

SIEMENS MOBILITY, INC., ET AL.
V.
METROM RAIL, LLC

Oral Arguments: March 28, 2024

IPR2023-00468 (Patent No. 9,043,131)

IPR2023-00470 (Patent No. 8,812,227)

Overview

- **Motions**
- **Person of Ordinary Skill in the Art ("POSITA")**
- **The Objective Indicia of Non-Obviousness are Compelling**
- **Specific Grounds**
 - Failure to make prima facie case
 - No motivation to combine references

Patent Owner's Motion to Supplement (Paper 37)

37 C.F.R. § 42.123 Filing of supplemental information.

- (b) Late submission of supplemental information. . . . The motion to submit supplemental information must show:
 - [1] why the supplemental information **reasonably** could not have been obtained earlier, and
 - [2] that consideration of the supplemental information would be in **the interests-of-justice**.

[1] Could Not Have Reasonably Been Obtained Earlier

- Exhibits 2030 and 2031: obtained Oct. 2023 and Petitioner previously refused production of similar documents.
- Exhibits 2032-36: newly relevant due to intervening event.
 - "Patent Owner's Motion was precipitated by an intervening event." *Hyberbranch Medical Tech., Inc. v. Incept LLC*, IPR2016-01836, Paper 58 at 7 (expert report in parallel district court case constituted an intervening event that "served to enlighten" patent owner as to the relevance of the supplemental information)

[2] The Interest of Justice

- Submission of new exhibits is in the interests of justice when those exhibits allow for a *more complete* record and when submissions will not delay the trial schedule. *See Sony Interactive Entertainment, LLC. v. Intellectual Pixels Ltd.*, IPR2020-01248, Paper 28 at 5

Petitioner's Motion to Exclude (Paper 54)

FRE 602 and 702

- **Rule 602. Need for Personal Knowledge**

- A witness may testify to a matter only if evidence is introduced sufficient to support a finding that the witness has personal knowledge of the matter. Evidence to prove personal knowledge may consist of the witness's own testimony.

- **Rule 702. Testimony by Expert Witnesses**

- A witness who is qualified as an expert by knowledge, skill, experience, training, or education may testify in the form of an opinion or otherwise if the proponent demonstrates to the court that it is more likely than not that:
 - (a) the expert's scientific, technical, or other specialized knowledge will help the trier of fact to understand the evidence or to determine a fact in issue;

Person of Ordinary Skill in the Art ("POSITA")

Petitioner POSITA:

- "[has] a background in wireless electronics, including at least a bachelor's degree in electrical engineering or a related field, and would have at least two years of experience with using such electronics for control systems applications such as collision-avoidance systems or positioning systems. Extensive experience and technical training may substitute for educational requirements, while advanced education such as relevant MS or PhD might substitute for experience."

Ex. 1003, ¶ 27.

Patent Owner POSITA:

- "[has] a bachelor's degree in electrical engineering with at least two years of experience in the field of designing safety systems for railroads. Such a person would have a general understanding of the challenges involved with developing railroad-specific safety and collision avoidance systems. They would also be familiar with prevailing technologies that were generally available and if those technologies were used in the railroad industry for safety and collision avoidance systems."

Ex. 2012, ¶ 37.

Carl Conti's Experience

Ex. 2012, pp. 52-54.

Carl E. Conti
180 Woodhaven Drive, Pittsburgh, PA 15228
E-mail: c.conti@sil4systems.com Mobile: 724-825-8351

ACHIEVEMENTS / SKILLS:

- 30 Years of Rail Transit Industry Leadership
 - Carbone Control Systems and Signaling
 - 25 years Safety Systems Platforms and Product Design, Development, Certification & deployment, including all RAMS activities
 - Lead SIL-4 Safety Development of First Driverless system in the USA - AP900 FSK Signaling System from Concept thru Certification, Installation & Commissioning (LACHTA)
 - SIL-2 Development / ISA on FDA Class II Medical Device, Medical Robotics and Wind Turbine Blade Pitch Control Robotics
 - Successful (\$20M+) Project Management
 - Defense/Aerospace: Designed MC68000 Single Board Computer (Yes, before VME) for MDAAC first-ever infrared imager (joint-services seeker)
- Industry-first Cyber Security Eco-System with on-board and TriAd mobile app bringing together 3 pillars of Cyber Security: People; Process; and Technology.
- Industry-first AI-enabled camera system (NeuralEye™) with advanced AI analytics and Automatic Passenger Counting
- Rail Transit Vehicle Expertise - ATP / ATD / ATP and signaling at US&S; Propulsion Design at ADtranz; EPIC Braking Systems Design at Wabtec; Event Recorders; Veh. Monitoring Systems & Communications.
- All LRV Systems Overhaul at TTA.
- Robotics - CHU Field Robotics Center; UBER ATC
- Publication: 2004/2011 Handbook of Optical and Laser Scanners

EXPERIENCE:

- SIL4 Systems Inc.** Pittsburgh, PA
Founder, President & CEO
President, CEO and Founder of company dedicated to building Embedded Safety & High Reliability Computing Platforms and Products including Safety Consulting, SIL-4 ATP/ATC/PTC Safety Platform and SIL-2 Brake Controller Application on entire Heavy Fleet at GCRTA. Pre-exciter and Fail-Safe Bandpass Filter design on entire Light Rail Fleet at GCRTA help keep their system safe and in operation. Industry first AI-enabled camera system (NeuralEye™) with advanced AI analytics and Automatic Passenger Counting for Rail Transit and Bus market. Industry-first Cyber Security Eco-System with on-board IDPS and TriAd mobile app bringing together 3 pillars of Cyber Security: People; Process; and Technology.
- Internationally recognized Safety Consulting (Canada, Brazil and USA) on ETHS/PTC/ATP and Brake Assurance Carbone Platforms (SIL-4) and Independent Safety Assessor (ISA) on SIL-3 Blade Pitch Control System (Architecture and Hardware / Software Design and all phases of development); FDA Class II Safety System Hardware and Software Design and Certification and Safety Assessment and consulting. Consulted on SIL-2 Gas meter and SIL-2 Medical Robot - architecture and Safety design processes. SIL-2 Safety design of embedded friction brake controller retrofit for an HRV fleet. Performed Safety Assessment of UBER ATC driverless car fail-over protection system.
- RVB-A; AECOM; Green Arrow Enterprise, LLC** Reston, VA; Miami, FL; Detroit, MI
Consulting Engineer - Veh. Systems & Signaling, Specification Compliance
Asked to consult from time to time on a variety of Rail Transit Vehicle Systems projects for clients that include Transit Authorities, Car-builders and Suppliers.
- GIGAHERTZ LLC** Pittsburgh, PA
VP of Engineering
Assisted a local medical firm to get an early prototype into production and FDA Class II approval. Hardware software and production Test set development along with V&V testing and documentation. All RAMS activities.
- UNION SWITCH & SIGNAL INC.** Pittsburgh, PA
Program Manager / Engineer
Program Manager for the 4 advanced technical product developments - Next Generation Cab ATP Event Recorder; RFID Positioning Tag; Communications Based Train Control (CBTC). Leading the group to FPGA based hardware architectures and designs. Developed and refined Safety Case for our programmable hardware design processes for

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safety systems per IEC-61508, DO-178B/254, FRA and EN50126/128/129 compliance and won an Ansaldo SignAward for innovation in 2007 - recognized across the worldwide corporation. RAMS engineer performing Systems Assurance for both Product and Application Safety, V&V activity.

TTA Systems, LLC Bath, NY
Vice President - Engineering and Programs
Mar 2003 - Jun 2005
Hired as Program Manager for the GCRTA full Light Rail vehicle overhaul program. I managed that program to production at half the engineering and indirect budget. I was promoted to Director of Railcar Overhauls in Sept. 2003 and to VP - Engineering and Programs in Feb. 2004.

- Assisted/guided recovery of 4 key programs while directing the GCRTA vehicle overhaul program.

ACCELIGHT NETWORKS Pittsburgh, PA
Lead Engineer - Hardware Development
Dec 2000 - Apr 2002
Lead Engineer responsible for design and development of our fabric switching card electronics. This included prototyping various topologies, verification and qual testing.

- Delivered board on schedule and met performance criteria for beta prototype system.
- Also, was the lead in performing fabric card/switch integration into the system for SuperComm demo and alpha system integration.

APPLIED ELECTRO-OPTICS (AEC) Pittsburgh, PA
Technical / Engineering Manager
2000
Technical Manager of all engineering activity including electrical design and optic switch development.

- Developed product prototypes for telecom and printing customer as well as internal R&D. Report was directly to the President and Founders.
- Managed all Engineering activity until acquisition by AccuLight Networks in Dec. 2000.

