

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ALLIANCE NORTH AMERICA, INC.
Petitioner

v.

MULTIQUIP INC.
Patent Owner

Case IPR2023-00_____
Patent 8,816,651

DECLARATION OF MICHAEL NRANIAN

Mail Stop Patent Board
Patent Trial and Appeal Board
U.S. Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

I. INTRODUCTION

A. Assignment

1. I, Michael Nranian, have been asked to submit this declaration on behalf of Petitioner Alliance North America, Inc. dba ANA (“Petitioner” or “ANA”) in connection with the Petition for *Inter Partes* Review of U.S. Patent No. 8,816,651 (the “’651 patent”), assigned to Patent Owner Multiquip, Inc. (“Patent Owner” or “Multiquip”). I understand this declaration and Petition are being submitted to the Patent Trial and Appeal Board of the United States Patent and Trademark Office by Petitioner.

2. I have been retained as an independent expert by the law firm of Gardner, Linn, Burkhardt & Ondersma, LLC on behalf of ANA to study and provide my opinions on the technology disclosed and claimed in the ‘651 patent, and the patentability or non-patentability of claims 1, 4, 8-19, 22, and 26-36 of the ‘651 Patent (“the Challenged Claims”).

3. This declaration is directed to the Challenged Claims of the Patents and sets forth certain opinions I have formed, the conclusions I have reached, and the bases for each.

4. Based on my experience, knowledge of the art at the relevant time, analysis of prior art references, and the understanding a POSITA would have of the claim terms in light of the specification, it is my opinion that each of the

Challenged Claims are unpatentable based on the prior art references cited by Petitioner, as discussed below.

5. My opinions expressed in this report are based on review and analysis of certain information obtained in connection with my work on this matter, together with my training, education, and experience. My opinions expressed are my own. If called as a witness in this matter, I am prepared to testify competently about them.

B. Compensation

6. I am being compensated for services provided in this matter at my regular hourly rate for this type of consulting activity. My compensation is not conditioned in any way on the opinions and conclusions I reach as a result of my analysis or on the outcome of this matter. Similarly, my compensation is not dependent upon and in no way influences the substance of my statements in this declaration.

7. I have no financial interest in Patent Owner's company or any of its products, or in the Patents.

C. Qualifications and Experience

8. Aspects of my education, experience, and qualifications and some details about my employment history are included in my CV which is attached as Appendix 1 to this Report. Appendix 1 also includes a list of the cases in which I

have testified as an expert witness at deposition, hearing, or trial during the past four years. I have had no publicly disclosed publications in the last 10 years, other than the patents described later in this report. In addition to my current position at the U.S. Army, I am also currently the principal of Automotive Design Analysis, a multi-disciplinary company that provides professional consulting, technical, and engineering services that I established in 2003.

9. In the following paragraphs, I will present some aspects of my technical, scientific, and engineering background that are relevant to the automotive/truck engineering, chemical engineering, electrical engineering, diesel engine, exhaust gas emissions, control systems, regulatory standards, alternator/generator, and diesel particulate filter regeneration technologies, as well as other issues involved in this matter, as well as some background for forming the opinions set forth in this Report.

10. My academic background is in engineering, and I also have over 35 years of work experience as an engineer and engineering manager in the automotive industry. I possess a Bachelor of Science in Chemical Engineering, a Bachelor of Science in Electrical and Computer Engineering, a Master of Science in Electrical Engineering, and a Juris Doctor from Wayne State University. I also received a Master of Business Administration from the University of Michigan. I also am a licensed Professional Engineer, Certified Project Management

Professional, as well as a Lean Six Sigma Black Belt certified through the American Society for Quality and the International Quality Federation. This Lean Six Sigma background as well as my extensive work experience in automotive electrical/electronic architectures and control modules, system performance, validation, root cause analyses, engines (including gas diesel engines), and also my extensive automotive design, testing, development, and validation, experience provides decades of real-world application experience to address the technologies discussed and claimed in the '651 Patent.

11. Although I have a law degree, and I am licensed to practice before the United States Patent and Trademark Office, I have not been asked to opine on any legal issues. I will not be giving any legal opinions throughout this report and throughout my work on this matter. My opinions provided herein are based on my engineering, technical, scientific, automotive, and business education and experience. I expect to testify at trial with respect to my educational and professional background.

12. I have extensive industry experience in the automotive industry for multiple companies. For example, I worked as a design engineer, senior project engineer, design analysis engineer, technical specialist, and engineering manager in the automotive industry from 1985 to 2007, which includes experience at Ford, General Motors, and Allied Signal. I worked at Allied Signal from 1992 to 1993,

General Motors from 1993 to 1995, and Ford Motor Company from 1985 to 1992, and from 1995 to 2007. Also, my work after 2007, and my current work for the U.S. Army at the Ground Vehicle System Center (formerly known as TARDEC – Tank and Automotive Research Development and Engineering Center) at TACOM (Tank and Automotive Command) involves extensive application of automotive applications. For example, approximately 80 percent of military ground vehicle systems are directly automotive related.

13. While at Ford, General Motors, and Allied Signal, I worked as a Product Design Engineer, a Senior Project Engineer, a Technical Specialist, a Design Analysis Engineer, and an Engineering Manager. I also have worked as a senior systems engineer and component engineer for military ground vehicles (including those systems that involve automotive – including heavy truck applications- e.g. diesel engines/emissions) at General Dynamics, Raytheon, and in my current position for the U.S. Army. My work as a senior systems engineer and component engineer involves extensive development, testing, and analyses of systems and components for automotive / military ground vehicles. My work included and currently includes the design and development of automotive systems and components for various different types of automotive applications. This includes, among other things, testing and development of systems, components, and materials, for engines and specifically diesel engine and emission systems,

vehicle electronic modules, sensors, and control systems, electrical/electronic system architectures, electrical/electronic circuitry and communication busses, power distribution, electrical component/system load effects, generators/alternators, temperature effects, system and component electrical load effects, including as related to performance, and emission gas/soot/particulate effects.

14. During my work at Ford, General Motors, AlliedSignal, General Dynamics, Raytheon, and in my current position for the U.S. Army, areas of my work also included the design, testing, assessment of, and development of, for example, various types of engines and powertrain systems and components used to reduce exhaust gas emissions (e.g. CO, NO_x, particulate matter (PM/soot)), including diesel engines and emissions systems, vehicle/automotive electrical/electronic communication busses, protocols, standards, specifications, vehicle electronic modules, including powertrain and engine control modules, sensors, and emission components. This includes methods used to reduce emissions (exhaust gas recirculation (EGR), Diesel Particulate Filter (DPF) and DPF regeneration cycles, Crankcase Ventilation (CCV)/Positive Crankcase Ventilation (PCV/PCV valve) Systems, Catalytic Converters/Selective Catalytic Reduction (SCR), Diesel Exhaust Fluid (DEF) Injection), and the related automotive electrical system architectures, electrical/electronic circuitry and data

communication busses, power distribution, electrical component/system load effects, generators/alternators, and components used and implemented for vehicle emission control.

15. I have extensive experience in designing, developing and testing automotive systems and components, including diesel engine systems and exhaust gas emissions, generator/alternators, cooling and heating systems and components, including engine cooling, thermal management systems, radiator and heat exchange systems for automotive and military vehicle applications. This includes, for example, diesel and gasoline engines, electric vehicles and batteries, auxiliary power units (generators - such as those employed for silent running), alternators, and data and communication busses. This also includes automotive, truck, and heavy/military vehicle testing and compliance experience, including vehicle and safety system compliance and diesel engines and exhaust gas emissions as related to regulatory and validation requirements (e.g. Environmental Protection Agency (EPA), California Air Resources Board (CARB), Federal Motor Vehicle Safety Standards (FMVSS), and corporate/industry standards). I have extensive experience in heat transfer measurement techniques, and assessments of temperature and heat measurement analyses, as well as gas component analyses, and component and material assessment of metals, composites, gases, liquids,

plastics, glass, and other materials for automotive/military vehicle components and systems.

16. My work also includes analyses, and testing regarding diesel engine emission particulate filters, Diesel engine exhaust gas regeneration cycles, engine control modules, powertrain control modules, control systems and algorithms, timing of temperature cycles, emissions and EPA/CARB regulations and compliance (including Tier IV standards requiring that that emphasize Particulate matter (PM/soot) and Nitrogen Oxide nitrogen oxides (e.g. NO and NO₂, NO_x, which are significant components of harmful air pollution), through the use of exhaust gas aftertreatment technologies, such as using urea-Selective Catalytic Reduction (SCR), and Diesel Exhaust Fluid (DEF).

17. My work also includes sensors and electrical/electronic metering and diagnostics for electrical load determination of components and systems (current, voltage, power, etc.), including DC, AC and single phase and/or multiphase (e.g. three phase power generation) systems, electrical load banks, resistor circuits/transformers/switches/relays/transistors (including field effect transistors for heavy current applications), fuses, circuit breakers, and short circuit / over-current / fire prevention mitigation/electrical shock prevention systems. I have worked on powertrain control modules, engine control modules, generators, alternators, vehicle busses (including those used to control alternators and

generators and also to provide inputs to the control modules from various sensors). This includes employing simulation benches and desk-top laboratories to simulate engine and electrical/electronic system performance duplicating that as used in the vehicle (including for example various load banks containing resistors/transformers/switches load boxes), for assessment of power management, thermal management, data and bus information exchange, and diagnostic analyses. I am currently working on conducting simulations using a systems integration laboratory that includes all the electrical/electronic systems used on variants of the Stryker combat vehicle, including diesel engine, electrical generators (e.g. as used for alternate power - silent running), and exhaust, as well as all other vehicle systems.

18. My work has included and currently includes extensive testing and analyses involving feedback from sensors (e.g. for analyses of exhaust gas temperatures, emissions, Nitrogen Oxides, Carbon Monoxide, Carbon Dioxide, PM, soot etc., and assessment of engine combustion efficiency). For example, I have also served as an expert witness and testified regarding diesel particulate filters and regeneration cycles used for emissions Particulate Matter (PM), soot, NOx burn-off for air pollution reduction specifically for systems involving failure of compliance to Environmental Protection Agency (EPA) and California Air Resources Board (CARB) regulatory requirements involving a 15 Million dollar

vehicle recall. I personally developed test protocols and performed testing in this matter related to diesel particulate filter regeneration cycles used for emissions pollution burn-off, and measured temperature effects of increase exhaust system temperatures and increase engine compartment temperatures on various vehicle/engine components to determine causes of failure. I am extensively experienced in the use of diagnostic tools (e.g. rotunda tools, OBD-II data communication interfaces, J-1939 data communication interfaces, CAN-BUS interfaces (e.g. vehicle spy), and electrical/electronic module readout tools and interfaces. For example, for many years, I served as a corporate representative and expert witness for Ford Motor Company, in the Design Analysis Group, where I conducted forensic investigation of field events involving vehicle electrical system diagnosis and root-cause analyses, and testified extensively regarding my analysis and findings. In short I served extensively as Ford's "black box" expert, and conducted hundreds of forensic investigations throughout the United States and testified regarding safety system diagnostic codes, engine system diagnostic codes, and data and information from control modules including engine and powertrain control modules, safety system control modules, and other vehicle control modules, components, vehicle data busses, and systems. Also, for example, I have served as an expert and testified in an International Trade Commission Intellectual Property matter involving vehicle generator, alternator, and starter motor design

that involved intricate breakdown, assessment, analyses, and photography of generator, alternator, and starter motor internal components.

19. My work has included embedded computing systems, hard-wired and wireless data and information transfer and communication, analog and digital signal processing, including specifically as related to automotive, truck, and military vehicles. This also includes MIL-STD-1553, Controller Area Networks, Local Interconnect Networks, SAE J1939 J1587 J1708, SAE J1850 Class B & On-board Diagnostics OBD-II (ISO 9141, ISO 15031), and Bluetooth. I have in-depth experience in vehicle diagnostic, OBDII interfaces, vehicle bus interfaces, class II and serial communication protocols, vehicle diagnostic and inter-module and inter-standards/protocols data transfer and communication (e.g. gateways), vehicle electrical and electronic systems architecture, vehicle control systems, algorithm development, and diagnostic and data analysis and interpretation. This also includes Media Oriented Systems Transport (MOST), IDB 1394 FireWire video-audio isochronous, Apple CarPlay ios. Android Auto, FlexRay brake-by-wire steer-by-wire, Byteflight, Time-division multiple access (TDMA), etc. I testified extensively in depositions and trials regarding the forensic analysis of this type of vehicle data and information. I also have conducted hundreds of forensic investigations and also served as a corporate representative and/or expert witness numerous times in litigation involving vehicle forensic and data analyses for

automotive data and information systems and transmission and storage, and the related components. My current work also involves vehicle, and network cyber security for automotive, vehicle, computer and network system development and threat mitigation, including vehicle module and network security and data and information transmission, at the U.S Army Development Command Ground Vehicle Systems Center, (“DEVCOM GVSC”) in Warren, Michigan. In my current position, I work on cyber security, vehicle system and module security, network and data/information transmission security analysis for U.S. Government military vehicle systems and components, sensors, weapon systems, networks, computers data, and programs, to develop cyber threat mitigation and to assess vulnerability, for the development of cyber security technologies to protect vehicle modules, networks, data, devices, programs, networks, and systems from attack, damage, and unauthorized access. This includes vehicle electrical/electronic modules and systems and vehicle networks cyber vulnerability and threat analyses and penetration testing, and cyber threat analyses and threat mitigation, for the continuous enhancement of cyber resiliency for vehicles, vehicle modules, vehicle electronic/electrical architectures, and networks. I currently possess an active Secret Security Clearance, which I have held since 2009.

20. I am also a Certified Information System Security Professional (CISSP) through the International Information System Security Certification

Consortium (ISC)², and I am also certified in Security+, Network+ through CompTIA, as well as implementing and auditing cyber security controls through the Global Information Assurance Certification (GIAC - through SANS Technology Institute). I am also a Certified Authorization Professional and work as a Cyber System Security Engineer developing, assessing and approving cyber security, information system security, data security, data transmission security and the design development and testing of related systems and components. This includes communication and data and information transmission security, inter-connective network security, including audio and visual real-time information and video/audio streaming information and data transfer, for information systems (including media and data and information transmission applications), automotive/military vehicle systems, vehicle networks, data communication and busses, through the U.S. Department of Defense risk management framework for cyber security and fraud and threat mitigation of computer systems, microprocessor systems, transmission systems, data and information communication systems, automotive and military vehicle data & networks, communication systems, information systems, vehicle bus and system bus communication and data transfer systems, network and connectivity systems, radio/telematics systems, for U.S. military and government systems, and as

especially and specifically applied for military and ground vehicle networks, busses, control systems, and electrical architectures.

21. I have designed, tested, developed, and released as a product design engineer and engineering manager, numerous vehicle electronic modules and sensors. My work has included modules that interface, communicate, and transmit data and information over vehicle networks, diagnostic interfaces, and also transmission mediums that include wired, wireless, telematics, satellite, internet, cellular, and other mediums and the related connectivity systems and components.

22. Also, for example, while obtaining my MS degree in Electrical Engineering, I concentrated on control systems and modules, data transmission and storage, solid state electronics and the related, inter-module communication, serial and parallel data and information transfer, wired and wireless data and information transfer, physics of electromagnetic waves including multiplexing & radio frequency and the related mediums and techniques used for information and data transfer, controls systems and vehicle busses. I also currently work in the transfer of vehicle module and system data and information, vehicle control systems and busses, vehicle diagnostics and fault codes, audio and video information, including in real-time, as well as data and information transmission for military vehicles and the related networks, modules, microprocessors, computers, and diagnostic systems. This includes the transfer of information in real time from soldiers and

operators to command centers. This data and information includes GPS location data, vehicle diagnostic and data, voice and camera information, target location information, and real time operator interaction and response, as well as numerous other types of data and information transmission. I also have extensive experience in data base structures, vehicle busses and networks, and physical wired and wireless and over-the-air network communication systems and interconnectivity, module algorithm development, message and data constructors, vehicle bus communication and data transfer and the related interfaces. My work has included the embedding of information contained in data packets contained in vehicle modules and inter-module signals (including, vehicle data and diagnostic information, streaming and media content and ancillary data and information), as well as the related transmitters and receivers, gateways, specifications and algorithms, as well as many other factors. This includes working with spectrum analyzers, vehicle module encoders and decoders, transmitters, receivers, transceivers, transducers.

23. Furthermore, I worked on many projects and systems that involve vehicle controls systems and busses, vehicle system and module information diagnostics, including in-vehicle and over-the-air communication and data transfer, electrical, electronic, and module microprocessor/computer systems and components, algorithm development, memory storage, gateways, video and audio

information transmission and communication, military vehicle systems and components, sensors, weapon systems, networks, programs, and devices, to explore cyber vulnerability and develop security processes and technologies to protect data, information, devices, programs, networks, and systems from cyber-attack, damage, and unauthorized access.

24. My work includes and has included working on many applications involving telematics, network communication, data bases, control systems and busses, in-vehicle and over-the-air network connectivity and message sets, and data/information transfer between vehicle modules, vehicle control systems and vehicle busses involving different protocols and standards, and transfer of data and information between vehicle modules and systems, and also data and command centers. This includes vehicle location detection and identifiers, vehicle/object/soldier location and tracking (including through the use of GPS), which are all part of Command, Control, Communications, Computers, Cyber, Intelligence, Surveillance, and Reconnaissance (C5ISR) systems. My work has also included 360-degree surveillance and the associated sensors and modules. My work also involves, for example, object and image detection, identification, enhancement, notification and display, friend and foe target recognition and tracking. This includes geographic information systems, image enhancement and recognition, military vehicle, soldier, image and object detection discrimination

and identification. The data and information can also be transferred with audio, video information as part of the broadcast information that is sent and received to and from command centers and military vehicles. This data and information can also include image information such as from electro-optical (e.g., CMOS, CCD) sensors, thermal viewers, and cameras as part of the information communicated along with the communication transmission and/or broadcast stream. Data and information transmitted and displayed also can include that obtained from geographic information systems, GPS and mapping location systems. This can include the use of differential GPS, repeaters, base stations, relays, and mobile data terminals. This also can be displayed as split-screen augmented information and can involve different types of visual displays and controllers, on-board vehicle displays as well as soldier handheld devices, and the transfer of this information across, for example, satellite systems, over-the-air, cellular, and wireless communication systems to command centers to soldiers and vehicles in the field, as well as the real-time communication of this information across command systems through satellite, cellular, radio frequency, wireless mediums, and related techniques.

25. I have also conducted electromagnetic interference testing and electromagnetic compatibility, and designed shielding and other techniques for hardening of components and systems. Also, for example, I am a co-inventor on

U.S. Patent No. 8,860,159 - Spintronic Electronic Device and Circuits, which, among other novel features, describes and claims an antenna and associated circuitry for detection of radio frequency waves (e.g., a beam of microwave energy), using a spintronic electronic apparatus having a multilayer structure that can operate in large amplitude, out-of-plane magnetization precession regime, which, depending on the circuit structure, can be adjustably biased and used to detect low frequency microwave signals that exceed a predetermined threshold current and have a frequency lower than a predetermined level. In alternative embodiments, the apparatus can be used for frequency identification of incoming electromagnetic waves and/or energy harvesting of incoming electromagnetic waves. Although not specifically related to vehicle electronics and control systems, I am also co-inventor on U.S. Patent No. 9,003,562 - Body Armor, which discloses a body armor system for improved ballistic protection (including femoral artery protection) for mitigation of injury and death to our soldiers who are at risk as they defend our nation. Also, for example, General Motors applied for and was granted a Statutory Invention Registration for rear-facing infant seat child/occupant detection and position detection using technologies that I developed employing either electronic circuits and infrared emitters and receptors, or alternatively emitters and detectors using light in the visual wavelength range, that I conceived of and developed.

26. I have also drafted numerous corporate standards, and signed-off on compliance to regulatory standards as a design and release engineer, technical specialist, and engineering manager for Ford, General Motors, and the supply base. Areas of my work also include and have included sensing systems, data/information and network interfaces and communication systems (e.g., including engine control systems, emission and exhaust system data and information transmission, and vehicle sensor diagnostics data and information, as well as load bank, simulation, and connectivity systems). My work had included laboratory tests, in-vehicle assessments, technology and prototype component assessments, as well as product testing, development, and performance verification and assessment.

27. My responsibilities also included ensuring compliance with regulatory and validation requirements (e.g. Environmental Protection Agency (EPA), California Air Resources Board (CARB), Federal Motor Vehicle Safety Standards (“FMVSS”), Economic Commission for Europe (“ECE”) regulations, Industry Standards, Corporate Standards, SAE and ISO standards, various international government regulations, and Due-Care Requirements. I also testified as a corporate representative and expert witness on behalf of Ford. In that role, I have analyzed, verified, and testified regarding compliance with these regulatory

requirements, and standards (e.g. Emission Test Cycles and Emission Standards such as Federal Test Procedure (FTP) – 75 driving cycles including cold start).

28. I have also conducted numerous system and component evaluations, laboratory tests, supplier and technology assessments, quality and reliability evaluations. I wrote and published system level Design Verification Plan and Reports (DVPRs) for prove out of these vehicle control systems, including vehicles containing diesel engine systems (including exhaust systems implementing selective catalytic reduction (SCR) cycles using Diesel Exhaust Fluid (DEF), to convert NOx pollutants to nitrogen (N₂), carbon dioxide (CO₂), and water (H₂O)), as well as electronic control modules, vehicle networks and busses, and electrical/electronic architectures and systems. This includes all testing requirements for sensors, engine components, and electrical/electronic components, as well as design manuals, specifications, requirements, Failure Modes and Effects Analyses (FMEAs), Control Plans, and design standards. I was also frequently involved in the review and implementation, and approval and sign-off of quality control procedures used to assure these products met customer requirements, federal regulations and standards, as well as corporate and industry standards and requirements, including numerous safety standards, ISO 26262 compliance. I also have extensive experience in manufacturing processes, including process optimization through, for example, design of experiments. I also

have extensive experience in lean six sigma techniques, quality processes, process cost and profitability optimization, process output optimization, and manufacturing quality control. My responsibilities include proper six sigma and lean manufacturing processes, design for manufacturing, quality control, and quality assurance, QS/ISO 9000 & 14000, TS 16949, ISO 9001, AS9100, compliance and process assurance, quality operating systems, design for manufacturing.

29. My work experience also includes extensive experience in electrical and electronic component design, testing, development, and manufacturing processes, quality, reliability, and manufacturing control and inspection. This work experience includes numerous electrical and electronic components, diesel engines, exhaust and emission systems, control modules, and sensors. I have extensive experience related to automotive components and systems, supplier processes, assembly, and manufacture quality review and sign-off for concurrence to control plans, as well as engineering and manufacturing specifications. I have reviewed numerous supplier manufacturing and assembly processes, implemented changes for quality and reliability improvement, to ensure compliance to engineering and manufacturing standards, so that components will function properly and reliably over long-term vehicle life, in both military and automotive applications. I am also thoroughly experienced in the related durability and reliability testing, specifications, and standards, and the proper assembly,

manufacturing, and quality control (e.g., including those involving lean six-sigma applications and techniques). My responsibilities also include conducting and leading technology and material source trade studies and analyses using preset requirements for evaluation to ensure the selected alternatives meet or exceed the requirements and specifications for the components, system, vehicle, and overall mission system integration requirements as well as Department of Defense 5000 and 5001 protocols.

30. I also have extensive experience in the testing, development, and prove-out (including life-cycle, hot and cold temperature extreme, thermal-shock, humidity, salt spray testing, and fluid exposure testing, etc.) for protection of automotive components. I have also analyzed and assessed engine compartment, engine, and engine component, exhaust gas and emissions, for these components and systems.

31. I am also a classic car enthusiast and I have been personally working on all aspects of vehicles since before my high school auto shop days at Cass Technical High School in Detroit, Michigan, where I took auto shop for every semester for the four years of High School Education, and frequently worked on vehicles after school. This includes regular analyses, repair, and replacement of engines (diesel and gasoline), exhaust systems, and vehicle components in numerous vehicles. At this time I personally restored a 1967 Mustang Fastback

with a 289 and a 4 barrel carburetor and manual transmission. I also worked on numerous other vehicles (cars, trucks, motorcycles, small engines, etc.), including Chevrolets, Mopars, Fords, Foreign, General Motors, Chrysler, and other vehicles. My current projects are a 1969 Super Cobra Jet Mustang Mach 1, and a 1968 428 Cobra Jet Mustang.

32. As I stated previously, I am also a lean six sigma black belt, with extensive experience in manufacturing processes, quality control, and process improvement. I am thoroughly familiar with heavy vehicle and automotive engineering specifications, product acceptance testing, control plans, PPAP, Failure Modes and Effects Analyses (FMEAs), and Design Validation Plans and Reports (DVPRs), as I have authored and released several of these documents and specifications, and approved components and systems verification verified per these tests, specifications, and requirements.

33. My work, including my decades of experience as an automotive engineer and engineering manager, at Ford, General Motors, AlliedSignal, Raytheon, General Dynamics, and also with the U.S. Army, specifically involves the testing and development of the aforementioned systems. This includes laboratory tests, in-vehicle assessments, technology and prototype component assessments, proving-ground testing (I am certified as a Ford Level II test track driver.), as well as product testing, development, and performance verification and

validation and extreme hot and cold temperature performance, thermal shock, and life-cycle testing to improve and ensure overall performance, durability, and reliability, of these products and systems.

34. My responsibilities include technology assessments and supplier and sourcing evaluation and selection, quoting and bidding, and overall source selection and the overall source selection process. For example, I specifically have prepared numerous extensive proposals and responses for many different domestic, European, Asian, and Pacific Rim requests for quotations (“RFQs”) in the hopes of winning awards as the Tier 1 supplier chosen for many original equipment manufacturer (“OEM”) programs. I was involved in both winning awards and non-winning awards on numerous programs for different OEMs. While at General Motors and Ford, and in my current position for the U.S. Army, I am part of, and also the leader of, many cross-functional teams involved in the sourcing selection, request for information (“RFI”) and RFQ processes and evaluations, and ultimate evaluation and decision as to which suppliers are chosen for purchase order (“PO”) awards on numerous vehicle programs.

35. My work also involved extensive inspection, investigation, and analysis of field events involving automotive systems. I have specifically performed numerous forensic investigations, evaluations, and assessments, and qualified to testify as an expert in state and federal courts throughout the United

States. I also performed off-road analyses using numerous car and truck platforms under different environmental extremes and conditions, including off-road performance and evaluation in Barstow, California. I also developed the testing specifications and requirements, as well as the standards and requirements for acceptable performance, for these aforementioned vehicle systems and components and directed how these tests are to be performed. I also conducted numerous environmental, humidity, drop, vibration, vehicle dynamics, thermal shock, EMC, and temperature tests (including conduction, convection, radiation thermal transfer and heat absorption), material emissivity/heat transfer, and established the environmental, temperature, vibration, (life cycle, temperature cycle, heat age, millivolt drop, wire & connector pull, drop testing, etc.) requirements for vehicle components and systems, including metals, plastics, coatings, electronic modules and sensors and their related specifications, to ensure proper system performance over long term vehicle life. In particular, I conducted live in-vehicle tests, over numerous on-road and off-road surfaces and conditions, and testing at environmental and operating extremes to establish proper requirements and their associated ranges for system and component specifications, DVPRs and subsystem design specifications, and life-cycle tests. I also developed and verified the manufacturing In-Process tests and Control Plans to ensure component manufacturing within proper reliability and confidence interval

requirements, as well as life-cycle testing for reliability over long-term vehicle life. My current responsibilities, as well as my previous work at Ford, General Motors, AlliedSignal, Raytheon, and General Dynamics, include the development of requirements, specifications, quality, reliability, process, manufacturing and compliance standards, control plans, Failure Mode and Effects Analyses (FMEA), Failure Analysis and Corrective Actions Reports (FRACAS), root cause analyses, application of six sigma techniques, 8 discipline and 14 discipline reports for automotive/military ground vehicle systems and components.

36. The opinions set forth in this report are based upon my knowledge, education, and extensive experience as I have discussed above which is directly applicable to the technologies discussed in the patent in this matter, and also on my review of the materials cited in this report and in the Exhibits, and those noted below. Although I have a law degree, and I am licensed to practice before the United States Patent and Trademark Office, I have not been asked to opine on any legal issues. I will not be giving any legal opinions throughout this report and throughout my work on this matter. My opinions provided herein are based on my automotive engineering, technical, scientific, and automotive industry/business education and experience. A list of cases for which I have testified as an expert is included as part of my CV provided, including all cases I testified in during the last four years.

D. Materials Considered

37. In forming my opinions regarding the Patents, I have reviewed the '651 patent and its file history as well as the materials identified in **Appendix 2** and those specifically referenced in this Declaration. I reserve the right to amend or supplement this list as needed.

II. LEGAL PRINCIPLES AND STANDARDS

38. I have been informed by counsel regarding certain legal principles and standards that apply to these proceedings. I have applied these principles and standards in providing my opinion in this Declaration.

39. I understand that claims in U.S. patents have a presumptive invention date that is the priority date for the claim. For the purposes of my declaration, I assume the filing date of February 26, 2013 for the '651 patent. When I refer to the "time of the invention," I refer to the time in or around the filing date I have assumed for this declaration. In the event a different date is established to be the time of the invention, I would address the analysis as of that established time, to the extent that time results in a change of the analysis.

A. Claim Construction

40. I have been informed and understand that the first step in determining the patentability of a challenged claim is for the claim terms to be properly

construed. I understand that in an IPR proceeding, claims of an unexpired patent are interpreted using the same standards applied by the courts.

41. I understand that there is a presumption that claim terms carry their “ordinary and customary meaning,” as would be understood by a person of ordinary skill in the art at the time of the invention considered in the context of the Challenged Patent and its prosecution.

42. I further understand therefore that claims should be construed in light of the patent’s intrinsic evidence—the claims, the specification, and prosecution history—and, to a lesser degree, extrinsic evidence, such as expert and inventor testimony, dictionaries, and learned treatises.

43. It is my understanding that a patent applicant can establish a meaning in the specification for a term that is a change from the ordinary meaning if the different meaning is set out in the specification in a manner sufficient to give a POSITA notice of the change from ordinary meaning.

44. It is my understanding that the purpose of claim construction is to interpret claim language to understand—but not to change—the scope of the claim.

B. Anticipation

45. I understand that references that qualify as prior art can be used to establish a patent claim is unpatentable as anticipated or as obvious.

46. I understand that, once the claims of a patent have been properly construed, the second step in determining anticipation of a patent claim requires a comparison of the properly construed claim language to the prior art on a limitation-by-limitation basis.

47. I understand that a prior art reference anticipates an asserted claim, and thus renders the claim unpatentable, if all elements of the claim are disclosed in that prior art reference, either explicitly or inherently.

C. Obviousness

48. I understand that even if a claim is not anticipated, it is still unpatentable if the differences between the invention and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art (“POSITA”) to which the subject matter pertains. To prove unpatentability for obviousness, the proposed combination of prior art references must disclose or render obvious each claim limitation of the challenged patent.

49. I also understand that the factual analysis relevant to obviousness requires analysis of the following four factors: (1) the scope and content of the prior art; (2) the differences between the prior art and the claims at issue; (3) the level of ordinary skill in the art; and (4) objective indicia of obviousness or nonobviousness, which include “secondary considerations” such as the

commercial success of the invention, long felt but unsolved needs, unexpected results, and the failure of others to arrive at the invention.

50. I have been told that analyzing these four factors to determine either obviousness or nonobviousness must not be done through impermissible hindsight analysis, but rather must be done from a view of that hypothetical POSITA as of February 26, 2013.

51. I understand that an obviousness determination can be based on a combination of multiple prior art references. I understand that the prior art references themselves may provide a suggestion, motivation, or reason to combine, but other times the nexus linking two or more prior art references is simple common sense. I further understand that obviousness analysis recognizes that market demand often drives innovation, and that a motivation to combine references may be supplied by the direction of the marketplace.

52. I understand that if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.

53. I also understand that practical and common sense considerations should guide a proper obviousness analysis, because familiar items may have obvious uses beyond their primary purposes. I further understand that a person of

ordinary skill in the art looking to overcome a problem will often be able to fit together the teachings of multiple publications. I understand that obviousness analysis therefore takes into account the inferences and creative steps that a person of ordinary skill in the art would employ under the circumstances.

54. I understand that a particular combination may be proven obvious merely by showing that it was obvious to try the combination. 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 person of ordinary skill has good reason to pursue the known options within his or her technical grasp because the result is likely the product not of innovation but of ordinary skill and common sense.

55. I understand that the combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results. When a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or a different one. If a person of ordinary skill can implement a predictable variation, the patent claim is likely obvious.

56. I understand that a claim can be obvious in light of a single reference, without the need to combine references, if the elements of the claim that are not

found explicitly or inherently in the reference can be supplied by the common sense of one of skill in the art.

57. I understand that secondary indicia of non-obviousness may include: (1) a long felt but unmet need in the prior art that was satisfied by the invention of the patent; (2) commercial success of processes covered by the patent; (3) unexpected results achieved by the invention; (4) praise of the invention by others skilled in the art; (5) taking of licenses under the patent by others; (6) deliberate copying of the invention; (7) failure of others to find a solution to the long felt need; and (8) skepticism by experts.

58. I also understand that there must be a relationship between any such secondary considerations and the invention. I further understand that contemporaneous and independent invention by others is a secondary consideration supporting an obviousness determination.

59. In sum, my understanding is that prior art teachings are properly combined where a person of ordinary skill in the art having the understanding and knowledge reflected in the prior art and motivated by the general problem facing the inventor, would have been led to make the combination of elements recited in the claims. Under this analysis, the prior art references themselves, or any need or problem known in the field of endeavor at the time of the invention, can provide a

reason for combining the elements of multiple prior art references in the claimed manner.

60. For the reasons stated in the exhibits to this report, I believe the Challenged Claims of the '651 patent are anticipated and/or obvious in light of the prior art analyzed therein. I additionally note that Multiquip has taken the position in response to Interrogatories (*Exhibit 1025*) served in a parallel district court proceeding that Multiquip does not allege that Multiquip has made or distributed systems that practice the claims of the '651 patent. For this reason, I am not aware of nor analyzed any secondary indicia of non-obviousness. I reserve the right to revise or supplement my opinions on this issue in response to evidence offered by Patent Owner.

III. PERSON OF ORDINARY SKILL IN THE ART

61. I understand that the claims and specification of a patent are addressed to and are intended to be read by persons of ordinary skill in the art ("POSITA") to which the patent pertains as they would be understood at the time of the filing of the patent application, in this case, on February 26, 2013. I understand and have been instructed that the factors that may be considered in determining the ordinary level of skill in the art include: (a) the levels of education and experience of persons working in the field; (b) the types of problems encountered in the field; and (c) the sophistication of the technology. I understand and have been instructed that a

person of ordinary skill in the art is not a specific real individual but rather a hypothetical individual having the qualities reflected by the factors discussed above.

62. I have considered the levels of education and experience of persons working in the field based on my personal experience, having been a member of this field when the '651 patent was filed.

63. Based on my education, training, and professional experience in the field of the claimed invention, I am familiar with the level and abilities of a person of ordinary skill in the art at the time of the claimed inventions.

64. A POSITA in the field of the '651 patent would have at least 3 years of experience in automotive engineering, and have a Bachelor of Science in electrical, chemical, and/or mechanical engineering, or an equivalent related educational background, and have experience applicable to automotive electronic modules, sensors, and control systems. This includes as related to diesel engines and exhaust gas emissions. A POSITA would have automotive testing and compliance experience, including as related to regulatory and validation requirements (e.g. Environmental Protection Agency (EPA), California Air Resources Board (CARB), Federal Motor Vehicle Safety Standards (FMVSS), and corporate/industry standards). A POSITA would also have experience in the design, testing, development of automotive electronic control modules and

systems, electrical system architectures and data communication/interchange, including as applicable to diesel engines and controls. This includes experience in environmental and temperature effects as related to automotive system performance, engine performance and diesel exhaust gas emissions (e.g. CO, NO_x, particulate matter (PM/soot)), and methods used to reduce emissions (exhaust gas recirculation (EGR), Diesel Particulate Filter (DPF) and DPF regeneration cycles, CrankCase Ventilation (CCV)/Positive Crankcase Ventilation (PCV/PCV valve) Systems, Catalytic Converters/Selective Catalytic Reduction (SCR), Diesel Exhaust Fluid (DEF) Injection), and the related automotive electrical system architectures, electrical/electronic circuitry and data communication busses, power distribution, electrical component/system load effects, generators/alternators, and components used and implemented for vehicle emission control.

65. I have also considered the types of problems encountered in the field. In particular, I have considered which types of problems were thought to be routine problems that were solved as an ordinary part of any development project as well as types of problems that would have been considered more substantial, and the solution to which would have been considered inventive.

66. I was a person of at least ordinary skill in the art at the time of filing the application for the '651 patent, and in fact I am and was an automotive technical

expert and corporate representative (for Ford Motor Company) by at least as of that time.

IV. OVERVIEW OF THE ‘651 PATENT

A. Background

67. The ‘651 Patent and the Challenged Claims address an engine generator, often referred to as a “genset” or “gen-set” (spelled in various ways), equipped with a load bank in order to increase load on the system and the system’s exhaust temperature in order to more completely burn fuel and burn contaminants that may otherwise build up in the engine exhaust system. That accumulation of contaminants, primarily soot, is referred to as “wet-stacking” which negatively impacts the performance of the genset and its efficiency. In addition, various regulations are directed to control of exhaust emissions from engine generators, which prompts the use of emission control devices. One emission control device used with engines such as in gensets, and in particular diesel engines, is an industry recognized device called a particulate filter which mechanically traps emission particles. The particulates trapped by a particulate filter must be periodically oxidized or burned off to maintain its operation, an industry recognized process referred to as “regeneration”. The independent Challenged Claims are directed to engaging the load bank either (a) during regeneration, or (b) after running in a low load condition referred to by the patent as a “neglect” case or condition, in which

the genset is operated for a period of time under low load conditions such that soot may build up. The controller also disconnects the load bank in case of a load spike.

68. Independent claim 1 and 19 are directed to conventional electrical, engine control or engine generator limitations. The dependent claims each add a well-known and conventional electrical control or engine generator limitation, such as the engine is a diesel engine (claims 8, 26), the genset and load bank are mounted either on a common base (claims 12, 30) or are separated (claims 14, 32), the system operates with a poly-phase or three-phase operation (claims 10, 11, 28, 29), or the system has a separate surge or spike protection to cut off some or all of the operation (claims 1), with the surge/spike protection tied to a conventional timed delay in order to avoid cut-offs which would otherwise result from typical system fluctuations (claims 16-18, 34-36).

69. The '651 Patent entitled "Engine-generator with load bank and control system," includes claims which recite conventional components and a specific manner in which the system operates. As disclosed, an engine-generator is made up of an engine 12 that drives an alternator 14, often called the generator. (See **EX1001** Col. 4:47-51.) This combination is also referred to as a genset, "gen-set" or "gen set."

70. The electrical load, or demand, on a gen-set can vary significantly (see **EX1001** Col. 1:11-16), and if an engine operates in a low-load condition unburned

hydrocarbons and soot may accumulate in the exhaust system, referred to as “wet-stacking.” (See **EX1001** Col. 1:11-3) Industry has long recognized that wet-stacking can be reduced by adding an additional “load” to the engine-generator when the real load is at a low level. A few examples showing such a recognition include: (1) **EX1001** Col. 1:59-2:2; **EX1011** Ultimate Service Association Information Sheet - Wet Stacking (2012) ANA0005551-52; (2) **EX1012** Avtron Loadbank Article (July 29, 2008) - ANA0000947; and (3) **EX1013** Volt Master America Engine Driven Generator Set Owner’s Manual (May 2009) ANA0005899. A conventional additional load, often referred to as a “dummy” load, is made up of a number, or “bank,” of resistors, which are similar to heater coils that consume significant amounts of electricity.

71. Many diesel engines from the 2000s forward used particulate filters for emission control in order to trap soot. These devices, commonplace prior to the ‘651 Patent and called “diesel particulate filters” or “DPF” when applied to a diesel engine, build up soot from use and periodically require a process known as “regeneration” to burn off the soot. (See **EX1001** Col. 1:27-47; **EX1014**.) Other emission control devices use chemical reactions to control other types of contaminants, rather than soot, and are not treated by regeneration. Examples other types of emissions control devices are diesel oxidation catalyst systems (“DOC”) used for hydrocarbons, and selective catalytic reduction systems (“SCR”), often

called catalytic converters, which break down nitrogen oxide (“NO_x) through a chemical reaction. (*EX1015*; *EX1016*.)

72. The ‘651 Patent discloses a first embodiment that is related to Figure 1A. This first embodiment of Figure 1A includes two separate controllers. In this first embodiment there are two connections or buses between the controllers, one used for conventional control and another for a “load dump” that completely shuts down or disengages the load bank. This is a common approach in electrical systems that provide a separate emergency shut down or cut-off for a system. Independent claim 1 reads on this first embodiment is read on by. A second embodiment is related to Figure 1B. The second embodiment shown in Figure 1B does not include a separate connection or bus for a “load dump” and only uses one controller. Independent claim 19 reads on this second embodiment of Figure 1B.

73. As shown below in the first embodiment of Figure 1A, the gen-set is made up of an engine 12 and an alternator/generator 14. Engine 12 includes a DPF 22 in the exhaust system.

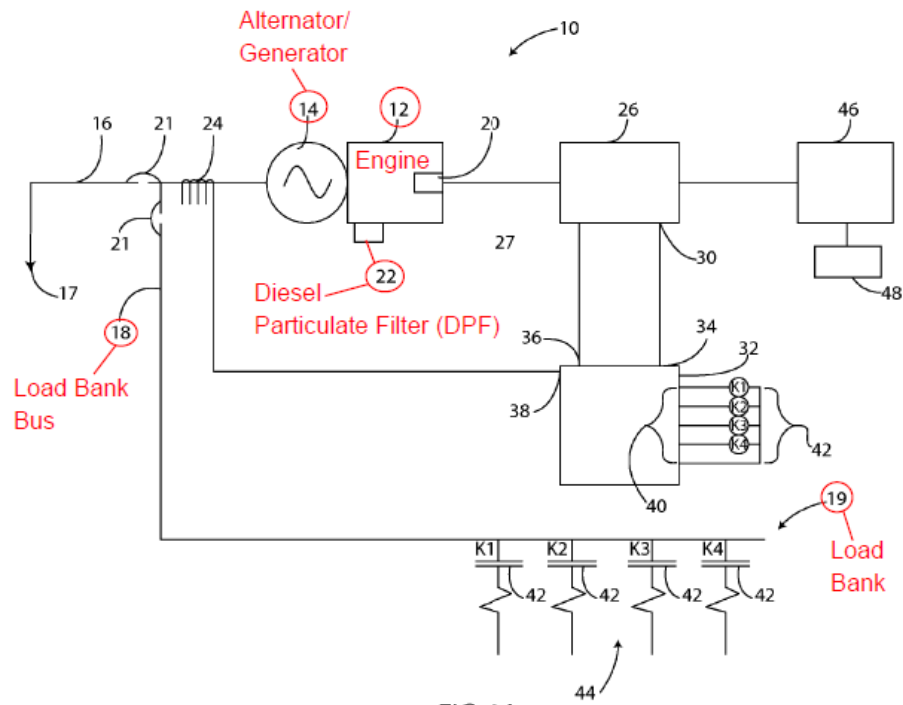
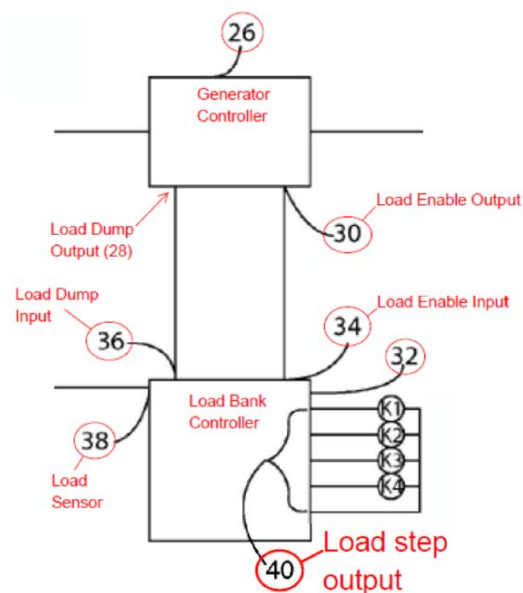


FIG. 1A

The engine-generator is also wired to a load bank 19 by a bus 18. (See **EX1001** Col. 4:37-56.) Load bank 19 adds resistance, or resistive “load,” to the system and may provide various levels or amounts of load or demand on the system. This is referred to as the load bank 19 being engaged in “steps,” which results in different amounts of load that may be selectively added rather than adding or engaging the entire load bank 19 simultaneously. (**EX1001** Col. 2:29-37.)

74. As disclosed and shown in Fig. 1A, a generator controller 26 has two



different connections which the patent refers to as “outputs.” The two outputs on the generator controller 26 are each connected to a separate “input” on a load bank controller 32 which is separate from generator controller 26. As shown in Figure 1A, generator controller 26 includes a “load dump output 28” as one connector and a separate “load enable output 30” as another connector. The load dump outlet is not labelled in patent Figure 1A, but is disclosed as designated in the Figure above. Wiring connects generator controller’s “load dump output” to the load bank controller’s “load dump input 36,” and connects generator controller’s “load enable output” to load bank controller’s “load enable input 34”. (*EX1001* Col. 5:16-22.)

75. In order to engage some or all of load bank 19, generator controller 26 transmits a signal through load enable output 30 to be received by load enable input 34 on the load bank controller 32. This causes a selected step or level of load bank

19 to be engaged. (Col. 2:29-37.) In the event that the entire load bank needs to be disconnected, such as a surge of load being added to the system, a different signal is transmitted by generator controller 26 through the load dump output 28 to be received by load dump input 36 on load bank controller 32. This prompts load bank controller 32 to transmit a signal which commands the entire load bank 19 to be disconnected. (**EX1001** Col. 2:37-40; Col. 3:64 – Col. 4:5.) A “load sensor 38” on load bank controller 32 provides information for control of the system. (**EX1001** Col. 5:16-22.)

76. Load bank 19 is made up of one or more load step resistors 44, each of which are selectively engaged to resist the flow of electrical current and thus create load or demand for power. As shown in Figure 1A, load bank controller 32 includes one or more “load step output” 40 which are each connected to a load step contactor 42. Each load step contactor 42, when activated, connects its respective load step resistor 44 with a bus 18 in order to be connected with alternator 14 and thus increase or add a demand for electricity. (**EX1001** Col. 5:23-36.)

77. As disclosed and shown in the embodiment of Figure 1B, the engine-generator includes an engine 12 with a DPF 22 and an alternator/generator 14. The engine-generator only includes one controller, a generator controller 26. A load bank

FIG. 1B

78. In the embodiment shown in Figure 1B, the single generator controller 26 itself controls the load bank directly, and therefor does not include a load bank controller. (**EX1001** Col. 4:6-9.) Generator controller 26 has a set of load step outputs 40, each of which are connected to a load step contactor 42 in order to connect a set of load step resistors 44 to the load bank bus 18.

The process of regeneration is well recognized by industry as a process used to burn off soot from a particulate filter in the engine's exhaust system. (See **EX1001** Col. 1:41-47.) Although a particulate filter may eventually need to be cleaned in a recognized manner, exhaust system particulate filters undergo periodic regeneration many times between cleanings. A second operating condition referenced in the '651 Patent is not a recognized term or condition in the industry. This condition is referred to by the '651 Patent as the system being subject to "neglect." This "neglect" term is coined by the '651 Patent. The neglect condition is the operation of the system sub-optimally for a period of time in order to save fuel until the system reaches a level of "neglect." (See **EX1001** Col. 3:7-9.) A third operating condition, "excessive idle," is not recited in the Challenged Claims. (See **EX1001** Col. 3:44-63.)

B. Prosecution History

80. The '651 patent issued from an application Serial No. 13/777,900 filed February 26, 2013, with 38 application claims. The '651 patent does not claim priority to any earlier applications, either an earlier filed U.S. application or a foreign filed application.

81. The patent examiner issued a notice of allowance, which included the following Statement of Reasons for Allowance:

3. Examiner's Statement of Reasons for Allowance:

Applicant(s) invention relates to an engine-generator system, and more Specifically, to a structure of such system,

The system of an engine-generator and load bank has an engine mechanically connected to and capable of driving an alternator; said engine having an control module and a particulate filter; said alternator in electrical communication with an output bus and a load bank bus; at least one load monitoring device in electrical communication with said output and load bank buses; a generator controller comprising a load dump outlet and a load enable output, said generator controller in electrical communication with said engine control module; a load bank controller, comprising a load enable input, a load dump input, a load sensor, and at least one load step output; said load dump output in electrical communication with said load dump input; said load enable output in electrical communication with said load enable input; said load monitoring device in electrical communication with said load sensor; at least one load step contactor in electrical communication with said at least one load step output; and at least one load step resistor in electrical communication with said load bank bus by way of said at least one load step contactor; wherein said generator controller provides a control signal via said load enable output in at least one of the following cases: neglect and regeneration; and wherein said generator controller provides a control signal via said load dump output in case of a load spike.

There are inventions in the field that provide similar functionality and/or have similar features, as prior art of record shows. Applicant(s) invention differs from the prior art of record by the combination of its functional features, which examiner's search failed to find.

(EX1002 Notice of Allowance; Production numbers Multiquip00000023-24)

82. The '651 patent subsequently issued without changes to the claims.

C. Challenged Claims

The challenged claims are as follows, in the format included in the Petition:

1. An engine-generator and load bank system comprising:
 - an engine mechanically connected to and capable of driving an alternator;
 - said engine having an engine control module and a particulate filter;
 - said alternator in electrical communication with an output bus and a load bank bus;
 - at least one load monitoring device in electrical communication with said output and load bank buses;

a generator controller comprising a load dump output and a load enable output,

said generator controller in electrical communication with said engine control module;

a load bank controller comprising a load enable input, a load dump input, a load sensor, and at least one load step output;

said load dump output in electrical communication with said load dump input;

said load enable output in electrical communication with said load enable input;

said load monitoring device in electrical communication with said load sensor;

at least one load step contactor in electrical communication with said at least one load step output; and

at least one load step resistor in electrical communication with said load bank bus by way of said at least one load step contactor;

wherein said generator controller provides a control signal via said load enable output

in at least one of the following cases: neglect and regeneration; and

wherein said generator controller provides a control signal via said load dump output in case of a load spike.

4. The engine-generator and load bank system of claim 1 comprising a plurality of load step resistors.
8. The engine-generator and load bank system of claim 1 wherein the engine is a diesel engine.
9. The engine-generator and load bank system of claim 1 wherein

the engine is a Tier IV Interim or newer diesel engine.

10. The engine-generator and load bank system of claim 1 wherein

said alternator, output bus, load bank bus, and at least one load step resistor comprise a polyphase electrical system.
11. The engine-generator and load bank system of claim 1 wherein

said alternator, output bus, load bank bus, and at least one load step resistor comprise a three-phase electrical system.
12. The engine-generator and load bank system of claim 1 which further comprises

a common base and enclosure.
13. The engine-generator and load bank system of claim 1 wherein

said at least one load step resistor is physically located in an enclosure connected to the radiator of said engine.
14. The engine-generator and load bank system of claim 1 wherein

said at least one load step resistor is located remotely from said engine-generator.
15. The engine-generator and load bank system of claim 1 wherein

the generator controller and engine control module are configured to communicate via SAE J1939 protocol.
16. The engine-generator and load bank system of claim 1 wherein

the generator controller is configured to provide said control signal to said load dump output within 10 seconds.
17. The engine-generator and load bank system of claim 1 wherein

the generator controller is configured to provide said control signal to said load dump output within 1 second.

18. The engine-generator and load bank system of claim 1 wherein

the generator controller is configured to provide said control signal to said load dump output within 0.1 second.

19. An engine-generator and load bank system comprising:

an engine mechanically connected to and capable of driving an alternator;

said engine having an engine control module and a particulate filter;

said alternator in electrical communication with an output bus and a load bank bus;

a generator controller in electrical communication with said engine control module,

said generator controller having at least one load step output;

at least one load step contactor in electrical communication with said at least one load step output; and

at least one load step resistor in electrical communication with said load bank bus by way of said at least one load step contactor;

wherein said generator controller is capable of operating said load step contactor to connect said load step resistor

in at least one of the following cases: neglect and regeneration; and

wherein said generator controller is capable of operating said load step contactor to disconnect said load step resistor in case of a load spike.

22. The engine-generator and load bank system of claim 19 comprising

a plurality of load step resistors.

26. The engine-generator and load bank system of claim 19 wherein

the engine is a diesel engine.

27. The engine-generator and load bank system of claim 19 wherein
the engine is a Tier IV Interim or newer diesel engine.
28. The engine-generator and load bank system of claim 19 wherein
said alternator, output bus, load bank bus, and at least one load step
resistor comprise a poly-phase electrical system.
29. The engine-generator and load bank system of claim 19 wherein
said alternator, output bus, load bank bus, and at least one load step
resistor comprise a three-phase electrical system.
30. The engine-generator and load bank system of claim 19 which further
comprises
a common base and enclosure.
31. The engine-generator and load bank system of claim 19 wherein
said at least one load step resistor is physically located in an enclosure
connected to the radiator of said engine.
32. The engine-generator and load bank system of claim 19 wherein
said at least one load step resistor is located remotely from said
engine-generator.
33. The engine-generator and load bank system of claim 19 wherein
the generator controller and engine control module are configured to
communicate via SAE J1939 protocol.
34. The engine-generator and load bank system of claim 19 wherein
the generator controller is configured to operate said load step
contactor to disconnect said load step resistor within 10 seconds.
35. The engine-generator and load bank system of claim 19 wherein

the generator controller is configured to operate said load step contactor to disconnect said load step resistor within 1 seconds.

