

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

PETITION FOR *INTER PARTES* REVIEW

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

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I. INTRODUCTION

Petitioner seeks *inter partes* review to invalidate claims 1, 4, 8-19, 22, and 26-36 (the “Challenged Claims”) of U.S. Patent No. 8,816,651 (the “‘651 Patent,” *EX1001*). This petition shows a reasonable likelihood that the challenged claims are unpatentable.

II. MANDATORY NOTICES

A. Real party in interest – Rule 42.8(b)(1)

Alliance North America, Inc., dba ANA, Inc., a Delaware corporation, of Cypress, California is the real party in interest. (“ANA”.)

B. Other proceedings – Rule 42.8(b)(2)

Petitioner is a defendant in an action filed by Multiquip Inc. in the United States District Court for the Northern District of Texas, Dallas Division, Civil Action No. 3:22-cv-2599-M (N.D. Tex. 2022). The complaint was filed November 18, 2022 and service made December 2, 2022.

The action is for infringement of the ‘651 Patent that is the subject of this Petition. A decision on this Petition might have an effect on or be affected by the action.

C. Counsel and Service – Rule 42.8(b)(3) and (b)(4)

Petitioner designates counsel as follows:

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Please direct call correspondence to lead counsel and back-up counsel at the contact information above. Petitioner consents to electronic mail service at patents@gardner-linn.com and the email addresses above. A power of attorney accompanies this petition.

D. Fees – Rule 42.103

The fee is being paid herewith the filing of this petition. The USPTO is authorized to charge any underpayment or additional fees that might be due to Deposit Account No. 50-5553/0444.

E. Certification of service – Rules 42.6(e)(4)(iii) and 42.105(a)

Petitioner certifies that a copy of this Request has been served in its entirety on the Patent Owner at the address provided for in 37 C.F.R. 42.6(e)(3).

Specifically, this Petition for *inter partes* review is being served on the correspondent of record for the ‘651 patent: Sean D. Burdick, P.E., 2537 W. State Street, Suite 220, Boise, ID 83702.

III. CERTIFICATION OF STANDING – RULE 42.104(a)

Petitioner certifies that the patent for which review is sought is available for *inter partes* review, and that Petitioner is not barred or estopped from requesting *inter partes* review challenging the patent claims on the grounds identified in this petition.

IV. IDENTIFICATION OF CHALLENGE; STATEMENT OF PRECISE RELIEF REQUESTED – RULES 42.22(a)(1) AND 42.104(b)(1)-(2)

Petitioner requests *inter partes* review and a determination that Challenged Claims 1, 4, 8-19, 22, and 26-36 in the ‘651 Patent are unpatentable for the reasons stated below, supported with exhibits, including the Declaration of Michael Nranian (*EX1003*) based on the following grounds under pre-AIA 35 U.S.C.:

Ground	Claims	Basis
1	19, 22, 26	Anticipated under §102(e) by U.S. Patent Application Pub. 2014/0150407 (“Van Niekerk,” EX1004), or alternatively obvious under §103 over Van Niekerk.
2	27-36	Obvious under §103 over the combination of Van Niekerk and U.S Patent No. 9,221,016 (“Van Niekerk 2,” EX1005), U.S Patent Application Publication No. 2003/0224833 (“Egan,” EX1006), U.S. Patent No. 6,701,221 (“Eaton,” EX1007), or Deep Sea Electronics DSE7200/7300 Series Operators Manual, Document Number 057-074, Issue 7 (February 4, 2011) (“DSE Manual 7,” EX1008) or Deep Sea Electronics DSE7200/7300 Series Operators Manual, Document Number 057-074, Issue 9 (May 30, 2012) (“DSE Manual 9,” EX1032)
3	1, 4, 8	Obvious under §103 over the combination of Van Niekerk and U.S Patent Publication No. 2006/0262807 (“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 U.S Patent No. 6,422,001 (“Sherman,” <i>EX1010</i>).
6	32-36	Obvious under §103 over the combination of Egan and Sherman, and further combination with JP Pat. Publication No. JP2000-162291 (“Miyoshi”), 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 Eaton

V. STATEMENT OF REASONS FOR RELIEF REQUESTED SHOWING A REASONABLE LIKELIHOOD THAT THE PETITIONER WILL PREVAIL – RULES 42.22(a)(2) AND 104(b)(4); 35 U.S.C. § 314(a)

A. The ‘651 Patent

The Challenged Claims address an engine generator equipped with a load bank, a device that selectively adds additional electrical load to the generator to improve combustion and increase the system’s exhaust temperature to burn contaminants. A particulate filter mechanically traps emission particles in the

exhaust and must be periodically “regenerated” to oxidize the trapped particulates. The independent Challenged Claims are directed to engaging the load bank either (a) during regeneration, or (b) after running under low load conditions in which soot builds up, dubbed a “neglect” condition. Dependent claims add a well-known and conventional engine generator features.

1. Background

The ‘651 Patent is directed toward an “engine-generator with load bank and control system,” in which an engine-generator, also referred to as a “gen-set,” is made up of engine 12 that drives a generator or alternator 14. (See *EX1001* Col. 4:47-51.)

The electrical load, or demand, on a gen-set can vary significantly (*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. 1:11-13.) It has long been recognized that wet-stacking can be reduced by adding additional “load” to the engine-generator when the real load is at a low level.¹ A conventional additional load, often referred to as a

¹ (See *EX1001* Col. 1:59-2:2; *EX1011* ANA0005551-52; *EX1012* ANA0000947; *EX1013* ANA0005899.)

“dummy” load, is made up of a “bank” of resistors similar to heater coils that draw electricity.

Many diesel engines from the 2000s forward used particulate filters for emission control to trap soot. These devices, commonplace prior to the ‘651 Patent and called “diesel particulate filters” or “DPF” when applied to a diesel engine, collect soot from the exhaust and periodically require a “regeneration” process 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 and do not undergo regeneration, examples of which are diesel oxidation catalyst (“DOC”) systems used for hydrocarbons, and selective catalytic reduction (“SCR”) systems, often called catalytic converters, which break down nitrogen oxide (“NO_x”). (*EX1015*; *EX1016*.)

The ‘651 Patent discloses two embodiments. One shown in Figure 1A has two separate controllers and is applicable to claim 1, while the other shown in Figure 1B uses only one controller and is applicable to claim 19. In Figure 1A (Claim 1) the gen-set includes an engine 12 with a DPF 22 and alternator/generator 14. A load bank 19 is wired to the engine-generator by bus 18. (See *EX1001* Col. 4:37-56.) Load bank 19 can add load in “steps” rather than the entire load bank 19 simultaneously. (*EX1001* Col. 2:29-37.)

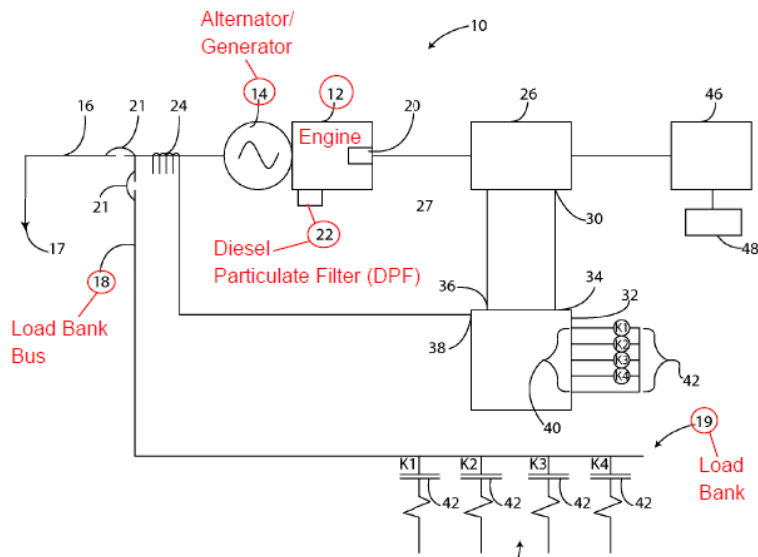
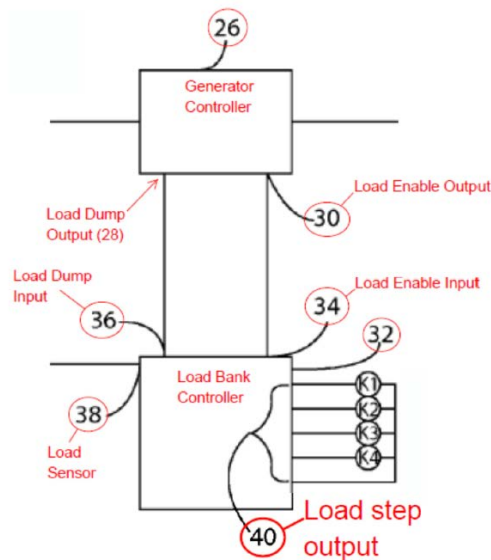


FIG. 1A

In Fig. 1A, a “generator” controller 26 has two different “output” connections (see “load dump output 28” and “load enable output 30”), and has two different “inputs” on a separate “load bank” controller 32 (see “load dump input 36” and “load enable input 34”). (*EX1001* Col. 5:16-22.)



Load bank 19 is turned on by generator controller 26 sending a signal from

load enable output 30 into load enable input 34 of load bank controller 32. (Col. 2:29-37.) If the system needs to disconnect the entire load bank, a different signal is sent by generator controller 26 from load dump output 28 into load dump input 36, causing load bank controller 32 to signal disconnect of the load bank 19. (**EX1001** Col. 2:37-40; Col. 3:64 – Col. 4:5.) Load bank controller 32 also includes a “load sensor 38.” (**EX1001** Col. 5:16-22.)

Load bank 19 includes one or more load step resistors 44, and in Figure 1A, load bank controller 32 has one or more “load step output” 40 connected to at least one load step contactor 42. Load step contactor 42 connects a load step resistor 44 through bus 18 with alternator 14 to add load. (**EX1001** Col. 5:23-36.)

In Figure 1B (Claim 19) the engine-generator includes only one controller, and includes engine 12 with DPF 22 and alternator/generator 14. A load bank 19 is wired to the engine-generator by bus 18. (**EX1001** Col. 6:23-34.)

