

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SIEMENS MOBILITY, INC., GROUND TRANSPORTATION SYSTEMS
USA, INC., HUMATICS CORP., and PIPER NETWORKS, INC.
Petitioners,

v.

METROM RAIL, LLC,
Patent Owner.

Case No. IPR2023-00470

Patent No. 8,812,227

**DECLARATION OF CARL CONTI,
IN SUPPORT OF PATENT OWNER'S RESPONSE**

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I, Carl Conti, declare as follows:

I. INTRODUCTION

1. I have been retained in this matter by McAndrews, Held & Malloy, Ltd. on behalf of Patent Owner Metrom Rail, LLC. to provide technical assistance in the *inter partes* review (“IPR”) of the claims of U.S. Patent No. 8,812,227 (“the 227 patent”). I refer to the claims of the 227 patent collectively as the Challenged Claims.

2. I understand that Petitioners Siemens Mobility, Inc., Ground Transportation Systems USA, Inc., Humatics Corp., and Piper Networks, Inc. (“Petitioners”) petition for *inter partes* review of the 227 patent and requests that the Patent Trial and Appeal Board (“Board”) cancel the Challenged Claims.

3. This declaration is a statement of my opinions on issues related to the patentability of the Challenged Claims.

II. BACKGROUND AND QUALIFICATIONS

4. In forming my opinions, I relied upon my education, knowledge, and experience and considered the level of ordinary skill in the art as discussed below. A copy of my current *curriculum vitae* is attached to this Declaration, and it provides a comprehensive description of my academic and employment history along with papers and books that I have published and patent and patent applications of which I am listed as an inventor.

5. I received a Bachelor of Science degree in electrical engineering from

the Pennsylvania State University 1981 and did graduate EE work at Northeastern University in Boston, MA and Carnegie-Mellon University in Pittsburgh.

6. I have 40+ years (1982-2023) of hands-on experience developing technology-driven embedded systems for leaders in industries such as:

- Defense / Aerospace: McDonnell-Douglas Astronautics; Draper Lab/MIT
- Academia: Penn State; Carnegie-Mellon University (CMU) and MIT;
- Robotics: CMU's Field Robotics Lab and Uber ATC
- Rail Transit: Wabtec; Union Switch & Signal; Ansaldo Trasporti; ADtranz; Daimler-Chrysler Rail Systems; and Bombardier Transportation among others.

7. With each I've had to advance the state of the art, as Metrom did with UWB at the time, so I am keenly aware of the challenges associated with making emerging technology work in a unique way.

8. At McDonnell-Douglas Astronautics, I designed a MC68000 single-board computer ahead of when Wozniak released his with Apple. It was needed to do real-time infrared image processing and non-linearity correction for the Joint Services (AF and Marines) seeker system. We won the down-select contract.

9. At Carnegie-Mellon's Field Robotics Lab, I was asked to consult on building rugged-high reliable electronics and after a meeting with CMU's FRC and RedZone (the famous robot-development leader Red Whitaker) and NASA

representatives, I told them they needed to completely redesign their input / output scheme to avoid high current ground loops among other observations from their failed Dante I project. The result was, they asked me to design 4 boards for the 6 board system and a back-up CPU for fault mitigation. As a result, I delivered 5 boards that were used in the successful Dante II mission.

10. At Union Switch & Signal, as Lead engineer, I coordinated and contributed in design & development of US&S's pioneering audio frequency (FSK-modulated) SIL-4/fail-safe, signaling track circuits (train detection / location and communication of speed restrictions and other data) for the LA Metro contract. It was US&S's first micro-processor based safety system and the first driverless-capable system in the US.

11. I also led the set up field test site for development and testing and performed all development testing from concept through release to production. Also responsible for deployment, field set-up and installation of system on-site and commissioning.

12. I was also deeply involved in the safety design of their MICROLOK II and Next Generation Cab Signaling products including a PTC prototype for a trial installation in Alaska.

13. Currently, I am the CEO of SIL4 Systems Inc., a company I founded in 2009, dedicated to the design and development of fail-safe and mission-critical

embedded systems targeting multiple markets however, primarily Rail Transit.

14. In those 14 years, I pioneered products in the Rail Transit market such as:

- SIL-level 2 Electronic Brake Control Unit – which is running on the entire Heavy Rail Fleet of GCRTA and has been for 6+ years
- Pre-Exciter: High Voltage / High current power supply that controls the field current to the traction motor during dynamic braking
- Fail-safe Band-Pass Filter: 4550Hz Fail-safe BPF
- High Density/High Speed Crash-hardened Memory Module
- AI-enabled camera system with advanced video analytics and Automatic Passenger Counting
- Cyber Secure Vehicle Network and a Cyber Security Eco-System that includes an On-board Intrusion Detection System (IDPS) and TriAD mobile application.

15. My company, SIL4 Systems, Inc., is being compensated for my time in connection with this matter at my standard consulting rate, which is \$250 per hour, plus reimbursement for actual expenses. My compensation is not dependent in any way upon the outcome of this matter.

III. MATERIALS CONSIDERED

16. In preparing this Declaration, I have reviewed the 227 patent and considered the following documents, as well as my own knowledge of the art:

Exhibit	Description
1001	U.S. Patent No. 8,812,227 to Carlson et al.

Exhibit	Description
1002	File History of the 227 Patent
1003	Declaration of Scott Andrews and the patents and articles cited in support therein
2007	Final Deposition Transcript of Scott Andrews, dated August 28, 2023
2008	Declaration of James Marchi
2009	Declaration of Kurt Gunther
2013	Web page – www.pipernetworks.com , retrieved on September 8, 2023
2019	AURA MOW Product Specification
Paper 11	Decision Granting Institution of Inter <i>Partes</i> Review (“ID”)

IV. LEGAL UNDERSTANDING

17. I am not an attorney, and I render no opinions on the law itself. My opinions are informed by my understanding of the relevant law as has been provided to me by counsel. I understand that the patentability analysis is conducted on a claim-by-claim and element-by-element basis.

18. I understand that, in this *inter partes* review, Petitioner has the burden of proving that each challenged claim is unpatentable by a preponderance of the evidence.

19. I understand that earlier patents and publications may render a patent unpatentable as anticipated under 35 U.S.C. §102 or obvious under 35 U.S.C. § 103. I understand Petitioner is only relying on obviousness in this proceeding.

A. Anticipation

20. I understand that a patent claim is unpatentable and invalid if the claim is “anticipated” by the prior art. I understand that a claimed invention is not novel or is anticipated if:

(i) the invention was known or used by others in this country, or was patented or described in a printed publication in this or a foreign country, before the invention by the patent applicant;

(ii) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country more than one year prior to the date of the application for patent in the United States; or

(iii) the invention was described in a published patent application by another filed in the United States before the invention by the applicant for patent; or

(iv) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the Patent Cooperation Treaty shall serve as prior art only if the international application designated the United States and was published under the treaty in the English language.

21. I understand that anticipation occurs when a single piece of prior art describes every element of the claimed invention, either expressly or inherently, arranged in the same way as in the claim. I understand that, for inherent anticipation,

it is required that the missing descriptive material is necessarily present in the prior art.

B. Obviousness

22. I further understand that a patent claim is unpatentable and invalid if the subject matter of the claim as a whole would have been obvious to a person of ordinary skill in the art (“POSITA”) of the claimed subject matter as of the time of the invention at issue. I understand that obviousness may be shown by considering more than one item of prior art or the knowledge of a POSITA.

23. I understand that the following factors should be evaluated to determine whether the claimed subject matter is obvious: (1) the scope and content of the prior art; (2) the difference or differences, if any, between each claim of the patent and the prior art; (3) the level of ordinary skill in the art at the time the patent was filed; and (4) the objective evidence of non-obviousness, also referred to as secondary considerations (described below).

24. I understand that a prior art reference is proper to use in an obviousness analysis if the prior art is analogous art to the claimed invention. I understand that a prior art reference is analogous art if at least one of the following two considerations is met: (1) the prior art reference is from the same field of endeavor as the claimed invention, even if the prior art reference addresses a different problem and/or arrives at a different solution; (2) the prior art reference is reasonably pertinent to the

problem faced by the inventor, even if it is not in the same field of endeavor as the claimed invention.