36. The engine-generator and load bank system of claim 19 wherein

the generator controller is configured to operate said load step contactor to disconnect said load step resistor within 0.1 seconds.

V. Claim construction

83. I previously discussed the standards applied to construction of patent claims. In this matter I understand that the '651 patent assigns meanings to two claim terms which the patent expressly sets in a manner that gives notice to a POSITA that the patent is assigning a particular meaning to those terms. Those two terms are (1) "neglect", and (2) "load spike."

A. Construction of "Neglect"

84. The term "neglect" is not an industry recognized term with regard to engine generators. Although the word "neglect" has a dictionary definition that connotes some improper operation or ignoring of the engine generator, it is clear that the '651 patent specification attempted to set out a definition for what is referred to in Claims 1 and 19 as the "neglect" case. Each of independent claims 1 and 19 recite the limitation of an action being taken or the system being capable of taking an action "in at least one of the following cases: neglect and regeneration." The definition provided by the specification for this term, however, is not sufficiently definite for a POSITA to know with reasonable certainty the scope of

that limitation and what is and what is not covered by the limitation. Although some indications are provided by the specification as to the assigned meaning of this term, no criteria or guidelines are provided to define the duration or parameters of the neglect case.

85. The '651 Patent discloses the “neglect” case is one in which the operator saves money by letting the gen-set operate in an improper condition rather than use the additional costly fuel that engaging the load bank would consume, and this condition is allowed to go on for more than a short time:

In a world of rapidly decreasing oil supplies, and rapidly increasing fuel costs, it is desirable to balance the benefits of minimum generator loading with economic realities. Said differently, it is advantageous to decrease soot product and wet-stacking events with dummy loads (aka load banks), while at the same time being mindful of the fuel costs associated with operating dummy loads.

(Ex. 1, Col. 2:9-16.)

Restricting the load bank to operation in a neglect case allows one to save fuel because the load bank will only draw power from the generator when necessary to prevent wet stacking and soot build up. The generator will thus be allowed to operate in a sub-optimal state until such time as wet stacking and soot build up are likely to occur.

(Ex. 1, Col. 3:4-9.)

85a. The following is the patent’s disclosure regarding the “neglect” scenario or case:

The control system operates the load bank to mitigate harmful effects of generator **neglect** and maintains loading for efficient DPF regeneration while allowing the generator to quickly dump the load bank when real load increases.

(Abstract)

In accordance with some embodiments of the disclosed technology, the generator and load bank controllers are configured to initiate the load bank when certain conditions exist. The load bank is initiated when there is a "neglect scenario" or "neglect case." The generator controller, via the load bank controller, monitors the load connected to the generator to ensure that the load is within a "window" or "load window" bounded by pre-set lower and upper load levels. If the load connected to the generator remains at or below some pre-set load condition--i.e., below the window--for a pre-set duration, the generator controller signals the load bank controller to initiate the load bank. The load bank controller then increases or decreases the total resistance of the load bank by connecting or disconnecting load step resistors as necessary to maintain the load within window. If the load rises above the window, the steps of the load bank are disconnected as necessary. In this way, the total load on the generator--i.e., the real load and the resistance of the load bank--remains within pre-set limits. The pre-set load corresponds to a power demand on the generator that provides for optimal operation, which minimizes wet stacking and soot build up.

Restricting the load bank to operation in a neglect case allows one to save fuel because the load bank will only draw power from the generator when necessary to prevent wet stacking and soot build up. The generator will thus be allowed to operate in a sub-optimal state until such time as wet stacking and soot build up are likely to occur. The load window and duration variables necessary for determining a neglect scenario will thus be based on manufacturer or user-defined values directed at pinpointing the time when wet stacking and soot build up is likely to begin.

In accordance with some embodiments of the disclosed technology, the duration variable for neglect is cumulative. The generator controller will constantly monitor load levels and will track the time period for which load levels are below the window. If the cumulative time the system is operated below the window reaches the pre-set duration, the generator controller signals the load bank controller to initiate the load bank. This cumulative timing of sub-optimal operation occurs even the system is operated for short periods of time at load levels within and above the window. If, however, the system operates for a pre-set time within the window, a neglect scenario may be avoided. The system thus accounts for the cumulative nature of soot build up in the engine. The problems associated with this soot accumulation

can be avoided if the engine is operated under loaded conditions for a pre-determined duration. The generator controller therefore ensures the system is operated under a designated load for a pre-set duration. This operation for a pre-set duration under set load conditions at full engine speed is disclosed here a "load cycle."

(Col. 2:50 - Col. 3:33)

FIG. 2 depicts a control system that the generator controller 26 may employ to control the system 10. The generator controller 26 first evaluates generator operating status 50 to determine if the engine 12 is in an acceptable operating condition 52. Whether the engine 12 is in an acceptable operating condition is a function of whether a **neglect scenario** or excessive idle scenario is present. Cases of **neglect** and excessive idle correspond to an engine 12 being in an unacceptable operating condition.

(Col. 6:45-53)

86. Although the definition assigned by the '651 patent to the neglect case is not sufficiently definite that a POSITA would know its scope, the '651 patent discloses some indications of factors relating to the neglect case. The specification discloses neglect is the intentionally running of the system sub-optimally for more than a short duration in order to save fuel and fuel costs. The specification in discussing the neglect scenario, however, does not specify what neglect is. As best that a POSITA would understand, the patent discloses the "neglect" case is one in which the operator saves money by letting the gen-set operate in an improper condition for more than a short time rather than use the additional costly fuel that engaging the load bank would consume. (**EX1001** Col. 2:9-16, Col. 3:4-9.) When the system has been run long enough that wet-stacking builds up, either running

continuously or in a cumulative set of periods, the load bank is engaged to burn off accumulation. (*EX1001* Col. 2:50-3:3; Col. 3:14-31.)

87. The ‘651 patent discloses three operative conditions relating to application of the load bank to the engine generator, (1) the neglect case, (2) regeneration, and (3) excessive idle control. (*EX1001* Col. 6:44-63.) The term “excessive idle control” is also not an industry standard term. The ‘651 patent does provide additional guidance in addressing the “excessive idle control” which is more definite than the disclosure regarding the neglect case. The ‘651 Patent discusses a specific example in order to provide a POSITA with a range of magnitude that is being addressed as excessive idle control: “In accordance with some embodiments, for every three (3) hour period of engine idle time, the engine must complete a load cycle of one (1) hour.” (*EX1001* Col. 3:61-63.) A POSA would recognize that to the extent the “excessive idle” control relates to a sub-optimal operation of the engine generator, that operation is measured in terms of hours.

88. The “neglect” case is described to be one where the engine generator is intentionally operated in a sub-optimal manner for a period of time in order to save fuel, which saves operational cost. (See *Ex. 1001* Col. 3:4-9.) A POSITA would recognize from the disclosure of the ‘651 patent that the neglect case means allowing the engine generator to run in a light load or sub-optimal condition for an indefinite

extended period of time and not a short period, in order to save fuel and reduce cost. Although a POSITA would not understand this construction to be definite, it would be the best effort a POSITA could apply to the disclosure of the ‘651 patent.

B. Construction of “Load Spike”

89. The term “load spike” is specifically defined in the ‘651 patent. Although the specific definition of the patent is similar to the general construction of “load spike” in industry, the definition assigned by the ‘651 patent is broader than that of the general term in industry. Typically industry understands “load spike” to be an abrupt and significant increase in load. The patent expressly assigns a different meaning.

90. Claims 1 and 19 each recite the generator controller takes action to disconnect the load bank “in case of a load spike.” The ‘651 patent specification expressly defines “load spike” as follows, with the bolding and italics added:

“In such a configuration, the generator controller signals the load bank controller to disconnect, or dump, the load bank if the generator controller and/or load bank recognizes a ‘load spike’ of monitored load. ***Load spike, as used here, is a scenario in which the load connected to the engine-generator exceeds some pre-set value.***”
(*EX1001* Col. 3:64-4:5.)

91. A POSITA would recognize the term “load spike” in the context of the ‘651 patent has the defined meaning of “a load connected to the engine generator exceeds some pre-set value.”

VI. SCOPE AND CONTENT OF THE PRIOR ART

A. TIER IV Standards

92. Internal combustion engines produce exhaust emissions that are environmental contaminants. Diesel engines in particular are prone to production of exhaust emission contaminants that have been the subject of various regulations and standards that target the reduction of such exhaust emissions. The United States Environmental Protection Agency (“EPA”) over a period of years has adopted various such standards referred to as “Tiers” which apply to different equipment and time periods that the standards come into effect.

93. The EPA’s “TIER IV” standards, both as “Interim” and “Final,” apply to engines that are present in a genset, and including for industrial or non-highway use. There are exceptions to Tier IV regulations that apply to stand-by gen sets as a result of these gensets being used for emergency power generation.

94. The EPA’s Tier IV standards adopted in 2004 were phased in over a period of time, with Tier IV Interim standards being phased in from 2008 to 2012. A significant body of literature regarding TIER IV standards was published prior to and during that phase in period due to the mandatory nature of its application to engines in the United States. An example of such a publication is Power Engineering Article of November 1, 2011 identified as **EX1016** that reviews those TIER IV emissions standards. A chart in that publication shows the phase in of

Tier IV standards by year for various size of genset engines, with Tier IV Interim standards shown in green and TIER IV Final standards shown in pink.

TABLE 2 EPA STATIONARY DIESEL NON-EMERGENCY GENSET EMISSIONS STANDARDS										
bkW	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
<8	10.5 8.0 1.0	7.5 8.0 0.80	7.5 8.0 0.40		7.5 8.0 0.60					
8<19	9.5 6.6 0.80	7.5 8.0 0.80	7.5 6.6 0.40							
19<37	9.2	7.5 5.5 0.60	7.5 5.5 0.30					4.7 5.5 0.03		
37<56 Option 1	9.2	7.5 5.0 0.40	4.7 5.0 0.30					4.7 5.0 0.03		
37<56 Option 2	9.2	7.5 5.0 0.40	4.7 5.0 0.40				4.7 0.5 0.33			
56<75	9.2	7.5 5.0 0.40	4.7 5.0 0.40				3.4 0.19 5.0 0.02			0.40 0.19 5.0 0.02
75<130	9.2	4.0 5.0 0.30					3.4 0.19 5.0 0.02			0.40 0.19 5.0 0.02
130<225	9.2 1.3 11.4 0.54	4.0 3.5 0.20				2.0 0.19 3.5 0.02			0.40 0.19 3.5 0.02	
225<450	9.2 1.3 11.4 0.54	4.0 3.5 0.20				2.0 0.19 3.5 0.02			0.40 0.19 3.5 0.02	
450<560	9.2 1.3 11.4 0.54	4.0 3.5 0.20				2.0 0.19 3.5 0.02			0.40 0.19 3.5 0.02	
560<900	9.2 1.3 11.4 0.54	6.4 3.5 0.20				3.5 0.40 3.5 0.10				0.67 0.19 3.5 0.03
900<2237	9.2 1.3 11.4 0.54	6.4 3.5 0.20				0.67 0.40 3.5 0.10				0.67 0.19 3.5 0.03
>2237	9.2 1.3 11.4 0.54					0.67 0.40 3.5 0.10				0.67 0.19 3.5 0.03

Legend

NOX, HC,
CO, PM
NOX + HC,
CO, PM
g/kW-hr

Tier 1 Tier 2 Tier 3 Tier 4-
Interim Tier 4
Final Power in kW
kW=0.9 kW

As reflected by the above chart, Tier IV Interim standards were required for most such diesel engines by 2011 and by 2012 either TIER IV Interim or TIER IV Final standards were required for all such engines.

95. Prior to implementation of TIER IV standards industry had developed a number of exhaust emissions control devices which targeted different forms of emissions. The exhaust emissions of a diesel engines that are principally regulated are particulate emissions, hydrocarbons (HC), carbon monoxide (CO), and oxides

of nitrogen (NO_x). In targeting different forms of emissions the different types of exhaust emissions control devices operated in different ways.

96. Exhaust emissions include solid particulates within the exhaust stream composed primarily of solid carbon, commonly referred to as soot. Also included are hydrocarbons from the combustion process or unburned lubricating oil absorbed on the carbon particles. Particulate emissions are primarily controlled by optimizing combustion and using higher fuel injection pressures.

97. Hydrocarbons or HCs are fuel that is unburned or partially oxidized during the combustion process and to some degree from lubrication oil. In general, when a genset is operated at low engine power levels or load the HC emissions are typically highest. The HC emissions when the genset is run at low load levels may be several times higher than when run at higher levels, such as 10 to 25 % higher. A wide variety of factors affect HC emissions.

98. NO_x emissions result from high temperature combustion, and lowering combustion temperatures may reduce NO_x formation within the cylinder. Various efforts may be used to lower combustion temperature, such as reducing inlet air temp, retarding fuel injection timing, slowing combustion and using exhaust gas recirculation to lower oxygen concentration to inhibit the formation of NO_x.

99. CO emissions are caused by incomplete combustion related to rich mixtures. The emissions control measures taken for other emissions typically avoid need for additional CO emissions devices.

100. Engine out exhaust emissions are controlled by optimization and tradeoffs of a wide range of variables. Exhaust emission regulations have been addressed by use of exhaust aftertreatment devices in addition to optimization of operation of the engine. Diesel engine exhaust aftertreatment devices have generally included one or more of three widely recognized devices, each of which provide different functions and operate in different manner: (1) Diesel Particulate Filters (“DPF”), (2) Diesel Oxidation Catalysts (“DOC”), and (3) Selective Catalytic Reduction systems (“SCR”).

101. A DPF traps particulate matter in order to mechanically remove solid particulate matter, principally soot, from the exhaust gas stream. A DPF includes a filter material or membrane through which the exhaust gas is forced in order to mechanically filter out and retain the particulate material. Exhaust emission particulate filters are well recognized in industry and have a known operation to mechanically remove exhaust particulates. A common structure for a DPF is a ceramic honeycomb structure type of filter with many parallel passages, in which adjacent parallel passages are plugged at alternating ends. The exhaust gas is

therefore forced through the porous walls of adjacent passages so that the porous walls filter and trap the particulates. (**EX1014.**)

102. A DOC is used to oxidize or burn HC and CO emissions. The DOC is a device that includes catalyst chemicals which promote the oxidation process without taking a direct part in the reactions. (**EX1015.**) The DOC does not trap particulate materials, but rather promotes a more complete oxidation. Since particulate emissions in an exhaust stream contain some HCs, a DOC promotes the oxidation of the HC component and the soot particles continues in the exhaust stream. As a result, the catalytic process may reduce the overall mass of exhaust particulate matter by oxidizing HCs on the soot particles, but the soot particles are not themselves removed from the exhaust stream. A conventional approach is to position a DOC in the exhaust stream upstream of the DPF. This provides a catalytic reaction by the DOC that promotes the oxidation of HC, and the soot particulate material is thereafter filtered and trapped by the DPF.

103. An SCR system reduces NO_x emissions by way of a chemical reaction using ammonia to convert or reduce the NO_x to nitrogen (N) and water (H₂O). The process provided by the SCR includes the introduction of ammonia, normally by way of an upstream injection of diesel emission fluid (“DEF”), which is a urea-water mixture. (See **EX1016.**)

104. An exhaust stream particulate filter, particularly in a diesel engine, will become overloaded or blocked by the collection of particulates. The DPF must therefore periodically undergo the process of regeneration in order to burn off the accumulated soot.

105. Passive regeneration may be used if the system operates at a temperature at which the trapped particulate in the DPF may be oxidized or burned off, such as in a system with sufficient catalyst materials that the oxidation temperature is lowered or the system is operated at a high enough temperature. A DPF may be actively regenerated at specific intervals by actively burning off the particulate accumulated, also referred to as forced regeneration. Active regeneration typically involves dosing the DPF with fuel, causing the temperature to raise sufficiently to burn off the accumulated particulates. A DPF may also be cleaned periodically, but that is a different process from regeneration and involves a conventional removal and cleaning of the device. This takes place periodically because regeneration does not completely remove all accumulated ash from the DPF.

106. When Tier IV standards were introduced it was widely believed that use of a DPF would be necessary to meet the standard. As implementation of the standard was undertaken by industry, it was recognized that a DPF was not necessarily required by modern engines to comply with the standard due to the

operation of modern diesel combustion systems such as the use of high fuel injection pressures.

B. SAE J1939 Protocol

107. The Society of Automotive Engineers (“SAE”) issued J1939 as a set of standards that form a protocol for ECU communication via a CAN bus. The SAE worked on the J1939 protocol during the 1990s and early 2000s, and issued various preliminary documents relating to the protocol. At least by 2002 the J1939 protocol was released, and has since become a widely-used and well-recognized standard for communication. **EX1018** is a screenshot of a website maintained by SAE through which SAE reports and publications can be obtained, which includes a short summery by the SAE as to the J1939 protocol.

108. The SAE J1939 protocol and CAN bus communications have been used by gensets for many years, including many years before the filing of the application for the ‘651 patent. Examples of publications noting such use include U.S. Patent 6,701,221 to Eaton et al., which was filed October 24, 2000 and issued March 2, 2004 (**EX1007** at Col. 4:13-30, 5:38-50); U.S. Pub. 2004/0010349 to Perez et al. filed July 12, 2002 and published January 15, 2004 (**EX1019 at** para. [0003], [0006], [0063]); U.S. Patent 8,209,962 to Sun et al, filed Sept. 28, 2005 and issued July 3, 2012 (**EX1020** Col. 1:63-66, Col. 2: 60-66, Col. 4:54-61). Gensets used on marine vessels have used the J1939 protocol as well. See U.S.

Patent 8,706,330, filed December 29, 2011 and published April 26, 2012 (Genset at Col. 6:57-64; and J1939 at Col. 8:18-27). The J1939 protocol is main universal standard used by the heavy heavy-duty truck industry, and also in use in numerous military vehicles that rely on engines and diesel engines acquired from heavy duty truck commercial manufacturers, such as, for example, Caterpillar, Inc. It is well known that SAE J1939 has been adopted widely by diesel engine manufacturers, and that one driving force behind this is the increasing adoption of the engine Electronic Control Unit (ECU), which provides one method of controlling exhaust gas emissions within US and European standards. This includes the Controller Area Network (CAN) ISO 11898 specification (including using the extended 29-bit message field identifier). I personally have conducted numerous analyses on diesel engines and diesel engine control modules employing the standard nine-pin interface connector for diagnostics for CAN analyses employing the J1939 standard on heavy trucks and military vehicles. An example of this interface is shown below –

Note: Black connector primary CAN is 250K, the green connector primary CAN is 500K. **Figure 2**

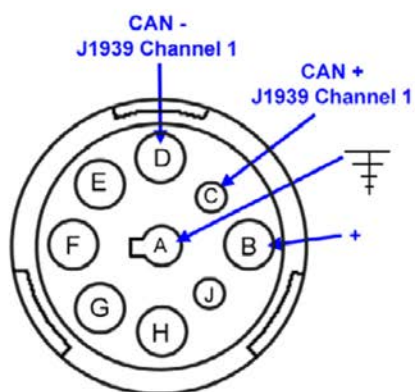


FIGURE 1



FIGURE 2

Two 120 Ω resistors are required to complete the J1939 network topology.

See https://www.terex.com/docs/librariesprovider7/tech-tips/techtip_87.pdf

(EX1033.)

C. Petitioner's Asserted Grounds for Unpatentability

109. I understand that Petitioner is asserting the following grounds for unpatentability of the Challenged Claims.

Ground	Claims	Basis
1	19, 22, 26	Anticipated under §102(e) by Van Niekerk EX1004 , or alternatively obvious under §103 over Van Niekerk.
2	27-36	Obvious under §103 over the combination of Van Niekerk and Van Niekerk 2 EX1005 , Egan EX1006 , Eaton

		EX1007 , or Deep Sea Manual 7 EX1008 or Deep Sea Manual 9 EX1032 .
3	1, 4, 8	Obvious under §103 over the combination of Van Niekerk and Aoki EX1009
4	9-18	Obvious under §103 over the combination of Van Niekerk and Aoki, and further combination with Van Niekerk 2, Egan, Eaton, or DSE Manual.
5	19, 22, 26-31	Obvious under §103 over the combination of Egan and Sherman EX1010 .
6	32-36	Obvious under §103 over the combination of Egan and Sherman, and further combination with Miyoshi EX1028 , Eaton, DSE Manual 7 or DSE Manual 9.
7	1, 4, 8-13, 16-18	Obvious under §103 over the combination of Egan and Sherman, and in further combination with DSE Manual 7 or DSE Manual 9, and Aoki.
8	14, 15	Obvious under §103 over the combination of Egan, Sherman, DSE Manual 7 or DSE Manual 9, and Aoki, and Further Combination with Miyoshi or Egan.

D. Van Niekerk

110. U.S. Patent Application Pub. 2014/0150407 by Van Niekerk et al (Van Niekerk **EX1004**) was filed December 5, 2012 and assigned to Cummins Cal Pacific, LLC. (**EX1021**.) Van Niekerk is prior art under 35 U.S.C. §102(e). As shown in Figure, Van Niekerk discloses a genset 8 includes an electrical generator 14 powered by (i.e. mechanically coupled to) a diesel engine. 16. An engine exhaust port 18 from the genset 8 is coupled to an exhaust aftertreatment system 10 that includes a load bank/exhaust heater 20. (**EX1004** para. [0010]-[0013]) The aftertreatment system includes a diesel particulate filter (DPF) 24 which is downstream from the load bank 20, and an SCR 26 downstream of the DPF 24. (**EX1004** para. [0010]-[1012], [0015]-[0016].)

111. The load bank/exhaust heater 20 draws power from the gen-set 8 and is engaged or connected by way of a power switch 28. Control system 12 provides a signal to power switch 28 in order to engage or disengage the load bank 20. (**EX1004** para. [0010].) The control system 12 includes a controller 30 coupled with power switch 28, and is coupled to other control systems such as industrial control systems or a gen-set controller. (**EX1004** para. [0011], [0027].) Controller 30 outputs a control signal to the power switch 28, such that the power switch 28 selectively applies a load (i.e., a selected set of resistive elements 56) on the load bank 20. (**EX1004** para. [0013].)

112. Controller 30 receives inputs from a temperature sensor 34 and a pressure sensor 32. Pressure sensor 32 monitors the backpressure upstream of the DPF 24, and operates to provide a command signal which directs the level or amount of power to be coupled to load bank 20 from genset 8. A current transformer 38 positioned on the output bus is used to monitor the power output of the genset 8. Current transformer 38 is coupled with a power sensor 36 which provides information to control system 12 as to the total power demand. (*EX1004* para. [0011]-[1012].)

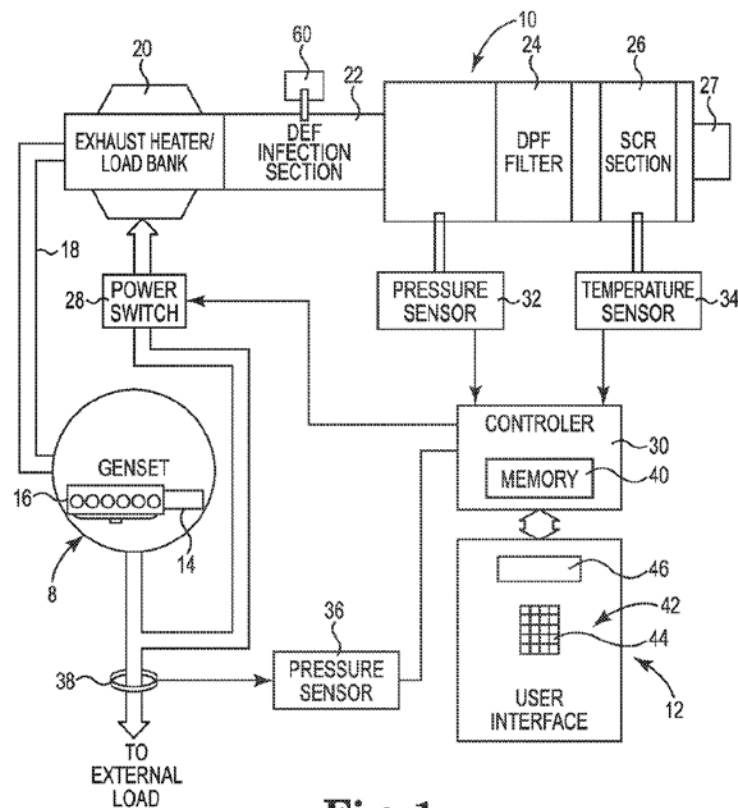


Fig. 1

113. Although Fig. 1 of Van Niekerk depicts a schematic box 36 labelled as “pressure sensor,” a POSITA would recognize this to be a typographical error.

The Van Niekerk specification discloses that item 36 is a “genset output power sensor 36.” (**EX1004** para. [0011].) Further, in the drawing which Van Niekerk originally filed with the application, Fig. 1 was correctly labelled “power sensor 36.” (**EX1022**.)

114. The load bank 20 is made up of a set of resistive elements 56. These elements may be individually coupled or decoupled to the system in order to control the added load and maintain a level that may be pre-selected for the system. (**EX1004** para. [0013].) The power switch 28 performs power switching (i.e., load contactor switching in response to controller load step outputs) to selectively engage selected resistive elements 56 of the load bank 20. (**EX1004** para. [0010]-[0013]).

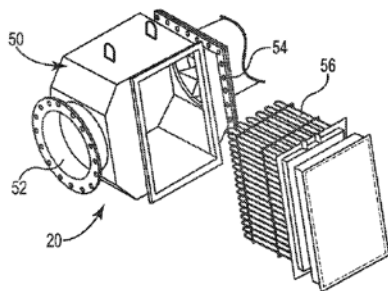


Fig. 2

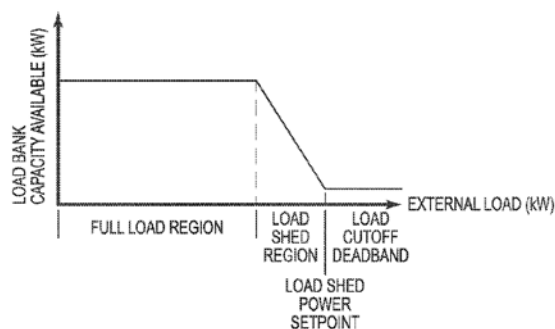


Fig. 4

115. In the Van Niekerk system, when the system undergoes regeneration of the DPF the load bank 20 is engaged. (**EX1004** para. [0016]-[1017], [0020], [0022]-[0023]; See original claims 6, 10, 36 (**EX1023**), which were published in Van Niekerk.) Van Niekerk recognizes that running at a low load condition will

cause greater soot accumulation, which in turn requires more frequent regeneration. (**EX1004** para. [0019].) Van Niekerk also recognizes the time duration in which the system is operated in the run mode may necessitate an increased regeneration time in the regen mode. After the Van Niekerk system undergoes a run interval, a switch to the regen mode 110 is signaled by control 12 and load bank 20 is engaged so as to maintain a load during regeneration. (**EX1004** para. [0020].)

116. A POSITA would not understand the scope or limits of the operational case of “neglect” from the ‘651 Patent. However, one of the benefits alleged by the ‘651 Patent is to enhance fuel consumption. (**EX1004** para. [0031].) The ‘651 Patent invites a practitioner to contact an engine manufacturer to determine what the so-called “neglect” parameter may be. A POSITA would, however, understand that in Van Niekerk the system engages the load bank 20 when the system has been run for more than a short period of time in a sub-optimal condition, which is associated with the “neglect” case. (**EX1004** para. [0022]-[1023]; see claims 12, 13, 37, 40.) After the system has been run for several cycles and the controller determines “excessive soot loading” is occurring, the controller signals a switch to the “deep clean” regen mode 116. In the deep clean regen mode load bank 20 engaged by the controller to create a higher temperature in order to burn off soot. (**EX1004** para. [0022]-[1023].)

117. Van Niekerk also addresses load spikes or increased loads on the system that exceed a pre-set level. The controller 30 monitors the power demand on the genset 8 and load bank 20 and reduces the power applied to the load bank 20 when the power demand on the genset 8 (i.e., sum of the external load and the load bank load) is greater than the genset's output power capacity (**EX1004** para. [0005] and [0028]).

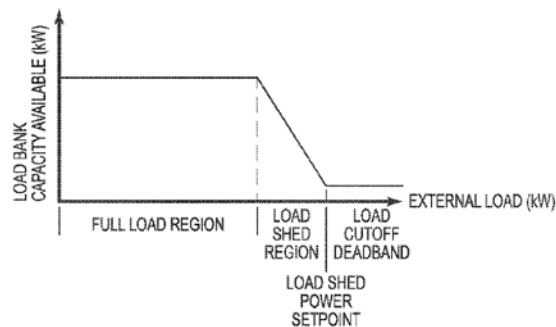


Fig. 4

For example, when an external load demands a power load above a threshold point (e.g., generator capacity), the control system 12 and controller 30 puts the load bank 20 into a load cutoff dead band at which no power is applied to the load bank 20. (**EX1004** para. [0028]). If load bank 20 is engaged and the total load on the system exceeds a pre-set level, control 12 signals for load shed mode 122 which reduces the added load that is applied by the load bank. Should the total load exceeds a maximum level, control 12 transmits a signal for a load cutoff dead band. At the dead band no load is added by load bank 20. (**EX1004** para. [0028];

See Figure 4.) The system recognizes with a load spike there will be a delay in the load cut-off.

E. Van Niekerk 2

118. U.S Patent No. 9,221,016 by Van Niekerk et al (Van Niekerk 2 **EX1005**) was filed December 5, 2012 and assigned to Cummins Cal Pacific, LLC. Van Niekerk 2, incorporates Van Niekerk in its entirety for all purposes. (**EX1005** Col. 4:64-5:2.) Van Niekerk 2 is also prior art under 35 U.S.C. §102(e).

119. Van Niekerk '016 discloses a genset 12 that is made up of a diesel engine 14 and electrical generator 16 with an exhaust aftertreatment system 20. (**EX1005** Col. 3:18-26.)

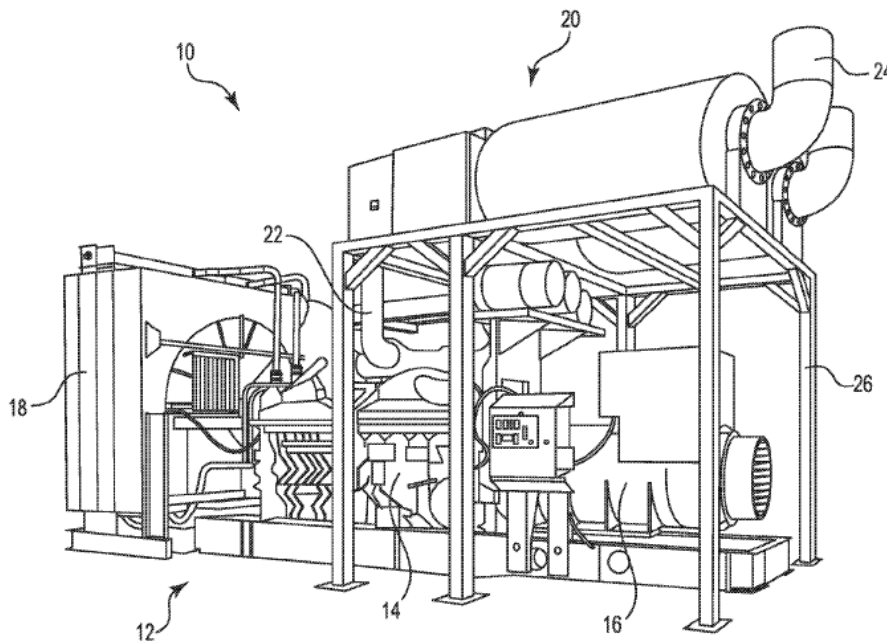


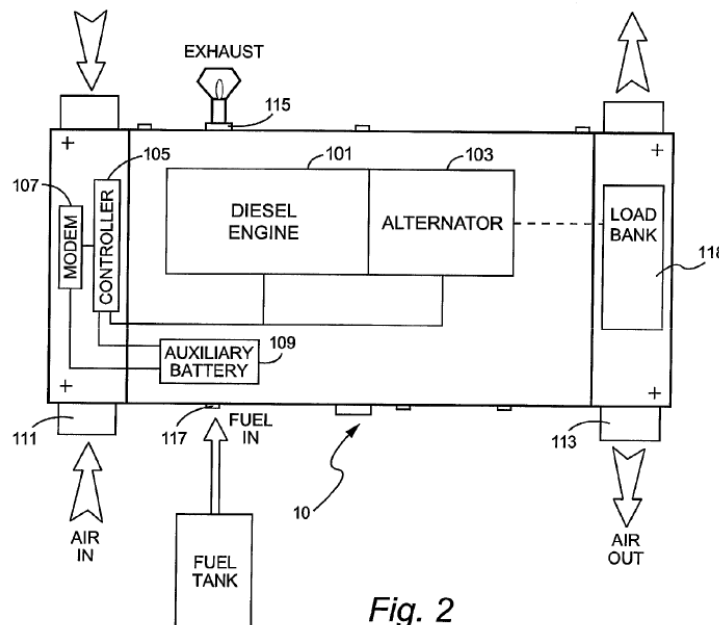
Fig. 1

120. The Van Niekerk 2 system discloses gensets which meet Tier IV Interim and Tier IV Final requirements. (**EX1005** Col. 3:1-3.) The exhaust aftertreatment system 20 includes a DPF section 62 which has ceramic filters that physically trap soot and other particulates. Van Niekerk 2 also discloses an SCR section 40 in the aftertreatment system 20 and an exhaust heater/load bank 80. The Van Niekerk 2 exhaust heater/load bank 80 operates in the manner disclosed in Van Niekerk **EX1004**. (**EX1005** '016 Col. 3:34-46; Col. 4:64-5:2; Col. 5:7-17; Col. 5:64-6:5.) The disclosed system of Van Niekerk 2 may locate the aftertreatment system 20 remotely above genset 12 on support structure 26, or alternatively at other locations. (**EX1005** Col. 3:26-23; Fig. 1.) The exhaust aftertreatment system 20 may be located next to or behind genset 12, in which case the aftertreatment system 20 would be mounted on the same pad or base or on a base that is immediately adjacent the base for the genset. (**EX1005** Col. 3:31-33.)

F. Egan

121. U.S Patent Application Pub. 2003/0224833 by Egan et al (Egan **EX1006**) was published December 4, 2002. Egan discloses a power generator 10 that includes a diesel engine 101, an alternator 103 and a controller 105. Engine 101 is mechanically coupled to alternator 103, since engine 101 drives a rotor of the alternator 103 with a load being placed on the engine when a load is placed on the alternator 103. (**EX1006** Para. [0041] and [0158].) An electrical load or load

bank 118 is used to increase the load on the engine/alternator 101, 103. Load bank 118 is located within the overall housing of the power generator 10 and positioned in the exhaust at the air outlet vents 113. (**EX1006** para. [0041]; Figures 2-3.) As shown in Figs. 2 and 3, the load bank 118 of Egan has a common base with the rest of power generator 10. Generator 10 is controlled by controller 105, which provides control of engine 101, alternator 103 and the load bank 118. Separate load bank controls 1056 are provided on the control panel of controller 105. (**EX1006** para. [0221]-[0222], [0248]-[0255], Figure 10.) Egan discloses the system may be either a single phase or a three phase system, and therefore may be a polyphase system. (**EX1006** para. [0160].)



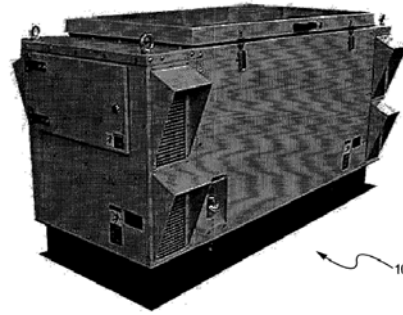


Fig. 3

121a. Power generator 10 is designed to provide a source of power to a cellular base station 30. Base station 30 is the requested load supplied by power generator 10. Power generator 10 also selectively provides power to load bank 118. Alternator 103 is therefore coupled both to a requested load and also to load bank 118. (**EX1006** Para. [0036] and [0350], Figures 1 and 2.)

121b. Controller 105 receives sensor signals from both diesel engine 101 and from alternator 103. Controller 105 uses information from those sensor signals in the control of diesel engine 101 and alternator 103. (**EX1006** Para. [0041]; Figure 2.) Controller 105 is therefore communicatively coupled to diesel engine 103 such that controller 105 includes both engine ECUs (or is communicatively coupled to the diesel engine 101 via ECUs or ECMs) and a generator controller. (**EX1006** Para. [0041], Figure 2.) Egan discloses an overload protection that reduces the alternator voltage. The overload protection includes a delay of nominally 5-10 seconds before the system reduces voltage. (**EX1006** Para. [0220].)

Other programmed delays are also used by the system before disconnecting switches. (**EX1006** Para. [0253], [0266].)

121c. Load bank 118 includes one or more heaters. Load bank 118 is controlled through load bank controls 1056. A pre-set level of the load on generator 10 is used by the Egan system. When the load on the generator drops below a pre-set level, load bank 118 automatically loads generator 10 with a resistive load periodically for a set period of time. When the load on the generator rises above the pre-set level the load from load bank 118 is disconnected. (**EX1006** Para. [0350]; claims 27-30.) The load bank 118 is used in this manner to avoid carbon deposits inside the exhaust manifold 115 due to continuous no-load or almost no-load operation, while still automatically disconnecting from the generator 10 when the load on the generator rises above the pre-set level (**EX1006** Para. [0350].)

122. Egan also engages load bank 118 for the operational condition referred to by the patent as the “neglect” case. Egan discloses that generator 10 is allowed to run in a low load condition under 4 kW for three hours, after which load bank 118 automatically applies a load of 5 kW for fifteen minutes. (**EX1006** para. [0350].) A POSITA would recognize that in this manner of operation generator 10 is run under a sub-optimal low/no load condition for a pre-determined period of time that is of significant duration, with the example being three hours. Egan

recognizes that with such operation the genset will require the load bank be engaged and run so as to add load and oxidize carbon deposits. (**EX1006** para. [0350].) A POSITA will recognize that the load bank 118 is not immediately engaged whenever a low/no load condition is determined, but rather the system is allowed to run in this low load condition, or neglect case, for a time with an increased risk of carbon deposits and then engage the load bank 118. (**EX1006** para. [0350].)

G. Eaton

123. U.S. Patent No. 6,701,221 by Eaton et al (Eaton **EX1007**) was filed October 24, 2000 and issued March 2, 2004. Eaton discloses controls for a genset 150. The genset includes a diesel engine 150 and an alternator 154 that is a three-phase system. ECM 160 is in communication with a genset controller 100 through a CAN serial link 170. Eaton discloses the CAN serial link 170 uses the SAEJ1939 protocol. Controller 100 provides commands to ECM 160 for operation of the engine. (**EX1007** Col. 4:13-56, 5:28-58.) Fig. 1 of Eaton is shown below:

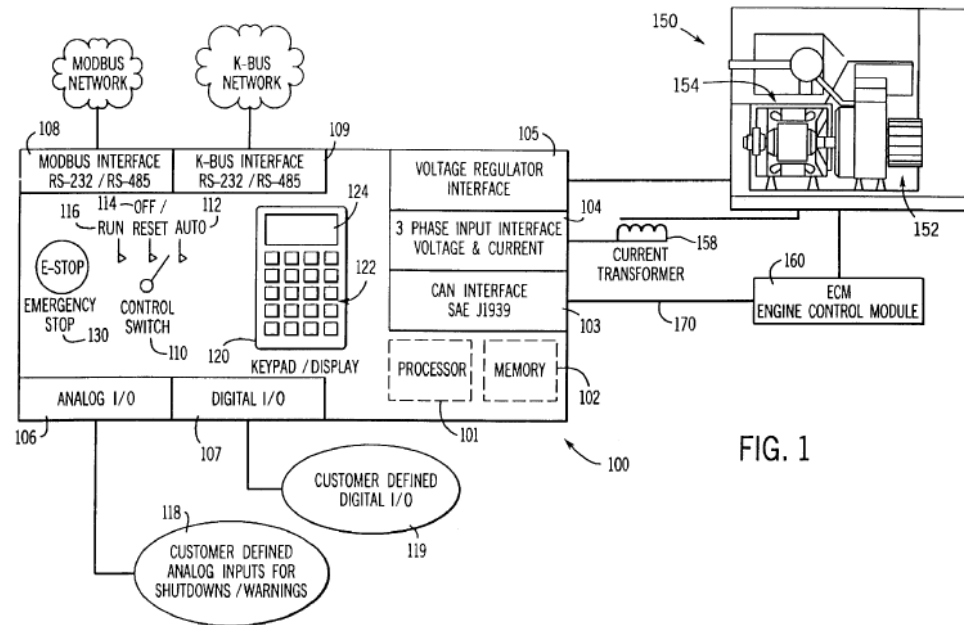


FIG. 1

124. In the event controller 100 determines one of the alternator's parameters exceeds a maximum value, controller 100 may generate a command to shut down some or all of genset 150, or may reduce an operational parameter of genset 150. The controller 100 uses a delay period of set duration, such as 10 second periods (or other periods) before issuing a shutdown command. (**EX1007** Col. 9:39-10:15, 13:19-33.) Eaton also discloses different embodiments. In one of Eaton's embodiments, the Genset controller also directly controls the engine, while in another of Eaton's embodiments, the Genset controller does not directly control the engine, but rather, the engine is controlled by an engine control module (ECM), and the Genset controller controls and monitors the ECM through a Controller Area Network (CAN) interface which connects to the CAN serial link, and

employs the J1939 protocol which is the industry standard interface for serial communications. For example Eatons discloses:

In addition to providing control and monitoring of alternator 154, genset controller 100 also provides control and monitoring of engine 152. Although in certain embodiments genset controller 100 directly controls engine 152, in the preferred embodiment genset controller 100 does not directly control the engine. Rather, the operation of engine 152 is directly controlled by an engine control module (ECM) 160, which typically is physically attached to the engine. ECM 160 can control engine speed (and other engine operating parameters), and thereby control the output power of alternator 154. ECM 160 also monitors a variety of engine characteristics, for example, fuel consumption, oil pressure, emissions levels, coolant temperature, time delay engine cool down information, and time delay engine start information.

The genset controller 100 controls and monitors the ECM 160 through CAN interface 103 which connects to the CAN serial link 170. CAN serial link 170, employs the SAE J1939 protocol which is an industry standard protocol for serial communications. By way of CAN databus 170, genset controller 100 receives the information about the operation of engine 152 that has been collected by ECM 160, and provides commands to the ECM 160 to influence the operation of the engine. Further, upon determining the occurrence of system faults, genset controller 100 provides commands to engine 152 via ECM 160 causing the engine to shutdown, by turning off both the ignition and the cranking of the engine. In particular, genset controller 100 can provide a command to slow down or entirely shut down the engine 152 if it is determined that one or more currents flowing through alternator 154 are excessive and may potentially produce excessive heat in the alternator.

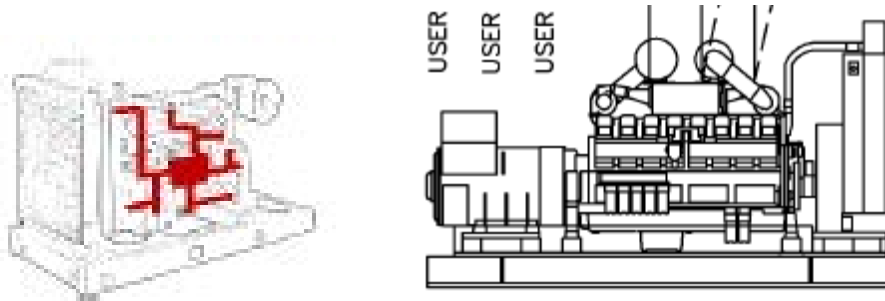
(EX1007 Col. 5:23-55)

H. DSE Manual 7 and DSE Manual 9

125. Deep Sea Electronics Inc. (“DSE”) is a supplier of electronic controllers for engine generators, and including controllers for engine generators that utilize load banks. It is my understanding that Petitioner ANA obtains

controllers from DSE that are used for the equipment that is the subject of the parallel lawsuit *Multiquip Inc. v. ANA, Inc.*, Civil Action No. 3:22-cv-2599 (United States District Court Northern District of Texas), see Answer and Counterclaims, Counterclaim paragraph 10.

126. DSE issued operators manuals for its Model or Series 7200/7300 Controller: Deep Sea Electronics DSE7200/7300 Series Operators Manual, Document Number 057-074, Issue 7 (Released February 4, 2011) (DSE Manual 7 **EX1008**) and Deep Sea Electronics DSE7200/7300 Series Operators Manual, Document Number 057-074, Issue 9 (Released May 30, 2012) (DSE Manual 9 **EX1032**). The relevant disclosures of the two manuals DSE Manual 7 and DSE Manual 9 are similar, but with different page numbers due to other materials in the manual that are not relevant to the disclosure of the '651 Patent. The DSE Manuals 7 and 9 disclose that it is for an engine generator controller that is to be used with a generator set having an engine and alternator (generator set), and for the control and integration of a dummy load set into the system. (**EX1008** p. 7, 73-74; **EX1032** p. 7, 75-76.) As disclosed in the DSE Manual, the alternator is a three phase, four wire alternator. (**EX1008** p. 43-52; **EX1032** p. 45-54) (**EX1008** p. 30, 39; **EX1032** p. 32, 41.) As shown below, the DSE Manual depicts a gen-set which includes an engine and a generator. (**EX1008** p. 14, 39; **EX1032** p. 14, 41.)



As disclosed in the DSE Manual, the DSE controller communicates with and provides control signals to the engine's ECU. (**EX1008** p. 39, 60, 67, 70, 75, 86; **EX1032** p. 41, 62, 69, 72, 79, 90.)

"The DSE7000 module monitors the engine...

The powerful ARM microprocessor contained within the module allows for incorporation of a range of complex features:

- Engine parameter monitoring.

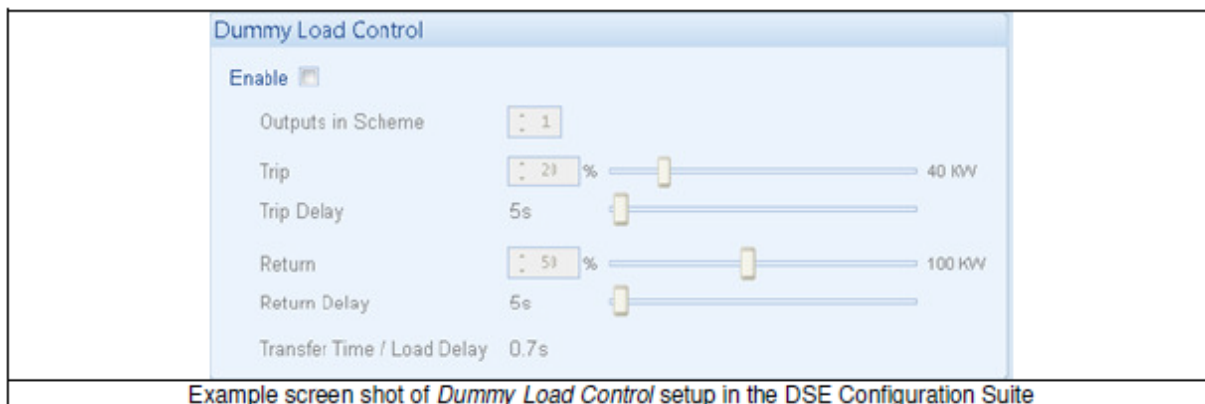
- Engine ECU interface to electronic engines."

(**EX1008** p.7)

127. The DSE Manual 7 was released February 4, 2011 and distributed on the DSE website www.deepseapl.com. at least by December 17, 2011, the date that the Issue 8 of the DSE Manual was released on December 17, 2011. (**EX1027**; **EX1029**; **EX1030**.) DSE Manual 9 was released and distributed on the DSE website www.deepseapl.com on May 30, 2012. (**EX1031**.) The DSE Manuals 7 and 9 reference various documents being publicly available on the DSE website. (**EX1008** p. 6; **EX1032** p. 6.) The DSE Manuals 7 and 9 as of their being placed on

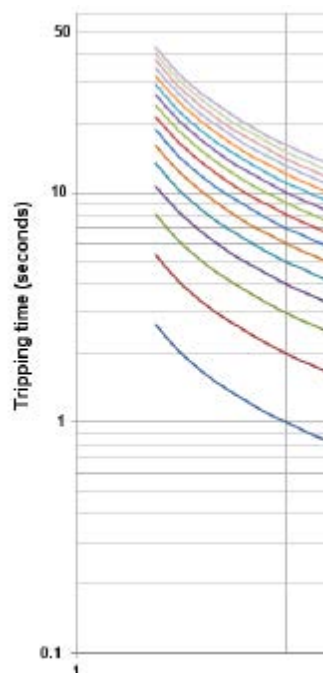
the website were publicly available for viewing and download. DSE manual notes the controller may be coupled with a Cummins genset. (**EX1008** p. 40; **EX1032** p. 42.) Cummins is a large and well known U.S. company that makes and distributes engine generators.

128. The DSE Manual discloses the controller monitors the engine, and transfers load to the generator of the “generator set” automatically. (**EX1008** p. 7, 73-74; **EX1032** p.7, 75-76.) The controller is CAN standard compliant and obtains information from the engine CAN controllers. (**EX1008** p. 14, 60, 67, 75-76, 86; **EX1032** p. 14, 62, 69, 78-80, 90.) The controller adds and subtracts steps of dummy load from a static load bank in order to maintain a nominal load and insure the engine is not too lightly loaded. (**EX1008** p. 73; **EX1032** p. 75.)

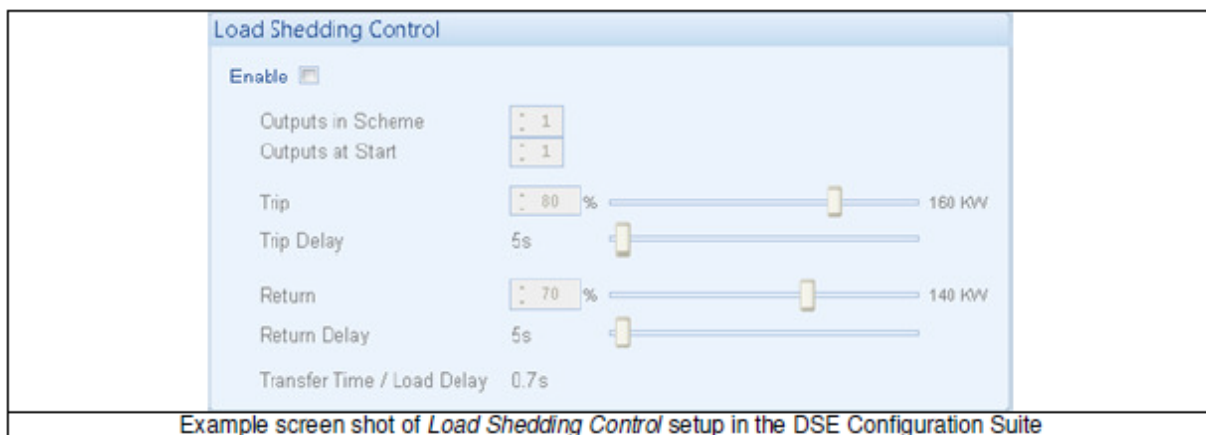


129. The Dummy Load Control feature provides up to five dummy load steps. A Dummy Load Trip setting is pre-selected and displayed. If the generator loading falls below the Dummy Load Trip setting, a pre-selected Dummy Load Control Trip Delay is activated. Should the load remain below the Trip setting for

the Trip Delay, the controller adds a first step of dummy load. If the load remains below the Trip setting, the Trip Delay is again activated and thereafter another step of dummy load is added, with the five steps of dummy load added in this manner. In the event the generator loading rise above a pre-set Dummy Load Return level, a Dummy Load Return Delay begins. Upon expiration of the Return Delay, if the load is still above the Return level the highest number of active dummy load steps is de-energized. The sequence is followed until all dummy load steps are de-energized. The delay time periods are adjustable, and the manual depicts an example with a 5 second delay. (**EX1008** p. 73; **EX1032** p. 75.) Various other delay timers are disclosed for alarms and shutdowns with delay times in seconds, for example the display for Earth Fault Shutdown labelled with delays ranging from 0.1, 1 and 10 seconds and greater. (**EX1008** p. 95; **EX1032** p. 97-101.)



130. The controller provides a load shedding Control feature. For start up the initial loading is kept to a minimum, and then additional load is added. A Load Shedding Trip level is pre-selected. When the load reaches the Load Shedding Trip level a Trip Delay timer is started, and if the generator loading is still above the Trip level at expiration, a first Load Shedding Control output will be energized and remove a step of dummy load. The sequence of load shedding is repeated until all Load Shedding Control outputs are energized. Should the load fall below a pre-selected Load Shedding Return level, a Return Time will start and at expiration if the load is still below the Return level the highest level of Load Shedding Control outputs is de-energized. That process is repeated until all outputs have de-energized. (*EX1008* p. 74; *EX1032* p.76.)