DAIMLER-CHRYSLER RAIL SYSTEMS (ADtranz) Pittsburgh, PA
Technical Manager: Logic Hardware Design, Test and Drafting Groups
1997 - 2000
Technical Manager of three groups concurrently:

- The Electronic Component Design Group of 14 Engineers responsible for all in-house component / circuit design relating to our Propulsion; Aux. Power & People Mover products/platforms sold worldwide.
- Manager of the Electronic Test Group, which is 17 Engineers responsible for all PCB test platforms/equipment. Also, manager of PCB drafting group (3 draftsmen) responsible for all PCB layouts.

UNION SWITCH & SIGNAL, INC. Pittsburgh, PA
Consulting Engineer, Research & Development Dept.
1992 - 1997
Lead hardware engineer, coordinated and contributed in design & development of US&S's pioneering audio frequency (FSK-modulated) SIL-4/fail-safe, signaling track circuits (train detection and communication) for LA Metro contract. It was US&S's first micro-processor based safety system.

- Set up field test site for development and testing.
- Performed all development testing from concept through release to production. Also responsible for all technical support, deployment, field set-up and installation of system on-site.
- Coordinated hardware V&V activity and lead the release to manufacturing.

CARNEGIE-MELLON UNIVERSITY - FIELD ROBOTICS CENTER Pittsburgh, PA
Consulting Engineer, CE Conti Consulting
1993 - 1994
Contracted to consult on Dante II robot development pertaining primarily to system architecture, design ruggedness and mission readiness. Also assisted in integration, test & design reviews with NASA/Jet Propulsion Lab reviewers.

- Designed, built and delivered five (5) VME-bus circuit boards performing motor/sensor/camera interface for the robot mission platform.

WESTINGHOUSE (WABTEC) Pittsburgh, PA
Sr. Design Engineer/Project Leader, Electronic Products Group
1989 - 1992
Project Leader/Lead designer of new product development from concept, customer/market research through complete HW design, included PCB layout, packaging, and manufacture of the TRACERTM Event Recording System - a "light recorder" product for the Railway Industry.

- Systems Electrical Engineer on EPIC (Electro-Pneumatic Integrated Control Brake controller for Rail Transit and Freight applications. Adapting existing pneumatic controls to electronic/processor-based control.

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CHARLES STARK DRAPER LABORATORY (M.I.T.) Cambridge, MA
Staff EE, Electronic Design Division
1985 - 1989
Engineer/Scientist, Electro-Optics Laboratory
1982 - 1985
Entire three years involved with development of Infrared (IR) scanning and imaging systems. Key member of group to establish and equip McDonnell Douglas Infrared Imaging Development Lab. Design 68000-based (before Jobs and Wozniak did) real-time DSP processor board and DSP pixel processing for resampling and offset correction.

- Our small R&D team (five members) designed / fielded the first McDonnell Douglas Imaging IR system.

EDUCATION:

MASSACHUSETTS INSTITUTE OF TECHNOLOGY | 2022
Professional Certificate in Cybersecurity
UNIVERSITY OF PITTSBURGH | 1995
The MBA Essentials Course and The Engineer As Manager
CARNEGIE-MELLON UNIVERSITY | 1989
Graduate EE Courses - Analog Linear Integrated Electronics
NORTHEASTERN UNIVERSITY | 1985 - 1987
6 Graduate Level EE courses - Signal Processing emphasis.
PENNSYLVANIA STATE UNIVERSITY | 1981
B.S. Electrical Engineering / Communications and Signal Processing

Expert at most International Embedded Safety System Design, Detailed Lifecycle Design Compliance & Certification:

- EN50126 | 2017: Railway Applications - The Specification of Reliability, Availability, Maintainability and Safety (RAMS).
- EN50128 | 2020: Railway Applications - Communications, Signaling and processing systems - Software for Control and Protection Systems.
- EN50129 | 2018: Railway Applications - Communications, Signaling and processing systems - Safety related Electronic Systems.
- FRA 49 / CFR Parts 209, 234, and 236: Standards for Development and use of Processor-Based Signal and Train Control Systems.
- IEC61508-1 thru -7: Functional Safety of Electrical/Electronic/ Programmable Electronic Safety-related Systems
- ISO26262 | 2018: Road Vehicles - Functional Safety
- EN50159: Safety Related Communications for Rail Transit
- IEC61601: Safety Requirements for Medical Electrical Systems
- IEC13849: Safety of Machinery
- IEC61511: Functional Safety - Safety Instrumented Systems for the process industry sector.
- DO-254: Design Assurance Guidance for Airborne Electronic Hardware.
- DO-178B: Software Considerations in Airborne Systems and Equipment Certification.
- IEC60987: Nuclear power plants - Instrumentation and control important to safety. Hardware design requirements for computer-based systems.
- IEC62138: Nuclear power plants - Instrumentation and control important for safety - Software aspects for computer-based systems (Cat B or C).
- MIL-STD-882: Dept. of Defense System Safety Standard

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Patent Owner's Motion to Strike (Paper 47)

Petitioner Cannot Add or Alter Grounds in their Reply

- “Petitioner may not submit new evidence or argument in reply that it could have presented earlier, e.g. to make out a *prima facie* case of unpatentability.”
PTAB Consolidated Trial Practice Guide (November 2019) at 73–75.
- Exhibit 1060 is offered on a *prima facie* issue – the scope and content of the prior art as related to Ground 2A.
- Petitioner did not submit Exhibit 1060 as supplemental evidence under 37 C.F.R. 42.123

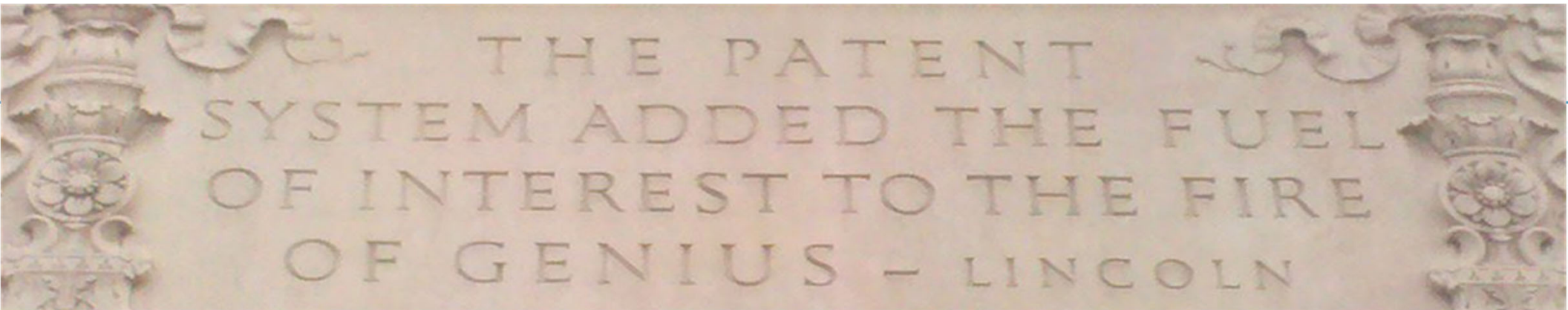
SIEMENS MOBILITY, INC., ET AL.
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Merits Argument

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Lincoln's Lectures on Discoveries and Inventions, 1858-59



THE PATENT
SYSTEM ADDED THE FUEL
OF INTEREST TO THE FIRE
OF GENIUS - LINCOLN

"Next came the Patent laws. These began in England in 1624; and, in this country, with the adoption of our constitution. Before then [these?], any man might instantly use what another had invented; so that the inventor had no special advantage from his own invention. The patent system changed this; secured to the inventor, for a limited time, the exclusive use of his invention; and thereby added the fuel of *interest* to the *fire* of genius, in the discovery and production of new and useful things."

Retrieved from <http://www.abrahamlincolnonline.org/lincoln/speeches/discoveries.htm> on March 13, 2024; citing R. Basler, *The Collected Works of Abraham Lincoln*, 1953.