25. I understand that it must be shown that a POSITA at the time of the invention would have had a reasonable expectation that a modification or combination of one or more prior art references would have succeeded. I further understand that a claim may be obvious in view of a single prior art reference, without the need to combine references, if the elements of the claim that are not found in the reference can be supplied by the knowledge or common sense of one of ordinary skill in the relevant art. Moreover, I understand that, to establish obviousness based on combining multiple embodiments from a single reference, there must be a motivation to make the combination and a reasonable expectation that such a combination would be successful.

26. I also understand that there should be a reason, suggestion, or motivation in the prior art that would lead a POSITA to combine the prior art references, and that would also suggest a reasonable likelihood of success. The reasons for combining references stem (explicitly or implicitly) from, for example: (a) the prior art references themselves; (b) the prior art as a whole; (c) the knowledge, common sense, and creativity of those of ordinary skill in the art; (d) the nature of the problem to be solved; (e) the demands in the design community and/or the market place; (f) the simple and predictable substitution of one known element for another

in accordance with their known functions; (g) the application of a known technique or method to a piece of prior art ready for improvement; (h) the obviousness of trying the combination; and/or (i) the general needs and problems in the field. For example, when there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a POSITA has good reason to pursue the known options within his or her technical grasp. If this leads to the anticipated success, it is likely the product is not of innovation but of ordinary skill and common sense. I also understand that, if a technique has been used to improve one device, and a POSITA would recognize that it would improve similar devices in the same way, using the technique is obvious unless its application is beyond his or her skill.

27. I understand that “objective indicia of non-obviousness,” also known as “secondary considerations,” are also to be considered when assessing obviousness if present. These include commercial success; long-felt but unresolved need; failure of others to solve the problem that the inventor solved; unexpected results; copying of the invention by others; and industry recognition or expressions of disbelief by experts in the field of the claimed invention. I also understand that a nexus, i.e., a tie, must exist between objective indicia of non-obviousness and the novel aspects of the claimed subject matter.

28. I understand that the test of obviousness is whether the claimed

invention, as a whole, would have been obvious to one of ordinary skill in the art as of the date of the invention in light of the prior art. I understand that the use of hindsight must be avoided when considering whether the alleged invention would have been obvious to the POSITA.

29. I understand that in determining obviousness, the POSITA is a person of ordinary creativity, not an automaton. I understand that, when there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a POSITA has good reason to pursue the known options within his or her technical grasp.

30. I understand that a dependent claim incorporates each and every limitation of the independent claim from which it depends. Thus, I understand that if a prior art reference fails to anticipate an independent claim, then that prior art also necessarily fails to anticipate all dependent claims that depend from the independent claim. Similarly, I understand that if a prior art reference or combination of prior art reference fails to render obvious an independent claim, then that prior art reference or combination of prior art references also necessarily fails to render obvious all dependent claims that depend from that independent claim.

C. Claim Construction

31. I understand that “claim construction” is the interpretation of the meaning of patent claims. I understand that claims in this *inter partes* review

proceeding are generally given their ordinary and customary meaning, which is the meaning they would have to a POSITA at the time of the invention, in light of the specification and file history.

32. I understand that many sources can be used to assist in understanding the meaning of a claim including the claims themselves, the specification, the prosecution history, and extrinsic evidence concerning scientific principles, the meaning of technical terms, and the state of the art.

33. In this declaration, I am using the ordinary meaning of the claims as I interpret them. In my review, I did not see anything in the patent or the file history that suggests that the claims mean anything other than what the ordinary meaning would have been to a person in this art at the time the patent application was filed.

V. LEVEL OF ORDINARY SKILL IN THE ART

34. I have been asked to analyze the 227 patent and the references discussed herein from the perspective of a POSITA at the time of invention. I understand that, for purposes of this *inter partes* review, the time of invention is assumed to be the 227 patent's priority date, which is May 19, 2011, however my opinion would be the same if the priority date of the utility application, May 17, 2012, is used.

35. I understand that a POSITA of the 227 patent is a hypothetical person who is presumed to be aware of pertinent art including knowledge in the art, thinks along conventional wisdom in the art, and is a person of ordinary creativity. I

understand that this hypothetical POSITA is considered to have the normal skills and knowledge of a person in the technical field.

36. I understand that factors that may be considered in determining the level of ordinary skill in the art include: (1) the education level of the inventor; (2) the types of problems encountered in the art; (3) the prior art solutions to those problems; (4) the rapidity with which innovations are made; (5) the sophistication of the technology; and (6) the education level of active workers in the field.

37. In my opinion, a POSITA relating to the subject matter of the 227 patent would be an individual having 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.

38. I believe that I am qualified to provide opinions about how one of ordinary skill at the time of the inventions of the 227 patent would have interpreted and understood the 227 patent and evaluate if a POSITA would have been motivated to combine the prior art references cited by Mr. Andrews to arrive at the Challenged Claims.

39. As set forth, in the prior section (§II), I have a Bachelor of Science degree in Electrical Engineering. I have significant work experience designing safety systems for railroads. I also have significant hands-on experience designing embedded hardware and software for various applications, including railroad applications. I have personal knowledge of the challenges faced in bringing new products to the railroad market. I have personal knowledge of the challenges involved with developing railroad-specific safety and collision avoidance systems. I am familiar with prevailing technologies that were generally available in 2011 and the use of those technologies in the railroad industry for safety and collision avoidance systems

40. Mr. Andrews describes the POSITA at the time of the inventions as someone who:

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. Extensive experience and technical training may substitute for educational requirements, while advanced education such as relevant MS or PhD might substitute for experience. This person would have been capable of understanding and applying the teachings of the '227 patent and the prior-art references discussed in this declaration.

Mr. Andrews' definition of a POSITA is not commensurate with the scope of the inventions. Innovation in the railroad industry is slow and the industry is resistant to

change. The Challenged Claims are directed to collision avoidance in the railroad industry. Mr. Andrews definition does not even mention the word railroad, the person he describes is not typical for an ordinary engineer in the railway safety space, and Mr. Andrews professional background is in the automotive space, not the railroad art. The rail industry as a whole is quite resistant to change. In part, due to the age and conservative nature of the leaders and established culture within the industry and its institutions. But also due to the inertia of a set of established suppliers as well as dated infrastructure that is interdependent with the vehicles, that renders the rail industry reliant upon these established suppliers continued support and maintenance. This severely impedes the “rapidity with which innovations are made” when relating to a person of “ordinary skill”. Further safety systems must undergo rigorous formal development lifecycle processes as well and sophisticated failure analysis to not only mitigate random faults of componentry but also systematic faults borne of human error in the development phases. Safety systems in particular have a design lifecycle that is 2-3 times as long as a non-safety system, as well as a requirement of “proven-in-use”, backwards looking reliability analysis, and typically a requirement for inter-operability with existing equipment. Thus, I believe my definition of a POSITA is more accurate and appropriate.

VI. GROUND 1A: GRISHAM DOES NOT RENDER CLAIMS 1, 11, AND 14 OBVIOUS

A. Claim 1

41. Mr. Andrews uses Grisham alone for his obviousness analysis on these claims, urging that the level of skill in the art fills any gaps in the Grisham reference. I do not agree. The practical reality of the art in 2011-12 was such that it was not at all obvious to implement Metrom's 227 patent invention. I have asked to opine on the state of railroad collision technology and UWB at the time of the invention. As explained below, there was a long-felt need for a reliable radio based railroad collision avoidance system. There was also a general skepticism and reluctance with using UWB.

42. The railroad industry has long had a need to prevent collisions. For decades, collision prevention has been based on visual rules and block occupancy. These systems use visual signals, track circuits, and in more modern times, narrow band radio to communicate train orders and movement authority. For Maintenance of Way (MOW) equipment specifically, as of 2011 I was not aware of any system for preventing collisions between MOW vehicles other than work rules based on maintaining visual spacing between MOW vehicles.

