

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MWE INVESTMENTS, LLC,
GENERAC POWER SYSTEMS, INC., and
HARBOR FREIGHT TOOLS USA, INC.,
Petitioners

v.

CHAMPION POWER EQUIPMENT, INC.,
Patent Owner.

U.S. Patent No. 11,905,895

DECLARATION OF MAHDI SHAHBAKHTI

TABLE OF CONTENTS

I.	BACKGROUND INFORMATION	13
A.	Qualifications and Experience	13
B.	Compensation.....	21
C.	Materials Considered.....	22
II.	STATEMENT OF LEGAL PRINCIPLES.....	24
A.	Person of Ordinary Skill in the Art	24
B.	Prior Art.....	25
C.	Claim Construction	26
D.	Anticipation (§102)	28
E.	Obviousness (§103).....	28
III.	SUMMARY OF THE ‘895 PATENT	34
A.	STATE OF THE ART:	36
IV.	THE CHALLENGED CLAIMS	42
V.	APPLICATION OF PRIOR ART TO THE CHALLENGED CLAIMS.....	42
A.	Overview of DuroMax Operator’s Manual (“DuroMax”).....	43
B.	U.S. Patent No. 5,718,265 to Elsdon (“Elsdon”)	44
C.	Overview of U.S. Patent No. 4,492,207 to Hallberg (“Hallberg”)	46
D.	U.S. Patent Application No. 2011/0100335 A1 to Parlatore (“Parlatore”)	51
E.	LP-Gas Code Handbook.....	53
VI.	CLAIM TERMS	54
A.	The Claimed “Fuel Lockout Apparatus”	54
B.	The Claimed Terms “Prevent...Coupling” and “Permit...to Couple”	77
VII.	THE CHALLENGED CLAIMS ARE UNPATENTABLE.....	87

A.	Ground 1: The Combination of DuroMax and Elsdon Renders Obvious Claims 1–4, 6–10, and 12–13.	87
B.	Ground 2: Claims 5, 11, and 14–21 Are Obvious in View of the Combination of DuroMax, Elsdon, and Parlatore.....	109
C.	Ground 3A/3B: Hallberg Anticipates Claims 1, 6, and 7 (Ground 2A) and Renders Obvious Claims 2, 8, 12, and 13 (Ground 2B).	140
D.	Ground 4: Claims 14, 15, 17-21 Are Obvious Over Parlatore in View of Hallberg.....	159
VIII.	CONCLUSION.....	171

LIST OF EXHIBITS

Exhibit	Description
Ex. 1001	U.S. Patent No. 11,905,895 (“the ’895 Patent”)
Ex. 1002	File History of the ’895 Patent
Ex. 1003	Curriculum Vitae Mahdi Shahbakhti
Ex. 1004	U.S. Patent No 1,931,698 to Holzapfel (“Holzapfel”)
Ex. 1005	LP-Gas Code Handbook, Eighth Edition, Lemoff, Theodore C., (2008) (excerpted) (“LP-Gas Handbook”)
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Ex. 1008	File History of U.S. Patent No. 10,221,780
Ex. 1009	Champion’s Claim Construction Brief CV-23-2371-PHX-DWL
Ex. 1010	DuroMax XP4400EH Operator’s Manual (“DuroMax”)
Ex. 1011	Declaration of David Raskin (dated May 7, 2025)
Ex. 1012	U.S. Patent No. 5,718,265 to Elsdon (“Elsdon”)
Ex. 1013	U.S. Patent Application No. 2011/0100335 A1 to Parlatore (“Parlatore”)
Ex. 1014	U.S. Patent No. 4,492,207 to Hallberg (“Hallberg”)
Ex. 1015	“Convert Blackmax 7000 Watt Generator to Propane and Natural Gas,” YouTube Video, posted October 11, 2013 (<i>available at</i> https://www.youtube.com/watch?v=Ip7ckWAZ3xQ)
Ex. 1016	<i>Intentionally Left Blank</i>
Ex. 1017	Constantine Arcoumanis, Internal Combustion Engines (Academic Press 1988)
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CLAIM LIST

Claim Element	Claim Language
[1.0]	A mechanical fuel lockout switch for a dual fuel engine comprising:
[1.1]	a mechanical fuel valve actuatable between a first position and a second position to selectively control fuel flow to the dual fuel engine from a first fuel source through a first fuel line and a second fuel source through a second fuel line,
[1.2]	the mechanical fuel valve configured to: allow communication between the first fuel source and the dual fuel engine and prevent communication between the second fuel source and the dual fuel engine while in the first position, and prevent communication between the first fuel source and the dual fuel engine while in the second position
[1.3]	and a fuel lockout apparatus coupled to the mechanical fuel valve
[1.4]	and configured to: prevent the second fuel source from coupling to the second fuel line while the mechanical fuel valve is in the first position, and permit the second fuel source to couple to the second fuel line while the mechanical fuel valve is in the second position.
Claim 2	Claim Language
[2]	The mechanical fuel lockout switch of claim 1 wherein the fuel lockout apparatus prevents actuation of the mechanical fuel valve to the first position when the second fuel source is in communication with the dual fuel engine.
Claim 3	Claim Language
[3.1]	The mechanical fuel lockout switch of claim 1 wherein the fuel lockout apparatus comprises a flange rigidly coupled to the mechanical fuel valve and configured to: cover an inlet of the second fuel line while the mechanical fuel valve is in the first position, and uncover

	the inlet of the second fuel line while the mechanical fuel valve is in the second position.
Claim 4	Claim Language
[4]	The mechanical fuel lockout switch of claim 3 wherein the mechanical fuel valve is configured to rotate between the first position and the second position and the flange is configured to rotate transversely across the inlet of the second fuel line.
Claim 5	Claim Language
[5]	The mechanical fuel lockout switch of claim 3 further comprising: a first end of a quick-disconnect hose coupling attached to the inlet of the second fuel line; and a second end of the quick-disconnect hose coupling configured to mate with the first end of the quick-disconnect hose coupling to couple the second fuel source to the second fuel line.
Claim 6	Claim Language
[6]	The mechanical fuel lockout switch of claim 1 wherein the mechanical fuel valve and the fuel lockout apparatus operate together to ensure that fuel from the first fuel source and fuel from the second fuel source are not simultaneously delivered to the dual fuel engine.
Claim 7	Claim Language
[7]	The mechanical fuel lockout switch of claim 6 wherein the mechanical fuel valve is configured to: provide liquid fuel from a liquid fuel tank of the first fuel source to the dual fuel engine while in the first position, and provide gaseous fuel from a pressurized fuel container of the second fuel source to the dual fuel engine while in the second position.
Claim 8	Claim Language
[8.0]	A mechanical fuel lockout switch for a dual fuel engine comprising:
[8.1]	a mechanical fuel valve actuatable between a first position and a second position to selectively control fuel

	flow to the dual fuel engine from a first fuel source through a first fuel line and a second fuel source through a second fuel line, the mechanical fuel valve configured to:
[8.2]	allow communication between the first fuel source and the dual fuel engine and prevent communication between the second fuel source and the dual fuel engine while the first position, and
[8.3]	prevent communication between the first fuel source and the dual fuel engine while in the second position; and
[8.4]	a fuel lockout apparatus coupled to the mechanical fuel valve and configured to prevent actuation of the mechanical fuel valve to the first position when the second fuel source is in communication with the dual fuel engine.
Claim 9	Claim Language
[9]	The mechanical fuel lockout switch of claim 8 wherein the fuel lockout apparatus comprises a flange rigidly coupled to the mechanical fuel valve and configured to: cover an inlet of the second fuel line while the mechanical fuel valve is in the first position, and uncover the inlet of the second fuel line while the mechanical fuel valve is in the second position.
Claim 10	Claim Language
[10]	The mechanical fuel lockout switch of claim 9 wherein the mechanical fuel valve is configured to rotate between the first position and the second position and the flange is configured to rotate transversely across the inlet of the second fuel line.
Claim 11	Claim Language
[11]	The mechanical fuel lockout switch of claim 9 further comprising: a first end of a quick-disconnect hose coupling attached to the inlet of the second fuel line; and a second end of the quick-disconnect hose coupling configured to mate with the first end of the quick-

	disconnect hose coupling to couple the second fuel source to the second fuel line.
Claim 12	Claim Language
[12]	The mechanical fuel lockout switch of claim 8 wherein the mechanical fuel valve and the fuel lockout apparatus operate together to ensure that fuel from the first fuel source and fuel from the second fuel source are not simultaneously delivered to the dual fuel engine.
Claim 13	Claim Language
[13]	The mechanical fuel lockout switch of claim 12 wherein the mechanical fuel valve is configured to: provide liquid fuel from a liquid fuel tank of the first fuel source to the dual fuel engine while in the first position, and provide gaseous fuel from a pressurized fuel container of the second fuel source to the dual fuel engine while in the second position.
Claim 14	Claim Language
[14.0]	A dual fuel generator and fuel delivery system comprising:
[14.1]	a dual fuel generator configured to operate on a liquid fuel supplied from a liquid fuel source through a liquid fuel line and a gaseous fuel supplied from a pressurized fuel source through a gaseous fuel line;
[14.2]	a fuel regulator system located off board the dual fuel generator, the fuel regulator system comprising:
[14.3]	a primary pressure regulator couplable to a service valve of the pressurized fuel source and configured to regulate the gaseous fuel supplied from the pressurized fuel source to a reduced pressure, and
[14.4]	a secondary pressure regulator couplable to the primary pressure regulator and configured to regulate the gaseous fuel supplied from the primary pressure regulator to a desired pressure for delivery through the gaseous fuel line to operate the dual fuel generator;

[14.5]	a mechanical fuel valve actuatable between a first position and a second position to selectively control fuel flow to the dual fuel generator from the liquid fuel source through the liquid fuel line and the pressurized fuel source through the gaseous fuel line, the mechanical fuel valve configured to open and close the liquid fuel line to selectively control fuel flow from the liquid fuel source to the dual fuel generator; and
[14.6]	a fuel lockout apparatus coupled to the mechanical fuel valve and configured to:
[14.7]	prevent the pressurized fuel source from coupling to the gaseous fuel line while the liquid fuel line is open, and
[14.8]	permit the pressurized fuel source to couple to the gaseous fuel line while the liquid fuel line is closed by the mechanical fuel valve.
Claim 15	Claim Language
[15]	The dual fuel generator and fuel delivery system of claim 14 wherein the fuel lockout apparatus is further configured to prevent the mechanical fuel valve from opening the liquid fuel line while the fuel regulator system is coupled to the gaseous fuel line.
Claim 16	Claim Language
[16]	The dual fuel generator and fuel delivery system of claim 14 wherein the fuel lockout apparatus comprises a fuel inlet cover that actuates with the mechanical fuel valve to cover an inlet of the gaseous fuel line while the liquid fuel line is open and to uncover the inlet of the gaseous fuel line when the liquid fuel line is closed.
Claim 17	Claim Language
[17]	The dual fuel generator and fuel delivery system of claim 14 further comprising: a first end of a quick-connect hose coupling coupled to an outlet of the secondary pressure regulator; and a second end of the quick-connect hose coupling coupled to an inlet of the gaseous fuel line and configured to mate with the first end of the quick-connect

	hose coupling to couple the secondary pressure regulator to the gaseous fuel line.
Claim 18	Claim Language
[18]	The dual fuel generator and fuel delivery system of claim 14 further comprising a regulator mounting device fixed to the pressurized fuel source; and at least the secondary pressure regulator is mounted on the regulator mounting device.
Claim 19	Claim Language
[19]	The dual fuel generator and fuel delivery system of claim 18 wherein the primary pressure regulator is mounted on the regulator mounting device.
Claim 20	Claim Language
[20]	The dual fuel generator and fuel delivery system of claim 19 wherein the regulator mounting device is configured to attach onto a collar of a pressurized fuel container of the pressurized fuel source so that the primary and secondary pressure regulators are positioned adjacent each other along an outer periphery of the collar.
Claim 21	Claim Language
[21]	The dual fuel generator and fuel delivery system of claim 14 wherein: the fuel regulator system comprises a dual stage pressure regulator; and the primary and secondary pressure regulators are integral components of the dual stage pressure regulator.

DECLARATION OF DR. MADHI SHAHBAKHTI

I declare that all statements made herein on my own knowledge are true and that all statements made on information and belief are believed to be true. These statements were made with the knowledge that willful false statements and the like so made are punishable under Section 1001 of Title 18 of the United States Code.

Date: Aug. 20, 2025

By: 
Dr. Mahdi Shahbakhti

I, Dr. Mahdi Shahbakhti declare as follows:

I. BACKGROUND INFORMATION

A. Qualifications and Experience

[0001]. I am a Professor of Mechanical Engineering at the University of Alberta and an Adjunct Professor of Mechanical Engineering at Michigan Technological University. At the University of Alberta, I serve as the Director of the Energy Mechatronics Laboratory. The Energy Mechatronics Laboratory conducts research in a multidisciplinary area of engineering that includes mechanical and electrical systems, design of thermo-fluid systems, and control engineering.

[0002]. I am also a professional engineer (PEng) registered in Alberta (license # 284744). Over the past years, I have led various projects in the area of internal combustion engines and mechanical engineering. I currently lead several design, fabrication, and testing projects in the field of mechanical engineering including, among other things, internal combustion engines and powertrain systems running with conventional and alternative fuels.

[0003]. Before joining Michigan Technological University in 2012, I spent two years as a post-doctoral scholar at the Mechanical Engineering Department at the University of California, Berkeley. My post-doctorate work

focused on model-based design and adaptive control of internal combustion engines and consisted of working closely with the Toyota Motor Company.

[0004]. I earned a Ph.D. in Mechanical Engineering from the University of Alberta in 2009 and a Master of Science degree from KNT University of Technology in 2003. Both my Ph.D. and MSc. dissertations were in the area of internal combustion engines.

[0005]. I have also worked on various aspects of internal combustion engines including design, modeling, benchmarking, experimental studies, calibration, and electronic control unit (ECU) design and implementation since 2000. These include dual fuel, bi-fuel, and single-fuel engines. I have studied engines running with a variety of fuels including but not limited to gasoline, diesel, ethanol, n-heptane, iso-octane, gaseous fuels (natural gas, butane, hydrogen, ...), and biofuels.

[0006]. I along with my research group have tested various dual fuel and bi-fuel engines for different applications. These include small (< 0.5 liter) to large scale engines (e.g., 15 liter). Our work has included carburetor, throttle body injection (TBI), port fuel injection (PFI), direct injection (DI) systems, and mixer systems for gaseous fuels in engines. In addition, my work has also covered various engine types including spark ignition, compression ignition, lean burn, low

temperature combustion (HCCI, PPCI, RCCI) engines, and their exhaust aftertreatment systems.

[0007]. I have direct industry experience related to the internal combustion engines. From 2001 to 2004, I worked as a researcher in the automotive industry. During this time, I was involved in the research and development of internal combustion engines and powertrain management systems for gasoline and natural gas bi-fuel vehicles. In the past 13 years, I, along with my research group, have performed a number of research projects sponsored by various companies such as Cummins, Westport, Ford Motor Company, Toyota Motor Corporation, General Motors Corporation, Hyundai, IAV GmbH, Hitachi, and Denso.

[0008]. I have taught undergraduate and graduate courses in mechanical engineering departments in the U.S. and Canada since 2004, taking the role as a primary instructor for more than 26 academic semesters, and a teaching assistant for eight academic semesters. I have regularly taught a graduate course and undergraduate technical elective course on “Internal Combustion Engines and Alternative Fuels”, MECE 541, at the University of Alberta since 2008. Some of the others courses I have taught include Thermodynamics, Fluid Dynamics, Energy Thermal Fluids, Feedback Control Design of Dynamic Systems, Model Predictive Control, Machine Learning Control, etc.

[0009]. I have supervised 148 graduate and undergraduate students for mechanical engineering research projects or dissertations. These include 37 Ph.D., 77 M.S. and 34 B.S. students in the mechanical engineering departments in four academic institutions from 2010 to 2025. Such mentorships have been in the areas of modeling, design, experimental studies, and control of mechanical engineering systems.

[0010]. I am currently the Technical Editor for the International Journal of American Society of Mechanical Engineers (ASME)/ Institute of Electrical and Electronics Engineers (IEEE) Transactions on Mechatronics. In addition, I served six years as the Associate Editor for ASME Journal of Dynamic Systems, Measurement, and Controls (2017–2023), Associate Editor (2014–2020) for the International Journal of Powertrains (Inderscience Publishers) and a guest editor for a special issue on “Optimal Design and Operation of Energy Systems” in the International Journal of Optimal Control Applications and Methods (2020–2022). In these roles, I have regularly evaluated research work in the field of mechanical and electrical engineering systems.

[0011]. I have also served on the United States’ National Science Foundation (NSF) and U.S. Department of Energy (DOE) review panels in the areas of mechanical engineering systems, controls, and energy systems. I have been a reviewer for: (i) international grant proposals from funding agencies from

the United States, Canada, Croatia, France, Germany, Poland, and the Netherlands,

(ii) the U.S. Academy of Engineering research program, (iii) 24 international engineering journals, and (iv) Springer International Publishing for books in the areas of mechanical engineering systems and mechatronics.

[0012]. I have been a member of the Society of Automotive Engineers (SAE) (membership #6109271569) for about 20 years. I have organized a number of technical sessions in the area of internal combustion engines at SAE World Congress in Detroit during 2016 and 2022. In addition, I have been a member of SAE Technical Committee on New Engines, Components, Actuators and Sensors since 2016.

[0013]. I have been a member of the American Society of Mechanical Engineers (ASME) for the past thirteen years (membership #125958). I am a very active member of ASME's Dynamic Systems & Control Division and have served as the chair of the Energy Systems technical committee (2018–2020), chair of the Automotive Transportation Systems technical committee (2020–2022), and chaired 45 sessions and co-organized more than 70 technical sessions in the areas of modeling, design, optimization, and control of mechanical engineering systems. I am currently part of the ASME executive committee for the Dynamic Systems & Control Division.

[0014]. I have been awarded over \$6.1 million in grants/support as a Principal Investigator (PI) and over \$9.0 million as a co-PI from international, federal, provincial, and industry sources for conducting research in the areas of design, modeling, optimization, and control of mechanical engineering systems. For example, I along with two of my colleagues recently received 1,140,000 CAD in funding from the Canada National Sciences and Engineering Research Council (NSERC) and Diesel Tech Industries for the period 2025–2028 to design and control dual fuel engines running with hydrogen and diesel fuels.

[0015]. As the director of Energy Mechatronics Laboratory (EML) at the University of Alberta, I currently supervise/co-supervise 26 members for research and development (R&D) engineering works. These include 3 research associates, 5 post-doctoral scholars, 11 PhD students, 3 MSc graduate students, and 2 lab engineers and 2 undergraduate students. The majority of the EML projects are with industry partners specializing in mechanical engineering systems. Our works center on modeling, design, fabrication, testing of mechanical-electrical-chemical engineering systems. Over the past 12 years (UAlberta, MichiganTech), I have led R&D projects with more than 20 companies most of them global companies (e.g., Cummins, Westport, Ford, GM, ...) for different engineering technologies. The majority of EML graduates/trainees (>70) are currently working in mechanical/electrical engineering companies in the U.S. and Canada.

[0016]. I have been recognized by different awards. Some of the recognitions/awards for my work related to internal combustion engines include:

- Transport Canada 2023 Technology Achievement Award Finalist, 2023.
- Best Presentation Award, SAE Int. Powertrain, Fuels & Lubricants Conference, Baltimore, MD, USA, 2016.
- Best Presentation in the Session, American Control Conference (ACC), 2012 (Montreal), 2015 (Chicago).
- Society of Automotive Engineers (SAE) International Ralph R. Teetor Educational Award, 2016 (An international award recognizing top engineering educators for outstanding contributions).
- Best Paper Award, ASME Automotive and Transportation Systems Technical Committee – ASME Dynamic Systems Control Conference, Columbus, OH, USA, 2015.
- Best Paper Award, ASME Automotive and Transportation Systems Technical Committee – ASME Dynamic Systems Control Conference, Fort Lauderdale, FL, USA, 2012.
- Canada NSERC (Natural Science and Engineering Research Council) Postdoctoral Fellowship, 2010 – 2012.

- Zita and John Rosen Teaching Excellence Award for Principal Instructor, University of Alberta, 2009 (An award for teaching Internal Combustion Engine (MECE 541) course. Only one award, across the university, is granted annually to give special recognition to a graduate student principal instructor who is an especially skilled and dedicated teacher).
- David Morris Graduate Scholarship in Automotive Engineering, University of Alberta, 2008.
- Winning Team (first prize) of a Total of 66 Research Teams from 26 Canadian Universities, Canada Automotive21 High Qualified Personnel Competition, Windsor, Canada, June 11-13, 2007.
- Chevron Graduate Scholarship in Natural Gas Engineering, University of Alberta, 2005.
- Best Paper Award in 3rd International Conference on Internal Combustion Engines, Tehran, Iran, 2004.
- Summa Cum Laude (ranked first among graduates) in MSc Mech Eng – Powertrain (2003), K. N. Toosi University of Technology, Tehran, Iran.

[0017]. My publications can be found at https://sites.ualberta.ca/~mahdi/Shahbakhti_Publications.html. These include more than 250 peer-reviewed publications in the field of mechanical engineering. Many of these publications are in the area of internal combustion engines. According to Google Scholar, these research publications have been recognized and cited over 6,400 times from more than 80 different countries.

[0018]. I have been retained as an expert in eight Inter Partes Review (“IPR”) proceedings and two International Trade Commission (“ITS”) proceedings in the past seven years to provide expert opinion in connection with different areas of mechanical engineering systems and mechatronics/control systems including: internal combustion engines, vehicles, powertrains, heating ventilation air conditioning (HVAC) systems, buildings, and vacuum systems.

[0019]. My full curriculum vitae (CV) is attached as Ex. 1003 to this report.

B. Compensation

[0020]. I have been retained by counsel for MWE Investments, LLC (“Petitioner”) to provide my expert opinion in connection with mechanical and control systems for internal combustion engines, fuel regulators, fuel valves, and controllers.

[0021]. I am being compensated through WIT Legal, LCC in

connection with this matter. WIT Legal, LCC is being compensated for my time in connection with this matter at a rate of \$550 per hour. My compensation is in no way based on the outcome of this investigation or on the opinions that I provide. I have no interest, financial or otherwise, in the outcome of this matter. I have no financial interest in, or affiliation with, any of the parties in this matter.

C. Materials Considered

[0022]. The analysis that I provide in this Declaration is based on my education, research, and experience, as well as the documents I have considered. In forming my opinions, I have read and considered U.S. Patent No. 11,905,895 (hereafter referred to as the “’895 patent”) and its prosecution history. I have cited to the following documents in my analysis below:

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Ex. 1014	U.S. Patent No. 4,492,207 to Hallberg ("Hallberg")
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[0023]. All the opinions contained in this declaration are based on the documents that I reviewed and my knowledge and professional judgment. My opinions have also been guided by my understanding of how a person of ordinary skill in the art would have understood the claims of the '895 patent.

[0024]. I reserve the right to supplement and amend any of my opinions in this declaration based on documents, testimony, and other information that becomes available to me after the date of this declaration.

II. STATEMENT OF LEGAL PRINCIPLES

[0025]. I am not a lawyer. My understanding of the legal standards to apply in reaching the conclusions in this declaration are based on discussions with counsel for Petitioner, my experience applying similar standards in other patent-related matters, and my reading of the documents submitted in this proceeding. In preparing this declaration, I have tried to faithfully apply these legal standards to the challenged claims.

A. Person of Ordinary Skill in the Art

[0026]. I understand that a person of ordinary skill in the art (hereinafter "POSA") would "be aware of all the pertinent prior art" at the time of

the alleged invention (*Custom Accessories, Inc. v. Jeffrey-Allan Indus.*, 807 F.2d 955, 963 (Fed. Cir. 1986)), including specialized knowledge applicable to various aspects of the claimed invention. *See, e.g., AVX Corp. v. Greatbatch, Ltd.*, IPR2014-00697, Paper 60 at 3 (P.T.A.B. Jan. 11, 2016). A POSA is also a person of ordinary creativity, not an automaton, and thus is able to make inferences from the art. *KSR Int'l Co. v. Teleflex*, 550 U.S. 398, 420-21 (2007).

[0027]. I have also been advised that to determine the appropriate level of a person having ordinary skill in the art, the following factors may be considered: (1) the types of problems encountered by those working in the field and prior art solutions thereto; (2) the sophistication of the technology in question, and the rapidity with which innovations occur in the field; (3) the educational level of active workers in the field; and (4) the educational level of the inventor.

[0028]. For purposes of this IPR, a POSA would have a college degree in mechanical engineering, physics, or related fields, and three years of work experience in combustion engines. Additional higher graduate education could substitute for work experience, and additional work experience/training could substitute for formal education.

B. Prior Art

[0029]. I have been advised and understand that the information used to evaluate whether an invention was new is generally referred to as “prior art.” I

understand that prior art includes patents and printed publications that existed before the earliest priority date or the earliest filing date of the patent (which I have been informed is also called the “effective filing date”). I have been informed and understand that a patent or published patent application is prior art if it was filed before the earliest filing date of the claimed invention and that a printed publication is prior art if it was publicly available before the earliest filing date.

[0030]. I have also been informed that material publicly disclosed before the earliest priority date or the earliest filing date of the patent also qualifies as “prior art.” Examples of material publicly disclosed include videos, books, presentations, speeches, etc.

C. Claim Construction

[0031]. I understand that a purpose of claim construction is to determine what a person of ordinary skill in the art would have understood the claim terms to mean. Claim terms are generally given their ordinary and customary meaning, which is the meaning that the term would have to a person of ordinary skill in the art in question as of the effective filing date.

[0032]. I understand that the person of ordinary skill in the art is deemed to read the claim term not only in the context of the particular claim in which the disputed term appears, but in the context of the entire patent, including the specification. I understand that the patent specification, under the legal

principles, has been described as the single best guide to the meaning of a claim term, and is thus highly relevant to the interpretation of claim terms. And I understand for terms that do not have a customary meaning within the art, the specification usually supplies the best context of understanding the meaning of those terms.

[0033]. I further understand that other claims of the patent in question, both asserted and unasserted, can be valuable sources of information as to the meaning of a claim term. Because the claim terms are normally used consistently throughout the patent, the usage of a term in one claim can often illuminate the meaning of the same term in other claims. Differences among claims can also be a useful guide in understanding the meaning of particular claim terms.

[0034]. I understand that the prosecution history can further inform the meaning of the claim language by demonstrating how the inventors understood the invention and whether the inventors limited the invention in the course of prosecution, making the claim scope narrower than it otherwise would be. Extrinsic evidence, such as dictionaries, may also be consulted in construing the claim terms.

[0035]. I understand that, in Inter Partes Review (IPR) proceedings, a claim of a patent shall be construed using the same claim construction standard that would be used to construe the claim in a civil action filed in a U.S. district court

(which I understand is called the “Phillips” claim construction standard), including construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.

[0036]. Accordingly, I have been instructed by counsel to apply the “Phillips” claim construction standard for purposes of interpreting the claims in this proceeding, to the extent they require a construction.

D. Anticipation (§102)

[0037]. I understand that under 35 U.S.C. §102, a patent claim is unpatentable for anticipation if the claimed subject matter was patented or described in a printed publication before the effective filing date of the claimed invention. I have been informed that this is referred to as unpatentability by anticipation. I have also been informed that a patent claim is anticipated under § 102 if a single prior art reference discloses all limitations of the claimed invention.

E. Obviousness (§103)

[0038]. I understand that a patent claim is obvious if, as of the effective filing date, it would have been obvious to a person having ordinary skill in the field of the technology (the “art”) to which the claimed subject matter belongs.

[0039]. I understand that the following factors should be considered in analyzing obviousness: (1) the scope and content of the prior art; (2) the

differences between the prior art and the claims; and (3) the level of ordinary skill in the pertinent art. I also understand that certain other facts known as “secondary considerations” such as commercial success, unexplained results, long felt but unsolved need, industry acclaim, simultaneous invention, copying by others, skepticism by experts in the field, and failure of others may be utilized as indicia of non-obviousness. I understand, however, that secondary considerations should be connected, or have a “nexus,” with the invention claimed in the patent at issue.

[0040]. I understand that a reference qualifies as prior art for obviousness purposes when it is analogous to the claimed invention. The test for determining what art is analogous is: (1) whether the art is from the same field of endeavor, regardless of the problem addressed, and (2) if the reference is not within the field of the inventor’s endeavor, whether the reference still is reasonably pertinent to the particular problem with which the inventor is involved.

[0041]. I understand that a person of ordinary skill in the art is assumed to have knowledge of all prior art. I understand that one skilled in the art can combine various prior art references based on teachings of those prior art references, general knowledge present in the art, or common sense. I understand that a motivation to combine references may be implicit in the prior art, and there is no requirement that there be an actual or explicit teaching to combine two references. Thus, one may take into account the inferences and creative steps that a

person of ordinary skill in the art would employ to combine the known elements in the prior art in the manner claimed by the patent at issue. I understand that one should avoid “hindsight bias” and ex post reasoning in performing an obviousness analysis. But this does not mean that a person of ordinary skill in the art for purposes of the obviousness inquiry does not have recourse to common sense.

[0042]. I understand that when determining whether a patent claim is obvious in light of the prior art, neither the particular motivation for the patent nor the stated purpose of the patentee is controlling. The primary inquiry has to do with the objective reach of the claims, and that if those claims extend to something that is obvious, then the entire patent claim is invalid.

[0043]. I understand one way that a patent can be found obvious is if there existed at the time of the invention a known problem for which there was an obvious solution encompassed by the patent’s claims. I understand that a motivation to combine various prior art references to solve a particular problem may come from a variety of sources, including market demand or scientific literature. I understand that a need or problem known in the field at the time of the invention can also provide a reason to combine prior art references and render a patent claim invalid for obviousness. I understand that familiar items may have obvious uses beyond their primary purpose, and that a person of ordinary skill in the art will be able to fit the teachings of multiple prior art references together like

the pieces of a puzzle. I understand that a person of ordinary skill is also a person of at least ordinary creativity. I understand when there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp. If this finite number of predictable solutions leads to the anticipated success, I understand that the invention is likely the product of ordinary skill and common sense, and not of any sort of innovation.

[0044]. I understand that the fact that a combination was obvious to try might also show that it was obvious, and hence invalid, under the patent laws. I understand that if a patent claims a combination of familiar elements according to known methods, the combination is likely to be obvious when it does no more than yield predictable results. Thus, if a person of ordinary skill in the art can implement a predictable variation, an invention is likely obvious. I understand that combining embodiments disclosed near each other in a prior art reference would not ordinarily require a leap of inventiveness.

[0045]. I understand that obviousness may be shown by demonstrating that it would have been obvious to modify what is taught in a single piece of prior art to create the patented invention. Obviousness may also be shown by demonstrating that it would have been obvious to combine the teachings of more than one item of prior art. I understand that a claimed invention may be obvious if

some teaching, suggestion, or motivation exists that would have led a person of ordinary skill in the art to combine the invalidating references. I also understand that this suggestion or motivation may come from the knowledge of a person having ordinary skill in the art, or from sources such as explicit statements in the prior art. I understand that when there is a design need or market pressure, and there are a finite number of predictable solutions, a person of ordinary skill may be motivated to apply common sense and his skill to combine the known options in order to solve the problem.

[0046]. I understand the following are examples of approaches and rationales that may be considered in determining whether a piece of prior art could have been combined with other prior art or with other information within the knowledge of a person having ordinary skill in the art:

- Some teaching, motivation, or suggestion in the prior art that would have led a person of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention;
- Known work in one field of endeavor may prompt variations of it for use in the same field or a different field based on design incentives or other market forces if the variations would have been predictable to a person of ordinary skill in the art;

- Combining prior art elements according to known methods to yield predictable results;
- Applying a known technique to a known device, method, or product ready for improvement to yield predictable results;
- Applying a technique or approach that would have been “obvious to try” (choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success);
- Simple substitution of one known element for another to obtain predictable results; or
- Use of a known technique to improve similar products, devices, or methods in the same way.

[0047]. I understand that, when determining whether a claimed combination is obvious, the correct analysis is not whether one of ordinary skill in the art, writing on a blank slate, would have chosen the particular combination of elements described in the claim. Instead, I understand the correct analysis considers whether one of ordinary skill, facing the wide range of needs created by developments in the field of endeavor, would have seen a benefit to selecting the combination claimed.

[0048]. I understand that the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of

the primary reference. The test for obviousness, in other words, is not whether the references could be physically combined but whether the claimed inventions are rendered obvious by the teachings of the prior art as a whole.

III. SUMMARY OF THE '895 PATENT

[0049]. The '895 patent generally relates to “a mechanical fuel lockout switch [38] for a dual fuel engine.” Ex. 1001, Abstract. The “[m]echanical fuel lockout switch 38, FIG. 2, includes a mechanical fuel valve 54 actuatable between first position 38(a) as shown in FIG. 2 and second position 38(b) as shown in FIG. 3 to selectively control fuel flow to the dual fuel engine from first fuel source 28 through a first fuel line and second fuel source 30 through a second fuel line 36.” *Id.*, 5:50–55.

[0050]. “Mechanical fuel valve 54 opens the first fuel line (to enable liquid fuel flow to the engine) when fuel valve handle 56 is in the first position, and mechanical fuel valve 54 closes the first fuel line (to prevent liquid fuel flow to the engine) when fuel valve handle 56 is in the second position.” *Id.*, 6:21–25.

“Fuel valve handle 56 is coupled to fuel lockout apparatus 58.” *Id.*, 6:29–30.

[0051]. “Fuel lockout apparatus 58 is controlled by fuel valve handle 56 so that moving fuel valve handle 56 to the first position causes fuel lockout apparatus 58 to block fuel inlet 59 for LPG and moving fuel valve handle 56 to the

second position causes fuel lockout apparatus 58 to unblock fuel inlet 59 for LPG.”

Id., 6:32–37.

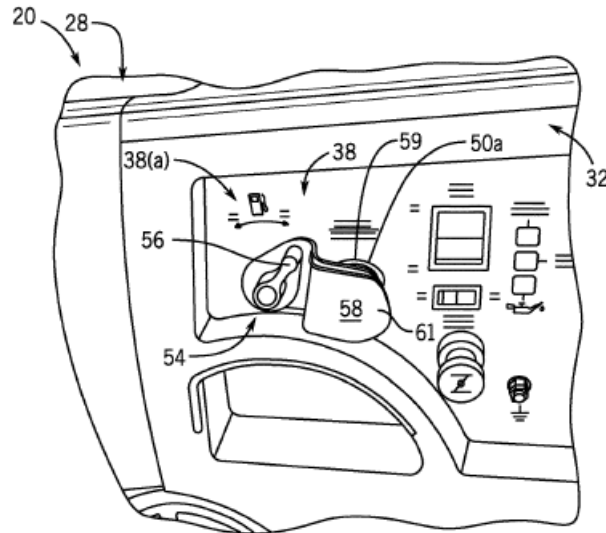
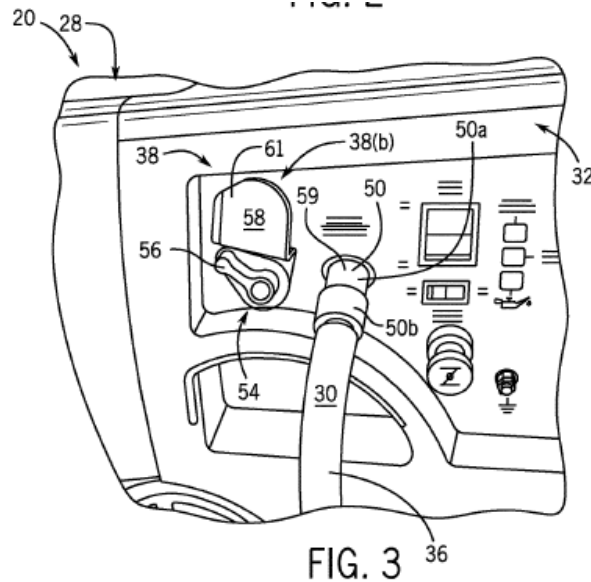


FIG. 2

Ex. 1001, FIG. 2.

[0052]. “Referring to FIG. 3, a detail view of a portion of generator 20 of FIG. 1 depicts mechanical fuel lockout switch 38 in a second position 38(b), in accordance with an embodiment of the invention. In this position, the mechanical fuel lockout switch 38 provides a disconnect to stop gasoline flow from gasoline tank 32 to the engine while allowing connection of LPG supply hose 36 to fuel inlet 59 of the second fuel line. FIG. 3 further shows LPG supply hose 36 coupling second fuel source 30 to generator 20 to deliver LPG to run the generator.” *Id.*, 6:51–60.



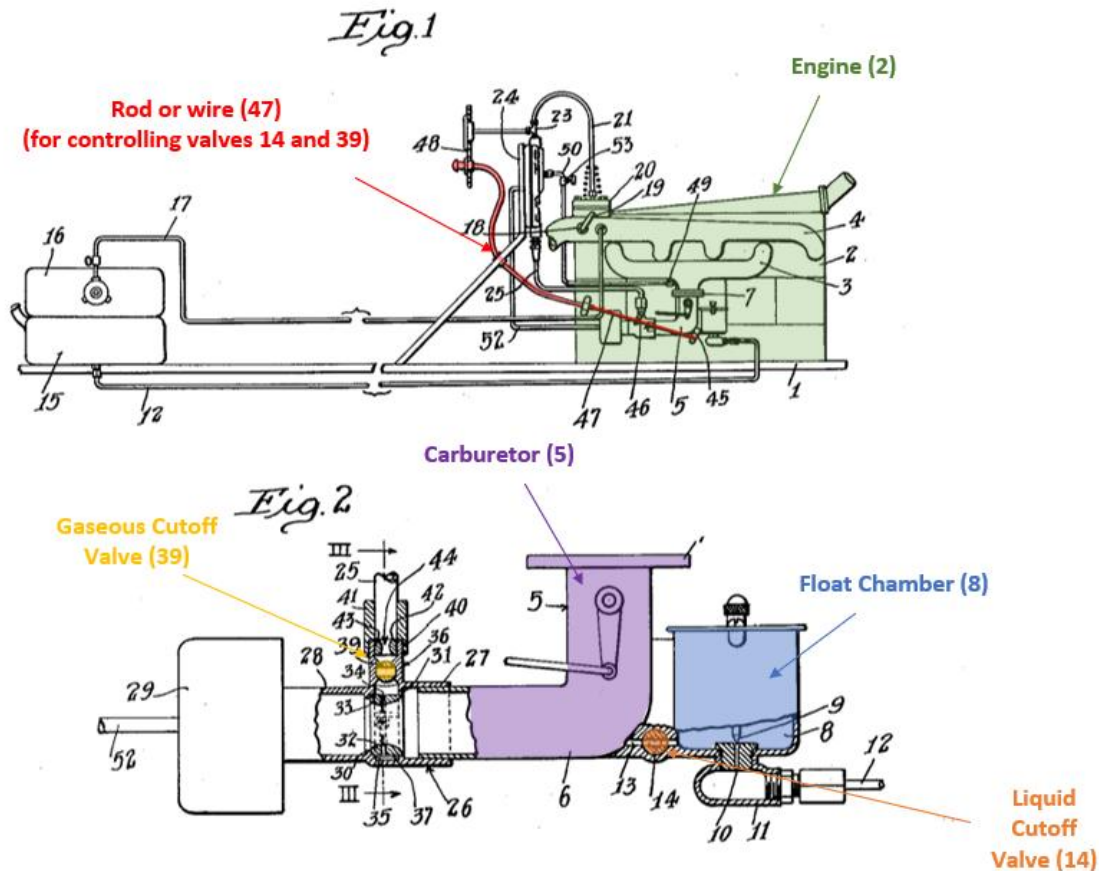
Ex. 1001, FIG. 3.

A. State of the Art:

1. Dual-Fuel Combustion Engine

[0053]. Dual-fuel engines that can alternate between running on liquid or gaseous fuel have been known in the art for nearly 100 years. For example, Holzapfel, U.S. Patent No 1,931,698, was filed in 1931 and discloses “a fuel system embodying the supplying of liquid fuel and gaseous fuel to an engine in alternation at will.” Ex. 1004, 1:1–5. Holzapfel further teaches that the disclosed engine “provide[s] a fuel system...in which the liquid fuel supply may be cut off and the gaseous fuel supply turned on, or vice versa so that when the liquid fuel is employed the gaseous fuel is disconnected and while the gaseous fuel is employed the liquid fuel is disconnected.” *Id.*, 1:35–42.

[0054]. Holzapfel further teaches that a “rod or wire 47” is connected to gaseous and liquid cutoff valves to control both valves, as seen in Holzapfel’s Figures 1 and 2 below:



Ex. 1004, FIGS. 1–2 (Annotated).

2. Dual-Stage Regulators

[0055]. A pressure regulator is designed to control vapor pressure. Ex. 1005, 118–119 (§5.8.1: “Propane appliances in buildings typically operate at 11 in. w.c. (2.7 kPa) (about 1/2 psi), so the vapor pressure of the propane in the container must be reduced to a much lower pressure for the appliance to operate safely.”). The same is true for outdoor appliances, such as portable generators and BBQ

grills. These appliances rely on a propane tank for fuel where propane is stored as a liquid under a pressure of approximately 100 psi that must be reduced to a much lower pressure to operate properly.

[0056]. As noted in LP-Gas Handbook, the LP-Gas Code has definitions for the various types of regulators, including the first-stage regulators, second-stage regulators, and integral two-stage regulators referenced in the '895 Patent:

3.3.64.2 First-Stage Regulator. A pressure regulator for LP-Gas vapor service designed to reduce pressure from the container to 10.0 psig (69 kPag) or less.