35 U.S.C. Section 103 - Obviousness

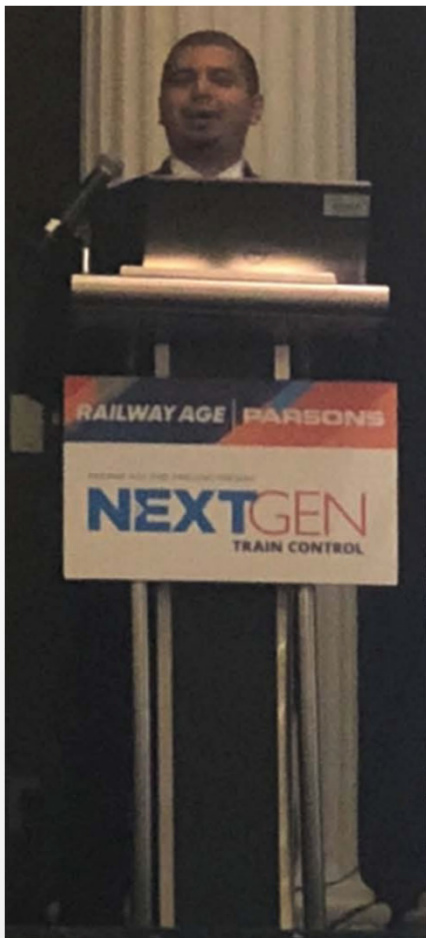
"A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made."

35 U.S.C. § 103.

"Under 103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background, the obviousness or nonobviousness of the subject matter is determined. Such secondary considerations as commercial success, long felt but unsolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented. As indicia of obviousness or nonobviousness, these inquiries may have relevancy."

Graham v. John Deere, 383 U.S. 1, 17-18 (1966).

The Inventions Are Objectively Not Obvious



From: Garcia, David <David.Garcia@parsons.com>
Sent: Friday, October 12, 2018 12:55 PM
To: Patel, Himanshu
Cc: Sara Woitel; Rick Carlson; Rick Carlson Jr.
Subject: NextGen - UWB Presentation Final Draft
Attachments: NextGen UWB Presentation_181018.pptx

Himanshu,
Attached is our final draft.

David Garcia
David.Garcia@Parsons.com - M: +1 312.402.8102

POR 6-15, Surreply 18-25

Person of Ordinary Skill

Person of Ordinary Skill (POSITA)

Petitioner

B. Level of Ordinary Skill in the Art

POSITAs would have had a background in wireless electronics, including at least a bachelor's degree in electrical engineering or a related field, and would have at least two years of experience with using such electronics for control systems applications such as collision-avoidance systems or positioning systems. EX1003, ¶¶23-28.

Patent Owner

industry specific reasons. *Id.* For that reason alone, the level of skill is lower than suggested by Petitioners. The hypothetical POSITA would have had a background in wireless electronics, including at least a bachelor's degree in electrical engineering or a related field, and would have at least two years of experience with using such electronics for control systems applications such as *railway* collision-avoidance systems or *railway* positioning systems. Ex. 2012 at ¶37. However, the hypothetical POSITA in this art would also be characterized as reluctant to innovate, a characteristic of this industry. *Id.* at ¶40.

Petition at 7, POR at 4-5, Conti Decl., Exhibit 2012 at ¶¶ 37, 40

Comparison between Mr. Andrews and Mr. Conti

Andrews (Exhibit 1003)	Conti (Exhibit 2012)
Professional Expert Witness Exhibit 2007 Tr. 13:11-14:2	Professional Railway Safety Consultant Exhibit 2012 at 52-54
Focuses on supporting IPR petitioners in the automotive space Exhibit 2005, 2007 Tr. 42:2-16	Focuses on developing and advising regarding railroad safety equipment <i>Id.</i> at ¶14 and p. 52, Exhibit 1053 Tr. 14:20-15:8, 24:18-26:22
Little, if any, experience in rail safety Exhibit 2007, Tr. 45:11-12, 20-22; 49:4-7	Nearly entire career in railway safety <i>Id.</i>
Primary source of income is patent litigation consulting Exhibit 2007 Tr. 13:11-14:2	Primary source of income is railway industry safety consulting <i>Id.</i>

POR at p.5

Compelling Indicia of Non-Obviousness

The Objective Evidence is Highly Probative

Indeed, evidence of secondary considerations may often be the most probative and cogent evidence in the record. It may often establish that an invention appearing to have been obvious in light of the prior art was not. It is to be considered as part of all the evidence, not just when the decisionmaker remains in doubt after reviewing the art.

Stratoflex, Inc. v. Aeroquip Corp., 713 F.2d 1530, 1538-39 (Fed. Cir. 1983)

Petitioners Opposed the Introduction of Objective Evidence at Every Opportunity

Opposed Patent Owners Motion for Additional Discovery (Paper No. 15)

Opposed Patent Owners Motion to Submit Supplemental Information (Paper No. 40)

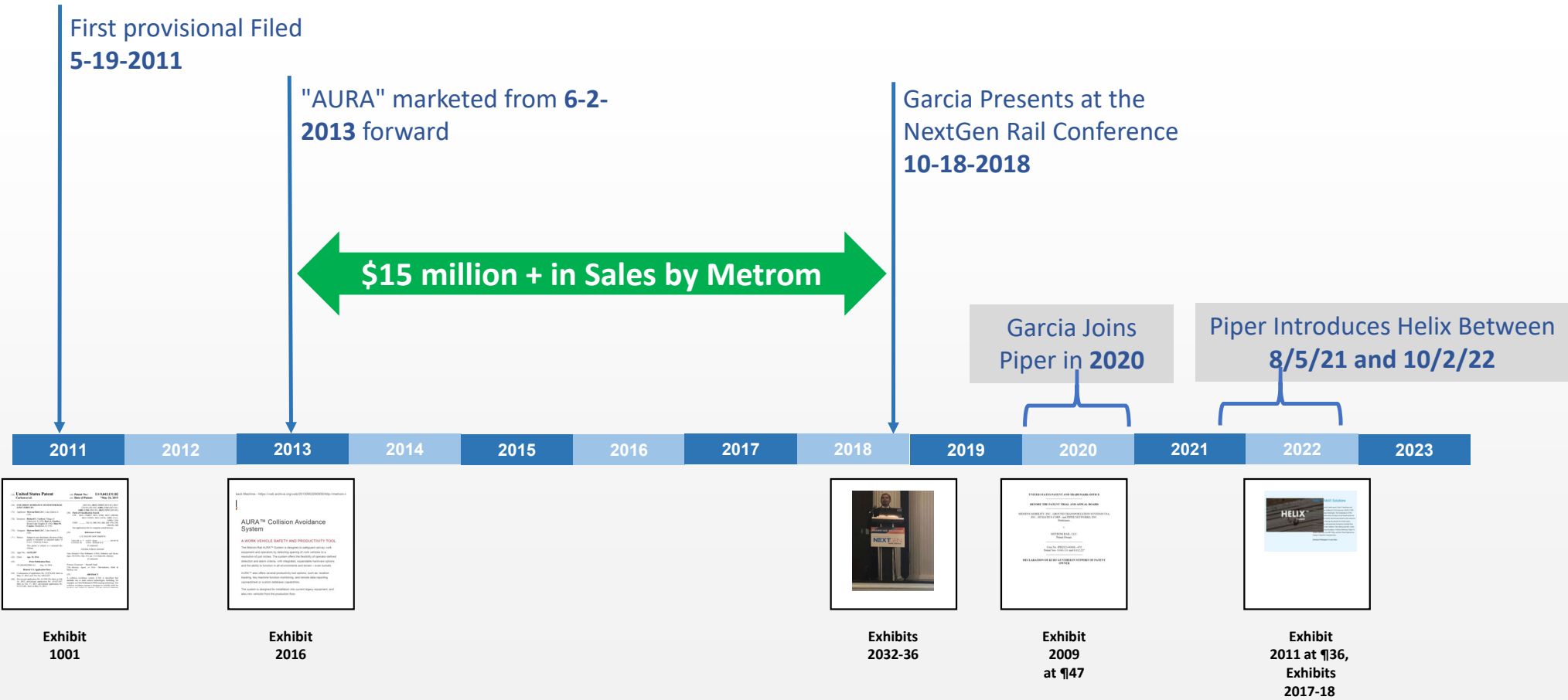
Moved to Strike Certain Opinions Regarding Objective Indicia by Conti (Paper No. 54)

Offered no Declarants in Response to Metrom's Copying and Industry Characteristics Evidence

Offered no Evidence Regarding the Content of Other Projects before Helix

PO Surreply at 19, 24-25

Metrom Invented, Achieved Success, and Was Then Copied



There is a Presumption of Nexus in this case – AURA is the invention Claimed and Disclosed

"As WBIP correctly argues, there is a presumption of nexus for objective considerations when the patentee shows that the asserted objective evidence is tied to a specific product and that product 'is the invention disclosed and claimed in the patent.'"