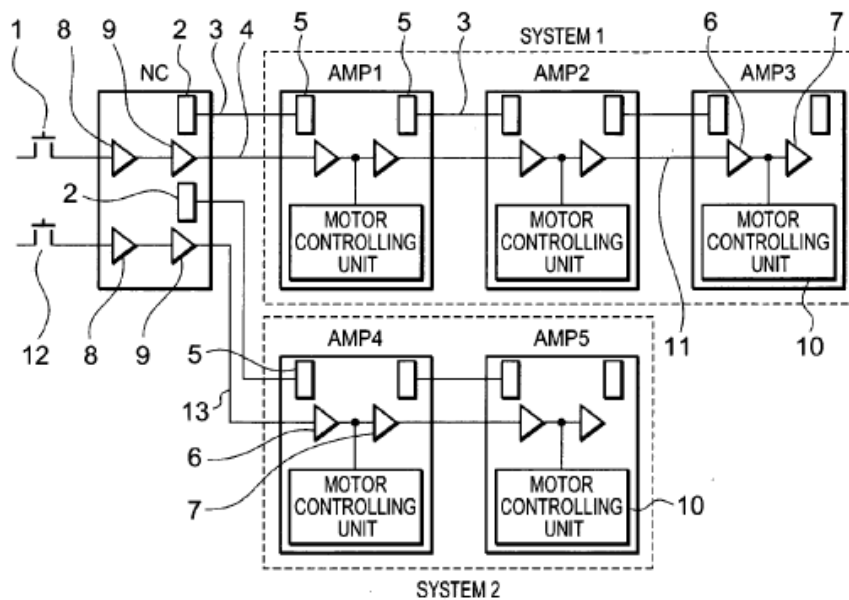


I. Aoki

131. U.S Patent Application Pub. 2006/0262807 by Aoki et al (Aoki *EX1009*) was published November 23, 2006. Aoki discloses at its background and

relative to Figure 11 a prior art system applicable to industrial equipment such as various machine tools and equipment. The prior art system is not asserted to be unique or inventive, but rather as a known manner of controlling equipment.

Fig. 11



132. Aoki discloses a two controller system in which two wires connect controllers, one wire providing a connection for communicating control signals for the controlled component and a separate wire providing a connection for communicating an emergency-stop-signal. (**EX1009** para. [0002]-[0003].) The separate wiring or connectors for the emergency-stop-signal is due to the interest in reliability for a cut-off or stop line. The use of a line dedicated for the cut-off or stop separate from the data communication line used for control of the system is referred to as being “indispensable.” (**EX1009** para. [0005].)

133. In the Aoki disclosed prior art a numerical control apparatus designated “NC” operates as the host controller for the system and communicates with a number of drive control apparatus or controllers designated “AMP__” as “client” control apparatus. (*EX1009* para. [0002], see para. [0014].) The NC control apparatus includes two separate connections 3 and 4 with the AMP controllers. Communication cables 3 and input output connectors 5 transmit and receive control information, while separate emergency-stop-signal transmitting and receiving cable 4 communicates the stop signal. (*EX1009* para. [0002]-[0003].) The Aoki prior art system includes two sets of drive controllers, one being AMP1, AMP2 and AMP3 that communicate through control cable 3 and cut-off cable 4, while a second set of AMP4 and AMP5 communicate through a different control cable 3 (unlabeled in Fig. 11) and cut-of cable 13. (*EX1009* para. [0002]-[0003], Fig. 11.)

J. Sherman

134. U.S Patent No. 6,422,001 by Sherman et al (Sherman *EX1010*) was filed October 10, 2000 and issued July 23, 2002. Sherman discloses a vehicle hybrid electrical drive system 10 that includes an internal combustion engine (engine) 12 that includes a rotating output shaft 12s which drives an electrical generator 14. (*EX1010* Col. 2:47-50; Figure 1.) The output of the electrical generator 14 is applied to a power-handling controller 16 which includes power

switches for controlling or switching the power flow to an electric motor 18 and/or a battery or other electrical storage device 22 as well as selectively to a power dissipating resistor 24 (i.e., a load bank). Thus generator 14 is in electrical communication with both the output bus for motor 18 and with a load bank bus for load bank/power dissipating resistor 24. An electrical controller 26 controls the operation of the power electrical controller 16 as well as interacting with the engine 12 by way of a signal path 38 for monitoring engine operation and controlling the engine 12. (**EX1010** Col. 2:47-Col. 3:10; Figure 1.)

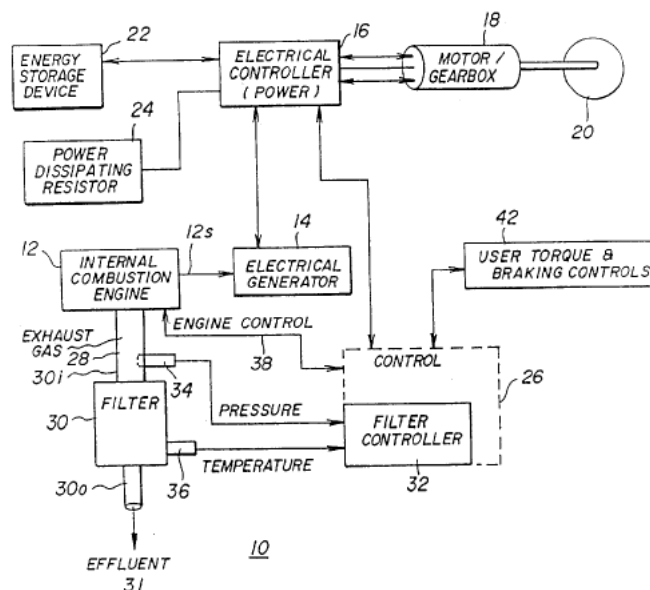


Figure 1

135. Sherman discloses that engine 12, which may be a diesel engine, produces exhaust gases that are led by an exhaust pipe 28 to pass through a regenerative particulate filter 30. The regenerative filter 30 is cleaned by heating particulates (trapped by the filter) to a high enough temperature where the

particulates combust or vaporize. (**EX1010** Col. 3:11-38, 4:60, 5:63.) During ordinary use of a vehicle having a regenerative filter operation at road speeds puts a sufficient load on the engine to produce exhaust gases that are sufficiently heated to raise the filter temperature above regeneration temperature (Col. 3:30-38.) However, when engines such as engine 12 are operated during conditions where a load on engine 12 is insufficient to properly heat the filter to the regeneration temperature the particulate filter 30 can become clogged (Col. 3:39-53.) In such case resistor 24 (load bank) is used to aid in regeneration. (Col. 7:4-16.) The resistive dissipating device (load bank) 234 may be selectively engaged in portions (i.e. steps), with the amount of load being adjusted to achieve a selected desired level. (**EX1010** Col. 7:47-51, claims 1-4.)

136. Sherman discloses a pressure sensor 34 associated with particulate filter 30 to measure back pressure at filter 30. An output signal from pressure sensor 34 is received by controller 26 and used to control filter regeneration (via filter controller 32). (**EX1010** Col. 3:54-67; Figure 1.) Using the output signal from pressure sensor 34, the filter controller 32 of controller 26 will control operation of engine 12, the application of power to battery 22 and to power dissipating resistor (i.e., a load bank) 24 according to whether the pressure at the pressure sensor is above a first threshold value P1 or above a second, higher threshold value P2 (Col. 4:1-32; Figures 1, 2).

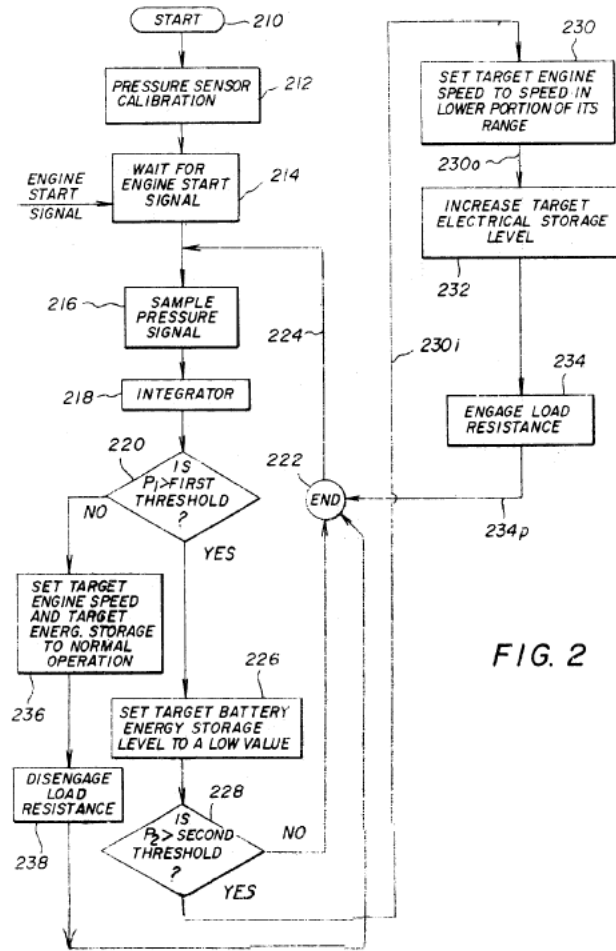


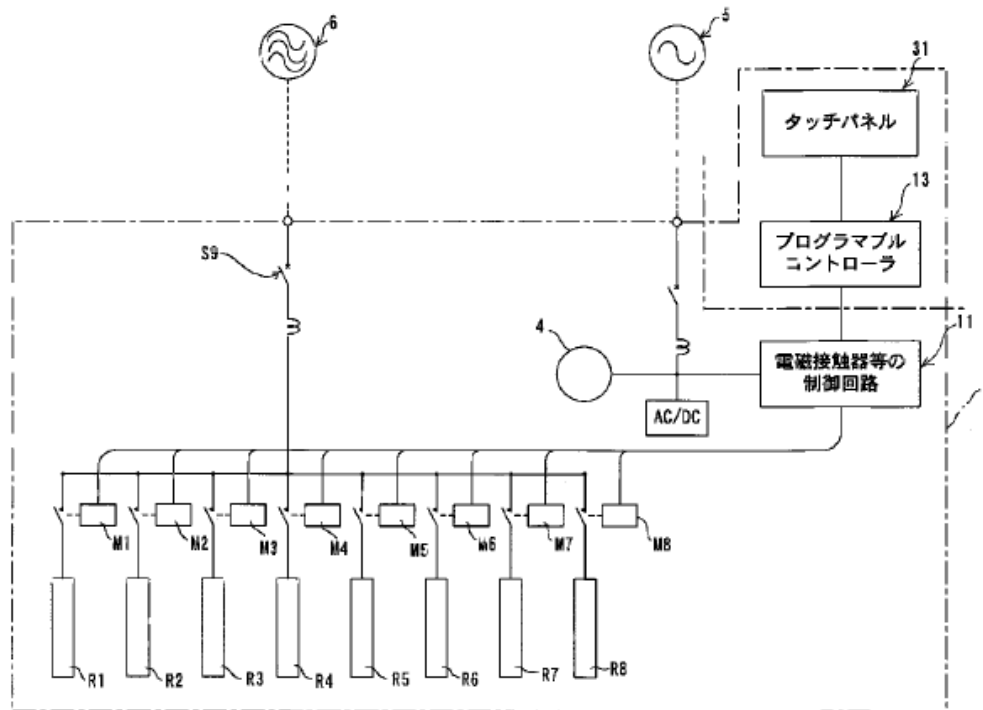
FIG. 2

137. Sherman discloses what is referred to in the '651 patent as a “neglect” case. When the backpressure at the regenerative filter 30 reaches the first threshold value P_1 , regeneration is considered to be “imminent.” In preparation, battery 22 is allowed to discharge so that when regeneration begins, energy can be stored in battery 22 without overcharging (Col. 4, lines 33-46, Figure 2.) When the backpressure has risen above the second threshold value P_2 , regeneration begins by increasing the load on the engine 12 by storing more power in the battery 22 and/or applying power to the power dissipating resistor 24 (Col. 4:47-Col. 5:17;

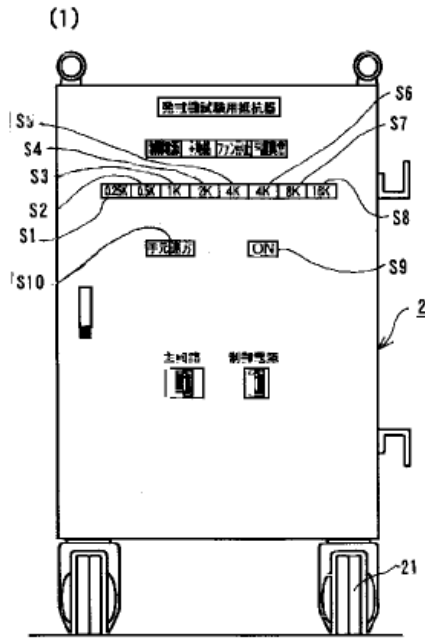
Figure 2.) The increase in exhaust gas temperatures (caused by the increased load on the engine 12) will aid in raising the filter temperature to the regeneration temperature. Sherman notes that the regeneration will continue until the backpressure measured by the pressure sensor 34 is below the first threshold value P1. (Col. 5:30-49: Figure 2.) Thus Egan operates the system in a condition in which accumulation occurs up to P1, and then continues to operate in this condition up to P2.

K. Miyoshi

138. Japanese Patent Publication JP2000-162291 by Miyoshi (Miyoshi *EX1028*) was published June 16, 2000. Miyoshi discloses a genset 6, which may be a three-phase generator, electrically coupled to a load bank 1. (*EX1028* para. [0019], [0015].) A programmable controller 13 coupled to a control circuit 11 controls the operation of the load bank 1. Control circuit 11 controls a series of electromagnetic contactors M1-M8 (i.e., load contactors), each of which controls the application of power from genset 6 to a respective resistor (i.e., a load step resistor) of the resistor group R1-R8, such that particular configurations of resistors may be selected. (*EX1028* para. [0019].)



139. Load bank 1 includes a main body section 2 separate from the gen-set 6 to which it is coupled, which houses the resistor group R1-R8. (*EX1028* para. [0013], [0017].) Load bank 1 may be used to apply a high load to the generator in order to burn out oil and carbon adhering to the exhaust system pipeline of the engine. (*EX1028* para. [0004].)



VII. UNPATENTABILITY OF THE CHALLENGED CLAIMS

140. My opinions related to the unpatentability of the Challenged Claims of the '651 patent are shown below.

F. Ground 1: Claims 19, 22, 26 Are Anticipated by Van Niekerk, or Alternatively Are Obvious Over Van Niekerk, or Alternatively Are Obvious over Van Niekerk in Combination With Eaton

1. Independent Claim 19

- a. **[19.0 Preamble] An engine-generator and load bank system comprising**

141. To the extent the preamble is considered limiting, Van Niekerk discloses an engine-generator 8, or genset, that is coupled with a load bank system 20 for controlling the load on the genset. (See *EX1004*, Fig. 1, para. [0010].)

- b. **[19.1] an engine mechanically connected to and capable of driving an alternator**

142. Van Niekerk discloses the genset 8 includes generator 14, i.e. an alternator, that is powered by an engine 16 and therefore mechanically connected, and teaches this element. (See **EX1004**, Fig. 1, para. [0010].) Fig. 1 of Van Niekerk EX1004 is shown below-

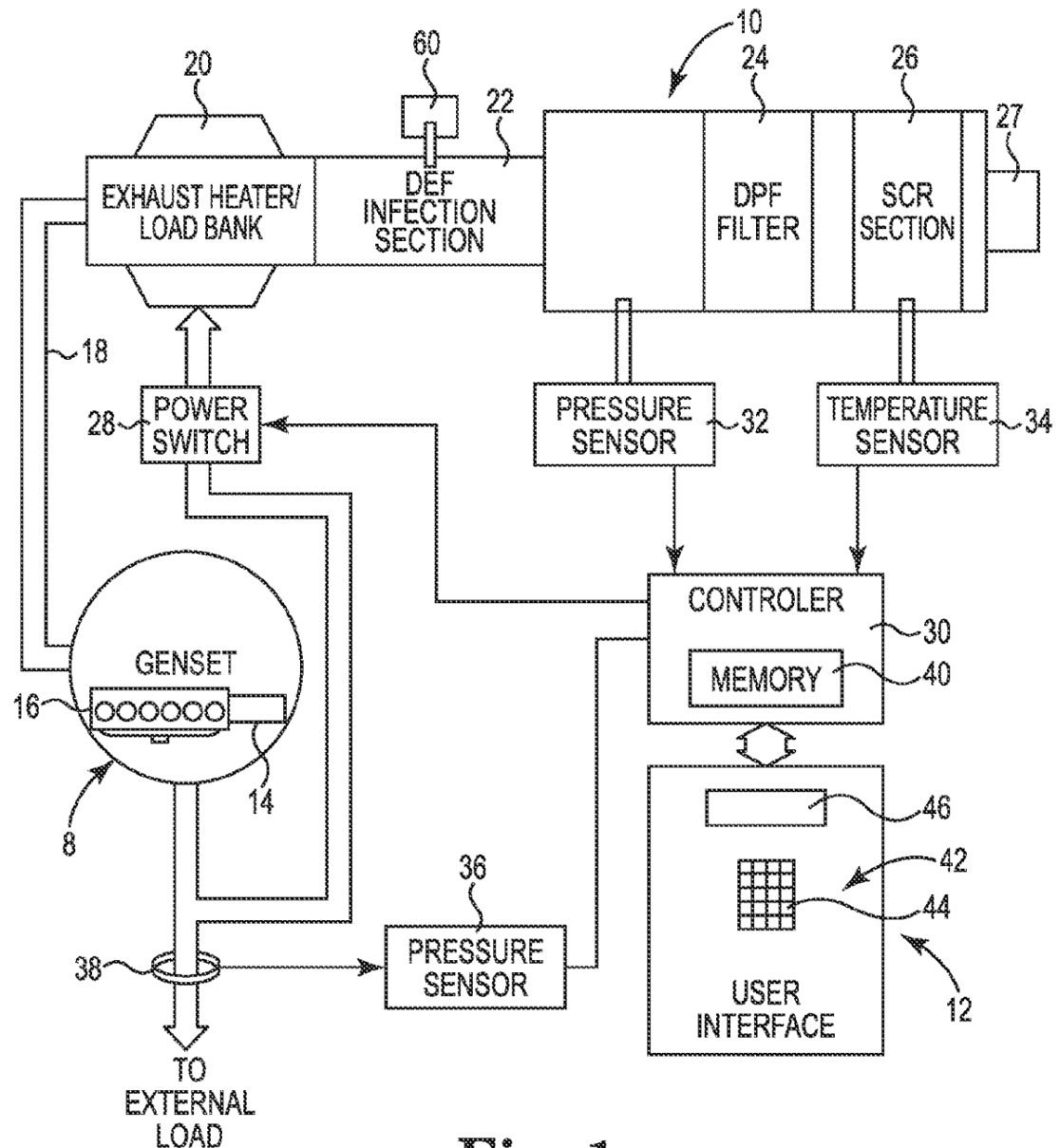


Fig. 1

c. [19.2] said engine having an engine control module and a particulate filter

142A. Van Niekerk discloses an exhaust aftertreatment system 10 for genset 8 that includes a DPF filter 24. The genset 8 also includes a control system 12 that may be coupled to a separate “genset controller” or alternatively to an overall facility controller that controls the operation of the genset 8. Van Niekerk teaches this element and/or it is obvious. (See **EX1004**, Fig. 1, para. [0004], [0010], [0027]). For example, see specifically para. [0010] “Power from the genset 8 is applied to the load bank/heater 20 through a power transfer switch 28 in response to a command signal from the control system 12 to provide the load bank and exhaust heating functions.”. Also for example, see specifically para. [0027] “In still other embodiments, operation of the aftertreatment system 10 can be initiated using interfaces (not shown) other than the user interface 42. For example, in embodiments the control system 12 can be coupled to other control systems such as an industrial control system controlling the overall operation of a facility that includes genset 8 and aftertreatment system 10, in addition to other equipment. In yet other embodiments the control system 12 can be coupled to a genset controller. In still other embodiments the control system can be coupled to devices used by service personnel. Any or all of these devices, which may be at locations remote from control system 12, can be used to initiate operation of the aftertreatment system 10 in the manual regen mode 120. Similarly, other operating modes of the aftertreatment system 10 can be initiated using other interfaces and/or from other locations.

d. [19.3] said alternator in electrical communication with an output bus and a load bank bus

143. The genset is in electrical communication with an output bus depicted in Fig. 1 as an output to “external load” with a genset output pressure sensor 36. (**EX1004**, Fig. 1, para. [0011].) Genset 8 is coupled to load bank 20 by a bus, as reflected by controller 30 providing command signals to regulate the Power Switch to Load Bank for the Exhaust Heater for “the amount of power to be coupled from genset 16 to load bank/heater 20.” (**EX1004**, Fig. 1, para. [0012].) It was known to

reference connections in gensets as buses. (See **EX1026** Col. 10:39-44.) As depicted in Fig. 1, the output from the genset includes an output communicated through an output bus that couples through power switch 28 to load bank 20. (**EX1004**, Fig. 1, para. [0012].) See also [0010] “Power from the genset 8 is applied to the load bank/heater 20 through a power transfer switch 28 in response to a command signal from the control system 12 to provide the load bank and exhaust heating functions.” Thus, Van Niekerk teaches this element and/or it is obvious.

e. [19.4] a generator controller in electrical communication with said engine control module

144. Van Niekerk discloses the control system 12, which is communication with the genset controller, includes a controller 30 that provides control signals for control of load bank 20 and this element is disclosed and/or obvious. Also for example, see [0010] “Power from the genset 8 is applied to the load bank/heater 20 through a power transfer switch 28 in response to a command signal from the control system 12 to provide the load bank and exhaust heating functions.” (See also **EX1004**, Fig. 1, para. [0011], [0012], [0027]) Furthermore, Eaton also discloses different embodiments. In one of Eaton’s embodiments, the Genset controller also directly controls the engine, while in another of Eaton’s embodiments, the Genset controller does not directly control the engine, but rather, the engine is controlled by an engine control module (ECM), and the Genset

controller controls and monitors the ECM through a Controller Area Network (CAN) interface which connects to the CAN serial link, and employs the J1939 protocol which is the industry standard interface for serial communications. For example Eatons discloses:

In addition to providing control and monitoring of alternator 154, genset controller 100 also provides control and monitoring of engine 152. Although in certain embodiments genset controller 100 directly controls engine 152, in the preferred embodiment genset controller 100 does not directly control the engine. Rather, the operation of engine 152 is directly controlled by an engine control module (ECM) 160, which typically is physically attached to the engine. ECM 160 can control engine speed (and other engine operating parameters), and thereby control the output power of alternator 154. ECM 160 also monitors a variety of engine characteristics, for example, fuel consumption, oil pressure, emissions levels, coolant temperature, time delay engine cool down information, and time delay engine start information.

The genset controller 100 controls and monitors the ECM 160 through CAN interface 103 which connects to the CAN serial link 170. CAN serial link 170, employs the SAE J1939 protocol which is an industry standard protocol for serial communications. By way of CAN databus 170, genset controller 100 receives the information about the operation of engine 152 that has been collected by ECM 160, and provides commands to the ECM 160 to influence the operation of the engine. Further, upon determining the occurrence of system faults, genset controller 100 provides commands to engine 152 via ECM 160 causing the engine to shutdown, by turning off both the ignition and the cranking of the engine. In particular, genset controller 100 can provide a command to slow down or entirely shut down the engine 152 if it is determined that one or more currents flowing through alternator 154 are excessive and may potentially produce excessive heat in the alternator.

(**EX1007** Col. 5:23-55) Furthermore, Van Niekerk and Van Niekerk 2 in

combination with Eaton (**EX1007**) discloses this claim element. It would be

obvious to a POSITA to combine Van Niekerk and Van Niekerk 2 with Eaton

since a POSITA would have readily understood that it is just a matter of simple design choice to either have the Genset controller also directly control the engine, or have the Genset controller not directly control the engine, but rather, have an engine control module (ECM) that controls the engine and have the Genset controller control and monitor the ECM, through, for example, a Controller Area Network (CAN) interface which connects to a CAN serial link, and employ the J1939 protocol which is the industry standard interface for serial communications, as explicitly disclosed and taught for the genset controller and ECM of Eaton. It would have been obvious for a POSITA to combine Eaton with Van Niekerk and Van Niekerk 2, since Eaton, Van Niekerk, and Van Niekerk 2 all disclose similar structures, components, and subject matter (e.g. genset controllers, alternators, diesel engines), and also all disclose ramping up, shutting down, or limiting system parameters using control modules based on system parameters and inputs. As evidenced by the Eaton, the use of Genset controller that also controls the engine, or the use of Genset controller that is a separate module and is in electrical communication with an engine control module was well known to a POSITA and a POSITA would have known that this type of configuration (as stated in this claim element) was commonly used for both diesel engines and diesel engine controller applications, as well as for industrial equipment applications. As disclosed, for example in Eaton, a POSITA would have readily employed a generator controller

in electrical communication with the engine control module as a substitution of a well-known and readily available configuration for another, and would have had at the very least a reasonable expectation of success in doing so (as explicitly disclosed in Eaton), and this substitution would have just been a matter of design choice to a POSITA, with the predictable outcome of providing two separate modules (generator controller and ECM - in electrical communication with each other) to provide separate parts which can, for example, be serviced and replaced separately should this be necessary for servicing, programming updates, and to save costs. A POSITA would have readily understood that having a generator controller as a separate module in electrical communication with the engine control module provides the opportunity to use develop, design, test, and commercially release both the generator control module and the engine control module as separate modules to compartmentalize their design, development, and testing, while also ensuring standardized communication and data interfaces to enable module to module communication, and thus a POSITA would have been motivated to make such a design choice with a reasonable expectation of success in doing so. Using either a Genset controller that also controls the engine, or a Genset controller that is a separate module and is in electrical communication with an engine control module (ECM) was well known and obvious to a POSITA (as shown in Eaton), and combining a separate Genset controller in communication

with a separate ECM as disclosed in Eaton, with Van Niekerk and Van Niekerk 2 is just combining prior art elements according to known methods to yield predictable results (separate modules in communication with each other designed, developed, tested, and released separately), and a simple substitution of one known element (two separate modules in communication with each other) for another (one integrated Genset controller that also controls the engine) to obtain predictable results (two separate modules compatible and in communication with each other through standardized communication and diagnostic interfaces), and also is the use of a known technique to improve similar devices (two separate modules instead of one, to be provided as separate parts which can, for example, be serviced and replaced separately should this be necessary for servicing, programming updates, and to save costs) in the same way (two separate modules in standardized communication with each other instead of one integrated module).

f. [19.5] *said generator controller having at least one load step output*

145. Van Niekerk teaches this element and discloses controller 30 provides command signals for engaging the amount of power applied by switch 28 to load bank 20. (**EX1004**, Fig. 1, para. [0012].) The resistive elements 56 may be individually coupled or decoupled to control the amount of preset load. (**EX1004**, Fig. 1, para. [0013].)

g. [19.6] at least one load step contactor in electrical communication with said at least one load step output

146. Power Switch 28 switches the amount of power to be applied to load bank 20 and is a load step contactor that individually couples or decouples resistive elements 56. (*EX1004*, Fig. 1, para. [0012], [0013].) This element is disclosed and/or obvious. For example see [0013] “FIG. 2 is a detailed exploded illustration of a load bank/heater 20 in accordance with one embodiment of the invention. As shown, the load bank/heater 20 includes a housing 50 having an inlet end 52 and an outlet end 54. A set of resistive elements 56 are located in the housing 50 between the inlet end 52 and the outlet end 54 (the elements are shown outside the housing in FIG. 2 for purposes of illustration) and are electrically coupled to the power switch 28. Exhaust from the genset engine 16 is coupled to the inlet end 52 of the housing 50, and will flow past the resistive elements 56 before exiting the housing at outlet end 54. Power applied to the resistive elements 56 through power switch 28 will heat the resistive elements and therefore the exhaust flowing past the resistive elements. The amount of exhaust heating by the load bank/heater 20 can be controlled through the amount of power applied to the resistive elements 56. Other embodiments of the invention can use other load bank/heaters. In one embodiment the duty cycle of the power applied to the resistive elements 56 is modulated to control the load presented to the genset, such as by silicon controlled rectifiers or other electrical switch element. In yet another embodiment, resistive

elements 56 are individually electrically coupled or decoupled to control the amount of the presented load. In one embodiment of the present invention, the load bank/heater 20 allows control of the exhaust gas temperatures to within $\pm 10^{\circ}$ F. of a selected target.” Fig. 2 is shown below-

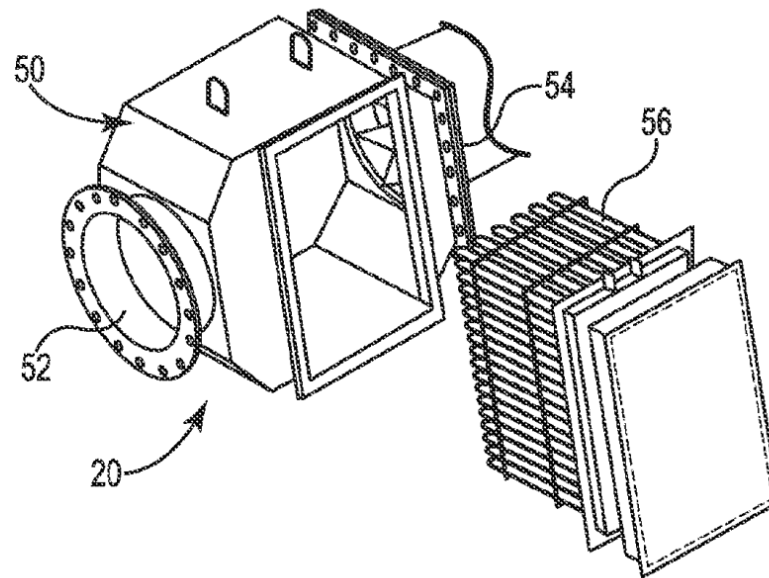


Fig. 2

- h. [19.7] at least one load step resistor in electrical communication with said load bank bus by way of said at least one load step contactor**

147. As disclosed in Van Niekerk, the bus between genset 8 and load bank 20 includes power switch 28 to provide electrical communication when in a closed mode. (*EX1004*, Fig. 1, para. [0011], [0012].)

- i. [19.8] wherein said generator controller is capable of operating said load step contactor to connect said load step resistor**

148. Controller 30 of the control system 12 provides command signals to power switch 28 to designate the amount of power to be coupled to the resistive elements 56 by power switch 28. (*EX1004*, Fig. 1, para. [0012].) This element is disclosed and/or obvious.

j. [19.9] (operating load step contactor) in at least one of the following cases: neglect and regeneration

149. Van Niekerk discloses power switch 28 is activated to connect one or more resistive elements 56 when the system undergoes regeneration, both in the Regen Mode 110 and in the Deep Clean Regen mode 116. In both regeneration cases the control system 12 regulates the application of power to the load bank/heater 20 to maintain the temperature for sufficient time to regenerate the DPF filter. (*EX1004*, para. [0020], [0022]-[0023].) Because Van Niekerk teaches the application of power to the load bank in the case of regeneration, Van Niekerk meets this element of “in at least one of” the cases, regardless of whether it operates in the so-called case of neglect.

150. However, Van Niekerk discloses operation in the Deep Clean Regen Mode 116, which meets to limitation of the “neglect” case. As best a POSITA would understand from the ‘651 disclosure, in the neglect case the system is operated in such manner over sufficient time, either continuously or in several cumulative segments, that wet stacking is likely to occur. Van Niekerk discloses

that the Deep Clean Regen Mode is used when the system has been run through several cycles, until the system determines soot accumulation has occurred and move involved and lengthy Deep Clean regeneration process must be undertaken. (**EX1004**, para. [0022]-[0023].) This is a Neglect case as disclosed in the '651 patent. During this Deep Clean regeneration Van Niekerk discloses the load bank is engaged. (*Id.* para. [0023].) Van Niekerk therefor discloses this element by engaging the load bank in the regeneration case as well as in the neglect case, and is obvious.

k. [19.10] wherein said generator controller is capable of operating said load step contactor to disconnect said load step resistor in case of a load spike

151. Van Niekerk discloses that controller 30 of the control system 12 operates power switch 28 to disconnect some or all of the resistive elements 56 of the load bank 20 in case of an increased load that exceeds a maximum pre-selected level, i.e. in the event of a load spike. (**EX1004**, Figure 3, Figure 4, para. [0028].) Fig.3 and Fig. 4 are shown below-

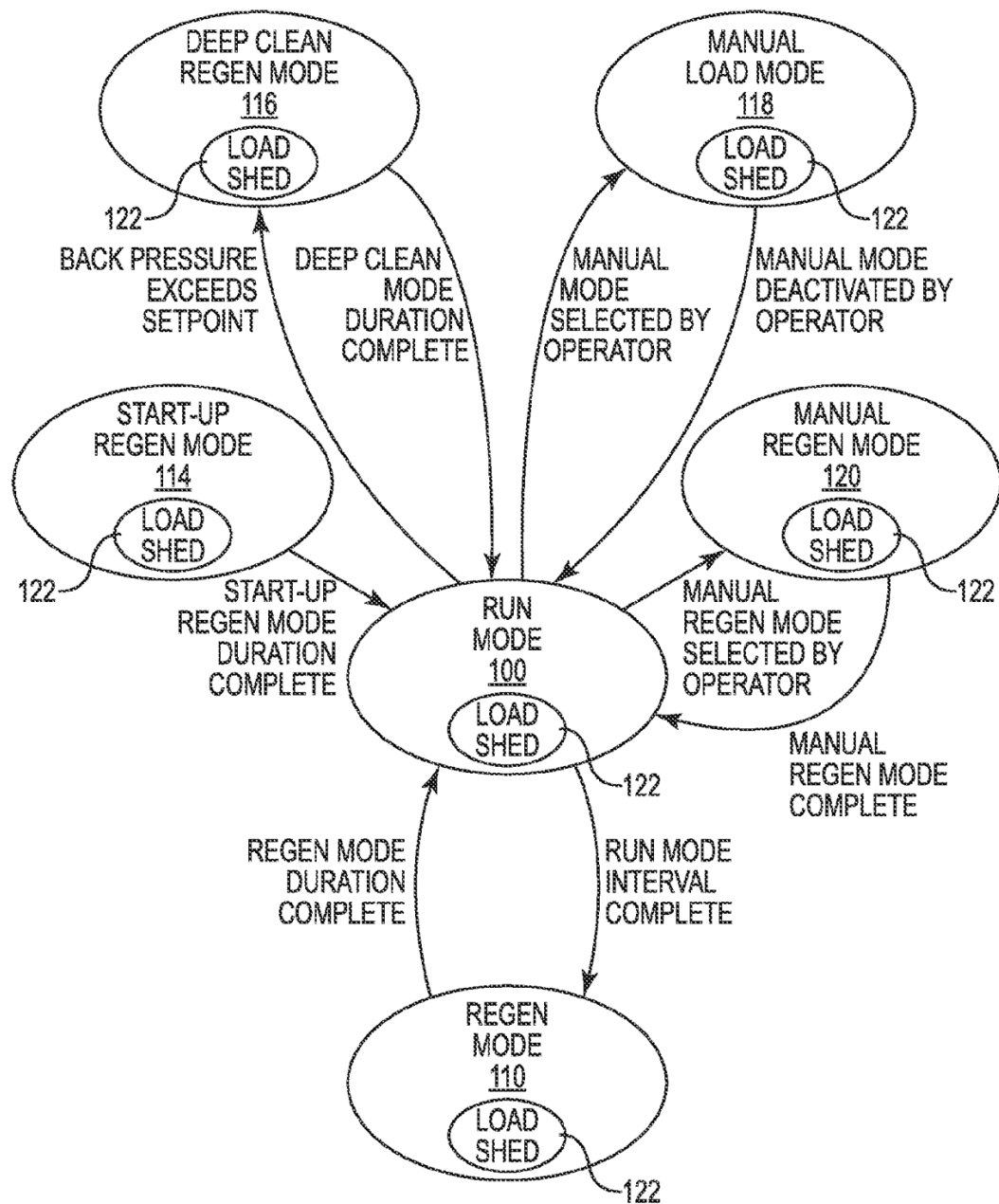


Fig. 3

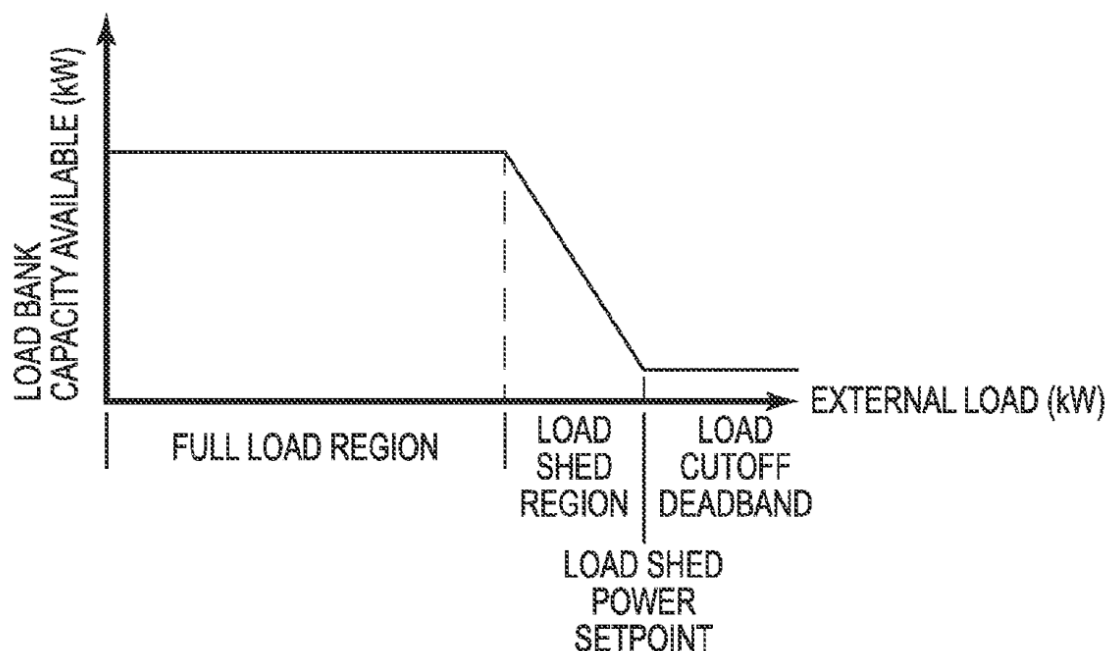


Fig. 4

In the event the reduction of power applied to the load bank can reduce the load beneath the pre-selected level, some resistive load is removed. In the event of too high of a load, control system 12 operates at a load cutoff “dead band” at which no power is applied to load bank 20. As previously noted, load application to load bank 20 is performed by controller 30 and load switch 28. Van Niekerk discloses this element and/or it is obvious. See for example [0028] “Overload-Based Load Shed Mode—Control system 12 operates the aftertreatment system 10 in an overload-based load shed mode 122 when the total power demand on the genset 8 (i.e., the sum of the external load and the load bank/heater load) exceeds the maximum capacity of the genset or a selected maximum genset output load level. The overload-based load shed mode 122 can be described with reference to FIG. 4.

As shown, during a full load region when the external load demands relatively low loads, the load bank/heater 20 can demand any load up to the maximum capacity of the load bank/heater. When the external load demands relatively higher amounts of power and the total power demand on the genset is greater than the genset capacity (or the selected maximum genset output level) but the external load demand is less than the genset capacity, the control system 12 operates the aftertreatment system 10 in a load shed region. In the load shed region the amount of power applied to the load bank/heater 20 is reduced by an amount proportional to the amount by which the total power demand exceeds the genset capacity. In one embodiment, for example, the control system 12 will reduce the power applied to the load bank/heater 20 by an amount generally equal to the amount by which the total power demand exceed the genset capacity. When the external load demands amounts of power greater than the genset capacity, the control system 12 operates the aftertreatment system 10 in a load cutoff dead band at which no power is applied to the load bank/heater 20. It is noted, however, that in this dead band region the exhaust temperature will be naturally elevated due to the load present on the genset. Data representative of the overload-based load shed operation including a setpoint characterizing the full load region-load shed region transition and a load shed power set point characterizing the transition from the load shed region to the load cutoff dead band (e.g., a setpoint representative of the maximum capacity of

the genset) can be stored in the memory 40 and used by the controller 30. The overload-based load shed mode 122 effectively prevents the genset 8 from being artificially “derated” or placed into an overload condition when the aftertreatment system 10 is demanding power by providing precedence to the external load demand over the load bank/heater demand. It is noted that this load demand may not be uniform and so in one embodiment, the genset utilizes hysteresis or a time window after experiencing a spike in load demand that has caused load shed, requiring that either load drop below a selected level or that a selected time period has passed before restoring power to load bank/heater 20. In yet another embodiment, the differential, second order differential, or simple rate of change of an increase in demand is used to preemptively shed load by the load bank/heater 20 if the rate of increase is deemed to be too great and likely to cause a load shed event. In the embodiment illustrated in FIG. 3, the overload-based load shed mode 122 can be entered from all of operating modes 100, 110, 114, 116, 118 and 120, and operation of the aftertreatment system 10 switches back to the mode in which the system was operating when the overload-based load shed mode was entered. In other embodiments the overload-based load shed mode 122 can be entered from one or more but not all of operating modes 100, 110, 114, 116, 118 and 120, and can be discontinued into other operating modes. Still other embodiments of the invention do not include the overload-based load shed mode 122.”

2. Dependent Claims 22 and 26

a. Claim 22

152. Claim 22 depends from claim 19. Claim 22 adds the requirement of:
“a plurality of load step resistors.”

Van Niekerk discloses this as a plurality of resistive elements 56 that may be individually coupled or decoupled to control the amount of load. (**EX1004**, para. [0013].) For example see [0013] “FIG. 2 is a detailed exploded illustration of a load bank/heater 20 in accordance with one embodiment of the invention. As shown, the load bank/heater 20 includes a housing 50 having an inlet end 52 and an outlet end 54. A set of resistive elements 56 are located in the housing 50 between the inlet end 52 and the outlet end 54 (the elements are shown outside the housing in FIG. 2 for purposes of illustration) and are electrically coupled to the power switch 28. Exhaust from the genset engine 16 is coupled to the inlet end 52 of the housing 50, and will flow past the resistive elements 56 before exiting the housing at outlet end 54. Power applied to the resistive elements 56 through power switch 28 will heat the resistive elements and therefore the exhaust flowing past the resistive elements. The amount of exhaust heating by the load bank/heater 20 can be controlled through the amount of power applied to the resistive elements 56. Other embodiments of the invention can use other load bank/heaters. In one embodiment the duty cycle of the power applied to the resistive elements 56 is

modulated to control the load presented to the genset, such as by silicon controlled rectifiers or other electrical switch element. In yet another embodiment, resistive elements 56 are individually electrically coupled or decoupled to control the amount of the presented load. In one embodiment of the present invention, the load bank/heater 20 allows control of the exhaust gas temperatures to within +/-10° F. of a selected target.”

b. Claim 26

153. Claim 26 depends from claim 19. Claim 26 adds the requirement of: “the engine is a diesel engine.”

Van Niekerk discloses the engine may be diesel. (*EX1004*, para. [0010].) For example, see [0010] “Genset 8, which can be a commercially available device, includes an electrical generator 14 powered by a diesel or other engine 16.”

G. Ground 2: Claims 27-36 Are Obvious over the Combination of Van Niekerk and Van Niekerk 2, Egan, Eaton, or DSE Manual 7 or 9

1. Claims 27, 30, 32, 33 Are Obvious Over the Combination of Van Niekerk and Van Niekerk 2

154. Van Niekerk 2 incorporates the entirety of Van Niekerk and thus renders obvious claims 27, 30, 32, 33. Alternatively, since Van Niekerk 2 incorporates Van Niekerk in its entirety, Van Niekerk 2 anticipates claim 19 as discussed above, and also anticipates these dependent claims as discussed below.

a. Rationale to combine and reasonable expectation of success

155. Van Niekerk and Van Niekerk 2 both disclose an integrated load bank and genset system, were filed the same day and have a common assignee. Van Niekerk 2 incorporates “the entire disclosure” of Van Niekerk “for all purposes.” (*EX1005* Col. 4: 64-5:2.) Thus, the motivation to combine Van Niekerk with Van Niekerk 2 is directly stated in Van Niekerk 2 since Van Niekerk 2 incorporates the entire disclosure of Van Niekerk for all purposes, and it would be obvious to a POSITA to combine the two since they have overlapping subject matter (e.g. exhaust after treatment system for a diesel-powered generator set (genset), that includes a Diesel Exhaust Fluid (DEF) injection system, Selective Catalyst Reduction (SCR), and also solve the same problem to reduce the levels of soot and other particulate matters emitted into the atmosphere which are a significant contributor to pollution in the environment in the same manner through improved exhaust treatment system, and also since Van Niekerk 2 points directly to Van Niekerk as an explicit example of an embodiment disclosed: “For example, the heater 36 can optionally be operated in the manner disclosed in co-pending U.S. patent application Ser. No. 13/706,301, filed on even date herewith and entitled Integrated Load Bank For A Diesel Genset Exhaust After-treatment System, the entire disclosure of which is expressly incorporated herein by reference for all purposes” (*EX1005* Col. 4: 64-5:2.)

b. Claim 27

156. Claim 27 depends from claim 19. Claim 27 adds the requirement of:

“the engine is a Tier IV Interim or newer diesel engine.”

As of 2012, essentially all stationary gensets were required to meet Tier IV Interim Standards. (*EX1016*.) Van Niekerk discloses the engine is diesel (*EX1004* para. [0010].) Van Niekerk 2 discloses a genset 12 comprising a diesel engine 14 with DPF 62 and electrical generator 16, and a load bank 80. (*EX1005*, Col. 3:18-24, Col. 5:64-67, Col. 6:35-39.) The systems are configured to meet Tier IV Interim and Final requirements, and discloses this requirement. (*EX1005*, Col. 3:1-3.) Also for example, Van Niekerk 2 on its face explicitly cites “Tier 4 Regulations Affect More than Engines, Jun. 6, 2011, downloaded from <http://www.power-eng.com/articles/pring/volume-115/issue-6/features/tier-4-regulations-af>.”, and also states “The present invention pertains generally but not exclusively to aftertreatment exhaust systems for stationary diesel-powered generators. These aftertreatment systems are configured to meet or exceed certain emissions standards, such as the present EPA Tier 4 Interim and Tier 4 Final requirements. Stationary diesel-powered generators tend to include substantial diesel engines that produce large volumes of exhaust that needs to be treated before release into the atmosphere.” (*EX1005*, Col. 3:1-6.)

c. Claim 30

157. Claim 30 depends from claim 19. Claim 30 adds the requirement of:

“a common base and enclosure.”

adds the requirement of a common base and enclosure. Van Niekerk 2 discloses the aftertreatment system 20 which includes load bank 80 may be located next to or behind genset 12, and thus would have a common base. (**EX1005**, Col. 3:31-33.) For example “In the illustrated embodiment, the exhaust aftertreatment system 20 is supported above the genset 12 via a support structure 26. The illustrated embodiment of system 10 utilizes the ceiling heights frequently found in generator rooms to minimize the overall footprint of the diesel genset system 10. In other embodiments, the exhaust aftertreatment system 20 can be located next to or behind the genset 12, or other locations.” (**EX1005**, Col. 3:26-33.) The inclusion of an enclosure protects the system and provides safety and sound abatement benefits, such that it would be obvious to a POSITA to provide such an enclosure.

d. Claim 32

158. Claim 32 depends from claim 19. Claim 32 adds the requirement of:

“said at least one load step resistor is located remotely from said engine-generator.”

adds the requirement of a load step resistor located remotely from the genset. Van Niekerk 2 discloses the aftertreatment system 20 which includes load bank

80 may be located on a support structure 26 and is thus located remotely above genset 12. (**EX1005**, Figure 1, Col. 3:26-28.)

e. Claim 33

159. Claim 33 depends from claim 19. Claim 33 adds the requirement of:

“the generator controller and engine control module are configured to communicate via SAE J1939 protocol.”

The requirement that the controller and engine control module use J1939 which has been widely known since 2002. It would be obvious to use this standardized protocol to enable ease of communication for diagnostics or combination to a trailer or vehicle. Furthermore, Van Niekerk and Van Niekerk 2 in combination with Eaton (**EX1007**) discloses Claim 34. For example, Eaton states “The genset controller 100 controls and monitors the ECM 160 through CAN interface 103 which connects to the CAN serial link 170. CAN serial link 170, employs the SAE J1939 protocol which is an industry standard protocol for serial communications. By way of CAN databus 170, genset controller 100 receives the information about the operation of engine 152 that has been collected by ECM 160, and provides commands to the ECM 160 to influence the operation of the engine.” (See **EX1007** Col. 5:38-55) It would be obvious to a POSITA to combine Van Niekerk and Van Niekerk 2 with Eaton since a POSITA would have readily understood to have used the well-known CAN J1939 protocol as explicitly disclosed and taught for the genset controller and ECM of Eaton for those as shown and disclosed in

Van Niekerk and Van Niekerk 2, since Eaton, Van Niekerk, and Van Niekerk 2 all disclose similar structures, components, and subject matter (e.g. genset controllers, alternators, diesel engines), and also all disclose ramping up, shutting down, or limiting system parameters using control modules based on system parameters and inputs. As evidenced by the Eaton, the CAN J1939 protocol was well known to a POSITA and a POSITA would have known that CAN J1939 was commonly used for both diesel engine and diesel engine controller applications, as well as for industrial equipment applications. As disclosed, for example in Eaton, a POSITA would have readily employed the CAN J1939 protocol as a substitution of a well-known and readily available technique for another, and would have had at the very least a reasonable expectation of success in doing so, and this substitution would have just been a matter of design choice to a POSITA, with the predictable outcome of providing a standard data communication technique to provide ready and interchangeable communication and diagnostic interface to well-established industry and commercial standards. A POSITA would have readily understood that the use of the CAN J1939 protocol provides the opportunity to use commercial off-the-shelf components that were readily available, standardized, and relatively in-expensive, and thus would have been motivated to make such a design choice with a reasonable expectation of success in doing so. Using the CAN J1939 protocol which was well known and obvious to a POSITA as shown in Eaton, with

Van Niekerk and Van Niekerk 2 is just combining prior art elements according to known methods to yield predictable results (availability of ready off-the-shelf commercially available components), and a simple substitution of one known element (CAN J1939 – commonly employed for diesel engine controllers) for another to obtain predictable results (standardized communication and diagnostic interfaces), and also is the use of a known technique to improve similar devices (gensets and genset controllers, and the related communication busses) in the same way (standardized commercial off-the-shelf components) to provide multiplexed CAN J1939 signals employing less wiring through using a multiplexed data and communication system.

2. Claims 28-31, 34-36 Are Obvious Over the Combination of Van Niekerk and Egan

a. Further Rationale to combine and reasonable expectation of success

160. Both Van Niekerk and Egan disclose diesel gensets coupled with load banks to avoid low load operation that may result in wet stacking, and automatically add load when the load is below a pre-set level. Both engage the load bank in a “neglect” case after the system has been run sub-optimally for a period of time. Both include an engine/controller that interacts with load bank control. A POSITA would consider it obvious to combine the teachings of the two systems designed to address the same problem, and also since the two systems have similar

components and operation. The combination of Egan's adjustable delay timer is an example of the use of a known technique to improve similar devices (diesel engine controllers that use gensets employing load banks, and also include exhaust treatment) in the same way (to account for load spikes, and also for example in the case of neglect cases (the definition of which is at best can be guessed by a POSITA given the disclosure of the Asserted Patent), and this combination is nothing more than applying a known technique to a known device to yield predictable results (not disengaging the load bank resistors for short duration transient electrical fluctuations). The choice of, for example, 10, 1, and/or 0.1 seconds would be obvious for a POSITA to try and is nothing more than choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success in doing so. A POSITA would have been motivated to combine the Egan delay timer with Van Niekerk and Van Niekerk 2 to prevent disengagement of the load bank resistors for transient short duration electrical fluctuations that do not affect the normal steady state operation of the system. Not only does Van Niekerk anticipate or render obvious claims 19, 22 and 26, but the combination of Van Niekerk and Egan renders those claims obvious as well as renders claims 28-31 obvious as well.

b. Claims 19, 22, 26

161. As discussed in Section F.1.a-k and F.2, Van Niekerk discloses and

renders claims 19, 22, and 23 obvious. Van Niekerk in combination with Egan further renders these claims obvious in that Egan likewise discloses the structural requirements of a diesel engine and generator with controls and a load bank that is engaged in a “neglect” case.

c. Claim 28

162. Claim 28 depends from claim 19. Claim 28 adds the requirement of:

“said alternator, output bus, load bank bus, and at least one load step resistor comprise a poly-phase electrical system.”