3.3.64.3 High-Pressure Regulator. A pressure regulator for LP-Gas liquid or vapor service designed to reduce pressure from the container to a lower pressure in excess of 1.0 psig (6.9 kPag).

3.3.64.4 Integral 2 psi Service Regulator. A pressure regulator for LP-Gas vapor service that combines a high-pressure regulator and a 2 psi service regulator into a single unit.

3.3.64.5 Integral Two-Stage Regulator. A pressure regulator for LP-Gas vapor service that combines a high-pressure regulator and a second-stage regulator into a single unit.

3.3.64.6 Line Pressure Regulator. A pressure regulator in accordance with the *Standard for Line Pressure Regulators*, ANSI Z-21.80/CSA 6.22, with no integral overpressure protection device for LP-Gas vapor service designed for installation inside a building to reduce a nominal 2 psig inlet pressure to 14 in. w.c. (4.0 kPa) or less.

3.3.64.7 Second-Stage Regulator. A pressure regulator for LP-Gas vapor service designed to reduce first-stage regulator outlet pressure to 14 in. w.c. (4.0 kPag) or less.

3.3.64.8 Single-Stage Regulator. A pressure regulator for LP-Gas vapor service designed to reduce pressure from the container to 1.0 psig (6.9 kPag) or less.

3.3.64.9 2 psi Regulator System. An LP-Gas vapor delivery system that combines a first-stage regulator, a 2 psi (14 kPag) service regulator, and a line pressure regulator(s).

3.3.64.10 2 psi Service Regulator. A pressure regulator for LP-Gas vapor service designed to reduce first-stage regulator outlet pressure to a nominal 2 psig (14 kPag).

3.3.64.11 Two-Stage Regulator System. An LP-Gas vapor delivery system that combines a first-stage regulator and a second-stage regulator(s), or utilizes a separate integral two-stage regulator.

Ex. 1005, 40–41 (§3.3.64) (annotated).

[0057]. As described in LP-Gas Handbook, since 1995, two-stage pressure regulation systems have been required for most fixed propane installations in buildings. The regulators used in two-stage regulator systems are designed to reduce propane container pressure to an intermediate pressure of 10 psig (69 kPag), and then further reduce pressure to 11 in. w.c. (2.7 kPag). This is accomplished with the use of two separate regulators (first- and second-stage), or with one single unit, an integral two-stage regulator.

Ex. 1005, 118–119 (commentary regarding §5.8.1).

[0058]. Although not strictly required for use outdoors, such as with generators and outdoor BBQ grills, using a two-stage pressure regulation system is advantageous because of its ability to maintain a constant and precise outlet pressure, particularly as the inlet fuel pressure varies. Use of two-stage pressure regulator allows for consistent and more precise gas flow, compared to using a single-stage pressure regulator.

[0059]. As LP-Gas Handbook indicates, dual-stage regulators were well-known at the time of the invention. For example, off-the-self dual-stage regulators were generally available at least by 2008, as shown below.



EXHIBIT 3.12 *Integral Two-Stage Regulator. (Courtesy of Engineered Controls International, Inc.)*

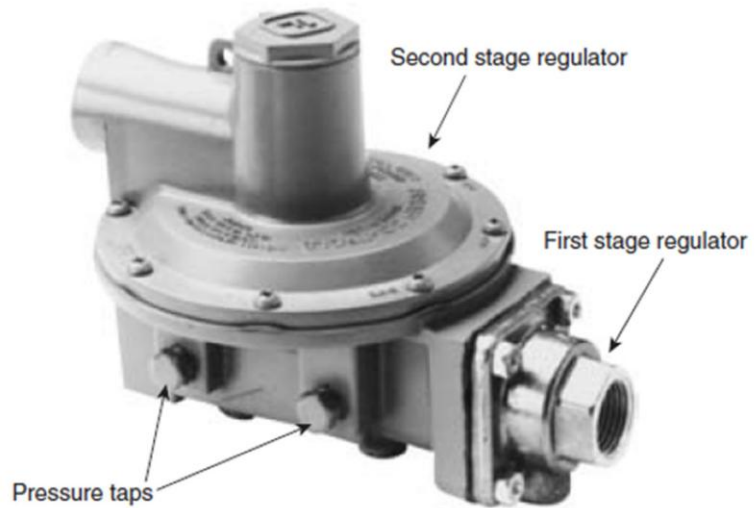


EXHIBIT 5.47 *Integral Two-Stage Regulator. (Courtesy of Fisher Controls Intl, LLC)*

Ex. 1006, 41, 120 (published in 2008).



2-Stage Low Pressure Regulator Assembly

\$70.00 SKU: 106238

Add to Cart

Used for connecting commercial grade BBQ & Catering Grills requiring gas input in excess of 100,000 BTU's per hour to a propane tank via high volume green Type 1 tank connection. The green Type 1 allows a higher volume of gas to pass through the tank connection before going into bypass mode. *Standard Hose Length is 18" OAL [Learn More](#)

[Add to Wishlist](#) | [Add to Compare](#)



2-Stage Low Pressure Regulator Assembly with Stainless Steel Overbraid

\$90.00 SKU: 106221

Add to Cart

Stainless Steel Overbraided Two-Stage Regulator Assembly used for connecting commercial grade BBQ & Catering Grills requiring gas input in excess of 100,000 BTU's per hour to a propane tank via high volume green Type 1 tank connection. The green Type 1 allows a higher volume of gas to pass through the tank connection before going into bypass mode. The overbraid keeps small animals from damaging the hose. *Standard Hose Length is 18" OAL [Learn More](#)

[Add to Wishlist](#) | [Add to Compare](#)

Ex. 1006 (webpage from 2013).

IV. THE CHALLENGED CLAIMS

[0060]. This Declaration address claims 1-21 of the '895 patent.

Claims 1, 8 and 14 are independent claims. Claims 2-7 depend from independent claim 1 respectively. Claims 9-13 depend from independent claim 8. Claims 15-21 depend from independent claim 14.

V. APPLICATION OF PRIOR ART TO THE CHALLENGED CLAIMS

[0061]. I have reviewed and analyzed the prior art references and materials listed in §I.C, supra. In my opinion the claims of the '895 patent would have been obvious to a person of ordinary skill in the art based on the following combinations of the prior art.

Ground	Basis	Challenged Claims	Reference(s)
1	§103	1–4, 6–10, and 12–13	DuroMax and Elsdon
2	§103	5, 11, and 14–21	DuroMax, Elsdon, and Parlatore in View of LP-Gas Handbook
3A	§102	1, 6, and 7	Hallberg
3B	§103	2, 8, 12, and 13	Hallberg
4	§103	14, 15, and 17-21	Hallberg and Parlatore in View of LP-Gas Handbook

[0062]. I am informed by counsel that each of the references cited in the grounds above qualifies as prior art to the challenged claims because each reference was filed before the '895 patent priority date of June 12, 2015.

A. Overview of DuroMax XP4400EH Operator's Manual ("DuroMax")

[0063]. DuroMax was published/publicly available at least by November 1, 2012, before the filing date of the earliest application to which the '895 Patent claims priority. Ex. 1010, ¶¶18–19. DuroMax is prior art to the '895 Patent under 35 U.S.C. §102(a).

[0064]. DuroMax discloses the XP4400EH dual fuel generator—a dual fuel generator that runs alternatively on gasoline or liquefied petroleum gas (LPG). The generator includes a mechanical fuel shutoff valve having a valve handle.

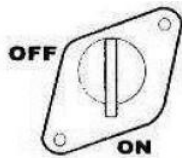


Figure 6 - fuel valve in the "on" position

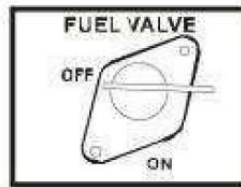
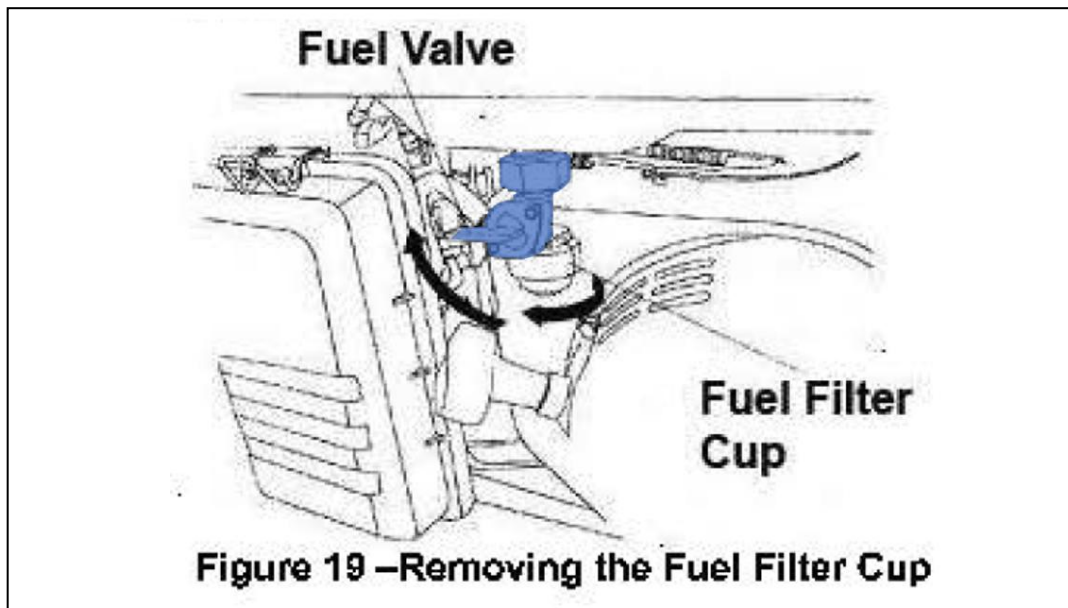


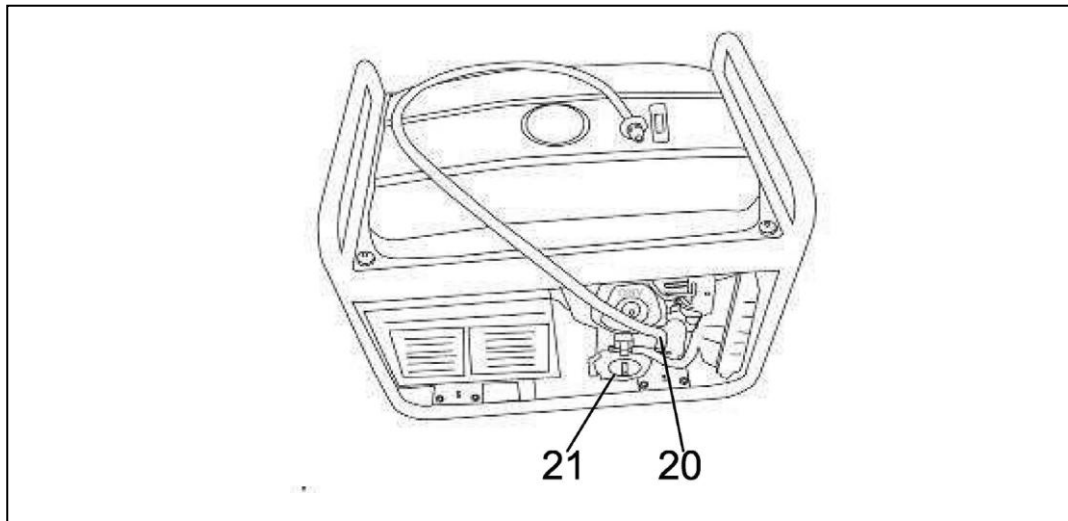
Figure A - Fuel Valve in the "OFF" position

Ex. 1010, pp.11,12.



Ex. 1010, p.20 (Annotated).

The generator also includes an LPG fuel inlet.



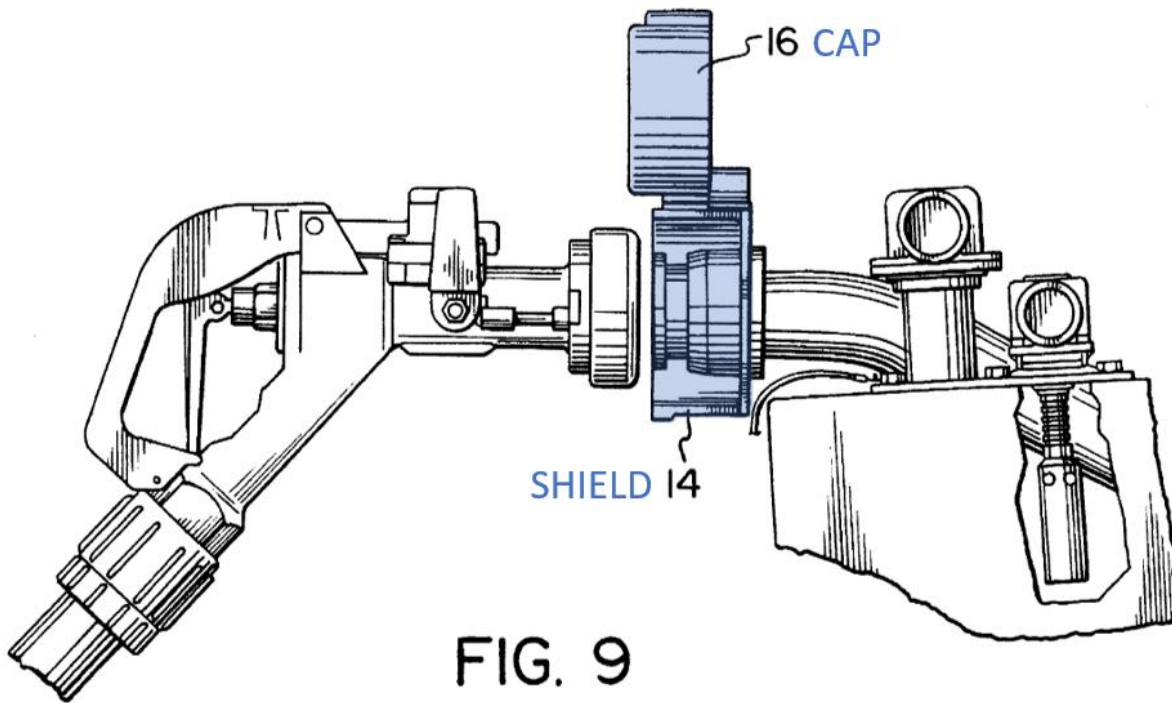
20. Hose connector- Connect liquid propane gas to generator.

Ex. 1010, p.7.

B. U.S. Patent No. 5,718,265 to Elsdon (“Elsdon”)

[0065]. Elsdon was filed on February 24, 1995. Elsdon issued on February 17, 1998. Elsdon is prior art to the '895 Patent under 35 U.S.C. §102(a).

[0066]. Elsdon discloses an assembly having cap 16 and shield 14 assembly of a fluid conduit coupler 12 that is used for “flammable or other hazardous fluids, such as fuel...” Ex. 1012, 1:10-13, 3:3-4, FIG. 9.



Ex. 1012, FIG. 9 (Annotated).

[0067]. Cap 16 is hingedly connected to shield 14 and is readily moveable between an open position (FIG. 9 above and FIG. 1 below) and a closed position (FIG. 2 below) in which cap 16 is positioned over the coupler 12 to prevent coupling with a fuel hose. Ex. 1012, 3:4-11.

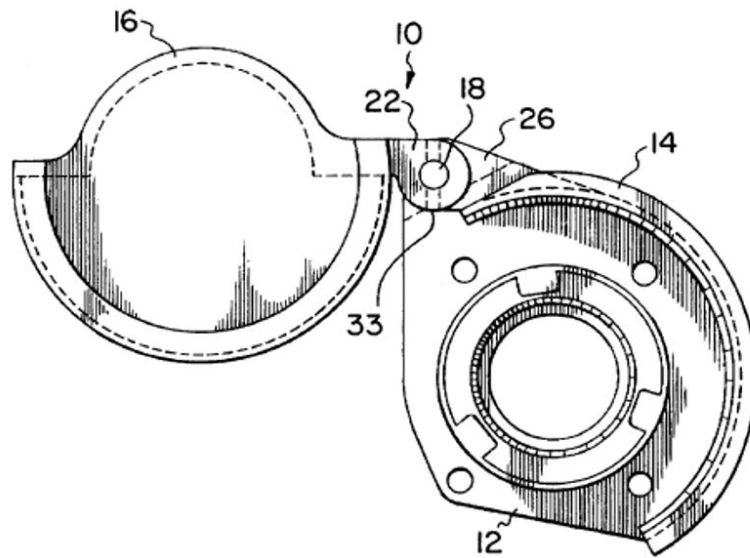


FIG. 1

Ex. 1012, FIG. 1.

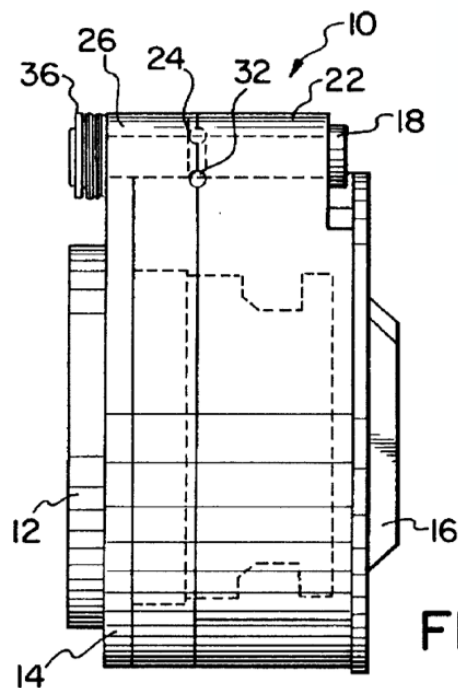


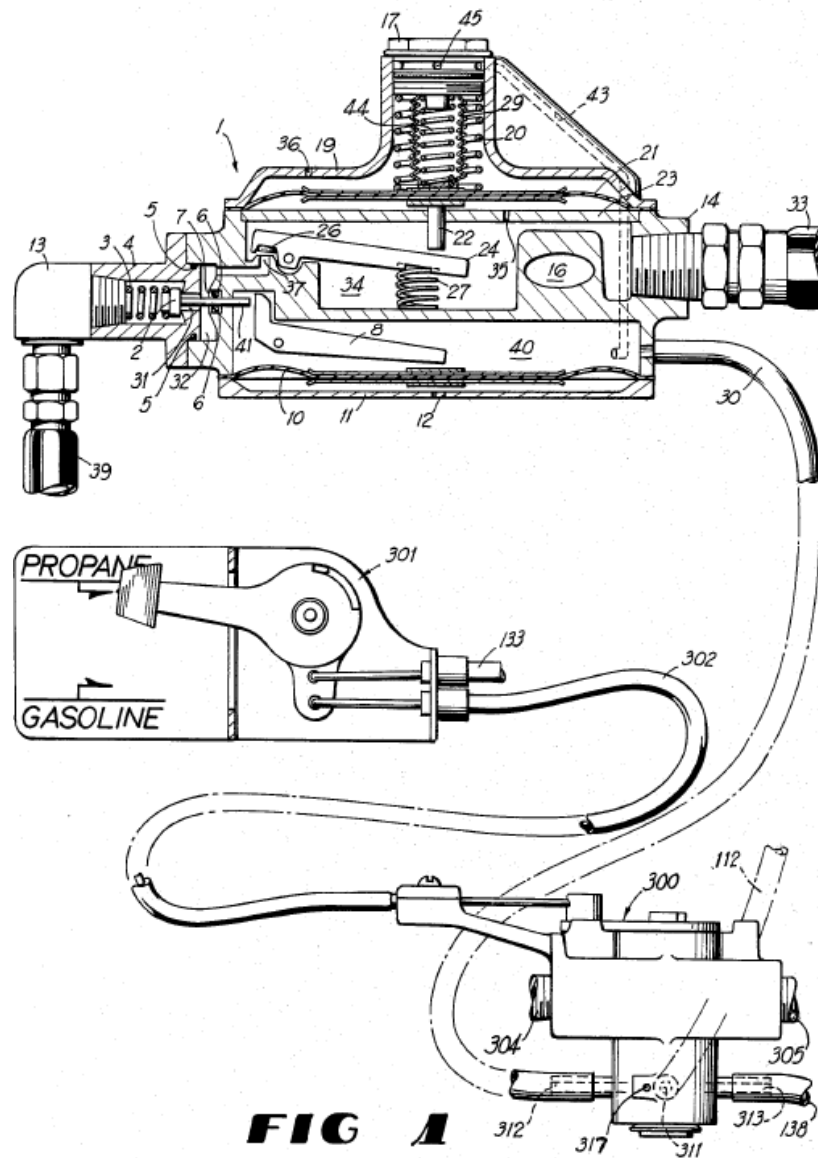
FIG. 2

Ex. 1012, FIG. 2.

C. Overview of U.S. Patent No. 4,492,207 to Hallberg (“Hallberg”)

[0068]. Hallberg (Ex. 1014) was filed on February 27, 1981, and issued on January 8, 1985. Hallberg is thus prior art to the '895 Patent under 35 U.S.C. §102(a).

[0069]. Hallberg discloses a dual fuel system for use with internal combustion engines. Ex. 1014, Abstract. Fuel to be utilized is selected by positioning fluid dual value control 301 in one of two positions, either “gasoline” or “propane.” *Id.*, 7:27–29, Fig. 1

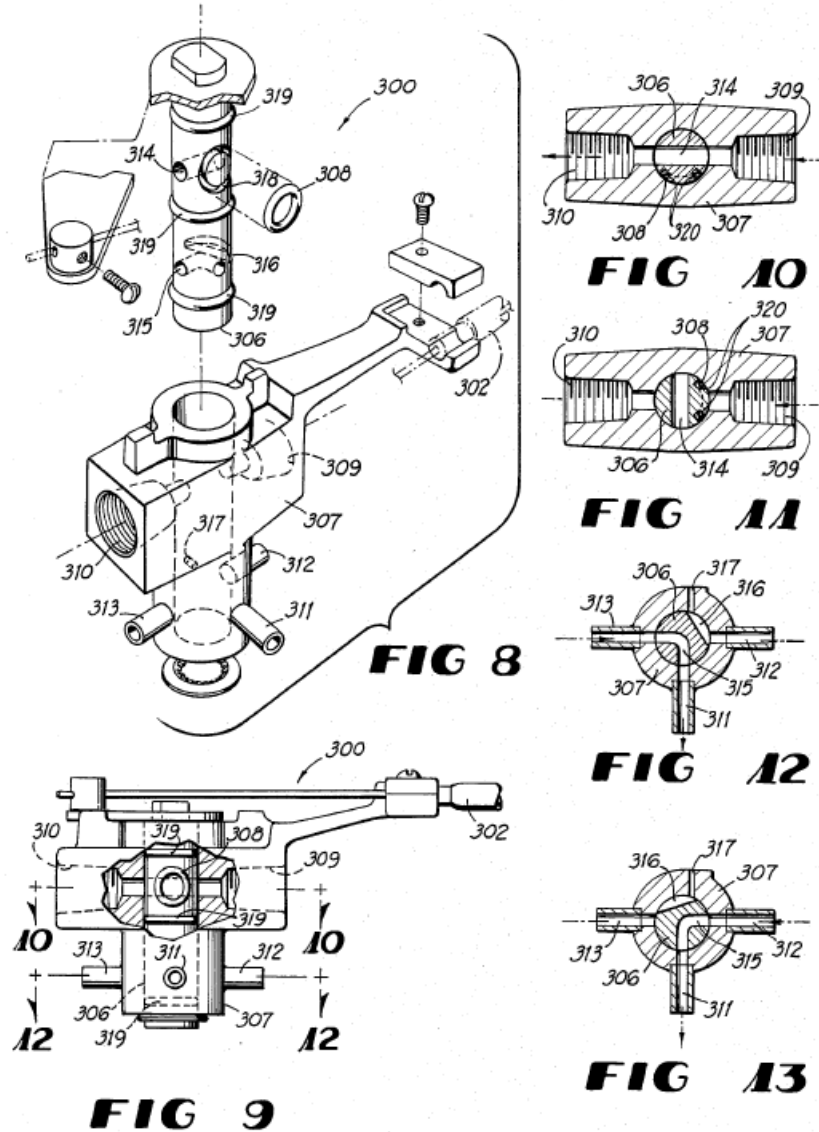


Ex. 1014, FIG. 1.

[0070]. Positioning of control 301 in the “gasoline” mode acts through control cable 302 to rotate spool 306 within valve body 307. *Id.*, 7:30–32. Simultaneously, gasoline from gasoline supply line 304 is supplied to the carburetor 110 through engine gasoline line 305, which lines communicate through tunnel 314 (as shown in FIG. 10) connecting liquid inlet opening 309 and liquid

outlet opening 310 in fluid dual valve 300. *Id.*, 7:33–44. In this mode, the carburetor functions normally. *Id.*

[0071]. When the “propane” mode of control 301 is selected, spool 306 is rotated within valve body 307 by control cable 302 such that O-ring 308 on the face of spool 306 forms a seal between spool 306 and valve body 307 around liquid inlet opening 309 (as shown in FIG. 11) thereby prohibiting flow of gasoline to a conventional carburetor 110. *Id.*, 8:3–10



Ex. 1014, FIGS. 8–13.

[0072]. When the engine is started, a vacuum, communicated to the engine intake manifold pressure chamber 40 via lines 112 and 30, creates a reduced pressure on the upper side of the liquid inlet diaphragm 10. *Id.*, 8:31–36. Atmospheric pressure on the opposite side of diaphragm 10 urges diaphragm upward against the liquid inlet lever 8, the opposite end of which drives inlet valve

shaft 41 against bias spring 3 and opens liquid inlet valve 2. *Id.*, 8:36–40. Upon opening valve 2, liquified gaseous fuel (e.g., propane) flows through inlet valve orifice 31 into liquified fuel passage 32 and onto the mixer 100. *Id.*, 8:40–60. When valve 2 is closed, valve 2 and related structures provide a “lock-off” of liquified gaseous fuel. *Id.*, 7:64–68.

D. U.S. Patent Application No. 2011/0100335 A1 to Parlatore (“Parlatore”)

[0073]. Parlature, filed November 5, 2009, is prior art under at least 35 U.S.C. §103. Ex. 1013, cover page. Parlature discloses a “method and system [having] one or more fuel storage tanks housing propane, one or more regulators through which fuel may flow and one or more fuel metering devices or systems.” *Id.*, Abstract. “[T]he LPG tank 102 may be connected to a regulator, such as a primary regulator 106.” *Id.*, [0016]. “The primary regulator 106 may step down the pressure of any stored propane vapor energy in tank 102, and may further output this lowered pressure to a secondary regulator 110.” *Id.* “The secondary regulator 110 can act as a vacuum-controlled flow rate regulator. Further, the secondary regulator 110 can meter propane gas to an engine 116.” *Id.* “[T]he regulator arrangement of the primary regulator 106 and the secondary regulator 110 may be such that they are combined as a single, two-stage, regulator 202 would then feed the vaporized propane into carburetor 114 through hose 112.”

Ex.1013, [0018]. An example of one embodiment of the primary and secondary regulator arrangement is shown in FIG. 1, below.

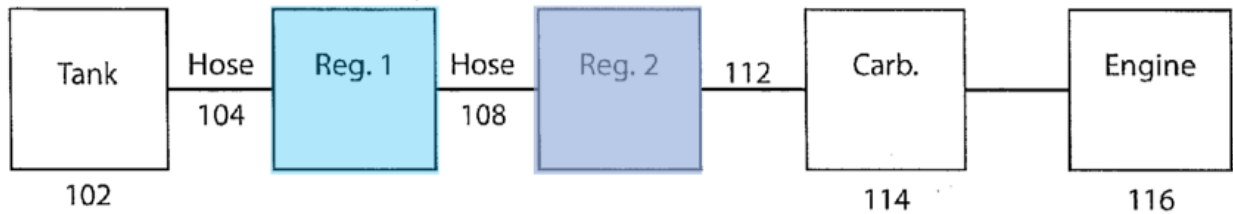
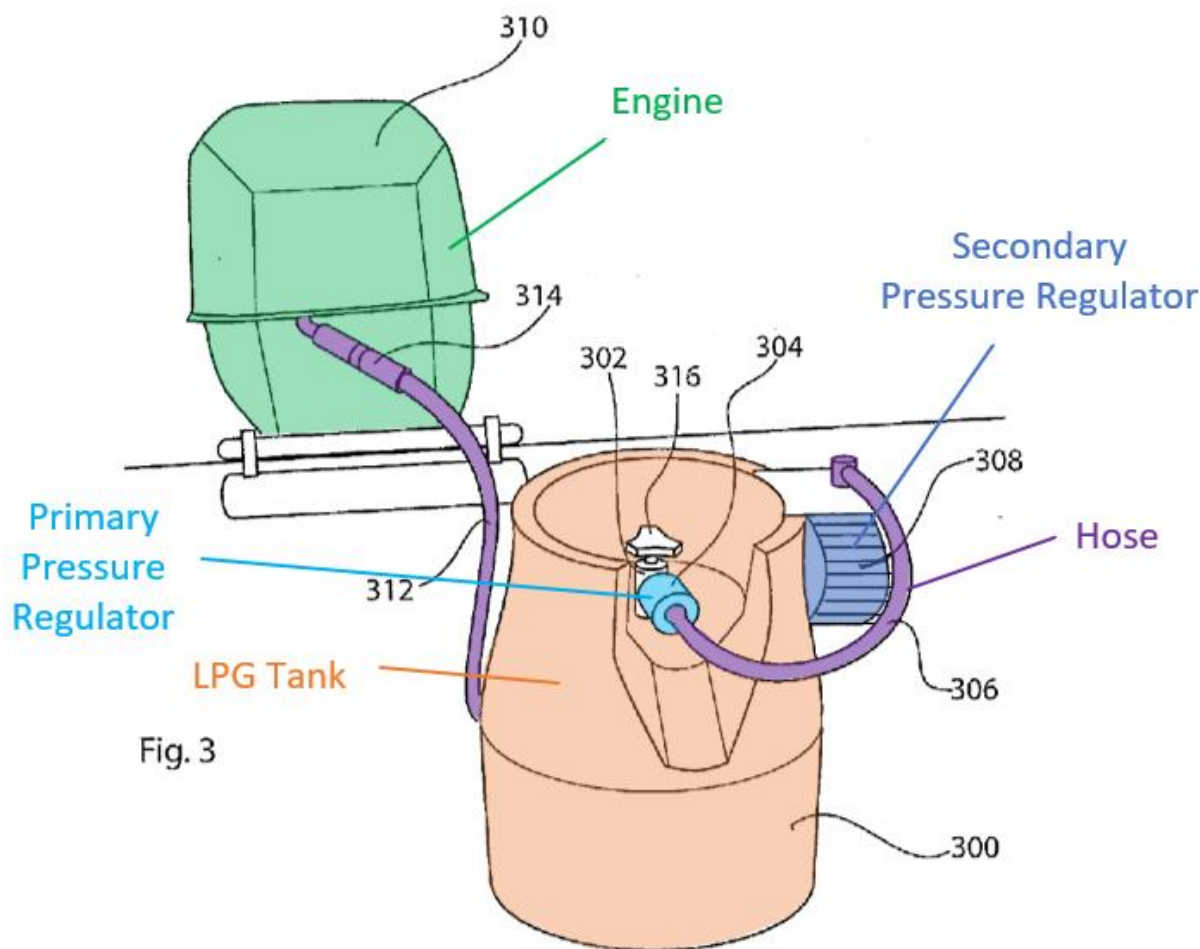


Fig. 1

Ex. 1013, FIG. 1.

[0074]. As shown in FIG. 3 (below), “[t]he LPG tank 300 may be connected to the primary regulator 304 as described previously, for example by connector 302. Additionally a low pressure output of the secondary regulator 308 may be attached to a propane carburetor (not pictured) on the engine 310 in any of a variety of manners, for example through hose 312 and coupling 314. Further, a low pressure output of the secondary regulator 308 may be attached to the propane carburetor either permanently or releasably.” *Id.*, [0020].



Ex. 1013, FIG. 3 (Annotated).

[0075]. “Still referring to exemplary FIG. 3, the primary regulator 304 and the secondary regulator 308 may be two separate regulators that can be based on the design and size of an engine. The primary regulator 304 in this exemplary embodiment may be connected to LPG tank 300 as described above. Additionally, the primary regulator 304 may be connected to the secondary regulator 308 by a hose 306, pipe, tube or the like, such as that described above.” *Id.*, [0021].

E. LP-Gas Code Handbook

[0076]. LP-Gas Handbook was published/publicly available in 2008.

Ex. 1005, p. 3. It is prior art under §102(a).

[0077]. LP-Gas Handbook is the Eighth Edition in its series. Ex. 1005, p. 2. It is a commentary on the 2008 edition of NFPA® 58, *Liquefied Petroleum Gas Code*, (“LP-Gas Code”) and includes the full text of the code. *Id.*, 2,24.

[0078]. LP-Gas Handbook provides commentary on the definition for “Quick Connectors”:

3.3.62 Quick Connectors. Fittings used to connect hose assemblies to piping and valves without the use of tools.

Quick connectors are used to connect transfer hose to piping and valves for loading and unloading cargo tank vehicles or railroad tank cars. They can also be used as connectors on swivel-type transfer piping. Quick connectors are also used in other LP-Gas systems, such as those used for engine fuel refueling and cylinder filling, connecting cylinders to gas-fired barbecue grills, and connecting gas systems between two sections of mobile homes.

Ex. 1005, 40.

VI. CLAIM TERMS

[0079]. I have been instructed that claims should be given their ordinary and customary meaning as understood by a POSA viewing the claim terms in the context of the entire patent. I have also been instructed that claims must always be read in light of the specification as the specification is the single best guide to the meaning of a disputed term. When a patentee defines a claim term, the patentee’s definition governs.

A. The Claimed “Fuel Lockout Apparatus”

[0080]. Every claim of the '895 Patent requires “a fuel lockout apparatus.” As explained below, the term “fuel lockout apparatus” is a means-plus-function claim term that covers the following corresponding structure and equivalents thereof: Items 58, 61 in Figs. 2, 3, 4A, 4B, as described at Ex.1001, 5:56–6:16; 6:29–50; 6:61–7:36; 8:6–19; 9:1–16.¹

1. “Fuel Lockout Apparatus” as Recited in the Specification

i. “Fuel Lockout Apparatus” Does Not Recite Any Structure and Therefore Invokes §112(f).

[0081]. The term “fuel lockout apparatus” recites a function without providing any structure or performing that function. The claim merely replaces the term “means” with “apparatus.” The term “fuel lockout apparatus” has no independent meaning aside from “a means for providing fuel lockout.”

[0082]. The term “fuel lockout apparatus” does not provide any structure corresponding to the function of providing fuel lockout. I am told that the term “fuel lockout apparatus” therefore invokes 35 U.S.C. §112(f).

[0083]. I am told that Section 112(f) applies to claim terms that recite “function without reciting sufficient structure for performing that function.”

¹ If this term is not treated as a means-plus-function limitation, it should be given the meaning that the Patentees chose for it, as clearly supported by the sole embodiment in the specification and discussed below: “a moveable barrier capable of blocking physical access for attaching a fuel source to a fuel inlet on the second fuel line.”

Williamson v. Citrix Online, LLC, 792 F.3d 1339, 1349 (Fed. Cir. 2015). The

“critical question” in making this assessment “is whether the claim term is used in common parlance or by persons of skill in the pertinent art to designate structure.”

MTD Prods. Inc. v. Iancu, 933 F.3d 1336, 1341 (Fed. Cir. 2019) (internal citations

omitted). I am also told that Generic terms such as “mechanism,” “element,”

“device,” and other nonce words . . . [are] tantamount to using the word “means”

because they “typically do not connote sufficiently definite structure” and therefore

invoke Section 112(f). *Williamson*, 792 F.3d at 1350 (Fed. Cir. 2015).

[0084]. The phrase “fuel lockout apparatus” recites a function without providing any structure for performing that function. The phrase “fuel lockout apparatus” is not understood by A POSA to connote a specific structure. The claim merely replaces the term “means” with “apparatus.” The term “fuel lockout apparatus” has no independent meaning aside from “a means for providing fuel lockout.” The claim language fails to provide any structure for the “providing fuel lockout” function and is therefore subject to construction under §112(f).

ii. The Corresponding Structure for “Fuel Lockout Apparatus.”

[0085]. The ’895 Patent describes a single embodiment of a “fuel lockout apparatus.” In that embodiment, the “fuel lockout apparatus 58” is a “flange” that “is rigidly coupled to the rotating handle [56].” Ex.1001, 6:38–50.

The flange “extends radially outward from fuel valve handle 56” and “sweeps

over” the LPG fuel hose coupling “as the fuel valve handle rotates.” *Id.* Based on the user selection, the flange “blocks off” or “uncovers” the “first end 50a of the quick-disconnect hose coupling when fuel valve handle is rotated” between the first and second positions. *See id.*, 7:32–36.

[0086]. Specifically, when the fuel lockout apparatus is in the first position (selecting gasoline), the flange provides a barrier that extends over the fuel hose coupling 50a and prevents the user from coupling an LPG supply hose to the fuel hose coupling 50, thereby providing LPG fuel lockout. Ex.1001, 7:23–36; FIGS. 2,4A.

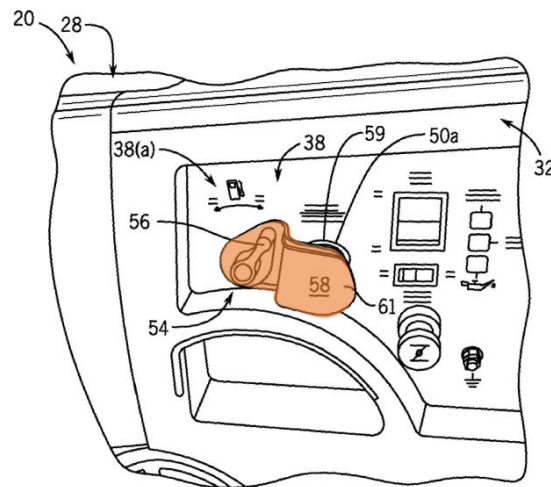


FIG. 2

Ex. 1001, FIG. 2 (Annotated).

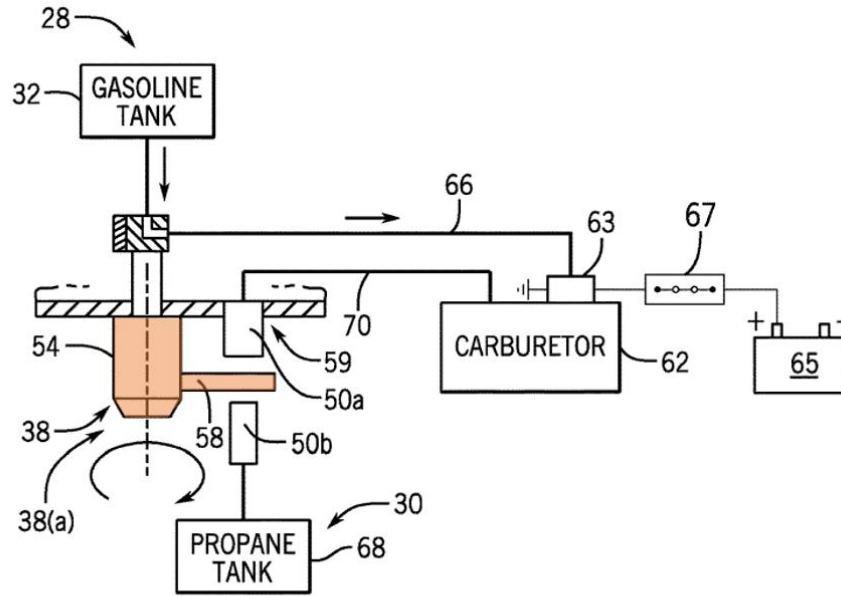
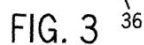


FIG. 4A

Ex. 1001, FIG. 4A (Annotated).

[0087]. When the fuel lockout apparatus is in the second position (selecting LPG), the fuel lockout apparatus prevents the user from selecting gasoline until the LPG supply hose is removed, and thereby providing gasoline fuel lockout. Ex.1001, 7:37–48; FIGS. 3,4B.



Ex.1001, FIG. 3 (Annotated).



Ex. 1001, FIG. 4B (Annotated)

[0088]. The flange that extends radially outward from the valve handle and rotates with the valve handle over the fuel hose coupling provides both the

gasoline and LPG lockout functionality. Thus, the proper structure corresponding to the “providing fuel lockout” functionality is: Items 58, 61 in Figs. 2, 3, 4A, 4B, as described at Ex. 1001, 5:57–6:16; 6:29–50; 6:61–7:36; 8:6–19; 9:1–16.

[0089]. I have been told that Patent Owner appears to adopt a claim construction wherein the “fuel lockout apparatus” can be any apparatus that prevents selection of more than one fuel source. *See, e.g.*, Ex. 1009, pp. 17,19

[0090]. An “apparatus,” is defined as a “set of...equipment designed for a particular use.” Ex. 1026, pp. 1-6. From this definition, it is clear that an “apparatus” includes a combination of different parts and equipment to serve a specific purpose. The “apparatus” can include valves (mechanical, electrical), chambers, gears, tubes, pumps, blowers, analyzers, sensors, controllers, or electronic actuators to serve intended purposes.

[0091]. A POSA would therefore understand that a fuel lockout apparatus includes elements that together are designed for a particular use. A POSA would also understand that the plain and ordinary meaning of the adjective “fuel lockout” is “preventing the flow of fuel.”

[0092]. Accordingly, a POSA would understand that the plain and ordinary meaning of the composite term “fuel lockout apparatus” is therefore a “set of...equipment designed” for “preventing the flow of fuel.”