WBIP, LLC v. Kohler Co., 829 F.3d 1317, 1329 (Fed. Cir. 2016) (citing *J.T. Eaton & Co. v. Atl. Paste & Glue Co.*, 106 F.3d 1563, 1571 (Fed. Cir. 1997); *Crocs, Inc. v. Int'l Trade Comm'n*, 598 F.3d 1294, 1310-11 (Fed. Cir. 2010); *Brown & Williamson Tobacco Corp. v. Philip Morris, Inc.*, 229 F.3d 1120, 1130 (Fed. Cir. 2000); *Demaco Corp. v. F. Von Langsdorff Licensing, Ltd.*, 851 F.2d at 1392-93)

Evidence For Nexus

- **Declarations:** Cooklev (Exhibit 2011, ¶¶ 40-41); Gunther (Exhibit 2009, ¶¶ 19-21); Marchi (Exhibit 2008, ¶ 23)
- **Deposition Transcripts:** Marchi (Exhibit 1054, Tr. 146:13-148:20); Gunther (Exhibit 1052, Tr. 114:22-115:12; 192:6-193:3)
- **Additional Exhibits:** 2002 (Claim chart – reading on Petitioner Piper); 2013 (Sales collateral describing Piper's systems); 2016-20 (Sales collateral covering Piper's "Helix" and Metrom's "Aura" collision avoidance systems); Metrom sales collateral describing Aura); 2021-23 (Claim charts and comparisons); 2030-31 (Piper sales collateral distributed at NextGen Rail, November 2023)
- **No Reply Declarants**
- **No Responsive claim chart for Helix**

POR 14-15; PO Surreply 18-19; Paper 14 at 4; Paper 37 at 6

"To protect its inventions embodied in the AURA CAS, filed patent applications . . . These applications issued as the Asserted Patents."

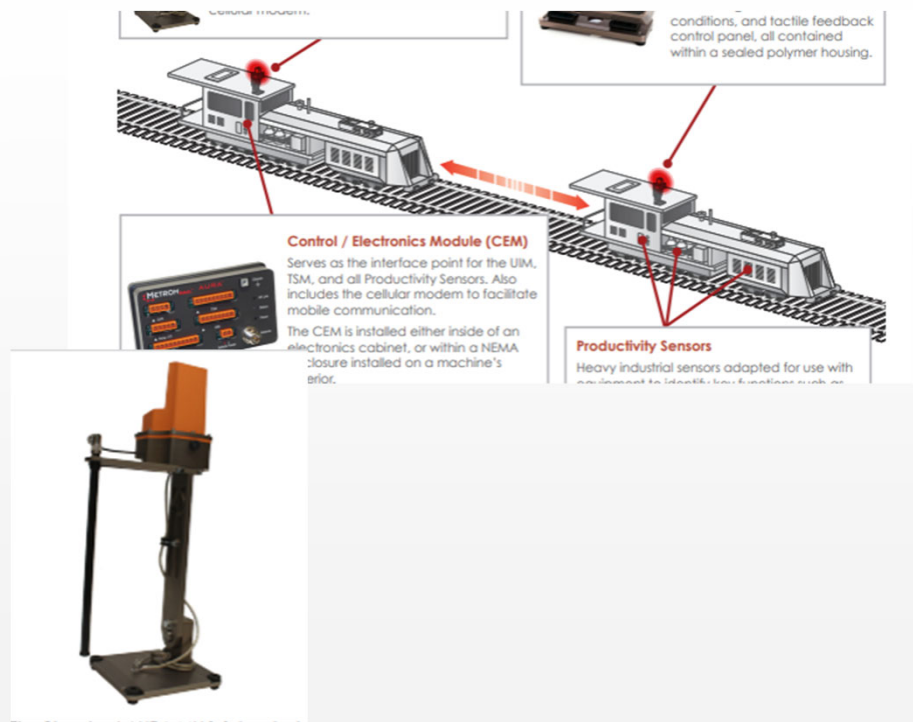
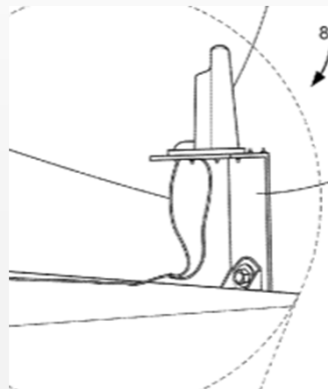
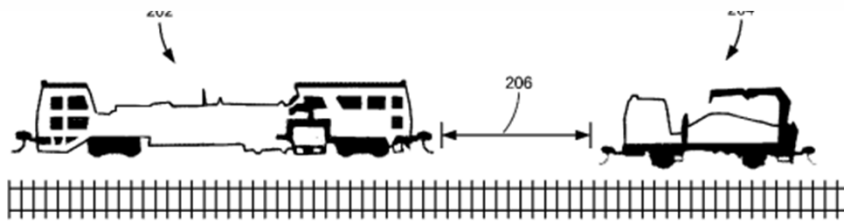


Exhibit 1001, pgs 1, 10; Exhibit 2016, pgs 5-6, Exhibit 2008 ¶ 23

AURA Is Purchased for Collision Avoidance, Not Unclaimed Features

22 Q Was the inclusion of this expandable hardware
23 options, as far as you know, was that important to
24 customers in the decision of whether or not to buy the
25 AURA CAS system?

1 A I doubt it, because they weren't really
2 necessarily aware of that. They were looking for a
3 Collision Avoidance capability. The importance of
4 those was more to us because it allowed us to deal with
5 variations in equipment that we experienced. So, as an

Exhibit 1052 (Gunther) Tr. 114:22-115:5; *See also* Exhibit 1054 (Marchi) Tr. 148:7-20

Long Felt Need

"Evidence of a long felt but unresolved need tends to show non-obviousness because it is reasonable to infer that the need would have not persisted had the solution been obvious."

WBIP, LLC v. Kohler Co., 829 F.3d 1317, 1332 (Fed. Cir. 2016)

Evidence for Long Felt Need

- **Declarations:** Conti (Exhibit 2012, ¶¶ 42-50); Gunther (Exhibit 2009, ¶ 19); Marchi (Exhibit 2008, ¶¶ 11, 15-16, 19, 23)
- **Deposition Transcripts:** Conti (Exhibit 1053, Tr. 24:18-26:22); Marchi (Exhibit 1054, Tr. 44:10-17; 45:21-46:9; 46:21-47:14; 48:16-21; 55:8-16); Gunther (Exhibit 1052, Tr. 36:16-37:4, 79:16-80:8)

Marchi – Nothing Else Worked

10 Q. Okay. What did you mean by that you
11 were familiar with it, then?

12 A. I was familiar with the dealings that I
13 had with the customers that told me they either had
14 products that they tried and didn't work or that
15 they didn't have any technology at all for
16 collision avoidance. That's where my knowledge
17 base comes from.

Exhibit 1054 (Marchi) Tr. 44:10-17

Skepticism of Others

"Doubt or disbelief by skilled artisans regarding the likely success of a combination or solution weighs against the notion that one would combine elements in references to achieve the claimed invention."

WBIP, LLC v. Kohler Co., 829 F.3d 1317, 1335 (Fed. Cir. 2016)

Evidence for Skepticism

- **Declarations:** Conti (Exhibit 2012, ¶¶ 41, 46, 48-49); Gunther (Exhibit 2009, ¶¶ 35-41); Marchi (Exhibit 2008, ¶ 11, 15, 19, 23)
- **Deposition Transcripts:** Conti (Exhibit 1053, Tr. 50:4-52:8; 98:10-100:15; 117:10-23; 126:5-127:2; 128:3-129:8; 154:7-155:9; 155:14-156:21; 157:11-159:6; 159:20-161:3; 161:24-162:14; 166:14-168:18); Marchi (Exhibit 1054, Tr. 44:10-17; 45:21-46:9; 46:21-47:14; 48:16-21; 55:8-16); Gunther (Exhibit 1052, Tr. 36:16-37:4, 79:16-80:8); Exhibit 2024
- **No counter-declarations**

POR 10-11, PO Surreply 19-21, Paper 57, Opposition to Motion to Exclude

Conti – Industry was Skeptical

3 Q. Can -- does that mean that it's your
4 opinion that there was no development in UWB in
5 2010?

6 A. No, but it was my opinion that it was
7 not obvious that UWB would be a strong candidate to
8 solve this problem coupled with the idea that I
9 hadn't heard of UWB while I was contemplating
10 various types of systems and coupled with the idea
11 that you'd have all this PTC activity going on and
12 from what I'm aware not a lot of them -- not a lot
13 of people that participated in that market used
14 UWB.

15 That's -- that was the strength of all
16 of this together, not just one article as, you
17 know, you're trying to, you know, characterize it
18 as --

19 Q. Well --

20 A. -- that it was not obvious that "UWB,
21 hey, this is a winner. My God, thank you for
22 this -- thank you for this band- -- bandwidth.
23 It's long overdue, and now we can seize the
24 moment."