Egan discloses a genset 10 with alternator 103 and load bank 118 that may have a plurality heaters or steps. (*EX1006*, para. [0041], [0350].) Egan discloses the alternator and thus the system may be a three-phase system, and thus discloses the system is a poly-phase system. (*EX1006*, para. [0166].) For example, “FIGS. 9A-9C illustrate an exemplary alternator 103 with exemplary dimensions including fan 1031, main rotor 1032, exciter rotor 1033 and shaft 1034. Technical specifications of an exemplary alternator 103 that may be used as part of generator 10 may include the following: General Description of Alternator make=Meccalte type=ECO 28 S/4 rotation speed=1,500 r.p.m. poles=4 rated power =16 kVA @ H class 3 ph 400V 50 Hz PF=0.8” (*EX1006*, paragraphs [0159-0166]). A POSITA would have readily understood that a three phase system (commonly designated as 3- Φ) is an example of a system that contains more than one phase and is known as

an example of a polyphase or multiphase system. A 3- Φ system contains three phases having a uniform frequency where a fixed angle of 120° exists between the source voltages generated by the alternator having three windings. (For example, a POSITA would also understand that similarly, there is a 90° angle difference between the two phases in a two phase supply system.) Whereas for comparison purposes, a single phase system contains a sinusoidal alternating voltage having a specific time period and frequency generated by a single winding alternator and has source voltage commonly known as a single phase supply system. A circuit fed by these voltages is known as a single phase AC circuit. In other words, the circuit contains a single alternating current and voltage (which is commonly identified as 1- Φ circuit). A POSITA would have readily understood the advantages of a three phase system over a single phase system, since it is commonly known for example that these advantages include:

- To transmit a specific power over a specific distance at a given rated voltage, a three phase system needs less conductor material as compared to the single phase system.
- The size of a three phase system operated machine is less than the machine operated at single phase voltage having the same output rating.
- In a three phase power supply system, the less voltage drop occurs from source to the load points,

- A three phase supply produces uniform rotating magnetic field therefore, three phase motors are simpler in construction, small in size and can be started automatically with smooth operation.
- A polyphase system produces power at a constant rate in the load.
- A three phase system can transmit more power as compared to a single phase system.
- The efficiency of three phase operated devices and appliances is higher than the single phase operated machines.
- Three phase machines are less costly and more efficient.
- A three phase system provides constant power while a single phase system provides pulsating power which leads to a smooth and vibration free operation of a 3- Φ machine as compared to the 1- Φ machines with noise and vibration.
- The output rating of machines can be increased by increasing the number of phases in a system.
- A three phase machine having the same rating occupies less space as compared to the single phase machine.
- A single phase supply can be obtained from three phase supply to run the 1-phase machines. A three phase machine can't be operated on single phase supply voltage.

- A three phase supply can be easily converted to a single phase supply while a complex system is needed to convert the single phase supply into a three phase supply system
- If a fault occurs on a single phase line, the whole system will have to shut down. In case of three phase single line fault, the other two lines provide the power supply to other single phase load points connected to them.

(see e.g. <https://www.electricaltechnology.org/2020/09/advantages-three-phase-over-single-phase.html>.)

Thus it would have been readily apparent to a POSITA that three phase operation, as exemplified in Egan, is a common configuration that provides power without fluctuation using the minimum number of wires, such that the combination would provide stable power with minimum components and a POSITA would have understood that it is obvious to provide in the systems of Van Niekerk and Van Niekerk 2. A POSITA would have been motivated to combine Egan's three phase system with Van Niekerk and Van Niekerk 2 to arrive at what is claimed in Claim 28 (and also Claim 29) for the well-known advantages as listed for three phase and polyphase systems as discussed immediately above. Combining Egan's three phase system with Van Niekerk and Van Niekerk 2 is nothing more than combining prior art elements according to known methods (e.g. three phase power, polyphase power) to yield predictable results (e.g. more efficient operation, and to

provide constant power which is an advantage over a single phase system that provides pulsating power), and is a simple substitution of one known element (three phase power, polyphase power) for another (single phase power) to obtain predictable results (e.g. more efficient operation, and to provide constant power while a single phase system provides pulsating power), and is also the use of a known technique (three phase and/or polyphase systems) to improve similar devices (generators, alternators, and power supply systems (all of which are disclosed in Egan, Van Niekerk, and Van Niekerk 2)) in the same way, and is just applying a known technique to a known device for improvement to yield predictable results. The application of Egan's three phase system would have been obvious for a POSITA to try and is nothing more than a simple matter of design choice to a POSITA which is choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success since the use of three phase and polyphase systems were well known and readily available for generator and alternator power systems as exemplified in Egan. Also, for example, Eaton (**EX1007**) (just as does Egan, Van Niekerk and Van Niekerk 2) also discloses electric generator sets (or "gensets") that are widely used to provide electric power (see motivation to combine rationale presented previously) and similar to Egan (**EX1006**), Eaton (**EX1007**) also discloses a three phase system- "Alternator 154 is typically a three-phase machine, such as the Model 5M4027

alternator manufactured by Marathon Electric Company.” (**EX1007** Col. 4:26-28), “The processor 240 operates under the direction of stored program instructions to read in information through the three-phase input interface 104 regarding the operation of the alternator 154 in the genset 150. Referring to FIGS. 1 and 2, the three-phase alternator output voltages are applied to system voltage inputs 224, and the three-phase alternator output currents are coupled through a current transformer 158 to system current inputs 225.” **EX1007** Col. 4:57-64). Thus a POSITA would have also recognized that Eaton is also readily combinable with the other references cited.

d. Claim 29

163. Claim 29 depends from claim 19. Claim 29 adds the requirement of:

“said alternator, output bus, load bank bus, and at least one load step resistor comprise a three-phase electrical system.”

As previously noted, Egan discloses the system may be three phase system. (**EX1006**, para. [0041], [0350], [0166].) Eaton also discloses a three phase system (**EX1007** Col. 4:26-28, Col. 4:57-64) Three phase operation is an example of polyphase operation. As noted regarding claim 28, well known three phase operation provides power without fluctuation over single phase systems, as well as the numerous other advantages that are readily known to a POSITA, as discussed for Claim 28 above, and such a combination would be obvious to a POSITA to try.

e. Claim 30

164. Claim 30 depends from claim 19. Claim 30 adds the requirement of:

“a common base and enclosure.”

As disclosed by Egan (**EX1006**) relative to Figures 2-7, the genset 101/103 and load bank 118 have a common base and enclosure and would be obvious to a POSITA and is nothing more than matter of design choice, and is obvious for a POSITA to try, since the use of a common base and enclosure is nothing more than choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success (motivation being to decrease part complexity, save space, and decrease costs, and increase convenience of having the entire system in one location). As an example, Fig. 3 of Egan is shown below is shown as an example of a common base and enclosure -

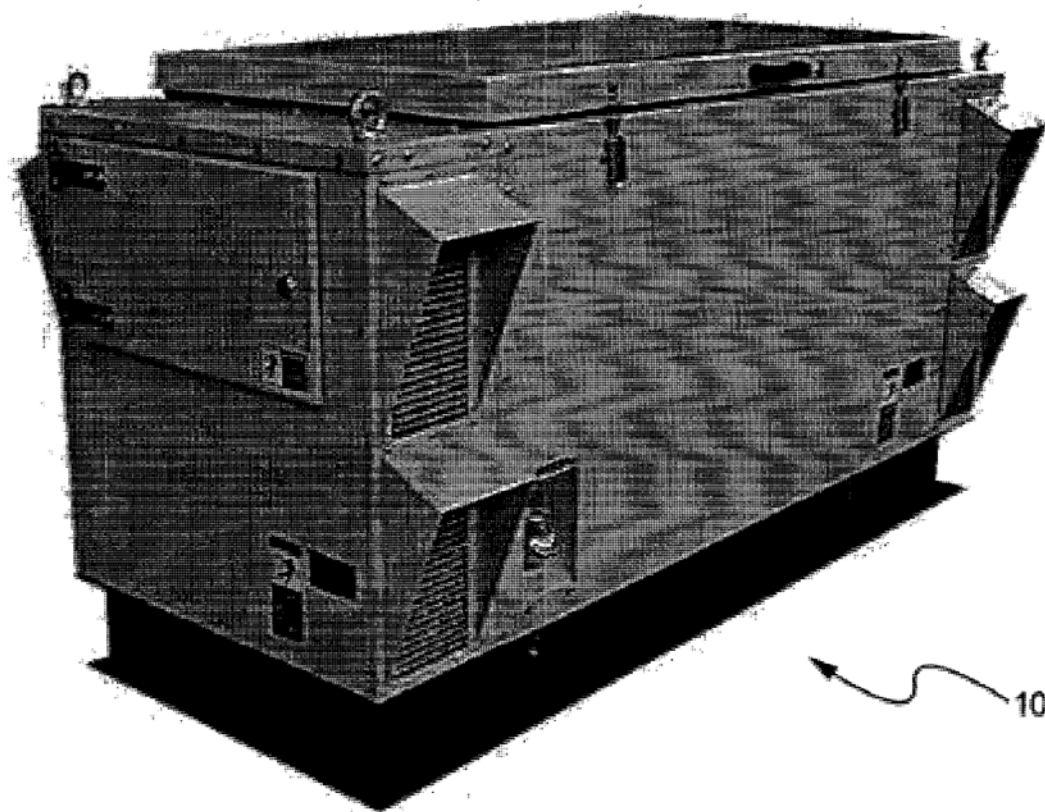


Fig. 3

f. Claim 31

165. Claim 31 depends from claim 19. Claim 31 adds the requirement of:

“said at least one load step resistor is physically located in an enclosure connected to the radiator of said engine.”

As disclosed by Egan (*EX1006*) relative to Figures 2-7, the intake of genset 101/103 is on ones side of the enclosure and load bank 118 is located at the exhaust side in the exhaust of the system. The choice of locating one load step resistor in an enclosure connected to the radiator of an engine would be one of

many predictable locations and would be obvious for POSITA to try. For example, it would have been readily known to a POSITA, that the engine compartment of a car, truck, or vehicle is an enclosure that contains a radiator (necessary for cooling the vehicle engine) and that the placing a load step resistor in an enclosure (e.g. engine compartment with vehicle hood) is nothing more than choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success, and that such a design choice would have been readily known to a POSITA depending on the packaging space available in the engine compartment and would be obvious to try. Also, for example, Eaton (**EX1007**) (just as does Egan, Van Niekerk and Van Niekerk 2) also discloses electric generator sets (or "gensets") that are widely used to provide electric power (see motivation to combine rationale presented previously) and similar to Egan (**EX1006**), Eaton (**EX1007**) also discloses a three phase system- "Alternator 154 is typically a three-phase machine, such as the Model 5M4027 alternator manufactured by Marathon Electric Company." (**EX1007** Col. 4:26-28), "The processor 240 operates under the direction of stored program instructions to read in information through the three-phase input interface 104 regarding the operation of the alternator 154 in the genset 150. Referring to FIGS. 1 and 2, the three-phase alternator output voltages are applied to system voltage inputs 224, and the three-phase alternator output currents are coupled through a current transformer 158 to system current inputs 225."

EX1007 Col. 4:57-64). Also for example, Eaton discloses “Referring to FIG. 1, a generator set controller (or genset controller) 100 is shown coupled to a generator set (genset) 150. Genset controller 100 can be located remotely from genset 150 (up to 40 feet) or attached to the genset directly by way of an engine harness. Genset 150 includes an engine 152 and an alternator (or synchronous generator) 154, and has a typical power rating of between 20 kW and 2000 kW or more. Engine 152 is typically an internal combustion engine that is powered by gasoline, diesel fuel, methane gas or other fuels, for example, the Series 60, Series 2000 or Series 4000 engines manufactured by Detroit Diesel Company of Detroit, Mich. Engine 152 rotates a rotor (not shown) of alternator 154, which outputs electrical power. Alternator 154 is typically a three-phase machine, such as the Model 5M4027 alternator manufactured by Marathon Electric Company.” (**EX1007** Col. 4:12-28) A POSITA would have readily known and recognized that Detroit Diesel engines as disclosed in Eaton are readily used in truck applications and located in engine compartments that are enclosed by vehicle hoods and also contain radiators for engine cooling. It would have been readily known to a POSITA, that the engine compartment of a car, truck, or vehicle is an enclosure that contains a radiator (necessary for cooling the vehicle engine) and that the placing a load step resistor in an enclosure (e.g. engine compartment with vehicle hood) is nothing more than choosing from a finite number of identified, predictable solutions, with a

reasonable expectation of success, and that such a design choice would have been readily known to a POSITA depending on the packaging space available in the engine compartment and would be obvious to try.

g. Claims 34

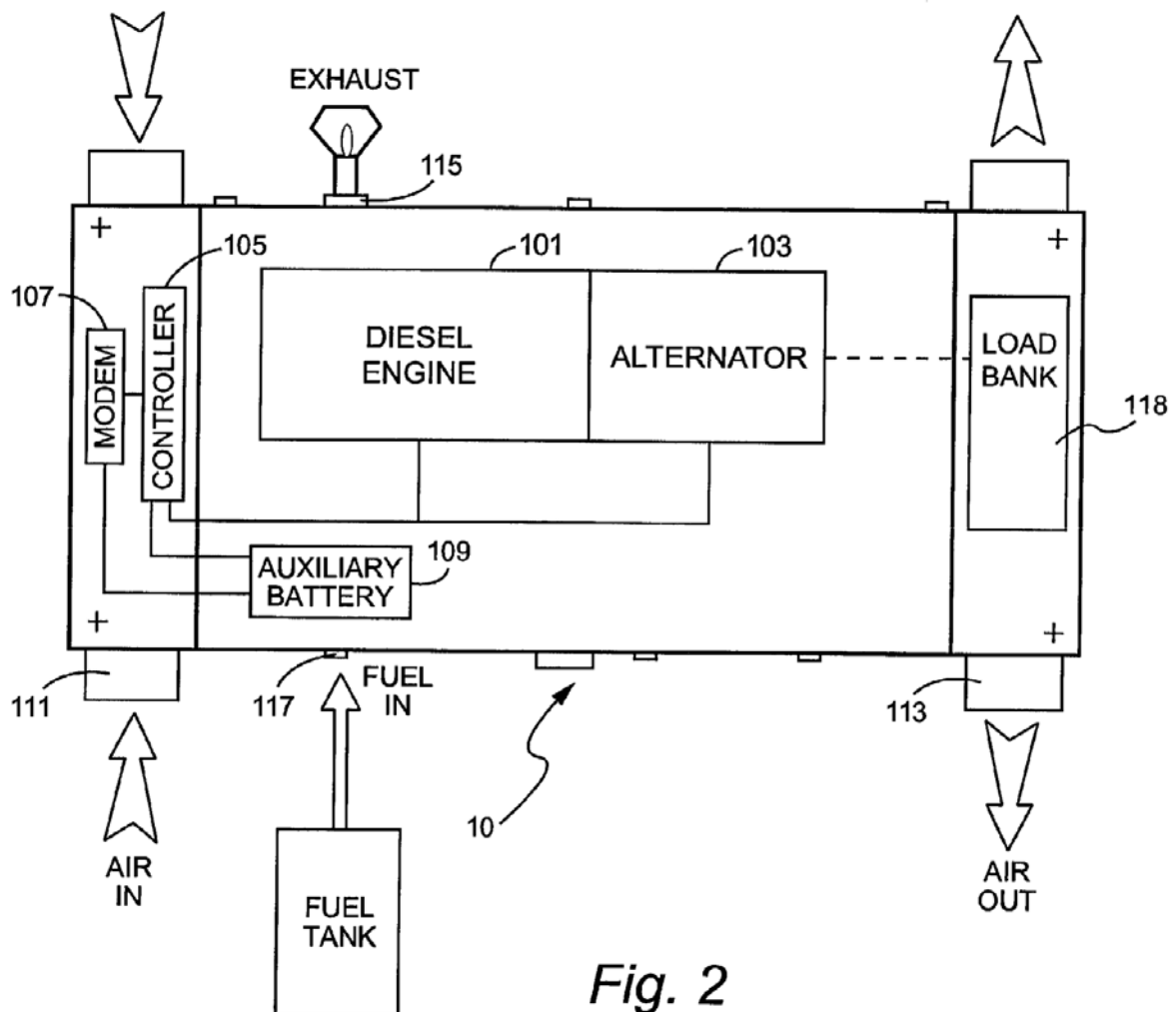
166. Claim 34 depends from claim 19. Claim 34 adds the requirement of:

“the generator controller is configured to operate said load step contactor to disconnect said load step resistor within 10 seconds.”

The specification assigns no significance to this time, with claims 33, 34 and 35 representing a conventional logarithmic progression. Egan [EX1006] discloses an overload protection that disengages voltage after a programmed delay (nominally 5-10 seconds) (para. [0220]) and disconnecting load bank 118 in the event of a load spike. (para. [0350].) It would be obvious to include a load bank disconnect with a delay to address common fluctuations, adjustable to one time in a conventional progression in view of their commonplace use in controllers. For example, similar to Van Niekerk and Van Niekerk 2, Egan “relates to electric power generators and particularly to an electric power generator which is monitored and controlled by a remote processing system and which provides electrical power” [EX1006 para. [0001]. Egan, Van Niekerk, Van Niekerk 2 are all in the same field, namely power generators and the related controllers and control systems. Egan, Van Niekerk, and Van Niekerk 2 all have similar structures and components (e.g. exhaust systems, load banks, load generators, diesel engines,

alternators/generators, air/fuel inlets) and also address common problems, for example including the problem of deposits in exhaust systems including in the cases of extended periods of time of no load or almost no load operation. Thus a POSITA would have understood that all three references are in the same fields of endeavor and would have readily looked to all of these references for known techniques to improve similar devices in the same well-known ways. Egan also discloses “These regulators may also have inherent overload protection which senses the exciter field voltages value. Should this field voltage value exceed the nominal value for a period of more than 20 seconds, then the alternator voltage is automatically reduced to a safe operating level. This overload function has a built-in delay to allow for the overload when starting motors (normally 5-10 Seconds). The operating threshold of this protection device is adjustable by the potentiometer marked “AMP”.” [EX1006 para. [0220]]. Egan also discloses “As illustrated in FIG. 2, generator 10 includes a load bank 118. In order to avoid carbon deposits inside the exhaust manifold 115 on the engine in case of continuous no load or almost no load operation, the load bank 118 has been designed to automatically load generator 10 with for example a 5 kW ventilated resistive load for 15 minutes every 3 hours when the output is less than 4 kW. When the requested load is more than 4 kW the load bank is automatically disconnected. Accordingly, load bank 118 may be connected/disconnected to receive an output originating from

alternator 103 to impose a load on generator 10. Load bank 118 may be formed by, for example, one or more heaters, and may be controlled through load bank controls 1056 (FIG. 10). Data related to the automatic loading by load bank 118 may be transmitted to processing system 20.” [EX1006 para. [350]]. Fig. 2 and Fig. 10 of Egan are shown below-



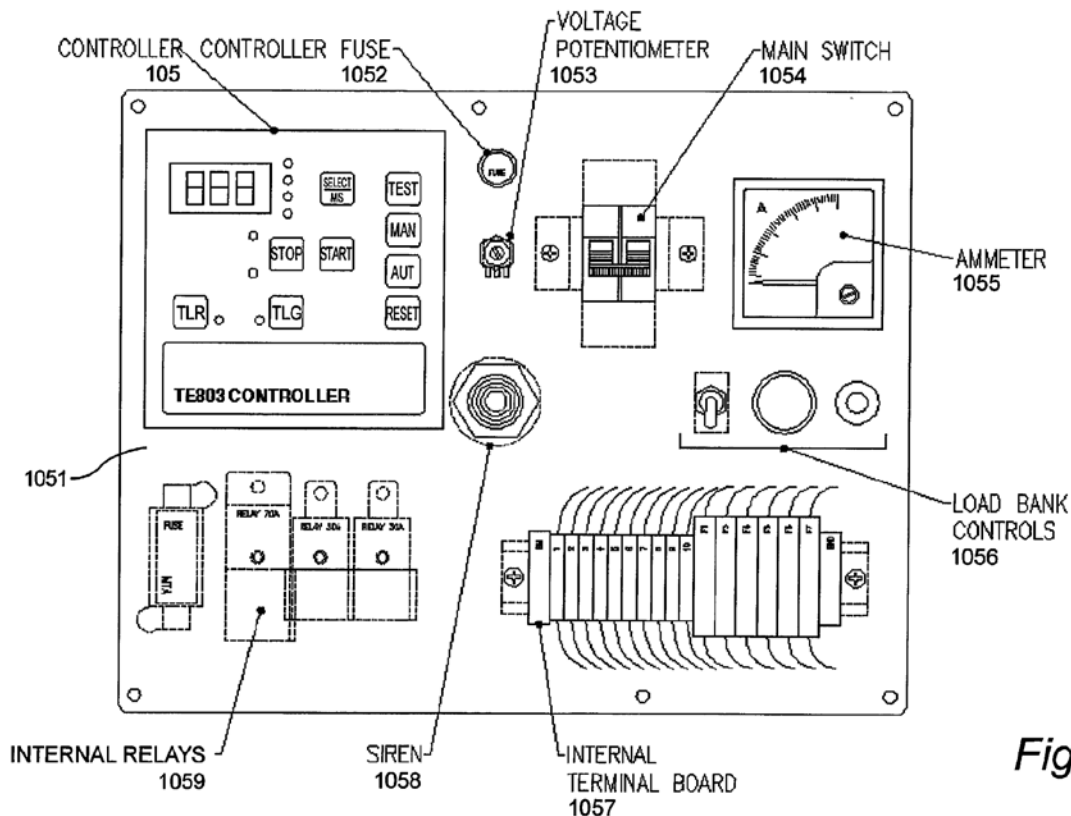


Fig. 10

Thus a POSITA would have readily understood, that similar to Van Niekerk and Van Niekerk 2, Egan discloses an overload protection that reduces load (e.g. Egan's "alternator voltage" that "is automatically reduced to a safe operating level". Also similar to Van Niekerk and Van Niekerk 2, Egan discloses a load bank 118 that has been designed to automatically load generator 10. It would have been obvious to a POSITA to combine Egan's overload function (that "has a built-in delay to allow for the overload when starting motors (e.g. normally 5-10 Seconds, and/or 20 seconds). The operating threshold of this protection device is adjustable by the potentiometer marked "AMP") with Van Niekerk and Van Niekerk 2 to explicitly and specifically set "the generator controller [that] is

configured to operate said load step contactor to disconnect said load step resistor within 10 seconds” to, as stated in Egan allow for transient electrical fluctuations such as when starting motors, to not disengage and disconnect the load step resistors (load bank) for small duration erratic electrical fluctuations which may readily occur during normal operation. A POSITA would have understood, that by combining Egan’s delay with the controller that controls the load banks in Van Niekerk and Van Niekerk 2, that this would have yielded the predictable and desirable result of not disengaging the load bank resistors for transient short-duration electrical fluctuations that would readily disappear once the system returns to steady state operation. The choice of a 10 second duration is simply a matter of design choice to a POSITA, and nothing more than combining prior art elements according to known methods to yield predictable results (e.g. preventing load bank disengagement for minor transient short duration transient fluctuations) and also a simple substitution of one known element for another to obtain predictable results (e.g. not disengaging the load bank resistors so that normal burning and cleaning of soot particles can continue to occur). Since Egan discloses that the delay time is adjustable, a POSITA would have readily understood that this delay time is just a simple matter of design choice to a POSITA, based on the particular system application, and a POSITA would have a reasonable expectation of success in choosing the delay time based on the observations of the particular

system during normal operation, and the 10 second time explicitly stated in this claim is just one of numerous predictable solutions that would be obvious to try.

h. Claims 35

167. Claim 35 depends from claim 19. Claim 35 adds the requirement of:

“the generator controller is configured to operate said load step contactor to disconnect said load step resistor within 1 seconds.”

The specification assigns no significance to this time, with claims 33, 34 and 35 representing a conventional logarithmic progression. Egan discloses an overload protection that disengages voltage after a programmed delay (e.g. nominally 5-10 seconds, or also 20 seconds) (para. [0220]) and disconnecting load bank 118 in the event of a load spike. (para. [0350].) It would be obvious to include a load bank disconnect with a delay to address common fluctuations, adjustable to one time in a conventional progression in view of their commonplace use in controllers. As stated for claim 34 above, the setting of Egan’s delay time to 1 second instead of 10 seconds, is just a matter of design choice to a POSITA and would have been obvious to try and a POSITA would have had a reasonable expectation of success in combining Egan’s delay timer with Van Niekerk and Van Niekerk 2. The rationale given for motivation to combine as stated for claim 34 also applies to claim 35.

i Claims 36

168. Claim 36 depends from claim 19. Claim 36 adds the requirement of:

“the generator controller is configured to operate said load step contactor to disconnect said load step resistor within 0.1 seconds.”

The specification assigns no significance to this time, with claims 33, 34 and 35 representing a conventional logarithmic progression. Egan discloses an overload protection that disengages voltage after a programmed delay (e.g. nominally 5-10 seconds, and/or 20 seconds) (para. [0220]) and disconnecting load bank 118 in the event of a load spike. (para. [0350].) It would be obvious to include a load bank disconnect with a delay to address common fluctuations, adjustable to one time in a conventional progression in view of their commonplace use in controllers. As stated for claim 34 above, the setting of Egan’s delay time to 0.1 second instead of 10 seconds, is just a matter of design choice to a POSITA and would have been obvious to try and a POSITA would have had a reasonable expectation of success in combining Egan’s delay timer with Van Niekerk and Van Niekerk 2. The rationale given for motivation to combine as stated for claim 34 also applies to claim 36.

3. Claim 33-36 are Obvious Over the Combination of Van Niekerk and Eaton

a. Claim 33:

169. Claim 33 depends from claim 19. Claim 33 adds the requirement of:

“the generator controller and engine control module are configured to communicate via SAE J1939 protocol.”

Eaton (*EX1007*) discloses a genset 150 having a diesel engine 150 and alternator 154 in which an ECM 160 communicates with a genset controller 100 using the J1939 protocol and CAN communications. As discussed above, it would be obvious to a POSITA to use the J1939 protocol and CAN communications (which would have been well-known to a POSITA as a primary data communication standard) with the gensets in Van Niekerk and Van Niekerk 2 in view of Eaton as an obvious design choice to provide standardized communications, and diagnostic interface (see also the previous discussion above regarding Claim 33, for example discusses the use of readily available commercial-off-the-shelf components and other motivations for a POSITA to combine Eaton with Van Niekerk and Van Niekerk 2).

b. Claims 34

170. Claim 34 depends from claim 19. Claim 34 adds the requirement of:

“the generator controller is configured to operate said load step contactor to disconnect said load step resistor within 10 seconds.”

The specification assigns no significance to this time, with claims 33, 34 and 35 representing a conventional logarithmic progression. Eaton discloses a shutdown or partial shutdown command is issued if a parameter is exceeded for a set duration, with an example of 10 second windows disclosed, (*EX1007*, Col. 9:39-10:15, 13:19-33.) For example, Eaton discloses: “Once the high current value is calculated in step 510, the subroutine proceeds to step 512, at which the high

current value is compared with a high current maximum value H_{MAX} . The comparison determines whether the following inequality is true:

$$\sum_{1}^{10} I^2 > H_{max}$$

where the left hand side of the inequality is the definition of the high current value as discussed with respect to step 510. In the preferred embodiment, the high current maximum value H_{MAX} is 90. The value of 90 is chosen based upon the NEMA MG 1-16.45 standards. Thus, if the normalized current value (I) is continuously greater than 3 for any 10-second window of operation of the engine 152, the inequality of equation (1) is true and therefore it is determined that the current within the alternator 154 is excessive. If the current is determined to be excessive at step 512, the subroutine proceeds to step 518, in which the processor 101 provides a command to shut down the operation of genset 150. The command provided at step 518 normally involves calling a system fault routine to shut the genset 150 down. In other embodiments, only a portion of the genset 150 is commanded to be shut down, such as the engine 152 or the alternator 154. In further embodiments, the processor 101 does not provide a command to completely shut down the genset 150 or a portion thereof, but rather provides a command to reduce some operational parameter of the genset or a portion thereof, e.g., a command to slow down the speed of engine 152. The system fault routine of

step 518 in one embodiment is performed by way of fault detection/handling subsystem 316. The command provided by processor 101 typically results in a signal being transmitted from CAN interface 103 to ECM 160, which then effects the appropriate response from the genset 150. In certain embodiments, the commands of the processor 101 are effected by way of voltage regulator interface 105 or another interface. In additional embodiments, elements of the genset controller 100 or other elements are also shut down, or other events are triggered, upon the determination of excessive current at step 512.” (**EX1007**, Col. 9:39-10:15) In my opinion, a POSITA would have readily understood that these parameters (for example as also discussed in Eaton) can be varied depending on the application, and the choice of time delay is a simple matter of design choice for a POSITA. For example, Eaton also discloses that these parameters can be varied depending on the application and that other time periods than those specified can be used to account for current variation - “For example, the maximum current value I_{MAX} can be determined in a manner other than through the use of equation (3) and the voltage/frequency table of FIG. 7, e.g., through the use of a formula. Also, for example, the exact low current and high current maximum values used in equations (1) and (2) can vary greatly depending upon the application, as can the exact manner in which the current measurement values are normalized for use in those equations. Additionally, in other embodiments, the calculations of the low

current and high current values can vary. For example, in different embodiments the calculations of these values will vary in terms of the number of normalized currents that are summed together, to account for current variation within the alternator 154 during other time periods than those specified herein.”

It would be obvious in a Van Niekerk genset in view of Eaton to include a load bank disconnect with a delay to address common fluctuations, adjustable to one time in a conventional progression in view of their commonplace use in controllers. For example, similar to Van Niekerk and Van Niekerk 2, Eaton relates to alternators, gensets, and their use to provide electric power. (*EX1007* Col.1: 1-33). Eaton, Van Niekerk, Van Niekerk 2 are all in the same field, namely power generators and the related controllers and control systems. Eaton, Van Niekerk, and Van Niekerk 2 all have similar structures and components (e.g. gensets, alternators/generators, diesel engines, and the related controls and control systems) and also address common problems, for example monitoring genset system parameters including over periods of time to engage and disengage genset system control parameters during extended periods of time of operation. Thus a POSITA would have understood that all three references are in the same fields of endeavor and would have readily looked to all of these references for known techniques to improve similar devices in the same well-known ways. Thus a POSITA would have readily understood, that similar to Van Niekerk and Van Niekerk 2, Eaton

discloses an overload protection that reduces load (e.g. Eaton's "high current value is compared with a high current maximum value H_{MAX} " in the summing equation shown above. Also, similar to Van Niekerk and Van Niekerk 2, Eaton discloses that this is done automatically through a pre-set control system. It would have been obvious to a POSITA to combine Eaton's overload protection function that "in different embodiments the calculations of these values will vary in terms of the number of normalized currents that are summed together, to account for current variation" "depending on the application" with Van Niekerk and van Niekerk 2 to explicitly and specifically set "the generator controller [that] is configured to operate said load step contactor to disconnect said load step resistor within 10 seconds" to (as stated in Eaton) account for current variation depending on the application to not disengage and disconnect the load step resistors (load banks in Van Niekerk and Van Niekerk 2) for small duration erratic electrical fluctuations which may readily occur during normal operation. A POSITA would have understood, that by combining Eaton's delay with the controller that controls the load banks in Van Niekerk and Van Niekerk 2, that this would have yielded the predictable and desirable result of not disengaging the load bank resistors for transient short-duration electrical fluctuations that would readily disappear once the system returns to steady state operation. The choice of a 10 second duration is simply a matter of design choice to a POSITA, and nothing more than combining

prior art elements according to known methods to yield predictable results (e.g. preventing load bank disengagement for minor short duration transient fluctuations) and also a simple substitution of one known element for another to obtain predictable results (e.g. not disengaging the load bank resistors so that normal burning and cleaning of soot particles can continue to occur). Since Eaton discloses that “in different embodiments the calculations of these values will vary in terms of the number of normalized currents that are summed together, to account for current variation” “depending on the application”, a POSITA would have readily understood that the delay time is adjustable based on the application, and a POSITA would have readily understood that this delay time is just a simple matter of design choice to a POSITA, based on the particular system application, and a POSITA would have a reasonable expectation of success in choosing the delay time based on the observations of the particular system during normal operation, and the 10 second time explicitly stated in this claim is just one of numerous predictable solutions that would be obvious to try.

c. Claims 35

171. Claim 35 depends from claim 19. Claim 35 adds the requirement of:

“the generator controller is configured to operate said load step contactor to disconnect said load step resistor within 1 seconds.”

The specification assigns no significance to this time, with claims 33, 34 and 35 representing a conventional logarithmic progression. Eaton discloses a shutdown

or partial shutdown command is issued if a parameter is exceeded for a set duration, with an example of 10 second windows disclosed, (*EX1007*, Col. 9:39-10:15, 13:19-33.) It would be obvious in a Van Niekerk genset in view of Eaton to include a load bank disconnect with a delay to address common fluctuations, adjustable to one time in a conventional progression in view of their commonplace use in controllers. As stated for claim 34 above, the setting of the delay time to 1 second instead of 10 seconds, is just a matter of design choice to a POSITA and would have been obvious to try and a POSITA would have had a reasonable expectation of success in combining Eaton's delay timer (which as stated in Eaton "in different embodiments the calculations of these values will vary in terms of the number of normalized currents that are summed together, to account for current variation" "depending on the application"). A POSITA would have readily understood that the delay time is adjustable based on the application, and a POSITA would have readily understood that this delay time setting is just a simple matter of design choice to a POSITA, based on the particular system application, and a POSITA would have a reasonable expectation of success in choosing the delay time based on the observations of the particular system during normal operation, and as stated for claim 34 above, the setting of Eaton's delay time to 1 second instead of 10 seconds, is just a matter of design choice to a POSITA and would have been obvious to try and a POSITA would have had a reasonable

expectation of success in combining Eaton's timer with Van Niekerk and Van Niekerk 2 for use as a delay timer. The rationale given for motivation to combine as stated for claim 34 also applies to claim 35. The 1 second time explicitly stated in this claim is just one of numerous predictable solutions that would be obvious to try. with Van Niekerk and Van Niekerk 2. The rationale given for motivation to combine as stated for claim 34 also applies to claim 35.

d. Claims 36

172. Claim 36 depends from claim 19. Claim 36 adds the requirement of:

“the generator controller is configured to operate said load step contactor to disconnect said load step resistor within 0.1 seconds.”

The specification assigns no significance to this time, with claims 33, 34 and 35 representing a conventional logarithmic progression. Eaton discloses a shutdown or partial shutdown command is issued if a parameter is exceeded for a set duration, with an example of 10 second windows disclosed, (*EX1007*, Col. 9:39-10:15, 13:19-33.) It would be obvious in a Van Niekerk genset in view of Eaton to include a load bank disconnect with a delay to address common fluctuations, adjustable to one time in a conventional progression in view of their commonplace use in controllers. As stated for claim 34 above, the setting of the delay time to 0.1 second instead of 10 seconds, is just a matter of design choice to a POSITA and would have been obvious to try and a POSITA would have had a reasonable

expectation of success in combining Eaton's timer with Van Niekerk and Van Niekerk 2 to configure the delay time for the generator controller to operate said load step contactor to disconnect said load step resistor within 0.1 seconds. The rationale given for motivation to combine as stated for claim 34 also applies to claim 36.

4. Claims 28-29, 33-36 Are Obvious Over the Combination of Van Niekerk and DSE Manual 7 or DSE Manual 9

a. Rationale to combine and reasonable expectation of success

173. Van Niekerk, Van Niekerk 2, and DSE Manual 7, and DSE Manual 9 are all in the same field, namely power generators and the related controllers and control systems, and all have similar structures and components (e.g. load banks, load generators, diesel engines, alternators/generators, load shedding, controls of gensets employing engines and alternators) and also address common problems, for example including load shedding, measurement of operating parameters, and time delays for engaging/disengaging system control parameters. All four references disclose load bank control systems for engine gensets. Also, all four references engage magnitude steps of the load bank when total load drops below a pre-set level, and disengage the load bank above a pre-set level. A POSITA would consider it obvious to use the controls of the DSE Manuals with Van Niekerk and Van Niekerk 2 as being a type of genset for which DSE Manuals were designed.

Thus a POSITA would have understood that all four references are in the same fields of endeavor and would have readily looked to all of these references for known techniques to improve similar devices in the same well-known ways. A POSITA would have readily looked to either or all of these references to combine any of the claim elements disclosed in these references since they are all well-known to a POSITA and combining any of these elements yields predictable results, and are a simple substitution of one known element for another to obtain predictable results. Furthermore a POSITA would have readily looked to either or all of these references to combine any of the claim elements disclosed in these references since they are all known methods and their use is the use of known techniques to improve similar devices (methods, or products) in the same ways (since they all have similar components), all are in the same field of endeavor, and all address the same problems, and substitution or addition of any elements from these four references to another reference is nothing more than applying a known technique to a known device (method, or product) for improvement to yield predictable results, and would be obvious for a POSITA to try since combining any of these elements together is choosing from a finite number of identified, predictable solutions, and a POSITA would have understood that doing so would be done with a reasonable expectation of success.

b. Claim 28

174. Claim 28 depends from claim 19. Claim 28 adds the requirement of:

“said alternator, output bus, load bank bus, and at least one load step resistor comprise a poly-phase electrical system.”

DSE Manual 7 and 9 discloses the genset is operated as a three phase system, and thus discloses operation as a poly-phase system. (*EX1008* p. 43-52; *EX1032* p. 45-54) For example DSE Manual 7 discloses:

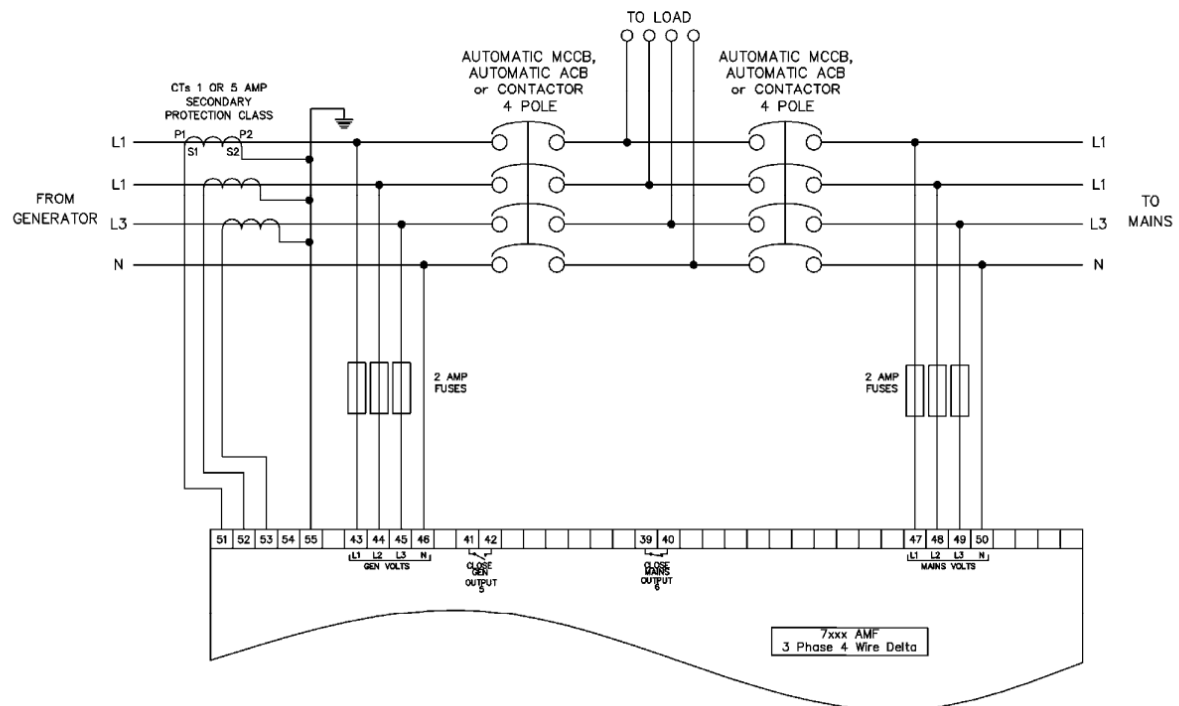
4.4 ALTERNATIVE TOPOLOGIES

The 7000 controller is factory configured to connect to a 3 phase, 4 wire Star connected alternator. This section details connections for alternative AC topologies. Ensure to configure the 7000 series controller to suit the required topology.

NOTE:- Further details of module configuration are contained within the DSE7000 Series configuration software manual (DSE part number 057-077)

4.4.1 3 PHASE, 4 WIRE WITHOUT EARTH FAULT PROTECTION

NOTE:- Mains sensing (Terminals 47-50) is not fitted to DSE7210/ DSE7310 autostart controllers.



(EX1008 page 43). For example DSE Manual 9 discloses:

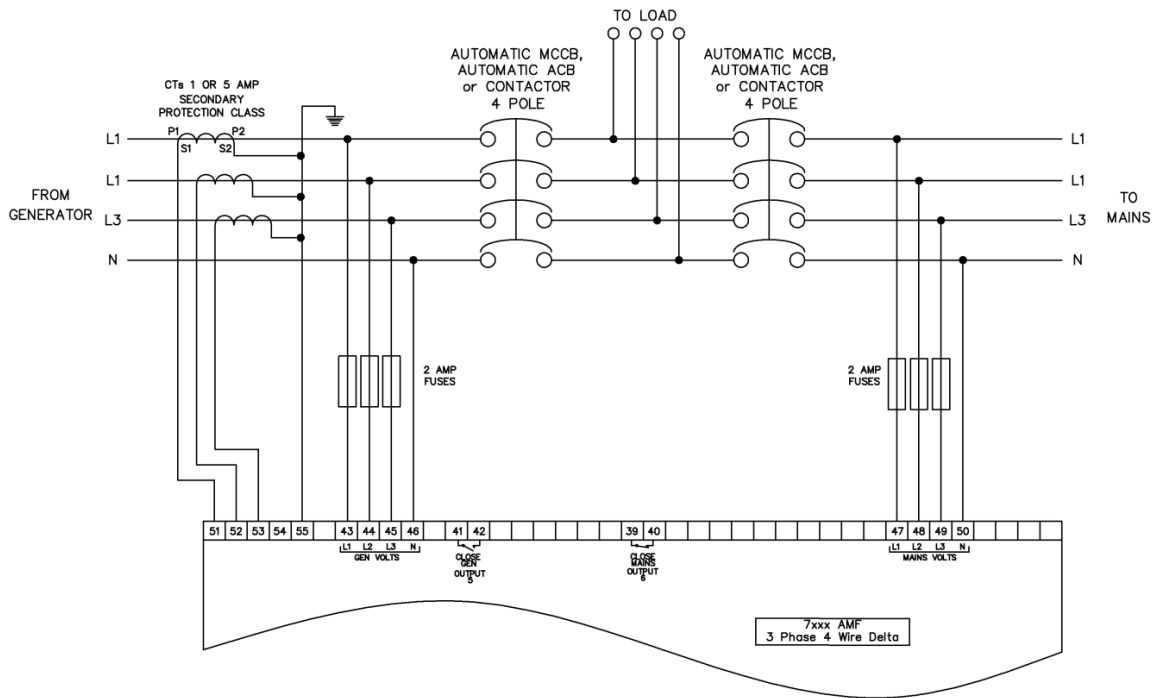
4.4 ALTERNATIVE TOPOLOGIES

The 7000 controller is factory configured to connect to a 3 phase, 4 wire Star connected alternator. This section details connections for alternative AC topologies. Ensure to configure the 7000 series controller to suit the required topology.

NOTE:- Further details of module configuration are contained within the DSE7000 Series configuration software manual (DSE part number 057-077)

4.4.1 3 PHASE, 4 WIRE WITHOUT EARTH FAULT PROTECTION

NOTE:- Mains sensing (Terminals 47-50) is not fitted to DSE7210/ DSE7310 autostart controllers.



(EX1032 page 43)

Just as noted regarding the combination of Van Niekerk, Van Niekerk 2 and Egan, and Eaton, three phase operation is a common configuration that provides power without fluctuation using the minimum number of wires, such that the combination would provide stable power with minimum components and obvious to a POSITA

to provide in the Van Niekerk system, and Van Niekerk 2 system. A POSITA would have readily understood that a three phase system (commonly designated as 3- Φ) is an example of a system that contains more than one phase and is known as an example of a polyphase or multiphase system. A 3- Φ system contains three phases having a uniform frequency where a fixed angle of 120° exists between the source voltages generated by the alternator having three windings. (For example, a POSITA would also understand that similarly, there is a 90° angle difference between the two phases in a two phase supply system.) Whereas for comparison purposes, a single phase system contains a sinusoidal alternating voltage having a specific time period and frequency generated by a single winding component such as an alternator and has source voltage commonly known as a single phase supply system. A circuit fed by these voltages is known as a single phase AC circuit. In other words, the circuit contains a single alternating current and voltage (which is commonly identified as 1- Φ circuit). A POSITA would have readily understood the advantages of a three phase system over a single phase system, since it is commonly known for example that these advantages include:

- To transmit a specific power over a specific distance at a given rated voltage, a three phase system needs less conductor material as compared to the single phase system.

- The size of a three phase system operated machine is less than the machine operated at single phase voltage having the same output rating.
- In a three phase power supply system, the less voltage drop occurs from source to the load points,
- A three phase supply produces uniform rotating magnetic field therefore, three phase motors are simpler in construction, small in size and can be started automatically with smooth operation.
- A polyphase system produces power at a constant rate in the load.
- A three phase system can transmit more power as compared to a single phase system.
- The efficiency of three phase operated devices and appliances is higher than the single phase operated machines.
- Three phase machines are less costly and more efficient.
- A three phase system provides constant power while a single phase system provides pulsating power which leads to a smooth and vibration free operation of a 3- Φ machine as compared to the 1- Φ machines with noise and vibration.
- The output rating of machines can be increased by increasing the number of phases in a system.

- A three phase machine having the same rating occupies less space as compared to the single phase machine.
- A single phase supply can be obtained from three phase supply to run the 1-phase machines. A three phase machine can't be operated on single phase supply voltage.
- A three phase supply can be easily converted to a single phase supply while a complex system is needed to convert the single phase supply into a three phase supply system
- If a fault occurs on a single phase line, the whole system will have to shut down. In case of three phase single line fault, the other two lines provide the power supply to other single phase load points connected to them.

(see e.g. <https://www.electricaltechnology.org/2020/09/advantages-three-phase-over-single-phase.html>.)

Thus it would have been readily apparent to a POSITA that three phase operation, as exemplified in DSE Manual 7 and 9, is a common configuration that provides power without fluctuation using the minimum number of wires, such that the combination would provide stable power with minimum components and obvious to provide in the systems of Van Niekerk and Van Niekerk 2. A POSITA would have been motivated to combine DSE Manual 7 and 9 three phase systems with Van Niekerk and Van Niekerk 2 to arrive at what is claimed in Claim 28 (and also

Claim 29) for the well-known advantages as listed for three phase and polyphase systems as discussed immediately above. Combining the DSE Manual 7 and 9 three phase systems with Van Niekerk and Van Niekerk 2 is nothing more than combining prior art elements according to known methods (three phase power) to yield predictable results (e.g. more efficient operation, and to provide constant power as compared to a single phase system that provides pulsating power), and is a simple substitution of one known element (three phase power) for another (single phase power) to obtain predictable results (e.g. more efficient operation, and to provide constant power while a single phase system provides pulsating power), and is also the use of a known technique (three phase and/or polyphase systems) to improve similar devices (generators, alternators, and power supply systems (all of which are disclosed in DSE Manual 7 and 9, Van Niekerk, and Van Niekerk 2)) in the same way, and is just applying a known technique to a known device for improvement to yield predictable results. The application of DSE Manual 7 and 9 three phase systems would have been obvious for a POSITA to try and is nothing more than a simple matter of design choice to a POSITA choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success since the use of three phase and polyphase systems were well known and readily available for generator and alternator power systems as exemplified in DSE Manual 7 and 9.

c. Claim 29

175. Claim 29 depends from claim 19. Claim 29 adds the requirement of:

“said alternator, output bus, load bank bus, and at least one load step resistor comprise a three-phase electrical system.”

As previously noted, DSE Manual 7 and 9 disclose the genset is operated as a three phase system. (**EX1008** p. 43-52; **EX1032** p. 45-54.) Three phase operation is an example of polyphase operation. As noted regarding claim 28, well known three phase operation provides power without fluctuation over single phase systems, as well as the numerous other advantages that are readily known to a POSITA, as discussed for Claim 28 above, and such a combination would be obvious to a POSITA to try.

d. Claim 33

176. Claim 33 depends from claim 19. Claim 33 adds the requirement of:

“the generator controller and engine control module are configured to communicate via SAE J1939 protocol.”

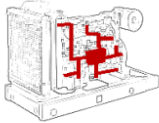
The DSE Manuals disclose the genset is CAN standard compliant and obtains information from engine CAN controllers. (**EX1008** p. 14, 60; **EX1032** p. 14, 62.)

For example DSE Manual 7 discloses:

CAN Port	<div>max distance 1.2km (7/8 mile)</div> <div>Engine CAN Port</div> <div>Standard implementation of 'Slow mode', up to 250K bits/s</div> <div>Non-Isolated.</div> <div>Internal Termination provided (120Ω)</div> <div>Max distance 40m (133 feet)</div>
----------	--

3.10 COMMUNICATION PORT USAGE

3.10.1 CAN INTERFACE



Modules are fitted with the CAN interface as standard and are capable of receiving engine data from engine CAN controllers compliant with the CAN standard. CAN enabled engine controllers monitor the engine's operating parameters such as engine speed, oil pressure, engine temperature (among others) in order to closely monitor and control the engine. The industry standard communications interface (CAN) transports data gathered by the engine controller interface. This allows generator controllers such as the DSE7000 series to access these engine parameters with no physical connection to the sensor device.

NOTE: - For further details for connections to CAN enabled engines and the functions available with each engine type, refer to the manual *Electronic Engines and DSE Wiring*. Part No. 057-004

DSE Manual 7 page 14, and DSE Manual 7 also discloses

5.4.2 ENGINE

Contains instrumentation gathered about the engine itself, some of which may be obtained using the CAN or other electronic engine link.

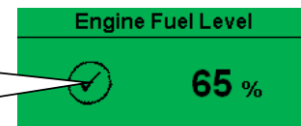
- Engine Speed
- Oil Pressure
- Coolant Temperature
- Engine Battery Volts
- Run Time
- Oil Temperature*
- Coolant Pressure*
- Inlet Temperature*
- Exhaust Temperature*
- Fuel Temperature*
- Turbo Pressure
- Fuel Pressure*
- Fuel Consumption*
- Fuel Used*
- Fuel Level*
- Auxiliary Sensors (If fitted and configured)
- Engine Maintenance Due (If configured)
- Engine ECU Link*

*When connected to suitably configured and compatible engine ECU. For details of supported engines see 'Electronic Engines and DSE wiring' (DSE Part number 057-004).

Depending upon configuration and instrument function, some of the instrumentation items may include a tick ✓ icon beside them. This denotes a further function is available, detailed in the 'operation' section of this document.

Example:

The tick ✓ icon denotes that manual fuel pump control is enabled in this system.
Press and hold to start the fuel transfer pump, release to stop the pump. This is further detailed in the section entitled 'operation' elsewhere in this document.

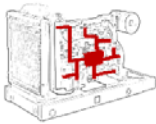


DSE Manual 7 page 60. DSE Manual 9 discloses

CAN Port	<div>max distance 1.2km (74 miles)</div> <div>Engine CAN Port</div> <div>Standard implementation of 'Slow mode', up to 250K bits/s</div> <div>Non-Isolated.</div> <div>Internal Termination provided (120Ω)</div> <div>Max distance 40m (133 feet)</div>
----------	--

3.11 COMMUNICATION PORT USAGE

3.11.1 CAN INTERFACE



Modules are fitted with the CAN interface as standard and are capable of receiving engine data from engine CAN controllers compliant with the CAN standard. CAN enabled engine controllers monitor the engine's operating parameters such as engine speed, oil pressure, engine temperature (among others) in order to closely monitor and control the engine. The industry standard communications interface (CAN) transports data gathered by the engine controller interface. This allows generator controllers such as the DSE7000 series to access these engine parameters with no physical connection to the sensor device.

NOTE: - For further details for connections to CAN enabled engines and the functions available with each engine type, refer to the manual *Electronic Engines and DSE Wiring*. Part No. 057-004

DSE Manual 9 page 14, and DSE Manual 9 discloses

5.4.2 ENGINE

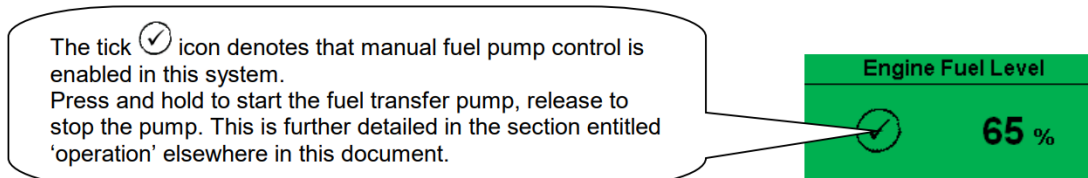
Contains instrumentation gathered about the engine itself, some of which may be obtained using the CAN or other electronic engine link.

- Engine Speed
- Oil Pressure
- Coolant Temperature
- Engine Battery Volts
- Run Time
- Oil Temperature*
- Coolant Pressure*
- Inlet Temperature*
- Exhaust Temperature*
- Fuel Temperature*
- Turbo Pressure
- Fuel Pressure*
- Fuel Consumption*
- Fuel Used*
- Fuel Level*
- Auxiliary Sensors (If fitted and configured)
- Engine Maintenance Due (If configured)
- Engine ECU Link*

*When connected to suitably configured and compatible engine ECU. For details of supported engines see 'Electronic Engines and DSE wiring' (DSE Part number 057-004).