43. In 2002, the FCC had announced an allocated frequency spectrum that had been appointed for commercial Ultra Wide-Band (UWB) use, which was defined as 3.1 GHz to 10.6GHz. In 2004, IEEE had defined and published a standard

by which to communicate over UWB (IEEE P802.15: Wireless Personal Area Networks). During and after the initial FCC specification of the UWB radio bands and IEEE specifications, before the shortcomings of UWB had been explored fully, many initial features were proposed for the technology as follows.

- Two way time of flight (UWB RADAR);
- Two way time of flight (transponder);
- Time Difference of Arrival (TDOA);
- Direction of Arrival (DOA);
- TDOA augmented with Direction of Arrival;
- GPS Augmentation

44. Because of the hope for potential improvements over current technology in the radio communications industry and the potentially high communications bandwidth (100MB/s), proposals for using UWB have been considered across many industries, and a variety of potential designs and applications were proposed, but not implemented..

45. Over the following 5-10 years, UWB did not live up to the potential that had been initially conceived. In 2012, the following was published about the implementations of UWB up and to that point (U.S. Dept. of Transportation Intelligent Transportation Systems Joint Program Office, 2012):

- UWB is an inherently low-powered signal, and thusly cannot travel

over large distances (>100 meters).

- UWB generates an inherently noisy signal, and this is likely to disrupt communications.
- UWB requires precise coordination of transponder positions and coordinating of ranges, and had been found to be rather impractical for real-world use-cases.
- If there is no direct path between UWB Transmitter & UWB Receiver, the accuracy of the distance measurement can decrease from ~50cm to 1 meter.
- Ranging requires expensive UWB beacons & responders, not a universal ranging application.

46. Because of the failure of initial implementation of UWB, by 2010-2012, most experts in radio communications across many, if not all, industries had declared UWB dead (Lande, 2022) (Ex. 2024). Most, if not all, of the initial use-cases proposed for the UWB communications had not taken the later-found shortcomings of the technology into account, and were thusly either not taken to market, or when taken to market had failed commercially.

47. By 2011-12, UWB had been relegated to mostly an academic endeavor, and companies that had been researching the technology and attempting to develop products and turn a profit had stopped by this time, especially in the Rail Transit

industry.

48. A POSITA in this art in 2012 may have never heard of the technology, as it was not commonly used in systems in rail transit. As compared to other commonly used technologies at the time, UWB was not common, even in other industries, and as such, was not an obvious choice for a safety system implemented in the rail environment.

49. The history of “Positive Train Control” or “PTC” is illustrative of how the industry has not generally embraced new technology for collision avoidance. For example, while it has long been recognized that failure to obey visual signals and operating rules is a significant risk for train operation, a cost effective solution at scale has eluded the industry. In 2008, Congress passed and the President signed the Rail Safety Improvement Act of 2008¹ requiring PTC systems to be fully implemented by December 31, 2015, on Class I railroads’ main lines that transport poison- or toxic-by-inhalation hazardous materials and any main lines with regularly scheduled intercity or commuter rail passenger service. In October 2015, Congress extended the deadline for full implementation by at least three years to December 31, 2018, and required FRA to approve any railroad’s request for an “alternative schedule and sequence” with a final deadline not later than December

¹ <https://railroads.dot.gov/research-development/program-areas/train-control/ptc/positive-train-control-ptc>

31, 2020, if a railroad demonstrated it met certain statutory criteria by December 31, 2018(US DOT, 2023). On December 29, 2020, FRA announced that PTC technology is in operation on all 57,536 required freight and passenger railroad route miles, prior to the December 31, 2020 statutory deadline set forth by Congress. (US DOT, 2023) None of the implemented solutions uses a terrestrial radio for train position, and I am aware of no proposals for implementing PTC in this way in 2012.

50. To summarize these points, by 2012, there had been long felt but unresolved needs in the market relating to improved collision avoidance in the rail industry field generally and for MOW specifically, there had been the failure of every other UWB/RADAR communications system so far to go to market, experts by 2010 had declared UWB dead (Lande, 2022), and the largest practical opportunity to implement a new collision avoidance system in the industry did not use UWB or any other form of terrestrial radio for location/ranging determinations. A POSITA would not have had any motivation to employ UWB technology up to this time, as it had been demonstrated to be not successful and panned by experts.

51. At least for these reasons, claim 1 is not obvious.

B. Claim 11

52. Claim 11 depends from independent claim 1 and is not obvious at least for the same reasons that claim 1 (Ground 1A) is not obvious.

C. Claim 14

53. Claim 14 depends from independent claim 1 and is not obvious at least for the same reasons that claim 1 (Ground 1A) is not obvious.

VII. GROUND 1B: OBVIOUSNESS OF CLAIMS 2-4 OVER GRISHAM AND DOUGLAS

54. Claim 2 depends from claim 1 and claims 3 and 4 depend from claim 2. Claim 2 recites in relevant part “a central tracking unit . . . , wherein the central tracking unit is operable to track the location of at least the first vehicle mounted module and the second vehicle mounted module.” Because claims 3 and 4 depend from claim 2, I understand that claims 3 and 4 also include the central tracking unit claimed by claim 2. Accordingly, my analysis of this claim 2 applies equally to claims 3 and 4.

55. Claims 2-4 require that the central tracking unit (CTU) is operable to track a location. Mr. Andrews maintains that the combination of Grisham and Douglas renders claims 2-4 obvious. Ex. 1003 at ¶¶133-142. Mr. Andrews does not allege that Grisham discloses the claimed central tracking unit. For the claimed central tracking unit functionality Mr. Andrews relies on the disclosure of Douglas.

Id. Specifically, Mr. Andrews states that:

Douglas discusses “avoiding collisions between trains.” EX1011, Abstract. Douglas teaches an “apparatus 32 located at the station 30,” which broadcasts the location of trains within a certain range (via a list of links to be traversed by and the direction of motion of each train).

Id., 4:32-49, 7:10-12. “The apparatus 32 typically, comprises a transmitter and a processor such that information may be transmitted by the apparatus 32. The apparatus may also comprise an input means to receive input and an output means to provide output.” *Id.*, 4:45-49. Apparatus 32’s broadcasts go to “the transceiver 34 of the apparatus 20 of each of the trains.” *Id.*, 6:25-31. “The received list is then provided to the processor 36 and the processor 36 determines if the links to be traversed by the respective train are adjacent links in the list. If the links to be traversed by the respect train are not adjacent links, the processor provides the corresponding output to the output means 40 to provide an indication of a danger in order to enable action to be taken to prevent the collision.” *Id.*, 6:31-38. Because the 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.

Ex. 1003 at ¶135. Mr. Andrews equates the apparatus 32 of Douglas with the claimed central tracking unit. *See* Ex. 1003 at ¶136 (“In the combination, Douglas’s apparatus (central tracking unit) broadcasts this tracking information to Grisham’s vehicle mounted modules (inter alia radio units, controller).”).