1 No, it was -- it had a lot of
2 shortcomings and people were -- were not solving
3 those problems, they were actually finding they
4 were true and very difficult, and it didn't seem
5 like anybody was -- was using it, so I thought it
6 was a -- you know, it was not obv- -- not obvious
7 that that would be a winner here at this -- at this
8 period of time, so that's what I --

Exhibit 1053 (Conti) Tr. 128:3-129:8;

Paper 57 at 2-3

Gunther – Interference Concerns for Radios used with UWB

1 Q Who in particular voiced that concern?

2 A Again, I don't remember specific names, but I
3 was -- the same types of engineers when they would
4 bring in RF engineers and we'd be talking to them,
5 presenting to them, when you have an engineer from a
6 narrowband background, in their mind, you have a
7 dedicated frequency or you have some type of
8 interference mitigation system in place, and here
9 you're talking about transmitting over a two gigabit,
10 sorry, 2 gigahertz wide bandwidth. They get very
11 concerned because it's totally unlike what you do in
12 the narrowband realm. You don't do that. You avoid
13 common frequencies. And it's just a complete paradigm
14 shift that is difficult for conventional radio
15 engineers to understand.

Exhibit 1052 (Gunther) 141:1-15

Paper 57 at 3

Commercial Success

"When a patentee can demonstrate commercial success, usually shown by significant sales in a relevant market, and that the successful product is the invention disclosed and claimed in the patent, it is presumed that the commercial success is due to the patented invention."

J.T. Eaton & Co. v. Atl. Paste & Glue Co., 106 F.3d 1563, 1571 (Fed. Cir. 1997)

Evidence for Commercial Success

- Declarations: Cooklev (Exhibit 2011, ¶¶ 39-41); Gunther (Exhibit 2009, ¶ 16); Marchi (Exhibit 2008, ¶¶ 18-19, 22-23, 25-26)
- Deposition Transcripts: Marchi (Exhibit 1054, Tr. 146:13-147:22; 148:1-20); Gunther (Exhibit 1052, Tr. 94:1-18)
- Other Exhibits: 2016, 2019, 2021, 2022, 2023, Proposed Exhibit 2030 ("hundreds of Amtrak's . . . vehicles"), Proposed Exhibit 2031

POR 11-12, PO Surreply 21-22, Paper 37 at p. 6

Evidence for Commercial Success

Altogether, we estimate that the Aura CAS system protects all Canadian National and Canadian Pacific Railways MOW assets, in addition to systems at MOW contractors and CSX, comprising roughly 33% of mainline freight MOW equipment in the United States. Until Petitioner Piper entered this space in about 2022, Metrom had virtually 100% of the installed market for a radio based collision avoidance system between MOW vehicles.

Collision Avoidance and Detection

Work zones often include multiple MoW vehicles operating in close proximity to each other with bi-directional movements. It's imperative to monitor the front and rear of each of these vehicles to prevent collisions and damage. For this function Piper deploys its field-tested UWB solution. The Helix CPU uses its knowledge of which track the vehicle is localized to and communicates with other Helix-equipped vehicles on the same track using UWB in a localized fashion. The ranging data collected from the UWB sensors allows the Helix CPU to accurately track the distance between the two vehicles and warn both operators if they begin to encroach on their safety envelopes. Operators are able to view this proximity information through the in-cab display alerts that follow the rules for safe separation of vehicles in both work and travel modes.



Exhibit 2008 (Marchi Decl.) at ¶126; Exhibit 2031; Exhibit 2014

Copying

"The prior art was open to the Regina Corporation. Yet it has not adopted the Domestic device or followed the structure of the Bennett patent. To paraphrase the language of the Supreme Court in *Diamond Rubber Co. v. Consol. Rubber Tire Co.*, 220 U. S. at page 441, 31 S. Ct. 444, 55 L. Ed. 527, it gives the tribute of its praise to the prior art, the tribute of its imitation to the Clements invention."

Clements Mfg. Co. v. Regina Corp., 34 F.2d 931, 935 (2d Cir. 1929)

Evidence of Copying

- **Declarations:** Gunther (Exhibit 2009, ¶¶42-47); Marchi (Exhibit 2008, ¶¶ 27-29); Cooklev (Exhibit 2011, ¶¶ 34-39)
- **Deposition Transcripts:** Marchi (Exhibit 1054, Tr. 96:9-98:20, 150:18-154:8, 157:8-162:14); Gunther (Exhibit 1052, 94:1-18, 158:1-172:24)
- **Other Exhibits:** 2002, 2013, 2016, 2018, 2019, 2020, 2021, 2022, 2025, Proposed Exhibits 2030-2036
- **No Reply Declarants**

POR 12-14, PO Surreply 23-25, Paper
14, Paper 37, Paper 41

David Garcia – from Parson's/Metrom to Petitioners/Piper

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David Garcia

Vice President at Piper Networks
Dallas-Fort Worth Metroplex

Experience

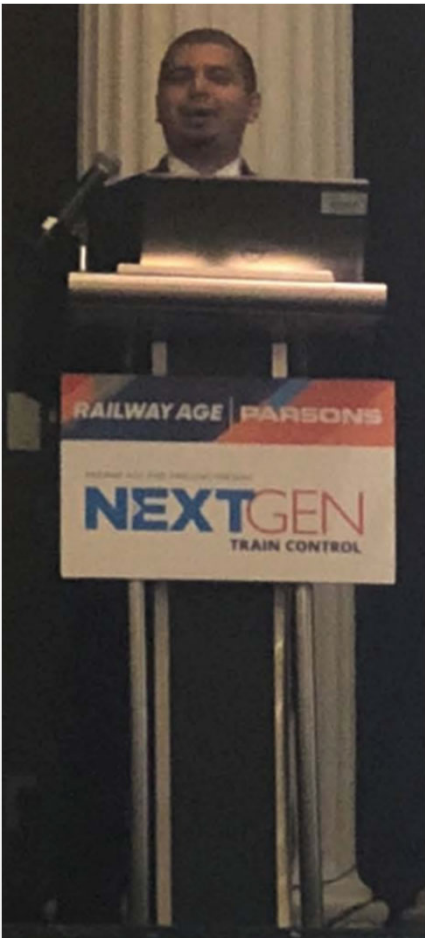
Piper Networks
Vice President

13 Q. My question is: Do you believe him to
14 be a thief who stole your technology?

15 A. I don't know if he's a thief. I -- I
16 don't know how to answer that question other than
17 to say I don't know what he did when he left our
18 offices and when he went to work for Piper, but I
19 know he had a full under-the-hood look at
20 everything that we do.

Exhibit 2025; Exhibit 1054, Marchi Dep. Tr. 157:13-20

Evidence of Copying – Metrom/Parsons-Parsons/Garcia-Garcia/Piper



9 The benefit of this technology include that it
10 is accurate with peer-to-peer ranging accuracy of two
11 centimeters. The technology is secure, and that low
12 power levels are virtually undetectable allowing for a
13 low probability of interception. Ultra wideband is
14 resistant to multipath distortion so that in highly
15 reflective environments, such as subways, the
16 technology uses better distance gains without
17 degrading accuracy.



12 So proving that it works. As noted before,
13 this product has been in service for over six years on
14 over 4,000 assets for collision avoidance. But beyond
15 that, Metrom Rail has done a number of demonstrations.

Exhibit 2035, 2036 page 2, Ins 9-17; page 7 lines 12-15, 2032 page 2

The Board Can Draw Adverse Inferences Against Petitioners

"The rule even in criminal cases is that if a party has it peculiarly within his power to produce witnesses whose testimony would elucidate the transaction, the fact that he does not do it creates the presumption that the testimony, if produced, would be unfavorable."