Depending upon configuration and instrument function, some of the instrumentation items may include a tick  icon beside them. This denotes a further function is available, detailed in the 'operation' section of this document.

Example:



DSE Manual 9 page 62. The SAE J1939 is a well-known communication protocol that is utilized with CAN standard systems. (**EX1016.**) It would be obvious to a POSITA to utilize a standardized protocol for CAN communications to make the system readily interactive for diagnostics and for example, when trailer mounted. This element just adds the requirement of the controller and engine control module use J1939 which has been widely known since 2002. It would be obvious to use

this standardized protocol to enable ease of communication for diagnostics or combination to a trailer or vehicle. Furthermore, it is my opinion that a POSITA would have understood that Van Niekerk and Van Niekerk 2, in combination with and DSE Manual 7, and/or DSE Manual 9 disclose “the generator controller and engine control module are configured to communicate via SAE J1939 protocol.”, since, as I have discussed above, SAE J1939 is a well-known standard protocol for use in CAN communications, and the choice of using the SAE J1939 standard for CAN communications is nothing more than a matter of design choice to a POSITA, and is also the use of known techniques to a known device to yield predictable results, and a matter of simple substitution of one known element for another to obtain predictable results to, for example, be compatible for established and well-known industry standard communications and diagnostic interface. A POSITA would understand that the use of the well-known SAE J1939 standard is nothing more than combining prior art elements according to known methods to yield predictable results.

Furthermore, the use of the SAE J1939 standard for CAN communications in the systems of Van Niekerk and Van Niekerk 2, in combination with and DSE Manual 7, and/or DSE Manual 9, in further combination with Eaton (**EX1007**) discloses Claim 34. For example, Eaton states “The genset controller 100 controls and monitors the ECM 160 through CAN interface 103 which connects to the CAN

serial link 170. CAN serial link 170, employs the SAE J1939 protocol which is an industry standard protocol for serial communications. By way of CAN databus 170, genset controller 100 receives the information about the operation of engine 152 that has been collected by ECM 160, and provides commands to the ECM 160 to influence the operation of the engine.” (See **EX1007** Col. 5:38-55) It would be obvious to POSITA to combine Van Niekerk and Van Niekerk 2 and/or the DSE Manuals with Eaton since a POSITA would have readily understood to have used the well-known CAN J1939 protocol as explicitly disclosed and taught for the genset controller and ECM of Eaton for those as shown and disclosed in Van Niekerk and Van Niekerk 2, and/or the DSE Manuals, since Eaton, Van Niekerk, and Van Niekerk 2 and the DSE Manuals all disclose similar structures, components, and subject matter (e.g. genset controllers, alternators, engines, and control of genset systems), and also all disclose ramping up, shutting down, or limiting system parameters using control modules based on system parameters and inputs. As evidenced by the Eaton, the CAN J1939 protocol was well-known to a POSITA and a POSITA would have known that CAN J1939 was commonly used in both engine and engine controller applications, as well as for industrial equipment applications. As disclosed, for example in Eaton, a POSITA would have readily employed the CAN J1939 protocol as a substitution of a well-known and readily available technique for another, and would have had at the very least a

reasonable expectation of success in doing so, and this substitution would have just been a matter of design choice to a POSITA, with the predictable outcome of providing a standard data communication technique to provide ready and interchangeable communication and diagnostic interface to industry and commercial standards. A POSITA would have readily understood that the use of the CAN J1939 protocol provides the opportunity to use commercial off-the-shelf components that were readily available, standardized, and relatively in-expensive, and thus would have been motivated to make such a design choice with a reasonable expectation of success in doing so. Using the CAN J1939 protocol which was well known and obvious to a POSITA (as shown in Eaton) and combining with Van Niekerk and Van Niekerk 2 and/or the DSE Manuals is just combining prior art elements according to known methods to yield predictable results (availability of ready off-the-shelf commercially available components), and a simple substitution of one known element (CAN J1939 – commonly employed for engine controllers and also diesel engine controllers) for another to obtain predictable results (standardized communication and diagnostic interfaces), and also use of a known technique to improve similar devices (gensets and genset controllers, and the related communication busses) in the same way (standardized commercial off-the-shelf components) to provide multiplexed CAN J1939 signals

employing less wiring through using a multiplexed data and communication system.

e. Claim 34

177. Claim 34 depends from claim 19. Claim 34 adds the requirement of:

“the generator controller is configured to operate said load step contactor to disconnect said load step resistor within 10 seconds.”

The specification assigns no significance to this time, with claims 33, 34 and 35 representing a conventional logarithmic progression. The DSE Manuals disclose that a selectively adjustable delay timer is used to disconnect the load step resistors and also for a disconnect of load, including all load. (*EX1008*, p. 73, 74; *EX1032* p. 75-76.) For example DSE Manual 7 discloses:

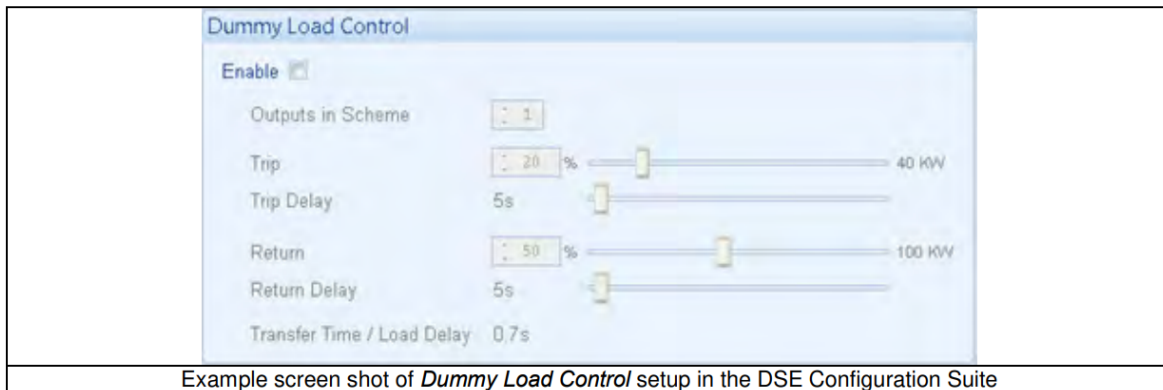
6.2.1 DUMMY LOAD CONTROL

The *dummy load control* feature (if enabled) allows for a maximum of five dummy load steps. When the set is first started, all configured *Dummy Load Control* outputs are de-energised. Once the generator is placed onto load, the generator loading is monitored by the *Dummy Load Control* scheme.

If the generator loading falls below the *Dummy Load Control Trip* setting (kW), the *Dummy Load Control Trip Delay* is displayed on the module display. If the generator loading remains at this low level for the duration of the timer, the first *Dummy Load Control* output is energised. This is used to energise external circuits to switch in (for instance) a static load bank.

The generator loading has now been increased by the first dummy load. Again the generator loading is monitored. This continues until all configured *Dummy Load Control* outputs are energised.

Should the generator loading rise above the *Dummy Load Return* level, the *Dummy Load Return Delay* begins. If the loading remains at these levels after the completion of the timer, the 'highest' active *Dummy Load Control* output is de-energised. This continues until all *Dummy Load Control* outputs have been de-energised.



Example screen shot of *Dummy Load Control* setup in the DSE Configuration Suite

6.2.2 LOAD SHEDDING CONTROL

The *Load Shedding Control* feature (if enabled) allows for a maximum of five load shedding steps.

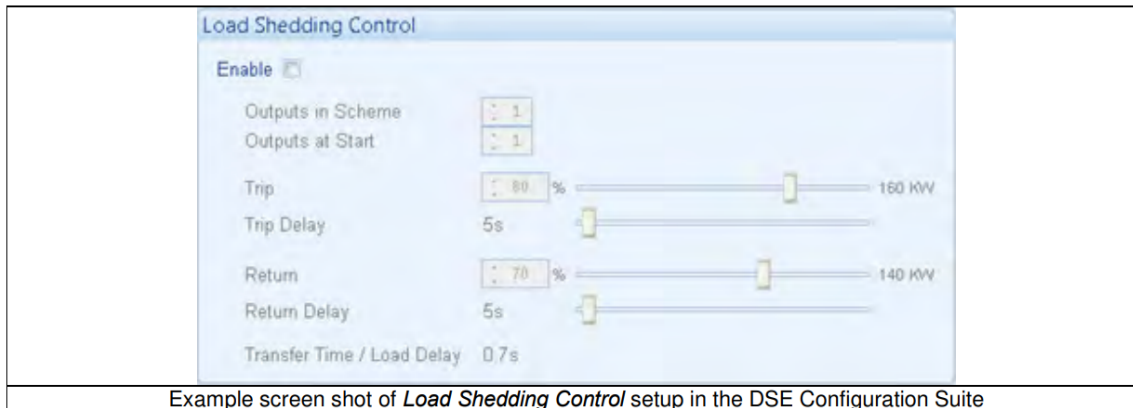
When the generator is about to take load, the configured number of *Load Shedding Control Outputs at Startup* will energise. This configurable setting allows (for instance) certain loads to be removed from the generator prior to the set's load switch being closed. This can be used to ensure the initial loading of the set is kept to a minimum, below the *Load Acceptance* specification of the generating set.

The generator is then placed on load. The *Load Shedding Control* scheme begins.

When the load reaches the *Load Shedding Trip* level the *Trip Delay* timer will start. If the generator loading is still high when the timer expires, the first *Load shedding Control* output will energise. When the load has been above the trip level for the duration of the timer the 'next' *Load shedding Control* output will energise and so on until all *Load Shedding Control outputs are energised*.

If at any time the load falls back below the *Load Shedding Return* level, the *Return Time* will start. If the load remains below the return level when the timer has expired the 'highest' *Load Shedding Control* output that has been energised will be de-energised. This process will continue until all outputs have been de-energised.

When the set enters a stopping sequence for any reason the *Load Shedding control* outputs will de-energise at the same time as the generator load switch is signalled to open.



Example screen shot of *Load Shedding Control* setup in the DSE Configuration Suite

(EX1008 74-75)DSE Manual 9 discloses:

6.2 DUMMY LOAD / LOAD SHEDDING CONTROL

NOTE:- Dummy Load / Load Shedding Control is only available on DSE7300 series controllers V4 or above. This feature is not available on DSE7200 series.

This feature may be enabled by the system designer to ensure the loading on the generator is kept to a nominal amount. If the load is low, 'dummy loads' (typically static load banks) can be introduced to ensure the engine is not too lightly loaded. Conversely as the load increases towards the maximum rating of the set, non-essential loads can be shed to prevent overload of the generator.

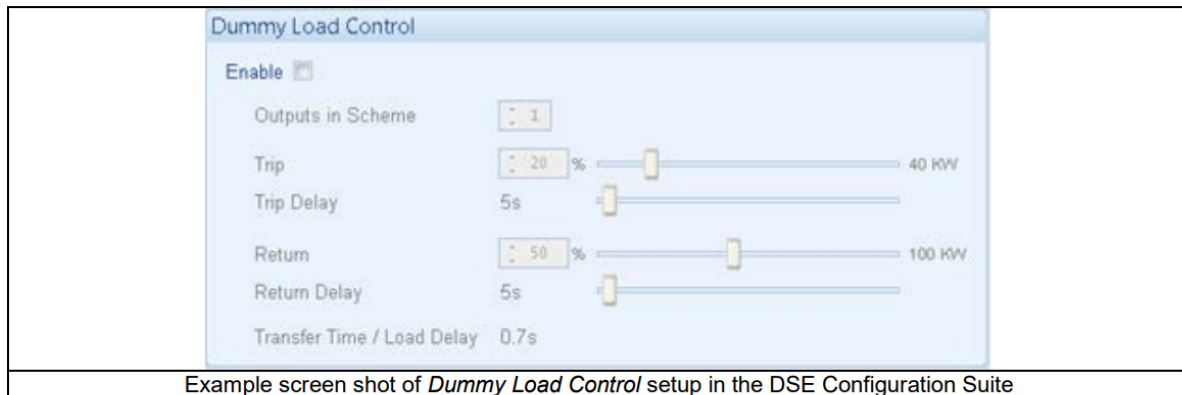
6.2.1 DUMMY LOAD CONTROL

The *dummy load control* feature (if enabled) allows for a maximum of five dummy load steps. When the set is first started, all configured *Dummy Load Control* outputs are de-energised. Once the generator is placed onto load, the generator loading is monitored by the *Dummy Load Control* scheme.

If the generator loading falls below the *Dummy Load Control Trip* setting (kW), the *Dummy Load Control Trip Delay* is displayed on the module display. If the generator loading remains at this low level for the duration of the timer, the first *Dummy Load Control* output is energised. This is used to energise external circuits to switch in (for instance) a static load bank.

The generator loading has now been increased by the first dummy load. Again the generator loading is monitored. This continues until all configured *Dummy Load Control* outputs are energised.

Should the generator loading rise above the *Dummy Load Return* level, the *Dummy Load Return Delay* begins. If the loading remains at these levels after the completion of the timer, the 'highest' active *Dummy Load Control* output is de-energised. This continues until all *Dummy Load Control* outputs have been de-energised.



Example screen shot of *Dummy Load Control* setup in the DSE Configuration Suite

6.2.2 LOAD SHEDDING CONTROL

The *Load Shedding Control* feature (if enabled) allows for a maximum of five load shedding steps.

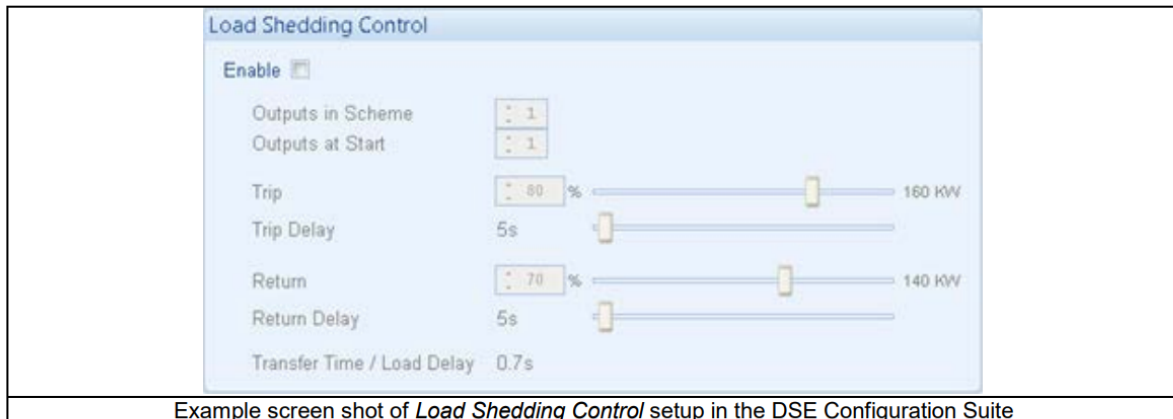
When the generator is about to take load, the configured number of *Load Shedding Control Outputs at Startup* will energise. This configurable setting allows (for instance) certain loads to be removed from the generator prior to the set's load switch being closed. This can be used to ensure the initial loading of the set is kept to a minimum, below the *Load Acceptance* specification of the generating set.

The generator is then placed on load. The *Load Shedding Control* scheme begins.

When the load reaches the *Load Shedding Trip* level the *Trip Delay* timer will start. If the generator loading is still high when the timer expires, the first *Load shedding Control* output will energise. When the load has been above the trip level for the duration of the timer the 'next' *Load shedding Control* output will energise and so on until all *Load Shedding Control outputs are energised*.

If at any time the load falls back below the *Load Shedding Return* level, the *Return Time* will start. If the load remains below the return level when the timer has expired the 'highest' *Load Shedding Control* output that has been energised will be de-energised. This process will continue until all outputs have been de-energised.

When the set enters a stopping sequence for any reason the *Load Shedding control* outputs will de-energise at the same time as the generator load switch is signalled to open.



Example screen shot of *Load Shedding Control* setup in the DSE Configuration Suite

(EX1032 75-76) One example delay shown is 5 seconds. Another delay timer disclosed in DSE Manual shows a conventional logarithmic progression of settings of 0.1, 1, 10 seconds and greater. (EX1008, p. 95-96; EX1032 p. 97-101.) For example, DSE Manual 7 shows:

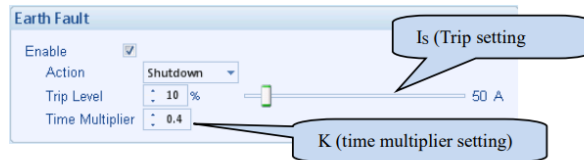
If the *Earth Fault alarm* is enabled, the DSE7300 Series controller begins following the IDMT 'curve'. If the *Trip* is surpassed for an excess amount of time the Alarm triggers (*Shutdown* or *Electric trip* as selected in *Action*).

The higher the Earth Fault, the faster the trip. The speed of the trip is dependent upon the fixed formula :

$$T = K \times 0.14 / ((I / I_s)^{0.02} - 1)$$

Where: T is the tripping time in seconds (accurate to +/- 5% or +/- 50ms (whichever is the greater)
K is the time multiplier setting
I is the actual earth current measured

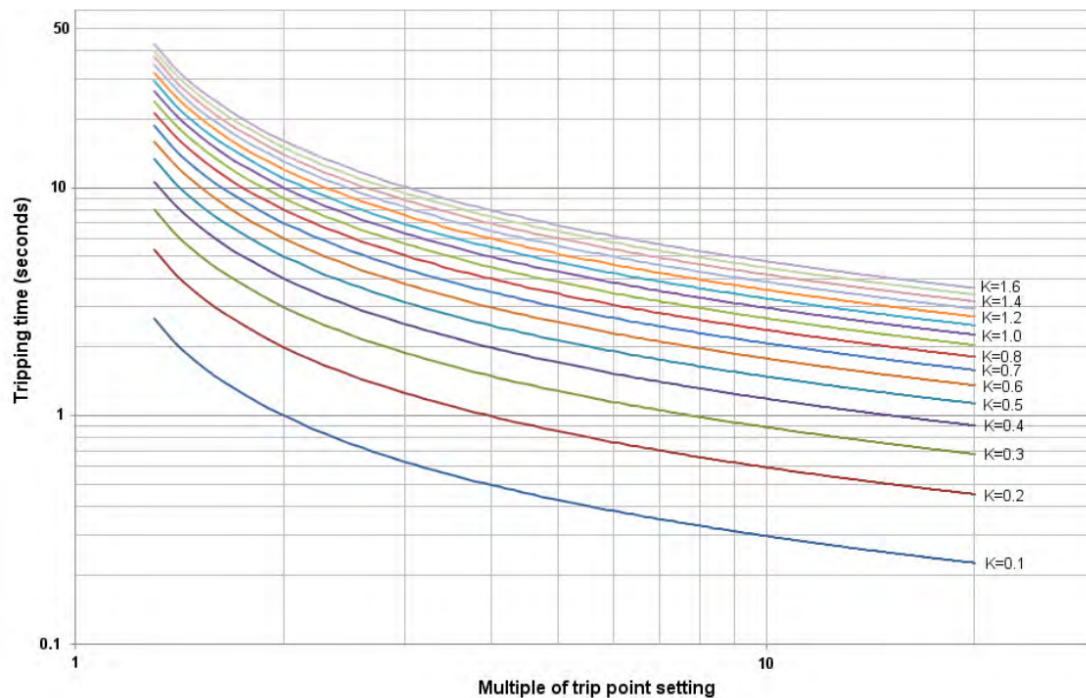
I_s is the trip setting value



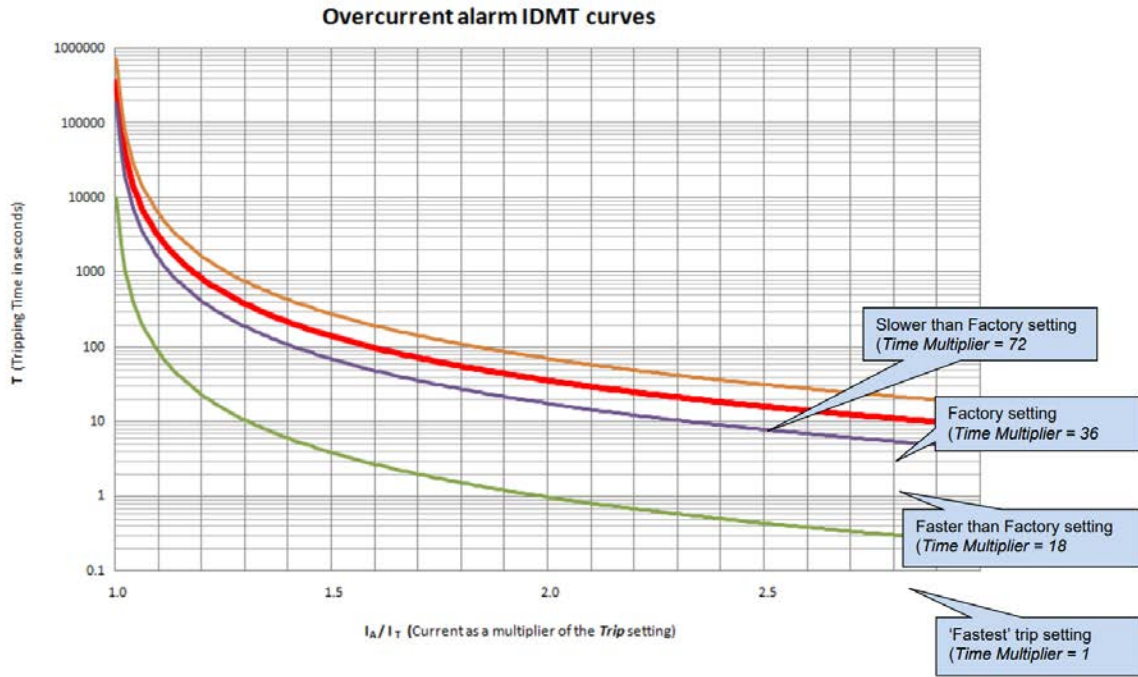
The settings shown in the example above are a screen capture of the DSE factory settings, taken from the DSE Configuration Suite software.

8.8.1 EARTH FAULT TRIPPING CURVES

NOTE: DSE Factory setting is time multiplier (K) = 0.4



(EX1008 page 95) DSE Manual 9 shows:



(EX1032 page 99),

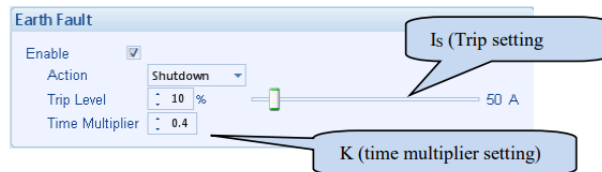
8.9 SHORT CIRCUIT ALARM

If the *Short Circuit alarm* is enabled, the controller begins following the IDMT 'curve'. If the *Trip* is surpassed for an excess amount of time the Alarm triggers (*Shutdown* or *Electrical trip* as selected in *Action*).

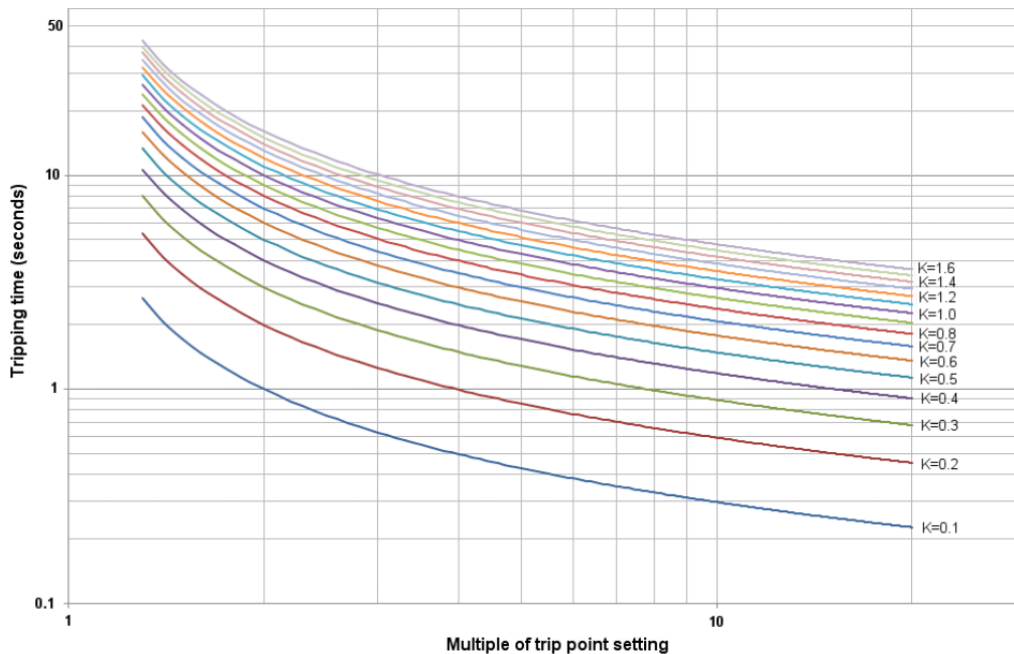
The higher the Short Circuit, the faster the trip. The speed of the trip is dependent upon the fixed formula :

$$T = K \times 0.14 / ((I / I_s)^{0.02} - 1)$$

Where: T is the tripping time in seconds (accurate to +/- 5% or +/- 50ms (whichever is the greater))
 K is the time multiplier setting
 I is the actual current measured
 Is is the trip setting value



The settings shown in the example above are a screen capture of the DSE factory settings, taken from the DSE Configuration Suite software.



8.10 MAINTENANCE ALARM

Depending upon module configuration one or more levels of maintenance alarm may occur based upon a configurable schedule.

There are three maintenance alarms in the DSE7200/DSE7300 series V3 and above, and one level of maintenance alarm in prior versions.

Example 1

Screen capture from DSE Configuration Suite Software showing the configuration of Maintenance Alarm 1 and Maintenance Alarm 2.

When activated, the maintenance alarm can be either a **warning** (set continues to run) or **shutdown** (running the set is not possible). Resetting the maintenance alarm is normally actioned by the site service engineer after performing the required maintenance.

The method of reset is either by:

- Activating a input that has been configured to maintenance x reset, where x is the number of the maintenance alarm (1 to 3).
- Pressing the maintenance reset button in the DSE Configuration Suite, Maintenance section.
- Pressing and holding the stop button when the module's display is on the maintenance alarm section. (V9.x.x and above)

Maintenance Alarm

Maintenance alarm 1

Enable ☒

Description Maintenance alarm 1

Action Warning

Engine run hours 10 hrs

Enable alarm on due date ☐

Maintenance interval 1 months

Maintenance alarm 2

Enable ☒

Description Maintenance alarm 2

Action Warning

Engine run hours 250 hrs

Enable alarm on due date ☐

Maintenance interval 1 months

Example 2

Screen capture from DSE Configuration Suite Software showing the configuration of a digital input for Reset Maintenance Alarm 1.

Digital Input A

Function Reset maintenance alarm 1

Polarity Close to Activate

Action

Arming

LCD Display

Activation Delay 0s

Example 3

Screen capture from DSE Configuration Suite Software showing the Maintenance Alarm Reset 'button' in the DSE Configuration Suite SCADA | MAINTENANCE section.

Maintenance Alarm

Running Time Until Next Maintenance
18 hrs

Date Of Next Maintenance
13 Jan 2009

Reset

Press reset to schedule next maintenance,
based upon module's maintenance configuration.

Example 4

Screen capture from DSE Configuration Suite Software showing the configuration holding stop button to reset the maintenance alarm.

Miscellaneous Options

Enable fast loading feature ☐

Audible alarm prior to starting ☐

All warnings are latched ☐

Enable sleep mode ☐

Enable manual fuel pump control ☐

Enable manual frequency trim control ☐

Support right-to-left languages in module strings ☐

Enable Alternative Breaker Button Control ☐

Enable cool down in stop mode ☐

Enable maintenance reset on module front panel ☒

(EX1032 pages 101-102). A POSITA would have understood, as shown above, as disclosed in DSE Manual 7 and DSE Manual 9, that the delay timer can be adjusted (e.g. by setting the k value to adjust the time delay) and that it would have been obvious to include a conventional logarithmic progression of settings of 0.1, 1, 10 seconds and greater to Van Niekerk and Van Niekerk 2. A POSITA would have understood that it would have been obvious to include a load bank disconnect with a delay to address common fluctuations, adjustable to one time in a conventional progression in view of their commonplace use in controllers. For example, as discussed above, a POSITA would have motivation to combine the DSE Manuals with Van Niekerk and Van Niekerk 2. For example, similar to Van Niekerk and Van Niekerk 2, the DSE Manuals relate to electric power generators and the control and control systems for electric power generators. Van Niekerk and Van Niekerk 2 and the DSE Manuals are all in the same field, namely power generators and the related controllers and control systems, and a POSITA would naturally look to the DSE Manuals for instructions on how to set the specifications for the electric power generators and control systems as shown in Van Niekerk and Van Niekerk 2. The DSE Manuals and Van Niekerk, and Van Niekerk 2 all have similar structures and components (e.g. loads, engines, alternators/generators, time delays) and also address common problems, for example including electric power systems. This also includes in the case of extended periods of time of operation

along with the monitoring of operating conditions and the automatic adjustment of control parameters and time delays that can be set for initiation of state and system changes based on system parameters and times of operations. This also includes adjustment of system loads during operation. Thus a POSITA would have understood that all these references are in the same fields of endeavor and would have readily looked to all of these references for known techniques to improve similar devices in the same well-known ways. It would have been obvious to a POSITA to combine the time delays as shown in the DSE Manuals with Van Niekerk and Van Niekerk 2 to explicitly and specifically set “the generator controller [that] is configured to operate said load step contactor to disconnect said load step resistor within 10 seconds” for example to as stated in the DSE Manuals to prevent the alternator windings from overheating, and to also have the amount of time that that can be adjustably set to allow for transient electrical fluctuations based on the system parameters. It would have been obvious for a POSITA to combine the DSE Manuals with Van Niekerk and Van Niekerk 2 to not disengage and disconnect the load step resistors (load bank) for small duration erratic electrical fluctuations which may readily occur during normal operation. A POSITA would have understood, that by combining the delay timer as disclosed in the controllers of the DSE Manuals with the controller that controls the load banks in Van Niekerk and Van Niekerk 2, that this would have yielded the predictable

and desirable result of not disengaging the load bank resistors for transient short-duration electrical fluctuations that would readily disappear once the system returns to steady state operation. The choice of a 10 second duration is simply a matter of design choice to a POSITA, and nothing more than combining prior art elements according to known methods to yield predictable results (e.g. preventing load bank disengagement for minor transient short duration transient fluctuations) and also a simple substitution of one known element for another to obtain predictable results (e.g. not disengaging the load bank resistors so that normal burning and cleaning of soot particles can continue to occur). Since the DSE Manuals disclose that the delay time is adjustable, a POSITA would have readily understood that this delay time is just a simple matter of design choice to a POSITA based on the particular system application, and a POSITA would have a reasonable expectation of success in choosing the delay time based on the observations of the particular system during normal operation, and the 10 second time explicitly stated in this claim is just one of numerous predictable solutions that would be obvious to try.

g. Claims 35

178. Claim 35 depends from claim 19. Claim 35 adds the requirement of:

“the generator controller is configured to operate said load step contactor to disconnect said load step resistor within 1 seconds.”

The specification assigns no significance to this time, with claims 33, 34 and 35 representing a conventional logarithmic progression. As discussed above, the DSE Manuals disclose a selectively adjustable delay timer. As discussed above, a POSITA would have readily looked to the DSE Manuals as an example of using the adjustable delay timer to disconnect the load step resistors and also for a disconnect of load, including all load. (**EX1008** p. 73, 74; **EX1032** p. 75-76.) One example delay shown is 5 seconds. Other examples show delay time curves over ranges of milliseconds to several seconds (with the delay times shown to have tripping time in seconds (accurate to +/- 5% or +/- 50ms (whichever is the greater) (see for example **EX1032** page 101)) and numerous other delay time curves are disclosed in the DSE Manuals (see example and discussion of delay time curves shown above). A POSITA would have understood that these delay times can be adjustable and set as a conventional logarithmic progression of settings of 0.1, 1, 10 seconds and greater. (**EX1008**, p. 95; **EX1032** p. 97-101.) It would be obvious to a POSITA to include a load bank disconnect with a delay to address common fluctuations, adjustable to one time in a conventional progression in view of their commonplace use in controllers. As stated for claim 34 above, the setting of the delay time to 1 second instead of 10 seconds, is just a matter of design choice to a POSITA and would have been obvious to try and a POSITA would have had a reasonable expectation of success in combining a delay timer (examples of which

are shown in the DSE Manuals) with Van Niekerk and Van Niekerk 2. The rationale given for motivation to combine as stated for claim 34 also applies to claim 35.

h Claims 36

179. Claim 36 depends from claim 19. Claim 36 adds the requirement of:

“the generator controller is configured to operate said load step contactor to disconnect said load step resistor within 0.1 seconds.”

The specification assigns no significance to this time, with claims 33, 34 and 35 representing a conventional logarithmic progression. As discussed above, a POSITA would have understood that the DSE Manuals disclose that a selectively adjustable delay timer is used to disconnect the load step resistors and also for a disconnect of load, including all load. (**EX1008**, p. 73, 74; **EX1032** p. 75-76.) One example delay shown is 5 seconds. Another delay timer disclosed in the DSE Manuals show a conventional logarithmic progression of settings, which a POSITA would have understood as obvious to include time periods of 0.1, 1, 10 seconds and greater. (**EX1008**, p. 95; **EX1032** p. 97-101.) It would be obvious to include a load bank disconnect with a delay to address common fluctuations, adjustable to one time in a conventional progression in view of their commonplace use in controllers. Other numerous examples show delay time curves - as shown in the DSE Manuals to have adjustment ranges of milliseconds to several seconds -

with the delay times shown to have tripping time in seconds (accurate to +/- 5% or +/- 50ms (whichever is the greater) (see for example **EX1032** page 101))- note that numerous other delay time curves are disclosed in the DSE Manuals (see example and discussion of delay time curves shown above). A POSITA would have understood that these delay times can be adjustable and set as a conventional logarithmic progression of settings of 0.1, 1, 10 seconds and greater. (EX1008, p. 95; EX1032 p. 97-101.) It would be obvious to include a load bank disconnect with a delay to address common fluctuations, adjustable to one time in a conventional progression in view of their commonplace use in controllers. As stated for claim 34 above, the setting of the delay time to 0.1 second instead of 10 seconds, is just a matter of design choice to a POSITA and would have been obvious to try and a POSITA would have had a reasonable expectation of success in combining a delay timer (examples of which are shown in the DSE Manuals) with Van Niekerk and Van Niekerk 2. The rationale given for motivation to combine as stated for claim 34 also applies to claim 36.

H. Ground 3: Claims 1, 4, 8 Are Obvious Over the combination of Van Niekerk and Aoki

1. Independent Claim 1

180. For those elements of claim 1 that are substantially to the same as an element of claim 19, the analysis detailed above with regard to claim 19 is

incorporated, with the understanding that the corresponding analysis equally applies.

a. [1.0 Preamble] *An engine-generator and load bank system comprising*

181. To the extent the preamble is a limitation, Van Niekerk discloses this limitation as discussed in Section F.1.a.

b. [1.1] *an engine mechanically connected to and capable of driving an alternator*

182. Van Niekerk discloses this limitation as discussed in Section F.1.b.

c. [1.2] *said engine having an engine control module and a particulate filter*

183. Van Niekerk discloses this limitation as discussed in Section F.1.c.

d. [1.3] *said alternator in electrical communication with an output bus and a load bank bus*

184. Van Niekerk discloses this limitation as discussed in Section F.1.d.

e. [1.4] *at least one load monitoring device in electrical communication with said output and load bank buses*

185. Van Niekerk discloses a current transformer 38 that operates as a load monitoring device which communicates with power sensor 36 that is in electrical communication through controller 30 to the output to power switch 28 (Fig. 1) and to the genset controller and its output to a facility (¶ [0027]). This limitation is disclosed or obvious.

f. [1.5] a generator controller comprising a load dump output and a load enable output

186. Van Niekerk discloses control 12 with controller 30 which provides signals to control the power switch 28, and selectively provides output signals to control the engagement of load bank 20, which operates as a load enable output signal. (¶¶ [0012], [0016]-[0017].) Control 12 with controller 30 also selectively provides output signals to cut off load in an “overload-based load shed mode,” which operates as a load dump output signal. (¶ [0028].) As discussed above, the DSE Manual 7 and DSE Manual 9 also disclose that it was known to have multiple signals (e.g. High Current, Earth Fault, Short Circuit, Maintenance, shut down electrical trip, and which can be run in stop mode, manual mode, auto mode) which can be triggered with adjustable time delays, that include one signal from the DSE controller to increase/decrease load and another signal for load shedding/dump above a preselected level (*EX1008* p. 73-74, 92-98; *EX1032* p. 75-76, 96-112.)

187. Aoki discloses, in the Background section, what is already well-known to a POSITA, that with communications between two controllers, reliability of a cut-off signal is improved if the cut-off and other control signals are communicated through separate connections. (*EX1009* ¶¶ [0002]-[0006]). For example, Aoki discloses: “From the fail-safe point of view in which, when an emergency-stop signal is generated or when an interruption of a signal occurs at any position within communication circuits, it is determined that an emergency

stop is instructed, a dedicated emergency-stop-signal transmitting and receiving cable independent from the communication cable 3 for the control data has been provided as an emergency-stop signal line. Reference numeral 1 denotes an emergency-stop switch utilized upon an emergency stop; the in-bound emergency-stop signal is received by the NC apparatus through a receiver 8 mounted in the NC apparatus, and is outputted by a driver 9 to the drive control apparatus by way of the emergency-stop-signal transmitting and receiving cable 4. Similarly, each drive control apparatus receives through a receiver 6 the emergency-stop signal and outputs through a driver 7 emergency-stop data to the following drive control apparatus. With regard to an emergency-stop signal, its reliability is most important and so it is required to prevent a malfunction. Therefore, in order to suppress effects of noise and the like, that cause the malfunction, in the emergency-stop-signal transmitting and receiving cables 4 between the NC apparatus and the drive control apparatus and between the drive control apparatuses, signals are utilized on a voltage level far higher than that of a control signal utilized within the drive control apparatus. In addition, in some cases, signals are transmitted and received as differential signals also in order to prevent the malfunction. Accordingly, due to the difference in the voltage level and the data format, the motor controlling unit is not able to deal with the emergency-stop signal; therefore, data that is inputted and outputted through the receiver 6, the

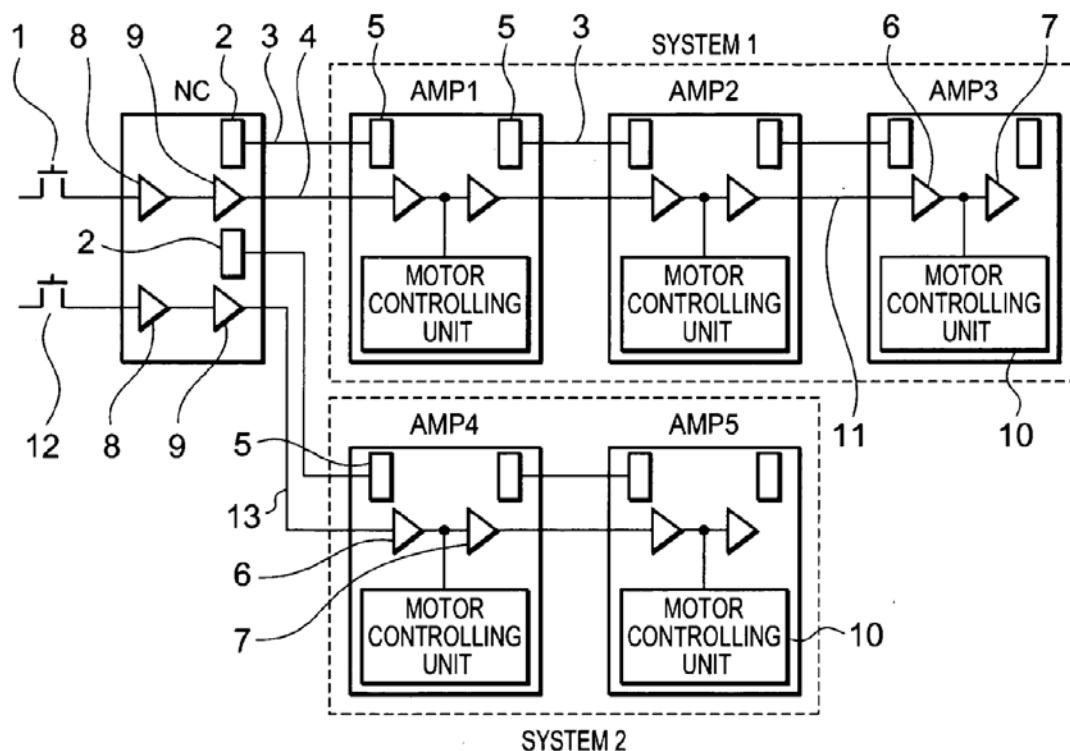
driver 7, the receiver 8, and the driver 9 is converted with regard to an electric level, and the differential signals are converted. The drive control apparatus that has received through these receivers the emergency-stop signal from the NC apparatus processes in the motor controlling unit 10 the emergency-stop signal, immediately halts the motor, and cuts off driving power for the motor. In addition, in the case where, as belt conveyer lines arranged in parallel to one another, each of systems controlled by the NC apparatus does not physically interfere with one another, and, even though one system is to be halted, other systems need to be operated, it is impossible to output the emergency-stop line from a single driver. Therefore, in the case where a plurality of systems are divided as illustrated in FIG. 11, in a conventional system in which an emergency stop line should be provided separately from a communication system line, a dedicated emergency-stop-signal transmitting and receiving cable 13 including an emergency stop button 12, for a system 2, should be provided, in addition to the emergency stop button 1 and the emergency-stop-signal transmitting and receiving cable 3, for a system 1. With regard to the emergency stop line, reliability is most important from the fail-safe point of view; therefore, it has been indispensable to provide a dedicated line independent from a data communication line (the communication cable 3) for controlling systems. Accordingly, there has been a problem in that, in carrying out connection between the NC apparatus and the drive control apparatus and between

drive control apparatuses for respective axles, wiring for the data communication cable 3 and the emergency-stop-signal transmitting and receiving cables 4 and 13 has been complex. Moreover, in the case where a plurality of systems are controlled by the same NC apparatus, the number of connectors provided for connecting emergency stop lines needs to be increased with increase of the number of systems; therefore, problems, such as raised complexity of a system configuration through hardware and increase in costs, have occurred.” (EX1009 ¶¶ [0003]-[0006])

188. It would be obvious to a POSITA in view of Aoki to use two separate connectors in Van Niekerk and Van Niekerk 2 between controller 30 and controller/power switch 28 for the load dump/shed signal and the load enable/control signal with the predictable result of increase in system reliability. Aoki, Van Niekerk, and Van Niekerk 2 are all in the same field of endeavor, controllers for use in industrial environments. For example, Aoki discloses: “The present invention relates to a technology for, in a control system utilizing serial communication that controls a motor and the like for driving a machine tool or an industrial robot, communicating emergency-stop information so that a motor or the like is immediately stopped in an emergency and power is cut off.” (EX1009 ¶ [0001]). Thus a POSITA would have readily understood, that similar to Van Niekerk and Van Niekerk 2, Aoki discloses disengagement, shutting off and

shutdown for safe operation. A POSITA would have been motivated to look to Aoki, since Aoki has similar components as Van Niekerk and Van Niekerk 2, namely controllers for controlling industrial equipment (e.g. Aoki's control system referred to as a numerical control system (NC apparatus, hereinafter) (*EX1009 ¶ [0002]*), with inputs from various system parameters that are monitored during continuous operation, and also outputs to adjust these parameters based on these inputs. For example, Aoki Fig. 11 which is identified as illustrating well-known conventional technology, is show below

Fig. 11



and Aoki discloses: “Reference numeral 2 denotes input/output connectors for transmitting and receiving instructions from the NC apparatus, for controlling a position, a speed, and the like, and data from the drive control apparatuses”

(**EX1009** ¶ [0002]) Also similar to the Van Niekerk and Van Niekerk 2 load banks that are made up of separate load resistors that can be engaged/disengaged, Aoki discloses a set of separate units (e.g. AMP units) and systems that must be controlled, communicated with, and engaged/disengaged separately for safety and reliability concerns. Thus a POSITA would have naturally looked to Aoki based on design incentives to modify Van Niekerk and Van Niekerk 2 as a predictable variation to one of ordinary skill in the art to modify Van Niekerk and Van Niekerk 2 to increase safety and reliability of the overall system to provide a generator controller comprising a separate load dump output and a load enable output. The choice of providing a generator controller comprising a separate load dump output and a load enable output is simply a matter of design choice to a POSITA, and nothing more than combining prior art elements according to known methods to yield predictable results (e.g. increasing system safety and reliability) and also a simple substitution of one known element for another to obtain predictable results (e.g. to provide a generator controller comprising a separate load dump output and a load enable output to not physically interfere with one another, so that in the case where even though one system is to be halted, other systems still need to be

operated, with an emergency stop line provided separately from the communication system. (see Aoki **EX1009** ¶ [0004]) Since Aoki discloses that the use of separate connectors and input/output lines are well-known to a POSITA, a POSITA would have readily understood that this incorporation of providing generator controller comprising a separate load dump output and a load enable output is just a simple matter of design choice to a POSITA, and a POSITA would have a reasonable expectation of success in doing so. A POSITA would have been motivated to do so to increase system safety and reliability and a POSITA would have understood that this is just one of numerous predictable solutions that would be obvious to try.

g. [1.6] *said generator controller in electrical communication with said engine control module*

189. Van Niekerk discloses this limitation as discussed in Section F.1.e.

Please see previous discussion regarding this element.

h. [1.7] *a load bank controller comprising a load enable input, a load dump input, a load sensor, and at least one load step output*

190. Van Niekerk discloses a power sensor 36 coupled to a current transformer 38. The power sensor 36 outputs signals to controller 30 representative of the total load on genset 8 and thus discloses a load bank controller comprising a load sensor. (EX1004, FIG. 1, ¶[0012].) Van Niekerk discloses that control system 12 includes a user interface 42 that is coupled to the controller 30 and is

used to operate the aftertreatment system 10, and that power to the load bank 20 is applied through “a power transfer switch 28 in response to a command signal from the control system 12 to provide the load bank and exhaust heating functions.” (¶¶[0010], [0011].) Van Niekerk discloses that “[c]ontrol system 12 periodically switches aftertreatment system 10 between the run mode 100 and operation in a regen mode 110. During the regen mode 110 the control system 10 [sic] causes the aftertreatment system 10 to operated [sic] in a manner that will regenerate the filter 24.” (¶[0017].) Van Niekerk thus discloses the load bank controller comprises a load enable input and a load dump input. Van Niekerk further discloses that a command signal from the controller 30 is representative of the amount of power from the genset 16 to be coupled to the load bank 20, such that Van Niekerk likewise discloses a load bank controller having at least one load step output, where Van Niekerk discloses power switch 28 that controls load bank 20 , and thus receives inputs as a load enable input signal, load enable output signals from controller 30 to control the engagement of load bank 20, and also receives or inputs overload based load shed mode output signals as a load dump input signal. (¶¶[0012], [0016]-[0017], [0028].) As discussed at Section H.f., it would be obvious in view of Aoki that the Van Niekerk and Van Niekerk 2 load bank control signal and the overload-based load shed signal would be input at two connectors of the Van Niekerk controller/power switch 28, of the Van Niekerk controller/power

switch 28, and a POSITA would be motivated to do this to increase overall system safety and reliability (as stated in Aoki), and this element is obvious to a POSITA. (EX1009 ¶¶ [0002]-[0006].) A POSITA would have understood that this is nothing more than the application of a known technique (feed-back closed loop control) to a known device (generator controller) for improvement to yield predictable results.

191. Van Niekerk also discloses that power sensor 36 determines the system load and control system 12 utilizes this information in communications to power switch 28. Power switch 28 provides a load enable signal to load bank 20 via an output connection, which may provide signals to control steps of load. (EX1005 Fig. 1; ¶¶ [0012]-[0013].) For example, Van Niekerk discloses: “In one embodiment the power switch 28 is a silicon controlled rectifier (SCR)-based switch that is responsive to the command signals from the controller 30. In the illustrated embodiment the power sensor 36 is coupled to a current transformer 38 and provides signals to the controller 30 representative of the total power demand on (and produced by) the genset 16 (i.e., the sum of the power demand by the external load and the power applied to the load bank/heater). Because of the control of power switch 28, the controller 30 has information representative of the amount of power that is being applied to the load bank/heater 20. The controller 30 can compute the power demand from the external load by subtracting the load bank/heater power from the power measured by power sensor 36. In other

embodiments of the invention the amount of power demanded by the external load and the load bank/heater can be determined by other approaches and power sensors.” (**EX1005** ¶ [0012].) It is my opinion that a POSITA would have understood that this limitation is disclosed by or obvious in view of Van Niekerk. It is also my opinion that a POSITA would have understood that this limitation is obvious in view of Aoki with Van Niekerk and Van Niekerk 2. Please see previous discussions and analyses regarding why a POSITA would be motivated to combine these references and why this combination is obvious presented in detail previously. That analyses also applies to this section.

i. [1.8] said load dump output in electrical communication with said load dump input

192. Van Niekerk discloses the load dump output signal of control 12 with controller 30 is received as a load dump input signal at power switch 28 (Fig. 1), and in view of Aoki it would be obvious to communicate via a separate connection between the load dump output signal and load dump input signal, and a POSITA would also have this load dump output in electrical communication with said load dump input to complete the overall system response feedback for system control. (This is a general requirement of feedback control for any closed loop control system, which a POSITA would understand is also disclosed in Aoki, as well as the Van Niekerk references). A POSITA would have understood that this combination is nothing more than the application of a known technique (feed-back

closed loop control) to a known device (generator controller) for improvement to yield predictable results. For example, Aoki discloses: “Each drive control apparatus that has received the instruction controls driving of a motor based on the information by a motor controlling unit 10. In this situation, **feedback data** and the like from the motor leaves the motor controlling unit 10, passes again through the communication cable 3 and the input/output connector 5, and then is received by the NC apparatus through the input/output connector 2.” (**EX1009**, [0002] **emphasis added**, see also Van Niekerk **EX1004 Fig. 1** showing feedback loops for closed loop controller operation through controller 30) Furthermore, as discussed at Sections H.f., and H.g., it would be obvious in view of Aoki that the Van Niekerk and Van Niekerk 2 and a POSITA would have motivation to combine these references to increase overall system safety and reliability (as stated in Aoki) and this element is obvious. (**EX1009 ¶¶** [0002]-[0006].)

j. [1.9] said load enable output in electrical communication with said load enable input

193. Van Niekerk discloses the load enable output signal of control 12 with controller 30 is received as a load enable input signal at power switch 28 (Fig. 1), and in view of Aoki it would be obvious to communicate via a separate connection between the load enable output signal and load enable input signal. As discussed at Sections H.f., and H.g., this would be obvious in view of Aoki that the Van Niekerk and Van Niekerk 2 to a POSITA. A POSITA would have motivation to

combine these references to increase overall system safety and reliability (as stated in Aoki) and this element is obvious to a POSITA. (**EX1009** ¶¶ [0002]-[0006].)

For example, a POSITA would understand that to have this load enable output in electrical communication with said load enable input as necessary to complete the overall system response feedback for system control. (This is a general requirement of feedback control for any closed loop control system, which a POSITA would understand is also as disclosed in Aoki, as well as the Van Niekerk references). A POSITA would have understood that this is nothing more than the application of a known technique (feed-back closed loop control) to a known device (generator controller) for improvement to yield predictable results. For example, Aoki discloses: “Each drive control apparatus that has received the instruction controls driving of a motor based on the information by a motor controlling unit 10. In this situation, feedback data and the like from the motor leaves the motor controlling unit 10, passes again through the communication cable 3 and the input/output connector 5, and then is received by the NC apparatus through the input/output connector 2.” (**EX1009**, [0002] emphasis added, see also Van Niekerk **EX1004** Fig. 1 showing feedback loops for closed loop controller operation through controller 30) Furthermore, as discussed at Sections H.f., and H.g., it would be obvious in view of Aoki and the Van Niekerk and Van Niekerk 2 references, and a POSITA would have motivation to combine these references to

increase overall system safety and reliability (as stated in Aoki). (See **EX1009 ¶¶** [0002]-[0006], for disclosure of this element.)

k. [1.10] *said load monitoring device in electrical communication with said load sensor*

194. Van Niekerk discloses current transformer 38 as a load monitoring device is in electrical communication with power sensor 36, and this element is disclosed or obvious. Furthermore, As discussed at Sections H.f., and H.g., this would be obvious in view of Aoki and the Van Niekerk and Van Niekerk 2 references to a POSITA, and a POSITA would have motivation to combine these references to increase overall system safety and reliability (as stated in Aoki). (see **EX1009 ¶¶** [0002]-[0006] for disclosure of this element.) For example, a POSITA would know that this load monitoring device in electrical communication with said load sensor is obvious as part of completing the overall system response feedback for system control. (This is a general requirement of feedback control for any closed loop control system, which a POSITA would understand is also as disclosed in Aoki, and the Van Niekerk references). A POSITA would have understood that this is nothing more than the application of a known technique (feed-back closed loop control) to a known device (generator controller) for improvement to yield predictable results. For example, Aoki discloses: “Each drive control apparatus that has received the instruction controls driving of a motor based on the information by a motor controlling unit 10. In this situation, feedback data and the

like from the motor leaves the motor controlling unit 10, passes again through the communication cable 3 and the input/output connector 5, and then is received by the NC apparatus through the input/output connector 2.” (**EX1009**, [0002] emphasis added, see also Van Niekerk **EX1004** Fig. 1 showing feedback loops for closed loop controller operation through controller 30) Furthermore, as discussed at Sections H.f., and H.g., it would be obvious in view of Aoki and the Van Niekerk and Van Niekerk 2 references, and a POSITA would have motivation to combine these references to increase overall system safety and reliability (as stated in Aoki). (**EX1009** ¶¶ [0002]-[0006].)