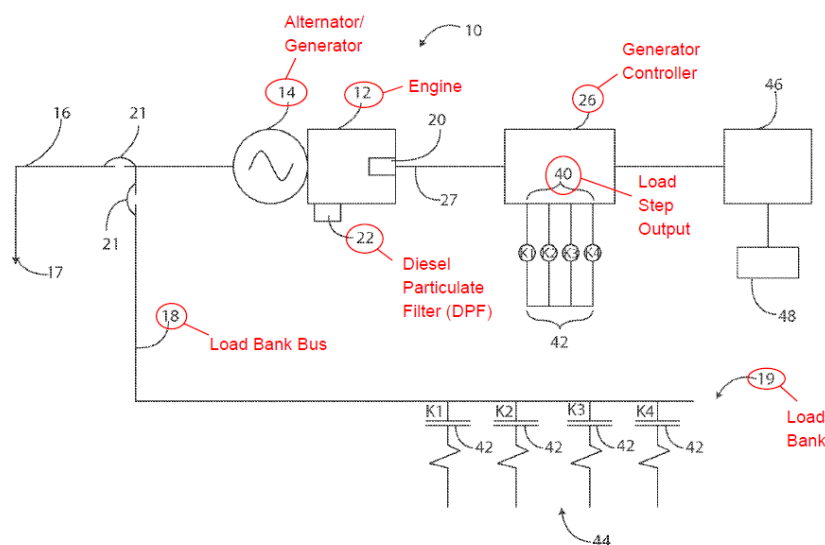


FIG. 1B

Generator controller 26 controls the load bank directly, with no load bank controller. (*EX1001* Col. 4:6-9.) Generator controller 26 has one or more load step output 40, each connected to a load step contactor 42 to connect load step resistors 44 to the bus 18.

The '651 Patent discloses three operating conditions, only two of which are recited in the Challenged Claims. One is the industry-recognized "regeneration" process that burns off soot from the particulate filter. (See *EX1001* Col. 1:41-47.) A second "neglect" condition is not an industry-recognized term but is coined by the '651 Patent in which the system is allowed to operate sub-optimally to save fuel until it reaches a level of "neglect." (See *EX1001* Col. 3:7-9.)

2. Challenged Claims

The Challenged Claims include independent claim 1 from which claims 4, 8-18 depend, and independent claim 19 from which claims 22 and 26-36 depend.

Claim 19 reads (formatting added):

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.

The remaining challenged claims are directed to additions of well-known and commonly used features of engine generators and diesel engines. (*EX1003* ¶68.)

3. Prosecution History

The application for the '651 Patent received a first action allowance.

B. Level of Ordinary Skill

The level of ordinary skill may be determined from the patent and prior art, as well as the education and experience a person would have in order to practice the invention. *See Helifix Ltd. v. Blok-Lok, Ltd.*, 208 F.3d 1339, 1347 (Fed.Cir. 2000). A POSITA in the field of the '651 Patent would have education and experience working with the design and specification of diesel engines, including their operation and exhaust aftertreatment and familiarity with relevant emissions regulations and standards. A POSITA would have at least a Bachelor's degree in Engineering such as Mechanical, or possibly Chemical Engineering, and three

years' experience in diesel engine systems and exhaust aftertreatment components.
(*EX1003* ¶¶62-65.)

C. Claim construction - Rule 42.104(b)

1. Legal Standard

Claims should be given their ordinary and customary meaning, consistent with the specification and prosecution history, as understood by a POSITA. *See* 37 C.F.R. § 42.100(b) (as amended Nov. 13, 2018); *see also* 83 Fed. Reg. 197 (Oct. 11, 2018); *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312-13 (Fed.Cir. 2005) (*en banc*). Unless otherwise discussed below, for this IPR claim terms are given their plain and ordinary meaning.²

2. Construction of “Neglect”

Claims 1 and 19 recite “in at least one of the following cases: neglect and regeneration.” “Neglect” is not an industry accepted term.³ The specification discloses intentionally running the engine sub-optimally for more than a short

² In the parallel District Court proceeding additional terms were subject to construction in order to provide guidance to a lay jury.

³ Without taking a position here on definiteness, the Board nevertheless can determine whether embodiments plainly within the scope of the claim would have been obvious. *Ex parte Tanksley*, 26 U.S.P.Q.2d 1384, 1387 (B.P.A.I. 1991).

duration in order to save fuel by letting the gen-set operate in an improper condition rather than use additional fuel by engaging the load bank. (*EX1001* Col. 2:9-16, Col. 3:4-9.) When the system has been run long enough such that wet-stacking is likely to have occurred, either by running continuously or over cumulative periods, the load bank is engaged to burn off accumulation to address this “neglect” case. (*EX1001* Col. 2:50-3:3; Col. 3:14-31.) The patent does not, however, disclose how to determine when the engine has been run sub-optimally to the point at which there is a “neglect” case.

The word “neglect” would connote that the engine generator has not been operated in the correct manner. A POSITA would recognize the “neglect” case means allowing the gen-set to run in a light load or sub-optimal condition for some undefined extended period of time and not a short period, in order to save fuel and reduce cost. (*EX1003* ¶¶84-88.)

3. Construction of “Load Spike”

Claims 1 and 19 recite the generator controller takes action to disconnect the load bank “in case of a load spike.” The specification expressly defines “load spike” as:

“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.)

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.” (*EX1003* ¶¶89-91.)

D. State of the Art

The patent addresses the problem of “wet stacking,” an accumulation of soot resulting from operation under light load, and acknowledges it was known to use a load bank to add a “dummy load” to address wet-stacking. (*EX1001* Col. 1:16-26, Col. 1:59-65.) Industry has known to automatically engage a load bank in low-load conditions to reduce wet-stacking. (*EX1010*, *EX1011*, *EX1012*.)

Several standards are applicable to gen-sets. The Tier IV Interim emission control standard was issued by the U.S. Environmental Protection Agency in 2008, and by 2012 was required for essentially all stationary non-emergency generator engines. (See 40 CFR §§1039.1, 1039.102; *EX1003* ¶¶92-94; *EX1017* Power Engineering.) SAE J1939 is a widely used protocol developed by the Society of Automotive Engineers that was released by 2002 in order to standardize communications between ECUs in heavy-duty vehicles and define how units communicate over a CAN bus. (See *EX1018*.) Generator sets have used the SAE

J1939 protocol and CAN communications for many years prior to the ‘651 patent⁴, including those with diesel engines and a DPF.⁵ (**EX1003** ¶¶107-108.) Outputs from generator systems with load banks were known to be connected for power transmission to external loads and load banks, such as via lines or buses.⁶

1. Van Niekerk (EX1004**)**

Van Niekerk was filed December 5, 2012 by Cummins Cal Pacific, LLC (**EX1021**) and is prior art under 35 U.S.C. §102(e). Van Niekerk discloses a genset 8 comprising diesel engine 16 and generator 14 that exhausts through load bank/exhaust heater 20 coupled with aftertreatment system 10 comprising DPF 24 and SCR 26. Power from genset 8 is applied to load bank 20 through power switch 28 which controls load bank 20 and is responsive to a signal from controller 30 of control system 12. (**EX1004** ¶¶[0010]-[0011].) Control system 12 receives inputs from temperature sensor 34 and pressure sensor 32 that monitors backpressure on DPF 24 to provide command signals to controller/power switch 28 regulating the power from genset 8 to load bank 20. Current transformer 38 coupled with power

⁴ **EX1007** Col. 4:13-30, 5:38-50; **EX1019** U.S. Pub. 2004/0010349 filed July 12, 2002, ¶¶[0003], [0006], [0063].

⁵ **EX1020** U.S. 8,209,962, filed Sept. 28, 2005, Col. 1:63-66, Col. 2: 60-66, Col. 4:54-61.

⁶ **EX1026** U.S. 5,583,440 filed Feb. 6, 1995, Col. 10:38-39 (bus 31).

sensor 36 provides control system 12 with the total power demand. (*EX1004*

¶¶[0011]-[1012].)⁷

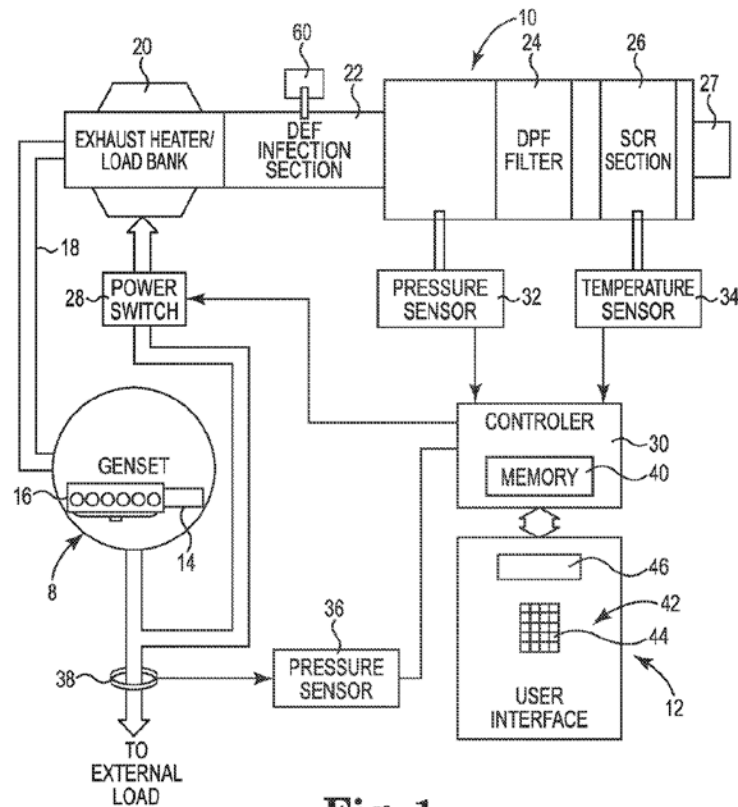


Fig. 1

⁷ Fig. 1 includes an error labelling item 36. Van Niekerk discloses “genset output power sensor 36” (¶ [0011]), and originally filed Fig. 1 was labelled “power sensor 36.” (*EX1022.*)

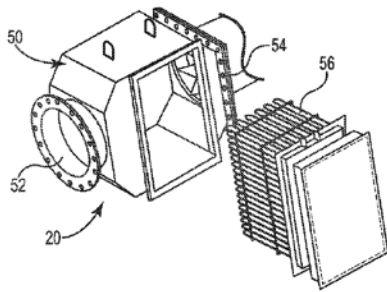


Fig. 2

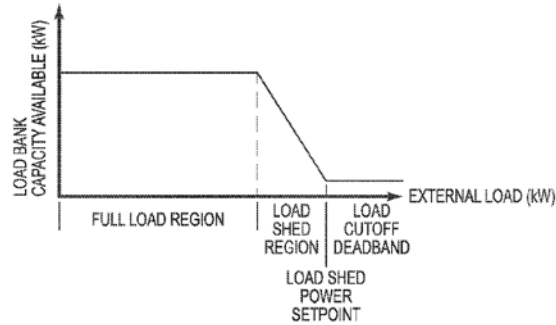


Fig. 4

Load bank 20 comprises a set of resistive elements 56 that may be individually coupled for additional load to maintain a preset total load. (**EX1004** ¶[0013].) The system engages load bank 20 when the system undergoes regeneration of the DPF. (**EX1004** ¶[0016]-[0017], [0020], [0022]-[0023]; claims 6, 10, 36.)⁸ Running at a low-load condition prompts greater soot accumulation and necessitates more frequent regeneration (**EX1004** ¶[0019]), and length of operation in run-mode may require a longer regen-mode. After undergoing a run interval, control 12 signals a switch to the regen mode 110 and load bank 20 is engaged to maintain load during regeneration. (**EX1004** ¶[0020].)