Graves v. United States, 150 U.S. 118, 121 (1893)

Evidence Controlled by Petitioners
David Garcia and Copying (Piper's Vice President)
Technical Evidence Regarding Helix (Piper)
Evidence Regarding Market Demand for Helix (Piper)
Evidence Regarding Failure and Skepticism in the Industry (All Petitioners)

Petitioners Failed to Meet Their Burden

Outline of Presentation

- Grounds 1A₁₃₁ and 3A₁₃₁: Claims 1 and 17 are not shown to be *Prima Facie* Obvious
 - No motivation provided to modify Grisham or Suzuki
- Grounds 1A₂₂₇, 2A₂₂₇, and 3A₂₂₇: Claims 1 and 17 are not shown to be *Prima Facie* Obvious
 - No motivation provided to modify Grisham or Suzuki
- Ground 1B₁₃₁: Claims 2-4 are not Unpatentable
 - Douglas does not "track a location"
- Ground 1C₁₃₁: Claims 5-6 are not Unpatentable
 - Motivation to combine is conclusory and lacks rational underpinning
- Ground 1D₁₃₁ and 3D₁₃₁: Claim 10 is not Unpatentable
 - Motivation to combine is conclusory and lacks rational underpinning

Outline of Presentation

- Ground 2A₁₃₁: Claims 7-8 are not Unpatentable
 - Motivation to combine is conclusory and lacks rational underpinning
- Grounds 2A₁₃₁ and 3A₁₃₁: Claim 17 is not shown to be *Prima Facie* Obvious
 - Neither Grisham nor Suzuki transmits separation distance
- Grounds 2B₁₃₁ and 3C₁₃₁: Claim 18 is not shown to be *Prima Facie* Obvious
 - Neither Grisham nor Suzuki is operable to receive calibration information
- Ground 2A₂₂₇: Claim 21 is not shown to be *Prima Facie* Obvious
 - Failure to articulate a motivation to combine references
- Ground 3A₂₂₇: Claim 24 is not shown to be *Prima Facie* Obvious
 - Neither Suzuki or Grisham communicates to determine a separation distance

Petitioners' Expert Admits that not all of his Opinions are Supported by Evidence

IV. MR. ANDREWS' CONCLUSORY OPINIONS SHOULD NOT BE ACCORDED ANY WEIGHT

The Challenged Claims are directed to railroad collision avoidance systems. Mr. Andrews and the Petition rely exclusively on obviousness to allege that the Challenged Claims are unpatentable. Petitioners' expert, Mr. Andrews, admits that he has no professional experience with railroad collision avoidance systems. *See e.g.*, Ex. 2007 (Deposition Transcript of Andrews, 08/28/2023) at 45:11-12 (“No, I haven’t worked on a collision avoidance system in a locomotive or on a locomotive.”); *see also id.* at 45:20-22 (“As a professional, I haven’t worked as a professional on a collision avoidance system on a train.”); 49:4-7 (“Q Yes. And that's the only time you've been on a locomotive, in a museum? A There may have been other times, but in some kind in an observer capacity, not as a professional.”).

Paper 22 (POR) at p. 5.

Petitioners' Expert Admits that not all of his Opinions are Supported by Evidence

Accordingly, because Mr. Andrews lacks any professional experience¹ with railroad collision avoidance systems, Mr. Andrews cannot testify based on his own personal experience or knowledge or the knowledge of a POSITA. Notwithstanding his lack of experience in this field, Mr. Andrews supports most of his opinions

Paper 22 (POR) at p. 6.

Petitioners' Expert Admits that not all of his Opinions are Supported by Evidence

regarding motivation to combine with unsupported conclusory assertions. And while Mr. Andrews admits that he has no experience to speak of with railroad collision avoidance systems, Mr. Andrews freely fills gaps in his analysis with the knowledge of a POSITA. But that perspective necessarily comes from his background in the automobile space, which Mr. Andrews asserts is a more sophisticated and challenging environment than the railroad space, which if credited proves the point: the level of skill in the railroad industry is lower in the area of collision avoidance. The Board should apply the lower level of skill advanced by Patent Owner and apply it through the lens of an industry that resists innovation and change.

Paper 22 (POR) at p. 6.

Petitioners' Expert Admits that not all of his Opinions are Supported by Evidence

Q What do you cite to?

A A person would have understood -- so I cite to what a POSITA would have known. There's a lot of background knowledge that people carry with them, and I don't have to cite to a separate reference for every single assertion that I make. If I understand what a person skilled in the art would have known, I can rely on that. Would have been obvious to someone that that would be the case.

Ex. 2007 (Andrews Dep. Tr. at 105:11-19)

Petitioners' Expert Admits that not all of his Opinions are supported by Evidence

Q You haven't cited to a reference that teaches or suggests the benefit of fusing UWB data with GPS data; is that correct?

A I've not cited to a specific reference for that, yes.

Q Sure. In fact, between paragraph 176 -- well, between 176 and 177 you've not cited to any reference other than the knowledge of a POSITA, correct?

A That's correct.

Q Okay.

Ex. 2007 (Andrews Dep. Tr. at 121:19-122:2

Petitioners' Expert Admits that not all of his Opinions are supported by Evidence

Q So is it fair to say you do not have personal experience with railroad collision avoidance equipment.

A I have personal experience, a great deal of personal experience, with collision avoidance systems. Whether they're applied to rail, vehicles, trucks or ships, is kind of irrelevant. I have a lot of experience in collision avoidance systems. Haven't worked specifically on one that was mounted to a train.

Ex. 2007 (Andrews Dep. Tr. at 46:5-12)

Ground 1B₁₃₁: Claims 2-4 are not Unpatentable*

Douglas does not “*track a location of the first vehicle mounted module and a location of the second vehicle mounted module*”

2. The collision avoidance system of claim 1, further comprising:

a central tracking unit in communication with the first vehicle mounted module and the second vehicle mounted module, wherein the central tracking unit is operable to track a location of the first vehicle mounted module and a location of the second vehicle mounted module.

Ex. 1001 at 31:13-20

the apparatus 20 of each of the trains.” *Id.*, 6:25-31. Because list of links **to be traversed** by and the direction of motion of each train disclose the path of trains, a POSITA would understand Douglas’s station-based apparatus *tracks the location* of the trains by repeatedly updating the trains’ paths. EX1003, ¶¶135-38.

Paper 5 (Pet.) at 21

*Grounds 1B₂₂₇ (Cl. 2-4), 2C₂₂₇ (Cl. 22, 27-28)

Ground 1B₁₃₁: Claims 2-4 are not Unpatentable* "links to be traversed" is not "track a location"

Douglas does not “*track a location* of the first vehicle mounted module and a location of the second vehicle mounted module”

(12) United States Patent Douglas et al.		(10) Patent No.: US 8,874,359 B2
		(45) Date of Patent: Oct. 28, 2014
(54) COLLISION AVOIDANCE METHOD, SYSTEM AND APPARATUS		USPC: 701/301; 701/19; 701/302
(75) Inventors: Antony Louis Piyakumar Douglas, Bangalore (IN); Deepa Felix, Quilon (IN); Denny Joseph, Bangalore (IN)		(58) Field of Classification Search CPC: G01S 13/94; G01S 13/931; G01S 2013/9353; G08G 1/16; B60T 7/22; B60W 30/09
(73) Assignee: Siemens Aktiengesellschaft, Munich (DE)		USPC: 701/301; 19, 469, 302, 300, 117; 246/182 R, 122 R, 125, 1 R, 3; 342/455, 342/557.34; 446/454
(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 573 days.		See application file for complete search history.
(21) Appl. No.: 13/264,198		(56) References Cited
(22) PCT Filed: Feb. 19, 2010		U.S. PATENT DOCUMENTS
(86) PCT No.: PCT/EP2010/052100		3,953,714 A * 4/1976 Gabillard 701/117
§ 371 (c)(1), (2), (4) Date: Oct. 27, 2011		4,864,306 A * 9/1989 Wita 342/42
(87) PCT Pub. No.: WO2010/118904		(Continued)
PCT Pub. Date: Oct. 21, 2010		FOREIGN PATENT DOCUMENTS
(65) Prior Publication Data US 2012/0035847 A1 Feb. 9, 2012		GB 2248512 A 4/1992
(30) Foreign Application Priority Data Apr. 13, 2009 (IN) 618/KOL/2009		RU 2288856 C2 12/2006
(51) Int. Cl. G08F 17/10 (2006.01) B61L 23/34 (2006.01) B60W 30/09 (2012.01) G01S 13/93 (2006.01) G08G 1/16 (2006.01) B60T 7/22 (2006.01)		(Continued)
(52) U.S. Cl. CPC: B61L 23/34 (2013.01); B60W 30/09 (2013.01); G01S 13/931 (2013.01); G08G 1/16 (2013.01); B60T 7/22 (2013.01); G01S 2013/9353 (2013.01)		Primary Examiner —Behrang Badi (74) Attorney, Agent, or Firm —Laurence A. Greenberg, Werner H. Siemer, Ralph E. Lecher
		(57) ABSTRACT A technique for avoiding collisions between trains includes equipping a plurality of trains each with a transceiver and broadcasting a signal periodically from the transceiver of each train. The signal contains a unique identification of a respective train and a unique identification of a track the respective train is moving on. The transceiver of each train receives the signal broadcasted by each of the other trains within a given range. The received signals are analyzed to extract the unique identification of each other train and the unique identification of the track each other train is moving on. It is determined if the track of the train receiving the signal and any of each other trains within the given range is the same and providing an indication if the track of the recipient train and any of other train within the range is the same.
		11 Claims, 13 Drawing Sheets

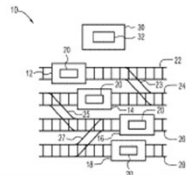


FIG. 7c illustrates a table containing the list including the links to be traversed by each of the trains and the direction of motion of the trains for the example illustrated in FIG. 7a. In the shown example of FIG. 7c, the list includes the links to be traversed by each of the trains. However, in an implementation, only the links to be traversed by a respective train and the direction of the respective train may be provided to each of the respective trains.