I. [1.11] at least one load step contactor in electrical communication with said at least one load step output; and

195. Van Niekerk discloses that resistive elements 56 are “individually coupled or decoupled” to control the amount of presented load. (¶ [0013]; Fig. 1.) This individual coupling/decoupling is one or more load step contactors in communication with the load step output of power switch 28. It is my opinion that a POSITA would have understand this element is disclosed and is obvious. Furthermore, as discussed at Sections H.f., and H.g., it would be obvious in view of Aoki and the Van Niekerk and Van Niekerk 2 references, that a POSITA would have motivation to combine these references to increase overall system safety and reliability (as stated in Aoki). (**EX1009** ¶¶ [0002]-[0006].) For example, a POSITA

would know that the at least one load step contactor in electrical communication with said at least one load step output is obvious to complete the overall system electrical connection(s) and is also an obvious part of providing response feedback for system control. (This is a general requirement of feedback control for any closed loop control system, which a POSITA would understand is also as disclosed in Aoki, and the Van Niekerk references). A POSITA would have understood that this is nothing more than the application of a known technique (feed-back closed loop control) to a known device (generator controller) for improvement to yield predictable results. For example, Aoki discloses: “Each drive control apparatus that has received the instruction controls driving of a motor based on the information by a motor controlling unit 10. In this situation, feedback data and the like from the motor leaves the motor controlling unit 10, passes again through the communication cable 3 and the input/output connector 5, and then is received by the NC apparatus through the input/output connector 2.” (**EX1009**, [0002] emphasis added, see also Van Niekerk **EX1004** Fig. 1 showing feedback loops for closed loop controller operation through controller 30) Furthermore, as discussed at Sections H.f., and H.g., it would be obvious in view of Aoki and the Van Niekerk and Van Niekerk 2 references, and a POSITA would have motivation to combine these references to increase overall system safety and reliability (as stated in Aoki). (**EX1009** ¶¶ [0002]-[0006].)

- m. **[1.12] at least one load step resistor in electrical communication with said load bank bus by way of said at least one load step contactor**

196. Van Niekerk discloses load bank 20 in communication with power switch 28 such that the load bank contactor is in communication with the load bank bus, and it is my opinion that a POSITA would know that this element is disclosed by the prior art and is obvious. Furthermore, as discussed at Sections H.f., and H.g., it would be obvious in view of Aoki and the Van Niekerk and Van Niekerk 2 references, that a POSITA would have motivation to combine these references to increase overall system safety and reliability (as stated in Aoki). (**EX1009 ¶¶ [0002]-[0006].**) For example, a POSITA would have known that it is obvious to have the at least one load step resistor in electrical communication with said load bank bus by way of said at least one load step contactor to complete the overall system electrical connection(s) since this is an obvious part of providing response feedback for system control. (This is a general requirement of feedback control for any closed loop control system, which a POSITA would understand is also disclosed in Aoki, and the Van Niekerk references). A POSITA would have understood that this is nothing more than the application of a known technique (feed-back closed loop control) to a known device (generator controller) for improvement to yield predictable results. For example, Aoki discloses: “Each drive control apparatus that has received the instruction controls driving of a motor

based on the information by a motor controlling unit 10. In this situation, feedback data and the like from the motor leaves the motor controlling unit 10, passes again through the communication cable 3 and the input/output connector 5, and then is received by the NC apparatus through the input/output connector 2.” (**EX1009**, [0002] emphasis added, see also Van Niekerk **EX1004** Fig. 1 showing feedback loops for closed loop controller operation through controller 30) Furthermore, as discussed at Sections H.f., and H.g., it would be obvious in view of Aoki and the Van Niekerk and Van Niekerk 2 references, and a POSITA would have motivation to combine these references to increase overall system safety and reliability (as stated in Aoki). (**EX1009** ¶¶ [0002]-[0006].)

n. [1.13] wherein said generator controller provides a control signal via said load enable output

197. Van Niekerk discloses that control system 12 with controller 30 provides enabling control signals to power switch 28, and in view of Aoki it would be obvious that such load enable output and load dump output would be separate as discussed at H.f. Furthermore, As discussed at Sections H.f., and H.g., it would be obvious in view of Aoki and the Van Niekerk and Van Niekerk 2 references, that a POSITA would have motivation to combine these references to increase overall system safety and reliability (as stated in Aoki) and this element is obvious. (**EX1009** ¶¶ [0002]-[0006].) For example, a POSITA would also have said generator controller provides a control signal via said load enable output to

complete the overall system electrical connection(s) as part of what is obviously necessary to provide response feedback for system control. (This is a general requirement of feedback control for any closed loop control system, which a POSITA would understand is also as disclosed in Aoki, and the Van Niekerk references). A POSITA would have readily understood that having the generator controller provide a control signal via said load enable output is a basic tenet of closed loop control, and is nothing more than the application of a known technique (feed-back closed loop control) to a known device (generator controller) for improvement to yield predictable results. For example, Aoki discloses: “Each drive control apparatus that has received the instruction controls driving of a motor based on the information by a motor controlling unit 10. In this situation, feedback data and the like from the motor leaves the motor controlling unit 10, passes again through the communication cable 3 and the input/output connector 5, and then is received by the NC apparatus through the input/output connector 2.” (**EX1009**, [0002] emphasis added, see also Van Niekerk **EX1004** Fig. 1 showing feedback loops for closed loop controller operation through controller 30) Furthermore, as discussed at Sections H.f., and H.g., it would be obvious in view of Aoki and the Van Niekerk and Van Niekerk 2 references, and a POSITA would have motivation to combine these references to increase overall system safety and reliability (as stated in Aoki). (EX1009 ¶¶ [0002]-[0006].)

- o. [1.14] (operating load step contactor) in at least one of the following cases: neglect and regeneration; and**

198. Van Niekerk discloses this limitation as discussed in Section F.1.j.

Please see previous detailed discussion regarding this element which also applies in this section.

- p. [1.15] wherein said generator controller provides a control signal via said load dump output in case of a load spike**

199. Van Niekerk discloses that an overload-based load-shed mode signal is output as a load dump signal in the event of the control system 12 with controller 30 determines a load exceeds a capacity. (¶ [0028].) As noted at Sections F.k. and H.h., this limitation is disclosed or obvious. Furthermore, as discussed at Sections H.f., and H.g., it would be obvious in view of Aoki and the Van Niekerk and Van Niekerk 2 references, that a POSITA would have motivation to combine these references to increase overall system safety and reliability (as stated in Aoki).

(**EX1009** ¶¶ [0002]-[0006].) For example, a POSITA would also have said generator controller provide a control signal via said load dump output in case of a load spike to complete the overall system electrical connection(s) and as a necessary part of providing response feedback for system control. (This is a general requirement of feedback control for any closed loop control system, which a POSITA would understand is also disclosed in Aoki, and the Van Niekerk references). A POSITA would have readily understood that having the generator

controller provide a control signal via said load enable output is a basic tenet of closed loop control, and is nothing more than the application of a known technique (feed-back closed loop control) to a known device (generator controller) for improvement to yield predictable results. For example, Aoki discloses: “Each drive control apparatus that has received the instruction controls driving of a motor based on the information by a motor controlling unit 10. In this situation, feedback data and the like from the motor leaves the motor controlling unit 10, passes again through the communication cable 3 and the input/output connector 5, and then is received by the NC apparatus through the input/output connector 2.” (*EX1009*, [0002] emphasis added, see also Van Niekerk *EX1004* Fig. 1 showing feedback loops for closed loop controller operation through controller 30) Furthermore, as discussed at Sections H.f., and H.g., it would be obvious in view of Aoki and the Van Niekerk and Van Niekerk 2 references, and a POSITA would have motivation to combine these references to increase overall system safety and reliability (as stated in Aoki). (*EX1009* ¶¶ [0002]-[0006].)

q. Additional Rationale to combine and reasonable expectation of success

200. The Van Niekerk references include a two controller system, controller 30 and controller/power switch 28 between which two different control signals are communicated. One to enable the operation of the load bank and a different signal to remove load above a limit. Aoki discloses a known separate cut-

off output connection between two controllers to increase reliability, and use of Aoki's separate wires between two controllers with Van Niekerk's two signals in order to improve reliability would produce predictable results. Please also see additional detailed discussions as presented in detail above for each claim element.

2. Dependent Claims 4 and 8

a. Claim 4

201. Claim 4 depends from claim 1. Claim 4 adds the requirement of:

“a plurality of load step resistors.”

Van Niekerk discloses this as a plurality of resistive elements 56 that may be individually coupled or decoupled to control the amount of load. (*EX1004*, ¶ [0013].)

b. Claim 8

202. Claim 8 depends from claim 1. Claim 8 adds the requirement of:

“the engine is a diesel engine.”

203. Van Niekerk discloses the engine may be diesel, and would be obvious. (*EX1004*, ¶ [0010].)

I. Ground 4: Claims 9-18 Are Obvious Over the Combination of Van Niekerk and Aoki, and Further Combination with Van Niekerk 2, Egan, Eaton, or DSE Manual 7 or DSE Manual 9

1. Claims 9, 14 Are Obvious Over the Combination of Van Niekerk and Aoki, and Further Combination with Van Niekerk 2

a. Rationale to combine and reasonable expectation of success

204. As discussed at G.1.a., Van Niekerk 2 incorporates “the entire disclosure” of Van Niekerk “for all purposes.” (*EX1005* Col. 4: 64-5:2.) At a minimum it would be obvious to further combine Van Niekerk 2 with Van Niekerk and also with Aoki, Egan, Eaton, and/or DSE Manual 7 and/or DSE Manual 9 since Van Niekerk 2 points directly to Van Niekerk and has overlapping subject matter, and also since all of these references as discussed above, are in the same field of endeavor, all disclose controllers for control of systems, are directed to solving the same problems, show examples of using known techniques to improve similar devices and yield predictable results, show examples of known techniques to improve and/or use on similar devices in the same way, are obvious to try to a POSITA as a matter of design choice from a finite number of identified predictable solutions with reasonable expectations of success, and are nothing more than combining prior art elements according to known methods to yield predictable results, as discussed for each of the elements above. These rationale as discussed above also apply to the sections below, and also apply as to why a POSITA would have motivation to combine these references per each of the elements discussed below.

b. Claim 9

205. Claim 9 depends from claim 1. Claim 9 adds the requirement of:

“the engine is a Tier IV Interim or newer diesel engine.”

By 2012, all stationary gensets were required to meet Tier IV Interim Standards (*EX1016*), and both Van Niekerk and Van Niekerk 2 disclose the engine is diesel (*EX1004* ¶ [0010]; *EX1005* Col. 3:18-24, 5:64-67) The systems are configured to meet Tier IV Interim and Final requirements, and discloses this requirement. (*EX1005*, Col. 3:1-3.) For example, Van Niekerk 2 specifically states: “These aftertreatment systems are configured to meet or exceed certain emissions standards, such as the present EPA Tier 4 Interim and Tier 4 Final requirements. Stationary diesel-powered generators tend to include Substantial diesel engines that produce large Volumes of exhaust that needs to be treated before release into the atmosphere.” (*EX1005*, Col. 3:1-6.) Van Niekerk 2 also discloses Tier 4 Regulations Affect More than Engines, Jun. 6, 2011, downloaded from <http://www.power-eng.com/articles/pring/volume-115/issue-6/features/tier-4-regulations-af>. (*EX1005*, page 2 OTHER PUBLICATIONS)

c. Claim 14

206. Claim 14 depends from claim 1. Claim 14 adds the requirement of:

“said at least one load step resistor is located remotely from said engine-generator.”

Van Niekerk 2 discloses the aftertreatment system 20 which includes load bank 80 may be located on a support structure 26 and is thus located remotely above genset 12. (*EX1005*, Figure 1, Col. 3:26-28.)

2. Claims 10-13 Are Obvious Over the Combination of Van Niekerk and Aoki, and Further Combination with Egan, and/or Eaton, and/or DSE Manuals

a. Rationale to combine and reasonable expectation of success

207. As discussed above in for example, but not limited to beginning at Section G.2.a., it is obvious to combine the Van Niekerk references and Egan, and also as discussed above in for example beginning at Section H.f. to further combine with Aoki for the same subject matter of these dependent claims. Similarly, as discussed beginning at, but not limited, to Section G.4.a., it is obvious to combine the DSE Manuals with Van Niekerk, and to further combine these combinations of Van Niekerk and Aoki. Similarly, as discussed beginning at, but not limited to, Section G.4.a., it is obvious to combine the DSE Manuals with Van Niekerk, and to further combine these combinations of Van Niekerk and Aoki, and to further combine with Eaton, as discussed beginning at, but not limited to Section G.e. See additional detailed discussions that are presented in detail above. These rationale as presented in detail above also apply to the sections below, and also

apply as to why a POSITA would have motivation to combine these references per each of the elements discussed below.

b. Claim 10

208. Claim 10 depends from claim 1. Claim 10 adds the requirement of:

“said alternator, output bus, load bank bus, and at least one load step resistor comprise a polyphase electrical system.”

209. Egan discloses genset 10 with alternator 103 and load bank 118 with a plurality of heaters or steps. (*EX1006*, ¶ [0041], [0350].) Egan discloses the system may be three-phase, and thus discloses a poly-phase system. (*EX1006*, ¶ [0166].)

210. Alternatively, DSE Manuals 7 and 9 discloses the genset is operated as a three phase system, and thus discloses operation as a poly-phase system. (*EX1008* p. 43-52; *EX1032* p. 45-54) (*EX1008* p. 30, 39; *EX1032* p. 32, 41.)

211. Three phase operation is a common configuration that provides power without fluctuation using the minimum number of wires, such that the combination would provide stable power with minimum components and a POSITA would have found it obvious to provide in the Van Niekerk systems in view of either Egan, Eaton, or DSE Manuals, as discussed previously in detail above.

c. Claim 11

212. Claim 11 depends from claim 1. Claim 11 adds the requirement of:

“said alternator, output bus, load bank bus, and at least one load step resistor comprise a three-phase electrical system.”

213. Egan discloses the system may be a three phase system. (**EX1006**, ¶¶ [0041], [0350], [0166].)

214. Alternatively, DSE Manuals 7 and 9 discloses the genset is operated as a three phase system. (**EX1008** p. 43-52; **EX1032** p. 45-54) (**EX1008**, p. 30, 39; **EX1032** p. 32, 41.)

215. As noted regarding claim 10, three phase operation provides power without fluctuation using the minimum number of wires, such that the combination of Van Niekerk references s would be obvious, as discussed previously above.

d. Claim 12

216. Claim 12 depends from claim 1. Claim 12 adds the requirement of: “a common base and enclosure.”

217. Egan discloses genset 101/103 and load bank 118 have a common base and enclosure (**EX1006**; Figures 2-7) and would be obvious for Van Niekerk and Aoki, as discussed previously above.

e. Claim 13

218. Claim 4 depends from claim 1. Claim 4 adds the requirement of:

“said at least one load step resistor is physically located in an enclosure connected to the radiator of said engine.”

219. As disclosed by Egan (**EX1006**; Figures 2-7), the intake of genset 101/103 is on one side of the enclosure and load bank 118 is located in the exhaust of the system, and would be obvious, as discussed previously above. Furthermore, a POSITA would have readily known that engines and diesel engines are used in cars, trucks, and vehicles, and that the engine compartment of a car, truck, or vehicle is an enclosure that contains a radiator (necessary for cooling the vehicle engine) and that the placing a load step resistor in an enclosure (e.g. engine compartment with vehicle hood) is nothing more than choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success, and that such a design choice would have been readily known to a POSITA depending on the packaging space available in the engine compartment and would be obvious to try. Please also see also previous detailed analyses regarding this element.

3. Claim 15-18 is Obvious Over the Combination of Van Niekerk and Aoki, and Further Combination with Eaton or DSE Manual 7 or DSE Manual 9

a. Claim 15

220. Claim 15 depends from claim 1. Claim 15 adds the requirement of:

“the generator controller and engine control module are configured to communicate via SAE J1939 protocol.”

221. Eaton (**EX1007** Col. 5:38-42) discloses a genset 150 having a diesel engine 150 and alternator 154 in which an ECM 160 communicates with a genset controller 100 using the J1939 protocol and CAN communications. It would be obvious to use a well-recognized standard used with gensets in a Van Niekerk genset in view of Eaton as an obvious design choice to provide the predictable result and benefit of standardized communications. Please see detailed discussion provided previously above.

b. Claim 16

222. Claim 16 depends from claim 1. Claim 16 adds the requirement of:

“the generator controller is configured to provide said control signal to said load dump output within 10 seconds.”

223. Eaton discloses a shutdown or partial shutdown command is issued if a parameter is exceeded for a set duration, with an example of 10 second windows disclosed, (**EX1007**, Col. 9:39-10:15, 13:19-33.)

224. DSE Manual 7 and 9 disclose that a selectively adjustable delay timer is used to disconnect the load step resistors and also for a disconnect of load, including all load. (**EX1008**, p. 73-74; **EX1032** p. 75-76.) One example delay shown is 5 seconds. Another delay timer disclosed in DSE Manual shows a

conventional logarithmic progression of settings of 0.1, 1, 10 seconds and greater. (*EX1008*, p. 95; *EX1032* p. 97-101.)

225. The '651 patent includes no disclosure relating to this particular time other than that of the claims, and there is no significance placed on this time. Rather, this time represents an arbitrary selection of one time in a logarithmic progression of seconds, and would be obvious in view of Eaton or DSE Manual to use as a delay in view of their commonplace use in controllers with predictable benefit of avoiding common fluctuations or brief changes causing unnecessary interruptions and start-ups. Please see discussions presented previously above regarding this claim element.

c. Claim 17

226. Claim 17 depends from claim 1. Claim 17 adds the requirement of:

“the generator controller is configured to provide said control signal to said load dump output within 1 second.”

227. Eaton discloses a shutdown or partial shutdown command is issued if a parameter is exceeded for a set duration, with an example of 10 second windows disclosed, (*EX1007*, Col. 9:39-10:15, 13:19-33.)

228. DSE Manual 7 and 9 disclose that a selectively adjustable delay timer is used to disconnect the load step resistors and also for a disconnect of load,

including all load. (**EX1008**, p. 73-74; **EX1032** p. 75-76.) One example delay shown is 5 seconds. Another delay timer disclosed in DSE Manual shows a conventional logarithmic progression of settings of 0.1, 1, 10 seconds and greater. (**EX1008**, p. 95; **EX1032** p. 97-101.)

229. The '651 patent includes no disclosure relating to this particular time other than that of the claims, and there is no significance placed on this time. Rather, this time represents an arbitrary selection of one time in a logarithmic progression of seconds, and would be obvious in view of Eaton or DSE Manual to use as a delay in view of their commonplace use in controllers with predictable benefit of avoiding common fluctuations or brief changes causing unnecessary interruptions and start-ups. Please see detailed discussions presented previously above regarding this claim element.

d. Claim 18

230. Claim 18 depends from claim 1. Claim 18 adds the requirement of:

“the generator controller is configured to provide said control signal to said load dump output within 0.1 second.”

231. Eaton discloses a shutdown or partial shutdown command is issued if a parameter is exceeded for a set duration, with an example of 10 second windows disclosed, (**EX1007**, Col. 9:39-10:15, 13:19-33.)

232. DSE Manual 7 and 9 disclose that a selectively adjustable delay timer is used to disconnect the load step resistors and also for a disconnect of load,

including all load. (**EX1008**, p. 73-74; **EX1032** p. 75-76.) One example delay shown is 5 seconds. Another delay timer disclosed in DSE Manual shows a conventional logarithmic progression of settings of 0.1, 1, 10 seconds and greater. (**EX1008**, p. 95; **EX1032** p. 97-101.)

233. The '651 patent includes no disclosure relating to this particular time other than that of the claims, and there is no significance placed on this time. Rather, this time represents an arbitrary selection of one time in a logarithmic progression of seconds, and would be obvious in view of Eaton or DSE Manual to use as a delay in view of their commonplace use in controllers with predictable benefit of avoiding common fluctuations or brief changes causing unnecessary interruptions and start-ups. Please see detailed discussions presented previously above regarding this claim element.

J. Ground 5: Claims 19, 22, 26-31 Are Obvious Over the combination of Egan and Sherman

1. Independent Claim 19

a. [19.0 Preamble] *An engine-generator and load bank system comprising*

234. To the extent the preamble is considered limiting, Egan discloses a power generator 10, or genset, that is coupled with a load bank 118 for controlling the load on the genset. (See **EX1006**, Fig. 2, para. [0041])

b. [19.1] *an engine mechanically connected to and capable of driving an alternator*

235. Egan discloses power generator 10 that includes a diesel engine 101 which drives an alternator 103. The diesel engine 101 and alternator 103 are therefore mechanically connected, and Egan teaches this element. (See **EX1006**, Fig. 2, para. [0041])

c. **[19.2] said engine having an engine control module and a particulate filter**

236. Egan discloses power generator 10 includes a diesel engine 101, and that a load bank is used to address carbon deposits. (See **EX1006**, para. [0041], [0350].) Sherman discloses a diesel engine and an exhaust particulate filter 30. (**EX1010**, Col. 1:49-55, 3:12-24, 4:60.) It would be obvious to include the Egan diesel engine with a particulate filter as suggested by Sherman. Sherman discloses “A method for regeneration of particulate filters or traps in the context of a hybrid electric vehicle includes the step of measuring the back pressure of the filter, and adjusting the engine parameters when the back pressure exceeds a particular value to increase the exhaust temperature, to aid in regeneration. In one mode, the engine speed and engine load are both reset toward particular target values. In another version in which the engine load includes an energy storage device such as a battery, increasing the load includes the step of increasing the battery charge level setpoint. Additionally, for those situations in which the battery cannot accept more charge, a power-dissipating resistor is coupled to an electric source to increase the

load. In yet another version, the use of the electrical resistor is made dependent upon the temperature of the filter during regeneration.” (EX1010 ABSTRACT)

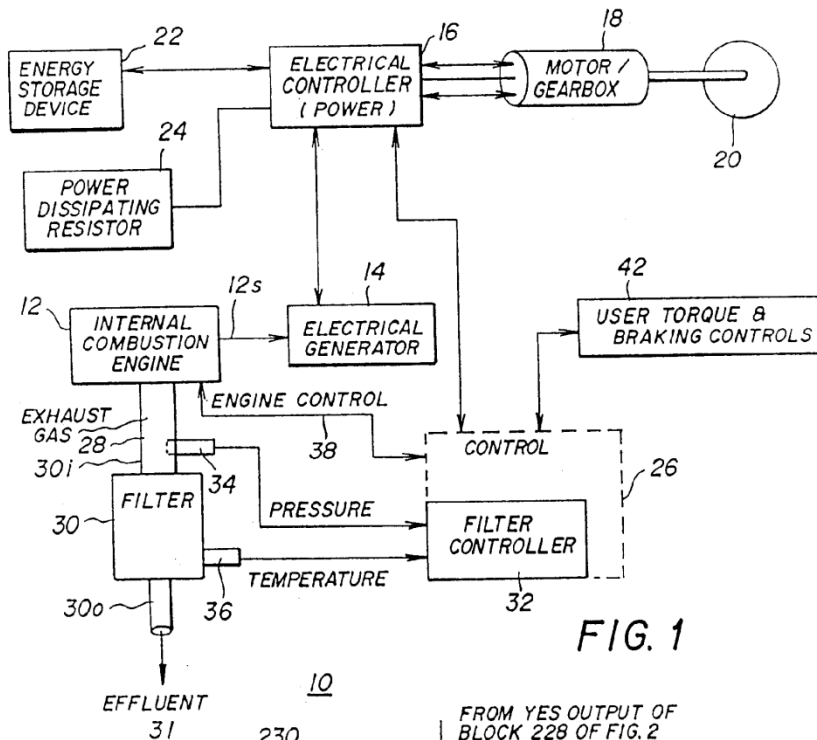
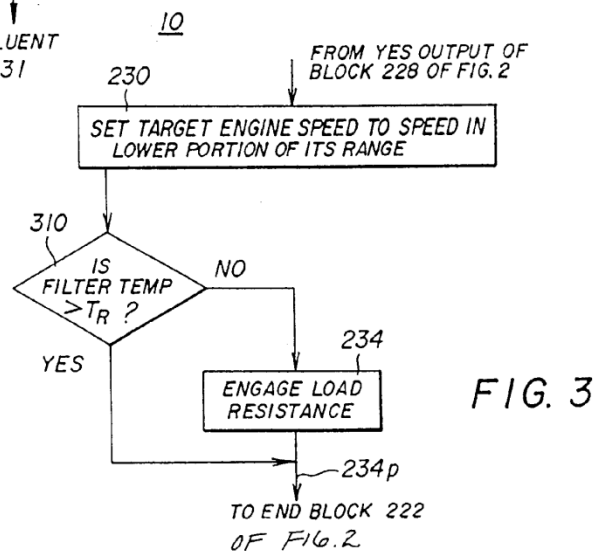
Fig. 1 and Fig. 3 of Sherman are shown below:

U.S. Patent

Jul. 23, 2002

Sheet 1 of 4

US 6,422,001 B1



237. Sherman also discloses: “In FIG. 1, a vehicle hybrid electrical drive system 10 includes an internal combustion engine 12 which has a rotating output shaft 12 s which drives an electrical generator 14. In general, modern generators for hybrid electric purposes are AC (alternating current) generators, but direct-voltage (DC) generators may be used with some minor system changes. Those skilled in the art know that the terms alternating voltage and alternating current are related terms, and that, in general, electrical current cannot exist in the absence of a motive force or voltage. The alternating current or alternating voltage produced by generator 14 is applied to a power-handling electrical controller 16, as known in the art. Power-handling controller 16 includes power switches which are controlled or switched in order to allow power flow in either direct voltage or alternating voltage form among an alternating-current induction motor 18, an alternating-current generator, and a battery or other electrical storage device 22. Motor 18 is mechanically coupled to at least one drive wheel of the vehicle, illustrated as wheel 20. Electrical controller 26 controls the operation of power electrical controller 16 in a field oriented manner, as known in the art, for controlling, among other things, the amount of power applied to or extracted from the motor, for providing driving torque or dynamic braking. Electrical controller 26 also interacts with engine 12 by way of a signal path 38 for monitoring engine operation, and for providing control signals to which the engine is responsive. Electrical controller 26 also interacts

with user controls such as a foot-operated torque demand “accelerator” and a foot-operated brake illustrated as a block 42, and may also provide indications of engine and system operation to the operator. In FIG. 1, the internal combustion engine 12 produces exhaust gases in an exhaust pipe designated as 28. Exhaust pipe 28 guides the exhaust gases to an input port 30 i of a regenerative particulate filter or trap 30. The filtered exhaust effluent leaves filter 30 by its output port 30 o. Those skilled in the art know that regenerative particulate filters tend to trap particles entrained within the exhaust gas, so that the filtered effluent is cleaner than the exhaust gas as it leaves the engine. Such filters may be made, for example, from a ceramic honeycomb material which is porous, so that the exhaust gases can pass from input to output, but leave behind at least some of the particulate matter. Deposits of such particulate matter can eventually clog the filter and may result in its destruction. Non-regenerative filters must be cleaned periodically. In the context of a vehicle, however, periodic cleaning may be inconvenient because the vehicle must be taken out of service, and cleaning may also be expensive. Regenerative filters, by contrast, can be cleaned by heating the particulate matter to a temperature at which it combusts or vaporizes. In ordinary use of a vehicle having a regenerative filter, operation at road speeds under moderate to full load generally produces exhaust gases which are at a high enough temperature to raise the filter temperature above the regeneration temperature. Thus, operation at road

speed is generally enough to regenerate or clean the particulate filter. Some regenerative filters use electrical heating elements for aiding in heating the filter to a suitable regeneration temperature.” (**EX1010** Col.2:47-3:38)

238. Egan also discloses that a controller 105 is communicative with and provides control signals to engine 101. (See **EX1006**, para. [0041]-[0042], [0221]-[0255].) The Egan system therefore inherently includes an engine control module ECU that receives the signals from controller 105 and controls engine 101.

Alternatively, Sherman discloses electrical controller 26 provides control signals to engine 12 via signal path 38 to which the engine is responsive. (**EX1010** Col. 3:3-6.) Sherman also inherently includes an engine ECU that communicates with controller 26 to interpret and act on the control signals. Regardless, it would be obvious in view of Egan and Sherman that the diesel engine would have an engine control module. It would be obvious to a POSITA to combine Egan with Sherman since a POSITA would have readily understood to use a well-known DPF of Sherman for the Egan’s system since Egan and Sherman disclose similar structures, components, and subject matter (e.g. exhaust systems, engine controllers, alternators, engines), and also all disclose ramping up, shutting down, or limiting system parameters using control modules based on system parameters and inputs, as well as disclose methods to reduce pollution by monitoring system parameters and when necessary loading the system with load resistance. As

evidenced by the Sherman, the use of DPF was well known to a POSITA and a POSITA would have known that DPFs were commonly used for engines and were controlled by the engine controller in engine applications, as well as for engines in hybrid vehicle applications. As disclosed, for example in Sherman, a POSITA would have readily employed the DPF as a substitution of a well-known and readily available technique for another (heating up the exhaust by adding resistance), and would have had at the very least a reasonable expectation of success in doing so. This substitution would have just been a matter of design choice to a POSITA, with the predictable outcome of providing the burning off of the exhaust particulates for the purpose of reducing pollution (as stated in Sherman). A POSITA would have readily understood that the use of DPFs provides the opportunity to employ an additional component that is readily available, and thus would have been motivated to make such a design choice with a reasonable expectation of success in doing so. Using a DPF with a controller and engine was well-known and obvious to a POSITA (as shown in Sherman) and combining it with the control system (e.g. engine, engine controller, exhaust system) is just combining prior art elements according to known methods to yield predictable results (to decrease pollution by burning off exhaust system particulates (as disclosed in both Sherman and Egan) using commercially available components (DPF)). A POSITA would consider this just a simple substitution of

one known element (DPF commonly employed for engines and diesel engines systems) for another to obtain predictable results (decreasing pollution and assisting the environment, and also to meet pollution regulatory requirements). A POSITA would also consider this as an obvious use of a known technique to improve similar devices (gensets and genset controllers, and the related exhaust systems) in the same way (burning off particulates trapped in the exhaust system) to provide decreases in pollutants.

d. [19.3] *said alternator in electrical communication with an output bus and a load bank bus*

239. Egan discloses that the system outputs power to a cellular base station and inherently includes an output bus in order to output the power. (**EX1006**, para. [0006], [0008], [0037], [0158].) Egan also discloses alternator 103 is connected with load bank 118 to provide selective connected/disconnected condition, and the load bank bus is shown in Fig. 2 as a dashed line. (**EX1006**, para. [0350], claims 27-30.) Sherman discloses generator 14 outputs on a connection to power controller 26 and then to motor/gearbox 18 as the output bus and from power controller 16 to the dissipating resistor 24 via what obvious to a POSITA is a load bank bus. (**EX1010** Fig. 1, Col. 2:56-3:3, 5:6-10.) Each disclose the alternator being in electrical communication with an output bus and a load bank bus, and the combination would be obvious. A POSITA would be motivated to combine Sherman and Egan as discussed previously above.

e. [19.4] a generator controller in electrical communication with said engine control module

240. Egan discloses controller 105 is communicative with and provides control signals to engine 101 and thus to the engine ECU. (See **EX1006**, para. [0041]-[0042], [0221]-[0255].) Sherman likewise discloses electrical controller 26 provides control signals to engine 12 via signal path 38 to which the engine is responsive and thus to an ECU engine control module. (**EX1010** Col. 3:3-6.) It would be obvious in view of Sherman for the controller of the generator of Egan to provide this communication with an engine control module. A POSITA would be motivated to combine Sherman and Egan as discussed previously above.

f. [19.5] said generator controller having at least one load step output

241. Egan discloses load bank 118 includes one or more heaters (i.e. different number of heaters or steps) that are directed by controller 105 to be connected to generator 10. (**EX1006** para. [0350].) Sherman discloses controller 26 causes dissipating device/load bank 24 to be selectively engaged in portions, i.e. steps, to adjustably achieve the desired level. (**EX1010** Col. 7:47-51, claims 1-4.) Thus both Sherman and Egan disclose this element. Furthermore, in view of Sherman it would be obvious for Egan's generator controller to have at least one load step output to signal the engagement of a step of load by resistor/heater 24. For example, but not limited to, Egan discloses "a command for controlling at least

one operational parameter of an alternator or engine of the power generator, and processing the received data and controlling the operational parameter of the alternator or engine of the power” (**EX1006** [0008]). A POSITA in reading Egan would have understood that Egan discloses a controller and engine control system that uses feedback closed-loop control.

242. Similar to Egan, Sherman discloses, for example, but not limited to: “According to an aspect of the invention, a pressure sensor is associated with the particulate filter, to provide a signal, preferably an electrical signal, representative of at least the existence of an average back pressure exceeding a particular value. In a preferred embodiment of the arrangement of FIG. 1, the pressure sensor 34 is coupled in pipe 28 near the input port 30 I of filter 30, to produce an electrical signal representative of or indicative of the back pressure. The electrical signal from sensor 34 representing the back pressure is coupled to a portion 32 of controller 26 which is provided for control of filter regeneration. Portion 32 of controller 26 may, in one version of the invention, also receive signals representing the filter temperature, or the temperature of at least a portion thereof, from a sensor 36. FIG. 2 is a simplified flow chart or flow diagram illustrating a form that the logic of filter controller 32 of FIG. 1 may take. In FIG. 2, the logic starts at a START block 210, and flows to a block 212, which represents initial calibration of the pressure sensor with the engine stopped. The indicated pressure is taken as the

ambient pressure or baseline for all subsequent pressure measurements, and is stored in memory. From block 212, the logic flows to a block 214, which represents a delay or pause until receipt of a signal representing the starting of the engine. When such a signal is received, the logic continues from block 214 to a block 216, which represents sampling of the pressure signal from sensor 34 of FIG. 1. The sampling may be at the clock rate or controlled by a loop, but must produce at least aperiodic samples of the back pressure. The pressure samples controlled by block 216 are applied to an integrator 218, for producing a time average signal. The time average should be sufficiently long to encompass at least several cycles of acceleration and deceleration in the context of a vehicle in an urban-duty driving cycle alluded to above. From integrator 218, the logic flows to a decision block 220, which compares the pressure represented by the pressure signal from sensor 34 of FIG. 1 with a first threshold value P1. This first threshold value P1, is a value somewhat lower than the pressure P2 deemed to represent the pressure at which regeneration will occur or is desired. At back pressure value P1, regeneration is deemed to be imminent. At values of back pressure less than the first threshold P1, the logic leaves decision block 220 by the NO output, and proceeds by way of blocks 236 and 238 to an END block 222. From END block 222, the logic returns by way of a logic path 224 to block 216, to continue the pressure sampling. Eventually, as operation of the vehicle continues, the back pressure of the filter

will reach the first threshold value P1, and the logic leaves decision block 220 of FIG. 2 by the YES output, thereby indicating that regeneration is imminent. From the YES output of decision block 220, the logic flows to a block 226, which represents setting the target value of energy storage in energy storage device 22 of FIG. 1 to a value lower than the value at which it would otherwise be set by the overall controller 26. Suitable arrangements for overall controller 26 are known to those skilled in the art. This resetting of the target energy storage, in turn, tends to reduce the amount of energy in the battery, so that, when regeneration begins, energy can be stored in the battery without overcharging. From block 226 of FIG. 2, the logic flows to a further decision block 228, which compares the current value of the average back pressure with second threshold value P2, which represents the back pressure at which regeneration is to begin. If the current value of the back pressure is less than the second threshold value P2, the logic leaves decision block 228 by the NO output, and flows to the END block 222. If the current value of the back pressure is equal to or exceeds the limit or threshold value P2, the logic exits decision block 228 by the YES output, and flows by way of a path 230 I to a block 230. Block 230 represents the resetting of the target value of engine speed controlled by overall controller 26 of FIG. 1, to set the engine in a lower portion of its range. As an example, for a diesel-electric hybrid omnibus intended for urban use, the normal overall control of the engine speed may be

dependent upon state of charge of the traction battery, traction demand, and other factors. The signals produced by filter control 32 tend to drive the engine speed toward a speed greater than idle, but less than about half-speed, but still under the control of controller 26. Schemes for resetting control values by summing, multiplication or substitution are well known. From block 230, the logic flows by way of a path 230 o to a block 232. Blocks 232 and 234 represent the application of a significant load to the engine. This is accomplished by setting upward the target energy storage level in the battery as suggested by block 232, or by applying electrical energy from the battery 22 and the generator 14 to an electrical power dissipating device such as resistor 24 as suggested by block 234, or possibly both. The logic then flows by way of a logic path 234 p to END block 222. The increase of an idle speed to a speed above idle concurrently with the application of the increased load prevents the engine speed from dropping below idle. The decreasing of the engine speed from a higher speed concurrently with the application of an increased load tends to increase the exhaust gas temperature above what it might otherwise be. The increased exhaust temperature, in turn, aids in raising the filter temperature to the regeneration temperature.” (**EX1010** Col. 3:53-5:18) Sherman

Fig. 2 is shown below:

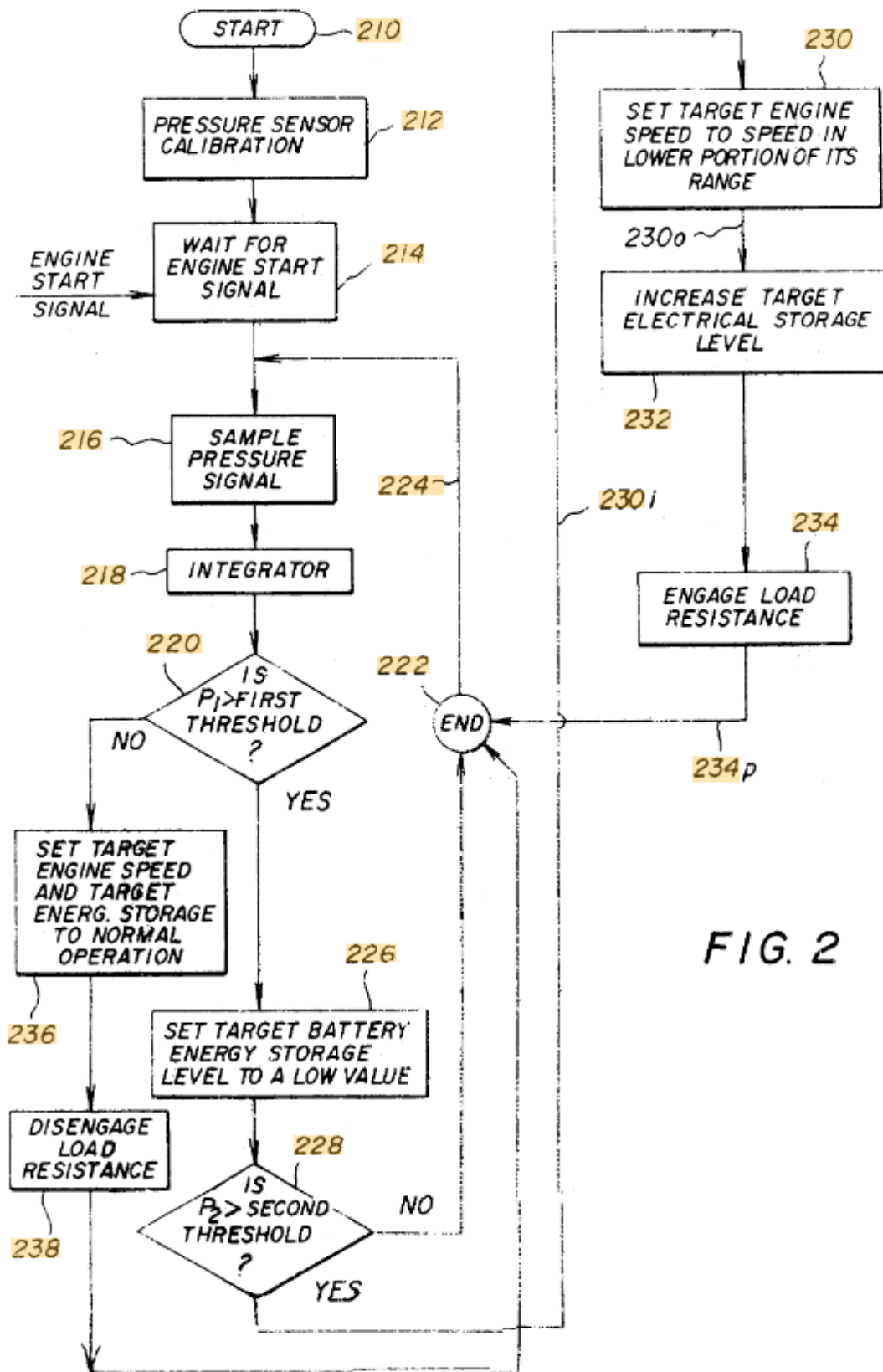


FIG. 2

243. Thus a POSITA would have understood that both Sherman and Egan disclose the application of a known technique (feed-back closed loop control) to a known device (generator controller), and the combination of these references for improvement would yield predictable results. In view of Sherman and Egan it is my opinion that a POSITA would have found it obvious to have the generator controller having at least one load step output, as an obvious part of completing the overall system response to feedback for system control. A POSITA would understand that one of the goals of feedback control for these types of control systems is having the generator controller as shown in Sherman, output a load step output to regulate and control the load bank. (This is a general requirement of feedback control for any closed loop control system, which a POSITA would understand is also as disclosed in both Sherman and Egan). A POSITA would also be motivated to combine Sherman and Egan as discussed in detail previously above.

g. [19.6] at least one load step contactor in electrical communication with said at least one load step output

244. Egan discloses controller 105 causes engagement of a selected load of one or more heaters of load bank 116. (*EX1006*, para. [0350].) Sherman discloses power-handling controller 16 includes switches that adjustably couple at least a portion of resistor 24 to generator 14. (*EX1010* Col. 2:59-64; 7:47-51, claims 1-4.) It would be obvious in view of Sherman for Egan's controller 105 to utilize at least

one load step contactor in communication with at least one load step output. A POSITA would also be motivated to make this combination as an obvious part of completing the overall system response feedback as an necessary part of monitoring the system inputs for system control. A POSITA would understand that one of the goals of feedback control for these control systems is to have the generator controller as shown in Sherman, to have at least one load step contactor in electrical communication with said at least one load step output. (This is a general requirement of feedback control for any closed loop control system, which a POSITA would understand is also as disclosed in Sherman and Egan). A POSITA would have understood that this is nothing more than the application of a known technique (feed-back closed loop control) to a known device (generator controller) for improvement to yield predictable results. A POSITA would also be motivated to combine Sherman and Egan as discussed in detail previously above.

h. [19.7] *at least one load step resistor in electrical communication with said load bank bus by way of said at least one load step contactor*

245. As previously discussed regarding elements 19.5 and 19.6, Egan discloses load bank 118 includes one or more heaters (i.e. different number of heaters or steps) directed by controller 105, and Sherman discloses controller 26 causes dissipating device/load bank 24 to be selectively engaged in portions, i.e. steps, directed by controller 26 through switches of controller 16. It would be

obvious in view of Sherman for Egan to utilize at least one load step contactor in communication with at least one load step output by way of at least one load step contactor, and a POSITA would also be motivated to make this combination to complete the overall system response feedback as an obvious part of monitoring the system inputs for system control. A POSITA would understand that one of the goals of feedback control for these control systems is to also have the generator controller as shown in Sherman, to have at least one load step resistor in electrical communication with said load bank bus by way of said at least one load step contactor. (This is a general requirement of feedback control for any closed loop control system, which a POSITA would understand is also as disclosed in Sherman and Egan). A POSITA would have understood that this is nothing more than the application of a known technique (feed-back closed loop control) to a known device (generator controller) for improvement to yield predictable results. A POSITA would also be motivated to combine Sherman and Egan as discussed in detail previously above.

i. [19.8] *wherein said generator controller is capable of operating said load step contactor to connect said load step resistor*

246. As discussed regarding element 19.6, controller 105 of Egan causes engagement of a selected load of one or more heaters of load bank 116, and controller 16 of Sherman includes switches that adjustably couple at least a portion

of resistor 24 to generator 14 by switches. It would be obvious in view of Sherman for the generator controller of Egan to be capable of operating a contactor to connect a portion of the load bank in a selected case, and a POSITA would also be motivated to make this combination to complete the overall system response feedback as part of monitoring the system inputs for system control. A POSITA would understand that it would be an obvious part of the feedback control for these control systems is to have the generator controller as shown in Sherman, capable of operating said load step contactor to connect said load step resistor. (This is a general requirement of feedback control for any closed loop control system, which a POSITA would understand is also as disclosed in Sherman and Egan). A POSITA would have understood that this is nothing more than the application of a known technique (feed-back closed loop control) to a known device (generator controller) for improvement to yield predictable results. A POSITA would also be motivated to combine Sherman and Egan as discussed in detail previously above.

j. [19.9] (*operating load step contactor*) in at least one of the following cases: *neglect and regeneration*

247. Egan discloses one or more of the heaters of load bank 118 is engaged in a neglect case to address carbon deposits. (**EX1006**, para. [0350].) For example, Egan discloses “As illustrated in FIG. 2, generator 10 includes a load bank 118. In order to avoid carbon deposits inside the exhaust manifold 115 on the engine in case of continuous no load or almost no load operation, the load bank 118 has been

designed to automatically load generator 10 with for example a 5 kW ventilated resistive load for 15 minutes every 3 hours when the output is less than 4 kW. When the requested load is more than 4 kW the load bank is automatically disconnected. Accordingly, load bank 118 may be connected/disconnected to receive an output originating from alternator 103 to impose a load on generator 10. Load bank 118 may be formed by, for example, one or more heaters, and may be controlled through load bank controls 1056 (FIG. 10). Data related to the automatic loading by load bank 118 may be transmitted to processing system 20. (**EX1006** para [0350]).

248. Sherman discloses the addition of at least a portion of resistor/load bank 24 is applied to increase load to aid in regeneration, and thus discloses operating the load step contactor in the case of regeneration. (**EX1010** Col. 1:61-67, 5:19-29, 5:42-49, 7:4-16.). For example, Sherman discloses “When the back-pressure signal reaches a predetermined threshold, the engine is set to or toward a speed in the lower portion of its range, and the engine loading is increased, whereby the temperature of the engine exhaust gases tends to increase, and the temperature of the filter also tends to increase, thereby aiding in regenerating the filter. (**EX1010** Col. 1:61-67). Sherman also discloses the addition of at least a portion of resistor/load bank 24 in a neglect case. (**EX1010** Col. 4:33-5:17; Figure 2.) For example, Sherman discloses: “As an example, for a diesel-electric hybrid

omnibus intended for urban use, the normal overall control of the engine speed may be dependent upon state of charge of the traction battery, traction demand, and other factors. The signals produced by filter control 32 tend to drive the engine speed toward a speed greater than idle, but less than about half-speed, but still under the control of controller 26....The increase of an idle speed to a speed above idle concurrently with the application of the increased load prevents the engine speed from dropping below idle. The decreasing of the engine speed from a higher speed concurrently with the application of an increased load tends to increase the exhaust gas temperature above what it might otherwise be. The increased exhaust temperature, in turn, aids in raising the filter temperature to the regeneration temperature.” (**EX1010** Col. 4:33-5:17; Figure 2.) Thus, it is my opinion that both Sherman and Egan disclose this element and that this element is obvious to a POSITA.

249. In addition, it is also my opinion that a POSITA would have found it obvious in view of Sherman for the generator controller of Egan to be capable of operating a contactor to connect a portion of the load bank in both a regeneration case and also in a neglect case. For example, a POSITA would have understood that both Sherman and Egan disclose the application of a known technique (feed-back closed loop control) to a known device (generator controller) for improvement to yield predictable results. In view of Sherman and Egan it is my

opinion that a POSITA would have found it obvious to have the (operating load step contactor) in at least one of the following cases: neglect and regeneration. A POSITA would understand that as an obvious part of feedback control for these types of control systems is to have the generator controller as shown in Sherman, read and monitor the system state input variables, as well as time periods of operation, and states of operation (e.g. neglect (as best can be understood given the lack of description in the Asserted Patent at issue) and regeneration, and then output the (operating load step contactor) in at least one of the following cases: neglect and regeneration. (A POSITA would consider this as an obvious and necessary part of the general requirement of feedback control for any closed loop control system, which a POSITA would understand is also as disclosed in Sherman and Egan). A POSITA would also be motivated to combine Sherman and Egan as discussed in detail previously above.

k. [19.10] wherein said generator controller is capable of operating said load step contactor to disconnect said load step resistor in case of a load spike

250. Egan discloses that the entire load bank 20 is disconnected in the event a load spike is detected. When the requested load, i.e. the actual load, is more than 4 kW load bank 20 is automatically disconnected. (**EX1006** para. [0350].) Sherman discloses the circuitry by which controller 26 controls the operation of switches of power controller 16 to deactivate resistor/load bank 24. (**EX1010** Col.

2:57-3:6, 5:1-18; Figure 2.) In view of Sherman it would be obvious to utilize the generator controller of Egan to issue signals to disconnect the load bank in the event of a load spike. Thus, it is my opinion that both Sherman and Egan disclose this element and that this element is obvious to a POSITA.

251. In addition, it is also my opinion that a POSITA would have found it obvious in view of Sherman for the generator controller of Egan to be capable of operating said load step contactor to disconnect said load step resistor in case of a load spike. For example, a POSITA would have understood that both Sherman and Egan disclose the application of a known technique (feed-back closed loop control) to a known device (generator controller) for improvement to yield predictable results. In view of Sherman and Egan it is my opinion that a POSITA would have found it obvious to have the generator controller monitor the system for load spikes and then disconnect the load step resistor in the case of a load spike to prevent overloading of the system, overheating of the system and or system damage, and also for overall safety reasons. A POSITA would understand that one of the goals of feedback control for these control systems is to have the generator controller as shown in Sherman, read and monitor the system state input variables, as well as time periods of operation, and states of operation, and a POSITA would have known it as obvious to monitor the system loads to determine if a load spike occurs and then disconnect the load step resistor to prevent overloading of the system,

overheating of the system, and/or system damage, and also for safety reasons. A POSITA would have been motivated to do this to reduce component and system failures as well as to extend reliability. A POSITA would consider monitoring the system for load spikes and then disconnecting the load step resistor in the case of a load spike as part of the natural and general requirements of feedback control for any closed loop control system (which a POSITA would understand is also as disclosed in Sherman and Egan). This is nothing more than applying a known technique (monitoring for load spikes and then shutting down system resistance in the case of a load spike) to a known device (the load bank resistors and their connection to the system) for improvement to yield predictable results (prevent overloading of the system, overheating of the system, and/or system damage, and also for safety reasons). A POSITA would also be motivated to combine Sherman and Egan as discussed in detail previously above.

a. Reason to Combine and Expectation of Success

252. Additional rationale regarding as to why a POSITA would combine Egan and Sherman are that both Egan and Sherman are directed to providing reliable electrical power generation using a diesel engine and alternator genset. Both recognize the problem with diesel generator exhaust accumulation and clogging, i.e. wet-stacking, and the use of a load bank to address the problem using similar components. (**EX1006** para. [0003], [0037], [0350]; **EX1010** Col. 3:39-53,

7:4-41.) Although Sherman discloses a genset that is mounted in a vehicle, that engine in some application is not used to directly propel the vehicle but generates electricity that is stored or applied to recharge for batteries and/or an electric motor. (**EX1010** Col. 1:28-44.) It would be obvious to a POSITA to utilize the genset/load bank control procedures of Sherman in the Egan genset/load bank control to address this common problem as recognized in all of these references and also since these references all have similar equipment. See also additional rationale for why a POSITA would combine Sherman with Egan as presented in detail previously.

2. Dependent Claims 22, 26-31, 34-36

a. Claim 22

253. Claim 22 depends from claim 19. Claim 22 adds the requirement of:

“a plurality of load step resistors.”