[0093]. As described in detail below, a POSA's understanding of the plain and ordinary meaning of the term "fuel lockout apparatus" is supported in internal combustion engine and mechanical engineering literature.

i. Use of the Term "apparatus" in Internal Combustion Engine Literature

[0094]. The definition of "**apparatus**" is aligned with how the term has been used in internal combustion engine (ICE) literature. Some of the examples of using term "apparatus" in ICE literature include: ignition apparatus, suction gas apparatus, starting apparatus, flow apparatus, electronic apparatus, vapor pressure apparatus, emission apparatus, refrigerating apparatus, cleaning apparatus, test apparatus, heating apparatus, cooling apparatus, adjustable guide apparatus, and exhaust apparatus – these apparatuses support different aspects of operation of internal combustion engines.

[0095]. In forming my opinion, I have reviewed the following ICE literature:

- Rolla C. Carpenter & H. Diederichs, *Internal Combustion Engines* (2d ed. 1909).
- Rowlands S. Benson & N.D. Whitehouse, *Internal Combustion Engines* (Pergamon Press 1979).

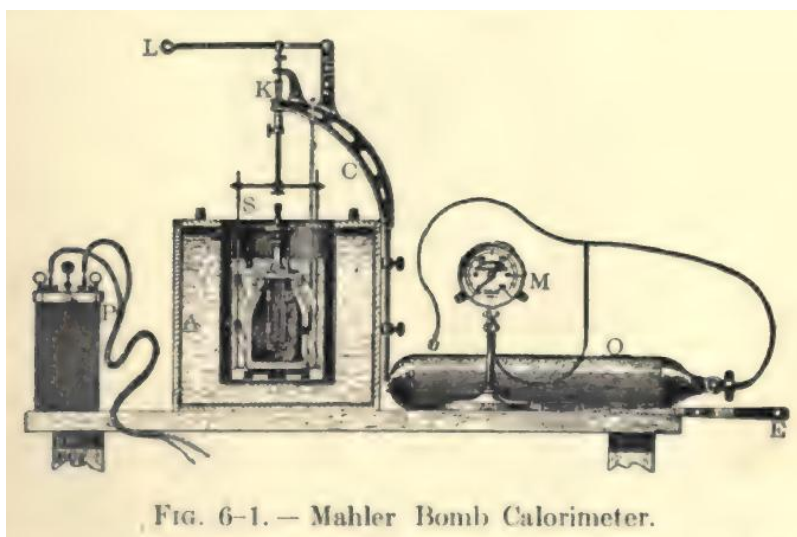
- Constantine Arcoumanis, *Internal Combustion Engines* (Academic Press 1988).
- Richard Stone, *Introduction to Internal Combustion Engines* (3d ed. 1999).
- A.J. Martyr & M.A. Plint, *Engine Testing: Theory and Practice* (3d ed. 2007).
- Günter P. Merker, Christian Schwarz & Rüdiger Teichmann, *Combustion Engines Development* (Springer 2012).
- M.K. Gajendra Babu & K.A. Subramanian, *Alternative Transportation Fuels: Utilisation in Combustion Engines* (CRC Press 2013).

[0096]. As found in *Internal Combustion Engines*, the term “apparatus” is used to describe a “**refrigerating apparatus**” for maintaining engine temperature. See Ex. 1023, p. 22.

[0097]. “Apparatus” is also used to describe an “**ignition apparatus**” when explaining the importance of adjusting ignition timing for every different fuel mixture and every different piston speed. See Ex. 1023, p. 91.

[0098]. “Apparatus is also used to describe “**apparatus L K S**” that includes multiple parts L, K, S (see below) to ensure the water is kept thoroughly

stirred. *See* Ex. 1023, p. 130. “The whole apparatus is carefully protected against radiation by an outer vessel.” *Id.*



[0099]. Apparatus is also used as a **“cleaning apparatus”** for cleaning equipment to remove/clean hydrocarbons from burning tar gases. *See* Ex. 1023, pp. 157-158.

[0100]. Apparatus is also used as a **“Loomis-Pettibone gas apparatus”** in Figure 7-20 (see below) that may be used for the making of producer gas alone, or for alternate manufacture of water gas and lean power gas. *See* Ex. 1023, p. 174.

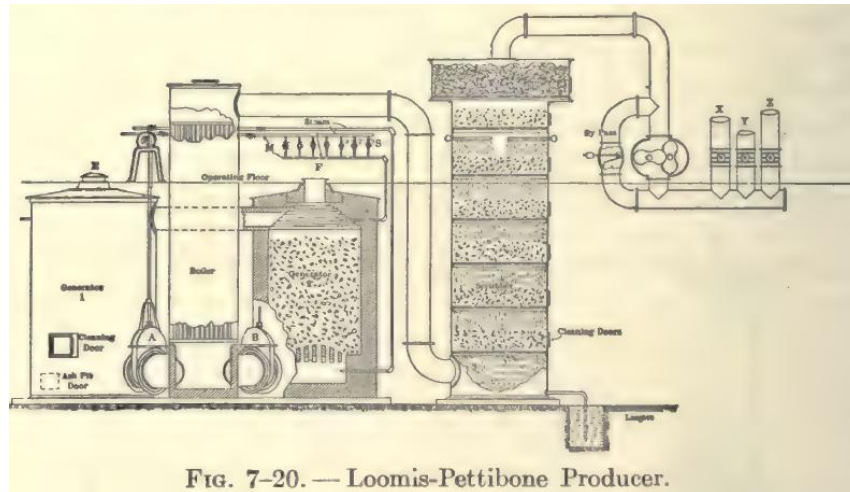


FIG. 7-20. — Loomis-Pettibone Producer.

[0101]. Apparatus is also used as an **“ignition apparatus”** for an Otto engine in Figure 11-20 (see below). See Ex. 1023, p. 252.

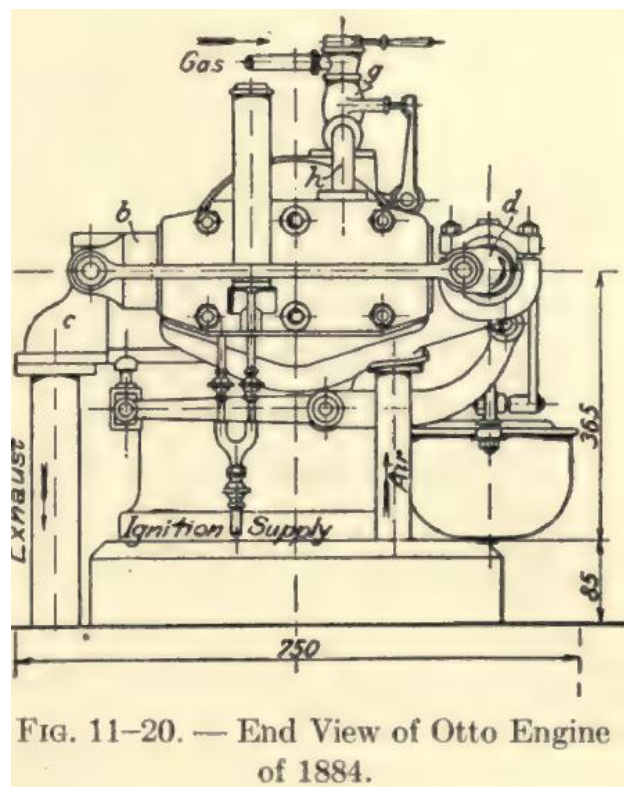
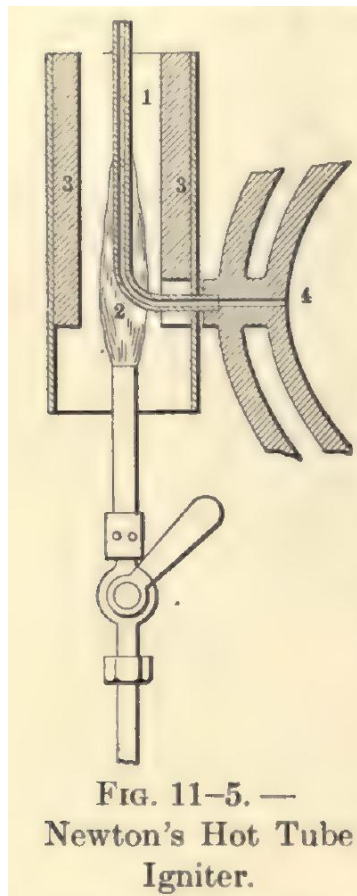
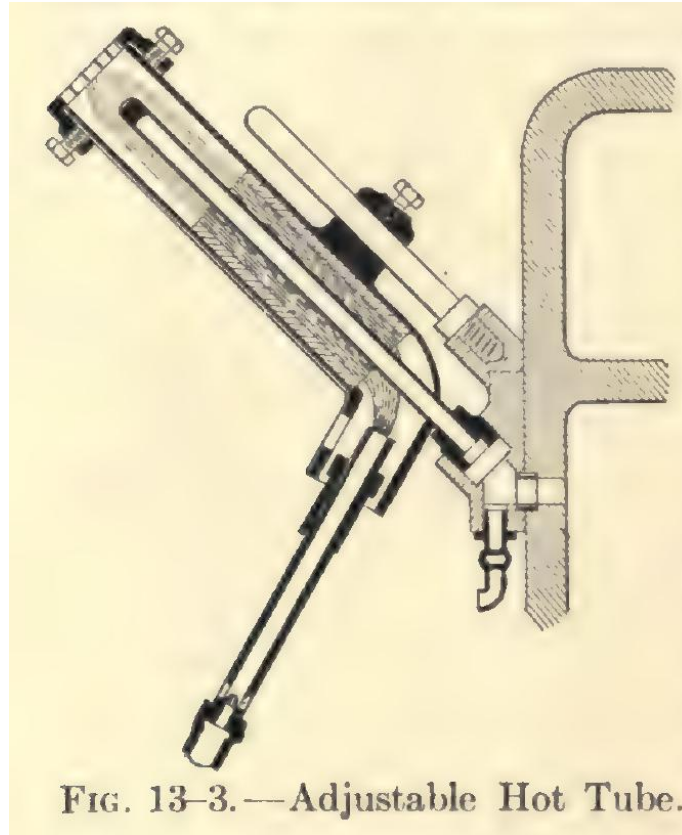


FIG. 11-20. — End View of Otto Engine of 1884.

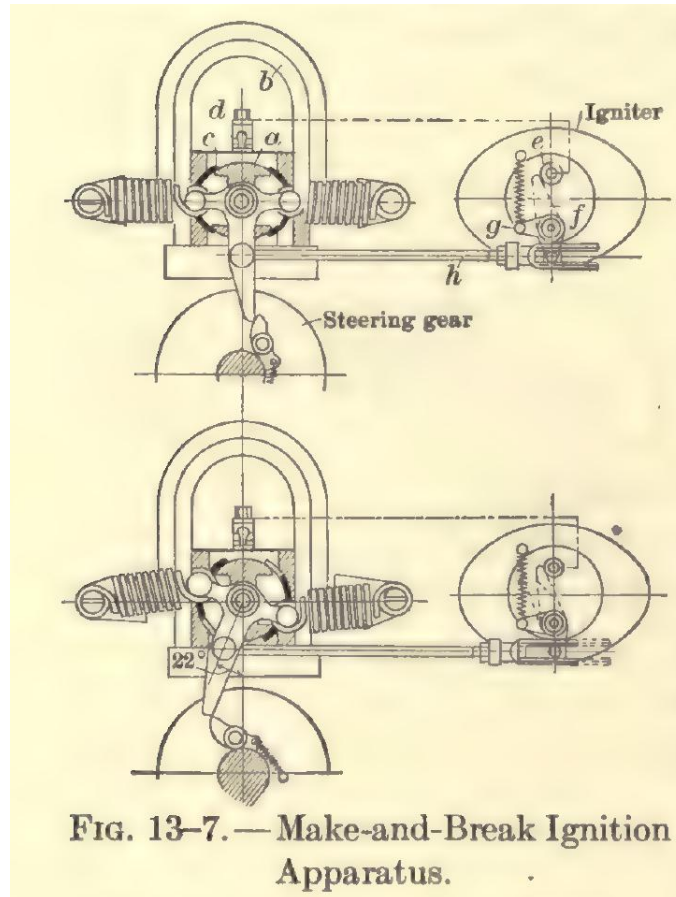
[0102]. Apparatus is also used as a **“suction gas apparatus”** for a marine propulsion system/engine. See Ex. 1023, pp. 366-367.

[0103]. Apparatus is also used as an **“ignition apparatus.”** Ex. 1011, p. 394. As shown in Figures 11-5 and 13-3 (see below), the ignition apparatus is a device that includes multiple components to provide ignition in the engine combustion chamber: “Ignition by Hot Tube. — The simplest form of the hot tube ignition apparatus has already been shown in Fig. 11-5 Chapter XI. It consists merely of a small tube 3 or 4 inches long, of steel, porcelain, or platinum. The open end of this tube is in communication with the combustion chamber, the other end is closed.” *Id.*





[0104]. As shown in Figure 13-7 (below), the whole system is referred to as a Make-and-Break Ignition Apparatus. Moreover, the figure further makes clear that “apparatus” includes different components to provide ignition and timing control of ignition. *Id.*



[0105]. Apparatus is also used as a **“starting apparatus.”** Ex. 1023, p.

428. Figure 13-38 (shown below) illustrates an **“Air-starting Apparatus.”** *Id.*

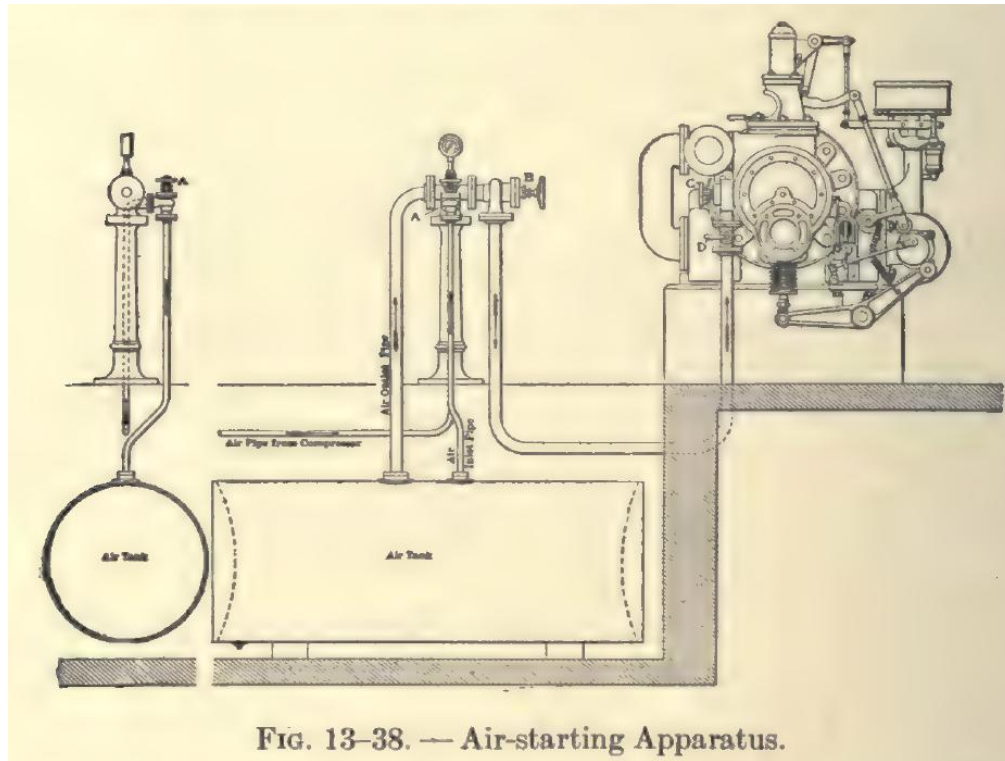


FIG. 13-38. — Air-starting Apparatus.

[0106]. The apparatus in Figure 13-38 includes multiple valves: gas (air) flow control valve A, gas shut-off (stop) valve B, and plug valve D that is inserted in the air pipe immediately ahead of the inlet valve. *Id.* A is the valve controlling the flow of air from a separately driven air compressor to the tank and B a similar valve in the pipe connecting the tank to the engine. *Id.* Both valves are mounted on one pillar, which also has screwed on top of it a gage indicating continuously the pressure in the tank. *Id.* Regulation of the supply of compressed air to the engine cylinder is affected by means of an automatic spring-loaded inlet poppet valve, the stem and disc of which may be released or held fast by screwing down or unscrewing the hand wheel C at the engine end of the air pipe. *Id.* A plug valve D is inserted in the air pipe immediately ahead of the inlet valve. *Id.* Before

starting the engine, the flywheel is turned into such a position that the crank is about 30 degrees above the inner dead center.” *Id.* The valve D is run by turning the handle D 90 degrees. *Id.*

[0107]. Apparatus is also used as a “**heating apparatus**” that consumes fuel. Ex. 1023, p. 482. A “dead weight testing apparatus.” Ex. 1023, p. 490. An “apparatus with which the electrical measurements are executed must be calibrated before and if possible [,] also after the test.” Ex. 1023, p. 520.

[0108]. Apparatus is also used as a “**cooling apparatus.**” Ex. 1023, p. 561.

[0109]. In *Internal Combustion Engines* the term “apparatus” is used as a “**flow apparatus**” for the system to measure and understand the reactions in the end gas of the combustion chamber of an engine. Ex. 1024, p. 106.

[0110]. *Internal Combustion Engines* also uses the term “apparatus” for the setup for photographing the combustion process. Ex. 1024, pp. 189-190. The setup is shown in Figure 1.19 (see below).

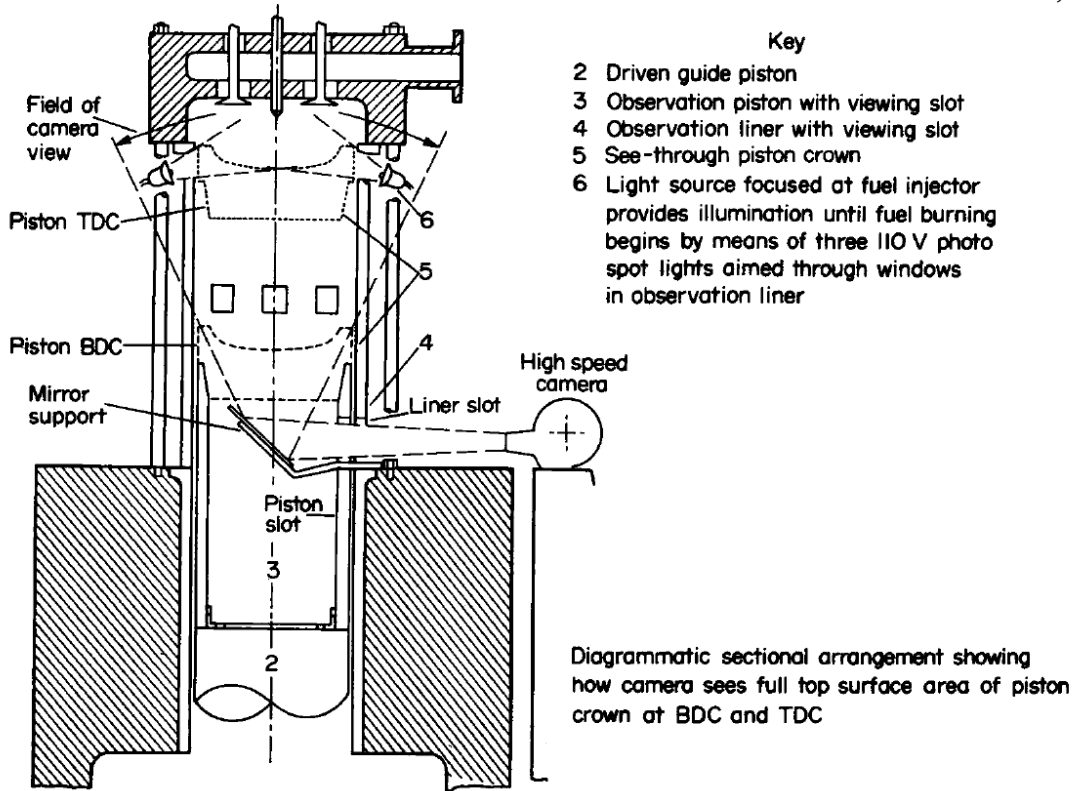


FIG. I.19. Diagrammatic arrangement for indirectly photographing combustion phenomena.

[0111]. Apparatus is also used as an “**Orsat Apparatus**” for the whole system to analyze exhaust gases from an engine. Ex. 1024, p. 190.

[0112]. *Internal Combustion Engines* also uses the term apparatus to describe an experimental setup built for a fuel droplet study. “Nishiwaki built an apparatus in which a droplet of fuel, suspended on a thin filament of silica, could suddenly be plunged into an environment of high temperature air.” Ex. 1017, p. 131. As shown in Figure 27 (see below), the term apparatus is also used to describe a setup that is used for flow visualization in engine design.

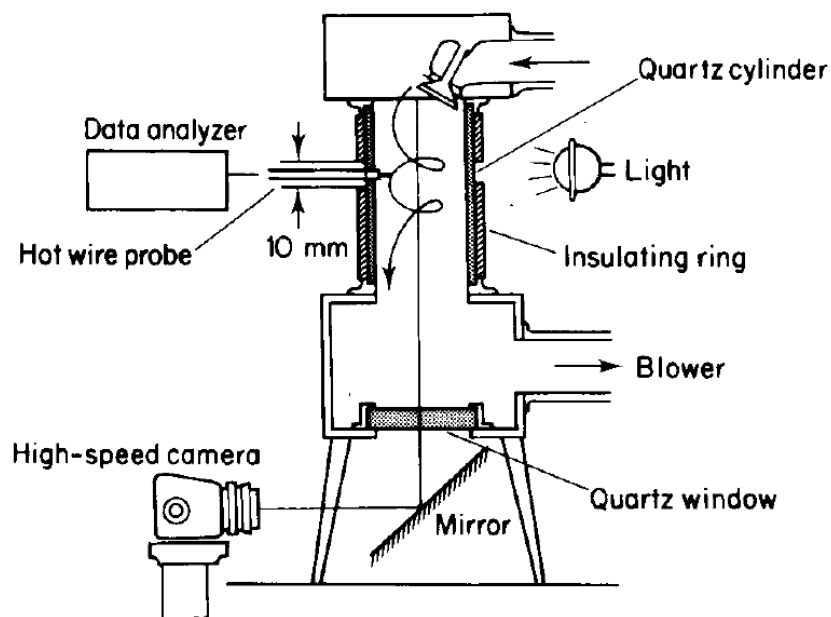
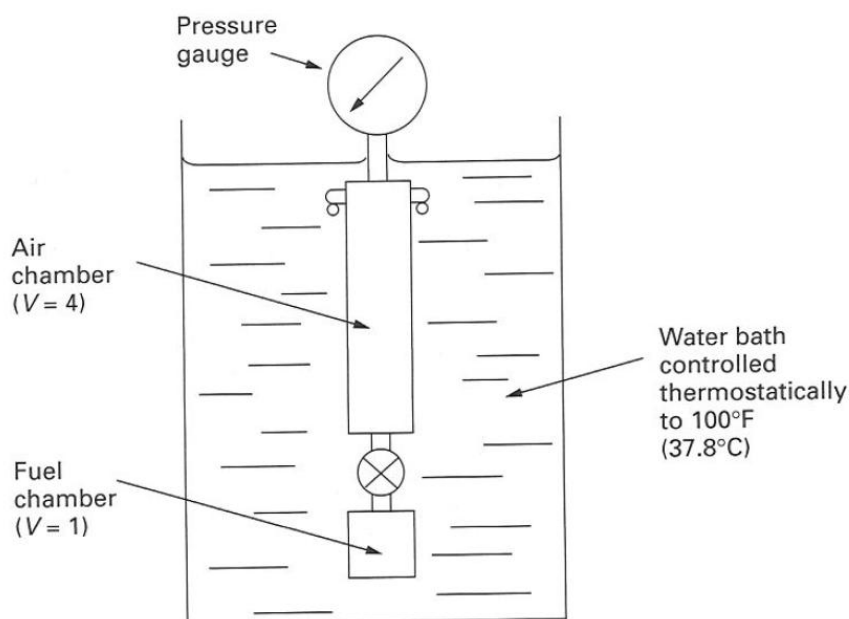


Figure 27 Experimental apparatus for gas flow study in cylinder by high speed photography and hot wire anemometry (Matsushita *et al.*, 1985).

[0113]. *Introduction to Internal Combustion Engines* uses the term apparatus for a “[r]eid vapor pressure apparatus.” Ex. 1022, p. 78. As shown in Figure 3.12 (see below), the setup comprises different chambers, a valve, and a pressure gauge. *Id.* The setup is designed to measure an engine fuel volatility property, known as reid vapor pressure (RVP), that affects engine start-ability during cold/winter seasons.

Figure 3.12
Reid vapour pressure
apparatus (from Goodger,
1975).



[0114]. *Introduction to Internal Combustion Engines*, further describes that “[t]he **Reid apparatus**...consists of a fuel chamber connected to an air chamber.” *Id.*

[0115]. In Chapter 16, of *Engine Testing Theory and Practice* the term “**emissions apparatus**” is used to refer to physical techniques and instruments that are required to measure engine exhaust emissions. Ex. 1012, p. 340.

[0116]. Chapter 18 uses the term “apparatus” as a variety of testing equipment such as brake tester, chassis dynamometers, and related equipment (e.g., safety, detectors, loading and emergency brakes) required for vehicle testing. *Id.*, 368-394. Chapter 18 discloses that “[i]n this chapter, an attempt has been made to survey the whole range of apparatus that may be described by the general heading

of rolling roads/chassis dynamometers, from the simple garage brake tester to complex and very costly climatic chambers and anechoic cells.” *Id.*

[0117]. An apparatus is also used as an “**electronic apparatus**” for the electronic equipment in the test room that generates heat and cause a moderate heating load. Ex. 1013, p. 94.

[0118]. *Combustion Engines Development* uses the term “apparatus” as a special “**test apparatus**” in describing Figure 3.14 (see below). Ex. 1021, p. 56. *Combustion Engines Development* discloses that “the test apparatus shown in Fig. 3.14 above (Glaser 1983) is employed, which makes it possible to subject an unstressed pressure sensor to a cyclical heating of similar size and frequency as arise in the engine. *Id.* The test apparatus includes a sensor, a radiant heat surface and a rotating diaphragm wheel. *Id.*

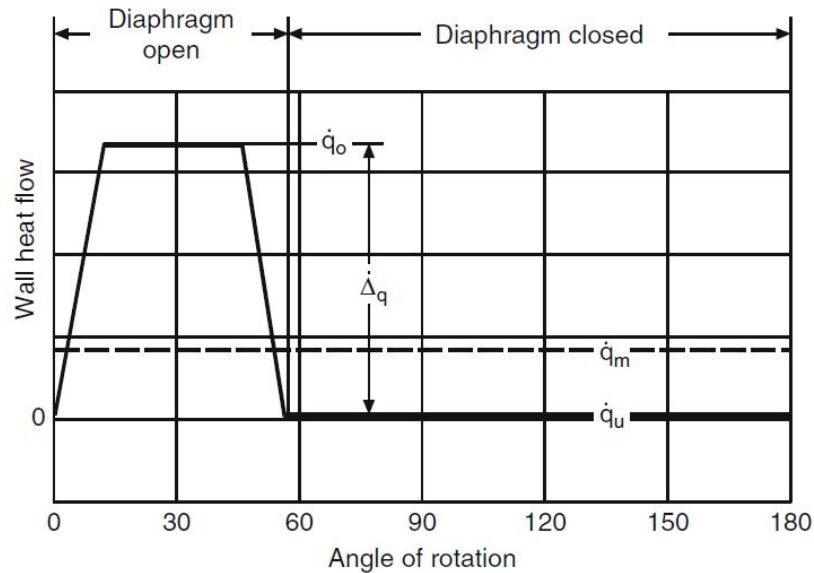
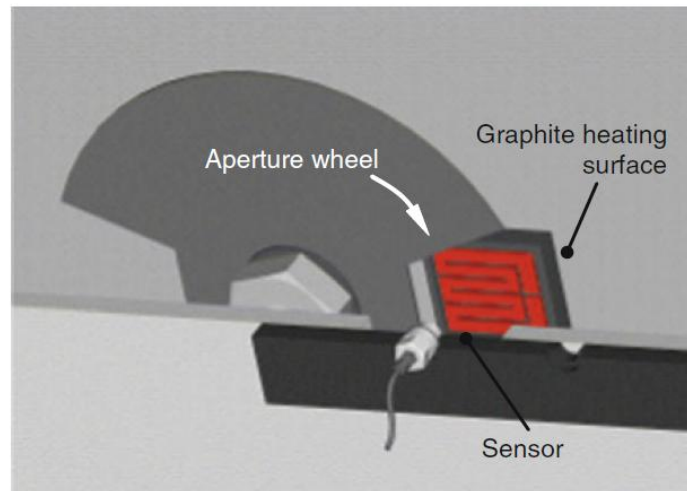


Fig. 3.14 Dynamic test apparatus to determine cyclical temperature drift

[0119]. *Combustion Engines Development* further discloses an “**exhaust apparatus**” for the exhaust system of an engine when describing the required changes for adding a supercharger to an engine. Ex. 1021, p. 318.

[0120]. An “apparatus” is also used as a “**guide apparatus**” for the setup to guide exhaust gas flow of an engine turbocharger to minimize flow dynamic losses. Ex. 1021, p. 324.

[0121]. *Combustion Engines Development* further discloses that

“[n]early all modern turbocharged car diesel engines have charge pressure control using an **adjustable guide apparatus**.” Ex. 1021, p. 327.

[0122]. *Alternative Transportation Fuels* uses the term “apparatus” for setups designed to measure properties of fuels for engines. For example, a Saybolt Viscometer, which consists of a standard cylindrical oil cup surrounded with a water bath with an immersion heater and a stirring device as shown in Figure 6.3.

Ex. 1018, p. 321.

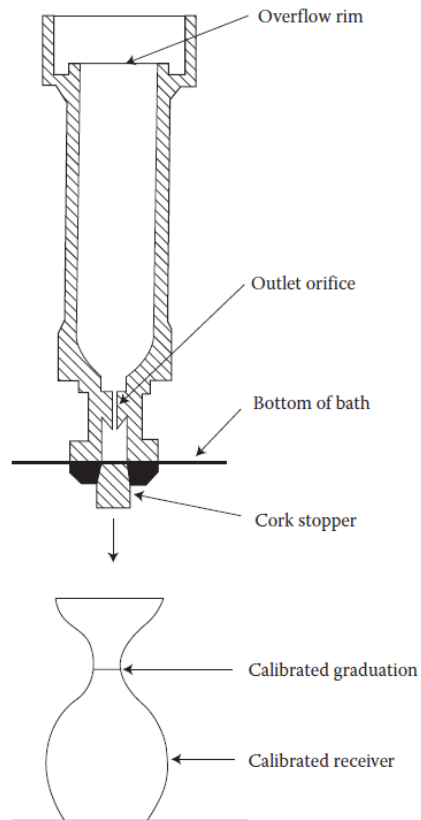


FIGURE 6.3
Saybolt viscometer.

[0123]. *Alternative Transportation Fuels* also discloses “[a]n Ables apparatus is used to determine the flash point that is shown in Figure 6.4.” Ex. 1018, pp. 323-324.

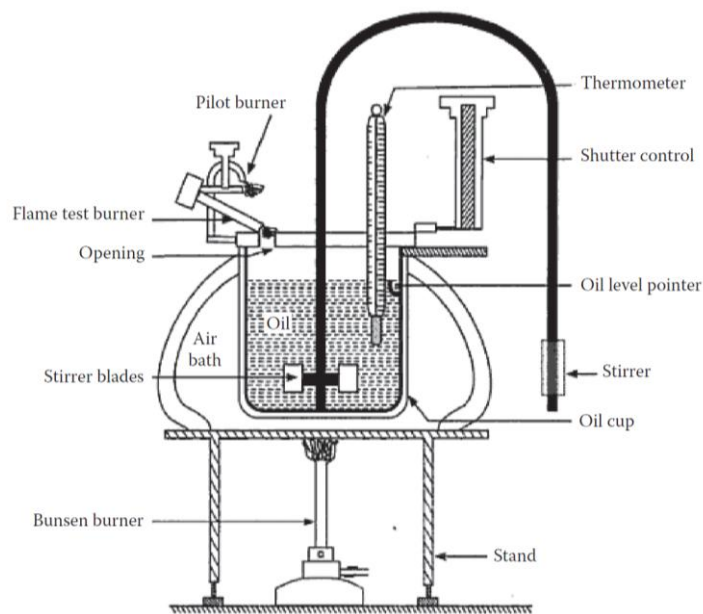


FIGURE 6.4
Ables apparatus.

[0124]. Moreover, *Alternative Transportation Fuels* discloses an apparatus comprising a cylindrical glass test for measuring cloud and pour points in Figure 6.5 (shown below). Ex. 1018, p. 325.

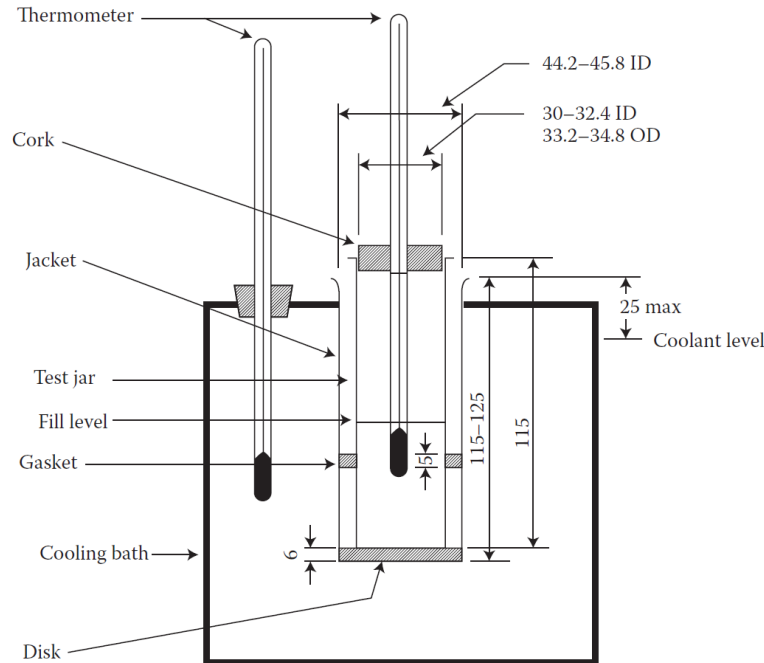


FIGURE 6.5
Apparatus for measuring cloud point and pour point.

B. The Claimed Terms “Prevent...Coupling” and “Permit...to Couple”

Claim 1 of the '895 Patent recites:

[A] fuel lockout apparatus coupled to the mechanical fuel valve and configured to: **prevent** the second fuel source from **coupling** to the second fuel line while the mechanical fuel valve is in the first position, and **permit** the second fuel source **to couple** to the second fuel line while the mechanical fuel valve is in the second position

[0125]. In looking to the specification, a POSA would have understood that the terms “prevent...coupling” and “permit...to couple” to refer to physically connecting or attaching two items. Ex. 1007, p. 14.

[0126]. As it was with the term “fuel lockout apparatus,” the specification of the ’895 Patent is the best guide for ascertaining what a POSA would have understood the terms “prevent[s]...coupling” and “permit...to couple” to mean.

1. “Prevent...Coupling” and “Permit...Coupling” as Recited in the Specification.

[0127]. The specification of the ’895 Patent discloses only one way in which the fuel lockout apparatus “prevent[s]...coupling” of the second fuel source to the second fuel line: the “flange” (item 61) of the fuel lockout apparatus “block[s] fuel inlet 59 to prevent coupling the first end 50a and second end 50b of the quick-disconnect hose coupling together.” Ex.1001, 8:12–16; *see also id.* 6:4–16, 6:29–50. FIGS. 2 and 4A illustrate this:

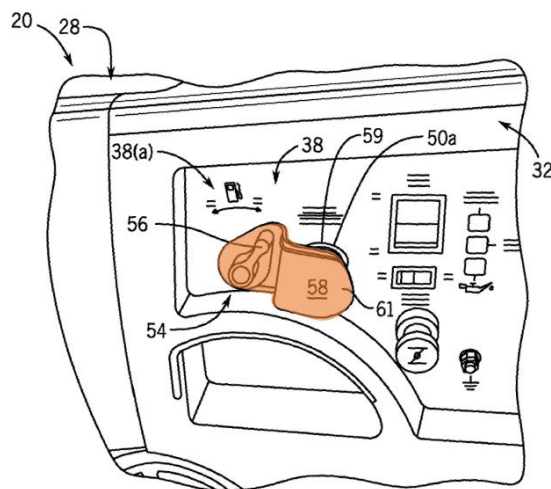


FIG. 2

Ex. 1001, FIG. 2 (Emphasis Added).

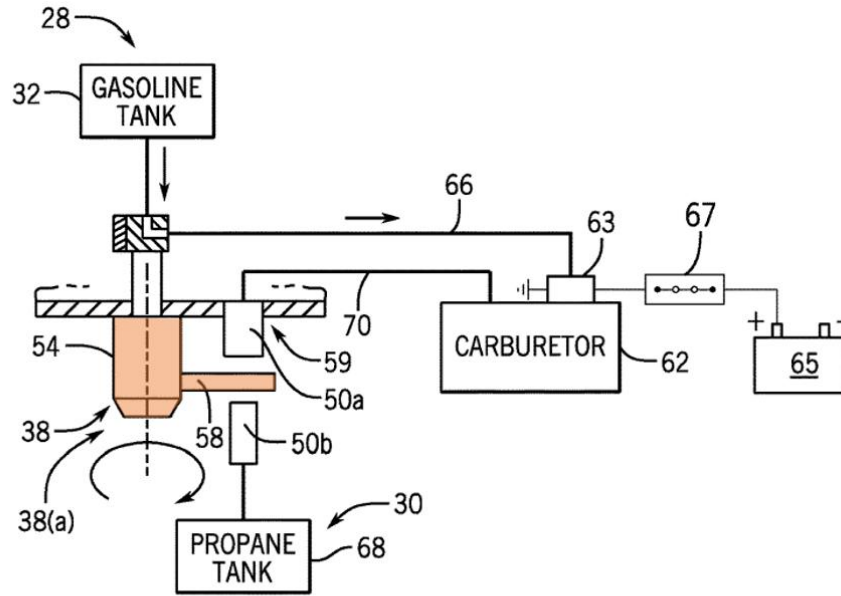


FIG. 4A

Ex. 1001, FIG. 4A (Emphasis Added).

[0128]. ‘The specification of the ’895 Patent also discloses only one way in which the fuel lockout apparatus “permits” the second fuel source “to couple” to the second fuel line: “fuel lockout apparatus 58 unblock[s] fuel inlet 59 to permit attaching first end 50a and second end 50b together.” Ex. 1001, 8:16–19; Figs. 3, 4B; *see also id.* 6:51–60, 8:57–67. FIGS. 3 and 4B illustrate this:

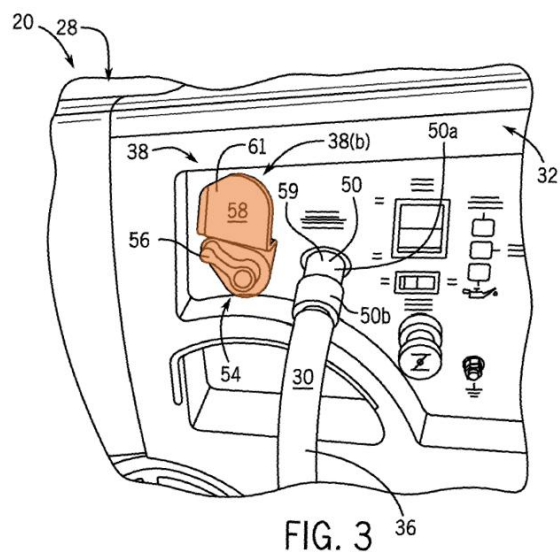


FIG. 3

Ex. 1001, FIG. 3 (Emphasis Added).

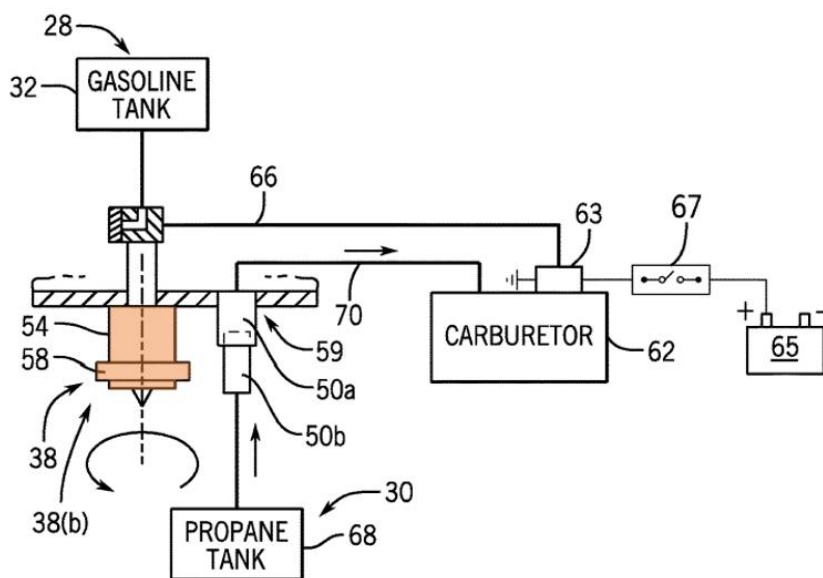


FIG. 4B

Ex. 1001, FIG. 4B (Emphasis Added)

[0129]. The construction of “prevent...coupling” and “permit...to couple” to mean “prevent...attaching” and “permit...to attach” thus finds ample support in the specification of the ’895 Patent.