56. I disagree with Mr. Andrews’ opinion that Douglas “teaches an ‘apparatus 32 located at the station 30,’ which broadcasts the location of trains within a certain range (via a list of links to be traversed by and the direction of motion of each train).” *Id.* (citing Douglas at 4:32-49, 7:10-12). Instead the apparatus 32, the alleged central tracking unit, disclosed in Douglas “broadcast[s] the information of links 23, 25, 27 and the list including the links 23, 25, 27 to be traversed by the respective train and the direction of motion of the respective train.” Ex. 1011 at 4:39-

43. The information broadcast by apparatus 32 does not include the location of the trains. Instead the information broadcast by apparatus 32 is train ID, link ID and direction. See Fig. 7b. The information does not include the location of the train. In fact, the term “location” does not appear anywhere in the Douglas. And although Douglas is directed to collision avoidance, its method of collision avoidance does not require or use location information. Specifically, with regard to collision avoidance, Douglas describes its method as follows:

FIGS. 4, 5 and 6 with reference to FIG. 1 through 3 illustrate a method for avoiding collision between trains according to the embodiments herein. At block 52, each of the train 12, 14, 16, 18 is equipped with a transceiver 34. The transceiver 34 is adapted to transmit and receive information. Next, at block 54, a signal is periodically broadcasted from the transceiver 34 of each of the train 12, 14, 16, 18. The signal comprises a unique identification of a respective train and a unique identification of a track the respective train is moving on. In an embodiment, the signal may include a direction of motion of the respective train. Typically, with respect to a track, a train can have motion in either of the two directions of the track. Moving, next to block 56, the transceiver 34 of the apparatus 20 of each train 12, 14, 16, 18 receives the signal transmitted by each other train 12, 14, 16, 18 within a range. The received signal is provided to the processor 36, and at 55 block 58, the signal is analyzed by the processor 36 to extract the unique identification of each other train and the unique identification of the track each other train is moving on. Moving next to block 60, it is determined if the track of the train receiving the signal and any of each other train within the range is same. *If the track of the train receiving the signal and any of each other train within the range is [the] same, then, at block 62, an indication of a danger is provided in order to enable action to be taken to prevent the collision.*

Ex. 1011 at 6:39-63. Thus, Douglas's method relies on knowing the tracks on which the various trains in a zone are moving and generating a warning if two trains in the zone are on the same track. Other than knowing that the trains are generally in the same zone and the tracks on which the trains are moving, Douglas has no knowledge of the location of the trains in the zone and therefore cannot "track the location" of the trains, as required by the claims.

57. The ID states that:

Douglas thus tracks the locations of trains along specific tracks 22–28 relative to links 23–27 that connect specific tracks to allow a specific train to switch tracks at a particular location and within the zone of station 30. This tracking of each train 12–18 and mounted apparatus 20 tracks its location as recited in claim 2. Petitioner and Mr. Andrews rely on teachings of Douglas that apparatuses 20 on each train broadcast their ID, track ID, and direction of motion location information so apparatus 32 at station 30 can broadcast a list of links that each train will traverse with a direction of motion and list of trains within a zone (location) of station 30.

ID at p. 25. The ID equates Douglas's "zone" of station 30 with the "location" recited in claim 2. Assuming for the sake of argument that a zone is a location, Douglas does not contemplate "tracking" the zone of a train. Before and after a train leaves a zone, Douglas' CTU does not know where the train is. And while in the zone "controlled from a station 30," (Ex. 1011 at 3:16-18) where the apparatus 32 is located, Douglas does not know where in the zone the train is located. I understand that all words of a claim must be considered. Because Douglas does not track a

“zone” of a train, nor a location once in a zone, Douglas does not “track a location,” as recited by the claim.

58. I disagree that knowing the track ID and direction is “tracking the location” of a train. The length of a track is typically on the order of miles. Knowing the track and direction of travel, is insufficient to track the location of the train on that track. I base my disagreement on my understanding of the differences between the CTU claimed and described in the 227 patent and Douglas’ purported CTU. The claimed CTU stores the absolute and relative locations of the vehicles and generates a warning if a separation distance between the vehicles is violated. Ex. 1001 at 6:37-41. It can do this because it stores the absolute and relative locations of the vehicles. Douglas does not contemplate storing any location data and therefore cannot generate a warning when a separation distance is violated. Instead Douglas generates a warning if two or more vehicles that happen to be in a zone² are on the same track. Thus, if two vehicles are in close proximity on the same track but in different zones, Douglas will not generate a warning. Also, if two vehicles are on different tracks and with minimum separation distance, Douglas will not generate a warning. Douglas is not concerned with separation distance. This difference is relevant because claim 1 that claims 2-4 depend from specifically recite “determin[ing] a

² Douglas defines a zone as “an area of the station up till which links controlled from the station may be provided on the tracks.” Ex. 1011 at 3:16-19.

separation distance.”

59. Because Douglas does not disclose “tracking a location” of a train, the combination of Douglas and Grisham does not disclose Challenged Claims 2-4.

60. The ID also states that:

Here, the ’227 patent and Douglas evidence a level of predictability in the art to implement a CAS with a central tracking unit that communicates with first and second VMMs to track the locations of the VMMs.

ID. at p. 25. As I previously explained, Douglas does not track the locations of the VMMs in a zone. Accordingly, the combination of Grisham with Douglas will not result in the claimed inventions of the Challenged Claims.

VIII. GROUND 1C: OBVIOUSNESS OF CLAIMS 5-6 OVER GRISHAM AND RICHARDSON

61. Claim 5 depends from claim 1 and claim 6 depends from claim 1. Claim 5 recites “an auxiliary transponder sensor module, the auxiliary transponder sensor module mounted on the first rail vehicle with an offset with respect to the transponder sensor module.” Grisham does not disclose an auxiliary transponder sensor module. Mr. Andrews relies on Richardson for the claimed “auxiliary transponder sensor module.” Mr. Andrews states that “a POSITA would have understood the benefits of providing an auxiliary transponder sensor module with an offset to the transponder sensor module, including better location measurements and improved collision avoidance due to more precise information relating to length of

the vehicle and mounting location of each sensor.” Ex. 1003 at ¶145. Mr. Andrews does not explain the reasoning for his statement.

62. Richardson is directed to “improving navigational capabilities and safety of operations for semi-autonomous systems that are emerging in applications such as construction and agricultural vehicles.” Ex. 1008 at 1. Richardson does not suggest that its teaching may be used to “account for the length of these trains” that “can be over a mile long.” Ex. 1003 at ¶ 145. Also, Grisham does not suggest that train length is an issue or that an auxiliary transponder sensor module would be a solution to this problem.

63. Mr. Andrews states that “Richardson Figures 6 and 7 illustrate each vehicle having 4 UWB transceivers, with transceivers 1 to 2 and 3 to 4 offset by a distance r_b .” Ex. 1003 at ¶145. Given that distance r_b is of the order of a few feet, it is not clear why a POSITA would be motivated to use this scheme to account for trains that can be over a mile long. Mr. Andrews has also not explained how Richardson’ scheme can be used to account for trains that are over a mile long. Additionally, Claim 20 recites “the rail vehicle module is operable to receive calibration information related to the length of the rail vehicle, the mounting location of the first wireless communications antenna *and* the mounting location of the second wireless communications antenna.” As Mr. Andrews admits, “Richardson does not explicitly teach providing this information on a user interface.” Ex. 1003 at

¶327. Yet, Andrews states It would have been obvious to a POSITA to add this information to the user interface of Grisham.” Ex. 1003 at ¶ 147. Mr. Andrews explains that “length information would be necessary in the system described in Richardson because it would facilitate determining the width of all zones other than (1,2) and (3,4).” *Id.* Mr. Andrews does not explain why a POSITA would understand that “a mounting location of the first wireless communications antenna, *and* a mounting location of the second wireless communications antenna” as required by claim 18b, would be required in Richardson. In fact, in my opinion Richardson does not require providing the mounting location once r_b is defined. Accordingly, a POSITA would not be motivated to provide “a mounting location of the first wireless communications antenna, *and* a mounting location of the second wireless communications antenna” because it is not necessary. Because Mr. Andrews does not allege that Richardson discloses providing a mounting location and does not provide a motivation to provide this information, Mr. Andrews has not established that claim 18 is obvious. And Separately, Mr. Andrews states that:

[I]t is my opinion that this length information would be necessary in the system described in Richardson because it would facilitate determining the width of all zones other that (1,2) and (3,4).

Ex. 1003 at ¶147. Mr. Andrews does not explain why providing the length information is required in the combination of Grisham and Richardson

IX. GROUND 1D: OBVIOUSNESS OF CLAIMS 12 AND 13 OVER GRISHAM AND BREED ‘945

64. Claims 12 and 13 depend from independent claim 1 and are not obvious at least for the same reasons that claim 1 (Ground 1A) is not obvious.

X. GROUND 1F: OBVIOUSNESS OF CLAIM 15 OVER GRISHAM AND CONNELL

65. Claim 15 depends from independent claim 1 and is not obvious at least for the same reasons that claim 1 (Ground 1A) is not obvious.