Egan discloses a plurality of load step resistors in the form of a load bank 118 formed by one or more heaters. (**EX1006** para. [0350].) Sherman likewise discloses resistor/load bank 24 may be selectively engaged in portions and the load is adjustable to a desired level. (**EX1010** Col. 7:47-51, claims 1-4.) Moreover, it was known to have and selectively apply a plurality of resistors in a load bank via selected contactors to select a load to be applied. It would be obvious in view of Sherman that the Egan resistor/load bank would be made of a plurality of load step

resistors. The use of a plurality of load step resistors is obvious to a POSITA, and is nothing more than the simple substitution of one known element (load step resistors) for another (one or more heaters) to obtain predictable results (increase resistance). A POSITA would have also known that many heating elements are based on resistors and increasing resistance to increase heat that is dissipated by the system. Use of a plurality of load step resistors in view of Sherman to the Egan resistor/load bank is nothing more than a known technique to improve similar devices (a load bank as used for engine exhaust) in the same way, and a POSITA would have recognized as applying a known technique (variable resistive loading, and/or variable resistive heating – applying a basic physical principle - as resistance increases – heat increases) to a known device (load bank) to yield predictable results (increasing the load resistance for increased heat). See also additional rationale for why a POSITA would combine Sherman with Egan as presented in detail previously.

b. Claim 26

254. Claim 26 depends from claim 19. Claim 26 adds the requirement of:
“the engine is a diesel engine.”

Both Egan and Sherman disclose the engine is diesel (EX1010 col.4:60-61 “diesel-electric hybrid omnibus”, **EX1006** [0066] “a diesel powered engine”) and this element is not only explicitly disclosed in each reference taken alone but is also

obvious in view of the combination of references. See also additional rationale for why a POSITA would combine Sherman with Egan as presented in detail previously.

c. Claim 27

255. Claim 27 depends from claim 19. Claim 27 adds the requirement of:

“the engine is a Tier IV Interim or newer diesel engine.”

As of 2012, essentially all stationary gensets were required to meet Tier IV Interim Standards. (See 40 CFR §§1039.1, 1039.102; **EX1016**.) It would be obvious in view of Egan and Sherman that at least by 2012 the genset would be obligated to meet Tier IV Interim requirements. It is my opinion that a POSITA would have known that stationary gensets at the time of the invention are required to meet Tier IV Interim Standards based on working experience from working in the industry. It is also my opinion that Egan in view of Sherman and also in further view of Van Niekerk 2 renders this element obvious to a POSITA, and Niekerk 2 specifically states: “These aftertreatment systems are configured to meet or exceed certain emissions standards, such as the present EPA Tier 4 Interim and Tier 4 Final requirements. Stationary diesel-powered generators tend to include Substantial diesel engines that produce large Volumes of exhaust that needs to be treated before release into the atmosphere.” (**EX1005**, Col. 3:1-6.) Van Niekerk 2 also discloses Tier 4 Regulations Affect More than Engines, Jun. 6, 2011, downloaded

from <http://www.power-eng.com/articles/pring/volume-115/issue-6/features/tier-4-regulations-af>. (*EX1005*, page 2 OTHER PUBLICATIONS) Rationale for how a POSITA would have been motivated to combine Egan and Van Niekerk 2 as well as Van Niekerk and Egan and Sherman have been already discussed and also would apply to this element as well. Please see previous detailed discussions presented above.

d. Claim 28

256. Claim 28 depends from claim 19. Claim 28 adds the requirement of:

“said alternator, output bus, load bank bus, and at least one load step resistor comprise a poly-phase electrical system.”

Egan discloses the generator system is a three-phase system and thus is poly-phase, and it would be obvious that the combination of Egan and Sherman would include a poly-phase system. (*EX1006* para. [0160].) Please see previous discussion regarding Egan’s disclosure of a polyphase system and three-phase electrical system above. A POSITA would find nothing in Sherman that prevents the use of Egan’s Polyphase and/or three-phase electrical system, but would be motivated to do so for the extensive list of advantages cited previously above.

e. Claim 29

257. Claim 29 depends from claim 19. Claim 29 adds the requirement of:

“said alternator, output bus, load bank bus, and at least one load step resistor comprise a three-phase electrical system.”

Egan discloses the generator system is a three-phase system and it would be obvious that the combination of Egan and Sherman would include a poly-phase system. (**EX1006** para. [0160].) Please see previous discussion regarding Egan's disclosure of a polyphase system and three-phase electrical system above. A POSITA would find nothing in Sherman that prevents the use of Egan's Polyphase and/or three-phase electrical system, but would be motivated to do so for the extensive list of advantages cited previously above.

f. Claim 30

258. Claim 30 depends from claim 19. Claim 30 adds the requirement of:

“a common base and enclosure.”

Egan discloses the genset and load bank have a common base and it would be obvious the combination of Egan and Sherman would have a common base. (**EX1006** para. [0041], Figures 2-3.) Please see previous discussion regarding Egan's disclosure of a common base and enclosure. A POSITA would find nothing in Sherman that prevents the use of Egan's common base and enclosure and the use of this is just a simple of design choice to a POSITA and applying a known method to a known product to yield the predictable results as discussed previously above. Please see discussion regarding this claim element previously presented above.

g. Claim 31

259. Claim 31 depends from claim 19. Claim 31 adds the requirement of:

“said at least one load step resistor is physically located in an enclosure connected to the radiator of said engine.”

Egan discloses the load bank is at the exhaust of the genset’s enclosure and it is obvious the combination of Egan and Sherman would have the load bank at the engine radiator of the genset enclosure. (*EX1006* para. [0041], Figures 2-3.)

Sherman discusses the use of a diesel engine in a hybrid vehicle (as discussed previously above). It is my opinion that a POSITA would have been readily known that the engine compartment of a car, truck, and vehicle is an enclosure that contains a radiator (necessary for cooling the vehicle engine) and that the placing of a load step resistor in an enclosure (e.g. engine compartment with vehicle hood) is nothing more than choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success, and that such a design choice would have been readily known to a POSITA depending on the packaging space available in the engine compartment and would also be obvious to try.

h. Claims 34

260. Claim 34 depends from claim 19. Claim 34 adds the requirement of:

“the generator controller is configured to operate said load step contactor to disconnect said load step resistor within 10 seconds.”

The specification assigns no significance to this time, with claims 33, 34 and 35

representing a conventional logarithmic progression. Egan discloses an overload protection that disengages voltage after a programmed delay (nominally 5-10 seconds) (**EX1006** para. [0220]) and disconnecting load bank 118 in the event of a load spike. (**EX1006** para. [0350].) For example, Egan discloses “SR7 regulators may be provided with an under-speed protection with an intervention threshold which can be adjusted by the potentiometer marked “Hz”. This protection intervenes instantaneously by reducing the alternator voltage to a safe value when the frequency falls below 10% of the nominal value. These regulators may also have inherent overload protection which senses the exciter field voltage value. Should this field voltage value exceed the nominal value for a period of more than 20 seconds, then the alternator voltage is automatically reduced to a safe operating level. This overload function has a built-in delay to allow for the overload when starting motors (normally 5-10 seconds). The operating threshold of this protection device is adjustable by the potentiometer marked “AMP”.” (**EX1006** para. [0220]) Egan also discloses “As illustrated in FIG. 2, generator 10 includes a load bank 118. In order to avoid carbon deposits inside the exhaust manifold 115 on the engine in case of continuous no load or almost no load operation, the load bank 118 has been designed to automatically load generator 10 with for example a 5 kW ventilated resistive load for 15 minutes every 3 hours when the output is less than 4 kW. When the requested load is more than 4 kW the load bank is automatically

disconnected. Accordingly, load bank 118 may be connected/disconnected to receive an output originating from alternator 103 to impose a load on generator 10. Load bank 118 may be formed by, for example, one or more heaters, and may be controlled through load bank controls 1056 (FIG. 10). Data related to the automatic loading by load bank 118 may be transmitted to processing system 20.” (*EX1006* para. [0350].) It would be obvious to a POSITA that the combination of Egan and Sherman would include a load bank disconnect with a delay to address common fluctuations, adjustable to one time in a conventional progression in view of their commonplace use in controllers. A POSITA would have understood, as shown above, as disclosed in Egan, that the delay timer can be adjusted and that it would have been obvious to include a conventional logarithmic progression of settings of 0.1, 1, 10 seconds and greater. A POSITA would have understood that it would have been obvious to include a load bank disconnect with a delay to address common fluctuations, adjustable to one time in a conventional progression in view of their commonplace use in controllers. For example, as discussed above, a POSITA would have motivation to combine Sherman and Egan. For example, these references both relate to electric power generators and the control and control systems for electric power generators, are all in the same field, namely power generators and the related controllers and control systems, and a POSITA would naturally look to Egan in combination with Sherman for how to set the

specifications for the electric power generators and control systems. These references have similar structures and components (e.g. loads that can be engaged/disengaged, engines, alternators/generators) and also address common problems, for example electric power systems. These references all also disclose electric power systems for the case of extended periods of time of operation and the monitoring of operating conditions and the automatic adjustment of control parameters and time delays that can be set for initiation of state and system changes based on system parameters and times of operations. These references also include adjustment of system loads during operation. Thus a POSITA would have understood that these references are in the same fields of endeavor and would have readily looked to all of these references for known techniques to improve similar devices in the same well-known ways. It would have been obvious to a POSITA to combine Sherman and Egan to explicitly and specifically set “the generator controller [that] is configured to operate said load step contactor to disconnect said load step resistor within 10 seconds” for example (as stated in Egan) to have the amount of time that that can be set adjustable to allow for transient electrical fluctuations based on the system parameters. It would have been obvious for a POSITA to combine these references to not disengage and disconnect the load step resistors (load bank) for small duration erratic electrical fluctuations which may readily occur during normal operation (as part of system

electrical noise). A POSITA would have understood, that by combining the delay timer as disclosed Egan to the Sherman controllers that this would have yielded the predictable and desirable result of not disengaging the load bank resistors for transient short-duration electrical fluctuations that would readily disappear once the system returns to steady state operation. The choice of a 10 second duration is simply a matter of design choice to a POSITA, and nothing more than combining prior art elements according to known methods to yield predictable results (e.g. preventing load bank disengagement for minor transient short duration transient fluctuations) and also a simple substitution of one known element for another to obtain predictable results (e.g. not disengaging the load bank resistors so that normal burning and cleaning of soot particles can continue to occur). Since Egan discloses that the delay time is adjustable, a POSITA would have readily understood that this delay time is just a simple matter of design choice to a POSITA, based on the particular system application, and a POSITA would have a reasonable expectation of success in choosing the delay time based on the observations of the particular system during normal operation, and the 10 second time explicitly stated in this claim is just one of numerous predictable solutions that would be obvious to try. Please see also previous detailed discussions presented above.

i. Claim 35

261. Claim 35 depends from claim 19. Claim 36 adds the requirement of:

“the generator controller is configured to operate said load step contactor to disconnect said load step resistor within 1 seconds.”

The specification assigns no significance to this time, with claims 33, 34 and 35 representing a conventional logarithmic progression. Egan discloses an overload protection that disengages voltage after a programmed delay (nominally 5-10 seconds) (**EX1006** para. [0220]) and disconnecting load bank 118 in the event of a load spike. (**EX1006** para. [0350].) It would be obvious to a POSITA that the combination of Egan and Sherman would include a load bank disconnect with a delay to address common fluctuations, adjustable to one time in a conventional progression in view of their commonplace use in controllers. As discussed above, Egan discloses a selectively adjustable delay timer. As discussed above, a POSITA would have readily looked to the Egan as an example of using the adjustable delay timer to disconnect the load step resistors and also for a disconnect of load, including all load. Example delays shown in Egan are 5-10 seconds and 20 seconds but these are time periods are not limited by Egan and are exemplary. A POSITA would have understood that these delay times can be adjustable and set as a conventional logarithmic progression of settings of 0.1, 1, 10 seconds and greater. It would be obvious to include a load bank disconnect with a delay to address common fluctuations, adjustable to one time in a conventional

progression in view of their commonplace use in controllers. As stated for claim 34 above, the setting of the delay time to 1 second instead of 10 seconds, is just a matter of design choice to a POSITA and would have been obvious to try and a POSITA would have had a reasonable expectation of success in combining a delay timer of different delay times that are adjustable, examples of which are shown in Egan. The rationale given for motivation to combine as stated for claim 34 also applies to claim 35.

j. Claim 36

262. Claim 36 depends from claim 19. Claim 36 adds the requirement of:

“the generator controller is configured to operate said load step contactor to disconnect said load step resistor within 0.1 seconds.”

The specification assigns no significance to this time, with claims 33, 34 and 35 representing a conventional logarithmic progression. Egan discloses an overload protection that disengages voltage after a programmed delay (nominally 5-10 seconds) (**EX1006** para. [0220]) and disconnecting load bank 118 in the event of a load spike. (**EX1006** para. [0350].) It would be obvious the combination of Egan and Sherman would include a load bank disconnect with a delay to address common fluctuations, adjustable to one time in a conventional progression in view of their commonplace use in controllers. As discussed above, Egan discloses a selectively adjustable delay timer. As discussed above, a POSITA would have readily looked to the Egan as an example of using the adjustable delay timer to

disconnect the load step resistors and also for a disconnect of load, including all load. Example delays shown are 5-10, and 20 seconds, and these are exemplary and not limited in Egan. A POSITA would have understood that these delay times can be adjustable and set as a conventional logarithmic progression of settings of 0.1, 1, 10 seconds and greater. It would be obvious to include a load bank disconnect with a delay to address common fluctuations, adjustable to one time in a conventional progression in view of their commonplace use in controllers. As stated for claim 34 above, the setting of the delay time to 0.1 second instead of 10 seconds, is just a matter of design choice to a POSITA and would have been obvious to try and a POSITA would have had a reasonable expectation of success in combining a delay timer, examples of which are shown in Egan. The rationale given for motivation to combine as stated for claim 34 also applies to claim 36.

K. Ground 6: Claims 32-36 Are Obvious Over the combination of Egan and Sherman, and Further Combination with Miyoshi, Eaton, or DSE Manual 7 or DSE Manual 9

263. Claim 19 is obvious in view of Egan and Sherman as previously discussed in Section J.

a. Claim 32

264. Claim 32 depends from claim 19. Claim 32 adds the requirement of:

“said at least one load step resistor is located remotely from said engine-generator.”

Miyoshi discloses a load bank comprising a plurality of selectively engaged resistors R1-R8 located in a main body section 2 that is separate from an engine generator to which it is coupled. (**EX1028** para. [0013], [0017], [0019], Figure 2.) For example, Miyoshi describes: “Field of the Invention The present invention relates to a load test device, and more particularly to a load test device for a generator” (EX1028 para. [0001]) For example, Miyoshi discloses: “As described above, according to the present invention, a plurality of resistors to which the output voltage of the generator is applied and at least one of the plurality of resistors are selectively connected to the generator to generate the power. A load circuit that generates a test load for the generator, and a load test device having a rated voltage value and a rated power value of the generator and a test power value or a test current value, and an input unit Calculate the test resistance value required to generate the test load from the rated voltage value and the rated power value, the test power value or the test current value, and the test from the plurality of resistors. In addition to selecting the resistor required to generate a resistance value, the calculation means for outputting the selection result as a signal, and the resistor necessary for generating the resistance value by the input of the signal to the load circuit. Since the configuration has a control circuit to be connected, if the rated voltage value and the rated power value and the test power value or the test current value are input to the input means, the arithmetic means automatically

calculates the test load value. Further, it becomes possible to automatically select the resistor used in the test and output the result, and the control circuit can select the resistor required for the load test according to the output signal.” (**EX1028** para. [0013]) For example, Miyoshi discloses “Further, as shown in FIG. 1, the electrical configuration of the main body 2 and the input unit 3 is such that the touch panel 31 of the load test apparatus 1 has a programmable controller as a computing unit that processes data input from the touch panel 31. 13 is connected to the programmable controller 13. Further, the programmable controller 13 is connected to a control circuit 11 such as an electromagnetic contactor or an electromagnetic contactor for controlling the operation of the cooling fan 4 for cooling the main body 2...A control circuit 11 such as an electromagnetic contactor is connected so as to control the operations of the electromagnetic contactors M1 to M8. Further, the electromagnetic contactors M1 to M8 are provided so as to open and close an electric path connecting the resistor groups R1 to R8 input as a test load and the generator 6 to be tested. As a power source for the control circuit 11 such as an electromagnetic contactor and the cooling fan 4, a cooling fan and a control circuit power source 5 which are commercial power sources of single-phase 100V and 50/60 Hz are used. This is because the rated voltage, the frequency, etc. of the generator 6 to be tested are not specified and are

not suitable for use as the cooling fan and the power supply for the control circuit, so that it is necessary to secure a separate power supply.” (**EX1028** para. [0019]).

265. Egan, Sherman and Miyoshi all disclose load banks coupled with gensets and it would be obvious the combination of Egan and Sherman may have the load bank located remotely from the genset in a conventional manner. Miyoshi, similar to Sherman and Egan, as well as Eaton and the DSE Manuals, all disclose similar structures, components, and subject matter (e.g. genset controllers, load banks composed of resistors, variable inputs to controllers and the measurement of output parameters from the controllers), and also all disclose measuring and/or monitoring system parameters to control modules and/or using control modules. As evidenced by Miyoshi, it was well known to a POSITA to have at least one load step resistor that is located remotely from the engine-generator, since for example, Miyoshi discloses a load bank comprising a plurality of selectively engaged resistors R1-R8 located in a main body section 2 that is separate from an engine generator to which it is coupled. As disclosed, for example in Miyoshi, a POSITA would have readily employed the use of at least one load step resistor that is located remotely from said engine-generator, as a readily available technique substituted for another, and would have had at the very least a reasonable expectation of success in doing so, and this substitution would have just been a matter of simple design choice to a POSITA, with the predictable outcome of

providing an adjustable resistance load bank for input to the genset and genset controller. A POSITA would have readily understood that the use of this bank of resistors provides the opportunity to use commercial off-the-shelf components that were readily available, standardized, and relatively in-expensive, and thus would have been motivated to make such a design choice with a reasonable expectation of success in doing so. Using at least one load step resistor that is located remotely from said engine-generator was well known and obvious to a POSITA (as shown in Miyoshi), and combining Miyoshi with Egan, Eaton, Sherman, as well as the DSE Manuals is just combining prior art elements according to known methods to yield predictable results (availability of ready off-the-shelf commercially available components), and a simple substitution of one known element (at least one load step resistor that is located remotely from the engine-generator, and/or a load bank comprising a plurality of selectively engaged resistors R1-R8 located in a main body section 2 that is separate from an engine generator to which it is coupled) for another to obtain predictable results (commonly available off-the-shelf components to use as inputs to the genset and/or genset controller), and also the use of a known technique to improve similar devices (gensets and/or genset controllers and the related test input of these components) in the same way (provide a method to vary the resistive load inputs using off-the-shelf components) for testing or controlling the system. Please see also previous discussions as to why a POSITA would find it

obvious and be motivated to combine all of these references that has been provided previously and which likewise also apply to this section.

b. Claim 33

266. Claim 33 depends from claim 19. Claim 33 adds the requirement of:

“the generator controller and engine control module are configured to communicate via SAE J1939 protocol.”

Eaton (**EX1007**) discloses a genset 150 having a diesel engine 150 and alternator 154 in which an ECM 160 communicates with a genset controller 100 using the J1939 protocol and CAN communications. It would be obvious to use a well-recognized standard used with gensets in an Egan and Sherman genset in view of Eaton as an obvious design choice to provide standardized communications.

267. It would be obvious for the combination of Egan and Sherman to utilize J1939 protocol to allow for ease of diagnostics and communications when in a trailer or other CAN based communication. (**EX1019.**) Eaton (EX1007 Col. 5:38-42) discloses a genset 150 having a diesel engine 150 and alternator 154 in which an ECM 160 communicates with a genset controller 100 using the J1939 protocol and CAN communications. It would be obvious to use a well-recognized standard used with gensets in Egan and/or Sherman in view of Eaton as an obvious design choice to provide the predictable result and benefit of standardized communications, please see detailed discussion provided previously above.

c. Claims 34

268. Claim 34 depends from claim 19. Claim 34 adds the requirement of:

“the generator controller is configured to operate said load step contactor to disconnect said load step resistor within 10 seconds.”

The specification assigns no significance to this time, with claims 33, 34 and 35 representing a conventional logarithmic progression. This is a conventional logarithmic progression of settings of 0.1, 1, 10 seconds and greater that is widely used in electronic sensors and controls. The ‘651 patent includes no disclosure relating to these particular times other than that of the claims, and there is no significance placed on these times.

269. Eaton discloses a shutdown or partial shutdown command is issued if a parameter is exceeded for a set duration, with an example of 10 second windows disclosed. (**EX1007**, Col. 9:39-10:15, 13:19-33.) The claimed times represent an arbitrary selection of a logarithmic progression of seconds, and would be obvious to a POSITA to use as delays in Egan and Sherman in view of Eaton and their commonplace use in controllers to address common fluctuations, adjustable to this one time in a conventional progression in view of their commonplace use in controllers.

270. In the alternative, DSE Manual discloses that a selectively adjustable delay timer is used to disconnect the load step resistors and also for a disconnect of load, including all load. (**EX1008** p. 73-74; **EX1032** p. 75-76.) One example delay

shown is 5 seconds. Another delay timer disclosed in DSE Manual shows a conventional logarithmic progression of settings of 0.1, 1, 10 seconds and greater. (*EX1008* p. 95; *EX1032* p. 97-101.) Particularly in view of the '651 specification placing no significance on these times, these times represent an arbitrary selection of a logarithmic progression of seconds, and would be obvious in view of DSE Manual which was designed to control systems such as Egan and Sherman to use these delays to address common fluctuations, adjustable to this one time in a conventional progression in view of their commonplace use in controllers. Please see previous discussions regarding these claim elements and also rationale as to why a POSITA would be motivated to combine all of these references and also as to how these references render this claim limitation obvious, as discussed in detail above.

d. Claim 35

271. Claim 35 depends from claim 19. Claim 36 adds the requirement of:

“the generator controller is configured to operate said load step contactor to disconnect said load step resistor within 1 seconds.”

As discussed in the previous section regarding claim 34, the specification assigns no significance to this time, with claims 33, 34 and 35 representing a conventional logarithmic progression. Eaton and DSE Manual disclose subject matter as discussed regarding claim 34, which are incorporated here. Particularly in view of the '651 specification placing no significance on these times, these times represent

an arbitrary selection of a logarithmic progression of seconds, and would be obvious in view of Eaton or DSE Manual which was designed to control systems such as Egan and Sherman to use these delays to address common fluctuations, adjustable to this one time in a conventional progression in view of their commonplace use in controllers. Please see previous discussions regarding these claim elements and also rationale as to why a POSITA would be motivated to combine all of these references and also as to how these references render this claim limitation obvious, as discussed in detail above.

e. Claim 36

272. Claim 36 depends from claim 19. Claim 36 adds the requirement of:

“the generator controller is configured to operate said load step contactor to disconnect said load step resistor within 0.1 seconds.”

As discussed in the previous section regarding claim 34, the specification assigns no significance to this time, with claims 33, 34 and 35 representing a conventional logarithmic progression. Eaton and DSE Manual disclose subject matter as discussed regarding claim 34, which are incorporated here. Particularly in view of the ‘651 specification placing no significance on these times, these times represent an arbitrary selection of a logarithmic progression of seconds, and would be obvious in view of Eaton or DSE Manual which was designed to control systems such as Egan and Sherman to use these delays to address common fluctuations, adjustable to this one time in a conventional progression in view of their

commonplace use in controllers. Please see previous discussions regarding these claim elements and also rationale as to why a POSITA would be motivated to combine all of these references and also as to how these references render this claim limitation obvious, as discussed in detail above.

L. Ground 7: Claims 1, 4, 8-13, 16-18 Are Obvious Over the combination of Egan and Sherman and Further Combination with DSE Manual 7 or 9, and Aoki

1. Independent Claim 1

273. For those elements of claim 1 that are substantially identical to an element of claim 19, reference is made to the analysis detailed above with regard to claim 19, with the understanding that the corresponding analysis equally applies. Please see the detailed discussions presented previously above.

a. [1.0 Preamble] *An engine-generator and load bank system comprising*

274. To the extent the preamble is a limitation, Egan and Sherman each disclose this limitation as discussed in Section J.1.a.

b. [1.1] *an engine mechanically connected to and capable of driving an alternator*

275. This limitation is obvious in view of the combination of Egan and Sherman as discussed in Section J.1.b.

c. [1.2] *said engine having an engine control module and a particulate filter*

276. This limitation is obvious in view of the combination of Egan and Sherman as discussed in Section J.1.c.

d. [1.3] *said alternator in electrical communication with an output bus and a load bank bus*

277. This limitation is obvious in view of the combination of Egan and Sherman as discussed in Section J.1.d.

e. [1.4] *at least one load monitoring device in electrical communication with said output and load bank buses*

278. Egan discloses controller 105 is communicative with and provides control signals to engine 101 and thus to the engine ECU. (See *EX1006*, ¶¶ [0041]-[0042], [0221]-[0255].) Sherman's electrical controller 26 provides signals to engine 12 via signal path 38 to which the engine is responsive, and also "knows" or monitors the actual load to traction motor 18, as well as the load to battery 22 and load bank 24, and thus the output and load bank buses. (*EX1010* Col. 2:59-3:6, 6:4-58.) It would be obvious in view of Sherman for the controller of the generator of Egan to comprise a load monitoring device providing communication with an output bus and load bank bus. Please also see previous discussions regarding these claim elements and also rationale as to why a POSITA would be motivated to combine all of these references and also as to how these references render this claim limitation obvious, as discussed in detail above.

f. [1.5] *a generator controller comprising a load dump output and a load enable output*

279. Egan and Sherman both disclose controllers to control the engagement of a load bank, while DSE Manuals 7 and 9 disclose a controller for controlling gensets such as those of Egan and Sherman, and having a dummy load enable signal and a separate dummy load shedding signal that operates as a load dump signal. (**EX1008** p. 78-79.) Aoki discloses it was known to provide separate output connections between two controllers, one to enable a device and another to cut-off the device in order to improve reliability. (**EX1009** ¶¶ [0002]-[0003].) It would be obvious in view of DSE Manual 7 or 9 and Aoki for the Egan/Sherman combination to use a separate connector for a load cut-off/dump between controllers. Please see previous discussions regarding these claim elements and also rationale as to why a POSITA would be motivated to combine all of these references and also as to how these references render this claim limitation obvious, as discussed in detail above.

g. [1.6] *said generator controller in electrical communication with said engine control module*

280. This limitation is obvious in view of the combination of Egan and Sherman as discussed in Section J.1.e. Please see previous discussions regarding these claim elements and also rationale as to why a POSITA would be motivated to combine all of these references and also as to how these references render this claim limitation obvious, as discussed in detail above.

- h. [1.7] *a load bank controller comprising a load enable input, a load dump input, a load sensor, and at least one load step output***

281. Sherman discloses controller 16 receives signals from controller 26 and includes power switches and thus a load step output, and the system knows the load outputs and thus sensors. (**EX1010** Fig. 1; Col. 2:59-64, 6:4-51.) As discussed at L.1.f., it would be obvious in view of DSE Manual and Aoki for Egan/Sherman to include a cut-off/dump output separate from the load enabling. Please see previous discussions regarding these claim elements and also rationale as to why a POSITA would be motivated to combine all of these references and also as to how these references render this claim limitation obvious, as discussed in detail above.

- i. [1.8] *said load dump output in electrical communication with said load dump input***
- j. [1.9] *said load enable output in electrical communication with said load enable input***
- k. [1.10] *said load monitoring device in electrical communication with said load sensor***

282. It would be obvious in view of DSE Manuals 7 or 9 and Aoki for these controller connections and monitoring device to communicate. See Sections L.1.f. and L.1.h. Please see previous discussions regarding these claim elements and also rationale as to why a POSITA would be motivated to combine all of these

references and also as to how these references render this claim limitation obvious, as discussed in detail above.

- l. [1.11] *at least one load step contactor in electrical communication with said at least one load step output; and***

283. It would be obvious in view of DSE Manual and Aoki for this communication. See Sections L.1.f. and L.1.h. Please see previous discussions regarding these claim elements and also rationale as to why a POSITA would be motivated to combine all of these references and also as to how these references render this claim limitation obvious, as discussed in detail above.

- m. [1.12] *at least one load step resistor in electrical communication with said load bank bus by way of said at least one load step contactor***

284. Sherman discloses controller 16 includes contactors that couple portions of resistor 234, and in view of DSE Manual and Aoki this requirement is obvious. (**EX1010** 7:47-52.) Please see previous discussions regarding these claim elements and also rationale as to why a POSITA would be motivated to combine all of these references and also as to how these references render this claim limitation obvious, as discussed in detail above.

- n. [1.13] *wherein said generator controller provides a control signal via said load enable output***

285. It would be obvious in view of DSE Manual and Aoki for this communication. See Sections L.1.f. and L.1.h. Please see previous discussions regarding these claim elements and also rationale as to why a POSITA would be motivated to combine all of these references and also as to how these references render this claim limitation obvious, as discussed in detail above.

o. [1.14] (*operating load step contactor*) in at least one of the following cases: neglect and regeneration; and

286. This limitation is obvious in view of the combination of Egan and Sherman as discussed in Section J.1.j. Please see previous discussions regarding these claim elements and also rationale as to why a POSITA would be motivated to combine all of these references and also as to how these references render this claim limitation obvious, as discussed in detail above.

p. [1.15] *wherein said generator controller provides a control signal via said load dump output in case of a load spike*

287. DSE Manual 7 and 9 disclose that upon the system load exceeding a preset limit, the controller reduces or sheds the load bank. (*EX1008* p. 74; *EX1032* p. 76.) This limitation is obvious in view of the combination of Egan and Sherman as discussed in Section J.1.j. Please see previous discussions regarding these claim elements and also rationale as to why a POSITA would be motivated to combine all of these references and also as to how these references render this claim limitation obvious, as discussed in detail above.

q. Rationale to combine and reasonable expectation of success

288. Please see previous discussions regarding these claim elements and also rationale as to why a POSITA would be motivated to combine all of these references and also as to how these references render this claim limitation obvious, as discussed in detail above. Furthermore, as discussed at Section J.1.I., Eagan and Sherman are both diesel gen-sets that address problems of wet stacking using a resistive load bank in a known manner. A POSITA would expect the similar technology would be combined and cooperatively operate in a known and predictable fashion to successfully reduce accumulations clogging the exhaust which would reduce the gen-set's efficiency. DSE Manuals also discloses load bank controls for diesel gen-sets to address the problem of wet stacking using separate load bank enabling and load dump signals. Eagan and Sherman are types of gen-sets that DSE Manuals were designed to control and operate, such that a POSITA would consider it obvious to use the DSE Manual 7 or 9 with Eagan and Sherman and expect to succeed as operating in a predictable manner. Aoki discloses a known separate cut-off output connection between two controllers to increase reliability, and use of Aoki's separate wires between two controllers with DSE Manual's two signals in order to improve reliability would produce predictable results.

2. Dependent Claims 4, 8-13, 16-18

a. Claim 4

289. Claim 4 depends from claim 1. Claim 4 adds the requirement of:
“a plurality of load step resistors.”

This claim is obvious for the reasons discussed at J.2.a. Please see previous discussions regarding these claim elements and also rationale as to why a POSITA would be motivated to combine all of these references and also as to how these references render this claim limitation obvious, as discussed in detail above.

b. Claim 8

290. Claim 8 depends from claim 1. Claim 8 adds the requirement of:
“the engine is a diesel engine.”

291. This claim is obvious for the reasons discussed at J.2.b. Please see previous discussions regarding these claim elements and also rationale as to why a POSITA would be motivated to combine all of these references and also as to how these references render this claim limitation obvious, as discussed in detail above.

c. Claim 9

292. Claim 9 depends from claim 1. Claim 9 adds the requirement of:
“the engine is a Tier IV Interim or newer diesel engine.”

293. This claim is obvious for the reasons discussed at J.2.c. Please see previous discussions regarding these claim elements and also rationale as to why a

POSITA would be motivated to combine all of these references and also as to how these references render this claim limitation obvious, as discussed in detail above.

d. Claim 10

294. Claim 10 depends from claim 1. Claim 10 adds the requirement of:

“said alternator, output bus, load bank bus, and at least one load step resistor comprise a polyphase electrical system.”

295. This claim is obvious for the reasons discussed at J.2.d. Please see previous discussions regarding these claim elements and also rationale as to why a POSITA would be motivated to combine all of these references and also as to how these references render this claim limitation obvious, as discussed in detail above.

e. Claim 11

296. Claim 11 depends from claim 1. Claim 11 adds the requirement of:

“said alternator, output bus, load bank bus, and at least one load step resistor comprise a three-phase electrical system.”

297. This claim is obvious for the reasons discussed at J.2.e. Please see previous discussions regarding these claim elements and also rationale as to why a POSITA would be motivated to combine all of these references and also as to how these references render this claim limitation obvious, as discussed in detail above.

f. Claim 12

298. Claim 12 depends from claim 1. Claim 12 adds the requirement of:

“a common base and enclosure.”

299. This claim is obvious for the reasons discussed at J.2.f. Please see previous discussions regarding these claim elements and also rationale as to why a POSITA would be motivated to combine all of these references and also as to how these references render this claim limitation obvious, as discussed in detail above.

g. Claim 13

300. Claim 13 depends from claim 1. Claim 13 adds the requirement of:

“said at least one load step resistor is physically located in an enclosure connected to the radiator of said engine.”

301. This claim is obvious for the reasons discussed at J.2.g. Please see previous discussions regarding these claim elements and also rationale as to why a POSITA would be motivated to combine all of these references and also as to how these references render this claim limitation obvious, as discussed in detail above.

h. Claim 16

302. Claim 16 depends from claim 1. Claim 16 adds the requirement of:

“the generator controller is configured to provide said control signal to said load dump output within 10 seconds.”

303. This claim is obvious for the reasons discussed at J.2.h. Please see previous discussions regarding these claim elements and also rationale as to why a POSITA would be motivated to combine all of these references and also as to how these references render this claim limitation obvious, as discussed in detail above.

i. Claim 17

304. Claim 17 depends from claim 1. Claim 17 adds the requirement of:

“the generator controller is configured to provide said control signal to said load dump output within 1 second.”

305. This claim is obvious for the reasons discussed at J.2.h. Please see previous discussions regarding these claim elements and also rationale as to why a POSITA would be motivated to combine all of these references and also as to how these references render this claim limitation obvious, as discussed in detail above.

j. Claim 18

306. Claim 18 depends from claim 1. Claim 18 adds the requirement of:

“the generator controller is configured to provide said control signal to said load dump output within 0.1 second.”

307. This claim is obvious for the reasons discussed at J.2.h. Please see previous discussions regarding these claim elements and also rationale as to why a POSITA would be motivated to combine all of these references and also as to how these references render this claim limitation obvious, as discussed in detail above.

M. Ground 8: Claims 14, 15 Are Obvious Over the Combination of Egan, Sherman, DSE Manual and Aoki, and Further Combination with Miyoshi or Egan

1. Claim 14

308. Claim 14 depends from claim 1. Claim 14 adds the requirement of:

“said at least one load step resistor is located remotely from said engine-generator.”

309. This claim is obvious further in view of Miyoshi as discussed at Section K regarding claim 32, with the predictable results not changing operation of the components. Please see previous discussions regarding these claim elements and also rationale as to why a POSITA would be motivated to combine all of these references and also as to how these references render this claim limitation obvious, as discussed in detail above.

2. Claim 15

310. Claim 15 depends from claim 1. Claim 15 adds the requirement of:

the generator controller and engine control module are configured to communicate via SAE J1939 protocol.

311. This claim is obvious further in view of Eaton as discussed at Section K regarding claim 33, with predictable results of standardized communications and ease of diagnostics and communication. Please see previous discussions regarding these claim elements and also rationale as to why a POSITA would be motivated to combine all of these references and also as to how these references render this claim limitation obvious, as discussed in detail above.

VIII. SECONDARY CONSIDERATIONS

312. In the parallel District Court proceeding Multiquip asserted that it does not practice the claimed invention of the ‘651 Patent. (**EX1023, EX1024.**) I

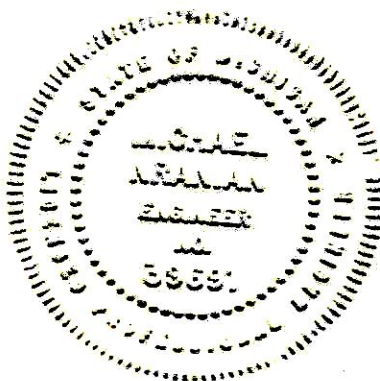
am unaware of any objective evidence of nonobviousness relating to the '651 patent.

IX. CONCLUSION

313. It is my opinion that the asserted claims of the Asserted Patents are invalid as anticipated and/or obvious for the reasons discussed above.

I declare under penalty of perjury under the laws of the State of Michigan and the United States of America that the foregoing statements are true and correct.
Dated this 17th day of November, 2023.

Michael Nranian P.E.
Michael Nranian P. E.



Michael Nranian

Expert in Intellectual Property & Product Liability

10945 Stoney Point • South Lyon, MI 48178

Cell: 248-376-0338 • Fax: 248-446-4052

WEBSITE: trialexpertwitness.com

Emails: mnranian@charter.net

mnranian@peoplepc.com

Education

Wayne State University

MS Electrical Engineering, 1991

BS Electrical & Computer Engineering, 1993

BS Chemical Engineering, 1984

Juris Doctor, 1999

University of Michigan

MBA, 2002



Qualifications: Six Sigma Black Belt – American Society for Quality & International Quality Federation; Licensed Professional Engineer; Certified Project Management Professional; Eagle Scout; Accident Reconstruction – Northwestern University; Active Secret Security Clearance; Certified Information System Security Professional CISSP, Security+, Network+, SANS 566 Security Controls GIAC, Certified Authorization Professional - Cyber System Security Engineer, Admitted to State Bars of Michigan & Texas, U.S. Supreme Court, United States Patent and Trademark Office

INTELLECTUAL PROPERTY SERVICES AND EXPERIENCE INCLUDE:

- Evaluation of patent infringement/non-infringement, and patent validity/invalidity, including America Invents Act, and 101, 102, 103, 112 and prior art arguments including analyses under literal infringement and the under the doctrine of equivalents. Prosecution history estoppel.
- Development of claim charts for Markman hearings, ITC & federal cases, Inter Partes reviews. Expert reports, depositions, hearing and trial testimony.
- Technology standards boards and licensing authorities, antitrust/DOJ, technology development and transfer, patents, trademarks, trade secrets, copyrights, data rights, trademark infringement/dilution, unfair competition/trade, false/deceptive advertising Lanham Act, Class Actions, etc.
- Georgia-Pacific factors analyses for determining reasonable royalty for plaintiff or defense. Willful infringement arguments.
- Development and Analysis of Markman briefs, claim charts, conducting prior art searches, and the analyses of patent file wrappers.
- Discovery and motion practice, summary judgment proceedings, evidentiary hearings, motions in limine, opposition and reply briefs.
- Patent Cooperation Treaty Applications, U.S. applications, international filings. Post-Grant Review, Inter Partes Review, Patent Trial & Appeal Board.
- Prior art/patentability research in technical literature, publications, product specifications, and dissertations to analyze validity and obviousness.
- Litigation support and technology education in patent disputes, Federal Cases, ITC cases, & re-examinations, derivation proceedings, prior user rights.
- Represent clients in all aspects of electrical, chemical, software, computers, microprocessors, & automotive components/systems for all aspects of intellectual property/litigation. Cellular, telecommunication, GPS/navigation, mobile, telematics, info/data/transmission, Human Machine Interfaces, etc.
- Deposition, hearing and trial experience in state and federal jurisdictions throughout the United States.

Cases include: Magna v. TRW; Bradley v. Fontaine Trailer; ATI; Remy v. WAI (ITC); Horizon v. Continental (IPR); Stratos v. Volvo; IQASR v. Wendt; Mobileye v. Picutup; Karma v. Lordstown; Speedguage v. Inthinc; Voxx v. JSI; Magna v. SMR; (MPEG); Stragent v. Volvo; Dorman v. Paccar & mul other cases

PRODUCT LIABILITY SERVICES AND EXPERIENCE INCLUDE:

- Direct participation in more than 300 litigation cases with in-depth evaluations of multiple high-dollar claims and lawsuits. Forensic Analyses.
- Expert witness reports, inspections, accident reconstruction, photographs, occupant kinematics & injury causation, component and system analyses.
- Development of case and trial strategy, summary judgment proceedings, evidentiary hearings, motions in limine, opposition and reply briefs.
- Deposition, hearing and trial experience in state and federal jurisdictions throughout the United States as Expert Witness and Corporate Representative.
- All areas of discovery, preparing and/or obtaining sets of requests for production, interrogatories, requests for admissions. E-discovery.
- Preparation of other witnesses prior to their depositions and trial testimonies, including all potential cross-examination questions. Forensic Analyses.
- Product Liability Law, indemnification, injury thresholds and regulatory requirements, including all FMVSS interpretation/compliance.
- Optical/vision systems, warning systems, forward collision/lane departure warning, medical devices, wheelchairs, and handicap assistance devices.
- Automotive, truck (including tractor-trailer) systems, sensing systems, including all crash recorders (Direct design experience in these modules for over 20 years). Accident reconstruction and analysis of crash pulse information. Electrical, electronic, electro-mechanical components and systems.
- Design validation plans and reports, failure modes and effects analyses, product prove-out, design verification, reliability/durability analyses/assessment.
- Analysis of component defects including seats, seatbelts, curtains, airbags, roof crush, structure, doors, all modes of sensors, crashworthiness.
- Electrical systems and architecture, fire cause and origin, lidar/radar, sensors, camera/optical/vision, warning & diagnostic system & fault code analyses.
- Insurance law, no fault insurance law, subrogation. Automotive domestic/international OEMs, customers, suppliers, manufacturing, operations.
- Field Analysis of Product Liability Issues and the Implementation of Design Changes to Reduce Exposure. Forensics. Analysis of Alternative Designs.
- Regulatory pre-emption arguments, express, implied, or fact-specific analyses. Workplace safety/standards/polices, Fall Protection, - OSHA, ANSI, etc.
- Depositions, Expert Testimony, Trial Testimony. *FCA v. Lear, Delphi - Please see Judicial Experience/Testimony History on website (too much to list here).*

Summary of Professional Experience

Principal - AUTOMOTIVE DESIGN ANALYSIS, South Lyon, MI - Technical consulting practice conducting objective, expert analysis, research, and investigation of all aspects of Intellectual Property; Patents, Products and Technologies; and Product Liability, defect investigation, Regulatory compliance. Forensic Analyses.

TARDEC/TACOM - U.S. Army, Warren, MI – Cyber Security- Computer Engineer Direct. IP - Invention disclosures/patents/contracts. (GTA & Alion contractual).

Associate, Intellectual Property - Vivacqua Law, Ann Arbor, MI - Represent clients in all intellectual property aspects of electrical, chemical, software, and automotive.

Principal Systems Engineer – TACOM - U.S. Army, Warren, MI - Conduct Systems Engineering/ Manage Cross-Functional Teams. DoD contracts. Consult via Raytheon Risk Analysis/Decision Analysis Lead - General Dynamics, Sterling Hts., MI - Decision analysis, trade studies, systems engineering, risk analysis, & mitigation.

Intellectual Property Litigation Associate, Dechert LLP, Austin, TX - Represent clients in all aspects of electrical, chemical, software, and computers involving all aspects of intellectual property, including licensing, USPTO matters, joint development agreements, contracts, opinion work, infringement analyses, standards boards, copyrights, trade secrets, & antitrust issues. Discovery, motion practice, trial/ settlement procedures. Cases include Lucent/MPT v. Gateway MPEG proceedings, Apple Computer-Lucent Licensing negotiations, Tendler v. Onstar, and Acer/Gateway v. Hewlett Packard International Trade Commission litigation.

Design Analysis Engineer/Technical Specialist/Engineering Manager, FORD, Dearborn, MI - Technical analysis of vehicles, systems, components, and diagnostics. Act as corporate representative and expert witness; testify in trials and depositions. Conduct accident investigations and prepare expert witness reports and responses to requests for discovery. Expert in FMVSS, ECE, regulatory, due-care, corporate standards, warnings, SAE and NHTSA publications, information for NHTSA inquiries, recalls, notices, vehicle diagnostic, OBDII interfaces, vehicle bus interfaces, communication protocols, human machine interface, analysis/interpretation of electrical components, system information stored in electronic crash sensors, diagnostic modules, system modules. Lead design, development, testing, and implementation of advanced-technology passive/active restraint systems. Conducted numerous (hundreds) crash, sled, and component tests. Developed design verification plans & reports, failure modes & effects analyses, product & production validation plans, and then develop the products & systems to meet these requirements. Quality control/assurance.

Senior Project Engineer, General Motors, Troy, MI - Design, development, testing, and release of electrical system, software/algorithm, sensing, and airbag and airbag suppression systems for all GM truck lines. FMVSS, ECE, corporate specifications and design standards, FMEA, DVPR, control plans, and Due-Care requirements.

Senior Project Engineer, AlliedSignal, Sterling Hts., MI - Managed European, Pacific Rim, & domestic programs. Design and development of electrical systems & components, airbag modules, sensors, and airbag systems. Developed statements of work and comprehensive system design/test requirements, contracts/subcontracts.

MICHAEL NRANIAN

ADDITIONAL INFORMATION



Michael Nranian Expert in Intellectual Property & Product Liability

10945 Stoney Point
South Lyon, MI 48178
Cell: 248-376-0338
Landline/Fax: 248-446-4052

WEBSITE: trialexpertwitness.com

Emails: mnrnian@charter.net
mnrnian@peoplepc.com

Cell: 248-376-0338

INTELLECTUAL PROPERTY SERVICES AND EXPERIENCE INCLUDE:

- Evaluation of patent infringement/non-infringement, and patent validity/invalidity, including America Invents Act, and 101, 102, 103, 112 and prior art arguments including analyses under literal infringement and the under the doctrine of equivalents. Prosecution history estoppel.
- Development of claim charts for Markman hearings, ITC cases, and federal cases. Expert reports, depositions, hearing and trial testimony.
- Technology standards boards and licensing authorities, antitrust/DOJ, technology development and transfer, patents, trademarks, trade secrets, copyrights, data rights, trademark infringement/dilution, unfair competition/trade, false/deceptive advertising Lanham Act, Class Actions, etc.
- Georgia-Pacific factors analyses for determining reasonable royalty for plaintiff or defense. Willful infringement arguments.
- Development and Analysis of Markman briefs, claim charts, conducting prior art searches, and the analyses of patent file wrappers.
- Discovery and motion practice, summary judgment proceedings, evidentiary hearings, motions in limine, opposition and reply briefs.
- Patent Cooperation Treaty Applications, U.S. applications, international filings. Post-Grant Review, Inter Partes Review, Patent Trial and Appeal Board.
- Prior art/patentability research in technical literature, publications, product specifications, and dissertations to analyze validity and obviousness.
- Litigation support and technology education in patent disputes, Federal Cases, ITC cases, & re-examinations, derivation proceedings, prior user rights.
- Represent clients in all aspects of electrical, chemical, software, computers, algorithms, microprocessors, & automotive components/systems involving all aspects of intellectual property litigation. Cellular, telecommunication, GPS/navigation, mobile telematics, information/data transmission, Human machine interfaces, etc.
- Deposition, hearing and trial experience in state and federal jurisdictions throughout the United States.
- **Cases include:** Magna v. TRW; Stragent v. Volvo; Bradley v. Fontaine Trailer; ATI v. Siemens; Remy v. WAI (ITC); Lucent/Gateway/MPEG; Karma v. Lordstown; StratosAudio v. Volvo; Mobileye Inc. v. Picutup Corp.; Transtex v. Ridge; KAR v. Ford; Speedguage v. Inthinc; Zoao Controls; Freedom Motors v. Allegiant; Magna Mirrors v. TRW; AVS v. Takata et al. (IPR); VOT v. Ford; Voxx v. Johnson Safety; Bosch v. Autel; Dorman v. Paccar & other cases

PRODUCT LIABILITY SERVICES AND EXPERIENCE INCLUDE:

- Direct participation in more than 300 litigation cases with in-depth evaluations of multiple high-dollar claims and lawsuits. Forensic Analyses & Investigations.
- Expert witness reports, inspections, accident reconstruction, photographs, occupant kinematics & injury causation, component and system analyses. Forensic Analyses. Investigations.
- Development of case and trial strategy, summary judgment proceedings, evidentiary hearings, motions in limine, opposition and reply briefs.
- Deposition, hearing and trial experience in state and federal jurisdictions throughout the United States as Expert Witness and Corporate Representative.
- All areas of discovery, preparing and/or obtaining sets of requests for production, interrogatories, requests for admissions. E-discovery.
- Preparation of other witnesses prior to their depositions and trial testimonies, including all potential cross-examination questions.
- Product Liability Law, indemnification, injury thresholds and regulatory requirements, including all FMVSS, interpretation/compliance.
- Optical/vision systems, warning systems, forward collision/lane departure warning, medical devices, wheelchairs, and handicap assistance devices. Workplace safety/standards/policies, Fall Protection, - OSHA, ANSI, etc. Inertia mechanisms, webbing, harnesses, forensics.
- Automotive, truck (including tractor-trailer) systems, sensing systems, including all crash recorders (Direct design experience in these modules for over 20 years). Accident reconstruction and analysis of crash pulse information. Electrical, electronic, electro-mechanical components and systems. Computer, algorithm, software, analyses. Occupant sensing and Out-of-position sensing and injury mitigation.
- Design validation plans and reports, failure modes and effects analyses, product prove-out, design verification, reliability/durability analyses/assessment.
- Analysis of component defects including seats, seatbelts, load limiters, pretensioners, curtains, airbags, roof crush, structure, doors, all modes of sensors, crashworthiness. Occupant position sensing, Occupant Out-of-position sensing, and injury mitigation systems & strategies.
- Workplace safety standards, practices, policies. Fall Protection, - OSHA, ANSI, etc. Inertia mechanisms, harnesses. Safety/machine guards.
- Electrical systems and architecture, fire cause and origin, lidar/radar, sensors, camera/optical/vision, warning & diagnostic system & fault code analyses. Human machine interfaces, controls, displays, warnings, diagnostic. Data/information/parameter storage & retrieval.
- Insurance law, no fault insurance law, subrogation, class actions. Automotive domestic/international OEMs, customers, suppliers, manufacturing, operations. NHTSA Complaints and Responses. FMVSS, IIHS, Sled and Barrier testing and analyses. Injury assessment.
- Field Analysis of Product Liability Issues and the Implementation of Design Changes to Reduce Exposure. Analysis of Alternative Designs.
- Regulatory pre-emption arguments, express, implied, or fact-specific analyses.
- Depositions, Expert Testimony, Trial Testimony. Recall cases-FCA v. Lear, Delphi; MPC v. Standex & numerous other Product Defect cases - Please see Judicial Experience/Testimony History on (Next Page - too much to list here).