[0130]. Moreover, during prosecution of the parent U.S. Patent No. 10,221,780 (the “’780 Patent”), the Examiner stated that a dependent claim would be allowable if presented as an independent claim based on the understanding that the “fuel lockout apparatus **prevent[s] the second fuel source from coupling to the second fuel line...mean[ing] that not only are the two not in fluid communication but they are not physically connected in any manner** (Emphasis Added).” Ex. 1008, p.160. In his reasoning, the Examiner stated that the prior art Champion Manual “discloses a dual fuel system as discussed...but its lockout switch **does not prevent the hose of the propane tank from even coupling to the engine fuel system lines** (Emphasis Added).” *Id.* The Examiner thus interpreted the term “coupling” to require not only “fluid communication,” but “physical[] connect[ion].”

[0131]. Therefore, a POSA would have understood the terms “prevent...coupling” and “permit...to couple” to mean “prevent...attaching” and “permit...to attach,” respectively. This construction finds ample support in the specification of the ’780 Patent.

i. Use of the Terms “coupled,” and “coupling” in Internal Combustion Engine and Mechanical Engineering Literature.

[0132]. The construction of “**coupled**” and “**coupling**” as “**to attach**” is aligned with how the terms have been used in internal combustion engine (ICE) literature. Some examples of using the terms “**coupled**” and “**coupling**” as “**attach**” include “**coupled mechanically**” and “**coupled hydraulically**” or “**fluid coupled.**”

[0133]. In forming my opinion, I have reviewed the following ICE literature:

- John B. Heywood, *Internal Combustion Engine Fundamentals* (McGraw-Hill 1988).
- Richard Stone, *Introduction to Internal Combustion Engines* (3d ed. 1999).
- Constantine Arcoumanis, *Internal Combustion Engines* (Academic Press 1988).
- A.J. Martyr & M.A. Plint, *Engine Testing: Theory and Practice* (3d ed. 2007).
- Lino Guzzella & Christopher H. Onder, *Introduction to Modeling and Control of Internal Combustion Engine Systems* (2010).

- Inst. of Mech. Eng'rs, *Internal Combustion Engines: Performance, Fuel Economy and Emissions* (2013).
- Carsten Baumgarten, *Mixture Formation in Internal Combustion Engines* (2006).
- Richard van Basshuysen & Fred Schäfer, *Internal Combustion Engine Handbook* (SAE Int'l 2004).
- Horst Bauer, *Bosch Gasoline-Engine Management: Basics and Components* (2001).
- Hua Zhao, *HCCI and CAI Engines for the Automotive Industry* (CRC Press 2006).
- Günter P. Merker, Christian Schwarz & Rüdiger Teichmann, *Combustion Engines Development* (2012).
- Eugene A. Avallone, Theodore Baumeister III & Ali M. Sadegh, *Marks' Standard Handbook for Mechanical Engineers* (11th ed. 2007).
- K.K. Ramalingam, *Handbook of Mechanical Engineering Terms* (2d ed. 2009).
- Thomas G. Beckwith, N. Lewis Buck & Roy D. Marangoni, *Mechanical Measurements* (3d ed. 1982).
- Myer Kutz, *Mechanical Engineers' Handbook* (2d ed. 1986).

- A. Parrish, *Mechanical Engineer's Reference Book* (Butterworth & Co. Publ'rs 1973).
- Rowland S. Benson & N.D. Whitehouse, *Internal Combustion Engines* (Pergamon Press 1979).
- Alexander A. Stotsky, *Automotive Engine Control, Estimation, Statistical Detection* (Springer 2009).

[0134]. Examples of “**coupled mechanically**” and “**coupled hydraulically**” or “**fluid coupled.**” are provided below.

i.-a. Coupled “Mechanically”

[0135]. **Mechanical coupling** is referred to rigid coupling including but not limited to couplings via gears, shafts, flanges, and stiff rubbers. In this case, movement of an object is linked/coupled to the movement of another object. Some examples are included in the followings.

[0136]. *Bosch Gasoline-engine Management Basics and Components* discloses that “[i]n conventional IC engines, camshaft and crankshaft are **mechanically coupled** to each other through toothed belt or chain. The valve opening period and lift are not affected by camshaft phase adjustment, which means that ‘intake opens’ and ‘intake closes’ remain invariably coupled with each other.” See Ex. 1011, p. 22.

[0137]. *Engine Testing: Theory and Practice*, mentions various forms of **mechanical couplings** such as **shaft coupling**, **flange coupling**, **stiff rubber coupling** to connect an engine to a dynamometer. See Ex. 1012, pp. 170-196.

[0138]. *Mechanical Engineer's Reference Book* explains different types of couplings including **mechanical couplings** with gears, shafts, rubbers, flanges, etc. It classifies couplings to “rigid” and “flexible” or “soft” types, among others. Ex. 1019, pp. 13-2, 13-3.

[0139]. *Mixture Formation in Internal Combustion Engines* discloses that “[t]he second main group of high-pressure injection systems are those in which the generation of injection pressure and the injection itself occur synchronously. These systems are driven by a camshaft, which is **mechanically coupled** with the engine.” See Ex. 1020, p. 34.

[0140]. *Combustion Engines Development* discloses that “in the case of mechanical supercharging, a charging aggregate mounted on the engine is usually powered by a belt or gearwheel drive, which is why the engine and compressor speeds are usually rigidly coupled.” See Ex. 1021, p. 313.

[0141]. *Engine Testing: Theory and Practice* also discloses that a “[m]anifold is coupled to a flexible stainless steel pipe, of fairly large diameter to minimize pressure waves, and led by way of a back pressure regulating valve to a pipe system suspended from the cell roof.” See Ex. 1021, p. 123.

[0142]. *Introduction to Internal Combustion Engines*, discloses that

“[t]he injection pump is **directly coupled** to the engine (half engine speed for a four-stroke engine) and [that] the pump controls the quantity and timing of the fuel injection (figure 5.12).” Ex. 1022, p. 232

i.-b. Coupled “Hydraulically” or “by Fluid”

[0143]. Hydraulic coupling or coupling via fluids is referred to coupling that is established based on fluid connection between two channels, sources, or objects. The fluid can be oil, coolant, or liquid fuel, but it is not limited to these fluids. The fluid channels will be connected/coupled via fluid pressure and it will include both positive pressures and negative pressures (e.g., vacuum lines). Examples of how fluid couplings are mentioned in the literature are provided below:

[0144]. Handbook of Mechanical Engineering Terms discloses “[a] liquid coupling used to transmit the engine effort (torque) to a clutch and transmission. This coupling is always a major part of the engine flywheel.” See Ex. 1025, p. 314.

[0145]. Mechanical Engineer’s Reference Book discloses “Hydrokinetic or Fluid Couplings for transmitting power due to the kinetic energy transfer in a fluid filling operation.” See Ex. 1019, pp. 13-3.

[0146]. Mixture Formation in Internal Combustion Engines discloses a “assembly consist[ing] of a piezo stack, a hydraulic coupling device, a control valve, and the nozzle module. The hydraulic coupling device amplifies the elongation of the piezo stack and transfers it to the control valve.” See Ex. 1020, p. 234.

[0147]. Combustion Engines Development discloses that a “flow-type coupling of both sub-components results in a significantly delayed torque build-up compared with the steady-state behavior of the engine.” See Ex. 1021, p. 330.

VII. THE CHALLENGED CLAIMS ARE UNPATENTABLE BASED ON THE PRIOR ART

A. Ground 1: The Combination of DuroMax and Elsdon Renders Obvious Claims 1–4, 6–10, and 12–13.

1. Independent Claim 1

a. Element [1.0] “A mechanical fuel lockout switch for a dual fuel engine comprising:”

[0148]. To the extent the preamble is limiting, the combination of DuroMax and Elsdon discloses element 1.0. DuroMax discloses a dual fuel generator in which either LPG or gasoline may be selected for operation of the generator. Ex.1010, pp.11–12. DuroMax also discloses a mechanical fuel valve coupled to the internal combustion engine. *Id.*

[0149]. Elsdon discloses a fuel conduit coupler shield 14 and cap 16 that when closed prevents connection of a fuel source. Ex.1012, 3:3–14. As

discussed in §VII.A.1.a.i-ii, *infra*, a POSA would have understood it to be obvious to combine the Elsdon fuel conduit coupler cap with the mechanical fuel valve of DuroMax to provide a mechanical fuel lockout switch and prevent unsafe operating conditions, such as where both fuels are simultaneously delivered to the generator engine.

i. Motivation to Combine DuroMax and Elson

[0150]. DuroMax discloses a dual fuel generator that is configured to operate on both LPG and gasoline fuel sources. Ex. 1010, pp.11–12.

To start your generator with gasoline, perform the following steps:

3 Turn the gasoline fuel valve to the "ON" position

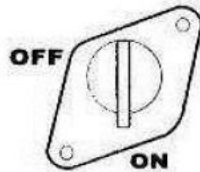


Figure 6 - fuel valve in the "on" position

Ex.1010, p.11.

To start your generator with LPG, perform the following steps:

3. Turn the gasoline fuel valve to the "OFF" position (see figure 6).

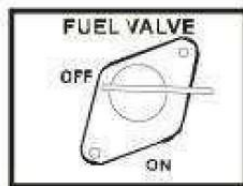


Figure A - Fuel Valve in the "OFF" position

Ex.1010, p.12.

[0151]. DuroMax discloses that the generator includes a gasoline fuel tank with a mechanical fuel valve that stops gasoline fuel from exiting the gasoline

tank and being delivered to the generator engine when run on LPG fuel. Ex. 1010, p.12.

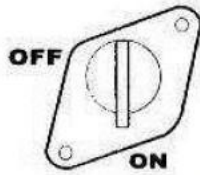


Figure 6 - fuel valve in the "on" position

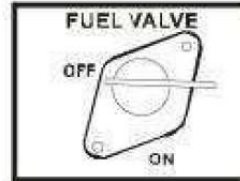


Figure A - Fuel Valve in the "OFF" position

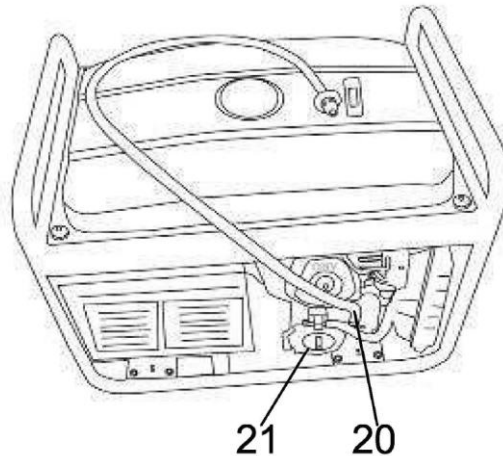
Ex. 1010, pp.11,12.



Figure 19 –Removing the Fuel Filter Cup

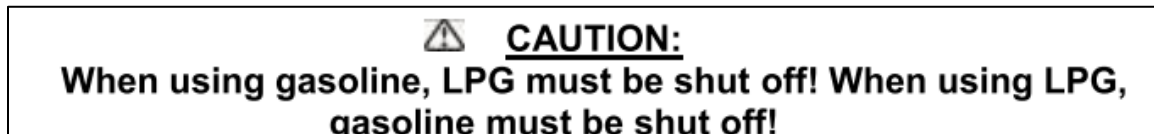
Ex. 1010, p.20 (Annotated).

[0152]. DuroMax also discloses an onboard LPG tank connector which couples to an LPG hose of an external LPG tank for delivering LPG fuel to the generator engine when run on LPG fuel. Ex.1010, p.7.



20. Hose connector- Connect liquid propane gas to generator.
Ex. 1010, pp.7-8.

[0153]. A POSA would understand that while DuroMax can run on either gasoline fuel or LPG fuel, DuroMax is not configured to run on both fuel sources at the same time. For example, DuroMax provides the following warning label:



Ex.1010, p.11.

[0154]. This is consistent with the background section of the '895 Patent, which discloses that prior art dual fuel engines “can experience overly rich air-fuel ratio when both fuels are simultaneously engaged” which can “make the engine hard to start or lead to unstable operating conditions.” Ex. 1001, 1:64–2:4. I have been informed that Courts have routinely held that disclosures in the background section of the Patent specification can be relied upon as admissions of

known art. As such, as POSA would have known that an overly rich air-fuel ratio when both fuels are simultaneously engaged would make the engine hard to start or lead to an unstable operating condition. *See Qualcomm Inc. v. Apple Inc.*, 24 F.4th 1367, 1375 (Fed. Cir. 2022) (“‘[I]t is appropriate to rely on admissions in a patent’s specification when assessing whether that patent’s claims would have been obvious’ in an *inter partes* review proceeding.”); *see also* USPTO, Updated Guidance on the Treatment of Statements of the Applicant in the Challenged Patent in Inter Partes Reviews under §311, at 4 (June 9, 2022).

[0155]. Elsdon discloses a cap and shield assembly for covering a fluid conduit (i.e., a fuel line). Ex.1012, 3:3–14. Elsdon discloses that by rotating cap 16 over conduit coupler 12, cap 16 prohibits access to the coupler interface, thereby preventing connecting of a hose with the coupler interface. Ex.1012, 3:3–14, 5:1–10.

[0156]. Elsdon explicitly recognizes the importance of properly sequencing the connection of fuel sources with the opening of associated valves. For example, Elsdon notes that it may be important to ensure the closing or opening of fuel valves before permitting coupling or uncoupling to the connection interface. Ex. 1012, 1:23–40. Elsdon discloses that its cap and shield may be utilized in such sequenced interconnected valve and coupler arrangements. Ex. 1012, 4:44–53.

[0157]. A POSA would be motivated to implement the fuel conduit coupler cap assembly of Elsdon to selectively cover and uncover the LPG fuel conduit coupler of DuroMax. Specifically, a POSA would have been motivated to connect the Elsdon fuel conduit coupler cap to the mechanical fuel valve of DuroMax to restrict access to the LPG hose connector interface of DuroMax when the DuroMax generator is running gasoline fuel.

[0158]. A POSA would have understood that by implementing the Elsdon fuel conduit coupler cap assembly in this way, one could link the opening and closing of the DuroMax mechanical fuel valve with the covering and uncovering of the LPG fuel conduit coupler. A POSA would have understood such an arrangement to prevent simultaneous use of LPG and gasoline, which was a known problem with generators such as DuroMax. Ex.1010, p.11; Ex. 1001, 1:43–55.

**ii. Reasonable Expectation of Success in
Combining DuroMax and Elson**

[0159]. A POSA would have had a reasonable expectation of success in implementing the fuel conduit coupler cap of Elsdon onto the LPG fuel conduit coupler of DuroMax. Elsdon emphasizes that its cap assembly may be “retrofit” to cover existing fuel couplers on “construction equipment” such as a generator. Ex. 1012, 2:27–32; 5:11–14. Elsdon utilizes a simple connection arrangement, in

which cap 16 rotates around the axis of the shaft 18. See Ex. 1012, FIGS. 1, 3

below (annotated).

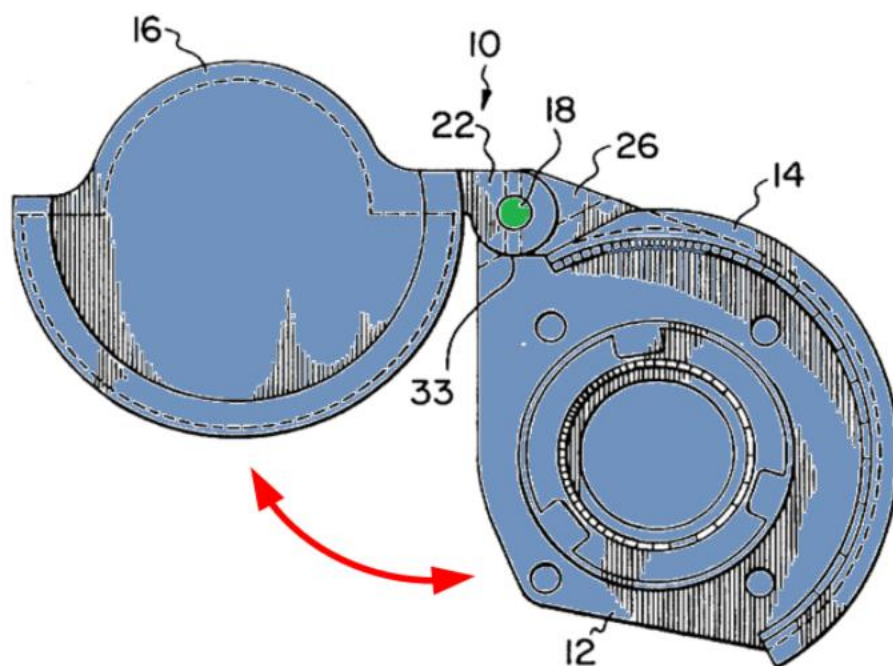


FIG. 1

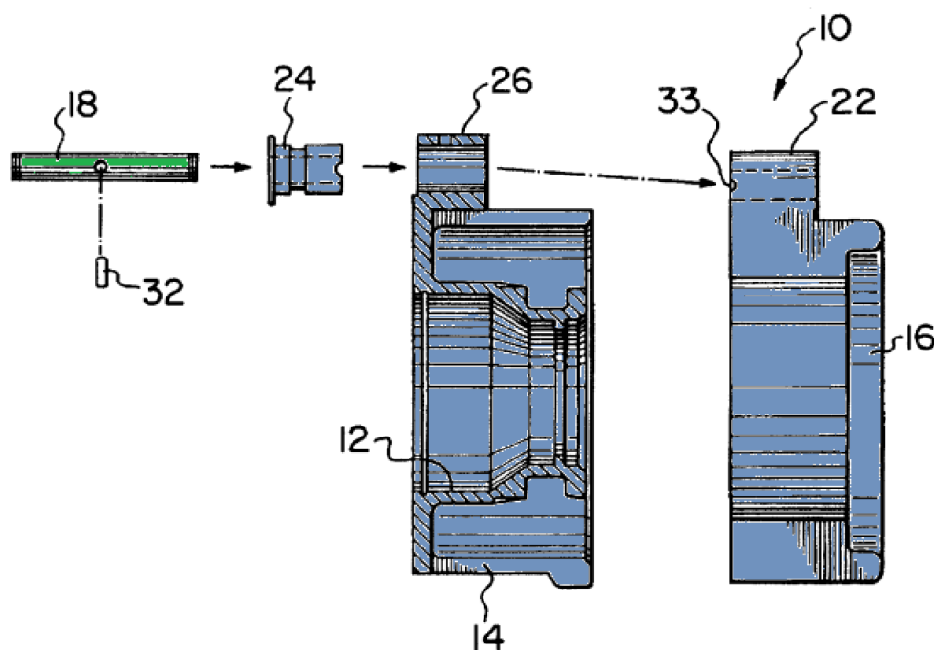


FIG. 3

[0160]. A POSA would have understood that the fuel valve of DuroMax is a simple mechanical fuel valve utilizing a valve handle that rotates a shaft (e.g., valve stem) connected to a stop inside of the valve body for preventing fuel flow. Ex. 1010, pp.11, 12.

[0161]. A POSA would have understood that the valve handle and shaft of the DuroMax fuel valve could be readily connected to cap 16 of Elsdon such that the DuroMax valve handle and shaft rotate together with Elsdon cap 16.

[0162]. A POSA would have further understood that the fuel valve and LPG fuel conduit coupler of DuroMax could easily be moved to different positions on the generator such that the two components are located immediately next to each other. *see also* Ex. 1015, 00:15:39–00:16:20 (discussing how the position of the LPG inlet connector on a portable generator can be easily moved around the generator). In that case, cap 16 of Elsdon would rotate with the valve handle of the DuroMax fuel valve to cover the LPG fuel conduit coupler when the DuroMax fuel valve is open, and could rotate to permit access to the LPG fuel conduit coupler when the DuroMax fuel valve is closed.

[0163]. For example, as disclosed in the YouTube video (Ex. 1015), it was well known in the art that the LPG inlet connector on a portable generator can be easily moved around the generator. Ex. 1015, 15:39-16:20. A POSA would understand that the propane inlet port can be installed on any side of the generator

accessible to the operator (e.g., the same side as a gasoline valve), so long as the propane inlet port does not interact with hot exhaust gases.

[0164]. Accordingly, a POSA would have understood that the cap 16 of Elsdon can rotate with the valve handle of the DuroMax fuel valve to cover the LPG fuel conduit coupler when the DuroMax mechanical fuel valve is open, and can rotate to permit access to the LPG fuel conduit coupler when the DuroMax mechanical fuel valve is closed.

- b. Element [1.1] “a mechanical fuel valve actuatable between a first position and a second position to selectively control fuel flow to the dual fuel engine from a first fuel source through a first fuel line and a second fuel source through a second fuel line”**

[0165]. DuroMax discloses a mechanical fuel valve coupled to the internal combustion engine. Ex. 1010, pp.11–12.

To start your generator with gasoline, perform the following steps:

- 3 Turn the gasoline fuel valve to the "ON" position**

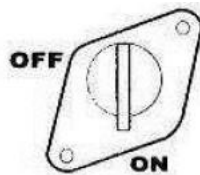


Figure 6 - fuel valve in the "on" position

Ex. 1010, p.11.

To start your generator with LPG, perform the following steps:

3. Turn the gasoline fuel valve to the "OFF" position (see *figure 6*).

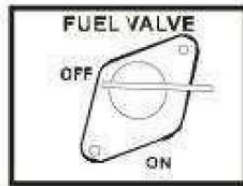
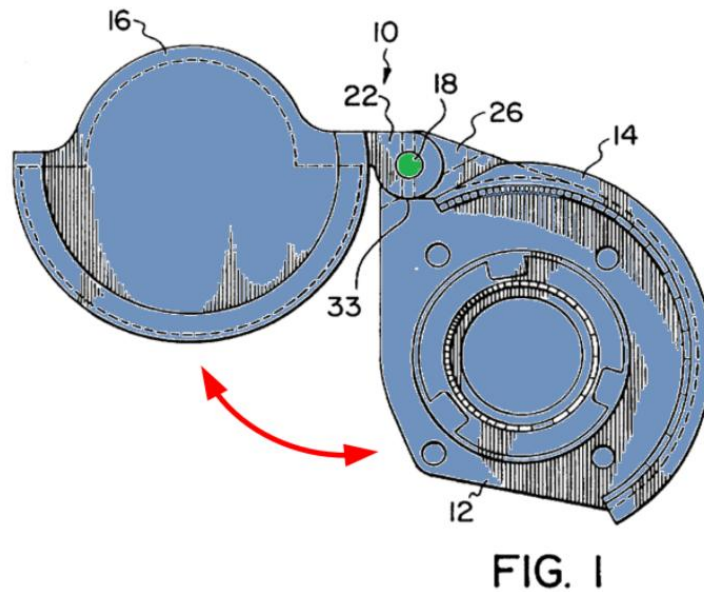


Figure A - Fuel Valve in the "OFF" position

Ex. 1010, p.12.

[0166]. Elsdon discloses a fuel conduit coupler shield 14 and cap 16 that when closed prevents connection of a fuel source. Ex. 1012, 3:3–14. Elsdon discloses that by rotating cap 16 over conduit coupler 12, cap 16 prohibits access to the coupler interface, thereby preventing connecting of a hose with the coupler interface. *Id.*, 3:3–14, 5:1–10.



Ex. 1012, FIG. 1 (annotated).

[0167]. It would have been obvious to a POSA to combine the Elsdon fuel conduit coupler cap with the gasoline fuel valve of DuroMax to provide a

mechanical fuel valve that both controls the flow of gasoline from the tank through the gasoline line (as disclosed by DuroMax) and simultaneously rotates to block and unblock the LPG inlet (as disclosed by Elsdon). By blocking and unblocking the LPG inlet, this combined apparatus would selectively control the flow of LPG through the LPG fuel line. This combination would appear and function the same way as Figures 2–4B of the '895 Patent.

- c. **Element [1.2] “the mechanical fuel valve configured to: allow communication between the first fuel source and the dual fuel engine and prevent communication between the second fuel source and the dual fuel engine while in the first position, and prevent communication between the first fuel source and the dual fuel engine while in the second position”**

[0168]. The DuroMax mechanical fuel valve rotates between a first position in which the valve is opened (communicating the gasoline fuel source to the dual fuel engine) and a second position in which the valve is closed (interrupting communication of the gasoline fuel source to the dual fuel engine). It would have been obvious to connect the valve handle and shaft of the DuroMax fuel valve to cap 16 of Elsdon to prevent the simultaneous flow of gasoline and LPG fuel to the dual fuel engine. *See*, §§VII.A.1.a.i–ii, above.

[0169]. Specifically, it would have been obvious to connect these components so that cap 16 covers the LPG fuel conduit coupler when the mechanical fuel valve is in the open (first) position (preventing communication

between the LPG fuel source and the dual fuel engine) and to uncover the LPG fuel conduit coupler (communicating the second fuel source to the dual fuel engine) when the mechanical fuel valve is in the closed (second) position. *See*, §§VII.A.1.a.i-ii, above.

d. Element [1.3] “and a fuel lockout apparatus coupled to the mechanical fuel valve;”

[0170]. The term “fuel lockout apparatus” is properly construed as a means plus function term covering items 58, 61 in Figs. 2, 3, 4A, 4B, as described at Ex. 1001, 5:56–6:16; 6:29–50; 6:61–7:36; 8:6–19; 9:1–16, and equivalents thereof. *See*, §VI.A.

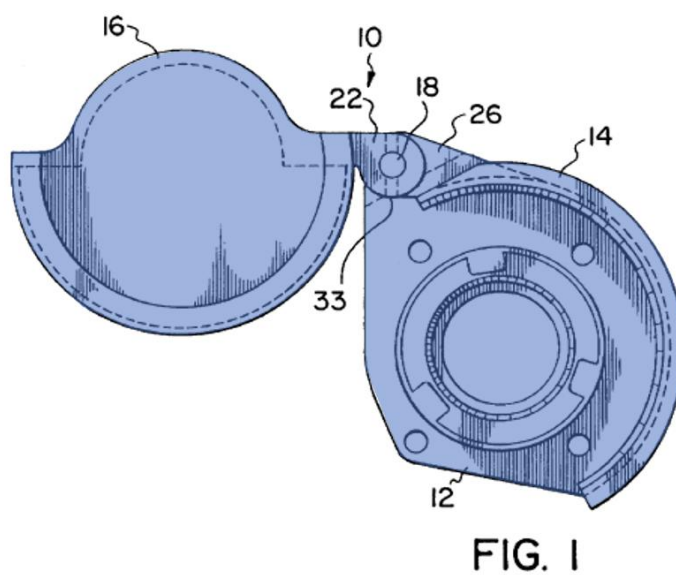
[0171]. As noted above, it would have been obvious to have connected the valve handle and shaft of the DuroMax fuel valve to cap 16 of Elsdon, which would have resulted in a flange that is rigidly coupled to a fuel valve handle, with the flange extending radially from the fuel valve handle so that the flange rotates with the fuel valve handle and rotates transversely over the fuel inlet for LPG between a first position in which the flange blocks access to the fuel inlet for the LPG when the fuel valve handle is in position to allow gasoline to run the engine, and between a second position in which the flange does not block the fuel inlet for the LPG when the fuel valve handle is in position to restrict gasoline from running the engine. *See* §§VII.A.1.a.i-ii, above. Thus, the combination of DuroMax and Elston teaches a “fuel lockout apparatus coupled to [a] mechanical fuel valve.”

- e. **Element [1.4] “and configured to: prevent the second fuel source from coupling to the second fuel line while the mechanical fuel valve is in the first position, and permit the second fuel source to couple to the second fuel line while the mechanical fuel valve is in the second position.”**

[0172]. It would have been obvious to have connected the valve handle and shaft of the DuroMax fuel valve to cap 16 of Elsdon so that cap 16 covers the LPG fuel conduit coupler when the mechanical fuel valve is in the open (first) position and to uncover the LPG fuel conduit coupler when the mechanical fuel valve is in the closed (second) position. *See*, §VII.A.1.c. When covering the LPG fuel conduit coupler, cap 16 would prevent the LPG hose from coupling to the LPG fuel conduit connector. When uncovering the LPG fuel conduit connector, cap 16 would permit the LPG hose to couple with the LPG fuel conduit connector.

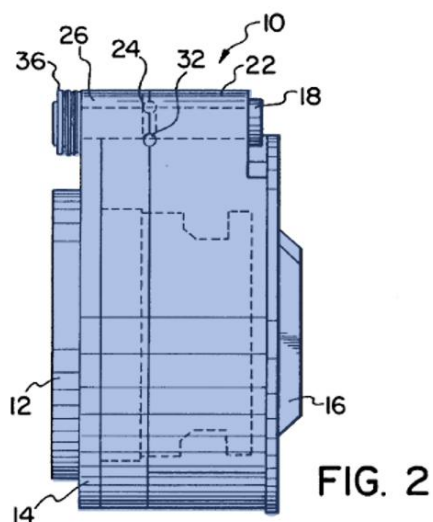
2. **Claim 2: “The mechanical fuel lockout switch of claim 1 wherein the fuel lockout apparatus prevents actuation of the mechanical fuel valve to the first position when the second fuel source is in communication with the dual fuel engine.”**

[0173]. Claim 2 depends from claim 1. The combination of DuroMax and Elsdon teaches claim 2. The combination of DuroMax and Elsdon discloses a fuel lockout apparatus coupled to a mechanical fuel valve. *See*, §VII.A.1.d. Elsdon discloses a fuel lockout apparatus comprising a cap and shield. *Id.* As seen in FIG. 1 (below), when the cap is in the open position the second fuel source (LPG) may be communicated to the internal combustion engine.



Ex. 1012, FIG. 1 (Annotated).

[0174]. As shown in FIG. 2 (below), when the cap is in the closed position, the second fuel source (LPG) is prevented from being communicated with the internal combustion engine.



Ex. 1012, FIG. 2 (Annotated).

[0175]. As described in §§VII.A.1.d.-e., a POSA would have understood that operation of the mechanical fuel valve and the fuel lockout apparatus is interconnected such that only one fuel can be communicated to the engine at one time.

[0176]. Specifically, the mechanical gasoline fuel valve of DuroMax would be rigidly connected to the cap of Eldson such that when the gasoline valve is rotated into a closed position, the cap of Eldson is moved into the open position and when the gasoline valve is rotated into an open position, the cap of Eldson is moved into the closed position.

[0177]. A POSA would have therefore understood that when the fuel lockout apparatus of Eldson is interconnected with the mechanical fuel valve of DuroMax, the mechanical fuel valve would be prevented from moving into the first position when the second fuel source communicates with the dual fuel engine (due to the cap coming into contact with the LPG input line).

[0178]. Accordingly, a POSA would have understood that the combination of DuroMax and Eldson teaches claim 2.

3. **Claim 3: “The mechanical fuel lockout switch of claim 1 wherein the fuel lockout apparatus comprises a flange rigidly coupled to the mechanical fuel valve and configured to: cover an inlet of the second fuel line while the mechanical fuel valve is in the first position, and uncover the inlet of the second fuel line while the mechanical fuel valve is in the second position.”**

[0179]. The combination of DuroMax and Elsdon teaches claim 3. The combination of DuroMax and Elsdon discloses a fuel lockout apparatus coupled to a mechanical fuel valve. *See*, §VII.A.1.d. The fuel lockout apparatus includes a cap. *Id.*

[0180]. A POSA would have understood it to be obvious to have rigidly connected the DuroMax gasoline fuel valve to the cap of Elsdon such that the DuroMax valve handle and shaft rotate together with Elsdon cap 16. *Supra*, §§VII.A.1.a.i-ii. A POSA would have further considered it to be obvious to have arranged the gasoline fuel valve and cap assembly of DuroMax and Elsdon adjacent to the LPG input such that the cap of Elsdon rotates over and covers the LPG inlet (preventing coupling thereto) when the gasoline fuel valve is placed into an open position and uncovers the LPG inlet (permitting coupling thereto) when the gasoline fuel valve is placed into the closed position. *Supra*, §§VII.A.1.a.i-ii.

[0181]. Accordingly, a POSA would have understood that the combination of DuroMax and Elsdon teaches claim 3.

4. **Claim 4: “The mechanical fuel lockout switch of claim 3 wherein the mechanical fuel valve is configured to rotate between the first position and the second position and the flange is configured to rotate transversely across the inlet of the second fuel line.”**

[0182]. The combination of DuroMax and Elsdon teaches claim 4. DuroMax discloses a mechanical fuel valve that rotates between a first position

and a second position. *Supra*, §VII.A.1.b. Elsdon discloses a flange comprising a cap and shield. *Id.* That the cap and shield are arranged such that when the cap is in a closed position, the fluid coupler is concealed, and when the cap is rotated from a closed position to an open position, the coupler is exposed. Ex. 1012, 2:19–23. A POSA would have understood that the cap and shield can thus rotate transversely across the inlet of a fuel line.

[0183]. Accordingly, a POSA would have understood that when the fuel valve of DuroMax is connected to the cap of Eldson, the mechanical fuel valve rotates between the first position and the second position, and the flange rotates transversely across the inlet of the second fuel line as recited in claim 4. *Supra*, §§VII.A.1.a.i.-ii.

5. **Claim 6: “The mechanical fuel lockout switch of claim 1 wherein the mechanical fuel valve and the fuel lockout apparatus operate together to ensure that fuel from the first fuel source and fuel from the second fuel source are not simultaneously delivered to the dual fuel engine.”**

[0184]. The combination of DuroMax and Elsdon teaches claim 6. A POSA would have considered it obvious to have connected the mechanical gasoline valve of DuroMax to the cap of Eldson to prevent the simultaneous delivery of gasoline and LPG fuel to the engine. *Supra*, §§VII.A.1.a.i.-ii.

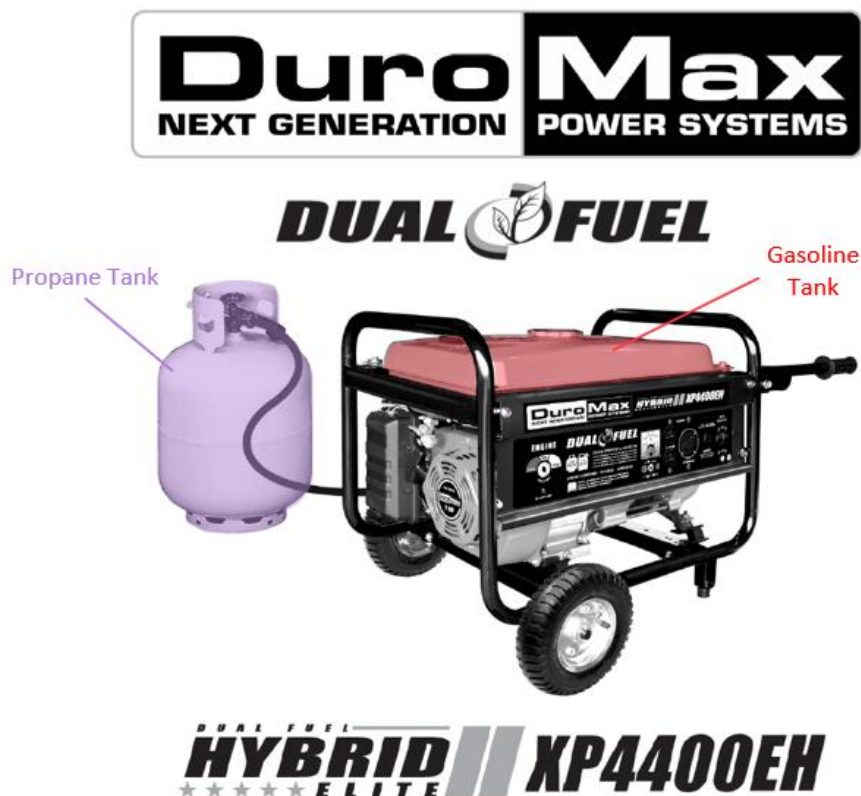
[0185]. Specifically, a POSA would have been motivated to connect the Elsdon fuel conduit coupler cap to the gasoline fuel valve of DuroMax to restrict

access to the LPG hose connector interface of DuroMax when the DuroMax generator gasoline valve is in the open position. Likewise, the combination would prevent the gasoline valve of DuroMax from being moved from the closed to the open position when an LPG hose is connected to the LPG hose connector interface due to the interference between the Eldson flange with the LPG hose. *Supra*, §VII.A.1.a.i.-ii.

[0186]. Accordingly, a POSA would have understood that the combination of DuroMax and Elsdon teaches claim 6.

6. **Claim 7: “The mechanical fuel lockout switch of claim 6 wherein the mechanical fuel valve is configured to: provide liquid fuel from a liquid fuel tank of the first fuel source to the dual fuel engine while in the first position, and provide gaseous fuel from a pressurized fuel container of the second fuel source to the dual fuel engine while in the second position.”**

[0187]. DuroMax teaches claim 7. DuroMax discloses a first fuel tank and a second fuel tank. Ex. 1010, p.1.



Ex. 1010, p.1 (Annotated)

The first fuel tank provides gasoline, and the second fuel tank provides propane. Ex. 1010, pp. 7, 11–12. A POSA would have understood that DuroMax discloses a first fuel source that provides liquid fuel from a liquid fuel tank to the dual fuel engine. A POSA would also have understood that DuroMax discloses a second fuel source that provides gaseous fuel from a pressurized fuel container to the dual fuel engine, and a mechanical fuel valve configured to let the engine run with the liquid fuel while in its first position (i.e., ON) and let the engine run with the gaseous fuel when in its second position (i.e., OFF). See §§VII.A.1.a-c., above.

[0188]. Accordingly, a POSA would have understood that DuroMax teaches claim 7.

7. Independent Claim 8

a. Element [8.0]: “A mechanical fuel lockout switch for a dual fuel engine comprising:”

[0189]. To the extent the preamble is limiting, DuroMax teaches [8.0] for at least the same reasons as [1.0]. *See*, §VII.A.1 above.

b. Element [8.1]: “a mechanical fuel valve actuatable between a first position and a second position to selectively control fuel flow to the dual fuel engine from a first fuel source through a first fuel line and a second fuel source through a second fuel line, the mechanical fuel valve configured to:”

[0190]. DuroMax teaches [8.1] for at least the same reasons as [1.1].
See, §VII.A.1.b., above.

c. Element [8.2]: “allow communication between the first fuel source and the dual fuel engine and prevent communication between the second fuel source and the dual fuel engine while the first position, and”

[0191]. DuroMax teaches [8.2] for at least the same reasons as [1.2].
See, §VII.A.1.c., above.

d. Element [8.3]: “prevent communication between the first fuel source and the dual fuel engine while in the second position; and”

[0192]. The combination DuroMax and Elsdon teaches the limitations of [8.3] for at least the same reasons as [1.3]. *See*, §VII.A.1.d., above.

- e. **Element [8.4]: “a fuel lockout apparatus coupled to the mechanical fuel valve and configured to prevent actuation of the mechanical fuel valve to the first position when the second fuel source is in communication with the dual fuel engine.”**

[0193]. The combination of DuroMax and Elsdon teaches and/or suggests the limitations of [8.4] for at least the same reasons as claim 2. *Supra*, §VII.A.2.

8. Claims 9 and 10

[0194]. Claims 9 and 10 recite identical limitations as claims 3 and 4, respectively, changing only their dependance from claims 1 and 3 to claims 8 and 9, respectively. For example, claim 9 recites: “[t]he mechanical fuel lockout switch of claim 8 wherein the fuel lockout apparatus comprises a flange rigidly coupled to the mechanical fuel valve and configured to: cover an inlet of the second fuel line while the mechanical fuel valve is in the first position, and uncover the inlet of the second fuel line while the mechanical fuel valve is in the second position.” Claim 10 recites: “[t]he mechanical fuel lockout switch of claim 9 wherein the mechanical fuel valve is configured to rotate between the first position and the second position, and the flange is configured to rotate transversely across the inlet of the second fuel line.”

[0195]. Faced with the problem of preventing coupling of a second fuel line to a mechanical fuel valve while a first fuel is being fed to a dual fuel engine,

and allowing coupling of the second fuel line when operation of the dual fuel engine on the second fuel is desired, a POSA would have been motivated to pursue a solution based on the combination of DuroMax and Elsdon as one of the finite number of predictable solutions for the problem for same reasons in claims 9 and 10 as with claims 3 and 4. *Supra*, §VII.A.3-4.

9. **Claim 12: “The mechanical fuel lockout switch of claim 8 wherein the mechanical fuel valve and the fuel lockout apparatus operate together to ensure that fuel from the first fuel source and fuel from the second fuel source are not simultaneously delivered to the dual fuel engine.”**

[0196]. Claim 12 recites identical limitations as claim 6, changing only its ultimate dependance from claim 1 to claim 8. The combination of DuroMax and Elsdon thus also teaches and/or suggests the limitations of claim 12 for at least the same reasons as claim 6. *Supra*, §VII.A.5.

10. **Claims 13: “The mechanical fuel lockout switch of claim 12 wherein the mechanical fuel valve is configured to: provide liquid fuel from a liquid fuel tank of the first fuel source to the dual fuel engine while in the first position, and provide gaseous fuel from a pressurized fuel container of the second fuel source to the dual fuel engine while in the second position.”**

[0197]. Claim 13 recites identical limitations as claim 7, changing only its ultimate dependance from claim 1 to claim 8. DuroMax thus also teaches and/or suggests the limitations of claim 13 for at least the same reasons as claim 7. *Supra* §VII.A.6.