Although the claimed “neglect” is indefinite, Van Niekerk engages load bank 20 when the system has run in a sub-optimal “neglect” case. (**EX1004** ¶[0022]-[0023]; see claims 12, 13, 37, 40.) An intent of Van Niekerk is to

⁸ The originally-filed claims of Van Niekerk are part of the disclosure. (**EX1023**.)

See *Hyatt v. Boone*, 146 F.3d 1348, 1352 (Fed.Cir. 1998).

enhance fuel consumption. (**EX1004** ¶[0031].) After running for several cycles and the controller determines “excessive soot loading” is occurring, the controller signals a switch to “deep clean” regen-mode 116 and load bank 20 is engaged for higher temperatures and soot burn off. (**EX1004** ¶¶[0022]-[1023].)

Van Niekerk’s load bank 20 addresses load spikes or increased loads. (**EX1004** ¶[0028]; Figure 4.) With a load spike there will be a delay in the load cut-off.

2. Van Niekerk 2 (EX1005)

Van Niekerk 2, filed December 5, 2012, incorporates Van Niekerk in its entirety for all purposes and is 35 U.S.C. §102(e) prior art. (**EX1005** Col. 4:64-5:2.) Van Niekerk 2 discloses genset 12 comprising diesel engine 14 and electrical generator 16 with exhaust aftertreatment system 20. (**EX1005** Col. 3:18-26.)

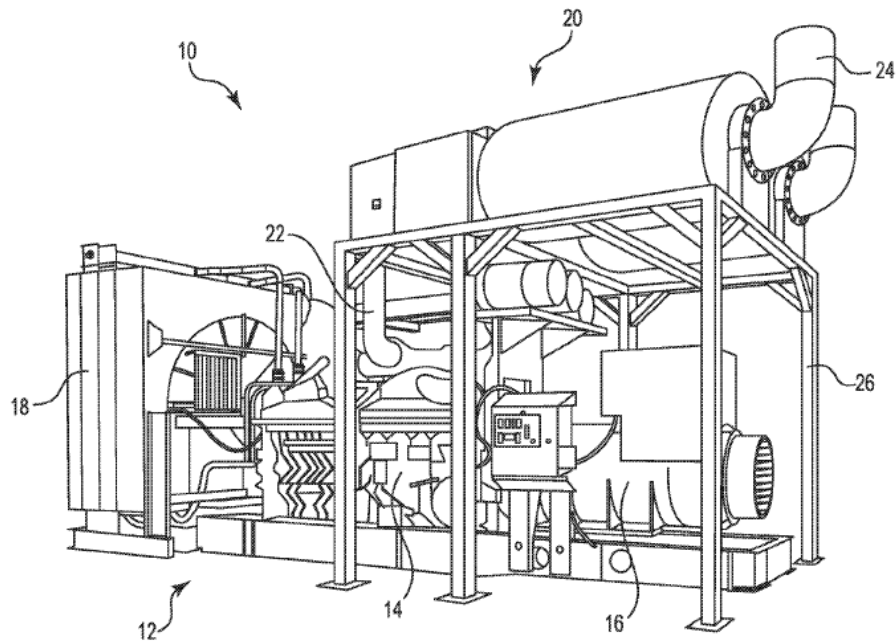


Fig. 1

Aftertreatment system 20 includes DPF section 62 with ceramic filters that physically traps soot, SCR section 40 and an exhaust heater/load bank 80 operated in accordance with the disclosure of Van Niekerk *EX1004*. (*EX1005* '016 Col. 3:34-46; Col. 4:64-5:2; Col. 5:7-17; Col. 5:64-6:5.) The system is for gensets meeting Tier IV Interim and Tier IV Final requirements. (*Ex1005* Col. 3:1-3.) Aftertreatment system 20 may be remotely located on support structure 26, (*EX1005* Col. 3:26-23; Fig. 1), or next to genset 12, i.e. on the same base. (*EX1005* Col. 3:31-33.)

3. Egan (*EX1006*)

Egan was published December 4, 2002. Egan discloses power generator 10 comprising diesel engine 101, alternator 103 and controller 105. Diesel engine 101

is mechanically coupled to alternator 103 to drive a rotor of alternator 103 such that when load is placed on alternator 103, a load is placed on the engine (*EX1006* ¶[0041] and [0158].) Load bank 118 is located at outlet vents 113 of power generator 10, and therefore shares a common base and enclosure with the genset. (*EX1006* ¶[0041]; Figures 2-3.) Controller 105 controls generator 10, including engine 101, and separate load bank controls 1056 are provided on the control panel. (*EX1006* ¶¶[0221]-[0222], [0248]-[0255], Figure 10.) The system may be three phase-polyphase. (*EX1006* ¶[0160].)

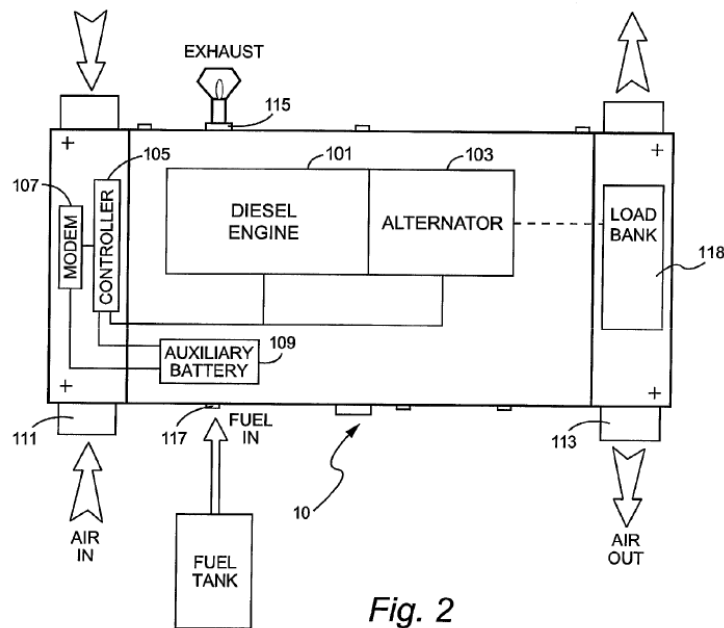


Fig. 2

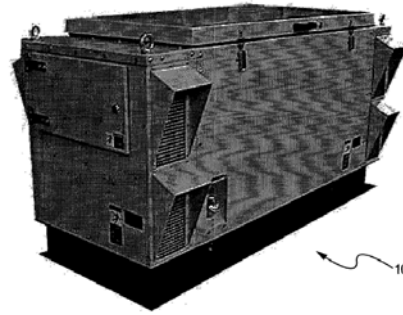


Fig. 3

Alternator 103 is coupled to both a load, cellular base station 30, and periodically to load bank 118 to provide power thereto. (*EX1006* ¶[0036] and [0350], Figures 1-2.)

Controller 105 receives sensor signals from both engine 101 and alternator 103 to control engine 101 and alternator 103. (*EX1006* ¶[0041]; Figure 2.) Thus, controller 105 is communicative with engine 101 such that controller 105 includes both engine ECUs (or is communicative with engine 101 via ECUs or ECMs) and a generator controller. (*EX1006* ¶[0041], Figure 2.) The system includes a 5-10 second nominal delay before reducing voltage for overload protection (*EX1006* ¶[0220]), and other programmed delays before disconnecting switches. (*EX1006* ¶[0253], [0266].)

Load bank 118 includes one or more heaters controlled through load bank controls 1056, such that load bank 118 automatically loads generator 10 with a resistive load periodically for a set time when the generator load drops below a pre-set level, and is disconnected when the generator load rises above that level.

(*EX1006* ¶[0350]; claims 27-30.) Thus, load bank 118 is used to avoid carbon deposits inside exhaust manifold 115 resulting from continuous no-load or almost no-load operation, but automatically disconnects from generator 10 when the generator load rises above the pre-set level (*EX1006* ¶[0350].)

Egan also engages load bank 118 in a so-called “neglect” case. Generator 10 is allowed to run in a low-load condition under 4 kW for three hours and then load bank 118 automatically applies a 5 kW load for fifteen minutes. (*EX1006* ¶[0350].) Generator 10 is therefore run under a sub-optimal low/no load condition for a set time that is not a short duration (e.g., three hours), with recognition that the load bank is required after that sub-optimal operation. (*EX1006* ¶[0350].)

4. Eaton (*EX1007*)

Eaton discloses controls for genset 150 including diesel engine 152 and three-phase alternator 154 in which ECM 160 communicates with genset controller 100 through CAN serial link 170 which uses the SAEJ1939 protocol. Controller 100 provides commands to ECM 160 to influence the operation of the engine. (*EX1007* Col. 4:13-56, 5:28-58.)

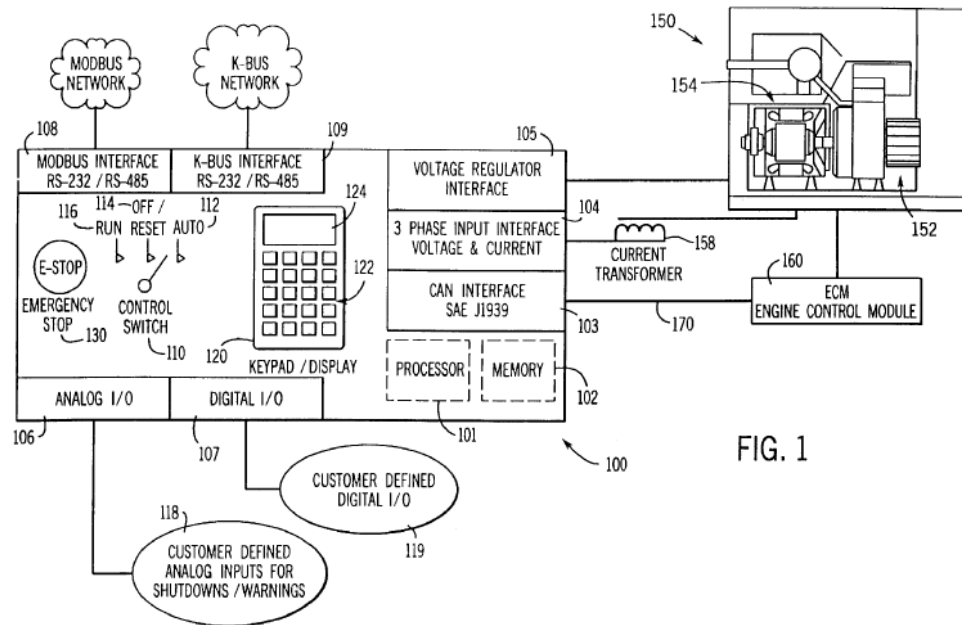


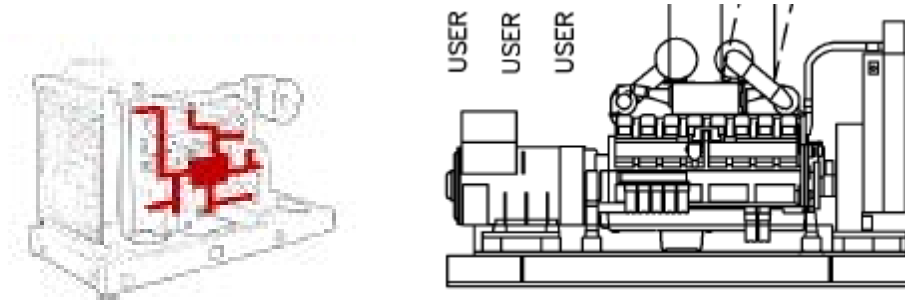
FIG. 1

Controller 100 determines if an alternator parameter exceeds a maximum value to provide a command to completely shut down genset 150 or a portion thereof, or reduce some operational parameter of genset 150. Controller uses a set delay period, such as ten seconds (or other periods) before issuing a shutdown command. (**EX1007** Col. 9:39-10:15, 13:19-33.) The engine may be controlled by an ECM, which the genset controller monitors and controls via a CAN interface and employs the J1939 protocol. (**EX1003** ¶124.)