Ex. 1011 (Douglas)

*Grounds 1B₂₂₇ (Cl. 2-4), 2C₂₂₇ (Cl. 22, 27-28)

Ground 1C₁₃₁: Claims 5-6 are not Unpatentable*

5. The collision avoidance system of claim 1, wherein the first vehicle mounted module further comprises a first auxiliary transponder sensor module, the first auxiliary transponder sensor module mounted on the first rail vehicle with a first offset with respect to the first transponder sensor module.

Ex. 1001 at 31:28-32

While Grisham is capable of providing distance calculations at the location of the impulse radio modules, a POSITA would have understood that the trains contemplated by Grisham can be quite long (*e.g.*, over a mile) and thus that distance calculations at one point on the train would not adequately avoid collisions at other points on the train (such as the end of the train potentially over a mile away). *Id.*, ¶148. Because of this, a POSITA would have been motivated to supplement Grisham's single-UWB-transceiver-based system with other vehicle proximity detection systems, including Richardson's use of multiple UWB transceivers, that can account for the length of a train, particularly to prevent collisions at both the front and rear of the trains. *Id.* A POSITA also would have understood the benefits

Paper 5 (Pet.) at 26

*Grounds 3B₁₃₁ (Cl. 5-6), 1C₂₂₇ (Cl. 5-6), 3B₂₂₇ (Cl. 5-6)

Ground 1D₁₃₁ and 3D₁₃₁: Claim 10 is not Unpatentable*

Modifying Grisham/Suzuki with McDaniel will not avoid nuisance alerts

10. The collision avoidance system of claim 1, wherein the first vehicle mounted module executes an adaptive threshold feature that modifies one or more vehicle separation thresholds based on a speed of the first rail vehicle and a speed of the second rail vehicle.

Ex. 1001 at 31:28-32

Grisham's systems are intended to avoid collisions of any rail vehicle, regardless of speed. EX1003, ¶¶155-56. A POSITA would have understood that a collision-avoidance system would need a way of alerting an operator only to potential collision situations, not merely situations where a train is nearby, given the number of trains that can safely be positioned within feet of each other in, for example, a train yard. *Id.* A POSITA thus would have been motivated to incorporate McDaniel's adaptive threshold warning system for vehicle collision avoidance into the collision-avoidance system in order to accurately and effectively avoid collisions when rail vehicles are approaching at different speeds and to avoid nuisance alerts to the operator of the safe approach or close proximity of other trains. *Id.*

Paper 5 (Pet.) at 30-31

2D₂₂₇ (Cl. 10), 2E₂₂₇ (Cl. 16), 3E₂₂₇ (Cl. 10), 3F₂₂₇ (Cl. 16)

Ground 2A₁₃₁: Claim 17 is not shown to be *Prima Facie* Unpatentable*

Grisham does not “*send and receive data representing the separation distance*”

17. A rail vehicle module mountable on a first rail vehicle, the module comprising:
a transponder sensor module comprising:
a radio communication unit operable to employ time of flight techniques to detect a separation distance between the first rail vehicle and a second vehicle;
a first wireless communications antenna operable to send and receive data representing the separation distance over the air;

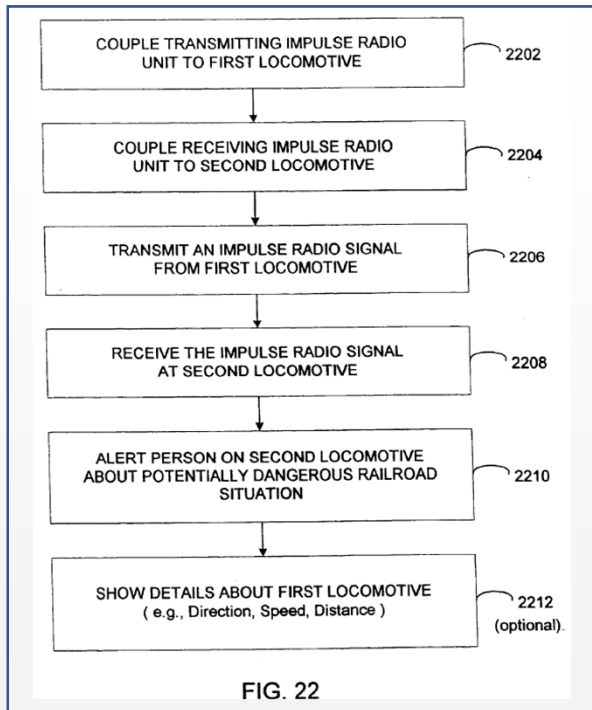
The radio units of Grisham continuously transmit and receive impulse radio signals wirelessly. See EX1006, FIG. 22, 23:42-47. The signals provide data such as direction, speed, and distance of each rail vehicle (showing the separation distance between trains). *Id.*, FIG. 22. As shown in FIGS. 6 and 7, Grisham details each component of impulse radios, which includes a “transmit antenna 624” and a “receive antenna 704.” *Id.*, 16:39-41, 59-60. Likewise, in the transceiver embodiment discussed in relation to claim 1 which achieves “substantial economy” by combining the transmitter and receiver, a single antenna 704 is used to send and receive data over the air. *Id.*, 17:44-48; EX1003, ¶192.

Pet. (Paper 2) at p. 40

*Claims 18-20 depend from Claim 17

Ground 2A₁₃₁: Claim 17 is not shown to be *Prima Facie* Unpatentable*

Grisham does not need to “*send and receive data representing the separation distance*”



Ex. 1006 (Grisham), Fig. 22

In addition, either display **1108a** or **1108b** is capable of showing (step **2210**) the direction, distance and/or speed of the oncoming first locomotive **1102**. To determine the distance that the first locomotive **1102** is from the second locomotive **2102**, a controller **1110** within the receiving impulse unit **904** can use the revolutionary positioning capabilities of impulse radio technology. In particular, the impulse radio signal **910** transmitted between the transmitting impulse radio unit **902** and the receiving impulse radio unit **904** enables the controller **1110** to measure distances to extremely fine resolution because of the absence of ambiguous cycles in the waveform of the impulse radio signal **910**.

Ex. 1006 (Grisham) at 23:64-24:8; Sur-reply at pp. 13-14

*Claims 18-20 depend from Claim 17

Ground 3A₁₃₁: Claim 17 is not shown to be *Prima Facie* Unpatentable*

Petition does not show that Suzuki “*send[s] and receive[s] data representing the separation distance*”

17. A rail vehicle module mountable on a first rail vehicle, the module comprising:

a transponder sensor module comprising:

a radio communication unit operable to employ time of flight techniques to detect a separation distance between the first rail vehicle and a second vehicle;

a first wireless communications antenna operable to send and receive data representing the separation distance over the air;

a global positioning system unit operable to receive information from one or more satellites to determine an absolute position of the first rail vehicle;

a control electronics module comprising a processor in communication with the transponder sensor module; and

a user interface module including a user interface operable to provide rail vehicle information to a vehicle operator and to receive input from the vehicle operator;

wherein the rail vehicle module communicates with a second rail vehicle module mountable on the second vehicle to detect a separation distance between the first rail vehicle and the second vehicle.

[17C] – Wireless Communications Antenna

Suzuki teaches the use of a wireless communications antenna to send and receive data over the air. *See supra* [1B] in Ground 3A; EX1003, ¶278. A POSITA would be motivated to use the single-antenna embodiment of Figure 2 in the in-vehicle radar device 110 because it would reduce the cost of antennas and save space inside of the vehicle mounted module. EX1003, ¶278.

Pet. (Paper 2) at p. 67

*Claims 18-20 depend from Claim 17

Ground 2C₁₃₁: Claim 18 is not shown to be *Prima Facie* Unpatentable

Prior art not shown to be "operable to receive calibration information related to . . ."

18. The rail vehicle module mountable on a first rail vehicle of claim 17, further comprising:
a second wireless communications antenna mounted on the first rail vehicle, wherein:
the second wireless communications antenna is mounted on the first rail vehicle at an offset from the wireless communications antenna; and
the rail vehicle module is operable to receive calibration information related to a length of the rail vehicle, a mounting location of the first wireless communications antenna, and a mounting location of the second wireless communications antenna.