B. Ground 2: Claims 5, 11, and 14–21 Are Obvious Over the Combination of DuroMax, Elsdon, and Parlatore in View of LP-Gas Handbook.

[0198]. Claim 5 depends from claim 3, which depends from claim 1. As discussed in §VII.A.1, *supra*, claim 1 is rendered obvious by the combination of DuroMax and Elsdon.

[0199]. Claim 3 depends from claim 1 and is also rendered obvious by the combination of DuroMax and Elsdon. *Supra*, §VII.A.3 above. A POSA would have looked to Parlatore to teach, and render obvious, any limitation of claim 5 not disclosed by the combination of DuroMax and Elsdon.

[0200]. Similarly, claim 8 is also rendered obvious by the combination of DuroMax and Elsdon, (*see* §VII.A.7, above), and claim 9 recites identical limitations as claim 3, changing only its ultimate dependance from claim 1 to claim 8. *Supra* §VII.A.8 above.

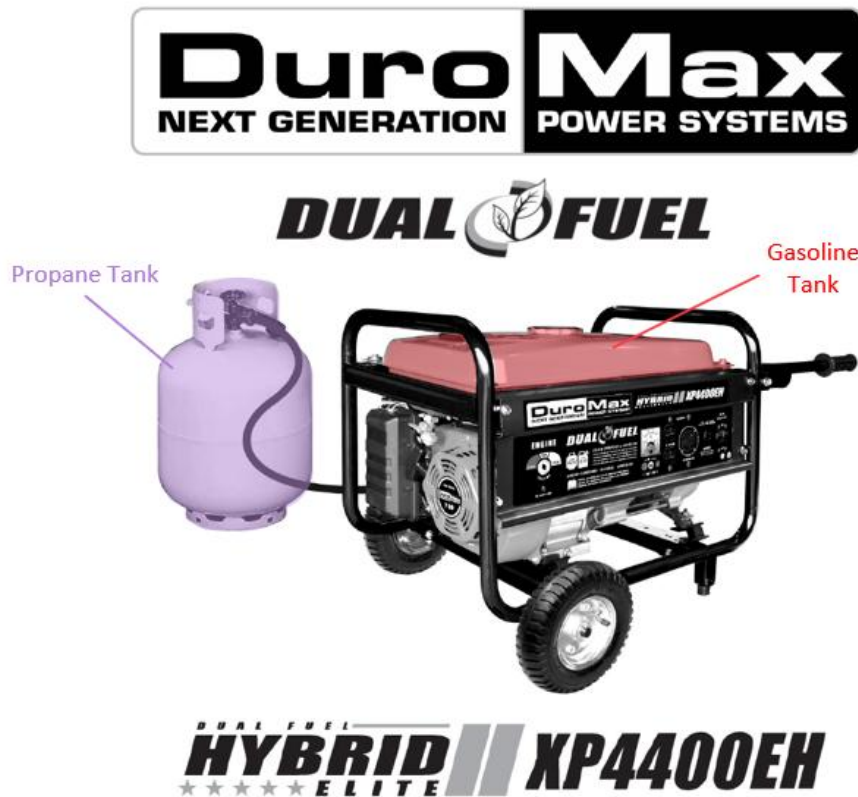
[0201]. Claim 11 recites identical limitations as claim 5, changing only its ultimate dependance from claim 3 to claim 9, and is therefore rendered obvious for the same reasons.

[0202]. Claims 14–21 include limitations similar to those of claims 1–3, 8, and 9, with additional limitations drawn to a fuel regulator system. Accordingly, a POSA would have looked to Parlatore to teach, and render obvious, any

limitation not disclosed by the combination of DuroMax and Elsdon. *See* §A.1–3, 7, and 8 above.

1. Motivation to Combine DuroMax, Elsdon, Parlatore, the LP-Gas Handbook, and POSA’s Reasonable Expectation of Success

[0203]. A POSA would have been motivated to use Parlatore’s off-board fuel regulator system with the DuroMax dual fuel system. DuroMax discloses a first fuel tank and a second fuel tank. Ex. 1010, p.1.



Ex. 1010, p.1 (Annotated)

[0204]. The first fuel tank provides gasoline, and the second fuel tank provides propane. Ex. 1010, pp. 7, 11–12. A POSA would have understood that

DuroMax discloses a first fuel source that provides liquid fuel from a liquid fuel tank to the dual fuel engine. A POSA would also have understood that DuroMax discloses a second fuel source that provides gaseous fuel from a pressurized fuel container to the dual fuel engine.

[0205]. Parlatores discloses a fuel delivery system that includes “a fuel tank that houses propane; a first regulator coupled to the fuel tank; a second regulator coupled to the first regulator; and a fuel metering system coupled to the second regulator and delivering propane to an engine.” Ex. 1013, [0005]. Parlatores further discloses that its fuel system where “a gas, such as liquefied petroleum gas or propane, may be supplied to an engine as fuel.” *Id.*, [0014].

[0206]. Parlatores discloses the LPG tank is pressurized. *Id.*, [0016] (LPG in tank is in a “high pressure state,” which is “approximately 180-250 psi”). The LPG is in gaseous state when delivered to the engine through a gaseous fuel line (one or more hoses). *Id.*, [0017] (system lets “fuel vapor flow into the carburetor 114”), [0017] (system feeds “vaporized propane into carburetor 114 through hose 112”), [0022], [0025].

[0207]. One reason to locate the fuel delivery regulators off-board from the generator and near or at the LPG tank is so that the fuel line leading to the engine will already be at the relatively lower pressure set by the output of the secondary regulator. This enhances safety in case this fuel line is punctured or

damaged in some way, since the fuel in this line will be at a lower pressure. *Id.*

Additional benefits include improved access for servicing engine and more stable operating conditions for the regulators (i.e., less exposure of the regulator to heat and vibrations created by the generator, both of which can prematurely wear the regulator components).

[0208]. It would have been obvious to a POSA to use the off-board fuel regulator system disclosed in Parlatore because Parlatore discloses the use of a regulator system with “any desired form of engine” and specifically suggests the use of its regulator system with generators. Ex. 1013, [0019], [0025]. A POSA would thus be motivated to combine the regulator systems described in Parlatore to regulate the gaseous fuel from a pressurized fuel container to the dual fuel engine described in DuroMax.

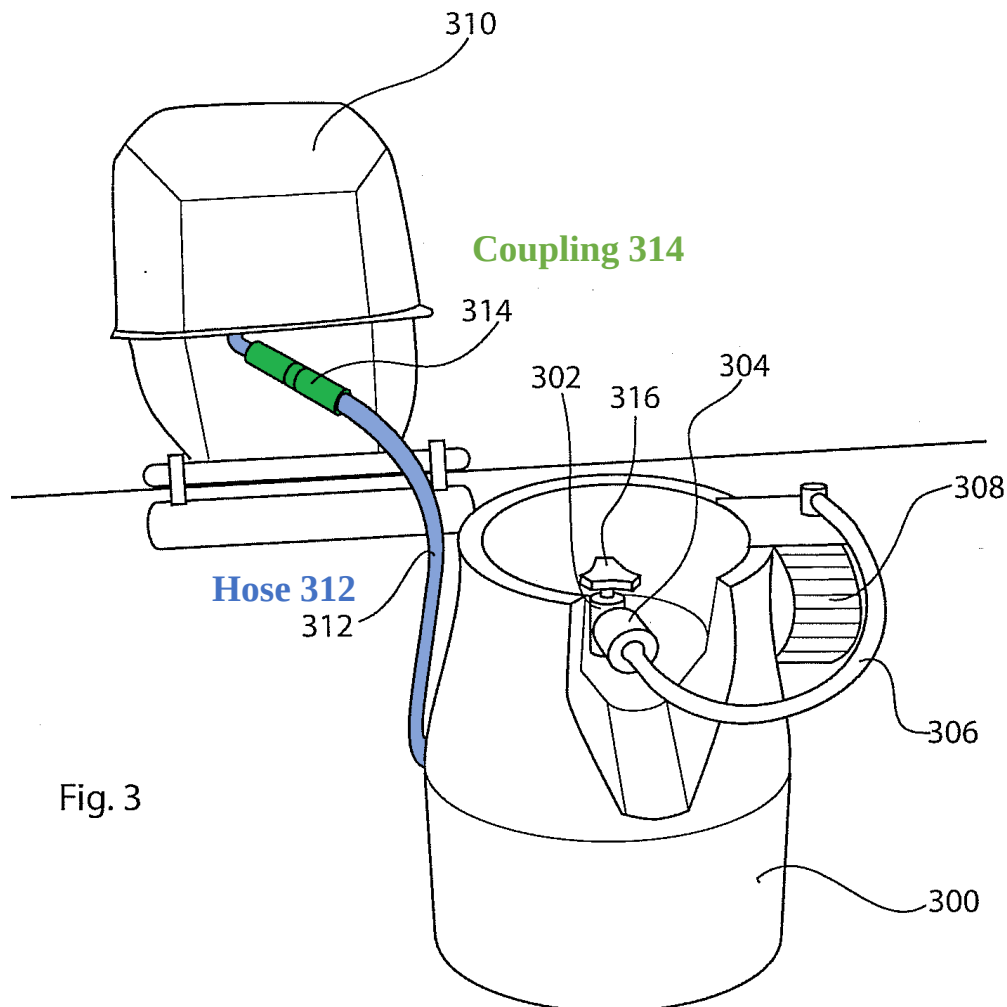
[0209]. A POSA would have had a reasonable expectation of success in using Parlatore’s off-board fuel regulator system with the DuroMax dual fuel system given that this implementation was already demonstrated by Parlatore. See Ex. 1013, [0019] (“For example, this embodiment may be beneficial in some desired situations ... such as generators.”). Moreover, the use of regulators with LPG tanks has been commonplace for decades.

[0210]. A POSA also would have been motivated to use a quick connector because Parlatore states that the secondary regulator may be connected

to the carburetor or engine “either permanently or releasably” (Ex. 1013, [0020])

and refers to “releasably coupling the second regulator to the engine” (Ex. 1013, claim 10, 15).

[0211]. As shown in Fig. 3, below, a POSA would have understood that a quick-connect could be used to achieve the releasable connection as coupling 314.



Ex. 1013, FIG. 3 (Annotated).

[0212]. As such, a first end would be coupled to the outlet of the secondary regulator 308 and a second end would be coupled to an inlet of the gaseous fuel line of the engine to couple the secondary pressure regulator to the gaseous fuel line. *Id.*

[0213]. At the time of the invention, quick-connect couplings were a standard, well understood solution for fuel lines where connections need to be secure but detachable, safe against leaks, and tool-free for ease of service. Ex. 1015, 40 (§3.3.62: “Quick Connectors. Fittings used to connect hose assemblies to piping and valves without the use of tools.”).

[0214]. A POSA would have also been motivated to use a quick connector for easy connection and disconnection of Parlatore’s LPG tank for refilling the tank or replacing an empty tank with a full tank.

[0215]. A POSA would have been further motivated to provide for easy connection/disconnection so that the tank could be used for other common applications when not in use by the generator, such as a BBQ grill. *Id.* A POSA would have been further motivated to use a quick connector to allow easy and rapid connection and disconnection so that the portable generator could be more easily moved to other locations or could be stored when not in use.

[0216]. Additionally, many quick connectors stop gas flow when disconnected, preventing propane from escaping during tank swaps or maintenance. This is especially valuable in off-board regulator setups.

[0217]. Quick connectors also allow users to connect and disconnect the hose effortlessly, making them ideal for non-experts using portable generators in residential or emergency settings. This minimizes downtime when replacing the propane tank, which is common in extended generator use or mobile applications.

[0218]. A POSA would have had a reasonable expectation of success because quick connectors were commonly used in propane and fuel systems, including portable setups like those described in Parlature. Ex. 1005, p. 40 (§3.3.62). The benefits of a quick-connect coupling, such as rapid setup, easy maintenance, and safety, would have been especially attractive in systems that were meant to be modular or portable, as the Parlature system is. See Ex. 1013, Fig. 3.

2. **Claim 5: “The mechanical fuel lockout switch of claim 3 further comprising: a first end of a quick-disconnect hose coupling attached to the inlet of the second fuel line; and a second end of the quick-disconnect hose coupling configured to mate with the first end of the quick-disconnect hose coupling to couple the second fuel source to the second fuel line.”**

[0219]. Claim 5 depends from claims 1 and 3. Claim 1 is rendered obvious by the combination of DuroMax and Elsdon. *Supra*, §VII.A.1. Claim 3 is

rendered obvious by the combination of DuroMax and Elsdon. *Supra*, §VII.A.3. A POSA would have looked to Parlatore, in view of LP-Gas Handbook, to teach, and render obvious, any limitation of claim 5 not disclosed by the combination of DuroMax and Elsdon.

[0220]. FIG. 3 of Parlatore discloses an LPG tank 102 coupled to an engine 310 via: a primary regulator 304, a hose 306, a secondary pressure regulator 308, a hose 312, and a coupling 314. Ex. 1013, [0020]–[0021], and FIG. 3.

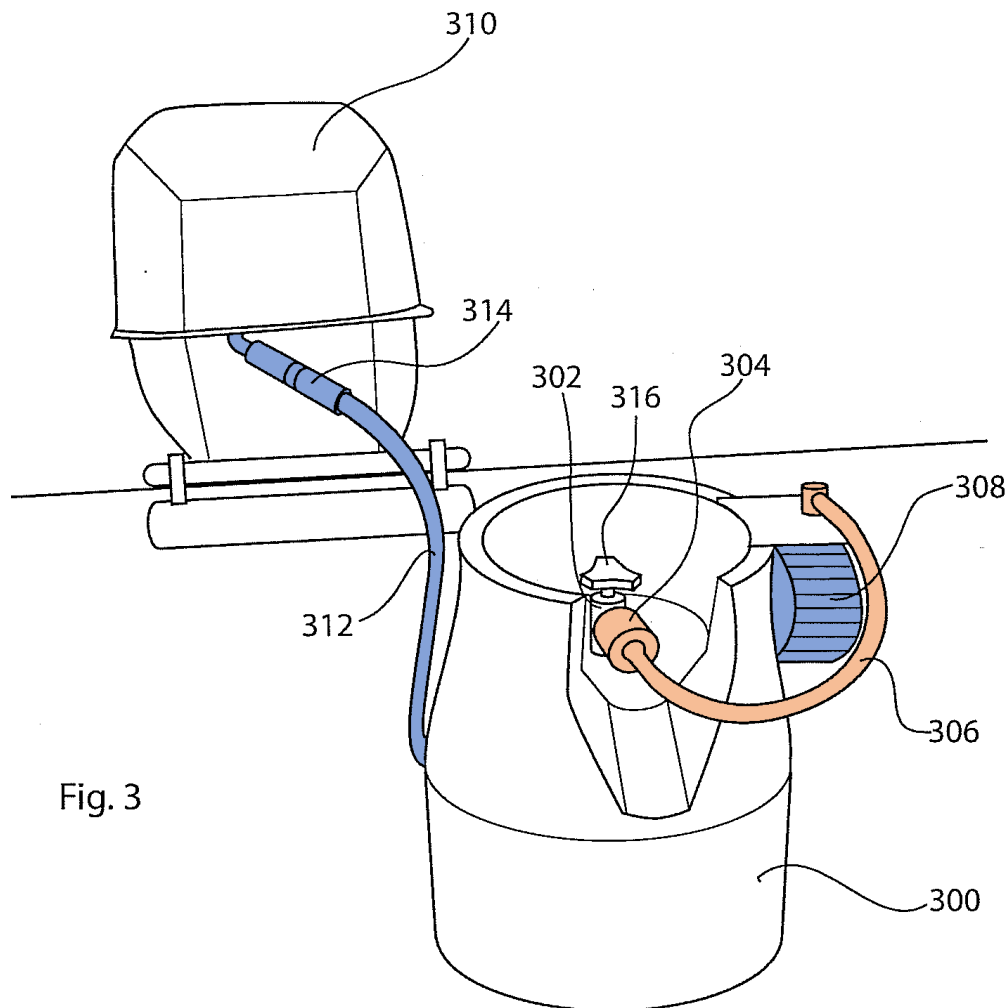


Fig. 3

Ex. 1013, FIG. 3 (Annotated).

[0221]. Parlature also discloses that a low pressure output of the secondary regulator 308 can be releasably attached to a propane carburetor. Ex. 1013, [0020]. The low pressure output can be attached to the propane carburetor through hose 312 and coupling 314. *Id.*

[0222]. Parlature does not explicitly disclose which type of hose coupling it uses. However, LP-Gas Handbook discloses the use of quick-connect couplings in LP gas systems. Ex. 1005, p.40 (§3.3.62 commentary: “Quick connectors are also used in other LP-Gas systems, such as those used for engine fuel refueling and cylinder filling, connecting cylinders to gas-fired barbecue grills, and connecting gas systems between two sections of mobile homes.”). It would have been obvious to a POSA to use a quick connector at the end of the Parlature hose (e.g., as coupling 314) in view of the teachings of the LP-Gas Handbook.

[0223]. A POSA would therefore understand that the combination of DuroMax, Elsdon and Parlature teaches claim 5.

3. **Claim 11: “The mechanical fuel lockout switch of claim 9 further comprising: a first end of a quick-disconnect hose coupling attached to the inlet of the second fuel line; and a second end of the quick-disconnect hose coupling configured to mate with the first end of the quick-disconnect hose coupling to couple the second fuel source to the second fuel line.”**

[0224]. Claim 11 recites identical limitations as claim 5, changing only its dependance from claim 3 to claim 9. A POSA would therefore understand that

the combination of DuroMax, Elsdon, and Parlatore teaches claim 11 for same reasons in claim 11 as with claim 5. *Supra*, §VII.B.2 above.

4. Independent Claim 14

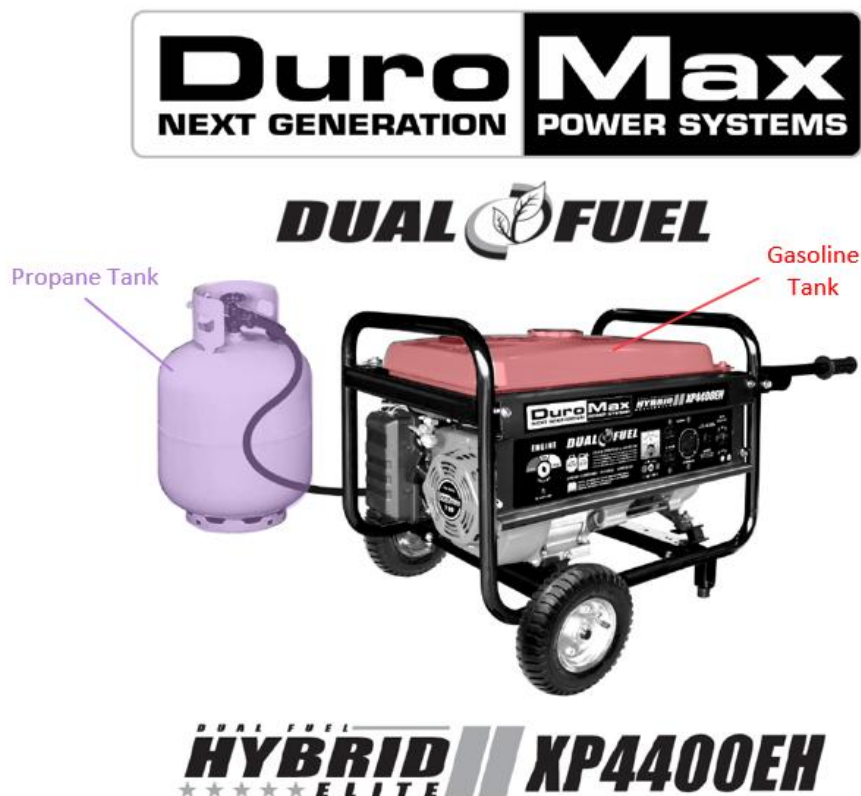
[0225]. Claims 14–21 include limitations similar to those of claims 1–3, 8, and 9, with additional limitations drawn to a fuel regulator system. A POSA would have looked to Parlatore, in view of LP-Gas Handbook, to teach, and render obvious, any limitation not disclosed by the combination of DuroMax and Elsdon. *Supra*, §VII.A.1–3, and 8 above.

a. Element [14.0]: “A dual fuel generator and fuel delivery system comprising:”

[0226]. To the extent the preamble is limiting, DuroMax discloses a dual fuel generator in which either LPG or gasoline may be selected for operation of the generator. Ex. 1010, pp.11–12.

b. Element [14.1]: “a dual fuel generator configured to operate on a liquid fuel supplied from a liquid fuel source through a liquid fuel line and a gaseous fuel supplied from a pressurized fuel source through a gaseous fuel line;”

[0227]. DuroMax discloses [14.1]. DuroMax discloses a first fuel tank and a second fuel tank. Ex. 1010, p.1.



Ex. 1010, p.1 (Annotated)

[0228]. The first fuel tank provides liquid gasoline, and the second fuel tank provides gaseous propane. Ex. 1010, pp. 7, 11–12. DuroMax discloses the liquid fuel (gasoline) is supplied from a liquid fuel source (tank) through a liquid fuel line. *Id.*, 9, 20-21, 30-31 (parts diagram/list depicting liquid fuel line as “Part No. 137, Outlet Pipe”). A POSA would have understood that DuroMax discloses a first fuel source that provides liquid fuel from a liquid fuel tank to the dual fuel engine.

[0229]. DuroMax also discloses a gaseous fuel line that supplies the gaseous fuel from a pressurized fuel source requiring a pressure regulator with a pressure release valve:



Figure C-Connect Valve



Figure D -Button on Presssure Release Valve

Ex. 1010, 12.

[0230]. A POSA thus would also have understood that DuroMax discloses a second fuel source that provides gaseous fuel from a pressurized fuel container to the dual fuel engine.

[0231]. Accordingly, a POSA would have understood that DuroMax teaches claim element [14.1].

c. **Element [14.2]: “a fuel regulator system located off board the dual fuel generator, the fuel regulator system comprising:”**

[0232]. Parlatores discloses [14.2]. In FIGS. 1–3, Parlatores discloses a propane vapor delivery system. Ex. 1013, [0013].

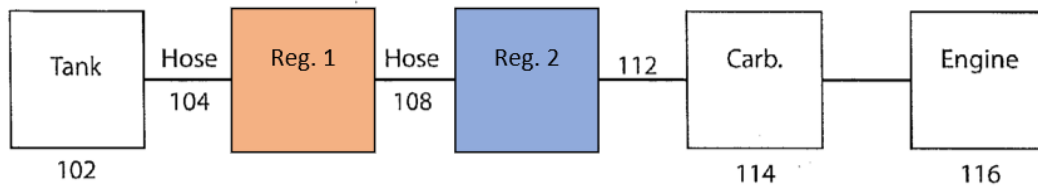


Fig. 1

Ex. 1013, FIG. 1.

[0233]. As shown in FIG. 3, the “LPG tank 300 may be located separate, but coupled to, an engine 310.”

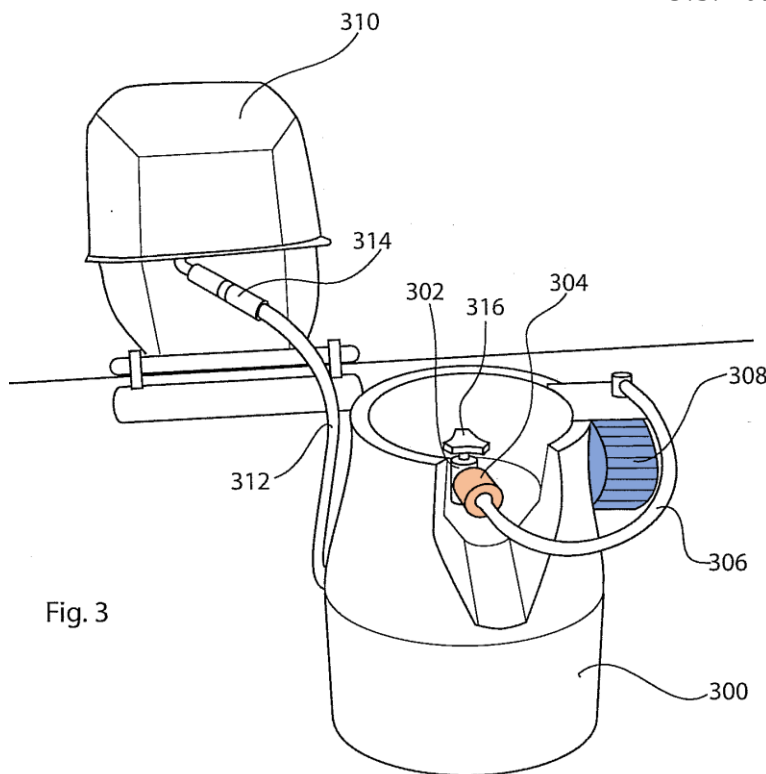


Fig. 3

Ex. 1013, FIG. 3 (Annotated).

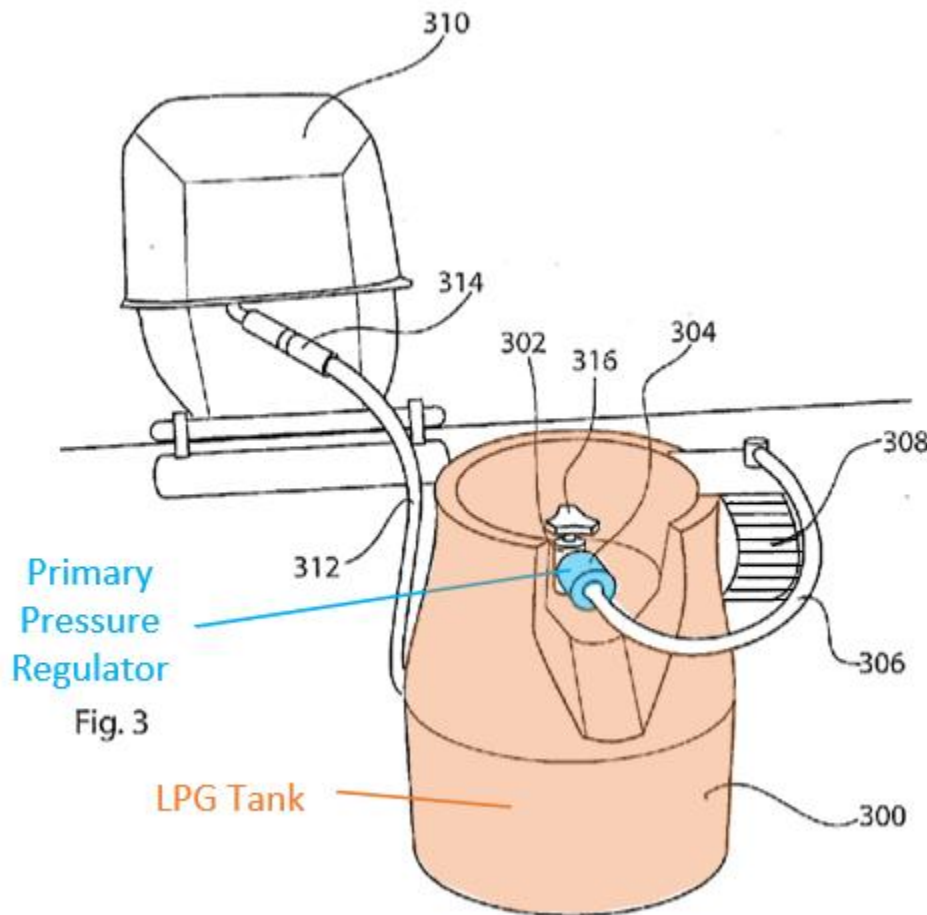
[0234]. Parlatore discloses that its propane vapor delivery system can be used for “generator” “or any situation where more fuel may be desired.”

Ex.1013, [0019], [0023]. A POSA would understand that the propane vapor delivery system of Parlatore is a fuel regulator system located off board the dual fuel generator. Accordingly, a POSA would understand that Parlatore teaches “a fuel regulator system located off board the dual fuel generator” as recited in Claim limitation [14.2].

- d. **Element [14.3]: “a primary pressure regulator couplable to a service valve of the pressurized fuel source and configured to regulate the gaseous fuel**

supplied from the pressurized fuel source to a reduced pressure, and”

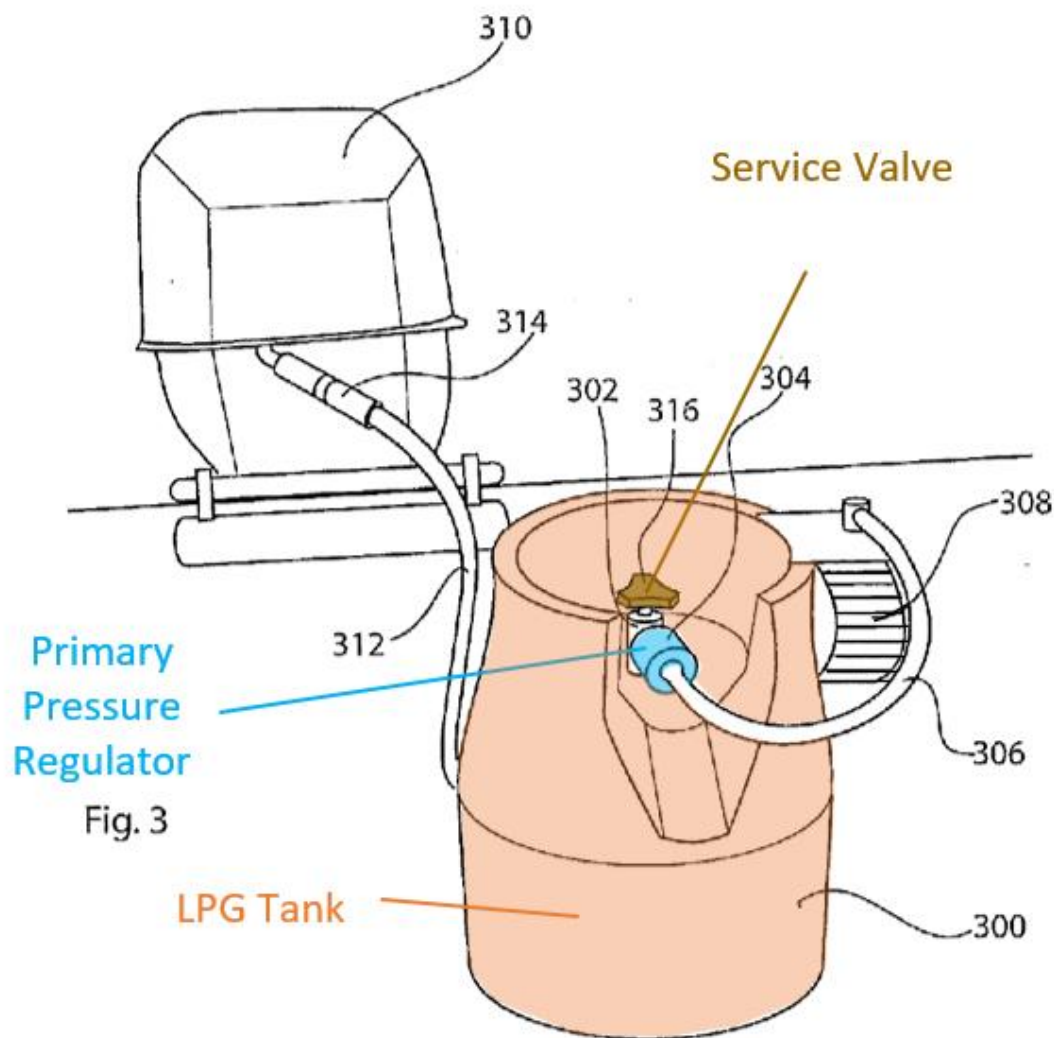
[0235]. Parlatore discloses [14.3]. Parlatore discloses that “[t]he LPG tank 300 may be connected to the primary regulator 304 as described previously, for example by connector 302.” Ex. 1013, [0020].



Ex. 1013, FIG. 3 (Annotated).

[0236]. Parlatore discloses that the “primary regulator 106 may step down the pressure of any stored propane vapor energy in tank 102 and may further output this lowered pressure to a secondary regulator 110.” *Id.*, [0016]. A POSA

would thus understand that the primary pressure regulator of Parlatore is coupled to a service valve (a “safety fuel shut-off valve 316,” *id.*, [0023]) of the pressurized fuel source and configured to regulate the fuel supplied from the pressurized fuel source to a reduced pressure.



Ex. 1013, FIG. 3 (Annotated).

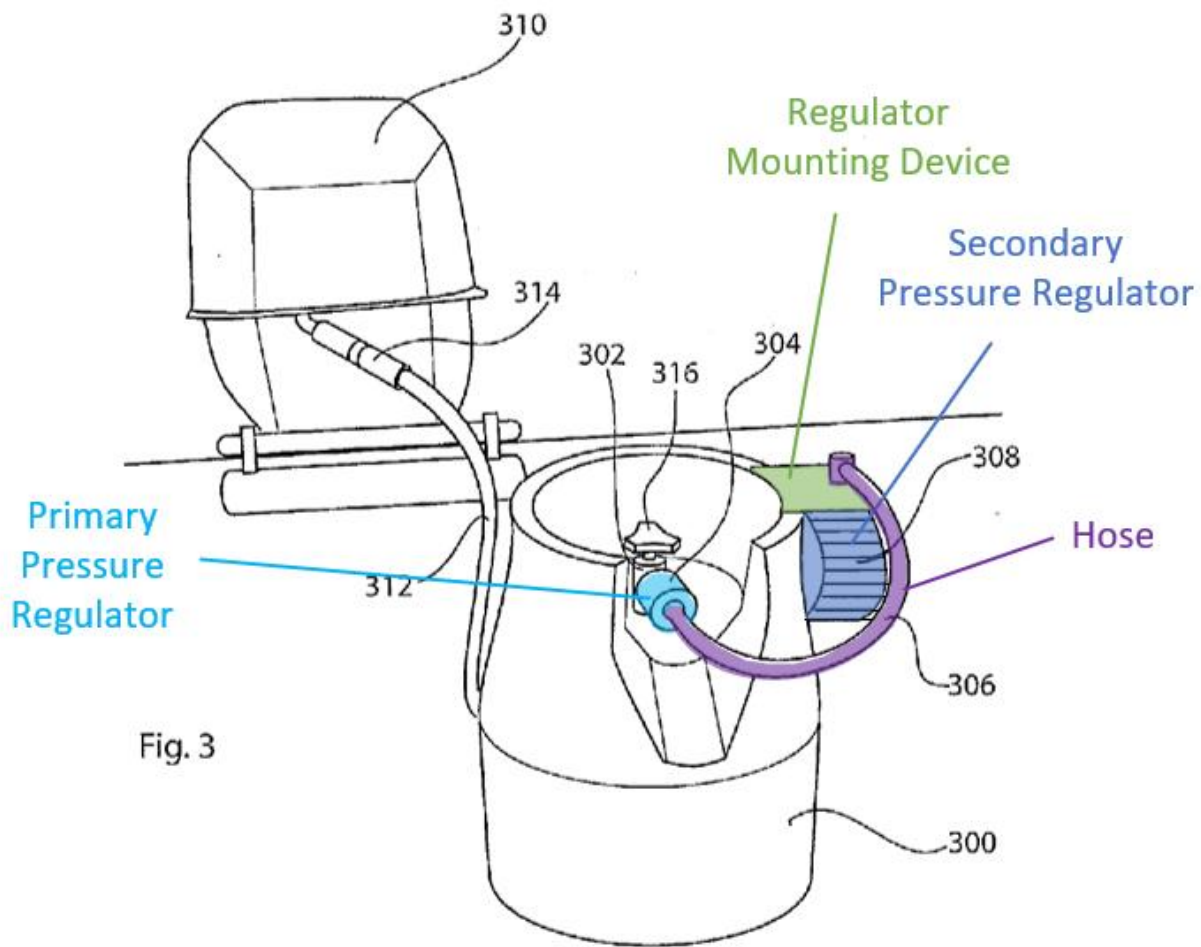
[0237]. Accordingly, a POSA would understand that Parlature teaches “a primary pressure regulator couplable to a service valve of the pressurized fuel

source and configured to regulate the gaseous fuel supplied from the pressurized fuel source to a reduced pressure” as recited in Claim element [14.3].

- e. **Element [14.4]: “a secondary pressure regulator couplable to the primary pressure regulator and configured to regulate the gaseous fuel supplied from the primary pressure regulator to a desired pressure for delivery through the gaseous fuel line to operate the dual fuel generator;”**

[0238]. Parlatore discloses [14.4]. “[P]rimary regulator 304 and...secondary regulator 308 may be two separate regulators that can be based on the design and size of an engine.” Ex. 1013, [0021]. “The primary regulator 304 in this exemplary embodiment may be connected to LPG tank 300 as described above.” *Id.*

[0239]. Parlatore discloses a secondary regulator 308 connected to the primary regulator 304 “by a hose 306, pipe, tube or the like.” *Id.*



Ex. 1013, FIG. 3.

[0240]. Parlature discloses that the “the secondary regulator 110 can meter propane gas to an engine 116,” *id.*, [0016], and that the “low pressure output of the secondary regulator 308 may be attached to a propane carburetor (not pictured) on the engine 310 in any of a variety of manners.” *Id.*, [0020].

[0241]. The LPG is in gaseous state when delivered to the engine through a gaseous fuel line (one or more hoses). *Id.*, [0017] (system lets “fuel

vapor flow into the carburetor 114”), [0018] (system feeds “vaporized propane into carburetor 114 through hose 112”), [0022], [0025].

[0242]. A POSA would thus understand that the primary pressure regulator is coupled to the secondary pressure regulator, and that the secondary pressure regulator is configured to regulate the gaseous fuel supplied from the primary pressure regulator to a desired pressure for delivery through the gaseous fuel line to operate the dual fuel generator.

[0243]. Accordingly, a POSA would understand that Parlatores teaches *“a secondary pressure regulator couplable to the primary pressure regulator and configured to regulate the gaseous fuel supplied from the primary pressure regulator to a desired pressure for delivery through the gaseous fuel line to operate the dual fuel generator.”*

- f. **Element [14.5]: “a mechanical fuel valve actuatable between a first position and a second position to selectively control fuel flow to the dual fuel generator from the liquid fuel source through the liquid fuel line and the pressurized fuel source through the gaseous fuel line, the mechanical fuel valve configured to open and close the liquid fuel line to selectively control fuel flow from the liquid fuel source to the dual fuel generator; and”**

[0244]. The combination of DuroMax and Elsdon discloses [14.5], for substantially the same reasons as limitation [1.1]. *Supra* §VII.A.1.b.

[0245]. Element [14.5] is substantially identical to element [1.1],

specifying that the “first” fuel is liquid, and the “second” fuel is pressurized gas:

Element [14.5] (emphasis added)	Element [1.1] (emphasis added)
a mechanical fuel valve actuatable between a first position and a second position to selectively control fuel flow to the dual fuel generator from the liquid fuel source through the liquid fuel line and the pressurized fuel source through the gaseous fuel line	a mechanical fuel valve actuatable between a first position and a second position to selectively control fuel flow to the dual fuel engine from a first fuel source through a first fuel line and a second fuel source through a second fuel line

[0246]. Further, as discussed above concerning claim 7, a POSA would have understood that the first fuel source in DuroMax provides liquid fuel from a liquid fuel tank to the dual fuel engine and the second fuel source provides gaseous fuel from a pressurized fuel container to the dual fuel engine. *Supra*, §VII.A.6.

[0247]. A POSA would thus have understood that the combination of DuroMax and Elsdon discloses a mechanical fuel valve that is actuatable between a first position and a second position to selectively control fuel flow to the dual fuel generator from the liquid fuel source through the liquid fuel line and the pressurized fuel source through the gaseous fuel line.

g. Element [14.6]: “a fuel lockout apparatus coupled to the mechanical fuel valve and configured to:”

[0248]. The combination of DuroMax and Elsdon discloses [14.6].

[0249]. Elsdon discloses a fuel conduit coupler shield 14 and cap 16 that when closed prevents connection of a fuel source. Ex. 1012, 3:3–14. Elsdon

discloses that by rotating cap 16 over conduit coupler 12, cap 16 prohibits access to the coupler interface, thereby preventing connecting of a hose with the coupler interface. *Id.*, 3:3–14, 5:1–10.

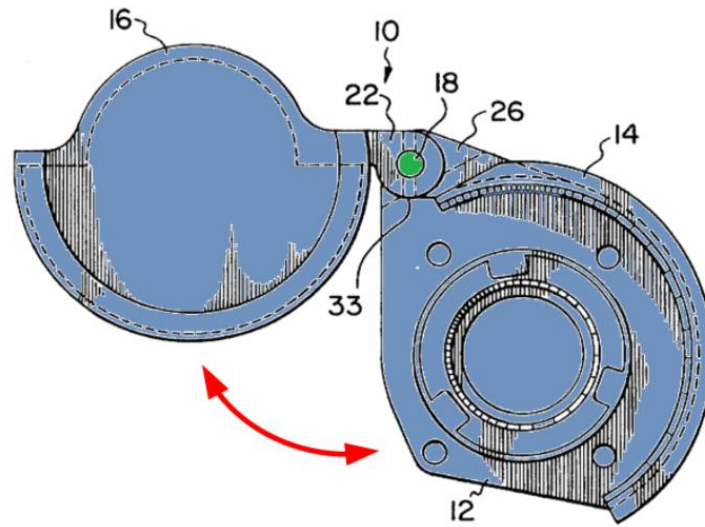


FIG. 1

Ex. 1012, FIG. 1 (annotated).

[0250]. It would have been obvious to a POSA to combine the Elsdon fuel conduit coupler cap with the gasoline fuel valve of DuroMax to provide a mechanical fuel valve that both controls the flow of gasoline from the tank through the gasoline line (as disclosed by DuroMax) and simultaneously rotates to block and unblock the LPG inlet (as disclosed by Elsdon).