5. DSE Manuals 7 (**EX1008**) and 9 (**EX1032**)

The DSE Manuals 7 and 9 are for a controller used with a generator set having an engine and alternator, including control and integration of a dummy load. (**EX1008** p. 7, 73-74; **EX1032** p. 7, 75-76.) The relevant disclosures of the

two manuals are similar, with different page numbers. The alternator is three phase. (**EX1008** p. 30, 39; **EX1032** p. 32, 41.)

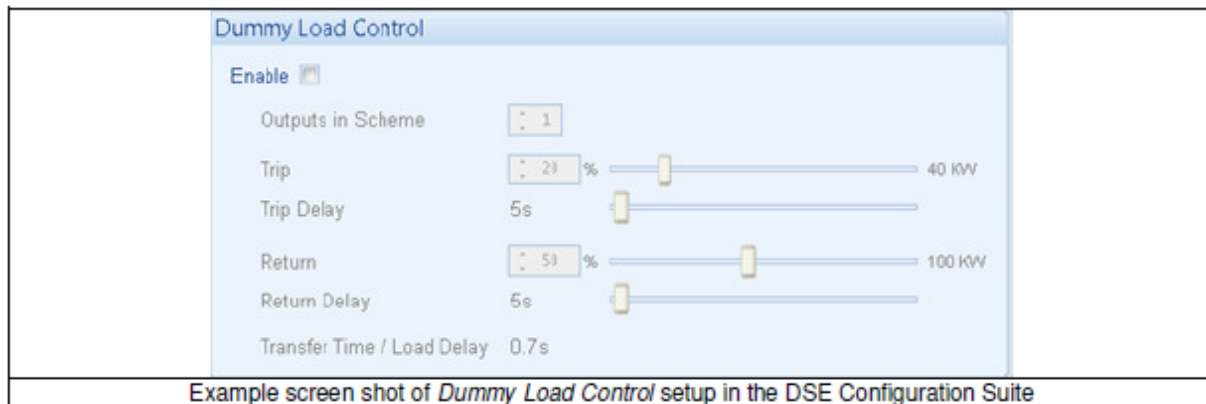


(**EX1008** p. 14, 39; **EX1032** p. 32, 41.) The controller communicates with and provides control signals to the engine's ECU. (**EX1008** p. 39, 60, 67, 70, 75, 86; **EX1032** p. 41, 62, 69, 72, 79, 90.)

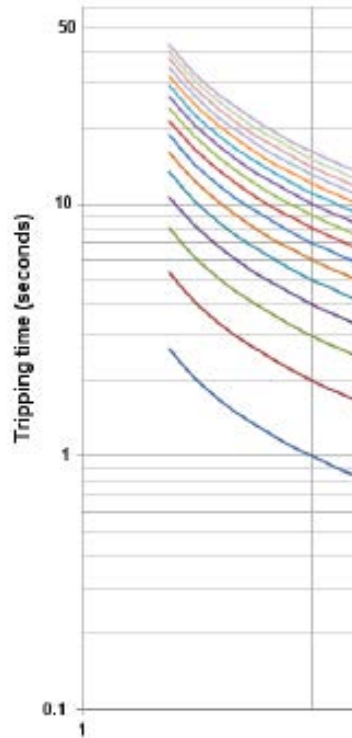
The DSE Manual 7 was released February 4, 2011 and distributed on the DSE website www.deepseapl.com. at least by December 17, 2011. (**EX1008** p. 6; **EX1027** ¶¶9-16; **EX1029**; **EX1030**.) DSE Manual 9 was released and distributed on the DSE website on May 30, 2012. (**EX1027** ¶¶17-24; **EX1031**.) DSE manuals 7 and 9 note the controller may be coupled with a Cummins genset. (**EX1008** p. 40; **EX1032** p.42.)

The controller monitors the engine, and transfers load to the generator 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 dummy load steps from a static load bank to maintain a nominal load and avoid light loading. (**EX1008** p. 73; **EX1032** p. 75.)



The Dummy Load Control provides up to five dummy load steps. If the generator loading falls below a pre-selected Dummy Load Trip setting, a Dummy Load Control Trip Delay is activated. Should the load remain below the Trip setting for the Trip Delay, a first step of dummy load is added. If the load remains below the Trip setting, the Trip Delay is again activated and the process repeated for five dummy load steps. If the generator loading exceeds a Dummy Load Return level, a Dummy Load Return Delay begins. Upon expiration, if the load is still above the Return level the highest active dummy load step is de-energized. The sequence is followed until all dummy load steps are de-energized. The delay time periods are adjustable, with an example of a five second delay. (**EX1008** p. 73; **EX1032** p. 75.) Various other delay timers are disclosed for alarms and shutdowns, for example the Earth Fault Shutdown labelled delays ranging from 0.1, 1 and 10 seconds and greater. (**EX1008** p. 95; **EX1032** p. 97-101.)



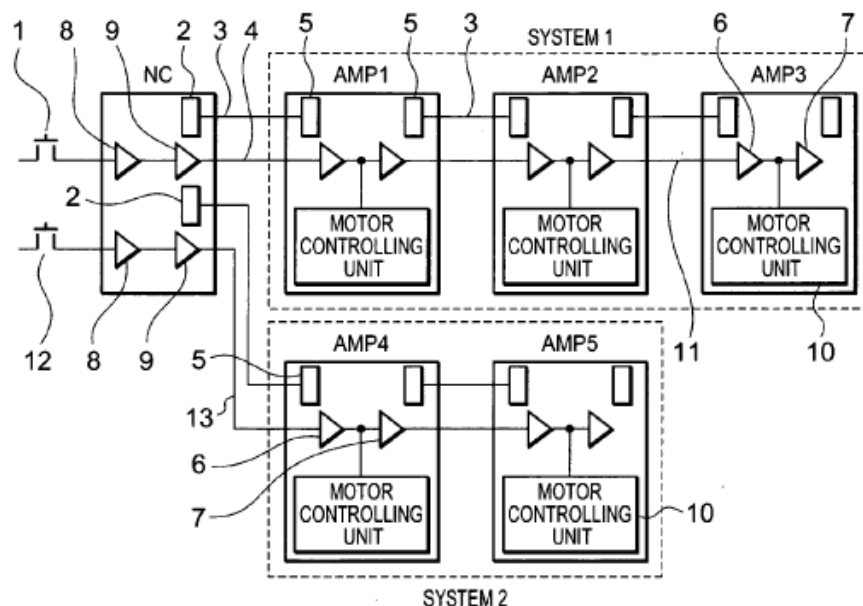
The controller provides a load shedding Control feature. When the load reaches a pre-selected Load Shedding Trip level a Trip Delay timer is started, and if loading is still above the Trip level at expiration, a Load Shedding Control output will be energized to remove a dummy load step. The sequence 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 the process run in reverse. (*EX1008* p. 74; *EX1032* p. 76.)

6. Aoki (*EX1009*)

Aoki published November 23, 2006 and discloses (Figure 11) a two controller-two wire system for industrial equipment in which a numerical control apparatus (“NC”) as host controller communicates with a drive control apparatus

(“AMP”) as client/drive controllers. The NC controller provides enabling signals via communication cable 3 to AMP controllers. An emergency-stop-signal is provided by NC controller to AMP controllers via a separate emergency-stop-signal cable 4, to insure reliability. (*EX1009* ¶¶[0002]-[0003], [0005].)

Fig. 11



7. Sherman (*EX1010*)

Sherman issued July 23, 2002. Sherman discloses a vehicle hybrid electrical drive system 10 that includes engine 12 with rotating output shaft 12s which drives an electrical generator 14. (*EX1010* Col. 2:47-50; Figure 1.) The output of generator 14 is applied to power-handling controller 16 which includes power switches for switching the power flow to electric motor 18 and/or a battery/electrical storage device 22 and selectively to power dissipating resistor 24 (i.e., a load bank). Electrical controller 26 controls operation of controller 16 as

well as interacting with the engine 12 by way of a signal path 38 for monitoring and controlling engine operation. (**EX1010** Col. 2:47-Col. 3:10; Figure 1.)

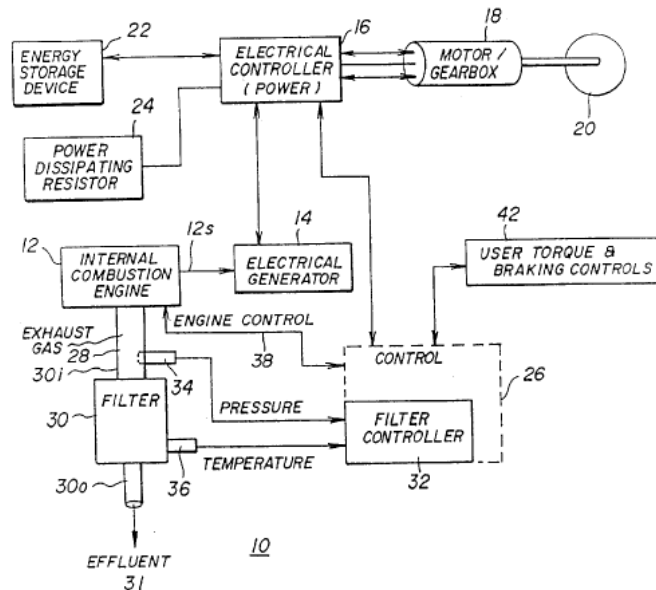


Figure 1

Engine 12 may be diesel and produces exhaust gases directed by exhaust pipe 28 to regenerative particulate filter 30. Filter 30 is cleaned by heating trapped particulates sufficiently that the particulates combust. (**EX1010** Col. 3:11-38, 4:60, 5:63.) During ordinary use a sufficient load is placed on the engine such that exhaust gases exceed a regeneration temperature (Col. 3:30-38.) When engine 12 is operated such that the engine load is insufficient to reach the regeneration temperature, particulate filter 30 can become clogged (Col. 3:39-53.) Resistor load bank 24 is then used to aid regeneration. (Col. 7:4-16.) The resistor/load bank 24 may be engaged in portions (steps), with the load adjusted to achieve a selected level. (**EX1010** Col. 7:47-51, claims 1-4.) Pressure sensor 34 measures back

pressure at filter 30. A signal from pressure sensor 34 is received by controller 26 to control regeneration (via filter controller 32). (*EX1010* Col. 3:54-67; Figure 1.)