I. Ground 2C – Claim 18 Obvious over Grisham, Nixon, and Richardson⁸

Claim 18 contains limitations that track the limitations of claims 5 and 6, and its limitations are satisfied for the same reasons as explained above for claims 5-6 in Ground 1C.

Pet. (Paper 2) at p. 42

5. The collision avoidance system of claim 1, wherein the first vehicle mounted module further comprises a first auxiliary transponder sensor module, the first auxiliary transponder sensor module mounted on the first rail vehicle with a first offset with respect to the first transponder sensor module.

6. The collision avoidance system of claim 5, wherein:
the first auxiliary transponder sensor module comprises a first auxiliary antenna, the first auxiliary antenna being connected to at least one of the first radio communication unit or a first auxiliary radio communication unit;
and
the first auxiliary antenna is mounted on the first rail vehicle with a first offset with respect to the first antenna.

Ground 3B₁₃₁: Claim 18 is not shown to be *Prima Facie* Unpatentable

Prior art not shown to be "operable to receive calibration information related to . . ."

18. The rail vehicle module mountable on a first rail vehicle of claim 17, further comprising:
a second wireless communications antenna mounted on the first rail vehicle, wherein:
the second wireless communications antenna is mounted on the first rail vehicle at an offset from the wireless communications antenna; and
the rail vehicle module is operable to receive calibration information related to a length of the rail vehicle, a mounting location of the first wireless communications antenna, and a mounting location of the second wireless communications antenna.

Claim 18 contains limitations that track the limitations of claims 5 and 6, and

its limitations are satisfied by Suzuki in view of Richardson or, alternatively Suzuki in view of Grisham and Richardson for the same reasons provided for claims 5-6 in

Ground 3B. *See also* Claim 18 in Ground 2C above.

Pet. (Paper 2) at pp. 73-74

5. The collision avoidance system of claim 1, wherein the first vehicle mounted module further comprises a first auxiliary transponder sensor module, the first auxiliary transponder sensor module mounted on the first rail vehicle with a first offset with respect to the first transponder sensor module.

6. The collision avoidance system of claim 5, wherein:
the first auxiliary transponder sensor module comprises a first auxiliary antenna, the first auxiliary antenna being connected to at least one of the first radio communication unit or a first auxiliary radio communication unit;
and
the first auxiliary antenna is mounted on the first rail vehicle with a first offset with respect to the first antenna.

Ground 3A₁₃₁: Claims 1, 7-8 , 11-14 and 17 are not Unpatentable*

Suzuki is not operable to communicate “*to detect/determine a separation distance between the first rail vehicle and the second vehicle*”

a second user interface module including a second user interface, the second user interface operable to provide rail vehicle information to the vehicle operator and to receive input from the vehicle operator;
wherein:
the first vehicle mounted module is operable to communicate with the second vehicle mounted module mounted on the second rail vehicle; and
the first vehicle mounted module and the second vehicle mounted module are operable to apply a time of flight technique to determine a separation distance between the first rail vehicle and the second rail vehicle.

Claim 1

17. A rail vehicle module mountable on a first rail vehicle, the module comprising:
a transponder sensor module comprising:
a radio communication unit operable to employ time of flight techniques to detect a separation distance between the first rail vehicle and a second vehicle;

wherein the rail vehicle module communicates with a second rail vehicle module mountable on the second vehicle to detect a separation distance between the first rail vehicle and the second vehicle.

Claim 17

* Claims 2-16 depend from Claim 1; Claims 18-20 depend from Claim 17
Ground 3A₂₂₇ (Cl. 1, 7-8, 11-14, 17-19, 24-25)

Ground 3A₁₃₁: Claims 1, 7-8, 11-14 and 17 are not Unpatentable*

Suzuki is not operable to communicate “*to detect/determine a separation distance between the first rail vehicle and the second vehicle*”

Suzuki teaches that if it detects its own vehicle ID in a received radar transmission, “the transmission timing and the reception timing obtained from the pattern detection part 134 are sent to the vehicle-to-vehicle distance measurement part 126, and then in the vehicle-to-vehicle distance measurement part 126 the value of a distance obtained *by multiplying the time difference between these transmission timing and reception timing by the speed of light is divided by two to thereby calculated the distance to a vehicle which reflected the radar wave . . .*”

EX1005, [0032] (emphasis added); *see also id.*, [0004]. This discloses using TOF (time of flight) to calculate a separation distance between the vehicles. EX1003,

Paper 5 (Pet.) at p. 58

*Claims 2-16 depend from Claim 1; Claims 18-20 depend from Claim 17

Ground 2A₁₃₁: Claims 7-8 are not Unpatentable*

No motivation to combine Grisham and Nixon to render the claims obvious

Also, a POSITA would have also understood that trains often operate in rail yards, where the trains maybe in close proximity to one another, but on different tracks. *Id.* In this situation using only a UWB radar to determine the proximity of another train would not have provided sufficient information to determine if the train represented a hazard. *Id.* A POSITA would have thus understood that using GPS location data to track the paths of the trains would allow the system to determine if those paths intersected at any point in the future, and thereby would assure a more robust and error free collision warning system. *Id.* [REDACTED]

Paper 5 (Pet.) at p. 37

*Ground 2A₂₂₇ (Cl. 7-8)

Ground 2A₁₃₁: Claims 7-8 are not Unpatentable*

No motivation to combine Grisham and Nixon to render the claims obvious

Both UWB and GPS provide positioning data, so it would have been readily apparent to a POSITA how to implement GPS into the radio units from Grisham. *Id.* Accordingly, a POSITA would have been motivated to implement a GPS receiver (*first GPS unit*) into Grisham's *first vehicle mounted module*. *Id.* A POSITA would have been motivated to communicate position data from a GPS receiver (*first GPS unit*) to Grisham's controller within its *first control electronics module* so the collision-avoidance system could account for the train's position, so that operators could see the train's position on a user interface, and so that the collision-avoidance system could communicate its train's position to other trains. *Id.*

Paper 5 (Pet.) at p. 37

*Ground 2A₂₂₇ (Cl. 7-8)

Ground 2A₁₃₁: Claims 9 is not Unpatentable*

No motivation to combine Grisham and Nixon to render the claims obvious

A POSITA would have been motivated to make Grisham's collision alarm systems more effective by distinguishing the alarm for collisions from other alarms, when the alarm is triggered, and what causes the alarm to change frequency, such as is taught by Nixon. EX1003, ¶187. A POSITA would have been motivated to modify Grisham to ensure a train operator can determine the proximity of an oncoming train and the urgency of when the operator needed to change the speed of the train, as specifically taught in Nixon. *Id.* Because Grisham already captures speed and distance information from other rail vehicles to trigger an alarm, a progressive alarm would simply and routinely be implemented into its system. *Id.*

Paper 5 (Pet.) at p. 58

*Ground 2A₂₂₇ (Cl. 9)

Ground 2A₂₂₇: Claim 21 is not shown to be *Prima Facie* Unpatentable

21. The rail vehicle module of claim 17, wherein the rail vehicle module is operable to utilize information generated by the radio communication unit and the global positioning system unit to determine whether one or more vehicle separation criteria are violated, and generate a progressive warn-

8. Claim 21 – UWB + GPS and Progressive Warning Signal

The limitations of Claim 21 track to Claims 8-9 and are satisfied by Grisham and Nixon for the same reasons provided for claims 8-9 in Ground 2A. EX1003, ¶¶197-98.

Paper 5 (Pet.) at p. 37

Ground 3A₂₂₇: Claim 24 is not shown to be *Prima Facie* Unpatentable

The limitations of [24E]-[24G] track to [1C]-[1F] and are satisfied by Suzuki alone or, alternatively, Suzuki in view of Grisham, for the same reasons provided in Ground 3A. EX1003, ¶¶308-10.

Pet. (Paper 2) at p. 67

[1C] a control electronics module comprising a processor in communication with at least the transponder sensor module unit; and

[1D] a user interface module including a user interface, the user interface being operable to provide rail vehicle information to a vehicle operator and to receive input from the vehicle operator; and

[1E] wherein each vehicle mounted module is operable to communicate with at least one other vehicle mounted module mounted on at least one other rail vehicle, and

[1F] wherein each vehicle mounted module is operable to apply a time of flight technique to determine a separation distance between the rail vehicles.

Claim 1

[24E] a control electronics module comprising a processor, the control electronics module being in communication with at least the transponder sensor module; and

[24F] a user interface operable to provide rail vehicle information to a vehicle operator and to receive input from the vehicle operator;

[24G] wherein each of the two or more rail vehicle modules communicate to determine a separation distance between each rail vehicle, and

Claim 24

*Claims 25-28 depend from Claim 24