[0251]. By blocking and unblocking the LPG inlet, this combined apparatus would selectively control the flow of LPG through the LPG fuel line. *Id.* This combination would appear and function the same way as Figures 2–4B of the '895 Patent.

[0252]. Thus, a POSA would have understood that the combination of DuroMax and Elsdon discloses a “*mechanical fuel valve configured to open and close the liquid fuel line to selectively control fuel flow from the liquid fuel source to the dual fuel generator.*”

- h. Element [14.7]: “prevent the pressurized fuel source from coupling to the gaseous fuel line while the liquid fuel line is open, and”**

[0253]. The combination of DuroMax and Elsdon teaches the limitations of [14.7] for at least the same reasons as [1.3]. *Supra*, §VII.A.1.d.

- i. Element [14.8]: “permit the pressurized fuel source to couple to the gaseous fuel line while the liquid fuel line is closed by the mechanical fuel valve.”**

[0254]. The combination of DuroMax and Elsdon discloses [14.8], for substantially the same reasons as limitation [1.4]. *Supra*, §VII.A.1.e.

[0255]. Element [14.8] is substantially identical to element [1.4], specifying that the “first” fuel is liquid, and the “second” fuel is pressurized gas:

Element [14.8] (emphasis added)	Element [1.4] (emphasis added)
configured to: prevent the pressurized fuel source from coupling to the gaseous fuel line while the liquid fuel line is open , and permit the pressurized fuel source to couple to the gaseous fuel line while the liquid fuel line is closed by the mechanical fuel valve .	and configured to: prevent the second fuel source from coupling to the second fuel line while the mechanical fuel valve is in the first position , and permit the second fuel source to couple to the second fuel line while the mechanical fuel valve is in the second position .

[0256]. When the mechanical fuel valve is in the first position, the liquid fuel line is open. *Supra* §VII.A.1.e. It would have been obvious to a POSA to combine the Elsdon fuel conduit coupler cap with the gasoline fuel valve of DuroMax to provide a mechanical fuel valve that both controls the flow of gasoline from the tank through the gasoline line (as disclosed by DuroMax) and simultaneously rotates to block and unblock the LPG inlet (as disclosed by Elsdon).

[0257]. By blocking and unblocking the LPG inlet, this combined apparatus would selectively control the flow of LPG through the LPG fuel line. *Id.* Thus, a POSA would understand that the combination of DuroMax and Elsdon discloses that the mechanical fuel valve is “*configured to: prevent the pressurized fuel source from coupling to the gaseous fuel line while the liquid fuel line is open, and permit the pressurized fuel source to couple to the gaseous fuel line while the liquid fuel line is closed by the mechanical fuel valve.*”

5. **Claim 15: “The dual fuel generator and fuel delivery system of claim 14 wherein the fuel lockout apparatus is further configured to prevent the mechanical fuel valve from opening the liquid fuel line while the fuel regulator system is coupled to the gaseous fuel line.”**

[0258]. The combination of DuroMax and Elsdon teaches the limitations of claim 15 for at least the same reasons as claim 2 and claim element [14.8]. *Supra*, §§VII.A.2, VII.B.4.i.

6. **Claim 16: “The dual fuel generator and fuel delivery system of claim 14 wherein the fuel lockout apparatus comprises a fuel inlet cover that actuates with the mechanical fuel valve to cover an inlet of the gaseous fuel line while the liquid fuel line is open and to uncover the inlet of the gaseous fuel line when the liquid fuel line is closed.”**

[0259]. The combination of DuroMax and Elsdon teaches the limitations of claim 16 for at least the same reasons as Claims 3 and 9. *Supra*, §§VII.A.3, VII.A.8.

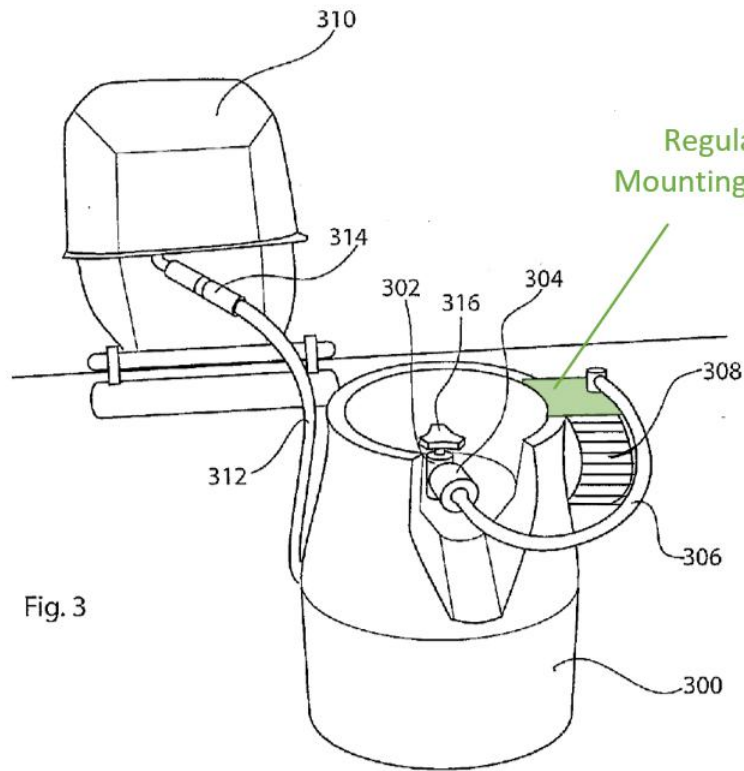
7. **Claim 17: “The dual fuel generator and fuel delivery system of claim 14 further comprising: a first end of a quick-connect hose coupling coupled to an outlet of the secondary pressure regulator; and a second end of the quick-connect hose coupling coupled to an inlet of the gaseous fuel line and configured to mate with the first end of the quick-connect hose coupling to couple the secondary pressure regulator to the gaseous fuel line.”**

[0260]. The combination of DuroMax, Elsdon, and Parlatores teaches the limitations of claim 17 for at least the same reasons as claims 5 and 11. *Supra*, §§VII.B.2.-3.

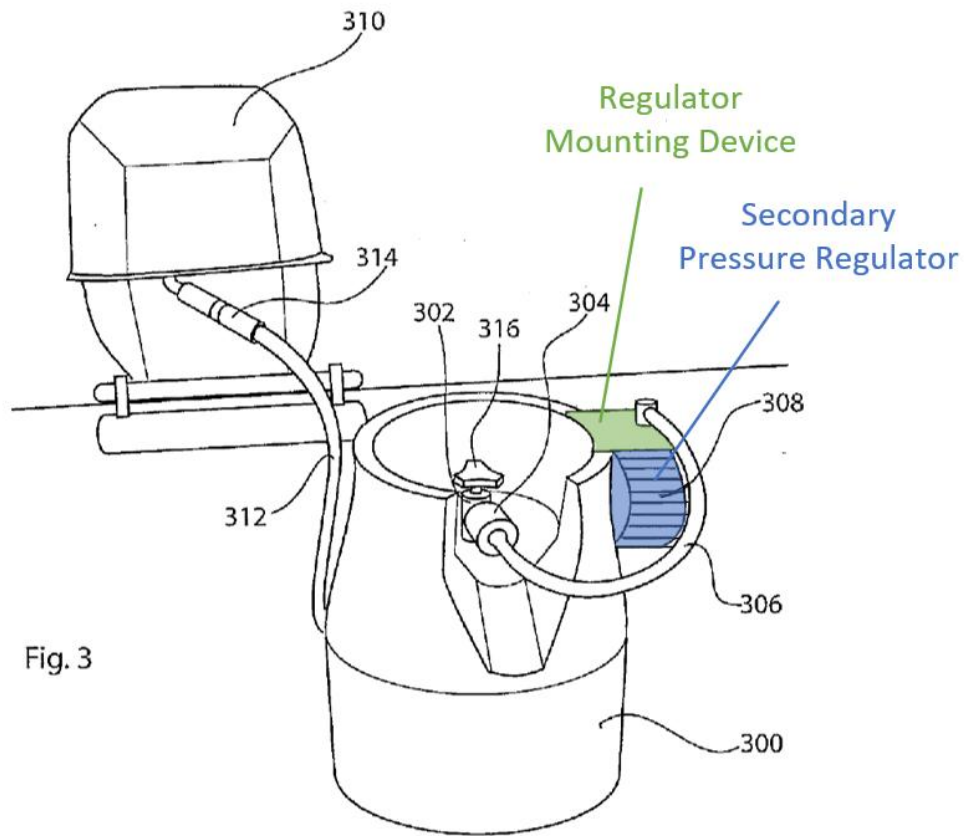
8. **Claim 18: “The dual fuel generator and fuel delivery system of claim 14 further comprising a regulator mounting device fixed to the pressurized fuel source; and at least the secondary pressure regulator is mounted on the regulator mounting device.”**

[0261]. The Combination of DuroMax, Elsdon, and Parlatores teaches the limitations of independent claim 14. *Supra*, §VII.B.4. Parlatores discloses the additional limitations of dependent claim 18.

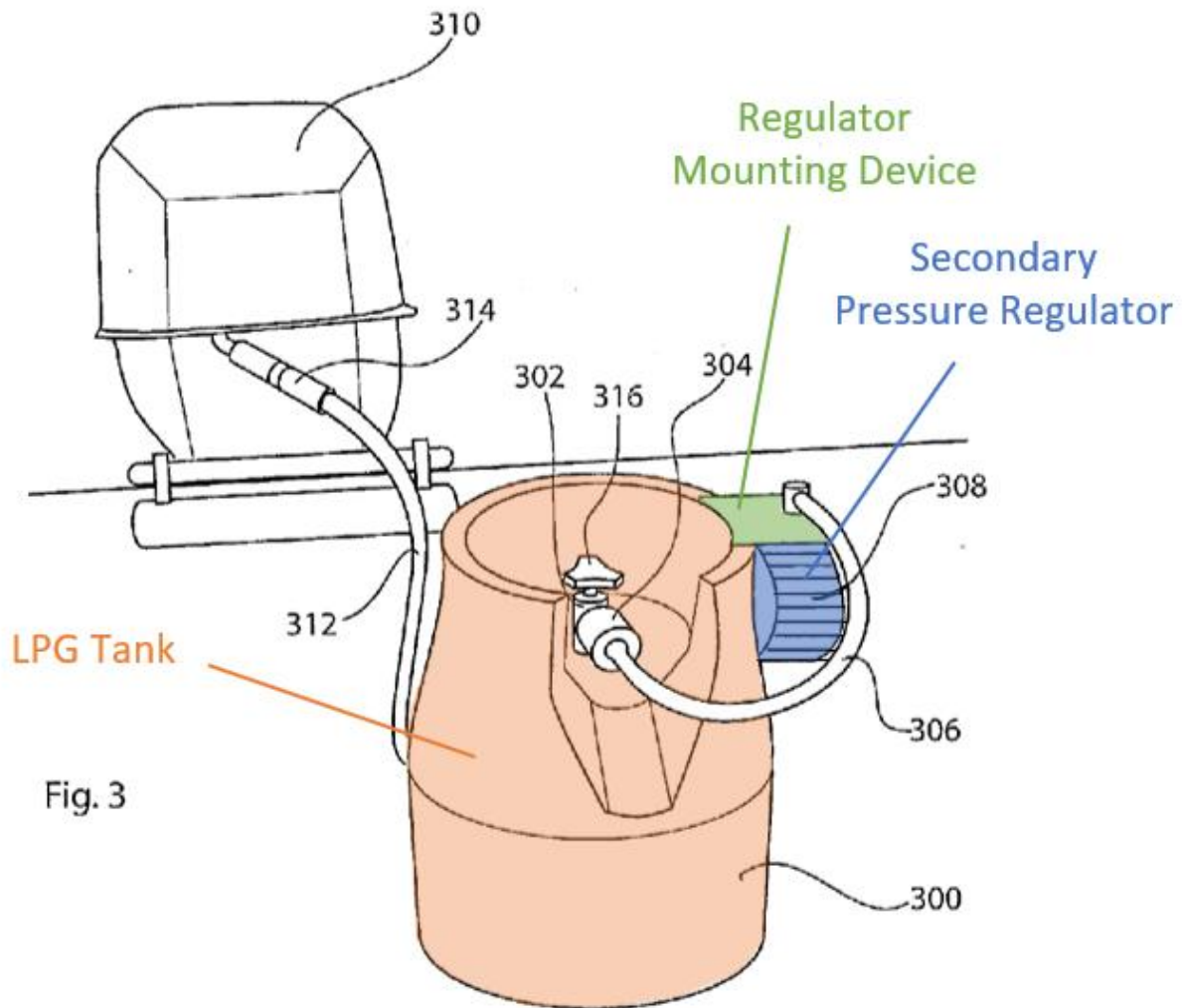
[0262]. As shown in Figure 3, Parlatore discloses that the secondary pressure regulator is mounted to the pressurized fuel source (the LPG tank) with a mounting device.



Ex. 1013, FIG. 3 (Emphasis Added)



Ex. 1013, FIG. 3 (Emphasis Added).



Ex. 1013, FIG. 3 (Emphasis Added).

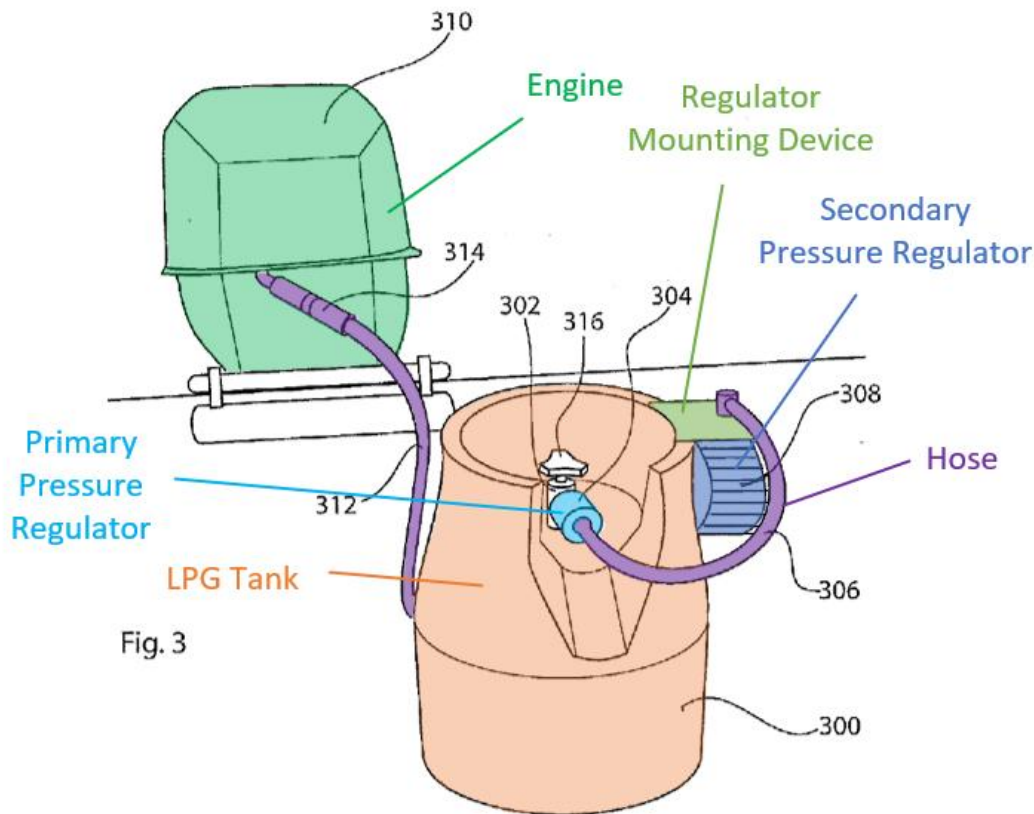
[0263]. Thus, a POSA would understand that Parlatore teaches a “regulator mounting device fixed to the pressurized fuel source; and at least the secondary pressure regulator is mounted on the regulator mounting device.”

9. **Claim 19: “The dual fuel generator and fuel delivery system of claim 18 wherein the primary pressure regulator is mounted on the regulator mounting device.”**

[0264]. The combination of DuroMax, Elsdon, and Parlatore teaches the limitations of independent claim 14. *Supra*, §VII.B.4. Parlatore discloses the additional limitations of dependent claim 19.

[0265]. Parlatore discloses that “the primary regulator 304 may be connected to the secondary regulator 308 by a hose 306, pipe, tube or the like.” Ex. 1013, [0021]. Parlatore also discloses that “the LPG tank 300 may be coupled with any conduit described herein, such as high pressure hoses, rigid tubes, pipes and the like in any desired manner, such as a screw fitting. Ex. 1013, [0024].

[0266]. A POSA would understand that a rigid pipe can connect the primary pressure regulator to the secondary regulator, which is disclosed in Parlatore as being mounted on the regulator mounting device (*see* §VII.B.8) to mount the primary pressure regulator on the regulator mounting device via the rigid connection between the primary pressure regulator and mounting device.



Ex. 1013, FIG 3 (Annotated)

[0267]. Parlatore also discloses that the primary and secondary regulators can be combined as a single, two-stage regulator, in which case, the primary pressure regulator would also be mounted onto the LPG tank. *Id.*, ¶ [0018]. Thus, a POSA would understand that Parlatore discloses a “*primary pressure regulator is mounted on the regulator mounting device.*”

10. **Claim 20:** “The dual fuel generator and fuel delivery system of claim 19 wherein the regulator mounting device is configured to attach onto a collar of a pressurized fuel container of the pressurized fuel source so that the primary and secondary pressure regulators are positioned adjacent each other along an outer periphery of the collar.”

[0268]. Parlatore also discloses the primary and secondary regulators can be combined as a single, two-stage regulator, in which case, the dual stage regulator would be mounted on the collar. Ex. 1013, [0018]. In this arrangement,

the primary and secondary pressure regulators would be positioned adjacent each other along an outer periphery of the collar.

[0269]. Thus, a POSA would understand that Parlatore discloses a “regulator mounting device is configured to attach onto a collar of a pressurized fuel container of the pressurized fuel source so that the primary and secondary pressure regulators are positioned adjacent each other along an outer periphery of the collar.”

11. Claim 21: “The dual fuel generator and fuel delivery system of claim 14 wherein: the fuel regulator system comprises a dual stage pressure regulator; and the primary and secondary pressure regulators are integral components of the dual stage pressure regulator.”

[0270]. The combination of DuroMax, Elsdon, and Parlatore teaches the limitations of independent claim 14. *Supra*, §VII.B.4. Parlatore discloses the additional limitations of dependent claim 21.

[0271]. Parlatore states that “the regulator arrangement of the primary regulator 106 and the secondary regulator 110 may be such that they are combined as a single, two-stage, regulator 202 would then feed the vaporized propane into carburetor 114 through hose 112.” Ex. 1013 [0018].

[0272]. Thus, a POSA would understand that the combination of DuroMax, Parlatore, and Elsdon, discloses a “fuel regulator system comprises a

dual stage pressure regulator; and the primary and secondary pressure regulators are integral components of the dual stage pressure regulator.”

C. Ground 3A/3B: Hallberg Anticipates Claims 1, 6, and 7 (Ground 3A) and Renders Obvious Claims 2, 8, 12, and 13 (Ground 3B).

[0273]. Petitioners include Grounds 3A/B showing how even under Patent Owner’s apparent construction, claims 1, 6 and 7 of the ‘895 Patent are anticipated by Hallberg (Ex. 1014) under §102, and claims 2, 8, 12, and 13 and 15 are rendered obvious by Hallberg under §103.

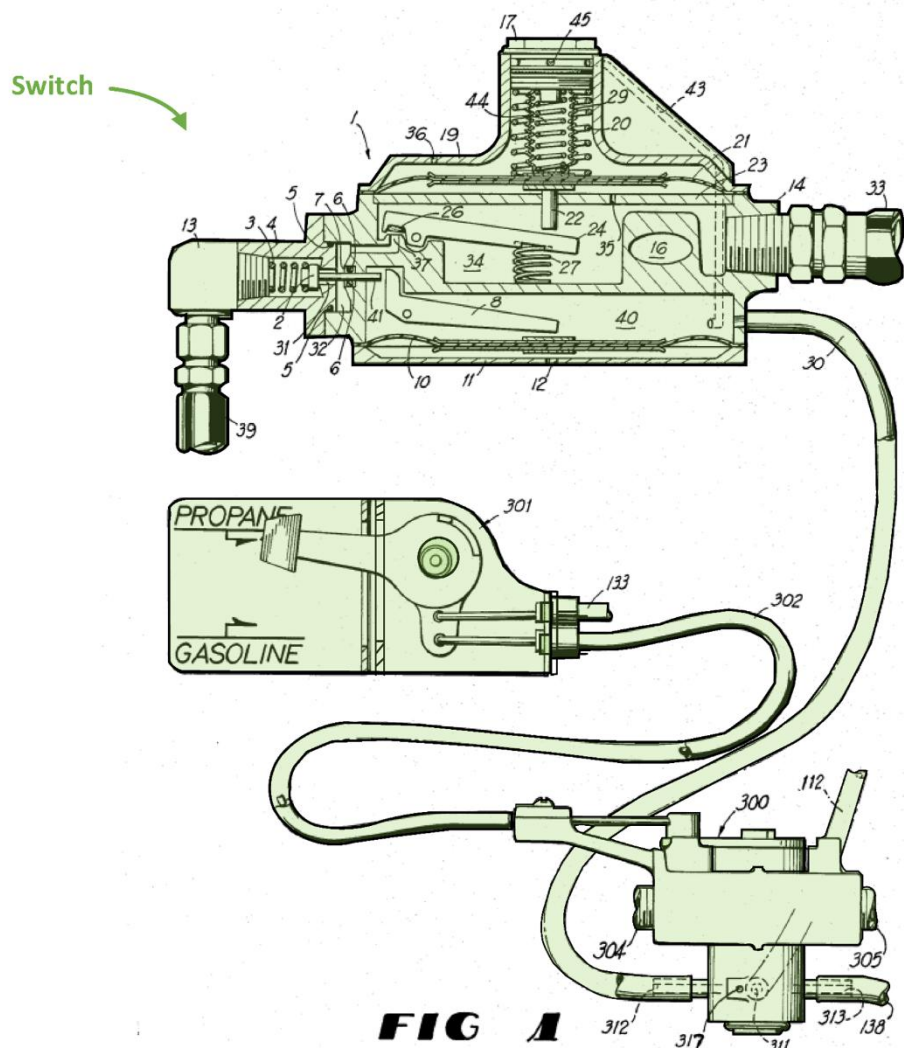
1. Independent Claim 1

a. Element [1.0]: “A mechanical fuel lockout switch for a dual fuel engine comprising:”

[0274]. To the extent the preamble is limiting, Hallberg discloses [1.0].

[0275]. Hallberg discloses a system which may be used with conventional internal combustion engines...to permit alternative utilization of a liquified gas fuel...such as propane...and a liquid fuel...such as gasoline. Ex. 1014, 3:49–55. The system includes a mechanical fuel lockout switch comprising a fluid dual valve control 301, a liquified-to-gaseous fuel converter 1, and a fluid dual valve structure 300. *Id.*, 7:5–6, 7:27–29.

[0276]. As shown in FIG. 1 (below), the liquified-to-gaseous fuel converter and fluid dual valve structure are controlled by a fluid dual valve control 301 having a gasoline and propane position. *Id.*, 7:27–29, Fig. 1.



Ex. 1014, FIG. 1 (Annotated).

[0277]. A POSA would have therefore understood Hallberg teaches a mechanical fuel lockout switch for a dual fuel engine.

- b. **Element [1.1]: “a mechanical fuel valve actuatable between a first position and a second position to selectively control fuel flow to the dual fuel engine from a first fuel source through a first fuel line and a second fuel source through a second fuel line,”**

[0278]. Hallberg discloses [1.1].

[illegible]

[0280]. Positioning of control 301 in “gasoline” (i.e., a first fuel source) mode acts through control cable 302 to rotate spool 306 within valve body 307 such that gasoline from gasoline supply line 304 is supplied to the carburetor 110 and the flow of propane (i.e., a second fuel source) is locked out. *Id.*, 7:27–40. As shown in FIG. 10 below, when the mechanical fuel valve is in gasoline mode,

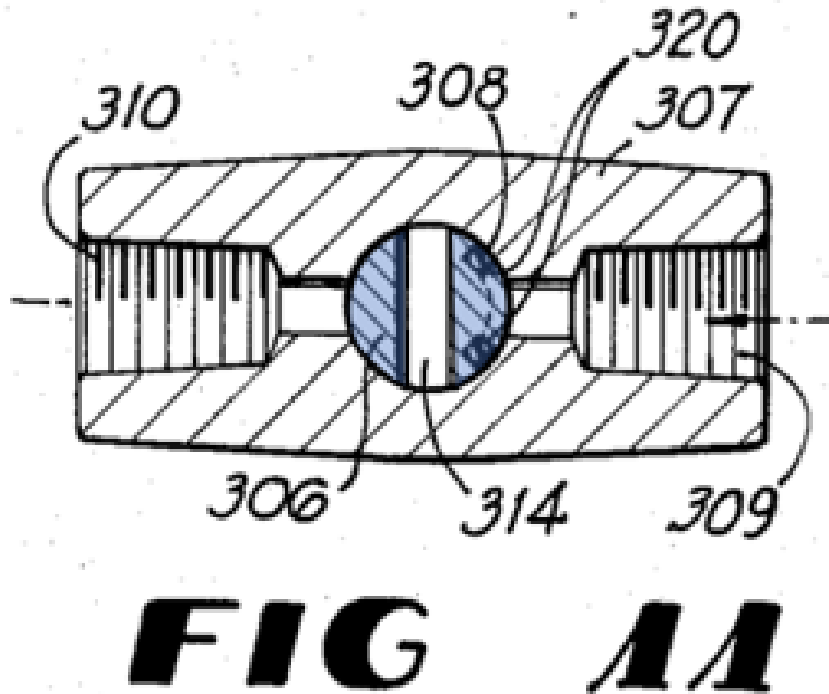
314. *Id.*, 7:40–43.

Ex. 1014, FIG. 10 (Annotated).

Petitioner MWE Investments, LLC, et al.
Exhibit 1003, Page 143

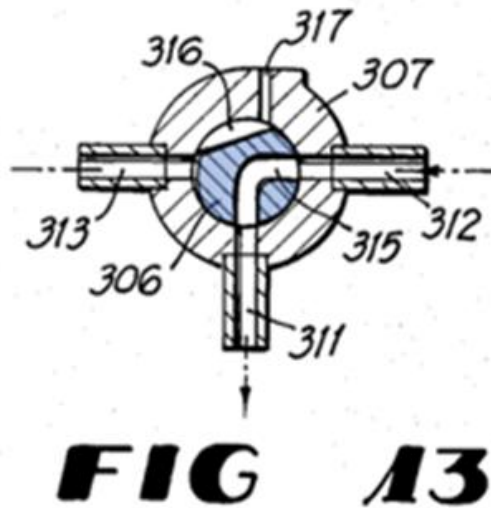
between spool 306 and valve body 307 around liquid inlet opening 309. Ex.1014, 8:3–7.

[0283]. Forming a seal between the spool 306 and valve body 307, prohibits the flow of gasoline to conventional carburetor 110. *Id.*, 8:7–10.



Ex. 1014, FIG. 11 (Annotated).

[0284]. However, as shown in FIG. 13 (below), during “propane” mode operation, duct 315 within spool 306 is simultaneously aligned to communicate with vacuum inlet port 311 and first vacuum outlet port 312. *Id.*, 8:23–26, Fig. 13. Communicating vacuum inlet port 311 with the first vacuum outlet port 312 connects converter vacuum line 30 (shown in FIG. 1) to the intake manifold, via intake manifold line 112. *Id.*, 8:26–30.



Ex. 1014, FIG. 13 (Annotated)

[0285]. When the engine is started, a vacuum is created in line 30, urging diaphragm 10 upward against liquid inlet lever 8. *Id.*, 8:31–38. Actuating inlet lever 8 drives inlet valve shaft 41 against bias spring 3 which opens liquid inlet valve 2 allowing propane to flow through the propane fuel line to the engine. *Id.*, 8:38–42.

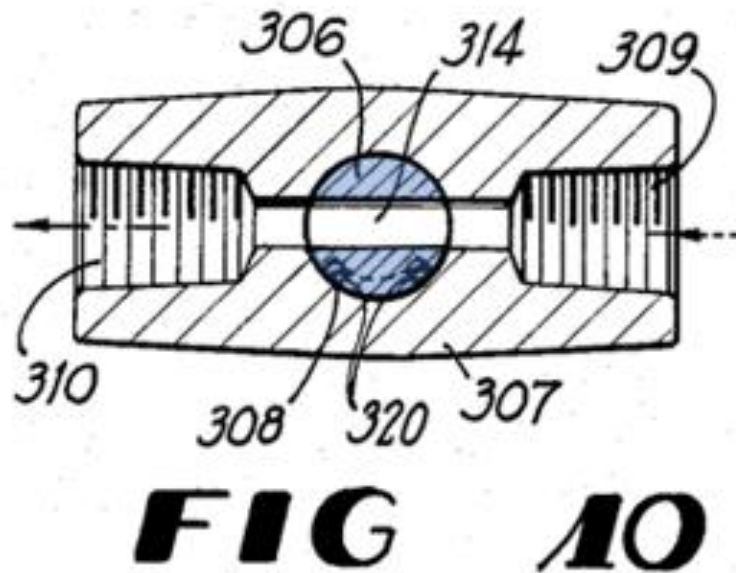
[0286]. A POSA would have thus understood that when the mechanical fuel valve is in propane mode, it is actuatable in a second position to selectively control fuel flow to the dual fuel engine from a second fuel source through a second fuel line.

[0287]. Together, POSA would have thus understood that Hallberg discloses a mechanical fuel valve actuatable between a first position (e.g., gasoline) and a second position (e.g., propane) to selectively control fuel flow to

the dual fuel engine from a first fuel source through a first fuel line and a second fuel source through a second fuel line.

c. Element [1.2]: “the mechanical fuel valve configured to: allow communication between the first fuel source and the dual fuel engine and prevent communication between the second fuel source and the dual fuel engine while in the first position, and prevent communication between the first fuel source and the dual fuel engine while in the second position”

[0288]. Hallberg discloses [1.2]. Hallberg discloses that when gasoline (i.e., a first fuel source) is selected on the fluid dual valve control 301, spool 306, within valve body 307, is rotated such that gasoline from gasoline supply line 304 is supplied to the carburetor 110 through engine gasoline line 305. Ex. 1014, 7:27–44. As shown in FIG. 10 below, when gasoline is selected, gasoline is communicated through inlet opening 309, tunnel 314 and liquid outlet opening 310.



Ex. 1014, FIG. 10 (Annotated).

[0289]. During gasoline mode, the fuel lockout apparatus prevents the flow of propane (i.e., a second fuel source) to the internal combustion engine.

Infra, §VII.C.1.d. A POSA would have therefore understood that when the mechanical fuel valve is in the first position, the mechanical fuel lockout switch communicates the first fuel source to the dual fuel engine and prevents communication between the second fuel source and the dual fuel engine.

[0290]. When propane (i.e., a second fuel source) mode is selected on the fluid dual valve control 301, propane is provided to the dual fuel engine. Ex. 1014, 7:27–44.

[0291]. As described in §VII.C.1.d., *supra* and §VII.C.1.d, *infra* when propane mode is selected, spool 306 is rotated within valve body 307 to form a seal

to prevent the flow of gasoline to the engine and a vacuum is created in line 30, urging diaphragm 10 upward against liquid inlet lever 8 which drives inlet valve shaft 41 against bias spring 3 which opens liquid inlet valve 2 allowing propane to flow through the propane fuel line to the engine.

[0292]. A POSA would have therefore also understood when the mechanical fuel valve is in a second position, the mechanical fuel lockout switch communicates the second fuel source to the dual fuel engine and interrupts the first fuel source communication with the dual fuel engine.

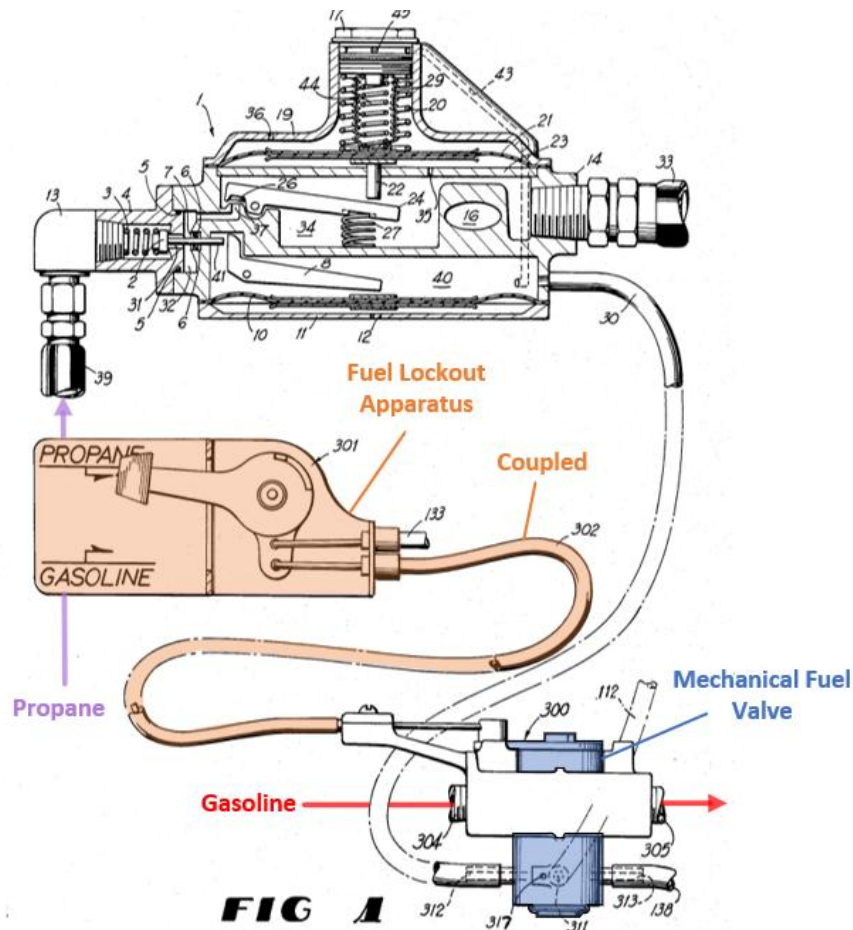
[0293]. Accordingly, a POSA would have understood that Hallberg teaches the limitations of [1.2].

d. Element [1.3]: “and a fuel lockout apparatus coupled to the mechanical fuel valve”

[0294]. Hallberg discloses [1.3]. Hallberg discloses a mechanical fuel valve. *Supra*, §VII.C.1.b. Hallberg also discloses a fuel lockout apparatus coupled to the mechanical fuel valve (fluid dual valve structure 300), the fuel lockout apparatus being configured to perform the function described in element [1.4]. *Supra*, §VII.C.1.e.

[0295]. Hallberg discloses a fuel lockout apparatus comprising fluid dual value control 301 and control cable 302. Ex. 1014, 7:27–44. As shown in FIG. 1 (below), the fuel lockout apparatus comprising fluid dual value control 301 and control cable 302 is coupled to fluid dual valve structure 300. Ex. 1014, 7:30–

36, 8:3–9. Positioning control 301 in the “gasoline” mode acts through control cable 302 to permit gasoline to flow through fluid dual valve structure 300, and to lock out propane from flowing through the propane fuel line to the engine. *Supra*, §VII.C.1.b. Positioning control 301 in the “propane” mode acts through control cable 302 to permit propane to flow through the propane fuel line to the engine, and to lock out gasoline from flowing through fluid dual valve structure 300. *Id.*

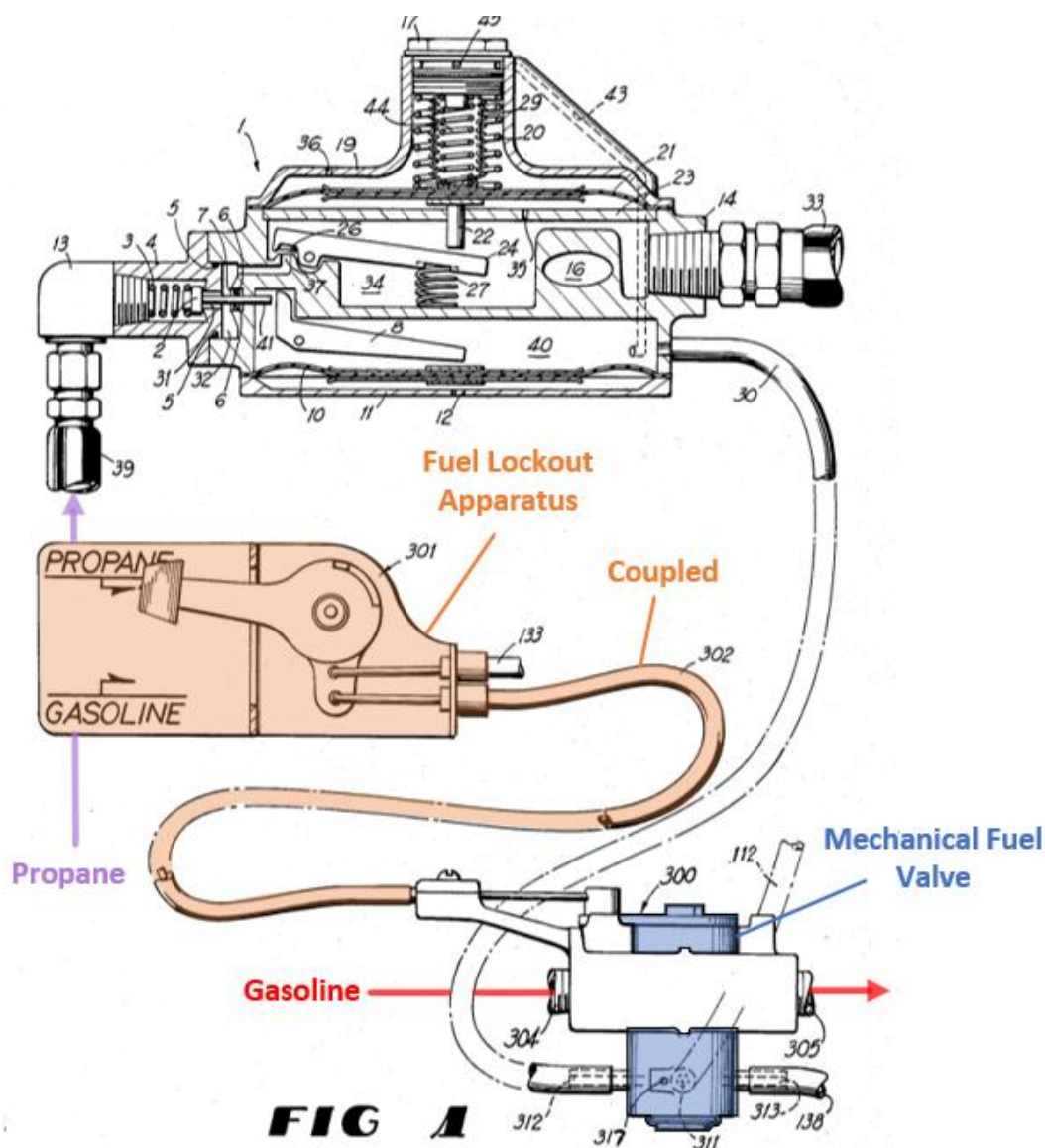


Ex. 1014, FIG. 1 (Annotated).

[0296]. A POSA would understand that the components of the fuel lockout apparatus (fluid dual valve control 302 and control cable 302) can be

actuated and/or engaged to allow propane to flow through propane supply line 39 to the internal combustion engine. A POSA would have also understood that if the components of the fuel lockout apparatus are not actuated and/or engaged, propane is not supplied to the dual fuel generator.

[0297]. As shown in FIG. 1 (below), control cable 302 couples the fuel lockout apparatus comprising fluid dual value control 301 and control cable 302 to the mechanical fuel valve. Without control cable 302, the fluid dual valve control 301 would be unable to rotate spool 306 within the valve body 307. Ex. 1014, 7:30–33.



Ex. 1014, FIG. 1 (Annotated).

[0298]. Accordingly, a POSA would have understood that Hallberg teaches a fuel lockout apparatus coupled to the mechanical fuel valve.

- e. **Element [1.4]: “and configured to: prevent the second fuel source from coupling to the second fuel line while the mechanical fuel valve is in the first position, and permit the second fuel source to couple to the second**

fuel line while the mechanical fuel valve is in the second position.”

[0299]. Hallberg discloses [1.4]. Hallberg discloses a fuel lockout apparatus comprising fluid dual value control 301 and control cable 302. *Supra* §VII.C.1.d.

[0300]. The fluid dual valve control 301 and control cable 302 can be actuated and/or engaged to allow either gasoline or propane to flow to the internal combustion engine. *Id.* Positioning control 301 in gasoline mode, acts through control cable 302, to rotate spool 306 within valve body 307 to permit gasoline (a first fuel) to flow through fluid dual valve structure 300 (a mechanical fuel valve) and lock out propane (a second fuel) from flowing through the propane fuel line to the engine. *Supra* §VII.C.1.b.

[0301]. A POSA would have understood that the fluid dual valve control 301 and control cable 302 is therefore a fuel lockout apparatus configured to prevent a second fuel source from coupling to the second fuel line while the mechanical fuel valve is in the first position.