Using the pressure sensor 34 signal, filter controller 32 of controller 26 controls operation of engine 12, application of power to battery 22 and to resistor/load bank 24 according to whether pressure is above a first threshold value P1 or above a second, higher threshold value P2 (Col. 4:1-32; Figures 1, 2).

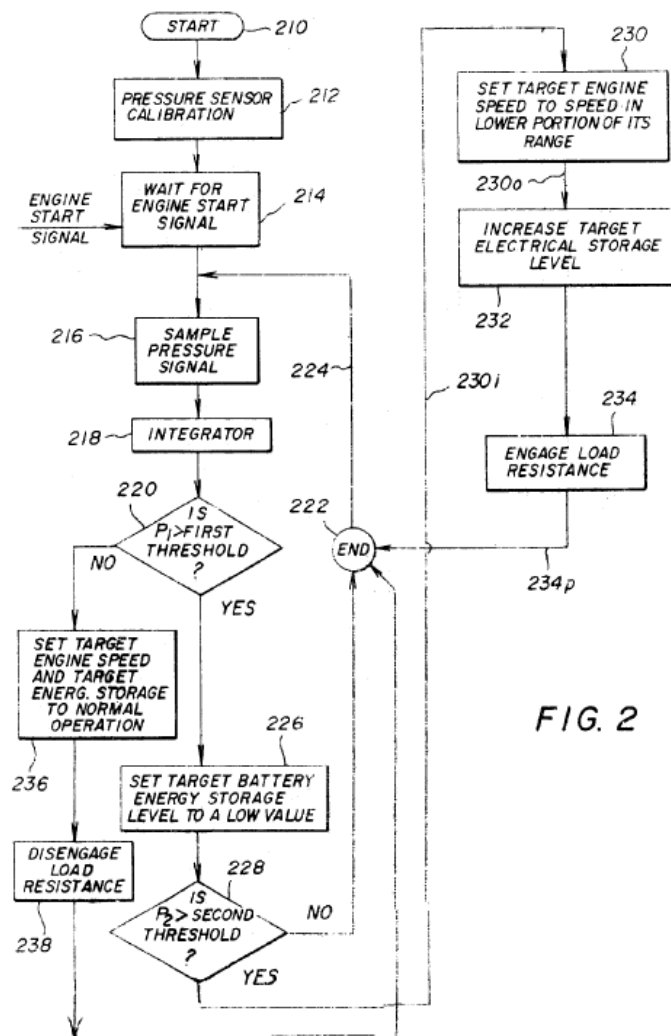
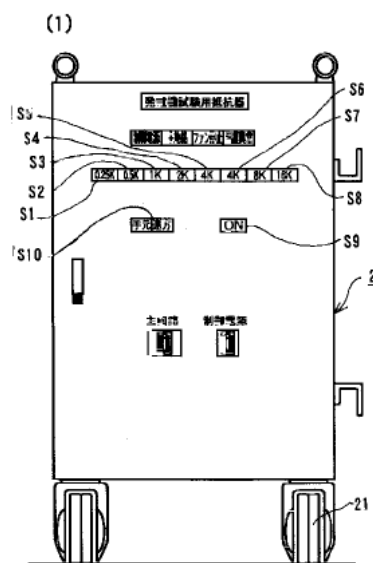


FIG. 2

Sherman discloses a so-called “neglect” case. When the backpressure at filter 30 reaches first threshold value P1, regeneration is considered “imminent.” (Col. 4, lines 33-46, Figure 2.) When the backpressure rises above threshold value P2, regeneration begins by increasing the load on the engine 12 by storing power in battery 22 and/or applying power to resistor 24 (Col. 4:47-Col. 5:17; Figure 2.) The associated increase in temperature aids in raising the filter to regeneration temperature. Sherman notes regeneration continues until the backpressure is below the first threshold value P1. (Col. 5:30-49; Figure 2.)

8. Miyoshi (EX1028)

Miyoshi discloses a load bank 1 comprising a plurality of selectively engaged resistors R1-R8 located in a main body section 2 separate from a three-phase gen-set 6 to which it is coupled, and may be used to burn off accumulation in the engine exhaust. ([0003]-[0004], [0013], [0015], [0017], [0019]; Figure 2.)



E. Ground 1: Claims 19, 22, 26 Are Anticipated by Van Niekerk, or Alternatively Are Obvious Over the combination of Van Niekerk and Eaton

1. Independent Claim 19

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

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, ¶ [0010].)

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

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, ¶ [0010]; **EX1003** ¶142.)

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

Van Niekerk discloses an exhaust aftertreatment system 10 for genset 8 that includes a DPF filter 24. Van Niekerk also discloses a control system 12 that provides a “command signal” for applying power to the load bank 20, where “control system 12 can be coupled to a gen set controller.” (**EX1004**, Fig. 1, ¶¶[0004], [0010], [0027].) Genset 8 includes engine 16. (**EX1004**, Fig. 1, ¶[0010].) The “genset controller” is thus an “engine control module” as claimed.

Van Niekerk teaches this element and/or it is obvious. (See **EX1004**, Fig. 1, ¶¶[0004], [0010], [0027]; **EX1003** ¶142A.)

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

The genset 8 is in electrical communication with an output bus depicted in Fig. 1 as an output to “external load”, and is coupled to load bank 20 by a load bank bus, as reflected by the connection to load bank 20 through power switch 28. (**EX1004**, Fig. 1, ¶¶[0001], [0012].) With reference to FIG. 1B of the ‘651 Patent, the disclosure states, “[t]he alternator 14 is connected to an output bus 16, which is connected to a real load 17, and a load bank bus 18, which is connected to a load bank 19.” (**EX1001**, Col.6, ll.15-18.) The identical connections are shown in FIG. 1 of Van Niekerk. To the extent output and load bank buses are construed as something other than the connections disclosed in Van Niekerk, the term “buses” for connections in gensets was known. (**EX1026** Col.10:39-44.) Van Niekerk teaches this element and/or it is obvious. (**EX1003** ¶143.)

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

Van Niekerk discloses that its control system 12 is coupled to and in communication with the genset controller. Van Niekerk further discloses that the control system 12 includes a controller 30 that provides control signals for control

of load bank 24. This element is disclosed and/or obvious. (**EX1004**, Fig. 1, ¶¶[0011], [0012], [0027]; **EX1003** ¶144.)

Alternatively, Eaton discloses an ECM 160 monitored and controlled by a genset controller 100 through a CAN interface using the J1939 protocol. It would be a simple design choice to substitute this arrangement for the controller of Van Niekerk to provide separated programming updates, parts, service and replacement for cost savings. (**EX1007**; **EX1003** ¶144.)

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

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, ¶[0012].) Resistive elements 56 may be individually coupled or decoupled to control the amount of load. (**EX1004** Fig. 1, ¶[0013]; **EX1003** ¶145.)

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

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, ¶¶[0012], [0013].) This element is disclosed and/or obvious. (**EX1003** ¶146.)

- 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**

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, ¶¶[0011]-[0012]; *EX1003* ¶147.)

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

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, ¶[0012].) This element is disclosed and/or obvious. (*EX1003* ¶148.)

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

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*, ¶¶[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.

Van Niekerk discloses operation in the Deep Clean Regen Mode 116, which also meets 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 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 the involved and lengthy Deep Clean regeneration process must be undertaken. (*EX1004*, ¶¶[0022]-[0023].) This is a “neglect” case as best understood in the ‘651 patent. During this Deep Clean regeneration Van Niekerk discloses the load bank is engaged. (*Id.* ¶[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. (*EX1003* ¶149-150.)

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*

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 4, ¶[0028].) 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. (*EX1003* ¶151.)

2. Dependent Claims 22 and 26

a. Claim 22

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 electrically coupled or decoupled to control the amount of the presented load.” (*EX1004*, FIG. 2, ¶[0013]; *EX1003* ¶152.)

b. Claim 26

Claim 26 adds that the engine is a diesel engine. Van Niekerk discloses the engine may be diesel. (*EX1004*, ¶[0010]; *EX1003* ¶153.)

F. 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

Van Niekerk 2 incorporates Van Niekerk and renders obvious claims 27, 30, 32, 33. Alternatively, since Van Niekerk 2 incorporates the entirety of Van Niekerk, Van Niekerk 2 anticipates claim 19 as discussed above, and these dependent claims as subsequently discussed.

a. Rationale to combine and reasonable expectation of success

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.) At a minimum it would be obvious to combine the two since Van Niekerk 2 points directly to the other and they have overlapping subject matter. (*EX1003* ¶155.)

Claim 27: adds that 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* ¶ [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; *EX1003* ¶156.)

Claim 30: adds the requirement of a common base and enclosure. FIG. 1 of Van Niekerk 2 discloses the engine 14 and generator 16 on a common base. Van Niekerk 2 further 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.) It would be obvious to include an enclosure over

Van Niekerk 2, such as shown in Egan (**EX1006**) to protect the system, for safety and/or sound abatement. (**EX1003** ¶157.)

Claim 32: adds the requirement of a load step resistor located remotely from the gen-set. Van Niekerk 2 discloses the aftertreatment system 20 which includes load bank 80 may be located on a separate support structure 26 and is thus located remotely above genset 12. (**EX1005** Figure 1, Col. 3:26-28.)

Claim 33: adds the requirement of the controller and engine control module use J1939 which has been widely known since 2002. It would be a simple substitution and obvious to use this standardized protocol to enable ease of communication, diagnostics and monitoring, and ability to use readily-available, off-the-shelf components that are readily available, standardized, inexpensive and less wiring. (**EX1018, EX1003** ¶159.)

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

a. Rationale to combine and reasonable expectation of success

Both Van Niekerk and Egan are in the same field of endeavor and disclose similar structures and components of diesel gensets coupled with load banks using known techniques 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 with similar components and operation. Including Egan's delay timer in Van Niekerk prevents disengaging the load bank for transient electrical fluctuations. 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, 34-36 obvious and simple matter of design choice. (**EX1003** ¶160.)

Claims 19, 22, 26: As discussed in Section F.1.a-k and F.2, Van Niekerk discloses and renders obvious these claims. 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.

Claims 28, 29: Claim 28 adds the requirement of the alternator, output and load bank buses and load step resistor are a poly-phase system, and claim 29 specifies a three-phase system. Egan discloses a genset 10 with alternator 103 and load bank 118 that may have a plurality heaters or steps. (**EX1006**, ¶¶[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**, ¶[0166].) Three phase operation provides known advantages, such as using less conductor

material over a specified distance, equipment is smaller and simpler, less voltage drop, higher efficiency, and higher reliability. 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 simple design choice, obvious to try and obvious to provide in the Van Niekerk system. (**EX1003** ¶162-163.)