XI. GROUND 2A: OBVIOUSNESS OF CLAIMS 7-9, 17-19, 21, AND 24-26 OVER GRISHAM AND NIXON

66. Claims 7-8, 17-19, 21, and 24-26 recite a “global positioning system.” Grisham does not disclose a global positioning system (GPS) unit. Mr. Andrews relies on Nixon for this disclosure.

A. Claim 7

67. As an initial matter, Grisham does not suggest improving its scheme with GPS. Instead, Mr. Andrews relies on the knowledge of a POSITA. *See* Ex. 1003 at ¶¶ 173-176. I note that Mr. Andrews does not cite to any contemporaneous source for his assertions.

68. With reference to claim 7, Mr. Andrews states that:

Generally, commercial UWB has a limited operating range due to low power operations. As discussed previously, it can be extremely accurate in determining distance to other objects and/or UWB units and determining relative position between those objects or UWB units. Without other assistance, UWB does not generally provide absolute

position of a UWB Unit. UWB units may communicate with wayside units with known absolute locations and from that communication approximate their location. This can be an expensive solution as the number of wayside units along a track can add significant costs in deployment. GPS provides a measure of absolute position as well as heading, and this, if communicated by UWB units between trains would allow them to determine if a collision was possible, or if they were, for example on parallel tracks where no collision is possible.

Ex. 1003 at ¶ 176. Mr. Andrews assertion that that “GPS . . . if communicated by UWB units between trains would allow . . . ” is unsupported. Neither Grisham nor Nixon suggest communicating GPS locations between trains using their respective UWB radios. And Mr. Andrews does not cite any other reference that teaches communicating GPS locations using UWB radios or for that matter a reference that teaches using both UWB and GPS. This is not surprising.

69. Since signals from GPS satellites have very low power levels (-130 dBm or -160 dBW) near the surface of the earth, potential interference from UWB to GPS receivers (and corresponding GPS-based systems such as aeronautical safety-critical flight systems) was a serious concern. A POSITA would not be motivated to combine GPS and UWB receivers for a mission-critical task like rail vehicle collision avoidance because of the risk that the UWB signal would interfere with the reception of the GPS signal.

70. Even assuming for the sake of argument that a POSITA would combine a UWB radio with a GPS receiver (they would not) and communicating GPS

locations using UWB radios was known (it was not), a POSITA would not use GPS “to determine if a collision was possible, or if they were, for example on parallel tracks where no collision is possible.” As an initial matter, it is unclear how two trains would know that they are on same or parallel trains, merely by knowing each other’s respective GPS coordinates.³ Importantly, given that Mr. Andrews readily admits that “GPS accuracy can vary by several meters or even tens of meters,” it would be impossible to determine if the trains are on the same track or on parallel tracks with this level of inaccuracy. Accordingly, a POSITA would not have been motivated to modify Grisham with the GPS disclosed in Nixon because it would not allow Grisham to determine if the trains are on the same track or parallel tracks. And to the extent, discriminating whether the trains were on the same track or parallel tracks was important, the lack accuracy of GPS would motivate a POSITA to look for an alternate solution.

71. Mr. Andrews also states that “[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.” Ex. 1003 at ¶173. I

³ During his deposition, Mr. Andrews suggested use of a “track database.” Ex. 2007 at 115:13-23. None of the references suggests using a track database and in my personal experience no such track database existed at the time of the invention.

disagree. As explained in the prior paragraph, UWB radio transmissions would have interfered with GPS reception resulting in an error-prone not error free collision warning system. Also, the admitted inaccuracy of GPS would never allow a system “to determine if those paths intersected at any point in the future.”

72. Separately, Mr. Andrews admits that “commercial UWB has a limited operating range due to low power operations” and then states that “GPS provides a measure of absolute position as well as heading, and this, if communicated by UWB units between trains would allow them to determine if a collision was possible.” Ex. 1003 at ¶176. However, because UWB has a limited operating range, the GPS information would be capable of being communicated between trains using UWB only when the trains are within the limited operating range of UWB. Accordingly, Mr. Andrews’ suggestion that augmenting UWB with GPS will allow a train to begin stopping much in advance (Ex. 1003 at ¶176) is incorrect, because two trains would be able to exchange GPS coordinates with each other only when they are within the operating range of UWB. Thus adding GPS to UWB will not improve the collision avoidance capability of UWB.

73. Finally, Mr. Andrews states that “[b]oth 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.” Ex. 1003 at ¶176. I disagree. I have not seen any evidence that would suggest that “it would have been readily

apparent to a POSITA how to implement GPS into the radio units from Grisham.”

B. Claim 8

74. Claim 8 depends from claim 7 and is not obvious for the same reasons as claim 7. Mr. Andrews analysis for claim 8 is deficient. Specifically, claim 8 recites “the first vehicle mounted module receives information generated by the global positioning system unit and the first ultra wideband unit to determine whether one or more vehicle separation criteria are violated.” Mr. Andrews’ analysis fails to explain how the combination “determines whether one or more vehicle separation criteria are violated” from “information generated by the first global positioning system unit *and* the first radio communication unit.” *See* Ex. 1003 ¶ 178-180. In fact Nixon does not use “information generated by the first global positioning system unit *and* the first radio communication unit” to determine if “vehicle separation criteria are violated.” At best, Nixon only discloses using the radio to “determine whether one or more vehicle separation criteria are violated,” not both the radio and GPS. *See* Ex. 1016 at p. 7.

75. Because Nixon does not “determine whether one or more vehicle separation criteria are violated” from “information generated by the first global positioning system unit *and* the first radio communication unit,” Nixon cannot disclose “generat[ing] a warning signal when one or more vehicle separation criteria are violated.”

76. Separately, Mr. Andrews assertion with reference to claim 8 that “[a] POSITA would have understood that trains on parallel tracks may violate a strict separation distance, but the use of GPS data would ensure that warning signals would only be generated when needed” is erroneous. Ex. 1003 at ¶ 180. Given GPS’ admitted inaccuracy of several meters or even tens of meters, GPS is more likely to generate spurious warning signals. Accordingly, a POSITA will not be motivated to combine Nixon’s GPS with Grisham “to determine whether one or more vehicle separation criteria are violated; and the first vehicle mounted module generates a warning signal when one or more vehicle separation criteria are violated.”

C. Claim 9

77. Claim 9 requires “execut[ing] a progressive warning signal if one or more vehicle separation criteria are violated.” Claim 9 depends from claim 1 and is not obvious at least because claim 1 is not obvious. Additionally, Mr. Andrews makes factually inaccurate statements regarding Grisham. Specifically, Mr. Andrews asserts that:

a POSITA would have been motivated to convert Grisham’s alarm to Nixon’s progressive alarm[,] [b]ecause 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 and in doing so would provide an audible representation of the extent or urgency of a potential hazard, which would be particularly useful to avoid the operator being distracted by having to look at a display to determine the degree of separation between the trains.

Ex. 1003 at ¶184. I disagree with Mr. Andrews' assertion that "Grisham already captures speed and distance information from other rail vehicles." As Mr. Andrews admitted during his deposition, Grisham only allows the determination of relative speed. Ex. 2007 (Deposition Transcript of Andrews, 08/28/2023) at 68:1:4 ("Q. So if both vehicles are moving, you would only be able to measure relative speed using Grisham's method, correct? A. That's correct[.]). Without knowing the actual speed and distance information of the other rail vehicles, "a progressive alarm would [not] simply and routinely be implemented into [Grisham's] system."

D. Claim 17

78. The combination of Grisham and Nixon does not render Claim 17 obvious for the reasons set forth below.

1. The combination of Grisham and Nixon does not disclose [17c] "a first wireless communications antenna operable to send and receive data representing the separation distance over the air."

79. Mr. Andrews relies on Grisham for this limitation. Specifically, Mr. Andrews states that "Grisham continuously transmit and receive impulse radio signals wirelessly" and "the signals can include data such as direction, speed, and distance of each rail vehicle." Ex. 1003 at ¶189 (citing Ex. 1006 (Grisham) at FIG. 22)). I disagree that FIG. 22 of Grisham discloses sending and receiving data representing the separation distance over the air. Reproduced below is Fig. 22 of Grisham.