[0302]. Positioning control 301 in propane mode, acts through control cable 302, to rotate spool 306 within valve body 307, to create a vacuum in line 30, which opens liquid inlet valve 2, allowing propane to flow through the propane fuel line to the engine. Ex. 1014, 8:38–42. A POSA would have understood that the fuel lockout apparatus therefore is configured to permit the second fuel source

to couple to the second fuel line while the mechanical fuel valve is in the second position.

[0303]. Accordingly, a POSA would understand that the fuel lockout apparatus of Hallberg prevents the mechanical fuel valve from coupling the second fuel source when the mechanical fuel valve is in the first position and permits the second fuel source to couple with the second fuel line when the mechanical fuel valve is in the second position.

2. Claim 2: “The mechanical fuel lockout switch of claim 1 wherein the fuel lockout apparatus prevents actuation of the mechanical fuel valve to the first position when the second fuel source is in communication with the dual fuel engine.”

[0304]. Hallberg teaches and/or suggests claim 2.

[0305]. Hallberg discloses that the fuel lockout apparatus prevents actuation of the mechanical fuel valve to the first position when the second fuel source communicates with the dual fuel engine.

[0306]. As described in §VII.C.1.e, *supra*, a POSA would have understood that operation of the mechanical fuel valve and the fuel lockout apparatus is interconnected such that only one fuel can be communicated to the engine at one time.

[0307]. A POSA would have therefore looked to the fuel lockout apparatus and mechanical fuel valve of Hallberg to render this limitation obvious.

[0308]. As shown in FIG. 12, positioning of control 301 in the “gasoline” mode acts through control cable 302 to rotate spool 306 within valve body 307 such that converter vacuum line 30 (communicating with first vacuum outlet port 312) is open to the atmosphere through notch 316 between first vacuum outlet port 312 and vent 317. Ex. 1014, 7:30–38. In this configuration, no vacuum is provided to vacuum line 30.

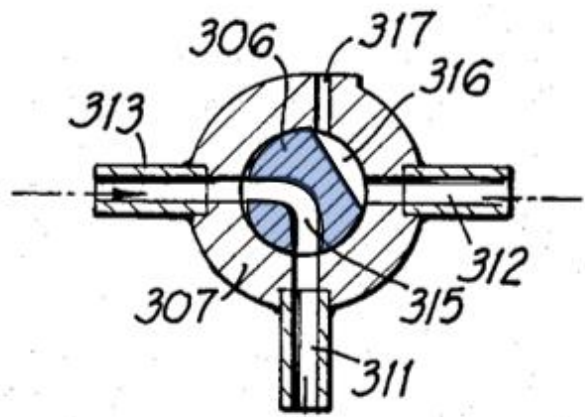


FIG 12

Ex. 1014, FIG. 12 (Annotated).

[0309]. As described in §§VII.C.1.b and VII.C.1.d, *supra*, when propane mode is engaged, spool 306 is rotated within valve body 307 to form a seal between spool 306 and valve body 307. When the spool 306 is rotated, vacuum inlet port 311 and vacuum outlet port 312 are aligned to provide vacuum, via vacuum line 30, to the fuel lockout apparatus to open liquid inlet valve 2.

[0310]. A POSA would have understood that when propane is communicated to the engine and vacuum is provided to the fuel lockout apparatus via vacuum line 30, the rotatable spool cannot be in a gasoline position as it is well known in the art that when a valve is in a first position, it cannot be in a second position.

[0311]. The fuel lockout apparatus therefore prevents actuation of the mechanical fuel valve to a first position. Accordingly, a POSA would have understood that Hallberg teaches and/or suggests a fuel lockout apparatus that prevents actuation of the mechanical fuel valve to the first position when the second fuel source communicates with the dual fuel engine as recited in claim 2.

3. Claim 6: “The mechanical fuel lockout switch of claim 1 wherein the mechanical fuel valve and the fuel lockout apparatus operate together to ensure that fuel from the first fuel source and fuel from the second fuel source are not simultaneously delivered to the dual fuel engine.”

[0312]. Hallberg discloses claim 6. Hallberg discloses a mechanical fuel valve actuatable between a first position and a second position to selectively control fuel flow to the dual fuel engine from a first fuel source and a second fuel source. *Supra*, §VII.C.1.b.

[0313]. Hallberg also discloses a fuel lockout apparatus configured to prevent the second fuel source from coupling to the second fuel line while the mechanical fuel valve is in the first position and permit the second fuel source to

couple to the second fuel line while the mechanical fuel valve is in the second position. *Supra*, §VII.C.1.e.

[0314]. The fuel lockout apparatus also prevents actuation of the mechanical fuel valve to the first position when the second fuel source communicates with the dual fuel engine. *Supra*, §VII.C.1.e.

[0315]. A POSA would have thus understood that the mechanical fuel valve and fuel lockout apparatus “function with each other” to ensure that the first fuel and the second fuel are not simultaneously delivered to the dual fuel engine.

[0316]. Accordingly, a POSA would have understood that Hallberg teaches wherein the mechanical fuel valve and the fuel lockout apparatus operate together to ensure that fuel from the first fuel source and fuel from the second fuel source are not simultaneously delivered to the dual fuel engine as recited in claim 6.

4. **Claim 7: “The mechanical fuel lockout switch of claim 6 wherein the mechanical fuel valve is configured to: provide liquid fuel from a liquid fuel tank of the first fuel source to the dual fuel engine while in the first position, and provide gaseous fuel from a pressurized fuel container of the second fuel source to the dual fuel engine while in the second position.”**

[0317]. Hallberg teaches the limitations of claim 7. Hallberg discloses that gasoline is provided to the dual fuel engine by way of the carburetor. *See Ex. 1014*, 7:36–43 (“gasoline from gasoline supply line 304 is supplied to the

carburetor 110 through engine gasoline line 305.”). Propane is supplied to the dual fuel engine by way of the mixer. *Id.*, 8:56–60 (“the mixer 100 admits pressurized gaseous fuel to the engine.”). The propane is stored in a pressurized fuel tank. *Id.*, 1:54–58 (“[l]iquified petroleum gas, propane and the other “gaseous” fuels with which the present invention is intended to be used are normally held for use in a reservoir or tank under sufficient pressure and at a temperature such that the fuels are in a liquid state.”).

[0318]. Accordingly, a POSA would have understood that the first fuel source provides liquid fuel from a liquid fuel tank to the dual fuel engine and the second fuel source provides gaseous fuel from a pressurized fuel container to the dual fuel engine.

5. Independent Claim 8

a. Element [8.0]: “A mechanical fuel lockout switch for a dual fuel engine comprising:”

[0319]. Hallberg teaches the limitations of [8.0] for at least the same reasons as [1.0]. *Supra*, §VII.C.1.a.

b. Element [8.1]: “a mechanical fuel valve actuatable between a first position and a second position to selectively control fuel flow to the dual fuel engine from a first fuel source through a first fuel line and a second fuel source through a second fuel line, the mechanical fuel valve configured to:”

[0320]. Hallberg teaches the limitations of [8.1] for at least the same reasons as [1.1]. *Supra*, §VII.C.1.b.

- c. **Element [8.2]: “allow communication between the first fuel source and the dual fuel engine and prevent communication between the second fuel source and the dual fuel engine while the first position, and”**

[0321]. Hallberg teaches the limitations of [8.2] for at least the same reasons as [1.2]. *Supra*, §VII.C.1.c.

- d. **Element [8.3]: “prevent communication between the first fuel source and the dual fuel engine while in the second position; and”**

[0322]. Hallberg teaches the limitations of [8.3] for at least the same reasons as [1.3]. *Supra*, §VII.C.1.d.

- e. **Element [8.4]: “a fuel lockout apparatus coupled to the mechanical fuel valve and configured to prevent actuation of the mechanical fuel valve to the first position when the second fuel source is in communication with the dual fuel engine.”**

[0323]. Hallberg teaches and/or suggests the limitations of [8.4] for at least the same reasons as claim 2. *Supra*, §VII.C.2.

6. Claims 12 and 13

[0324]. Claims 12 and 13 recite identical limitations as claims 6 and 7, respectively, changing only their ultimate dependence from claim 1 to claim 8. For example, claim 12 recites “[t]he mechanical fuel lockout switch of claim 8 wherein the mechanical fuel valve and the fuel lockout apparatus operate together to ensure

that fuel from the first fuel source and fuel from the second fuel source are not simultaneously delivered to the dual fuel engine.” Claim 13 recites “[t]he mechanical fuel lockout switch of claim 12 wherein the mechanical fuel valve is configured to: provide liquid fuel from a liquid fuel tank of the first fuel source to the dual fuel engine while in the first position, and provide gaseous fuel from a pressurized fuel container of the second fuel source to the dual fuel engine while in the second position.”

[0325]. Hallberg thus also teaches and/or suggests the limitations of claims 12 and 13 for at least the same reasons as claims 6 and 7. *Supra*, §§ VII.C.3, VII.C.4.

D. Ground 4: Claims 14, 15, 17-21 Are Obvious Over the Combination of Hallberg and Parlature in View of LP-Gas Handbook.

[0326]. Claims 14, 15, 17-21 of the '985 patent are obvious over Parlature in view of Hallberg under §103, as detailed below.

1. Motivation to Combine Parlature, Hallberg, and POSA's Reasonable Expectation of Success

[0327]. A POSA would have been motivated to use Parlature's off-board fuel regulator system with the Hallberg dual fuel system.

[0328]. The engine of Hallberg is configured to operate on gaseous fuel (propane) and on a liquid fuel (gasoline). Ex. 1014, 7:27–29, Fig. 1. Hallberg discloses an LPG regulator system but does not indicate whether the regulator

system is “off-board.” *Id.*, 6:65–7:8, 8:31–9:61. A POSA would have been motivated to use Parlature’s “off-board” regulator system shown in Figure 3 with a generator having Hallberg’s dual-fuel engine.

[0329]. Parlature discloses using its fuel delivery system with “any desired form of engine,” including an engine for generators. Ex.1013, [0025], [0019]. As discussed, it would have been obvious to a POSA to use Parlature’s fuel regulator system with a dual-fuel generator. *Supra*, §VII.B.4.c. Hallberg discloses an example of a dual-fuel engine that could be used with a generator.

[0330]. As discussed, a POSA would have been motivated to use Parlature’s offboard regulator system for use with a generator and would have had a reasonable expectation of success. *Supra* §VII.B.1. Moreover, the use of regulators with LPG tanks has been commonplace for decades.

2. Independent Claim 14

a. Element [14.0]

[0331]. To the extent the preamble is limiting, the combination of Parlature and Hallberg discloses a dual fuel generator in which either LPG or gasoline may be selected for operation of the generator.

b. Element [14.1]

[0332]. The combination of Parlature and Hallberg discloses [14.1].

[0333]. The engine of Hallberg is configured to operate on gaseous fuel (propane) and on a liquid fuel (gasoline). Ex. 1014, 7:27-29, Fig. 1. Hallberg discloses that the liquid fuel is supplied from a liquid fuel source through a liquid fuel line. *Id.*, 7:27–44, Fig. 1, Claim 17.

[0334]. Hallberg discloses an LPG regulator system but does not indicate whether the regulator system is “off-board.” Ex. 1014, 6:65–7:8, 8:31–9:61. A POSA would have been motivated to use Parlatore’s “off-board” regulator system shown in Figure 3 with a generator having Hallberg’s dual-fuel engine.

[0335]. Accordingly, a POSA would have understood that the combination of Parlatore and Hallberg teaches [14.1].

c. Element [14.2]

[0336]. Parlatore discloses [14.2]. *Supra*, §VII.B.4.c.

d. Element [14.3]

[0337]. Parlatore discloses [14.3]. *Supra*, §VII.B.4.d.

e. Element [14.4]

[0338]. Parlatore discloses [14.4]. *Supra*, §VII.B.4.e.

f. Element [14.5]

[0339]. The Hallberg discloses [14.5], for substantially the same reasons as limitation [1.1]. *Supra*, §VII.C.1.b.

[0340]. [14.5] is substantially identical to [1.1], specifying that the “first” fuel is liquid, and the “second” fuel is pressurized gas. *Supra*, §VII.B.4. Further, as discussed above concerning claim 7, a POSA would have understood that the first fuel source in Hallberg provides liquid fuel from a liquid fuel tank to the dual fuel engine and the second fuel source provides gaseous fuel from a pressurized fuel container to the dual fuel engine. *Supra*, §VII.C.4.

[0341]. A POSA would thus have understood that Hallberg discloses a mechanical fuel valve that is actuatable between a first position and a second position to selectively control fuel flow to the dual fuel generator from the liquid fuel source through the liquid fuel line and the pressurized fuel source through the gaseous fuel line.

g. Element [14.6]

[0342]. Hallberg discloses a fuel lockout apparatus comprising control 301 and control cable 302. Ex. 1014, 7:27–44. The fuel lockout apparatus (comprising control 301 and control cable 302) is coupled to fluid dual valve 300. Ex. 1014, 7:30–36, 8:3–9, Fig. 1. Positioning control 301 in the “gasoline” mode acts through control cable 302 to permit gasoline to flow through fluid dual valve 300, and to lock out propane from flowing to the dual-fuel engine. *Supra*, §VII.C.1.b. Positioning control 301 in the “propane” mode acts through control

cable 302 to permit propane to flow to the dual-fuel engine, and to lock out gasoline from flowing through fluid dual valve 300. *Id.*

[0343]. Thus, a POSA would have understood that Hallberg teaches [14.6].

h. Element [14.7]

[0344]. Hallberg teaches the limitations of [14.7] for at least the same reasons as [1.3]. *Supra*, §VII.C.1.d.

i. Element [14.8]

[0345]. Hallberg discloses [14.8], for substantially the same reasons as limitation [1.4]. *Supra*, §VII.C.1.e.

[0346]. [14.8] is substantially identical to [1.4], specifying that the “first” fuel is liquid, and the “second” fuel is pressurized gas. *Supra*, §VII.C.1.e. Further, as discussed above concerning claim 7, a POSA would have understood that the first fuel source in Hallberg provides liquid fuel from a liquid fuel tank to the dual fuel engine and the second fuel source provides gaseous fuel from a pressurized fuel container to the dual fuel engine. *Supra* §VII.C.4.

[0347]. A POSA thus would understand that Hallberg teaches [14.8].

3. Claim 15

[0348]. The combination of Parlatore and Hallberg teaches the limitations of claim 15 for at least the same reasons as claim 2 and [14.8].

§VII.C.2.

4. Claim 17

[0349]. Claim 17 depends from 14. The combination of Hallberg and Parlatore in view of LP-Gas Handbook teaches claim 14. *Supra*, §VII.D.

[0350]. FIG. 3 of Parlatore discloses an LPG tank 300 coupled to an engine 310 via: a primary regulator 304, a hose 306, a secondary pressure regulator 308, a hose 312, and a coupling 314. Ex. 1013, [0020]–[0021], and FIG. 3.

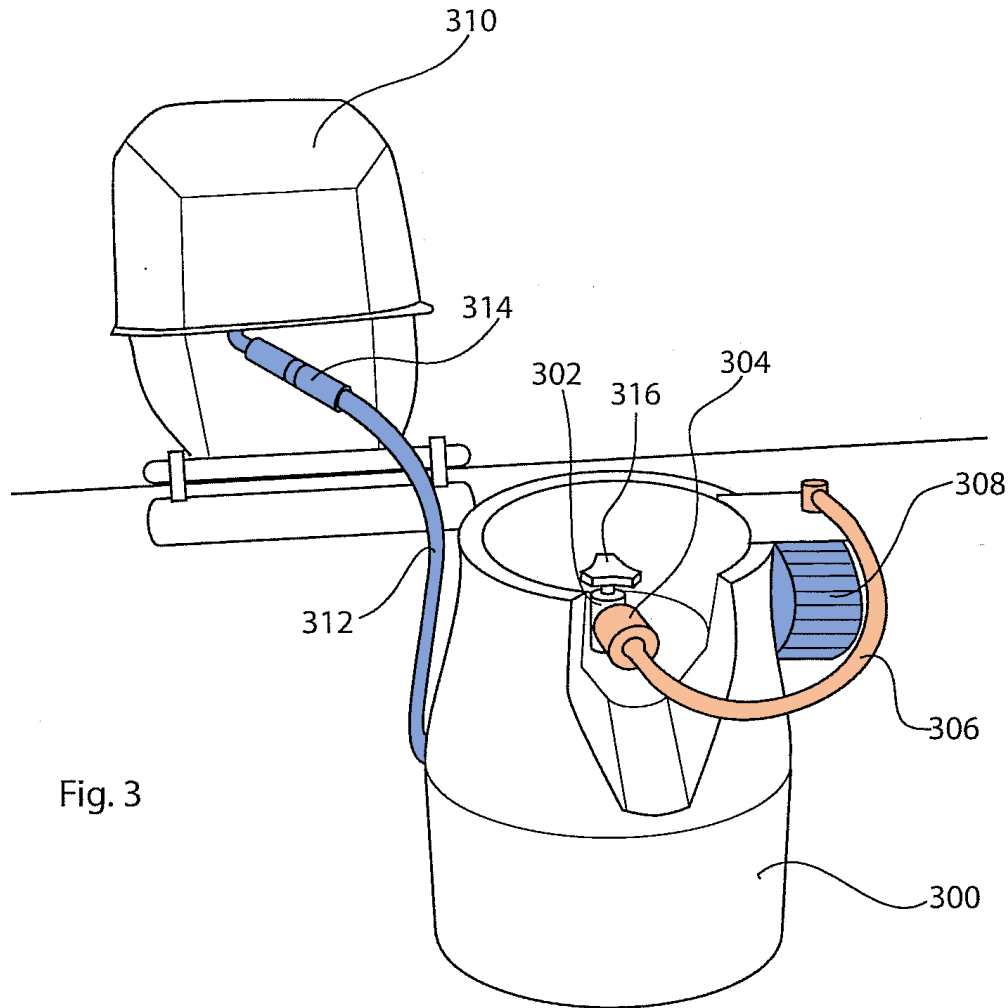


Fig. 3

Ex. 1013, Fig. 3.

[0351]. Parlature also discloses that a low pressure output of the secondary regulator 308 can be releasably attached to a propane carburetor. Ex. 1013, [0020]. The low pressure output can be attached to the propane carburetor through hose 312 and coupling 314. *Id.*

[0352]. Parlature does not explicitly disclose which type of hose coupling it uses. However, LP-Gas Handbook discloses the use of quick-connect couplings in LP-gas systems. Ex. 1005, p.40 (§3.3.62 commentary: “Quick

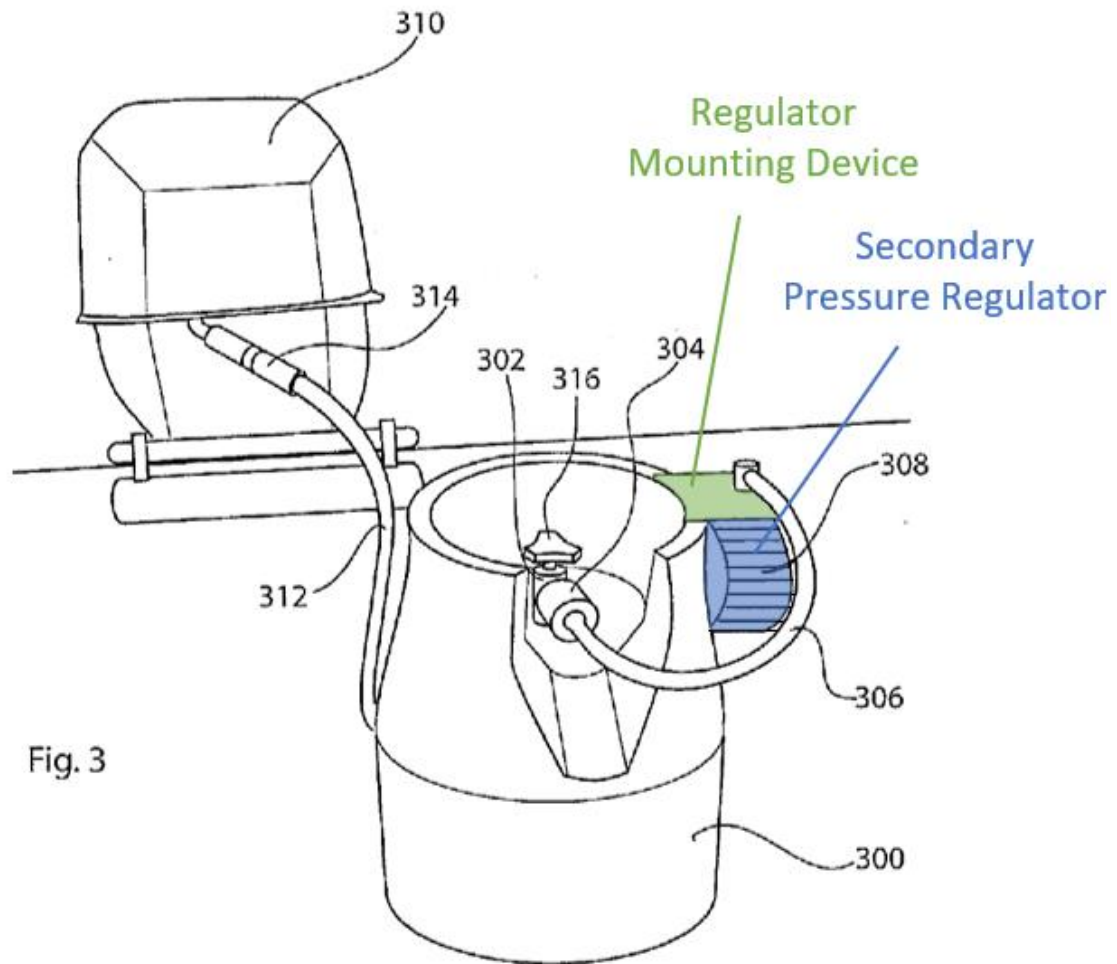
connectors are also used in other LP-Gas systems, such as those used for engine fuel refueling and cylinder filling, connecting cylinders to gas-fired barbecue grills, and connecting gas systems between two sections of mobile homes.”). It would have been obvious to a POSA to use a quick connector at the end of the Parlature hose (e.g., as coupling 314) in view of the teachings of LP-Gas Handbook.

[0353]. A POSA would therefore understand that the combination of Hallberg and Parlature in view of LP-Gas Handbook teaches claim 17.

5. Claim 18

[0354]. The combination of Hallberg and Parlature teaches claim 14. *Supra*, §VII.B.4. Parlature discloses the additional limitations of dependent claim 18.

[0355]. As shown in FIG. 3, Parlature discloses that the secondary pressure regulator is mounted to the pressurized fuel source (the LPG tank) with a mounting device.



Ex. 1013, FIG. 3 (Annotated)

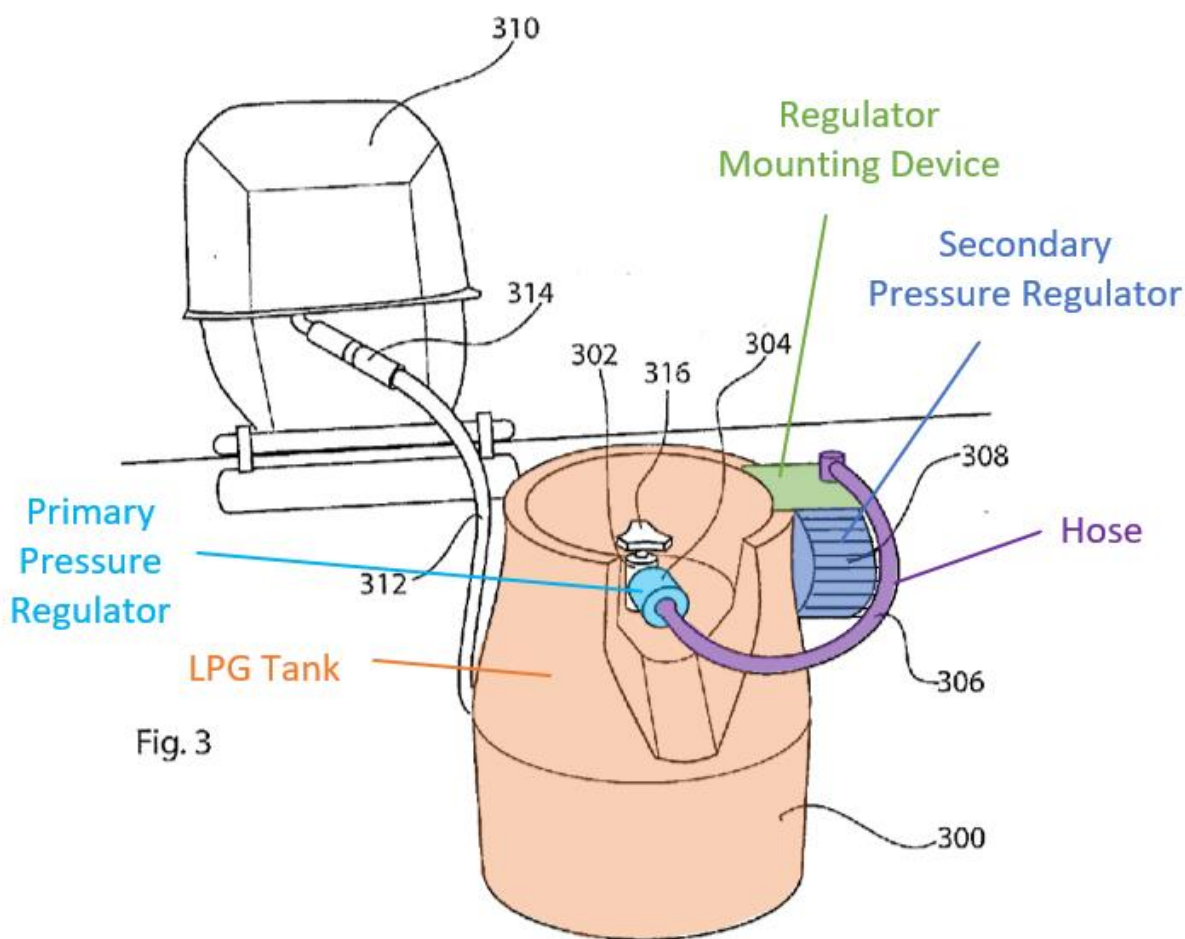
[0356]. Thus, a POSA would understand that the combination of Hallberg and Parlatore teaches claim 18.

6. Claim 19

[0357]. The combination of Hallberg and Parlatore teaches claim 14. *Supra*, §VII.D.2. Parlatore discloses the additional limitations of dependent claim 19.

[0358]. Parlatore discloses that “the primary regulator 304 may be connected to the secondary regulator 308 by a hose 306, pipe, tube or the like.”

Ex. 1013, [0021]. As shown in FIG. 3 (below) a hose connects the primary pressure regulator to the secondary regulator, which is disclosed in Parlatore as being mounted on the regulator mounting device, (*Supra*, §VII.B.8). The regulator mounting device mounts the secondary pressure regulator to the LPG tank.



Ex. 1013, FIG 3 (Annotated)

[0359]. Parlature also discloses a rigid pipe connecting the primary pressure regulator to the secondary regulator. *Supra*, §VII.B.8. The rigid pipe is mounted on the regulator mounting device and serves to mount the primary pressure regulator on the regulator mounting device via its connection to the secondary pressure regulator.

[0360]. Parlature also discloses that the primary and secondary regulators can be combined as a single, two-stage regulator. *Id.*, [0018]. A POSA would understand that the single, two-stage regulator can also be mounted onto the LPG tank. Thus, a POSA would understand that the combination of Hallberg and Parlature teaches claim 19.

7. Claim 20

[0361]. The combination of Hallberg and Parlature teaches claim 14. *Supra*, §VII.D.2. Parlature discloses the additional limitations of dependent claim 20. Parlature discloses the mounting device secures to the collar of the propane tank:

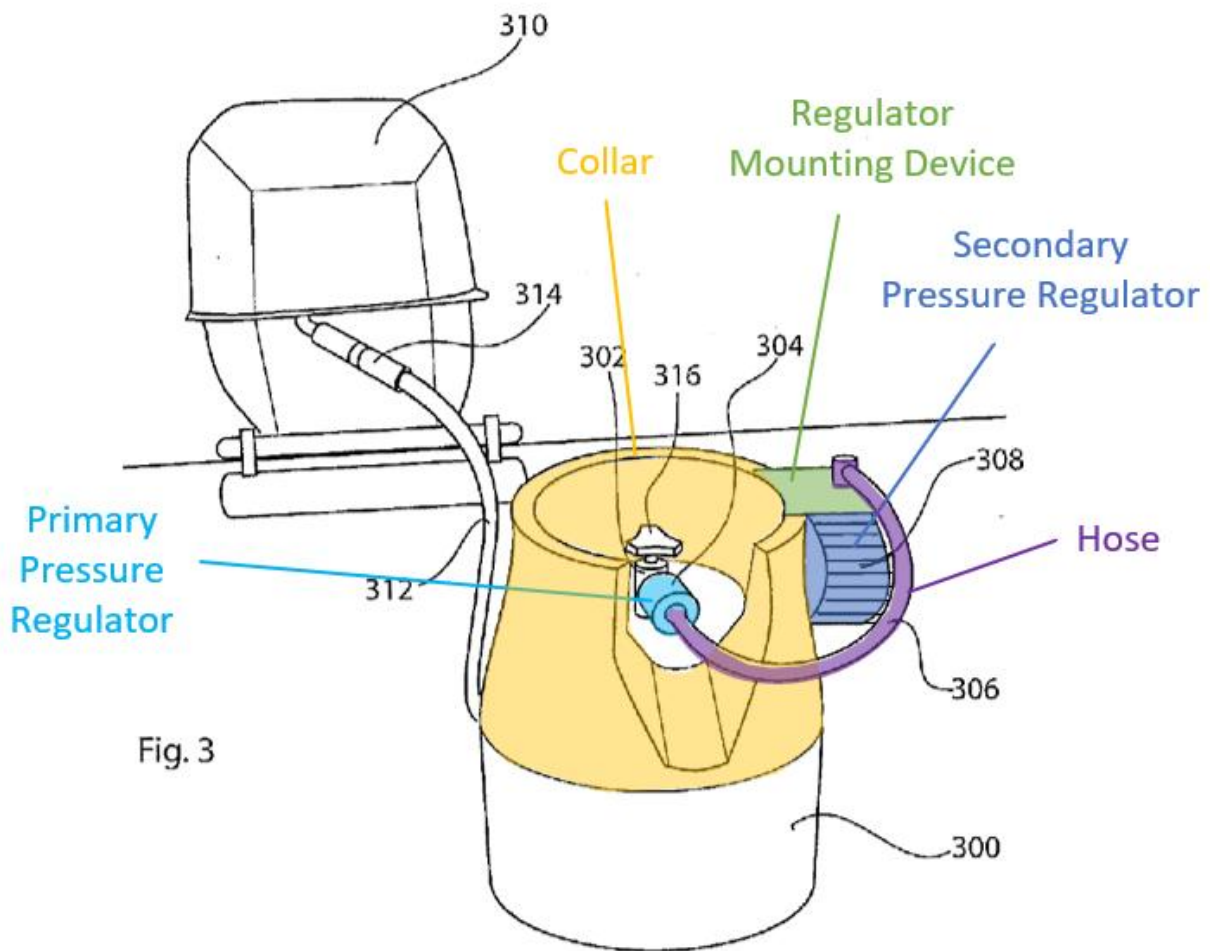


Fig. 3

Ex. 1013, FIG 3 (Annotated)

[0362]. Parlature also discloses the primary and secondary regulators can be combined as a single, two-stage regulator, in which case, the dual stage regulator would be mounted on the collar. Ex. 1013, [0018]. In this arrangement, the primary and secondary pressure regulators would be positioned adjacent each other along an outer periphery of the collar. Thus, a POSA would understand that the combination of Hallberg and Parlature teaches claim 20.

8. Claim 21

[0363]. The combination of Parlatore and Hallberg teaches the limitations of independent claim 14. *Supra*, §VII.D.2. Parlatore discloses the additional limitations of dependent claim 21.

[0364]. Parlatore states that “the regulator arrangement of the primary regulator 106 and the secondary regulator 110 may be such that they are combined as a single, two-stage, regulator 202 would then feed the vaporized propane into carburetor 114 through hose 112.” Ex.1013, [0018]. Thus, a POSA would understand that the combination of Parlatore and Hallberg teaches claim 21.

VIII. CONCLUSION

[0365]. In signing this Declaration, I recognize that the Declaration will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I also recognize that I may be subject to cross-examination in this proceeding. If required, I will appear for cross-examination at the appropriate time. I reserve the right to offer opinions relevant to the invalidity of the challenged claims and/or offer testimony in support of this Declaration.

[0366]. I hereby declare that all statements made herein of my own knowledge are true and that all statements are made on information and belief are believed to be true, and further that these statements were made with the

knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001.

EXHIBIT 1001

(12) **United States Patent**
Sarder et al.

(10) **Patent No.:** **US 11,905,895 B2**
(45) **Date of Patent:** ***Feb. 20, 2024**

(54) **DUAL FUEL LOCKOUT SWITCH FOR GENERATOR ENGINE**

(71) Applicant: **Champion Power Equipment, Inc.**,
Santa Fe Springs, CA (US)

(72) Inventors: **Mark J. Sarder**, Waukesha, WI (US);
Aleko D. Sotiriades, Cedarburg, WI (US); **James J. Dehn**, Brookfield, WI (US); **Leigh Jenison**, Hartland, WI (US)

(73) Assignee: **Champion Power Equipment, Inc.**,
Santa Fe Springs, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **18/183,734**

(22) Filed: **Mar. 14, 2023**

(65) **Prior Publication Data**

US 2023/0235707 A1 Jul. 27, 2023

Related U.S. Application Data

(63) Continuation of application No. 17/937,046, filed on Sep. 30, 2022, now Pat. No. 11,840,970, which is a continuation of application No. 16/783,455, filed on Feb. 6, 2020, now Pat. No. 11,492,985, which is a continuation of application No. 16/191,503, filed on Nov. 15, 2018, now Pat. No. 11,530,654, which is a continuation of application No. 14/738,060, filed on Jun. 12, 2015, now Pat. No. 10,221,780.

(51) **Int. Cl.**

F02D 19/06 (2006.01)

(52) **U.S. Cl.**

CPC **F02D 19/0613** (2013.01); **F02D 19/0605** (2013.01); **F02D 19/0647** (2013.01); **F02D 19/0673** (2013.01); **Y02T 10/30** (2013.01)

(58) **Field of Classification Search**

CPC F02D 19/0673; F02D 19/0647; F02D 19/0605; F02D 19/0613

See application file for complete search history.

(56)

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Primary Examiner — Kevin A Lathers

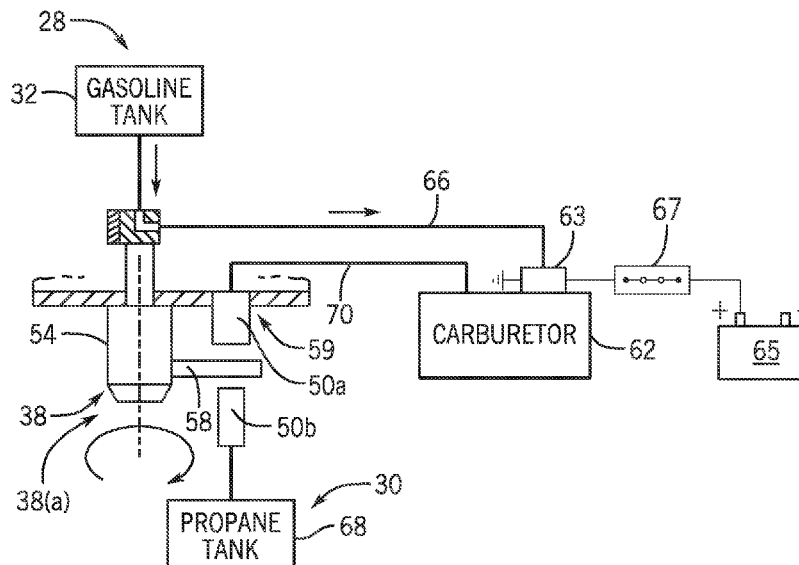
(74) *Attorney, Agent, or Firm* — Ziolkowski Patent Solutions Group, SC

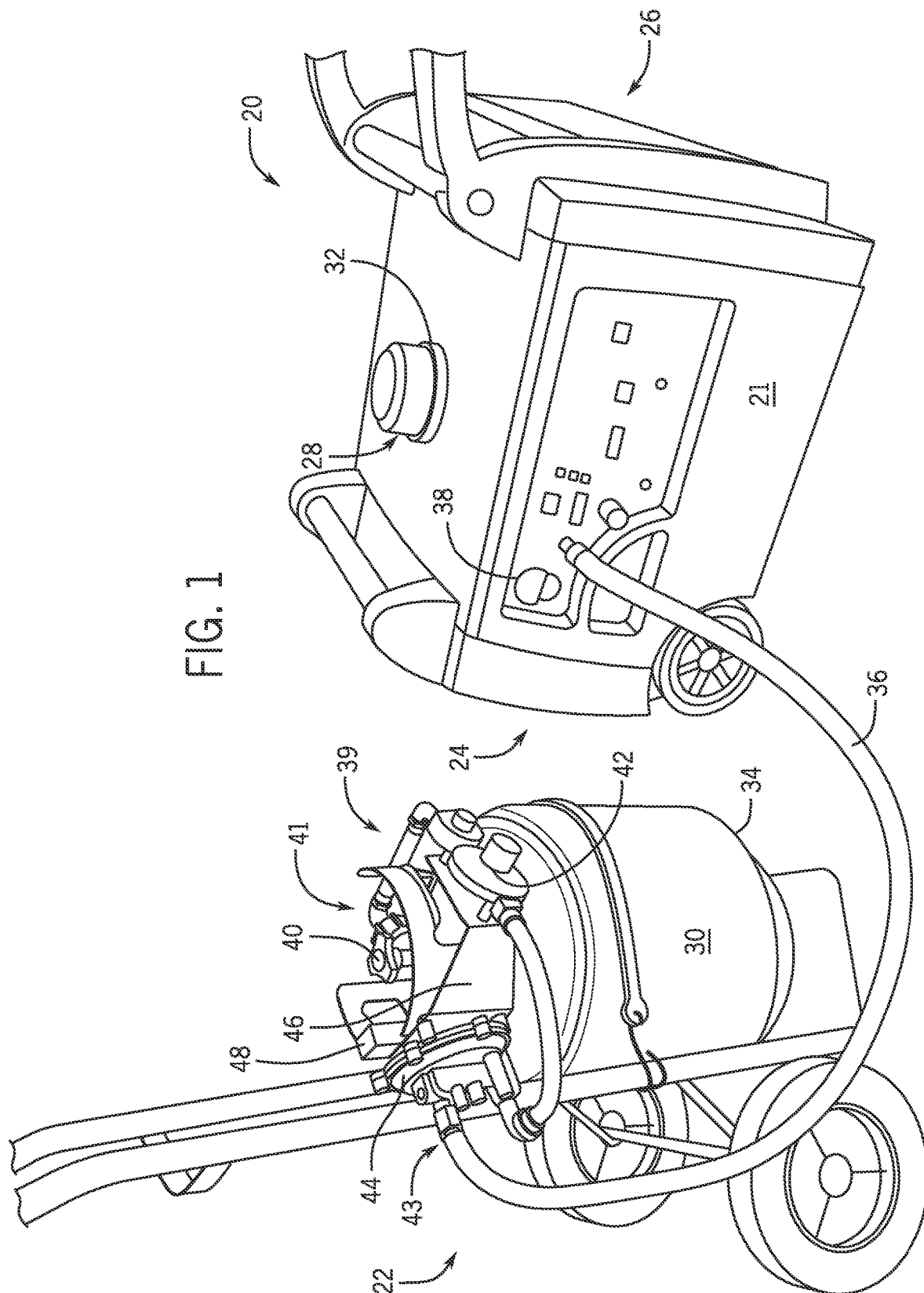
(57)

ABSTRACT

A mechanical fuel lockout switch for a dual fuel engine includes a mechanical fuel valve actuatable between a first position and a second position to selectively control fuel flow to the dual fuel engine from a first fuel source through a first fuel line and a second fuel source through a second fuel line. The mechanical fuel lockout switch may also include a fuel lockout apparatus coupled to the mechanical fuel valve. The mechanical fuel valve may be configured to allow communication between the first fuel source and the dual fuel engine and prevent communication between the second fuel source and the dual fuel engine while in the first position, and prevent communication between the first fuel source and the dual fuel engine while in the second position.