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 decrease part complexity and costs, save space and increase convenience. (**EX1003** ¶164.)

Claim 31: adds the requirement of the load step resistor is in an enclosure connected to the radiator of the engine. As disclosed by Egan (**EX1006**) relative to Figures 2-7, the intake of genset 101/103 is on one side of the enclosure and load bank 118 is located within the enclosure at the exhaust side. Engine 101 and its radiator are likewise in the enclosure and connected to the load bank 118. This claim would be a simple design choice with predictable results, obvious to try and to provide a compact packaging. (**EX1003** ¶165.)

Claims 34-36: each add the controller causes the load step resistor to disconnect within a set number of seconds, claim 34- 10 seconds, claim 35- 1 second, and claim 36- 0.1 seconds. The specification assigns no significance to

these times which are a conventional logarithmic progression. Egan is in the same field of endeavor as Van Niekerk with similar structures and discloses an overload protection that disengages voltage after a programmed delay (nominally 5-10 seconds) (**EX1006** ¶[0220]) and disconnecting load bank 118 in the event of a load spike. (¶[0350].) It would be a simple matter of design choice and obvious to include a load bank disconnect with a delay adjustable to a conventional progression with predictable benefit of avoiding commonplace transient fluctuations or brief changes causing unnecessary interruptions and start-ups, with the specific time a matter of design choice. (**EX1003** ¶166-168.)

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

Claim 33: 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 a Van Niekerk genset in view of Eaton as an obvious design choice to predictably provide standardized communications and allow ease of diagnostics with CAN-based communication. (**EX1003** ¶169.)

Claim 34, 35, and 36: each add the requirement of the controller causes the load step resistor to disconnect within a set number of seconds, claim 34 being 10 seconds, claim 35 being 1 second, and claim 36 being 0.1 seconds. 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 ‘651 patent includes no disclosure relating to these particular times other than the claims, and no significance placed on this arbitrary selection of a logarithmic progression of seconds. It would be a simple matter of design choice and obvious to a POSITA to use a load dump delay of these durations in view of their commonplace use in controllers with predictable benefit of avoiding transient fluctuations or brief changes causing unnecessary interruptions and start-ups. (*EX1003* ¶170-172.)

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

a. Rationale to combine and reasonable expectation of success

Van Niekerk and DSE Manuals are in the same field, having similar structures and components, and disclose load bank control systems for diesel gensets to address common problems of wet stacking. All engage magnitude of steps of the load bank when total load falls below a pre-set level, and disengage the load bank above a pre-set load level. A POSITA would consider it a simple substitution and obvious to use the DSE Manual control with Van Niekerk as being a type of genset for which DSE Manual was designed to produce the expected, predictable results. (*EX1003* ¶173.)

Claims 28, 29: Claim 28 adds the requirement of the alternator, output and load bank buses and load step resistor are a poly-phase system, and claim 29 specifies a three-phase system. DSE Manual discloses the genset is operated as a three phase system, and thus discloses operation as a poly-phase system. (*EX1008* p. 30, 39; *EX1032* p.32, 41.) Just as noted regarding the combination of Van Niekerk and Egan, three phase operation is a common configuration that provides various benefits, including power without fluctuation using the minimum number of wires, such that the combination with DSE Manual would provide stable power with minimum components and be predictable and obvious to a POSITA to try and to provide in the Van Niekerk system. (*EX1003* ¶174-175.)

Claim 33: adds the requirement that the generator controller and engine control module communicate via the J1939 protocol. DSE Manual discloses the genset is CAN standard compliant and obtains information from engine CAN controllers. (*EX1008* p. 14, 60; *EX1032* p. 14, 62.) The SAE J1939 is a well-known communication protocol that is utilized with CAN standard systems. (*EX1018*.) It would be obvious to a POSITA to try and to utilize a standardized protocol for CAN communications to make the system readily interactive for communications, diagnostics and monitoring and facilitating off-the-shelf components with predictable results. (*EX1003* ¶176.)

Claims 34, 35, and 36: each add the requirement that the controller causes the load step resistor to disconnect within a set number of seconds, claim 34 being 10 seconds, claim 35 being 1 second, and claim 36 being 0.1 seconds. DSE Manual discloses that a selectively adjustable delay timer is used to disconnect the load step resistors and also for a disconnect of all load. (*EX1008* p. 73-74; *EX1032* p. 75-76.) One example delay shown is 5 seconds which is a predictable solution. Other delay timers disclosed in DSE Manual show a conventional logarithmic progression of settings of 0.1, 1, 10 seconds and greater. (*EX1008* p. 95; *EX1032* p. 97-101.) 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. Rather, these times represent an arbitrary selection of a logarithmic progression of seconds, and would be obvious to a POSITA as a matter of design choice to use as delays in view of their commonplace use in controllers with predictable benefit of avoiding common fluctuations or brief changes causing unnecessary interruptions and start-ups. (*EX1003* ¶177-179.)

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

1. Independent Claim 1

For elements of claim 1 that are substantially identical to a claim 19 element, the analysis detailed above is referenced with regard to claim 19, and the corresponding analysis equally applies.

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

Van Niekerk discloses this as discussed in Section E.1.a.

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

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

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

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

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

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

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

Van Niekerk discloses a current transformer 38 as a load monitoring device that communicates with power sensor 36 that is in electrical communication through controller 30 to the output to power switch 28 (Fig. 1) (*EX1004*, ¶¶[0012], [0027]). This limitation is disclosed or obvious. (*EX1003* ¶185.)

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

Van Niekerk discloses control 12 with controller 30 provides signals to control power switch 28, and selectively provides signals to control the engagement of load bank 20, which operates as a load enable signal. (¶¶[0012],

[0016]-[0017].) Control 12 with controller 30 also selectively provides signals to cut off load in an “overload-based load shed mode,” which operates as a load dump signal. (¶[0028].)⁹

Aoki discloses that with communications between two controllers, reliability of a cut-off or enable signal is improved if the control signals are communicated through separate connections. (**EX1009** ¶¶[0002]-[0003], [0005].) Each of the controlled systems do not interfere with each other. The references are in the same field of endeavor and Aoki presents design incentives as a matter of simple design choice that would be looked to for increased reliability and safety. It would be obvious in view of Aoki as a simple substitution to use two separate connectors in Van Niekerk between controller 30 and controller/power switch 28 and/or between controller 30 and control system 12 for the load dump/shed signal and the load enable/control signal with predictable result of reliability. This element is disclosed or obvious (**EX1003** ¶186-188.)

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

⁹ DSE Manuals 7 and 9 also disclose it was known for separate signals from the DSE controller to increase/decrease load and for load shedding/dump. (**EX1008** p. 73-74; **EX1032** p. 75-76.)

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

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*

Van Niekerk discloses a power sensor 36 coupled to a current transformer 38 that provide 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 to enable operation of 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 “[t]he controller 30 produces a command signal representative of the amount of power to be coupled from the genset 16 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 receives 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 G.f., it would be obvious in view of Aoki that the Van Niekerk load bank control signal and the overload-based load shed signal would be input at two connectors of Van Niekerk, such as at the controller/power switch 28 and/or between the controller 30 and control system 12 shown in FIG. 1 and this limitation is obvious. (**EX1003** ¶190-191; **EX1009** ¶¶[0002]-[0003].)

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

Van Niekerk discloses the load dump output signal of control 12 with controller 30 is received as a load dump input signal for controlling power switch 28 (Fig. 1) a POSITA would know as a known technique of feed-back closed loop control, and in view of Aoki it would be predictable and obvious to communicate via a separate connection between the load dump output signal and load dump input signal to increase safety and reliability as previously discussed. (**EX1003** ¶192.)

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

Van Niekerk discloses the load enable output signal of control 12 with

controller 30 is received as a load enable input signal for controlling 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 for safety and reliability. (*EX1003* ¶193.)

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

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. (Fig. 1; *EX1003* ¶194.)

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

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, and this element is disclosed or obvious to complete the overall system electrical connections and an obvious part of providing response feedback for system control as is generally required of feedback control for any closed loop system such as that of Aoki and Van Niekerk. (*EX1003* ¶195.)

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*

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 this element is disclosed or obvious. (*EX1003* ¶196.)

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

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 G.f. (*EX1003* ¶197.)

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

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

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

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. (*EX1004* ¶[0028].) As noted at Sections E.k. and G.h., this limitation is disclosed or obvious. (*EX1003* ¶199.)

q. Rationale to combine and reasonable expectation of success

In addition to the reasons to combine discussed above, the references are in the same field of endeavor using similar components. Van Niekerk includes a two controller system, controller 30 and controller/power switch 28 and/or controller 30 and control system 12 comprising interface 42, between which two different control signals are communicated. One to enable load bank operation and another to remove load above a limit. Aoki discloses a known separate cut-off output connection between two controllers to increase reliability and safety. Use of Aoki's known technique of separate wires between two controllers with Van Niekerk's two signals in order to improve reliability would produce predictable results and be obvious to try and matter of design choice. (*EX1003* ¶200.)

2. Dependent Claims 4, 8

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]; *EX1003* ¶201.)

Claim 8: adds that the engine is a diesel engine. Van Niekerk discloses the engine may be diesel, and would be obvious. (*EX1004*, ¶[0010]; *EX1003* ¶202.)

H. 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

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

As discussed at G.1.a., Van Niekerk 2 incorporates “the entire disclosure” of Van Niekerk. (*EX1005* Col. 4: 64-5:2.) At a minimum it would be obvious to further combine Van Niekerk 2 with Van Niekerk and Aoki since Van Niekerk 2 points directly to Van Niekerk and has overlapping subject matter. (*EX1003* ¶204.)

Claim 9: adds that 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; *EX1003* ¶205.)

Claim 14: adds the requirement of a load step resistor located remotely from the gen-set. 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; *EX1003* ¶206.)

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

b. Rationale to combine and reasonable expectation of success

As discussed at Section G.2.a., it would have been obvious to combine Van Niekerk and Egan, and thus obvious to combine Egan with the obvious combination of Van Niekerk and Aoki for the same subject matter of these dependent claims. Similarly, as discussed at Section G.4.a., it would have been obvious to combine the DSE Manual with Van Niekerk, and thus obvious to combine with the combination of Van Niekerk and Aoki. (*EX1003* ¶207.)

Claims 10, 11: Claim 10 adds the requirement of the alternator, output and load bank buses and load step resistor are a poly-phase system, and claim 11 adds the requirement that it is a three-phase system. Egan discloses genset 10 with alternator 103 and load bank 118 with a plurality heaters or steps. (*EX1006* ¶¶[0041], [0350].) Egan discloses the system may be three-phase, and thus discloses a poly-phase system. (*EX1006* ¶[0166].)

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. 30, 39; *EX1032* p. 32, 41.)

