMS

Claim Limitation	Claim Language
Claim 38 Preamble	A system for detecting operational anomalies on a train consist or railcar, comprising:
Limitation 38(a)	(a) one or more communication management units mounted on one or more railcars;
Limitation 38(b)	(b) one or more <u>wireless sensor</u> [[s]] <u>nodes</u> located on said one or more railcars <u>and</u> configured to sense an operational parameter of said one or more railcars, said <u>one or more wireless sensor</u> [[s]] <u>nodes</u> being in communication with said one or more communication management units, wherein the one or more <u>wireless sensor</u> [[s]] <u>nodes</u> comprise <u>a tri-axis ~~one or more~~ sensor</u> [[s]] configured to measure accelerations of the railcar <u>along a plurality of axes comprising a first axis extending along a length of the railcar, a second axis extending across a width of the railcar, and a third axis extending along a height of the railcar; and</u>
Limitation 38(c)(i)	(c) <u>a plurality of ~~one or more~~ sensor sections that are provided with the one or more wireless sensor nodes and that comprise</u> (i) <u>a plurality of filters that are each configured to filter at least a portion of the accelerations by receiving an output signal directly from the tri-axis sensor and selecting ones of the accelerations in the output signal that were measured in a dimension represented by a respective axis of the plurality of axes, and</u>
Limitation 38(c)(ii)	(ii) <u>a plurality of detectors respectively coupled to the plurality of filters, each one of the detectors being configured to detect a respective one of a plurality of different railcar conditions based on ones of the accelerations that are associated with only the respective axis of the plurality of axes;</u>
Limitation 38(d)	wherein said communication management units perform the functions of: (i) <u>collecting, from the one or more wireless sensor nodes, data regarding said ~~one or more railcar~~ operational parameter</u> [[s]] <u>of said one or more railcars;</u>

Claim Limitation	Claim Language
Limitation 38(e)	(ii) analyzing said collected data <u>to detect a</u> [[for]] trend[[s]] or event[[s]] indicative of an anomalous operational condition of said one or more railcars; and
Limitation 38(f)	(iii) communicating a message to a remote receiver when said trend or event is detected.
Claim 39	The system of claim 38[[1]], wherein at least one of said communication management units includes at least one ~~of said~~ sensor[[s]] <u>configured to measure accelerations of the railcar.</u>
Claim 40	The system of claim 38[[1]], further comprising a powered wireless gateway configured to control a train-based network that includes said powered wireless gateway and a plurality of said communication management units.
Claim 41	The system of claim 38[[1]], wherein the one or more <u>wireless sensor nodes further</u> ~~filters~~ comprise one or more mechanical filters that include a resilient material configured to filter out undesirable accelerations from the accelerations, wherein the one or more mechanical filters are disposed to remove the undesirable accelerations before the undesirable accelerations reach the <u>tri-axis</u> ~~one or more~~ sensor[[s]] that <u>is</u> [[are]] configured to measure accelerations.
Claim 42	The system of claim 38[[1]], ~~further comprising one or more wireless sensor nodes in communication with at least one of the communication management units, wherein the one or more sensors form part of the one or more wireless sensor nodes,~~ wherein one or more of the wireless sensor nodes comprise a protective housing, wherein the <u>tri-axis</u> ~~one or more~~ sensor[[s]] <u>is</u> [[are]] mounted within the protective housing, wherein the protective housing comprises a <u>potting material configured to tune the wireless sensor nodes by absorbing at least a portion of undesirable accelerations.</u>
Claim 43	The system of claim 38[[1]], ~~further comprising one or more wireless sensor nodes in communication with at least one of the communication management units, wherein the one or more sensors form part of the one or more wireless sensor nodes,~~ wherein one or more of the wireless sensor nodes comprises a microprocessor configured to execute firmware to control operation of the one or more of the wireless sensor