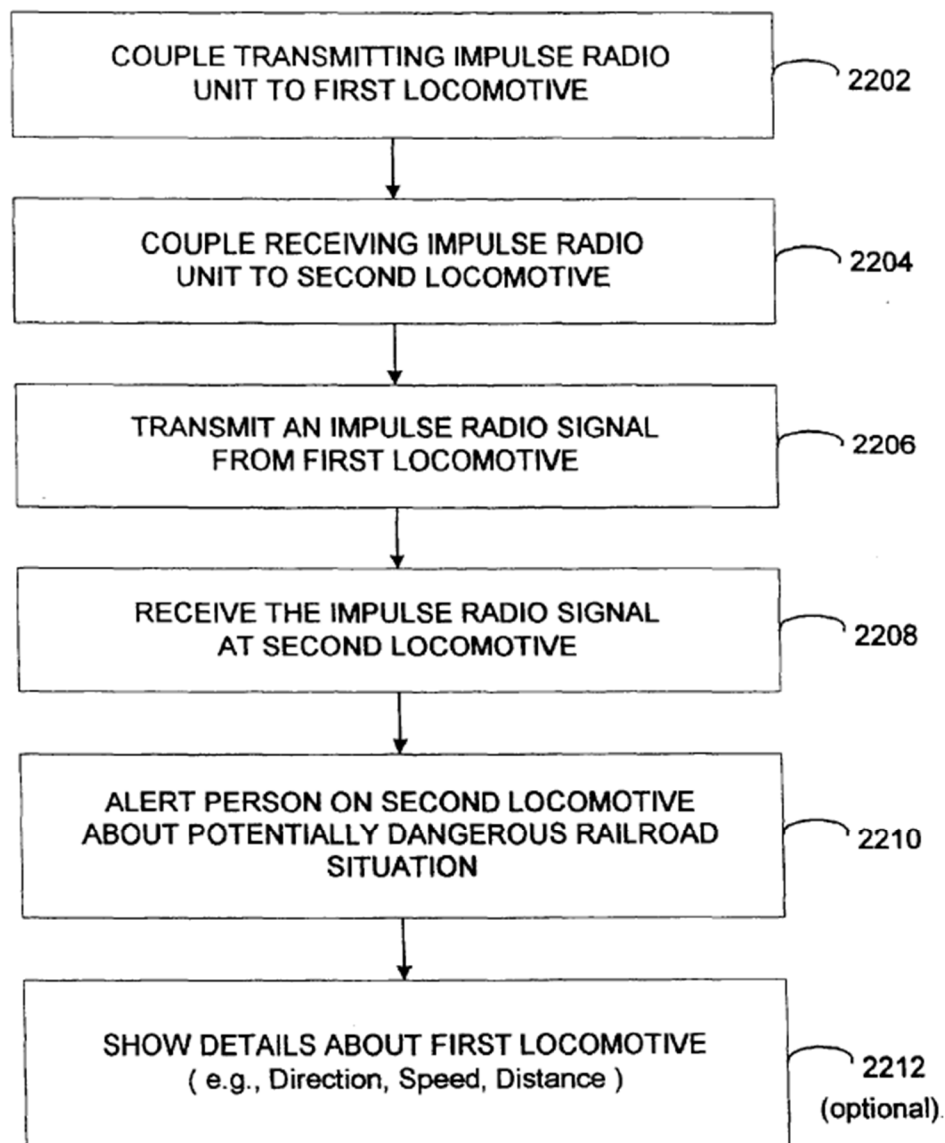


FIG. 22

80. There is no teaching or suggestion in Fig. 22 that Grisham's impulse radios transmit and receive data "representing the separation distance over the air." Mr. Andrews has not pointed to any other disclosure in Grisham that teaches that Grisham's impulse radios transmit and receive data "representing the separation distance over the air." Mr. Andrews has not shown that Grisham discloses this

limitation.

2. No motivation to combine Grisham and Nixon to render obvious 17[d] “a global positioning system unit operable to receive information from one or more satellites to determine an absolute position of the first rail vehicle”

81. Mr. Andrews incorporates his opinion for claim 7. For the same reasons set forth in my analysis of claim 7 (Ground 2A), it is my opinion that the combination of Grisham and Nixon does not render claim 17 obvious.

E. Claim 18

82. Claim 18 depends from claim 17 and is not obvious at least for the same reasons that claim 17 is not obvious.

F. Claim 19

83. Claim 19 depends from claim 18 and is not obvious at least for the same reasons that claims 17 and 18 are not obvious.

G. Claim 21

84. Claim 21 depends from claim 17 and is not obvious at least because claim 17 is not obvious. Mr. Andrews opines that claim 21 is obvious for the same reasons that claims 8 and 9 are obvious. In my opinion claim 21 is not obvious for the same reasons that claims 8 and 9 (Ground 2A) are not obvious.

85. Claim 21 recites “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.” Mr. Andrews does not explain where Nixon discloses this limitation and Mr. Andrews analysis for claims 8 and 9 similarly fail to explain where this limitation is disclosed. Accordingly, Claim 21 is not obvious.

H. Claim 24

86. Mr. Andrews opines that claim 24 is obvious for the same reasons that claims 1, 7, and 8 are obvious. In my opinion claim 24 is not obvious for the same reasons that claims 1, 7, and 8 (Ground 2A) are not obvious.

I. Claim 25

87. Claim 25 depends from claim 24 and is not obvious at least for the same reasons that claim 24 is not obvious.

J. Claim 26

88. Claim 26 depends from claim 24 and is not obvious at least for the same reasons that claim 24 is not obvious.

XII. GROUND 2B: OBVIOUSNESS OF CLAIM 20 OVER GRISHAM, NIXON AND RICHARDSON

89. Claim 20 recites “the rail vehicle module is operable to receive calibration information related to the length of the rail vehicle, the mounting location of the first wireless communications antenna *and* the mounting location of the second wireless communications antenna.” Mr. Andrews admits in Ground 3B (regarding Claim 5) that “Richardson does not explicitly teach providing this

information on a user interface.” Ex. 1003 at ¶327. However, in Ground 2B Mr. Andrews states It would have been obvious to a POSITA to add this information to the user interface of Grisham.” Ex. 1003 at ¶ 147. Mr. Andrews explains that “length information would be necessary in the system described in Richardson because it would facilitate determining the width of all zones other than (1,2) and (3,4).” *Id.* Mr. Andrews does not explain why a POSITA would understand that “a mounting location of the first wireless communications antenna, **and** a mounting location of the second wireless communications antenna” as required by claim 18b, would be required in Richardson. In fact, in my opinion Richardson does not require providing the mounting location once r_b is defined. Accordingly, a POSITA would not be motivated to provide “a mounting location of the first wireless communications antenna, **and** a mounting location of the second wireless communications antenna” because it is not necessary. Because Mr. Andrews does not allege that Richardson discloses providing a mounting location and does not provide a motivation to provide this information, Mr. Andrews has not established that claim 18 is obvious.

90. Separately, Mr. Andrews states that:

[I]t is my opinion that this length information would be necessary in the system described in Richardson because it would facilitate determining the width of all zones other that (1.2) and (3,4).

Ex. 1003 at ¶147. Mr. Andrews does not explain why providing the length information is required in the combination of Grisham and Richardson.

XIII. GROUND 2C: OBVIOUSNESS OF CLAIMS 22, 27-28 OVER GRISHAM, NIXON AND DOUGLAS

A. Claim 22

91. Mr. Andrews opines that claim 22 is obvious for the same reasons that claims 2 and 3 are obvious. In my opinion claim 22 is not obvious for the same reasons that claims 2 and 3 (Ground 1B) are not obvious.

B. Claim 27

92. Mr. Andrews opines that claim 27 is obvious for the same reasons that claim 2 is obvious. In my opinion claim 27 is not obvious for the same reasons that claim 2 (Ground 1B) is not obvious.