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 provide in the Van Niekerk system in view of either Egan or DSE Manual. (*EX1003* ¶208-215.)

Claim 12: adds the requirement of a common base and enclosure. 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, such as for protection, safety or noise abatement. (*EX1003* ¶217.)

Claim 13: adds the requirement of the load step resistor is in an enclosure connected to the radiator of the engine. 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. (*EX1003* ¶218-219.)

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

Claim 15: adds the requirement of the generator controller and engine control module configured for J1939 protocol. 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.

(*EX1003* ¶220-221.)

Claim 16, 17, 18: each add the requirement of the controller causes the load step resistor to disconnect within a set number of seconds, claim 16 being 10 seconds, claim 17 being 1 second, and claim 18 being 0.1 seconds. 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.)

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.)

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. Rather, these times represent an arbitrary selection of a logarithmic progression of seconds, and would be obvious in view of Eaton or DSE Manual to use as delays in view of their commonplace use in controllers with predictable benefit of avoiding

common fluctuations or brief changes causing unnecessary interruptions and start-ups. (*EX1003* ¶222-233.)

I. 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*

Egan discloses a power generator 10, or genset, coupled with a load bank 118 to control the load on the genset. (See *EX1006* Fig. 2, ¶[0041]; *EX1003* ¶234.)

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

Egan discloses power generator 10 that includes a diesel engine 101 that drives an alternator 103 and therefore is mechanically connected, and teaches this element. (See *EX1006* Fig. 2, ¶[0041]; *EX1003* ¶235.)

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

Egan discloses power generator 10 includes a diesel engine 101, and that a load bank is used to address carbon deposits. (See *EX1006* ¶¶[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 as a simple substitution driven by emissions control regulations.

Egan also discloses that a controller 105 is communicative with and provides control signals to engine 101. (See **EX1006** ¶¶[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. (**EX1025** Col. 3:3-6.) Sherman also inherently includes an engine ECU that communicates with controller 26 to interpret and act on the control signals. Egan and Sherman disclose similar structures, components, and subject matter, and also ramping up, shutting down, or limiting system parameters using control modules based on parameters and inputs, as well as reducing pollution by monitoring and applying load resistance. Regardless, it would be obvious in view of Egan and Sherman that the diesel engine would have an engine control module. (**EX1003** ¶236-238.)

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

Egan discloses the system outputs power to a cellular base station and inherently includes an output bus in order to output the power. (**EX1006** ¶¶[0006], [0008], [0037], [0158]; See **EX1026** Col.10:39-44.) 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** ¶[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 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. (**EX1003** ¶239.)

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

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 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. (**EX1003** ¶240.)

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

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** ¶[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.) Both

provide feed-back closed loop control and it would be obvious to include a load stop output to regulate the load bank. It would be obvious for Egan's generator controller to have a load step output, and complete the system feed-back necessary for control. (*EX1003* ¶241-243.)

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

Egan discloses controller 105 causes engagement of a selected load of one or more heaters of load bank 116. (*EX1006* ¶[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, to complete feedback for monitoring and control. (*EX1003* ¶244.)

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

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. (**EX1003** ¶245.)

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

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 complete the feed-back as part of monitoring and control. (**EX1003** ¶246.)

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

Egan discloses one or more of the heaters of load bank 118 is engaged in a neglect case to address carbon deposits. (**EX1006** ¶[0350].) 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 at least one case - regeneration. (**EX1010** Col. 1:61-67, 5:19-29, 5:42-49, 7:4-16.), Sherman also discloses adding a portion of resistor/load bank 24 in one case - neglect. (**X1010** Col. 4:33-5:17; Figure 2.) Both address soot accumulation. In view of Sherman it would be obvious to try and have the generator controller of

Egan be capable of operating a contactor to connect a load bank in both the regeneration and neglect cases. (*EX1003* ¶247-249.)

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*

Egan discloses that the entire load bank 20 is disconnected in the event a load spike is detected. When the requested load (actual load) is more than 4 kW load bank 20 is automatically disconnected. (*EX1006* ¶[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, in order to prevent overload damage. (*EX1003* ¶250-251.)

l. Reason to Combine and Expectation of Success

In addition to the reasons to combine noted above, both Egan and Sherman disclose similar structures, components and subject matter, are directed to providing reliable electrical power generation using a diesel engine and alternator genset, and both disclose ramping up, shutting down or limiting parameters and meeting emissions regulations. 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* ¶¶[0003], [0037], [0350];

EX1010 Col. 3:39-53, 7:4-41.) Although Sherman discloses a genset that is mounted in a vehicle, that engine is not used to directly propel the vehicle but generates electricity that is stored or applied to an electric motor. (**EX1010** Col. 1:28-44.) The operation of the power generators are predictable and the combination results are predictable. 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 the common problem with similar equipment, and it would be a simple substitution of an element. (**EX1003** ¶252.)

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

a. Claim 22

Claim 22 adds the requirement of a plurality of load step resistors. Egan discloses this as load bank 118 formed by one or more heaters. (**EX1006** para. [0350].) Sherman also discloses resistor/load bank 24 may be selectively engaged in portions and the load adjustable to a desired level. (**EX1010** Col. 7:47-51, claims 1-4.) It would be obvious in view of Sherman that the Egan resistor/load bank would be made of a plurality of load step resistors. (**EX1003** ¶253.)

b. Claim 26

Claim 26 adds that the engine is diesel. Both Egan and Sherman disclose the engine is diesel and this element is obvious in view of the combination. (**EX1003** ¶254.)

c. Claim 27

Claim 27 adds that 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. (**EX1003** ¶255.)

d. Claim 28

Claim 28 adds that the alternator and system comprise a poly-phase 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** ¶¶[0160]; **EX1003** ¶256.)

e. Claim 29

Claim 29 adds that the alternator and system comprise a three-phase 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** ¶[0160]; **EX1003** ¶257.)

f. Claim 30

Claim 30 adds that the genset and load bank system have a common base and enclosure. Egan discloses the genset and load bank have a common base/enclosure and it would be obvious the combination of Egan and Sherman

would have a common base/enclosure. (*EX1006* ¶[0041], Figures 2-3; *EX1003* ¶258.)

g. Claim 31

Claim 31 adds that at least one load step resistor is physically located in an enclosure with the engine radiator. 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* ¶[0041], Figures 2-3; *EX1003* ¶259.)

h. Claims 34-36

Claims 34-36: each add the controller causes the load step resistor to disconnect within a set number of seconds, claim 34- 10 seconds, claim 35- 1 second, and claim 36- 0.1 seconds. The specification assigns no significance to these times which are a conventional logarithmic progression. Egan discloses an overload protection that disengages voltage after a programmed delay (nominally 5-10 seconds) (¶[0220]) and disconnecting load bank 118 in the event of a load spike. (¶[0350].) It would be obvious to include a load bank disconnect with a logarithmic progression of delays in view of their commonplace use in controllers with predictable benefit of avoiding common fluctuations or brief changes causing unnecessary interruptions and start-ups. (*EX1003* ¶260-262.)

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

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

Claim 32: adds the requirement of the load step resistor being located remotely from the engine generator. Miyoshi discloses a resistive load bank in a body section 2 separate from the engine generator to which it is coupled, and may be used to burn off exhaust accumulation. (*EX1028* ¶¶[0003]-[0004], [0013], [0015], [0017], [0019]; Figure 2) It would be obvious in view of Miyoshi that the Egan-Sherman load bank may be located remotely from the genset. All three address gen-sets and locating the load bank remotely would not change the operation of either device and results would be predictable. (*EX1003* ¶264-265.)

Claim 33: adds the controller and engine control module communicate via SAE J1939 protocol. Eaton (*EX1007* Col. 5:38-42) discloses genset 150 comprising diesel engine 150 and alternator 154 and ECM 160 communicates with genset controller 100 using the J1939 protocol. Sherman contemplates vehicle-mounted gen-sets. In view of Eaton it would be an obvious design choice to use the recognized standard in an Egan-Sherman genset to predictably provide standardized communications and allow ease of diagnostics with CAN-based communication. (*EX1003* ¶266-267.)

Claims 34, 35, 36: each add the requirement of the controller causes the load step resistor to disconnect within a set number of seconds, claim 34 being 10 seconds, claim 35 being 1 second, and claim 36 being 0.1 seconds. 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. (*EX1003* ¶268.) 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.

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 with predictable benefit of avoiding common fluctuations or brief changes causing unnecessary interruptions and start-ups. (*EX1003* ¶268-269, 271-272.)

In the alternative, 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. Other delay timers disclosed in DSE Manual show 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 with predictable benefit of avoiding common fluctuations or brief changes causing unnecessary interruptions and start-ups. (*EX1003* ¶270-272.)

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

1. Independent Claim 1

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.

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

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

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

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

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

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

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

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

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

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. (**EX1003** ¶278.)

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

Egan and Sherman both disclose controllers to control the engagement of a load bank, while DSE Manual 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 and Aoki for the Egan/Sherman combination to use a separate connector for a load cut-off/dump between controllers. (**EX1003** ¶279.)

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

This limitation is obvious in view of the combination of Egan and Sherman as discussed in Section I.1.e.

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*

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 k.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. (**EX1003** ¶281.)

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***

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 K.1.f. and K.1.h. (*EX1003* ¶282.)

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

It would be obvious in view of DSE Manual and Aoki for this communication. See Sections K.1.f. and K.1.h. (*EX1003* ¶283.)

- 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***

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* Col. 7:47-52; *EX1003* ¶284.)

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

It would be obvious in view of DSE Manual and Aoki for this communication. See Sections K.1.f. and K.1.h. (*EX1003* ¶285.)

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

This limitation is obvious in view of the combination of Egan and Sherman as discussed in Section I.1.j.

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

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 I.1.j.

- q. Rationale to combine and reasonable expectation of success**

As discussed at Section I.1.l., Egan 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. Egan and Sherman are types of gen-sets that DSE Manuals were designed to control and operate, such that a POSTA 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. (*EX1003* ¶288.)

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

Claim 4: adds the requirement of a plurality of load step resistors and is obvious as discussed at I.2.a.

Claim 8: adds requirement of a diesel engine, and is obvious as discussed at I.2.b.

Claim 9: adds requirement of a Tier IV engine and is obvious as discussed at I.2.c.

Claim 10: adds requirement of a poly-phase system and is obvious as discussed at I.2.d.

Claim 11: adds requirement of a three-phase system and is obvious as discussed at I.2.e.

Claim 12: adds requirement of a common base and enclosure and is obvious as discussed at I.2.f.

Claim 13: adds requirement of a resistor physically located in the enclosure with the radiator and is obvious as discussed at I.2.g.

Claim 16-18: each adds requirement of disconnect delay, (10, 1, or 0,1 seconds) and is obvious as discussed at I.2.h.

L. Ground 8: Claims 14, 15 Are Obvious Over the combination of Egan, Sherman, DSE Manual and Aoki, and Further Combination with Miyoshi or Eaton

1. Claim 14

Claim 14: adds requirement of at least one resistor is located remotely from the gen-set, and is obvious further in view of Miyoshi as discussed at Section J regarding claim 32, with the predictable results not changing operation of the components.