Claim Limitation	Claim Language
	nodes, wherein the firmware comprises one or more software filters configured to isolate one or more types of accelerations, and wherein a <u>first one of the plurality of detectors is always enabled when the railcar is moving, and a second one of the plurality of detections is enabled when the railcar is traveling faster than a specific speed and is disabled when the railcar is traveling slower than the specific speed.</u>
Claim 44	The system of claim 38[[1]], wherein the one or more <u>wireless sensor nodes</u> ~~filters~~ <u>further</u> comprise one or more mechanical filters.
Claim 45	The system of claim 38[[1]], wherein said remote receiver is located off-train.
Claim 46 Preamble	A method for detecting operational anomalies on a train consist or railcar comprising the steps of:
Limitation 46(a)	sensing, by a <u>~~one or more~~ tri-axis sensor[[s]] of one or more wireless sensor nodes</u> located on one or more railcars, one or more operational parameters of the one or more railcars, wherein the one or more operational parameters comprise one or more accelerations <u>and the tri-axis sensor is configured to measure accelerations of the ~~one or more~~ railcar[[s]] along a plurality of axes comprising a first axis extending along a length of the railcar, a second axis extending across a width of the railcar, and a third axis extending along a height of the railcar;</u>
Limitation 46(b)	filtering, by <u>each of a plurality of ~~one or more~~ filters of a plurality of sensor sections that are provided with the one or more wireless sensor nodes</u> , at least a portion of the accelerations <u>by receiving an output signal directly from the tri-axis sensor and selecting ones of the accelerations in the output signal that were measured in a dimension represented by a respective axis of the plurality of axes; and</u>
Limitation 46(c)	detecting, by each of a plurality of detectors of the plurality <u>of sensor sections, a respective one of a plurality of different railcar conditions based on ones of the accelerations that are associated with only the respective axis of the plurality of axes; and</u>
Limitation 46(d)	by one or more communication management units associated with the one or more railcars:

Claim Limitation	Claim Language
	collecting, from the one or more wireless sensor nodes, data regarding said ~~one or more railcar~~ operational parameters of said one or more railcars;
Limitation 46(e)	analyzing said collected data <u>to detect a</u> [[for]] trend[[s]] or event[[s]] indicative of an anomalous operational condition of said one or more railcars; and
Limitation 46(f)	communicating a message to a remote receiver when said trend or event is detected.
Claim 47 Preamble	A system for detecting operational anomalies on a railcar that is part of a train consist comprising:
Limitation 47(a)	(a) at least one communication management unit (CMU) mounted on the [[a]] railcar in said train consist;
Limitation 47(b)	(b) at least two <u>wireless sensor</u> [[s]] <u>nodes</u> located on the [[said]] railcar <u>and</u> [[for]] configured to sense operational parameters of the railcar, said <u>wireless sensor</u> [[s]] <u>nodes</u> being in communication with said communication management unit, wherein the <u>at least two</u> ~~one or more~~ <u>wireless sensor</u> [[s]] <u>nodes</u> comprise <u>a tri-axis</u> ~~one or more~~ <u>sensor</u> [[s]] configured to measure accelerations of the railcar <u>along a plurality of axes comprising a first axis extending along a length of the railcar, a second axis extending across a width of the railcar, and a third axis extending along a height of the railcar;</u> and
Limitation 47(c)(i)	(c) <u>a plurality of</u> ~~one or more~~ <u>sensor sections that are provided with the one or more wireless sensor nodes and that comprise</u> <u>a plurality of filters that are each configured to filter at least a portion of the accelerations by receiving an output signal directly from the tri-axis sensor and selecting ones of the accelerations in the output signal that were measured in a dimension represented by a respective axis of the plurality of axes, and</u>
Limitation 47(c)(ii)	<u>a plurality of detectors respectively coupled to the plurality of filters, each one of the detectors being configured to detect a respective one of a plurality of different railcar conditions based on ones of the accelerations that are associated with only the respective axis of the plurality of axes;</u>
Limitation 47(d)	wherein said communication management unit performs the

Claim Limitation	Claim Language
	following functions: (i) receiving data from said <u>at least two wireless sensor</u> [[s]] <u>nodes</u> ;
Limitation 47(e)	(ii) drawing inferences from the data received from at least two <u>wireless</u> ~~of the~~ sensor[[s]] <u>nodes</u> regarding the performance of the railcar; and
Limitation 47(f)	(iii) communicating a message to a remote receiver when an anomaly is detected.
Claim 48 Preamble	The system of claim 47[[36]],
Limitation 48(a)	wherein said <u>tri-axis</u> sensors comprise accelerometers positioned at different locations of the railcar,
Limitation 48(b)	wherein said step of drawing inferences comprises the comparison of data from ~~two or more of~~ said accelerometers,
Limitation 48(c)	wherein said accelerometers are positioned on the railcar to provide data for carrying out one or more of the following functions:
Limitation 48(d)	(i) compare accelerations from one railcar wheel with that of another railcar wheel on the same axle but opposite side of the railcar,
Limitation 48(e)	(ii) compare accelerations from one railcar wheel with that of at least one other wheel on the same side of said railcar, and
Limitation 48(f)	(iii) compare accelerations from one railcar wheel with that of at least one other railcar wheel on the same side of said one railcar wheel and which other wheel is on another railcar of the same train consist.