MICHAEL NRANIAN

JUDICIAL APPEARANCES AND TESTIMONY HISTORY (PAGE 1 OF 4)

Depositions

- Kupovits v. Wright & Fillipis, Oakland County Circuit Court, Michigan, August 23, 2000
- Paisner v. Chonus, Superior Court of New Jersey, October 9-10, 2000
- Brown v. Ford, Greenup Circuit Court, Greenup, Kentucky, April 3, 2001
- Davis v. Ford, United States District Court, District of Nevada, January 9, 2002
- Estate of Edward Thompson, Lisa Bryant v. Ford, United States District Court, Eastern District of Tennessee, March 7, 2002
- Dotson v. Ford, United States District Court, Western District of Virginia, July 26, 2002
- O'neal and Johnson v. Ford et al, Circuit Court of Warren County, Mississippi, August 29, 2003
- Galam et al v. Ford et al, Los Angeles County Superior Court, September 22, 2004
- Lindop/Billich v. Ford, Santa Clara County Superior Court, San Jose California, March 17, 2005
- Davis v. Ford, Contra Costa County Superior Court, Martinez, California, March 31, 2005
- Davis v. Ford, Contra Costa County Superior Court, Martinez, California, May 26, 2005
- Sister Guadalupe Gonzalez v. Ford et al, Superior Court of California, County of Los Angeles, July 13, 2005
- Davis v. Ford, Contra Costa County Superior Court, Martinez, California, July 28-29, 2005
- Carney (Wisnewski) v. Darrin Ray Cochran, Dennis Cochran, and Ford, Circuit Court of Kanawha County, West Virginia, August 17, 2005
- Davis v. Ford, Contra Costa County Superior Court, Martinez, California, September 7, 2005
- Sister Guadalupe Gonzalez v. Ford et al, Superior Court of California, County of Los Angeles, September 13, 2005
- Cox v. Ford et al, 14th Judicial District Parish of Calcasieu Louisiana, October 21, 2005
- Mancha et al v. Ford et al, 23rd Judicial District Wharton County, Texas, November 3, 2005
- McCoy v. Ford et al, Court of Common Pleas County of Richland, South Carolina, November 8, 2005
- Davis v. Ford, Contra Costa County Superior Court, Martinez, California, November 17, 2005
- Shannon/Lynthacum v. Ford, General Court of Justice, Superior Court Division, County of Richmond, North Carolina, January 12, 2006
- Walker v. Ford, United States District Circuit Court of the 17th Judicial District, Southern District Broward County, Florida, February 2, 2006
- Cook v. Ford, Marion County Superior Court, County of Marion, State of Indiana, July 11, 2006.
- Elliot v. Ford, United States District Court, District of Arizona, September 20, 2006.
- In the Matter of Certain Starter Motors and Alternators, Inv. No. 337-TA-755, United States International Trade Commission, Washington, D.C., August 31, 2011
- Zachery Bradley, et al v. Fontaine Trailer Company, Inc., Case No. 3:06 CV 0062 (WWE), United States District Court District of Connecticut, September 27, 2011
- Mobileye, Inc. v. Picutup Corp., et al, Case No. 12 CV 1994, United States District Court Southern District of New York, August 28, 2012
- Cody Cormier, et al v. Tammy Threatts, et al 15th Judicial District Court Parish of Acadia State of Louisiana, Docket No. 2009-10199, Div. B, April 8, 2014
- Sunday Brumfield, Individually and as Tutrix of the Minors Shane Brumfield and Dalton Brumfield, v. Dana Shell, Ford Motor Company, Mississippi Farm Bureau Casualty Insurance Company, City of Baker, City of Baton Rouge, 20th Judicial District Court for the Parish of East Feliciana, State of Louisiana, Docket No. 39,092 Division B, May 15, 2014
- Toyota Motor Corp., Petitioner, v. Leroy G. Hagenbuch, Patent Owner, Case IPR2013-00483, Patent 8,014,917, Administrative Patent Judge Jameson Lee, USPTO-PTAB July 8, 2014
- CHRISTINA M. DAVIS, individually and on behalf of her minor child, BRANDON DAVIS, Plaintiff, v. Isuzu Motors Limited, a foreign corporation; Isuzu Motors America, LLC, a California limited liability company; Suburu of Indiana Automotive, Inc., an Indiana corporation, f/n/a Suburu-Isuzu Automotive, Inc.; Ronnie O. Underwood and Jane Doe Underwood, husband and wife, and Does 1-100, Inclusive, Defendants, In and for the County of Navajo, In the Superior Court of the State of Arizona, NO. CV201000098, August 21, 2014
- Vehicle Interface Technologies, L.L.C. v. Ford Motor Company, L.L.C., United States District Court for the District of Delaware, C.A. No. 12-1284-RGA, August 27-29, 2014
- Vehicle Interface Technologies, L.L.C. v. Jaguar Land Rover North America, L.L.C., United States District Court for the District of Delaware, C.A. No. 12-1285-RGA, August 27-29, & September 3, 2014
- Toyota Motor Corp., Petitioner, v. Leroy G. Hagenbuch, Patent Owner, Case IPR2013-00638, Patent 8,014,917, Administrative Patent Judge Jameson Lee, Michael W. Kim, & Adam V. Floyd, USPTO-PTAB September 19, 2014

MICHAEL NRANIAN

JUDICIAL APPEARANCES AND TESTIMONY HISTORY (PAGE 2 OF 4)

Depositions

- CHRISTINA M. DAVIS, individually and on behalf of her minor child, BRANDON DAVIS, Plaintiff, v. Isuzu Motors Limited, a foreign corporation; Isuzu Motors America, LLC, a California limited liability company; Suburu of Indiana Automotive, Inc., an Indiana corporation, f/n/a Suburu-Isuzu Automotive, Inc.; Ronnie O. Underwood and Jane Doe Underwood, husband and wife, and Does 1-100, Inclusive, Defendants, In and for the County of Navajo, In the Superior Court of the State of Arizona, NO. CV201000098, September 22, 2014
- Toyota Motor Corp., Petitioner, v. Leroy G. Hagenbuch, Patent Owner, Case IPR2014-00123 Case IPR2014-00124, Patent 8,532,867, Administrative Patent Judge Jameson Lee, Michael W. Kim, & Adam V. Floyd, USPTO-PTAB September 30, 2014
- Ford Motor Company, BMW of North America LLC, v. Vehicle Operation Technologies, LLC Patent Owner, Case IPR2014-00594, Case IPR2014-00600, Case IPR 2014-00601, Case IPR2014-00602, Case IPR2014-00603 U.S. Patent No. 7,145,442 Vehicle Operation Display System, Administrative Patent Judges Glenn J. Perry, Brian J. McNamara, & Bart A. Gerstenblith USPTO-PTAB, April 7, 2015
- Steven Newbern and Claudia Newbern Plaintiffs, v. Ford Motor Company and Stephen Ronald McGee Defendants, Court of Common Pleas for the Ninth Judicial Circuit, State of South Carolina, C/A No. 2013-CP-2928, April 30, 2015
- TRW Automotive US LLC, Petitioner, v. Magna Electronics Inc., Patent Owner Case IPR2014-01010 Patent 7,533,998 B2, Administrative Patent Judges James P. Calve, Michael J. Fitzpatrick, & Barry L. Grossman, USPTO-PTAB, May 19, 2015
- Sunday Brumfield, Individually and as Tutrix of the Minors Shane Brumfield and Dalton Brumfield, v. Dana Shell, Ford Motor Company, Mississippi Farm Bureau Casualty Insurance Company, City of Baker, City of Baton Rouge, 20th Judicial District Court for the Parish of East Feliciana, State of Louisiana, Docket No. 39,092 Division B, May 21, 2015
- Steven Newbern and Claudia Newbern Plaintiffs, v. Ford Motor Company and Stephen Ronald McGee Defendants, Court of Common Pleas for the Ninth Judicial Circuit, State of South Carolina, C/A No. 2013-CP-2928, July 29, 2015
- Magna Electronics Inc. Plaintiff, v. TRW Automotive Holdings Corp; TRW Automotive US LLC; and TRW Vehicle Safety Systems Inc. Defendants – United States District Court for the Western District of Michigan - Civil Action No. 1:12-cv-00654, Civil Action No. 1:13-cv-00324, Honorable Paul L. Maloney, July 7, 2015
- Margaret Scholan, as guardian for Meta Scholan and Bailey Scholan, Plaintiff, vs. Toyota Motor Corporation, a foreign Corporation, Toyota Motor Sales USA, a foreign Corporation, and Daytona BR-GD, Inc. d/b/a Daytona Toyota, a Florida corporation, Defendants; Circuit Court Seventh Judicial Circuit in and for Volusia County Florida- Case No. 2013-31068 CICI Division 31, August 5, 2015
- TRW Automotive US LLC, Petitioner, v. Magna Electronics Inc., Patent Owner; Cases IPR2014-01497 Patent 8,531,278, IPR2014-01499 Patent 8531279; Administrative Patent Judges Jamison Lee, Barry L. Grossman, & Bart A Gerstenblith, USPTO-PTAB, September 15, 2015
- Velocity Patent, LLC, Plaintiff, v. Mercedes USA, LLC; Mercedes-Benz U.S. International, Inc., & FCA US, LLC, Defendants, Case Nos. 1:13-cv-08413, Case Nos. 1:13-cv-08419 , United States District Court for the Northern District of Illinois Eastern Division, Case Nos. 1:13-cv-08419 Judge John W. Darragh Magistrate Judge Michael T. Mason, February 1, 2016
- Dorman Products, Inc., Plaintiff, v. Paccar Inc., Defendant, Civil Action No. 2:13-cv-06383-JD, United States District Court for the Eastern District of Pennsylvania, April 8, 2016
- Gayle N. Robbins, Plaintiff, v. Ford Motor Company, Defendant, Case No. 415cv01360hea, United States District Court, Eastern District of Missouri, Eastern Division, August 16, 2016
- Unified Patents Inc, Petitioner v. American Vehicular Sciences, LLC Patent Owner, IPR2016-00364 Patent 9,043,093, Administration Patent Judges Benjamin D. M. Wood, Jennifer Meyer Chagnon, Timothy J. Goodson, USPTO-PTAB, October 14, 2016
- FCA US, Plaintiff, v. Lear Corporation, Defendant/Third Party Plaintiff, v. Delphi Connection Systems US, Inc., f/k/a FCI Automotive USA, Inc., DPH Holdings Corp. and Delphi Automotive LLP, Third Party Defendants, Case No. 15-146773-CK, State of Michigan, In the Circuit Court for the County of Oakland, Hon. James M. Alexander, October 25, 2016
- Autoliv ASP, Inc.; Nihon Plast Co., LTD.; Neaton Auto Products Manufacturing Inc.; Takata Corp.; TK Holdings, Inc.; Toyoda Gosei Co. Ltd.; Hyundai Mobis Co., Ltd.; Mobis Alabama, LLC; and Mobis Parts America LLC, Petitioner, v. American Vehicular Sciences, LLC, Patent Owner, IPR2016-01790 Patent 9,043,093 Administration Patent Judges Trevor M. Jefferson, Jennifer Meyer Chagnon, and Scott C. Moore, USPTO-PTAB, August 29, 2017
- Autoliv ASP, Inc.; Nihon Plast Co., LTD.; Neaton Auto Products Manufacturing Inc.; Takata Corp.; TK Holdings, Inc.; Toyoda Gosei Co. Ltd.; Hyundai Mobis Co., Ltd.; Mobis Alabama, LLC; and Mobis Parts America LLC, Petitioner, v. American Vehicular Sciences, LLC, Patent Owner, IPR2016-01794 Patent 9,043,093 Administration Patent Judges Trevor M. Jefferson, Jennifer Meyer Chagnon, and Scott C. Moore, USPTO-PTAB, August 30, 2017

MICHAEL NRANIAN

JUDICIAL APPEARANCES AND TESTIMONY HISTORY (PAGE 3 OF 4)

Depositions

- Magna Electronics Inc. Plaintiff v. Valeo Inc., Valeo S.A.; Valeo GMBH, Connaught Electronics Ltd., Valeo Schalter und Sensorem GMBH, Valeo North America, Inc., Defendants, United States District Court for the Eastern District of Michigan, Case No. 2:13-cv-11376 Honorable Avern Cohn, October 1, 2018.
- Michael Ogden, Plaintiff, v. McCarthy Leonard Kaemmerer Owen, McGovern Striler, & Menghini LC, Andrew B. Leonard, Brian McGovern, and James Owen, Defendants, In the Circuit Court of St. Louis County, State of Missouri, Cause No. 11SL-CC00005 Division No. 4. November 9, 2018.
- Magna Mirrors of America, Inc. Plaintiff v. Samvardhana Motherson Reflectec Group, et al. Defendants, United States District Court for the Western District of Michigan Southern Division, Case No. 1:17-CV-77 Honorable Robert J. Jonker, August 6, 2019.
- Katherine King, Plaintiff, v. James Bowden, Cassandra Fudge, Tonya Lenore Samuel, First Student Transport, LLC, First Transit, Inc., First Student, Inc., Defendants, State of Michigan, In the Circuit Court for the County of Oakland, Civil Action Case No. 2018-166480-NI, Hon. Phyllis C. McMillen, September 23, 2019
- Procon Analytics, LLC Plaintiff/Counterclaim Defendant, v. Spireon Inc., Defendant/Counterclaim Plaintiff, United States District Court Eastern District of Tennessee at Knoxville Case No. 3:19-cv-00201, Hon. Judge Reeves, August 18, 2020.
- Miniature Precision Components, Inc., Plaintiff, v. Standex Electronics, Inc., Defendant, United States District Court Eastern District of Wisconsin, Case No. 2:18-cv-01838, November 24 and December 4, 2020
- Parabit Systems, Inc., Plaintiff, vs. Synergistics, Inc., Millenium Group, Inc., Island Master Locksmith Inc., IML Security, Gregory I. Goldman, Cathy T. Goldman, Steven R. London, Marc Seidenberg, and John Does I-III, Defendants, United States District Court Eastern District of New York, Case No. 19-cv-888 (BMC), February 2, 2021
- Motherson Innovations Co., LTD., Petitioner, v. Magna Mirrors of America, Inc., Patent Owner, IPR2020-00777 U.S. Patent No. 10,261,648, Administration Patent Judges Sally C. Medley, Jessica C. Kaiser, Scott E. Bain, USPTO-PTAB, February 26, 2021.
- Continental Automotive Systems Inc., Petitioner, v. Horizon Global Americas Inc., Patent Owner, IPR2021-00320 U.S. Patent No. 8,789,896 IPR2021-00321 U.S. Patent No. 9,758,138, Administration Patent Judges Barry L. Grossman, Scott B. Howard, Matthew S. Meyers, USPTO-PTAB, November 9, 2021.
- Continental Automotive Systems Inc., Petitioner, v. Horizon Global Americas Inc., Patent Owner, IPR2021-00322 U.S. Patent No 10,040,437 B2, Administration Patent Judges Barry L. Grossman, Scott B. Howard, Matthew S. Meyers, USPTO-PTAB, November 10, 2021.
- StratosAudio, Inc., Plaintiff v. Volvo Car USA, LLC, Defendant, United States District Court for the Southern District of Texas Waco Division, Case No. 6:20-cv-01129-ADA, July 13-14, 2022.
- Karma Automotive, LLC, a California limited liability company, Plaintiff, vs. Lordstown Motors Corp., an Ohio corporation, et al., Steve Burns, an individual, Darren Post, an individual, Rich Schmidt, an individual, Roger J. Durre, an individual, Hong Xin Huan (AKA "George" Huan), an individual, Beo Qin, an individual, Stephen Punak, an individual, Christopher Kim, an individual, Dan Zhihong Huang, an individual, Punak Engineering, Inc., a California corporation, and Does 1 through 50, inclusive, 15 Defendants, United States District Court for the Central District of California Case No: 8:20-cv-02104 Judge James V. Selna, August 26, 2022.
- Stragent LLC, Plaintiff, v. Volvo Car USA, LLC, Defendant, United States District Court for the District of Delaware, Case No. C.A. No. 1:22-cv-00293-JDW, May 4-5, 2023.
- Electrolysis Prevention Solutions LLC, Plaintiff, v. Daimler Trucks North America LLC, Defendant, United States District Court Western District of North Carolina NORTH CAROLINA Charlotte Division Case No.: 3:21-cv-00171-RJC-DCK, Judge Robert J. Conrad Jr. June 29, 2023.

Hearings

- Paisner v. Chonus, Superior Court of New Jersey, June 28, 2000
- O'neal and Johnson v. Ford et al, Circuit Court of Warren County, Mississippi, October 9, 2003
- Parabit Systems, Inc., Plaintiff, vs. Synergistics, Inc., Millenium Group, Inc., Island Master Locksmith Inc., IML Security, Gregory I. Goldman, Cathy T. Goldman, Steven R. London, Marc Seidenberg, and John Does I-III, Defendants, United States District Court Eastern District of New York, Case No. 19-cv-888 (BMC), Patent Markman Hearing February 16, 2021
- R. Lee McElroy, IV et al. v. Paul Wilson Streater et al. Case No.: 50-2019-CA-016073, Valeria Marchi et al. v. Paul Wilson Streater et al. Case No.: 50-2019-CA-008018 In the Circuit Court of the Fifteenth Judicial Circuit for Palm Beach County, Florida Civil Division Honorable Gregory M. Keyser, August 18, 2023.

MICHAEL NRANIAN

JUDICIAL APPEARANCES AND TESTIMONY HISTORY (PAGE 4 OF 4)

Trial Expert Testimonies

- Schicksnider v. Ford, 17th Judicial District Court, Parish of Lafourche, Louisiana, October 30, 2003
- Schach v. Ford and Bridgestone/Firestone, United States District Court, Middle District of Pennsylvania, May 5-6, 2004
- Colton v. Ford, General District Court for City of Newport News Virginia, Southeastern District of Virginia, January 12, 2005
- Laing v. Ford, 19th District Court Dearborn, Michigan, March 10, 2005
- Edwards v. Ford, 7th Judicial District Court Parish of Concordia Vidalia, Louisiana, May 2, 2005
- Walker v. Ford, United States District, Circuit Court of the 17th Judicial District Southern District, Broward County, Florida, March 8, 2006
- Sunday Brumfield, Individually and as Tutrix of the Minors Shane Brumfield and Dalton Brumfield, v. Dana Shell, Ford Motor Company, Mississippi Farm Bureau Casualty Insurance Company, City of Baker, City of Baton Rouge, 20th Judicial District Court for the Parish of East Feliciana, State of Louisiana, Docket No. 39,092 Division B, June 2-3, 2015
- Margaret Scholan, as guardian for Meta Scholan and Bailey Scholan, Plaintiff, vs. Toyota Motor Corporation, a foreign Corporation, Toyota Motor Sales USA, a foreign Corporation, and Daytona BR-GD, Inc. d/b/a Daytona Toyota, a Florida corporation, Defendants; Circuit Court Seventh Judicial Circuit in and for Volusia County Florida- Case No. 2013-31068 CICI Division 31, November 3, 2015
- FCA US, Plaintiff, v. Lear Corporation, Defendant/Third Party Plaintiff, v. Delphi Connection Systems US, Inc., f/k/a FCI Automotive USA, Inc., DPH Holdings Corp. and Delphi Automotive LLP, Third Party Defendants, Case No. 15-146773-CK, State of Michigan, In the Circuit Court for the County of Oakland, Hon. James M. Alexander, April 28, 2017
- Magna Mirrors of America, Inc., Plaintiff, v. Samvardhana Motherson, Reflectec Group Holdings Limited, et al., Defendants, Case No. 1:17-cv-77, United States District Court Western District of Michigan Southern Division, Hon. Jane M. Beckering. Trial - December 6-13, 2022. Trial testimony December 9, 2022

Cell: 248-376-0338 • Fax/Landline: 248-446-4052 • mnranian@charter.net • mnranian@peoplepc.com

Education & Qualifications

University of Michigan
Wayne State University

MBA, with high distinction, 2002

MS, Electrical Engineering, GPA 3.71/4.0, 1991

BS, *summa cum laude*, Electrical and Computer Engineering, 1993

BS, with distinction, Chemical Engineering, 1984

JD, GPA 3.61/4.0, *Order of the Coif*, 1999

Six Sigma Black Belt – American Society for Quality and International Quality Federation

Licensed Professional Engineer

Certified Project Management Professional

Eagle Scout

Certified Information System Security Professional CISSP

Security+

Network+

SANS 566 Security Controls GIAC

Certified Authorization Professional - Cyber System Security Engineer

Accident Reconstruction – Northwestern University

Active Secret Security Clearance

Admitted to practice to United States Patent and Trademark Office,

US Supreme Court, and State Bars of Michigan & Texas

Summary of Professional Experience

Principal - AUTOMOTIVE DESIGN ANALYSIS South Lyon, MI - Technical consulting practice conducting objective, expert analysis and investigation of Intellectual Property (patents, prior art, copyrights, trademarks, unfair competition, trade secrets, etc.). Clarification of prior art in technical literature, publications, product specifications, and dissertations to analyze validity and obviousness. Specification and claim analysis of scientific and engineering patents. Analysis under America Invents Act and all 101, 102, 103, 112 and other arguments. Product and technology analysis, patent portfolios, patentability research. Litigation support, patent infringement/non-infringement, patent validity/invalidity, and technology education in patent disputes, claim charts, patent reexaminations. Federal and state jurisdictions, International Trade Commission (ITC) proceedings. Product Liability (including component defect allegations, vehicle crashes and occupant kinematics/injury causation) for automotive and other industries. Expert analyses of crash recorders, and electrical systems, including fault codes, crash pulse, and all recorded information. Truck, commercial, and recreational vehicles, electrical, electronic, telematics, mobile communications, and numerous other components/systems. *TARDEC/TACOM - U.S. Army, Warren, MI* – Cyber Security Computer Engineer CISSP Certified Information System Security Professional Direct. IP-Develop technologies for DoD, draft invention disclosures/patents (contract).

Associate, Intellectual Property - Vivacqua Law, Ann Arbor, MI - Represent clients in all intellectual property aspects of electrical, chemical, software, and automotive.

Principal Systems Engineer – TACOM - U.S. Army, Warren, MI - Conduct Systems Engineering. Manage Cross-Functional Teams. DoD contracts Consult via Raytheon Risk Analysis/Decision Analysis Lead - General Dynamics, Sterling Hts., MI - Decision analysis, trade studies, systems engineering, risk analysis, & mitigation.

Intellectual Property Litigation Associate, Dechert LLP, Austin, TX - Represent clients in all aspects of electrical, chemical, software, and computers involving all aspects of intellectual property, including licensing, USPTO matters, joint development agreements, contracts, opinion work, infringement analyses, standards boards, trade secrets, & antitrust issues, copyrights. Discovery, motion practice, trial/ settlement procedures. Cases include Lucent/MPT v. Gateway MPEG proceedings, Apple Computer-Lucent Licensing negotiations, Tessler v. Onstar, and Acer/Gateway v. Hewlett Packard International Trade Commission litigation.

Design Analysis Engineer/Technical Specialist/Engineering Manager, FORD, Dearborn, MI - Responsible for technical analysis of vehicles, systems, and components, including airbags, seat belts, and automotive electrical systems and diagnostics. Contribute to continuous improvement of existing products and the design/development of new products through extensive field analysis and reporting of product performance. Evaluate vehicle component defect allegations, vehicle crashworthiness. Act as corporate representative and expert witness; testify in trials and depositions. Conduct accident investigations and prepare expert witness reports and responses to requests for discovery. Extremely knowledgeable in electrical systems, electromechanical components, as well as overall restraint systems and vehicle crashworthiness for all front and side impacts and rollover. Determination of vehicle electrical system architecture and performance, electrical component analysis, BEV, accident reconstruction, occupant kinematics, and body structure performance. Extremely knowledgeable in FMVSS, ECE, regulatory and corporate standards, warnings, as well as obtaining SAE and NHTSA publications, and obtaining information related to NHTSA inquiries, recalls, and notices. In-depth experience in vehicle diagnostic, OBDII interfaces, vehicle bus interfaces, class II and serial communication protocols, and the analysis and interpretation of electrical components, system information stored in Electronic Crash Sensors, Diagnostic Modules, software programming & algorithm methods/processes, computers, microprocessors, and other automotive system modules.

Senior Design Engineer FORD, Dearborn, MI - Lead design, development, testing, and implementation of advanced-technology passive/active restraint systems. Managed body engineering and restraint engineering, and electrical system projects for truck and car platforms. Extensive product development & program management experience. Six Sigma Black Belt; very knowledgeable in Design for Manufacturing, DOE, QC, and QA techniques. In depth experience in establishing system management plans, critical guidelines, corporate standards, design standards, specifications, test requirements, Subsystem Design Specifications, Product Verification Specifications, control plans, system and component level FMEAs, DVPRs, ISO and QS standards, Business Operating Systems, Quality Operating Systems, process reengineering, and lean manufacturing. Conducted numerous (hundreds) crash, sled, and component tests. Developed design verification plans and reports, failure modes and effects analyses, product and production validation plans, and then developed the products and systems to meet these requirements. Developed and integrated electrical and sensing systems, restraint & inflatable restraint systems, sensing systems, airbag & canopy systems, and components for front, side, & rollover, FMVSS, ECE, SAE, due-care, and corporate requirements. Developed electrical system architectures, including CAN, LIN, MOST, Byteflight, IDB1394, Flexray, Bluetooth, etc.

Design Engineer- Developed sensing, airbag and restraint systems for Ford/Mercury Car and Truck programs.

Senior Project Engineer, General Motors, Troy, MI - Design, development, testing, and release of electrical system, sensing, and airbag and airbag suppression systems for all GM truck lines. FMVSS, ECE, SAE, corporate specifications and design standards, FMEA, DVPR, control plans, and Due-Care requirements.

Senior Project Engineer, AlliedSignal, Sterling Hts., MI - Managed European, Pacific Rim, & domestic programs. Design and development of electrical systems & components, airbag modules, sensors, and airbag systems. Developed statements of work and comprehensive system design/test requirements, contracts/subcontracts.

Summary- TARDEC/TACOM U.S. Army Research and Development Center, Warren, MI – Cyber Security Team Leader Direct November 2016 to Present. Intellectual Property Development - Chief Scientist's Office – Contractual - February, 2010-July, 2016; Vivacqua Law, Ann Arbor, MI - Associate, October 2009- February, 2010; Raytheon, General Dynamics, TACOM, Warren & Sterling Hts., MI - Risk and Decision Analysis/Principal Systems Manager, February 2008- October, 2009 - Fixed Duration Contractual; Dechert LLP, Austin, TX - Intellectual Property Litigation Associate, February, 2007- December, 2007; Ford Motor Company, Dearborn, MI - Design Analysis - Technical Case Manager, February, 1999- February, 2007, Ford Motor Company, Dearborn, MI, Design Engineer, October, 1995- February, 1999 & July, 1985-July, 1992; General Motors Truck Engineering, Troy, MI - Senior Project Engineer, September, 1993- October, 1995; AlliedSignal Automotive, Sterling Heights, MI - Senior Project Engineer, Program Manager July, 1992 – September, 1993

MICHAEL NRANIAN

Cell: 248-376-0338

ADDITIONAL INTELLECTUAL PROPERTY INFORMATION:

I have deposition, hearing and trial experience in state and federal jurisdictions throughout the United States. Additional areas of experience include:

- Evaluation of patent infringement/non-infringement, and patent validity/invalidity, including America Invents Act & 101, 102, 103, 112 and prior art arguments. Analyses performed under literal infringement and the doctrine of equivalents. Prosecution History Estoppel.
- Development and Analysis of claim charts for Markman hearings, ITC cases, & federal cases, and Inter Partes reviews.
- Expert reports, depositions, hearing and trial testimony.
- Intellectual property, including technology standards boards and licensing authorities, antitrust/DOJ, technology development and transfer, patents, trademarks, trade secrets, trademark infringement/dilution, unfair competition/trade, false/deceptive advertising, Lanham Act, copyrights. Analyses of designs for Trade secrets misappropriation.
- Contracts negotiation, contract drafting/interpretation, and IP related clauses, licensing indemnification, business financial impact assessments, valuation & potential ROI. Georgia-Pacific factors analyses for determining reasonable royalty for plaintiff or defense. Willful infringement arguments. Goodwill damages. Class actions.
- Developing and analyzing Markman briefs, conduct prior art searches, and the analyses of patent file wrappers.
- Contracts, licenses, joint development agreements, statements of work. Summary judgment proceedings, evidentiary hearings, motions in limine, opposition & reply reports, briefs, claim charts.
- Analysis and assessment of industry trends - followed by working with product development activities, program managers, and cross-functional teams for new product innovation and to implement strategic design changes and the development of new products.
- Commercialization of innovations and intellectual property. Assessment of the engineering development/product development necessary and likelihood of innovations and/or patented inventions to become commercial products.
- Patent Cooperation Treaty Applications, U.S. applications, & international filings. Post-Grant Review, Inter Partes Review. Patent Drafting, Prosecution, and USPTO Office Action responses.
- Clarification of prior art in technical literature, publications, product specifications, and dissertations to analyze validity and obviousness.
- Specification and literature analysis of scientific and engineering patents. Product and technology analysis, patent portfolios, patentability research.
- Litigation support and technology education in patent disputes, claim charts, patent reexaminations, derivation proceedings, prior user rights.
- Technology Contracts, Freedom of Operation and Infringement Analyses. Technology Standards Groups and Licensing Authorities.
- All Aspects of Discovery and Disclosure Requirements, e-Discovery, Discovery Policy and Strategy. Document Production and Accurate/Consistent Response Preparation. Trial and Settlement Procedures.
- Flesh out and convey the novel and innovative arguments for new technologies and inventions, and understand and convey technical similarities and differences for infringement analyses.
- Design Validation Plans and Reports, Failure Modes and Effects Analyses, product prove-out, design verification, reliability and durability analyses.
- Represent clients in all aspects of electrical, chemical, software, source code/algorithm methods/processes, computers, microprocessors, & automotive components & systems involving all aspects of intellectual property litigation. Safety systems, accident avoidance, telematics/telecommunications, mobile cellular information data transmission (transmitters/receivers), traffic/weather, communication protocols, radio optical satellite wireless mediums, GPS, navigation, monitoring/surveillance/security/tracking systems, camera/vision/optical systems, fleet management systems, Bluetooth, smartphones, truck/commercial/recreational vehicles, construction/excavation, electrical/electronic, diagnostics. Human machine interfaces/displays, diagnostics, warnings. Data/ storage/retrieval. Workplace safety.

CASES INCLUDE

- | | |
|----------------------------------|-------------------------------------|
| • Mobileye v. iOnRoad | • Remy v. WAI et al (ITC) |
| • Karma v. Lordstown | • Speedguage v. Inthinc |
| • Parabit v. Millenium Locksmith | • Dorman v. Paccar (Design Patents) |
| • Voxx v. Johnson Safety Inc. | • Magna Mirrors v SMR Motherson |
| • Bosch v. Autel | • Hagenbuch v. Toyota (IPR) |
| • Stragent v. Volvo | • Magna v. TRW |
| • Continental v. Horizon | • StratosAudio v. Volvo Cars USA |

Also involved in other cases as technical expert consultant

MICHAEL NRANIAN

Cell: 248-376-0338

ADDITIONAL PRODUCT LIABILITY EXPERIENCE INFORMATION:

I have directly participated in more than 300 litigation cases providing overall technical and legal case management from notice through trial if necessary, including working with trial counsel, development of case and trial strategy, dispute resolution, and in-depth evaluations of multiple high-dollar lawsuits and claims. I have extensive experience in analyzing and assessing litigation risks. I have direct experience in all areas of discovery and motion practice as well as trial and settlement procedures. I understand the importance of accurate and consistent discovery and I have overseen and prepared hundreds of sets of responses to requests for productions, interrogatories, and requests for admissions. I have deposition, hearing and trial experience in state and federal jurisdictions throughout the United States. I have extensive experience in providing litigation and counseling support to national clients. I have extensive experience in analyzing and assessing claims and then working with product development activities and leading cross-functional teams to implement the necessary design changes to continuously improve products and designs and reduce overall exposure. I have direct experience in summary judgment proceedings, evidentiary hearings, motions in limine, as well as the related opposition and reply documents. I have prepared numerous expert witness reports, and have served as the expert witness and/or corporate representative in depositions, hearings, and trials, in state and federal jurisdictions throughout the United States for product liability cases. I have prepared and prepped other witnesses prior to their depositions and trial testimonies, including all potential cross-examination questions. Complete Forensic Analyses and Investigations.

Additionally, through these experiences, I have developed strong working knowledge of the following areas, among others:

- Product Liability Law, Automotive Defense, Indemnification. Forensic Analyses.
- Injury Thresholds as Related to Statutory Bars. Injury causation. Kinematic analyses.
- Medical devices, wheelchairs, motorized wheelchairs, controllers, and handicap assistance devices.
- Workplace safety/standards, Fall Protection, - OSHA, ANSI, etc. Inertia mechanisms, webbing, harnesses, forensics.
- Regulatory Requirements, including all FMVSS, ECE, SAE, Due-Care, Product Prove-out Interpretation/Compliance.
- Automotive and Truck (including Tractor-Trailer) systems, commercial recreational vehicles, construction equipment.
- Sensing systems, including all crash recorders (Direct design experience in these modules for over 20 years).
- Programming and algorithm development and verification to meet system requirements.
- Design Validation Plans and Reports, Failure Modes and Effects Analyses, product prove-out, design verification, reliability and durability analyses.
- Electrical, electronic, electro-mechanical, camera/vision, weight/occupant sensing, components and systems. Software, source code, algorithm, processes and methods. Quality control/assurance.
- Analysis of component defects including seats, seatbelts, pre-tensioners, load limiters, curtains, airbags, roof crush, structure, doors, and all modes of sensors. FMVSS and IIHS testing. Sled & Barrier & Crash testing. Forensic Analyses.
- Analysis of alternative designs, as well as design and product prove-out assessment and field analysis.
- Occupant kinematics & injury causation. Occupant detection and Out-of-position occupant detection & injury mitigation.
- Accident reconstruction and analysis of crash pulse information. Parameter and data analyses.
- Electrical systems and architecture, diagnostics, fault codes, forward collision warning, lane departure warning, collision warning, autonomous braking/cruise control, tire pressure monitoring, blind spot detection.
- Fire cause and origin (chemical/electrical). Fuel systems.
- Diagnostic system and fault code analyses, audio/visual warning systems, fail safes, labels, vehicle/operator performance.
- Insurance Law, No Fault Insurance Law, Subrogation, Class Actions, NHTSA complaints & responses.
- Automotive OEMs, Customers, Suppliers, Manufacturing, Operations in domestic, European and Asian environments.
- Depositions, Expert Testimony, Trial Testimony, and Witness Preparation.
- Field Analysis of Product Liability Issues and the Implementation of Design Changes to continuously improve products.
- Support for development of Trial Strategies, Trial and Motion Practice, Dispute Resolution, Negotiation, and Settlement.
- All Aspects of Discovery and Disclosure Requirements, e-Discovery, Establishment of Discovery Policy and Strategy.
- Document Production and Accurate/Consistent Response Preparation.
- Pre-emption arguments, express, implied, or fact-specific analyses.
- Represent clients in all aspects of electrical, chemical, software methods/processes, computers, microprocessors, source code, programming, and controllers. Automotive components and systems. Safety systems, accident avoidance, telematics/telecommunications, mobile cellular information data transmission (transmitters/receivers), traffic/weather, communication protocols, radio optical satellite wireless mediums, GPS, navigation, monitoring & surveillance, security/tracking systems, camera/vision/optical systems, fleet management systems, Bluetooth, smartphones, truck, recreational, and commercial vehicle systems, construction/excavation, electrical/electronic, diagnostics, etc.

ADDITIONAL AUTOMOTIVE PRODUCT DEVELOPMENT EXPERIENCE INFORMATION:

Ford Motor Company

Responsible for vehicle safety systems, ensuring legal and certification targets are achieved. Clarify requirements, resolve issues, and conduct certification testing. Identify legal and certification targets, and translate targets into build requirements. Monitor engineering development activities to ensure compliance, and assess and mitigate risks to program and system design, development, cost, and timing benchmarks. Interpret certification and regulatory requirements and communicate these to engineering teams. Perform data analysis, write reports, and monitor test and program plans. Conduct technical and legal analysis of vehicles, systems, and components, including airbags, inflatable curtains, seat belts, sensing systems, and system diagnostics and interpretation. Extensive trial and deposition testimony experience as corporate representative and expert witness. Extensive experience in the expert analysis of Ford, General Motors, and other domestic, European, and Pacific Rim crash recorders. (Direct design experience in these modules for over 20 years), Programming and algorithm source code development and verification to meet system requirements. Direct design experience in the development and verification of performance of algorithm and programming in these modules. Interpretation and analysis of the information stored in the memory of these systems and the correlation to field events and accident reconstruction Completed Northwestern Accident Reconstruction. Perform research on legal, regulatory, and technical issues and then recommend, plan, and follow through to improve systems. Very familiar with document production, and support of discovery and motion practice as well as trial and settlement procedures. Consultant to outside counsel in litigation involving customers, suppliers, and other third parties. Serve as the corporate representative and expert witness in litigation. Complete Forensic Analyses. Analyses of vehicle and component defect allegations. Extremely knowledgeable in overall restraint systems and vehicle crashworthiness for all front and side impacts and rollover. Determination of vehicle crush, BEV, accident reconstruction, occupant kinematics, and body structure performance. Extremely knowledgeable in FMVSS, ECE, regulatory and corporate standards, homologation, warnings, as well as obtaining SAE and NHTSA publications, and obtaining information related to NHTSA inquiries, recalls, and notices. Perform accident investigations, accident reconstructions, prepare expert witness reports, and testify in trials and depositions. Respond to requests for discovery in litigation. Direct experience in dealing with NHTSA inquiries, transport of Canada, and the interpretation of automotive regulatory requirements. Forensic Analyses and Investigations.

Direct experience in design, development, testing and release of SIR sensing and electrical systems, sensing algorithm development, sensing and airbag strategy, seatbelt/restraint systems and components, vision systems, airbag modules, airbag suppression systems, occupant and infant/child seat sensing, Occupant detection and Out-of-position occupant detection & injury mitigation, steering wheel, sheetmetal, structure, trim, front side and rollover sensing systems and front and side airbag/inflatable curtain systems. Extensive interface with suppliers, and manufacturing. Respond to consumer and plant issues related to electrical and safety systems. Develop the procedures for conducting electromagnetic interference testing. Wrote and published the system level Design Verification Plan and Report for prove out of both foreign and domestic safety systems. This includes all testing requirements for sensors, electrical, seats, and airbags, for corporate, European, and Federal Motor Vehicle Safety Standards.

Wrote and Published the Ford Motor Company Airbag Sensor and Electrical Design Standards, Airbag Sensor Design Manual, and Product Specifications. Directly responsible for the design validation and product verification of airbag sensor systems and airbag modules, inflatable curtains on the Mustang, Taurus, Explorer, Expedition, Escort, Focus, F-Series, Lincoln and Mark carlines. In depth experience in front, side, and rollover sensor system algorithm development and validation. In-depth experience in vehicle electrical system design and architecture - CAN, LIN, MOST, Byteflight, IDB1394, Flexray, Bluetooth, etc. In-depth experience in vehicle diagnostic, OBDII interfaces, vehicle bus interfaces, class II and serial communication protocols, and the analysis and interpretation of restraint system information stored in Electronic Crash Sensors, Restraint Control Modules, Sensing Diagnostic Modules, and other restraint & inflatable restraint system modules. Performed modeling and analysis to develop structural modifications, sensor locations/calibrations, and airbag module parameters to ensure these systems meet government regulations and design standards. Developed new electrical system protection and routing to maintain Supplemental Inflatable Restraints electrical system integrity during crash and over long-term vehicle life. Extensive experience in training and mentoring design, development, and test engineers as well as production and manufacturing personnel.

Conducted numerous crash, sled, and component tests. Managed body engineering and restraint engineering projects. Extensive experience in optimizing front, side, rollover, restraint, inflatable restraint, sensing, sensor algorithms, vehicle structure, interior seat and trim, IP, steering wheel, electrical diagnostic, passenger classification, and overall vehicle safety system performance to meet overall cost, timing and performance objectives. Developed design verification plans and reports, comprehensive statements of work, safety system management plans, failure modes and effects analyses, product and production validation plans, and then developed the products and systems to meet these requirements. Six Sigma Black Belt, very knowledgeable in design for manufacturing, quality control, and quality assurance techniques. Also very knowledgeable in QS/ISO 9000 & 14000, TS 16949 compliance and process setup, as well as Quality Operating systems, Business Operating Systems, design for manufacturing, quality control, and quality assurance techniques.

MICHAEL NRANIAN

Cell: 248-376-0338

ADDITIONAL AUTOMOTIVE PRODUCT DEVELOPMENT EXPERIENCE INFORMATION: *(CONTINUED FROM PREVIOUS PAGE)*

Ford Motor Company

In-depth knowledge of Ford, General Motors, as well as other domestic, European, & Pacific Rim component and system design/performance specifications and requirements. Extremely experienced in electronics and electrical diagnostic systems for vehicles. Extremely knowledgeable in digital electronic circuitry, computers and microprocessors, modeling, algorithm development, electrical diagnostic systems, chemical engineering, metallurgical engineering, materials science, solid state electronics, software development, source code, all Microsoft applications, and new safety system technologies including sensing, airbag, curtain, seatbelt, pretensioners, passenger recognition, occupant classification, vision, radar, and the development of these systems and technologies involving multiple engineering disciplines. Strong background in commercial and operational matters, product development, and project/program management/leadership. Extensive experience in interaction with suppliers, OEMs, customers, assembly plants, and manufacturing. Workplace safety/standards/policies, Fall Protection, - OSHA, ANSI, etc. Inertia mechanisms, webbing, harnesses, forensics investigations and analyses.

Experience in multi-cultural environments. Interfaced extensively with Mazda in Japan, Ford of Europe, Ford of Mexico as well as suppliers and assembly plants. Conducted field investigations on vehicle accidents to evaluate legal and technical issues. Completed 1-year timeline in 10 months to develop mandated airbag systems for multiple product lines. Saved \$9 million annually and cut number of components needed by 20% to 40% for 3 product lines. Protected \$1.4 billion annual revenue with turnaround of underperforming system.

General Motors Truck Engineering

Responsible for vehicle and system level compliance with Domestic, European, and Pacific-Rim regulatory requirements, as well as overall vehicle homologation for truck platforms. Responsible for the design, development, testing, and release of SIR sensing and electrical systems for the Chevy S-10 and Jimmy Truck platforms and their derivatives. Developed the Sensing Diagnostic Module systems for truck platforms. Development and verification of performance of algorithm and programming in these controllers/modules. In-depth experience in sensing system design and development, sensor algorithm development and validation, and airbag, seatbelt, vehicle structure, and vehicle interior design and development. Perform analysis to establish the best overall system performance to meet FMVSS, ECE, SAE, corporate, and due-care requirements. Developed various airbag suppression systems for rear facing infant seats. Occupant detection and Out-of-position occupant detection & injury mitigation. Technologies under review include ultrasonic, infrared, radio frequency, light emitting diode, camera, vision, and seat pressure pattern recognition. Developed, designed, and integrated the active passenger airbag suppression switch until passive systems become production ready. Interface extensively with suppliers, assembly plants, and manufacturing. Extensive experience in reporting and presenting issues and appropriate next steps to regulatory agencies and senior management. Saved \$15 million annually by leading development of new electronic sensor systems.

AlliedSignal Automotive

Developed system and vehicle plans to demonstrate compliance to domestic, Asian, and European regulations and requirements. Develop contracts, statements of work and comprehensive design and testing requirements for complete restraint system development for domestic, Asian, and European suppliers and customers. Managed domestic and European programs for the design, development, testing, and release of airbag modules for the Opel J-Car, Saab 9000, Isuzu, and Chrysler platforms, and the stored gas driver and passenger hybrid inflators. Lead the cross-functional teams of development & test engineers and technicians dedicated to these programs. Conducted component, deployment, and sled and barrier testing to determine hybrid inflator performance standards. Build sled bucks to match vehicle design parameters. In-depth knowledge of Chrysler, Ford, General Motors, Asian, European, and Australian business practices and requirements. Developed requirements for system electrical diagnostic interface.

Additional Background:

Certified in Accident Reconstruction - Northwestern University's Traffic Accident Reconstruction program. Developed critical guidelines and corporate standards for OEMs and the supply base. Extensive design & development experience in automotive electrical systems, sensing systems, diagnostic systems, as well as restraints, crash and sled testing, frontal, side, rollover impacts, occupant kinematics, injury and accident data bases, fire cause and origin, SAE and technical publications, and accident reconstruction. Direct experience in all aspects of intellectual property, including patents, joint venture agreements, trademarks, trade secrets, standards boards, antitrust issues, International Trade Commission cases, and licensing. Conduct objective assessment and evaluation. Conduct research on legal, regulatory, and technical issues. In-depth knowledge of domestic, European, Pacific Rim component and system design/performance specifications and requirements including necessary due-care airbag system development requirements. Expert investigation and analysis of vehicle electrical systems, electrical components, as well as airbag, seatbelt, and electrical diagnostic systems for vehicles. Expert analysis of domestic, European, and Pacific Rim crash recorders & crash pulse analyses. Extensive experience reviewing service bulletins, recalls, field service actions, customer contacts, owner and shop manuals for technical accuracy and adherence to federal standards. Direct experience in design, development, testing and release of SIR, sensing, & electrical systems.

MICHAEL NRANIAN

Cell: 248-376-0338

ADDITIONAL DEFENSE/MILITARY PROGRAM MANAGEMENT INFORMATION:

TARDEC/TACOM U.S. Army Research and Development Center

Cyber Security – (Direct) Computer Engineer – Science & Technology Team Leader & Cyber Penetration Testing 2016-Present Ground Systems Cyber Engineering

Prior Assignment - Intellectual Property Development – Chief Scientist Office -Invention Evaluation Committee (contractual through GTA & Alion) (February 2010 – July 2016)

- Manage the invention disclosures & intellectual property development for U.S. army TARDEC Research & Development Center. Work with TARDEC scientists and technical staff/engineers to develop new inventions and intellectual property.
- Develop Invention disclosures for prosecution & drafting of patent applications & develop responses to office actions, conduct searches, and infringement/freedom to practice analyses. Develop technologies through joint research and development collaboration and contracts with defense contractors, universities, and other entities. Develop joint research and development contracts with defense contractors, universities, and other entities.
- Technologies include: Cyber Security, software methods/processes, latency reduction, human machine interfaces, displays, warnings, sensors, sensor fusion, sensing processes & algorithms, software algorithms & process, robotics, manufacturing, battery, fuel cells, hybrid/electric vehicle, generators, capacitors, energy storage, gasoline diesel combustion engines, fuel/energy control systems, sensors, transducers, acoustics, armor, robotics, gyroscopes, thermal measurement, fire sensing/extinguishment, solid state electronics, spintronics, blast mitigation. injury reduction, mobility systems, IED & blast detection & injury mitigation, optical/vision/camera/infrared/lidar/radar 360° assessment, active/passive safety systems, AC/DC conversion, telecommunications, command, control, electrical/electronic satellite radio mobile communications data transmission, survivability, lethality, manufacturing, crash mitigation and crash avoidance. Occupant injury mitigation.
- Extensive experience in ITAR, FAR, and DoD government contracts and subcontracts.

Raytheon

Principal Systems Engineer-Team Lead

- Experience in risk management, trade studies, risk mitigation, US government defense projects. Expert in vehicle electrical system architecture.
- Extensive experience in requirements management, writing requirements and technical specifications.
- Cross-Functional Team Leader of on-site team of systems engineers supporting the Program Manager, Modular Brigade Enhancements United States Government Customer located at the US Army Arsenal in Warren, Michigan. Conduct the analysis of mission systems requirements, as they relate to the implementation of combat capabilities across the family of current and future ground combat vehicles.
- Perform systems engineering analysis supporting the performance of systems-of-systems and systems evaluations. Conduct architecture trades necessary to balance capability, risk, affordability, and supportability. Develop a set of systems engineering foundation documents that establish the tenants for comprehensive mission systems integration.
- Provide best value approaches to systems engineering training. Responsible for overall program/project management, cross-platform commonization, process improvement, metrics reporting, and overall requirements planning, establishment, & documentation. Provide consultation and oversee development of CMMI processes, software, and requirements to enable customer to achieve CMMI Process capability and improvement.

General Dynamics

Risk Analysis/Trade Studies Systems Manager

- Perform trade studies, systems engineering, as well as program, system, and component risk identification, analysis, mitigation and overall risk management for department of defense projects. Manage Program Cross-Functional Teams.
- Responsible for Requests for Information, and selecting/managing suppliers for defense systems and components. Establish Metrics and Evaluation criteria for supplier and supply chain assessment.
- Perform Make/Buy analyses, selection of component and system integration alternatives, and select suppliers based on Metrics Evaluation. Programs include Abrams Tank, Stryker, and Expeditionary Fighting Vehicle variants.
- Experience in risk management, opportunity management, trade studies, risk mitigation, US government defense projects.
- Extensive experience in requirements management, DOORS, writing requirements and technical specifications.

Technical Program and Systems Manager — Continuous Process Improvement, Six Sigma (Black Belt), New Product & Technology Development, Project & Budget Management, Risk/Opportunity Management & Compliance, Innovation and Intellectual Property, Lean Manufacturing. Direct Experience in all aspects of Six Sigma leadership, with Six Sigma Projects in process conformance, Requirements Development, Configuration Management and process artifact & document development. Experience in CMMI, software requirements development and system maturity level improvement as well as Quality Management Systems. Experience in leading teams and departments in developing and implementing metrics and measures, and the incorporation of metrics and measures from lower level sub-processes to higher enterprise level processes, and organizational balanced scorecards. Extensive experience in New Product and Technology Development. Leader of Cross Functional Teams.

Supplement to Michael Nranian CV Listing of Cases Over the Prior Three Years

Carter v. Ford, U.S. District Court for Southern District of Florida Broward Division Case No.: 19-cv-62646-RKA

Epilay Inc., v. Kirsch Research and Development LLC, ITC case Inv. No. 337-TA-1202 In the matter of Certain Synthetic Roofing Underlayment Products and Components Thereof Before the Honorable MaryJoan McNamara ITC Matter U.S. Patent No. 8,765,251 B2

Omega Patents LLC v. Firstech LLC (not sure of case venue)

CURTIS CUMMINS, DECEASED EMPLOYER: D&M STEEL ERECTORS INSURER: MISSOURIE EMPLOYERS MUTUAL INSURANCE CO. - assisting widow to collect on claims

Davis et al. v. Ford Motor Company (not sure of case venue)

GHSP V. SILLS (DCA FILE NO. 3731-01) GHSP, INC. V. ARTHUR HAZEN SILLS, U.S. DIST. COURT FOR THE W.D. OF MICHIGAN CASE NO. 1:21-CV-218, HON. PAUL L. MALONEY

TOYOTA RAV4 BATTERIES CLASS ACTION, CASE NO. 4:21-CV-00178-ALM (E.D. TEX)

BMW Canada Inc. v Autoport Limited, Court File No. CV-17-568847 (CANADA)

Avature Limited v. Strategi Consulting LLC IN THE UNITED STATES PATENT AND TRADEMARK OFFICE BEFORE THE TRADEMARK TRIAL AND APPEAL BOARD AVATURE LIMITED, Opposer, v. STRATEGI CONSULTING, LLC, Applicant. Serial No. 90/290,435 Opposition No.: 91269806 Mark: APERTURE

The Lockout Co., LLC et. al, Plaintiffs, v. Legacy Barricades, Inc., Defendant U.S. Patent No. 10,174,932 Case No. 1:22-CV_415 Hon. Hala Y. Jarbou United States District Court Western District of Michigan Southern Division

LKQ CORPORATION AND KEYSTONE AUTOMOTIVE INDUSTRIES, INC. V. KIA MOTORS AMERICA, INC. ET AL. United States International Trade Commission Washington DC In the Matter of Certain Replacement Automotive Lamps. INV. NO. 337-TA-1291, and all related cases and matters.

Streater, Paul v. General Motors Circuit Court of the Fifteenth Judicial Circuit and for Palm Beach County, Florida Civil Division Case No.: 2019-CA-016073, and IN THE CIRCUIT COURT OF THE FIFTEENTH JUDICIAL CIRCUIT IN AND FOR PALM BEACH COUNTY, FLORIDA STATE OF FLORIDA, Plaintiff, v. PAUL WILSON STREATER, Defendant., and also related matters and cases for Streater.

CORIENNA MORTIZ V. PULSAR PRODUCTS INCORPORATED; HOME DEPOT Superior Court San Bernardino County

WABTEC CORPORATION V. RAIL ASSETS, LLC W.D. PA; CIVIL ACTION NO. 2:19-CV-1636-NR

Mesker, Adam: Claims Against Employer, Hess Corporation and Harley's Fleet Service - North Dakota
Motor Vehicle Crash Report 2020004766 State Crash No. 1097704

BROCK GROUP V. 3M, Cause NO. DC-20-18342 In the District Court 160th Judicial Division Dallas County,
Texas

Courtney Brown v. General Motors et al. US District Court for the Eastern District of Louisiana Case No.
2:21-CV-01254-SSV-DMD

CUNNINGHAM EL AL. V. FORD MOTOR COMPANY 4:21-CV-10781-MFL-KGA (E.D. MICHIGAN)

Syron v. Ford (Waterford, Michigan – not sure of case venue)

ZPE LICENSING INC., a California Corporation, Plaintiff, v. ZZ PERFORMANCE, LLC and UZOMA IWUAGWU
U.S. Patent No. 8,931,156 Case No: 22-cv-00857 Hon. Robert J. Jonker Mag. Judge Phillip J. Green
United States District Court Western District of Michigan Southern Division

IN THE UNITED STATES DISTRICT COURT FOR THE NORTHERN DISTRICT OF TEXAS DALLAS DIVISION,
MULTIQUIP INC., Plaintiff, v. ANA, INC., Defendants, CIVIL ACTION NO. 3:22-cv-2599-M Honorable
Barbara M. G. Lynn

STATE OF MICHIGAN IN THE CIRCUIT COURT FOR THE COUNTY OF INGHAM Case No: 14-001380-FC-C30
PEOPLE OF THE STATE OF MICHIGAN, Plaintiff, v. John C. Kelsey, II Defendant Hon. James S. Jamo, -
criminal appeal matter involving GM suspension recall

Appendix 2

Materials Considered by Michael Nranian

U.S. Patent No. 8,816,651 Fell
File History U.S. Patent No. 8,816,651
US 2014/0150407 A1 - Van Niekerk et al
U.S. Patent No. 9,221,016 B2 – Van Niekerk et al
US 2003/0224833 A1 – Egan et al
U.S. Patent No. 6,701,221 B1 – Eaton et al
Deep Sea Electronics DSE7200 / 7300 Series Operators Manual Doc 057-074
US 2006/0262807 A1 – Aoki et al
U.S. Patent No. 6,422,001 B1 – Sherman et al
Ultimate Service Association Information Sheet – Wet Stacking
Avtron Loadbank “Load Banks for Prevention of Wet-Stacking in Diesel Generator Sets” July 29, 2008
Volt Master America Engine Driven Generator Set Owner’s Manual, pp 1-3
EPA Technical Bulletin – Diesel Particulate Filter General Information – EPA-420-F-10-029, May 2010
EPA Technical Bulletin – Diesel Oxidation Catalyst General Information – EPA-420-F-10-031, May 2010
Air Pollution Control Technology Fact Sheet – EPA-452/F-03-032
Power Engineering “How the Tier 4 Rule Affects Generator Specification” 11.01.2011
SAE Webpages SAE Standards Collection (ANA0005675-ANA0005677)
US 2004/0010349 A1 Perez et al
U.S. Patent No. 8,209,962 B2
Patent Assignment Van Niekerk et al
Van Niekerk App Drawings
Van Niekerk Original Application Claims
Excerpts of Multiquip’s Responses to ANA’s First Request for Documents (1-50)
Responses to Defendant’s First Set of Interrogatories (1-10)
Miyoshi JP2000-162291A w English translation
Terex Tech Tips No. 87
Document Update Checklist for 057-074_D128 for Deep Sea Electronics DSE72/7300 Series Operators Manual, Updating from Issue 6 to Issue 7.
Document Update Checklist for 057-074_D128 for Deep Sea Electronics DSE72/7300 Series Operators Manual, Updating from Issue 7 to Issue 8.
Document Update Checklist for 057-074_D128 for Deep Sea Electronics DSE72/7300 Series Operators Manual, Updating from Issue 8 to Issue 9.

Deep Sea Electronics DSE720/7300 Series Operators Manual, Document Number 057-074, Issue 9 (May 30, 2012) (DSE Manual 9)

Terex Tech Tips No. 87