Claim 15: adds the requirement of communication via J1939 protocol and is obvious further in view of Eaton as discussed at Section J regarding claim 33, with predictable results of standardized communications and ease of diagnostics and communication.

VI. SECONDARY CONSIDERATIONS

ANA is unaware of any objective evidence of nonobviousness that would outweigh a conclusion of obviousness of the claims. Moreover, Multiquip has asserted in the parallel District Court proceeding that Multiquip does not practice the claimed invention of the '651 Patent, and therefore could not submit any evidence supporting any objective evidence of nonobviousness. (*EX1023*, *EX1024*)

VII. CONCLUSION

The challenged claims are unpatentable. ANA respectfully requests that IPR be instituted.

Respectfully submitted,

/s/Terence J. Linn
Terence J. Linn, Reg. 30283
Lead Counsel for Petitioner ANA

EXHIBIT LISTING APPENDIX

Exhibit	Description
1001	U.S. Patent No. 8,816,651
1002	File History of U.S. Patent No. 8,816,651
1003	Declaration of Mr. Michael Nranian
1004	U.S. Patent Application Publication 2014/0150407 to Van Niekerk et al (Van Niekerk)
1005	U.S. Patent 9,221,016 to Van Niekerk et al (Van Niekerk 2)
1006	U.S. Patent Application Publication 2003/0224833 to Egan et al (Egan)
1007	U.S. Patent 6,701,221 to Eaton et al (Eaton)
1008	Deep Sea Electronics DSE720/7300 Series Operators Manual, Document Number 057-074, Issue 7 (February 4, 2011)(DSE Manual 7)
1009	U.S. Patent Application Publication 2006/0262807 to Aoki et al (Aoki)
1010	U.S. Patent No. 6,422,001 to Sherman et al (Sherman)
1011	Ultimate Service Association Information Sheet “Wet Stacking of Generator Sets and How to Avoid It (2012)
1012	Avtron Load Bank Article (July 29, 2008)
1013	Volt Master America Engine Driven Generator Set Owner’s Manual Excerpt (May 2009)
1014	US Environmental Protection Agency, Technical Bulletin EPA -420-F-10-029, <i>Diesel Particulate Filter General Information</i> , (May 2010)
1015	US Environmental Protection Agency, Technical Bulletin EPA -452/F-03-031, <i>Diesel Oxidation Catalyst General Information</i> , (May 2020)
1016	US Environmental Protection Agency, Fact Sheet EPA -452/F-03-032, <i>Air Pollution Control Technology, Selective Catalytic Reduction (SCR)</i> , (2003)
1017	Power Engineering Article, Tier IV
1018	SAE J1939 Standards Collection
1019	U.S. Patent Application Publication 2004/0010349 to Perez et al (Perez)
1020	U.S. Patent No. 8,209,962 to Sun et al (Sun)
1021	Assignment of Van Niekerk Pat Pub 2014/0150407 to Cummins Cal Pacific, LLC
1022	Van Niekerk Original Application Drawings
1023	Van Niekerk Original Application Claims
1024	Excerpt of Multiquip Inc. Responses to Defendant’s First Set of Requests for Production (1-50), Civil Action No. 3:22-cv-2599 (N.D. Tex.), Responses 11-13, 17, 21-22, 25-34, 44, 47-50.

1025	Multiquip Inc. Responses to Defendant's First Set of Interrogatories (1-10)
1026	U.S. Patent No. 5,583,440 to Bisher (Bisher)
1027	Declaration of John Ruddock
1028	JP Pat. Publication No. JP2000-162291 to Miyoshi, published June 16, 2000, together with certified translation.
1029	Document Update Checklist for 057-074_D128 for Deep Sea Electronics DSE72/7300 Series Operators Manual, Updating from Issue 6 to Issue 7.
1030	Document Update Checklist for 057-074_D128 for Deep Sea Electronics DSE72/7300 Series Operators Manual, Updating from Issue 7 to Issue 8.
1031	Document Update Checklist for 057-074_D128 for Deep Sea Electronics DSE72/7300 Series Operators Manual, Updating from Issue 8 to Issue 9.
1032	Deep Sea Electronics DSE720/7300 Series Operators Manual, Document Number 057-074, Issue 9 (May 30, 2012) (DSE Manual 9)
1033	Terex Tech Tips No. 87
1034	Declaration of Terence J. Linn

CLAIMS LISTING APPENDIX

Claim or Element #	Claim Language
1	
[1.0]	An engine-generator and load bank system comprising:
[1.1]	an engine mechanically connected to and capable of driving an alternator;
[1.2]	said engine having an engine control module and a particulate filter;
[1.3]	said alternator in electrical communication with an output bus and a load bank bus;
[1.4]	at least one load monitoring device in electrical communication with said output and load bank buses;
[1.5]	a generator controller comprising a load dump output and a load enable output,
[1.6]	said generator controller in electrical communication with said engine control module;
[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;
[1.8]	said load dump output in electrical communication with said load dump input;
[1.9]	said load enable output in electrical communication with said load enable input;
[1.10]	said load monitoring device in electrical communication with said load sensor;
[1.11]	at least one load step contactor in electrical communication with said at least one load step output; and
[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;
[1.13]	wherein said generator controller provides a control signal via said load enable output
[1.14]	(operating load step contactor) in at least one of the following cases: neglect and regeneration; and

[1.15]	wherein said generator controller provides a control signal via said load dump output in case of a load spike.
4	
[4.0]	The engine-generator and load bank system of claim 1 comprising
[4.1]	a plurality of load step resistors.
8	
[8.0]	The engine-generator and load bank system of claim 1 wherein
[8.1]	the engine is a diesel engine.
9	
[9.0]	The engine-generator and load bank system of claim 1 wherein
[9.1]	the engine is a Tier IV Interim or newer diesel engine.
10	
[10.0]	The engine-generator and load bank system of claim 1 wherein
[10.1]	said alternator, output bus, load bank bus, and at least one load step resistor comprise a polyphase electrical system.
11	
[11.0]	The engine-generator and load bank system of claim 1 wherein
[11.1]	said alternator, output bus, load bank bus, and at least one load step resistor comprise a three-phase electrical system.
12	
[12.0]	The engine-generator and load bank system of claim 1 which further comprises
[12.1]	a common base and enclosure.

13	
[13.0]	The engine-generator and load bank system of claim 1 wherein
[13.1]	said at least one load step resistor is physically located in an enclosure connected to the radiator of said engine.
14	
[14.0]	The engine-generator and load bank system of claim 1 wherein
[14.1]	said at least one load step resistor is located remotely from said engine-generator.
15	
[15.0]	The engine-generator and load bank system of claim 1 wherein
[15.1]	the generator controller and engine control module are configured to communicate via SAE J1939 protocol.
16	
[16.0]	The engine-generator and load bank system of claim 1 wherein
[16.1]	the generator controller is configured to provide said control signal to said load dump output within 10 seconds.
17	
[17.0]	The engine-generator and load bank system of claim 1 wherein
[17.1]	the generator controller is configured to provide said control signal to said load dump output within 1 second.
18	
[18.0]	The engine-generator and load bank system of claim 1 wherein
[18.1]	the generator controller is configured to provide said control signal to said load dump output within 0.1 second.
19	

[19.0]	An engine-generator and load bank system comprising:
[19.1]	an engine mechanically connected to and capable of driving an alternator;
[19.2]	said engine having an engine control module and a particulate filter;
[19.3]	said alternator in electrical communication with an output bus and a load bank bus;
[19.4]	a generator controller in electrical communication with said engine control module,
[19.5]	said generator controller having at least one load step output;
[19.6]	at least one load step contactor in electrical communication with said at least one load step output; and
[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;
[19.8]	wherein said generator controller is capable of operating said load step contactor to connect said load step resistor
[19.9]	[operating load step contactor] in at least one of the following cases: neglect and regeneration; and
[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.
22	
[22.0]	The engine-generator and load bank system of claim 19 comprising
[22.1]	a plurality of load step resistors.
26	
[26.0]	The engine-generator and load bank system of claim 19 wherein
[26.1]	the engine is a diesel engine.
27	
[27.0]	The engine-generator and load bank system of claim 19 wherein

[27.1]	the engine is a Tier IV Interim or newer diesel engine.
28	
[28.0]	The engine-generator and load bank system of claim 19 wherein
[28.1]	said alternator, output bus, load bank bus, and at least one load step resistor comprise a poly-phase electrical system.
29	
[29.0]	The engine-generator and load bank system of claim 19 wherein
[29.1]	said alternator, output bus, load bank bus, and at least one load step resistor comprise a three-phase electrical system.
30	
[30.0]	The engine-generator and load bank system of claim 19 which further comprises
[30.1]	a common base and enclosure.
31	
[31.0]	The engine-generator and load bank system of claim 19 wherein
[31.1]	said at least one load step resistor is physically located in an enclosure connected to the radiator of said engine.
32	
[32.0]	The engine-generator and load bank system of claim 19 wherein
[32.1]	said at least one load step resistor is located remotely from said engine-generator.
33	
[33.0]	The engine-generator and load bank system of claim 19 wherein
[33.1]	the generator controller and engine control module are configured to communicate via SAE J1939 protocol.

34	
[34.0]	The engine-generator and load bank system of claim 19 wherein
[34.1]	the generator controller is configured to operate said load step contactor to disconnect said load step resistor within 10 seconds.
35	
[35.0]	The engine-generator and load bank system of claim 19 wherein
[35.1]	the generator controller is configured to operate said load step contactor to disconnect said load step resistor within 1 seconds.
36	
[36.0]	The engine-generator and load bank system of claim 19 wherein
[36.1]	the generator controller is configured to operate said load step contactor to disconnect said load step resistor within 0.1 seconds.

CERTIFICATION OF SERVICE ON PATENT OWNER

Pursuant to 37 C.F.R § 42.6 and 42.105, I hereby certify that the foregoing **PETITION FOR *INTER PARTES* REVIEW**, the associated Exhibit List, and all associated Exhibits were served via Federal Express to the Patent Owner by serving the correspondence address of record for U.S. Patent No. 8,816,651 as listed on PAIR:

13155 – Burdick Patents
Attn: Sean Burdick
2537 State Street, Suite 220
Boise, ID 83702

Date: November 17, 2023

/s/Terence J. Linn
Terence J. Linn
Lead Counsel for Petitioner

CERTIFICATION OF WORD COUNT

The undersigned certifies pursuant to 37 C.F.R. §42.24 that the foregoing Petition for *Inter Partes* Review, excluding any table of contents, mandatory notices under 37 C.F.R. §42.8, certificates of service or word count, or appendix of exhibits, contains 13,966 words according to the word-processing program used to prepare this document (Microsoft Word).

Date: November 17, 2023

/s/Terence J. Linn
Terence J. Linn (Reg. No. 30283)
Lead Counsel for Petitioner