C. Claim 28

93. Mr. Andrews opines that claim 28 is obvious for the same reasons that claim 3 is obvious. In my opinion claim 28 is not obvious for the same reasons that claim 3 (Ground 1B) is not obvious.

XIV. GROUND 2D: OBVIOUSNESS OF CLAIM 10 OVER GRISHAM, NIXON AND MCDANIEL

94. Claim 10 depends from claim 1 and is not obvious at least for the same reasons that claim 1 is not obvious.

95. Claim 10 recites “an adaptive threshold feature that modifies one or more vehicle separation thresholds based on the speed of the first rail vehicle and the speed of the second rail vehicle.” A pre-requisite of claim 10 is that the collision avoidance system know “a speed of the first rail vehicle and a speed of the second

rail vehicle.” Mr. Andrews states that “McDaniel teaches a threshold warning distance (an adaptive threshold feature) that modifies the separation threshold based on vehicle speeds.” Ex. 1003 at ¶219. McDaniel’s scheme requires that the local object know its own velocity and the velocity of the remote object. *See* Ex. 1015 at [0038]-[0039]; Ex. 2007 at 93:15-18. Mr. Andrews admits that McDaniel does not teach . . . how you determine the velocity of the first vehicle.” Ex. 2007. at 94:7-9. Mr. Andrews does not rely on any other disclosure of McDaniel or Grisham to explain how the local velocity is determined. Without knowing this, it would be not be possible to implement McDaniel’s adaptive threshold feature. Accordingly, the combination of Grisham and McDaniel does not render claim 10 obvious.

96. During his deposition, Mr. Andrews attempted to remedy this deficiency by relying on the Fig. 13 embodiment of Grisham. However, Mr. Andrews relied on Fig. 21 of Grisham for his opinions regarding Claim 1. *See* Ex. 1003 at ¶¶107-108. It appears Mr. Andrews is attempting to change theories midstream which I have been informed is improper.

XV. GROUND 2E: OBVIOUSNESS OF CLAIM 16 OVER GRISHAM, NIXON, MCDANIEL AND DOUGLAS

97. Mr. Andrews opines that claim 16 is obvious for the same reasons that claims 9, 10, and 15 are obvious. In my opinion claim 16 is not obvious for the same reasons that claims 9 (Ground 2A), 10 (Ground 2D), and 15 (Ground 1F) are not obvious.

XVI. GROUND 2F: OBVIOUSNESS OF CLAIM 23 OVER GRISHAM, NIXON, MCDANIEL, CONNELL AND BREED '945

98. Mr. Andrews opines that claim 23 is obvious for the same reasons that claim 12 is obvious. In my opinion claim 23 is not obvious for the same reasons that claims 12 (Ground 1D) is not obvious.

XVII. GROUND 3A: OBVIOUSNESS OF CLAIMS 1, 7-8, 11-14, 17-19, AND 24-25 OVER SUZUKI ALONE OR IN COMBINATION WITH GRISHAM

A. Claim 1

99. Since Ground 3A is also in reference to claim 1 of 227 patent, the secondary considerations previously considered with reference to Ground 1A still pertains to the obviousness of Ground 3A.

100. A POSITA designing safety and collision avoidance systems in 2012 would not be motivated to incorporate Suzuki into an invention for many reasons and has little overlap in solving the same problem set that a POSITA would be motivated to implement at the time. The system described by Suzuki describes an entirely disparate approach to collision avoidance, and only has radio communications in common with the system of 227 patent. Suzuki describes a system that controls and dictates position in regard to vehicles with steering, with a computer system containing a database to make decisions, which is not applicable to the invention of 227 patent. The radio technology of Suzuki is not entirely dependent upon UWB either, relying on much higher frequency bands, which

change the operation of the technology greatly. The radio technology of signaling data is also far different from what had been invented in 227 patent, not relying upon packets, however communication power of the waveform.

101. Element 1f of claim 1 recites “wherein *each* vehicle mounted module is operable to apply a time of flight technique to determine a separation distance between the rail vehicles.” The last limitation of claim 1 makes it clear that it is the round trip time of a communication between the vehicles, not a reflection off of a surface, that results in the time of flight measurement. This is not taught by Suzuki. Suzuki operates in a “radar” mode, seeking to measure the time to receive a reflection of a transmitted signal. Ex. 1005 at Fig. 1A, [0015], [0013], [0016], [0031] (“If the own vehicle ID is not detected from the received signal, the measurement of the distance between two cars by means of the radar function is considered to have failed.”). In fact, Mr. Andrews’ analysis admits that Suzuki “only calculate the distance to a vehicle which reflected the radar wave[.]” Ex. 1005 at [0032]; see also Ex. 1003 at ¶261 (citing Ex. 1005 at [0032]). Accordingly, Suzuki does not disclose element 1f and consequently cannot render claim 1 obvious.

102. The radar aspect of Suzuki greatly reduces its effective range because of power loss to the point where it would not be useful in the rail scenario, where stopping distances and times are much larger than for even a fast moving car.

103. In sum, Suzuki is directed to cars and does not use the claimed time of

flight technique. *See e.g.*, Ex. 1005 at [0016] (“The vehicle-to-vehicle distance measurement part 126 calculates the distance B between two cars”) In my experience, a person designing a railroad collision system would not look to a reference directed to cars because of the differences in the two modes of travel. Mr. Andrews does not explain why a POSITA would be motivated to modify Grisham with Suzuki, and for the reasons above a POSITA would not look to Suzuki in the first instance.

B. Claims 7-8 and 11-14

104. Claims 7-8 and 11-14 depend from claim 1 are not obvious for the same reasons that claim 1 (Ground 3A) is not obvious. Also a POSITA would not be motivated to combine UWB with GPS because of the potential interference that the UWB signal would cause to a GPS signal.

105. Further with reference to claim 8, claim 8a recites “information generated by the global positioning system unit *and* the first ultra wideband unit to determine whether one or more vehicle separation criteria are violated.” Mr. Andrews asserts that “Suzuki discloses using the combination of UWB and GPS to determine if a vehicle separation criterion has been violated.” Ex. 1003 at ¶271. I disagree. Suzuki only uses the reflected radio signal to determine if generating a warning is required. Specifically, Suzuki uses the reflected radar wave to measure the separation distance between cars.

From the distance A between two cars or the distance B between two cars obtained by receiving a radar wave, the shortest distance C between two cars is calculated in the control part 123 (step 509). Next, the control part 123 determines whether the distance C between two cars is a specified value or less (step 510), and if it is the specified value or less, the control part 123 issues a warning indication to an external device (for example, a warning device) (step 511).

106. Ex. 1005 at [0034]. Suzuki does not disclose using GPS **and** radar to determine the distance A or distance B. Thus, Suzuki does not disclose claim 8. Accordingly, claim 8 is not obvious.

C. Claim 17

107. The combination of Grisham and Nixon does not render Claim 17 obvious for the same reasons set forth in Ground 3A, claim 1.

D. Claims 18 and 19

108. Claims 18 and 19 depend from claim 17 and are not obvious for the same reasons that claim 17 (Ground 3A) is not obvious.

E. Claim 24

109. Mr. Andrews opines that claim 24 is obvious for the same reasons that claims 1, 7 and 8 are obvious (Ground 3A). In my opinion claim 24 is not obvious for the same reasons that claim 1, 7, and 8 (Ground 3A) are not obvious.

F. Claims 25

110. Claim 25 depends from claim 24 and is not obvious for the same reasons that claim 24 (Ground 3A) is not obvious.

**XVIII. GROUND 3B: OBVIOUSNESS OF CLAIMS 2-6, 20, 22, AND 27-28
OVER SUZUKI AND RICHARDSON OR SUZUKI, GRISHAM,
AND RICHARDSON**

111. Claims 2-6 depend from independent claim 1 and are not obvious at least for the same reasons that claim 1 (Ground 3A) is not obvious. Additionally, claims 5 and 6 are not obvious for the reasons set forth with reference to claims 5 and 6 (Ground 1C).

112. Claims 20 and 22 depend from independent claim 17 and are not obvious at least for the same reasons that claim 17 (Ground 3A) is not obvious.

113. Further for claim 20a, Mr. Andrews incorporates his arguments regarding claim 6 and asserts that “Richardson teaches this limitation.” I disagree for the reasons set forth with reference to claim 6 (Grounds 3B and 1C).

114. Claims 27 and 28 depend from independent claim 24 and are not obvious at least for the same reasons that claim 17 (Ground 3A) is not obvious.

**XIX. GROUND 3C: OBVIOUSNESS OF CLAIMS 9, 21, AND 26 OVER
SUZUKI AND NIXON OR SUZUKI, GRISHAM AND NIXON**

115. Claim 9 depends from independent claim 1 and is not obvious at least for the same reasons that claim 1 (Ground 3A) is not obvious.

116. Claim 21 depends from independent claim 17 and is not obvious at least for the same reasons that claim 17 (Ground 3A) is not obvious.

117. Claim 26 depends from independent claim 24 and is not obvious at least for the same reasons that claim 24 (Ground 3A) is not obvious.

XX. GROUND 3D: OBVIOUSNESS OF CLAIM 15 OVER SUZUKI, AND CONNELL OR SUZUKI, GRISHAM, AND CONNEL

118. Claim 15 depends from claim 1. Claim 15 is not obvious at least for the same reasons that claim 1 (Ground 3A) is not obvious.

XXI. GROUND 3E: OBVIOUSNESS OF CLAIM 10 OVER SUZUKI, NIXON AND MCDANIEL OR SUZUKI, GRISHAM, NIXON, AND MCDANIEL

119. Claim 10 recites “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.” A pre-requisite of claim 10 is that the collision avoidance system know “the speed of the first rail vehicle and a speed of the second rail vehicle.”

120. Mr. Andrews admits that Suzuki in view of Nixon or further in view of Grisham “fails to teach or suggest the use of adaptive thresholds.” Ex. 1003 at ¶358. For this Mr. Andrews relies on McDaniel. For the reasons set forth below a POSITA would not be motivated to combine McDaniel to arrive at the claimed invention.

121. As an initial matter, Mr. Andrews fails to address how Suzuki collects the speed of a first rail vehicle and a second rail vehicle. Suzuki only collects relative speed, not the speeds of the local and remote vehicles. *See e.g.*, Ex. 1005 at [0001] (“Then, operations such as controlling to make the distance between two cars constant and the like are carried out according to the detected distance between two cars and relative speed.”). Mr. Andrews does not cite to any evidence that Suzuki

determines absolute speeds of the two vehicles. Rather, Mr. Andrews merely points to his reasoning with regard to Claim 9 and fails to articulate why a POSITA would have been motivated to incorporate Nixon and McDaniel into Suzuki.

122. A POSITA would not be motivated to incorporate McDaniel into Suzuki, because neither McDaniel nor Suzuki disclose “a speed of the first rail vehicle.” Specifically, Mr. Andrews states that “McDaniel teaches a threshold warning distance (an adaptive threshold feature) that modifies the separation threshold based on vehicle speeds.” Ex. 1003 at ¶153. McDaniel’s adaptive threshold feature requires that the local object know its own velocity and the velocity of the remote object. *See* Ex. 1015 at [0038]-[0039]; Ex. 2009 at 93:15-18. Mr. Andrews admits that McDaniel does not teach . . . how you determine the velocity of the first vehicle.” Ex. 2009 at 94:7-9. As explained in the prior paragraph neither does Suzuki explain how the local velocity is determined. Without knowing this, it would be not be possible to implement McDaniel’s adaptive threshold feature.

123. Accordingly, to the extent a POSITA was motivated “to accurately and effectively avoid collisions when rail vehicles are approaching at different speeds or braking conditions and to avoid nuisance alerts to the operator of the safe approach or close proximity of other trains,” they would not be motivated to combine references as proposed, because neither Suzuki nor McDaniel disclose measuring “a speed of the first rail vehicle.”

**XXII.GROUND 3F: OBVIOUSNESS OF CLAIM 16 AND 23 OVER
SUZUKI, NIXON, MCDANIEL AND CONNELL OR SUZUKI,
GRISHAM, NIXON, MCDANIEL AND CONNELL**

A. Claim 16

124. Mr. Andrews opinions regarding claim 16 are not commensurate with the claim. Specifically, Mr. Andrews states that “Suzuki in view of Connell, Nixon and McDaniel teaches or renders claim 16 obvious.” Ex. 1003 at ¶359 (citing § VIII.N.1. and VIII.P.1.). However, section VIII.H.1 is directed to claim 18 and a combination of Grisham, Nixon and Richardson. There is no discussion of Connell. Accordingly, Mr. Andrews has not established that claim 16 is obvious.

125. Separately, Claim 16 depends from claim 15 which in turn depends from claim 1. Claim 16 is not obvious at least for the same reasons that claims 15 (Ground 3D) and 1 (Ground 3A) are not obvious.

B. Claim 23

126. Claim 23 depends from claim 16. Claim 23 is not obvious at least for the same reasons that claim 16 is not obvious.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements are punishable by fine or imprisonment, or both, under

Declaration of Carl Conti
IPR2023-00470

Section 1001 of Title 18 of the United States Code.



Date: 15-SEP-2023

Carl Conti

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ACHIEVEMENTS / SKILLS:

- ✦ 30 Years of Rail Transit Industry Leadership
 - Carborne Control Systems and Signaling
 - ✦ 25 years Safety Systems Platforms and Product Design, Development, Certification & deployment, including all RAMS activities
 - ✦ Led SIL-4 Safety Development of First Driverless system in the USA - AF900 FSK Signaling System from Concept thru Certification, Installation & Commissioning (LACMTA)
 - ✦ SIL-2 Development / ISA on FDA Class II Medical Device, Medical Robotics and Wind Turbine Blade Pitch Control Robotics
 - ✦ Successful (\$20MM+) Project Management
 - ✦ Defense/Aerospace: Designed MC68000 Single Board Computer (Yes, before Woz) for MDAC first-ever infrared imager (joint-services seeker)
 - ✦ 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.
 - ✦ Industry-first AI-enabled camera system (NeuralEye™) with advanced AI analytics and Automatic Passenger Counting
 - ✦ Rail Transit Vehicle Expertise – ATP / ATO / ATS 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 - CMU Field Robotics Center; UBER ATC
 - ✦ Publication: 2004/2011 Handbook of Optical and Laser Scanners
-

EXPERIENCE:

SIL4 Systems Inc.
Founder, President & CEO

Pittsburgh, PA
Mar 2009 – Present

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 ETMS/PTC/ATP and Brake Assurance Carborne 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
Consulting Engineer – Veh. Systems & Signaling, Specification Compliance

Reston,VA; Miami,FL; Detroit,MI
Jul 2011 to Present

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
VP of Engineering

Pittsburgh, PA
Aug 2008 – Mar 2009

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.
Program Manager/ Engineer

Pittsburgh, PA
Jun 2005 – Jul 2008

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

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 AcceLight 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/marker research through complete HW design, included PCB layout, packaging, and manufacture of the *TRACERTM* Event Recording System - a "flight 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.

CHARLES STARK DRAPER LABORATORY (M.I.T.)
Staff EE, Electronic Design Division

Cambridge, MA
1985 - 1989

- ✦ Circuit & system performance analysis - Inertial Guidance Measurement Unit (IMU) in various environments.
- ✦ Design of all FPA interface hardware for "Star Mapper" PC-based, proof-of-concept sensor project.

McDONNELL DOUGLAS ASTRONAUTICS CO.
Engineer/Scientist, Electro-Optics Laboratory

Huntington Beach, CA
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 responsivity 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

Cambridge, MA

M.I.T. xPRO

Pittsburgh, PA

Katz School, Univ. Of Pitt.

Pittsburgh, PA

EE Dept.

Boston, MA

ES/CS Dept.

University Park, PA

EE Dept.

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