21 Claims, 5 Drawing Sheets





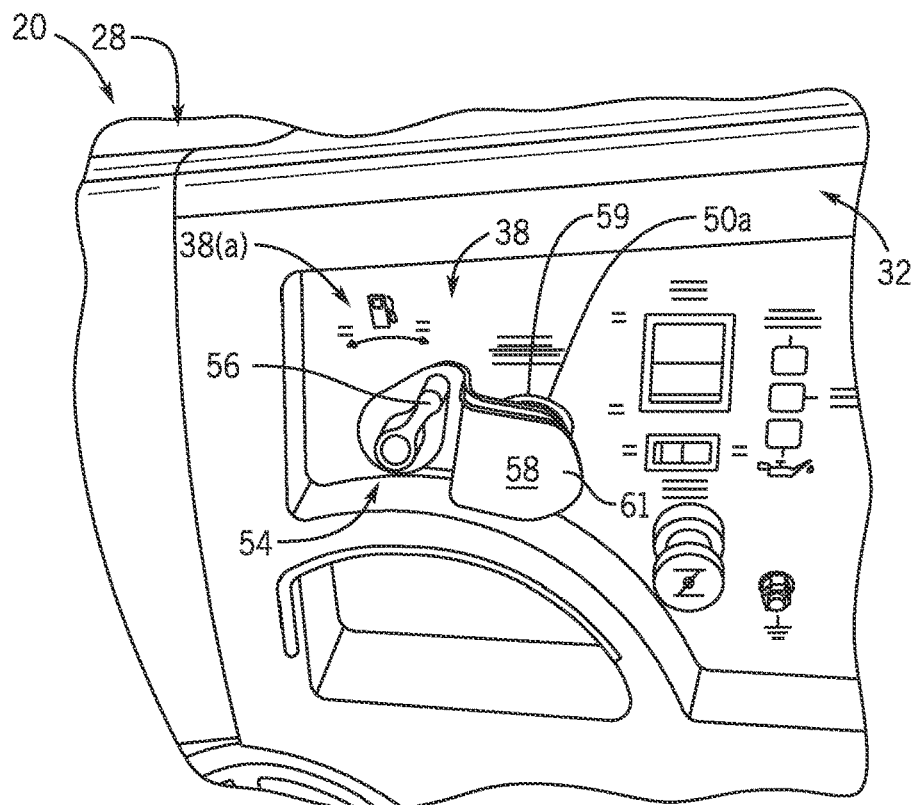


FIG. 2

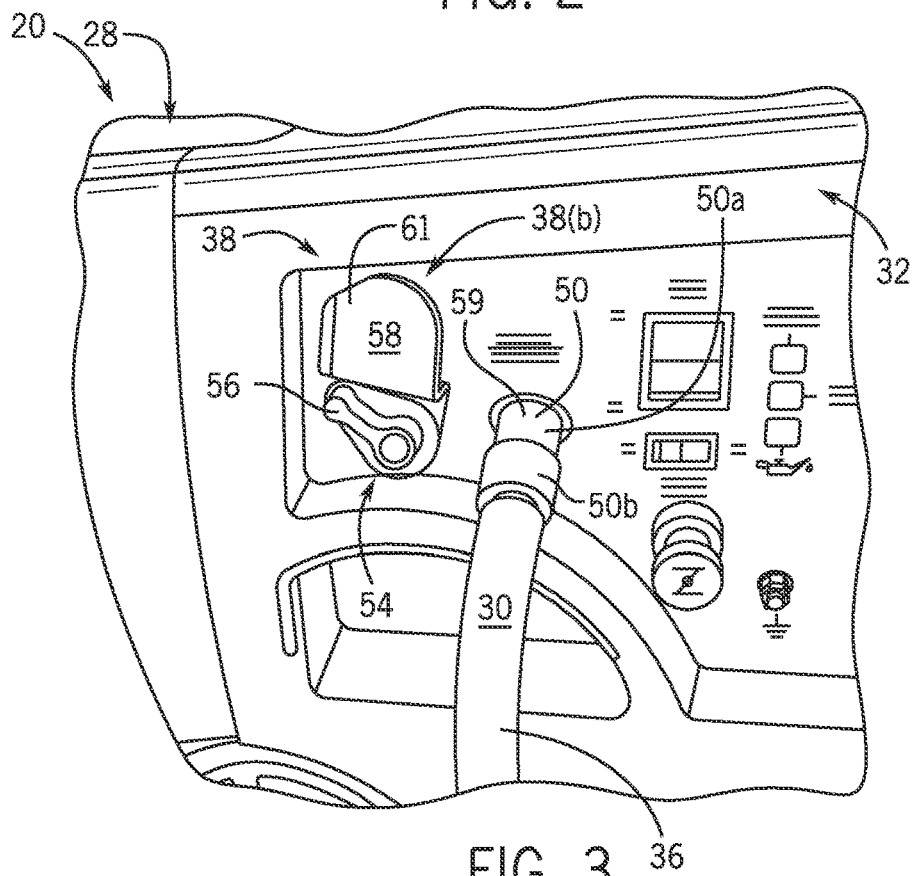


FIG. 3

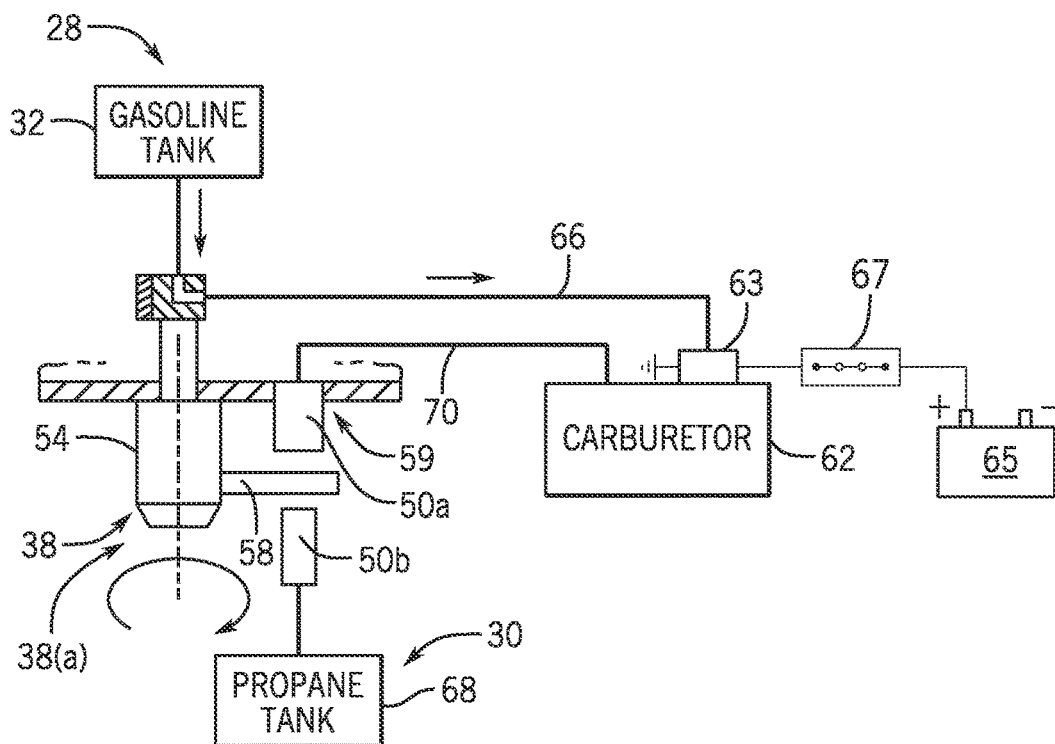


FIG. 4A

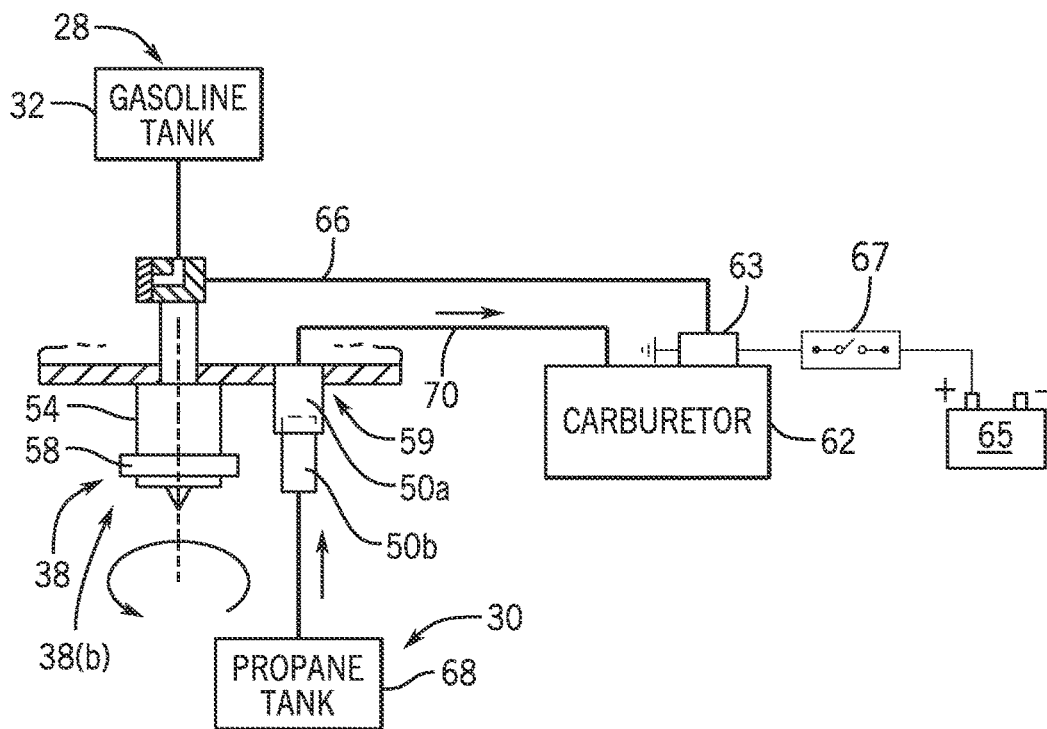


FIG. 4B

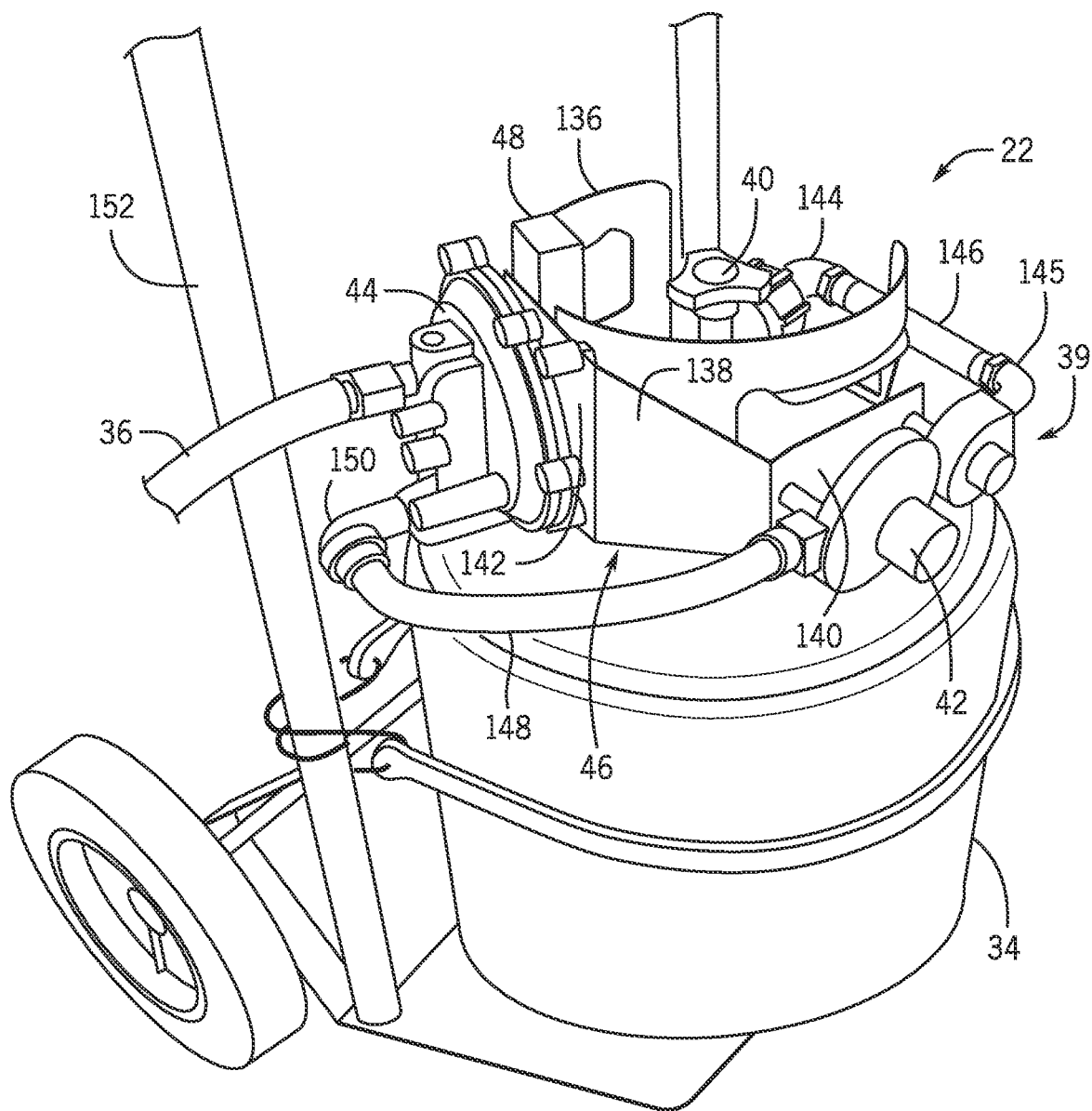


FIG. 5

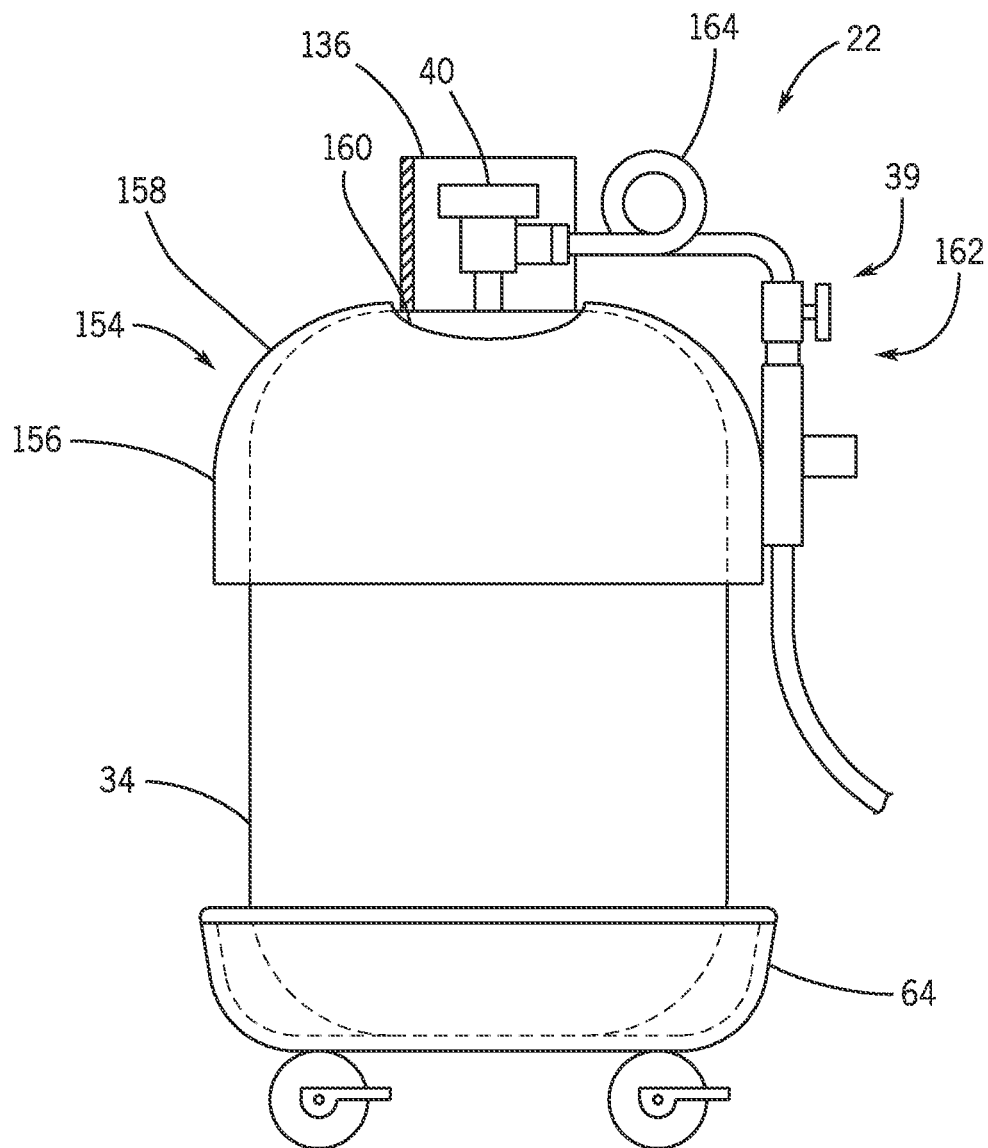


FIG. 6

1

**DUAL FUEL LOCKOUT SWITCH FOR
GENERATOR ENGINE****CROSS-REFERENCE TO RELATED
APPLICATION**

The present application is a continuation of, and claims priority to, U.S. patent application Ser. No. 17/937,046, filed on Sep. 30, 2022, which is a continuation of, and claims priority to, U.S. patent application Ser. No. 16/783,455, filed on Feb. 6, 2020, now U.S. Pat. No. 11,492,985, which is a continuation of, and claims priority to, U.S. patent application Ser. No. 16/191,503, filed on Nov. 15, 2018, now U.S. Pat. No. 11,530,654, which is a continuation of, and claims priority to, U.S. patent application Ser. No. 14/738,060, filed on Jun. 12, 2015, now U.S. Pat. No. 10,221,780, the disclosures of which are incorporated herein by reference in their entirety.

BACKGROUND OF THE INVENTION

Embodiments of the invention relate generally to dual fuel generators, and more particularly, to an apparatus and method for delivering liquid fuel and gaseous fuel to a dual fuel generator.

Electric generators are frequently driven by internal combustion engines that use gasoline as a fuel source. Gasoline is a common fuel source for generators in a variety of applications. However, alternative fuel sources also provide a desirable fuel source. For instance, alternative fuels may provide a clean burning fuel that limits hazardous emissions. Alternative fuels may also be stored for long periods of time without degradation, whereas gasoline can degrade over a period of months leading to hard starting, rough running, and also lead to gum and varnish deposit left in the fuel system. In addition, generators that operate on alternative fuels may generate electricity when gasoline is not readily available. For instance, generators are frequently used when power outages in the utility grid result from severe weather. Unfortunately, gas stations may also be closed as a result of the power outage. Such a circumstance presents just one example where it would be advantageous to operate electrical generators on alternative fuels.

Certain generators are configured to operate as “dual fuel” generators, otherwise known as bi-fuel generators. These generators are driven by an internal combustion engine that is configured to operate on a liquid fuel for a period of operation and an alternative fuel for another period of operation. The alternative fuel source may exist in a gaseous state at normal temperature and pressure and can be any one of liquefied petroleum gas, compressed natural gas, hydrogen, or the like. Liquefied petroleum gas (LPG), often referred to as propane, exists in a gaseous state at normal temperature and pressure but can be conveniently stored under pressure in a liquid state. LPG may be a desirable fuel source for internal combustion engines because it can be stored for longer periods of time and contains fewer impurities than gasoline, resulting in smoother and cleaner operation, and often resulting in a longer lasting engine.

In order to provide the liquid and gaseous fuel to the engine, the dual fuel engine may have a first fuel line for liquid fuel and a second fuel line for gaseous fuel. A liquid fuel source and a gaseous fuel source may be coupled to the respective lines to provide fuel to the engine. However, a common problem with such configurations that couple two

2

engaged during cross-over switching between the fuel sources. Further, such simultaneous delivery of fuel from the first fuel line and the second fuel line may make the engine hard to start or lead to unstable operating conditions.

Therefore, it would be desirable to design a dual fuel generator having a liquid fuel and gaseous fuel delivery system that overcomes the aforementioned detriments without substantially increasing the overall cost of the system.

BRIEF DESCRIPTION OF THE INVENTION

In accordance with one aspect of the invention, a mechanical fuel lockout switch for a dual fuel engine includes a mechanical fuel valve actuatable between a first position and a second position to selectively control fuel flow to the dual fuel engine from a first fuel source through a first fuel line and a second fuel source through a second fuel line. The mechanical fuel valve may be configured to allow communication between the first fuel source and the dual fuel engine and prevent communication between the second fuel source and the dual fuel engine while in the first position, and prevent communication between the first fuel source and the dual fuel engine while in the second position. The mechanical fuel lockout switch may also include a fuel lockout apparatus coupled to the mechanical fuel valve and configured to prevent the second fuel source from coupling to the second fuel line while the mechanical fuel valve is in the first position, and permit the second fuel source to couple to the second fuel line while the mechanical fuel valve is in the second position.

In accordance with another aspect of the invention, a mechanical fuel lockout switch for a dual fuel engine includes a mechanical fuel valve actuatable between a first position and a second position to selectively control fuel flow to the dual fuel engine from a first fuel source through a first fuel line and a second fuel source through a second fuel line. The mechanical fuel valve may be configured to allow communication between the first fuel source and the dual fuel engine and prevent communication between the second fuel source and the dual fuel engine while the first position, and prevent communication between the first fuel source and the dual fuel engine while in the second position. The mechanical fuel lockout switch may also include a fuel lockout apparatus coupled to the mechanical fuel valve and configured to prevent actuation of the mechanical fuel valve to the first position when the second fuel source is in communication with the dual fuel engine.

In accordance with yet another aspect of the invention, a dual fuel generator and fuel delivery system includes a dual fuel generator configured to operate on a liquid fuel supplied from a liquid fuel source through a liquid fuel line and a gaseous fuel supplied from a pressurized fuel source through a gaseous fuel line, and a fuel regulator system located off board the dual fuel generator. The fuel regulator system may include a primary pressure regulator couplable to a service valve of the pressurized fuel source and configured to regulate the gaseous fuel supplied from the pressurized fuel source to a reduced pressure, and a secondary pressure regulator couplable to the primary pressure regulator and configured to regulate the gaseous fuel supplied from the primary pressure regulator to a desired pressure for delivery through the gaseous fuel line to operate the dual fuel generator. The dual fuel generator and fuel delivery system may also include a mechanical fuel valve actuatable between a first position and a second position to selectively control fuel flow to the dual fuel generator from the liquid fuel source through the liquid fuel line and the pressurized fuel

3

source through the gaseous fuel line, the mechanical fuel valve configured to open and close the liquid fuel line to selectively control fuel flow from the liquid fuel source to the dual fuel generator. A fuel lockout apparatus may couple to the mechanical fuel valve configured to prevent the pressurized fuel source from coupling to the gaseous fuel line while the liquid fuel line is open, and permit the pressurized fuel source to couple to the gaseous fuel line while the liquid fuel line is closed by the mechanical fuel valve.

Various other features and advantages will be made apparent from the following detailed description and the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The drawings illustrate preferred embodiments presently contemplated for carrying out the invention.

In the drawings:

FIG. 1 is a perspective view of a dual fuel generator coupled to a fuel delivery system, according to an embodiment of the invention.

FIG. 2 is a detail view of a portion of the generator of FIG. 1 about a mechanical fuel lockout switch with the switch in a first position, according to an embodiment of the invention.

FIG. 3 is a detail view similar to FIG. 2 and showing the mechanical fuel lockout switch in a second position, with an LPG supply line connected thereto, according to an embodiment of the invention.

FIG. 4A is a schematic diagram of a fuel system for the dual fuel generator of FIG. 1 showing a liquid fuel source in communication with a carburetor of the generator consistent with the first position of the switch as shown in FIG. 2, according to an embodiment of the invention.

FIG. 4B is a schematic diagram of the fuel system of FIG. 4A showing a gaseous fuel source in communication with a carburetor of the generator of FIG. 1 consistent with the second position of the switch as shown in FIG. 3, according to an embodiment of the invention.

FIG. 5 is a perspective view of a fuel delivery system for the dual fuel generator of FIG. 1, according to an embodiment of the invention.

FIG. 6 is a side view of a fuel delivery system for the dual fuel generator of FIG. 1, according to an embodiment of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The operating environment of the invention is described with respect to a dual fuel generator. However, it will be appreciated by those skilled in the art that the invention is equally applicable for use with any dual fuel internal combustion engine. Moreover, the invention will be described with respect to a dual fuel generator configured to operate on a liquid fuel and a gaseous fuel. However, one skilled in the art will further appreciate that the invention is equally applicable for use with other fuel combinations for dual fuel generators and internal combustion engines.

Referring to FIG. 1, a dual fuel generator 20 is coupled to a fuel delivery system 22, in accordance with an embodiment of the invention. Dual fuel generator 20 includes an internal combustion engine (not shown) within housing 21 at one end 24, operatively connected to an alternator also enclosed in housing 21 at another end 26, by conventional means. Dual fuel generator 20 is configured to operate on

4

different fuels via either a first fuel source 28 or a second fuel source 30. In an exemplary embodiment of the invention, first fuel source 28 is a liquid fuel and second fuel source 30 is a gaseous fuel. The liquid fuel may be gasoline and the gaseous fuel may be liquid petroleum gas (LPG). Each can selectively operate the generator as desired and controlled by an operator. For instance, generator 20 may operate on gasoline for a first period of operation and then switch to LPG for a second period of operation. However, it is contemplated that dual fuel generator 20 is configured to operate on fuels other than gasoline and LPG (e.g., natural gas, biodiesel, etc.), and thus the scope of the invention is not meant to be limited strictly to a dual fuel arrangement where first fuel source 28 provides gasoline and second fuel source 30 provides LPG.

In one embodiment of the invention, dual fuel generator 20 includes a gasoline tank 32 or, generally, a liquid fuel tank, located inside cover 21 onboard generator 20 to provide gasoline to the engine as first fuel source 28. Gasoline tank 32 connects to a first fuel line to provide gasoline to the carburetor to run the engine, as will later be described with reference to FIGS. 4A and 4B. Generator 20 is also coupled to a pressurized fuel container 34, or a pressurized fuel source, located off board generator 20 to provide LPG to the engine as second fuel source 30. Pressurized fuel container 34 is coupled to generator 20 with an LPG supply hose 36. LPG supply hose 36 is coupled to a second fuel line within generator 20 to provide LPG to the carburetor to run the engine. Dual fuel generator 20 includes a mechanical fuel lockout switch 38 for selecting a desired fuel to be provided to the engine. The mechanical fuel lockout switch 38 is actuated to select first fuel source 28 when in a first position, as shown in FIG. 2, and alternately to select second fuel source 30 when in a second position, as shown in FIG. 3.

Referring back to FIG. 1, in an exemplary embodiment, fuel 30 from pressurized fuel container 34 is regulated using a fuel regulator system 39 for delivery to the engine. Fuel regulator system 39 includes one or more pressure regulators that reduce and control the pressure of the fuel from pressurized fuel container 34 and delivers fuel at a desired pressure for operation of the engine. Fuel regulator system 39 has an inlet 41 operatively coupled to a service valve 40 of pressurized fuel container 34 and an outlet 43 coupled to LPG supply hose 36. Fuel regulator system 39 includes a primary pressure regulator 42 coupled to pressurized fuel container 34 and a secondary pressure regulator 44. Primary pressure regulator 42 protects downstream components from high pressure of pressurized fuel container 34. Primary pressure regulator 42 receives LPG through service valve 40 of pressurized fuel container 34 and reduces the pressure of the LPG to a first stage. In one embodiment of the invention, the first stage may be delivered directly to generator 20 at a pressure required for operation of the engine.

In an exemplary embodiment of the invention, fuel regulator system 39 includes secondary pressure regulator 44 coupled to the outlet of primary pressure regulator 42 in order to use standard "off-the-shelf" components. Typically, the primary pressure regulator is mounted on the LPG tank, while the secondary pressure regulator is mounted on the component using the fuel, such as an engine or grill. Here, since generator 20 can be used as a gasoline only generator, secondary pressure regulator 44 is mounted off-board the generator to reduce size and cost of the generator. Secondary pressure regulator 44 receives LPG from primary pressure regulator 42 and further reduces the pressure of LPG to a second stage to be delivered to generator 20. In a system

5

with two regulators, primary pressure regulator 42 regulates fuel received from pressurized fuel container 34 and reduces the pressure of the fuel to a level required for operation of secondary pressure regulator 44. Secondary pressure regulator 44 regulates fuel received from primary pressure regulator 42 and further reduces the pressure of the fuel to a level required for operation of generator 20. In addition, primary pressure regulator 42 may compensate for varying tank pressure as fuel is depleted while secondary pressure regulator 44 may compensate for varying demand from generator 20.

In accordance with an exemplary embodiment of the invention, fuel regulator system 39 includes both the primary and secondary regulators, or a custom single regulator, but in any case is located remotely, or off-board, from dual fuel generator 20. Fuel regulator system 39 may be directly mounted to pressurized fuel container 34 using a regulator mounting bracket 46. Regulator mounting bracket 46 has mounting locations for primary pressure regulator 42 and secondary pressure regulator 44. Regulator mounting bracket 46 also has a securing mechanism 48 to secure regulator mounting bracket 46 to pressurized fuel container 34.

In another embodiment of the invention, primary pressure regulator 42 is mounted on regulator mounting bracket 46 while secondary pressure regulator 44 could be mounted on or near generator 20. In yet another embodiment of the invention, a dual stage regulator may regulate the fuel received from pressurized fuel container 34 and deliver fuel at a pressure required for operation of generator 20. Such a dual stage regulator may regulate the fuel to the second stage within a single structure. The dual stage regulator may be mounted directly on fuel container 34.

Referring to FIG. 2, a detail view of a portion of generator 20 of FIG. 1 depicts mechanical fuel lockout switch 38 in a first position 38(a), in accordance with an embodiment of the invention. In this position, mechanical fuel lockout switch 38 provides gasoline flow from gasoline tank 32 to the engine while preventing connection of an LPG supply line to fuel inlet 59 of the second fuel line, as will later be discussed in detail with reference to FIGS. 4A and 4B. Still referring to FIG. 2, mechanical fuel lockout switch 38 provides a combination liquid fuel shutoff valve and a gaseous fuel supply lockout that prevents simultaneous delivery of fuel to the engine from gasoline tank 32 and pressurized fuel container 34, FIG. 1. As such, mechanical fuel lockout switch 38 provides a fuel selector to ensure only the selected fuel is provided to dual fuel generator 20.

Mechanical fuel lockout switch 38, FIG. 2, includes mechanical fuel valve 54 actuatable between first position 38(a) as shown in FIG. 2 and second position 38(b) as shown in FIG. 3 to selectively control fuel flow to the dual fuel engine from first fuel source 28 through a first fuel line and second fuel source 30 through a second fuel line 36. Mechanical fuel lockout switch 38 may also include fuel lockout apparatus 58 coupled to mechanical fuel valve 54 to communicate fuel sources individually to generator 20. In one embodiment of the invention, fuel lockout apparatus 58 communicates first fuel source 28 to the engine by actuating mechanical fuel valve 54 to first position 38(a) to open the first fuel line as shown in FIG. 2, and communicates second fuel source 30 to the engine by actuating mechanical fuel valve 54 to second position 38(b) to open communication of the second fuel source 30 to the engine as shown in FIG. 3. Referring back to FIG. 2, when mechanical fuel valve 54 is in first position 38(a), fuel lockout apparatus 58 communi-

6

cates first fuel source 28 to the dual fuel engine and prevents communication between the second fuel source and the dual fuel engine.

In an exemplary embodiment of the invention, mechanical fuel valve 54 controls the flow of LPG to the engine by actuating fuel lockout apparatus 58 to block or unblock fuel inlet 59 for the second fuel source. Mechanical fuel valve 54 is coupled to the first fuel line, as shown in FIGS. 4A and 4B, and therefore can control the flow of gasoline to the engine by opening and closing the first fuel line. When the mechanical fuel valve 54, FIG. 2, is in the first position 38(a), gasoline flows from the gasoline tank to the engine and the fuel lockout apparatus 58 blocks the fuel inlet 59. Accordingly, fuel lockout apparatus 58 prevents LPG flow to generator 20 when the mechanical fuel valve 54 is in first position 38(a) wherein the engine is operated on gasoline.

Mechanical fuel valve 54 includes a fuel valve handle 56 to control the opening and closing of the valve. Fuel valve handle 56 is movable between first position 38(a) as shown in FIG. 2 and second position 38(b) as shown in FIG. 3. Mechanical fuel valve 54 opens the first fuel line (to enable liquid fuel flow to the engine) when fuel valve handle 56 is in the first position, and mechanical fuel valve 54 closes the first fuel line (to prevent liquid fuel flow to the engine) when fuel valve handle 56 is in the second position. Thus, when fuel valve handle 56 is in first position 38(a) as shown in FIG. 2, mechanical fuel valve 54 opens the first fuel line and allows gasoline from gasoline tank 32 to flow to the engine.

Fuel valve handle 56 is coupled to fuel lockout apparatus 58. Fuel valve handle 56 actuates with fuel lockout apparatus 58 to prevent LPG flow to generator 20 when gasoline flow to the generator is enabled. Fuel lockout apparatus 58 is controlled by fuel valve handle 56 so that moving fuel valve handle 56 to the first position causes fuel lockout apparatus 58 to block fuel inlet 59 for LPG, and moving fuel valve handle 56 to the second position causes fuel lockout apparatus 58 to unblock fuel inlet 59 for LPG.

In an exemplary embodiment of the invention, fuel valve handle 56 rotates between the first position and the second position and fuel lockout apparatus 58 is rigidly coupled to the rotating handle. Fuel lockout apparatus 58 may include a fuel inlet cover 61, which may be a flange, coupled to fuel valve handle 56 so that fuel inlet cover 61 rotates with the handle. Fuel inlet cover 61 extends radially outward from fuel valve handle 56 and sweeps over fuel inlet 59 for LPG as fuel valve handle 56 rotates. That is, fuel inlet cover 61 rotates transversely across fuel inlet 59 and blocks access thereto. Accordingly, fuel inlet cover 61 prevents LPG flow to generator 20 when fuel valve handle 56 is in first position 38(a) to allow gasoline to run the engine.

Referring to FIG. 3, a detail view of a portion of generator 20 of FIG. 1 depicts mechanical fuel lockout switch 38 in a second position 38(b), in accordance with an embodiment of the invention. In this position, the mechanical fuel lockout switch 38 provides a disconnect to stop gasoline flow from gasoline tank 32 to the engine while allowing connection of LPG supply hose 36 to fuel inlet 59 of the second fuel line. FIG. 3 further shows LPG supply hose 36 coupling second fuel source 30 to generator 20 to deliver LPG to run the generator.

Mechanical fuel lockout switch 38 includes mechanical fuel valve 54 coupled to fuel lockout apparatus 58 to prevent gasoline flow to generator 20 when LPG from the LPG service hose 36 is supplied to the engine. In one embodiment of the invention, actuation of mechanical fuel valve 54 to second position 38(b) causes fuel lockout apparatus 58 to allow communication of second fuel source 30 to the dual

7

fuel engine, and interrupts the first fuel source **28** communication with the dual fuel engine. The position of fuel lockout apparatus **58** prevents the fuel valve handle **56** from moving to first position **38(a)** (FIG. 2) while LPG supply hose **36** is connected to generator **20**.

A quick-disconnect hose coupling **50**, also referred to as a quick-connect hose coupling, connects LPG supply hose **36** to generator **20** so that LPG supply hose **36** may be quickly attached and detached from generator **20**. Hose coupling **50** has a first end **50a** mounted on the external surface of generator **20** and coupled to supply the second fuel to the engine. Hose coupling **50** has a second end **50b** coupled to the outlet of LPG supply hose **36**. Hose coupling **50** has a valve that opens when the couplings are engaged and closes when the couplings are disengaged. As such, quick-disconnect hose coupling **50** automatically opens when connected to enable fuel flow from LPG supply hose **36** to the engine. Hose coupling **50** automatically disconnects fluid communication when disconnected. Accordingly, when the supply hose is detached from generator **20**, the coupling **50** is automatically closed so that fuel does not escape and unwanted air does not enter the fuel system.

In one embodiment, fuel inlet cover **61** is coupled to fuel valve handle **56** so that it is spaced apart from the surface of generator **20** to provide clearance for first end **50a** of the quick-disconnect hose coupling **50** that protrudes from the surface of generator **20**. As shown in FIG. 2, fuel inlet cover **61** blocks off first end **50a** of the quick-disconnect hose coupling when fuel valve handle **56** is rotated to first position **38(a)** to enable gasoline flow so that fuel inlet cover **61** prevents connection of LPG supply hose **36** (FIG. 3) to generator **20**. As shown in FIG. 3, fuel inlet cover **61** uncovers first end **50a** of the quick-disconnect hose coupling **50** when fuel valve handle **56** is rotated to second position **38(b)** to disable gasoline flow so that fuel inlet cover **61** permits connection of LPG supply hose **36** to generator **20**.

To operate generator **20** on LPG, fuel valve handle **56** is turned to second position **38(b)** to disable the flow of gasoline to the engine and to expose first end **50a** of hose coupling **50** on generator **20**. LPG supply hose **36** is then connected to generator **20** via hose coupling **50** to enable the flow of LPG to the engine. To operate generator **20** on gasoline, LPG supply hose **36** is disconnected from generator **20** via hose coupling **50** to disable the flow of LPG to the engine and to unblock fuel valve handle **56** from rotating to the first position. As shown in FIG. 2, fuel valve handle **56** is then turned to first position **38(a)** to enable the flow of gasoline to generator **20**.

Referring to FIG. 4A, a schematic diagram of a fuel system for a dual fuel engine shows mechanical fuel lockout switch **38** in first position **38(a)** to provide communication between the first fuel source **28** and dual fuel carburetor **62**, according to an embodiment of the invention. Mechanical fuel lockout switch **38** prevents communication between second fuel source **30** and dual fuel carburetor **62** when the switch is in first position **38(a)**. In one embodiment of the invention, first fuel source **28** includes a gasoline tank **32** to provide gasoline to carburetor **62** through a first fuel line **66**, and second fuel source **30** includes a propane or LPG tank **68** to provide propane or LPG to carburetor **62** through a second fuel line **70**. Accordingly, first fuel line **66** may be a liquid fuel line and second fuel line **70** may be a gaseous fuel line.

Mechanical fuel lockout switch **38** includes a mechanical fuel valve **54** actuatable between first position **38(a)** as shown in FIG. 4A and second position **38(b)** as shown in FIG. 4B to selectively control fuel flow to the dual fuel

8

engine from first fuel source **28** through first fuel line **66** and second fuel source **30** through second fuel line **70**. Referring back to FIG. 4A, mechanical fuel valve **54** selectively controls fuel flow through first fuel line **66** by opening the line when the mechanical fuel lockout switch **38** actuates to first position **38(a)**. Mechanical fuel valve **54** may be coupled to fuel lockout apparatus **58** that actuates with mechanical fuel valve **54** to block and unblock fuel inlet **59** of second fuel line **70**. First end **50a** of the quick-disconnect hose coupling is located at fuel inlet **59** and a mating end **50b** of the quick-disconnect hose coupling is coupled to the propane or LPG tank **68**. Actuation of mechanical fuel valve **54** to first position **38(a)** causes fuel lockout apparatus **58** to block fuel inlet **59** to prevent coupling the first end **50a** and second end **50b** of the quick-disconnect hose coupling together, and actuation of mechanical fuel valve **54** to another position causes fuel lockout apparatus **58** to unblock fuel inlet **59** to permit attaching first end **50a** and second end **50b** together.

In one embodiment of the invention, a fuel cut solenoid **63** couples to carburetor **62** to regulate liquid fuel flow into a main nozzle within the carburetor. Fuel cut solenoid **63** is advantageous to control liquid fuel flow downstream of a float bowl in the carburetor and can stop fuel flow to the engine immediately after ignition shutdown. As such, fuel cut solenoid **63** prevents the engine from drawing in fuel from the float bowl while the engine shuts off. Fuel cut solenoid **63** also traps fuel in the float bowl to eliminate delay in filling the bowl when starting the engine on liquid fuel, and prevents liquid fuel flow from the float bowl to the engine when starting on gaseous fuel.

Fuel cut solenoid **63** may regulate fuel flow through multiple fuel lines in carburetor **62** that provide fuel from the float bowl to the engine. For instance, carburetor **62** may have a main fuel line and an idle fuel line that receive fuel from the float bowl. Fuel cut solenoid **63** may control fuel flow through all of the fuel lines that receive fuel from the float bowl or may regulate only some of the fuel lines. As such, fuel cut solenoid **63** may block fuel flow through the main fuel line while small amounts of fuel can flow through the idle fuel line.

Fuel cut solenoid **63** preferably operates as a normally closed valve that opens when powered by a 12 volt battery **65**, although fuel cut solenoid **63** may also be operated as a normally open valve. The normally closed valve is opened for gasoline mode to allow gasoline flow to the engine and closed for LPG mode to prevent gasoline flow to the engine. Fuel cut solenoid **63** is operated by an electrical switch **67** which may be mechanically actuated and controlled by mechanical fuel lockout switch **38**. As such, actuation of mechanical fuel lockout switch **38** to first position **38(a)** closes electrical switch **67** to power and open fuel cut solenoid **63** as represented in FIG. 4A, and actuation of mechanical fuel lockout switch **38** to second position **38(b)** opens electrical switch **67** to interrupt power and close fuel cut solenoid **63** as represented in FIG. 4B.

Referring to FIG. 4B, a schematic diagram of a fuel system for a dual fuel engine shows mechanical fuel lockout switch **38** in second position **38(b)** to provide communication between second fuel source **30** and dual fuel carburetor **62**, according to an embodiment of the invention. Mechanical fuel lockout switch **38** prevents communication between first fuel source **28** and dual fuel carburetor **62** when the switch is in second position **38(b)**. The dual fuel engine has a first fuel line **66** to provide fuel from first fuel source **28** to carburetor **62** and a second fuel line **70** to provide fuel from second fuel source **30** to carburetor **62**.

Mechanical fuel lockout switch 38 includes mechanical fuel valve 54 that selectively controls fuel flow through first fuel line 66 by closing the line when mechanical fuel lockout switch 38 actuates to second position 38(b). Mechanical fuel lockout switch 38 may also include a mechanical lockout apparatus 58 to block and unblock fuel inlet 59 of the second fuel line 70. Fuel inlet 59 may include first end 50a of the quick-connect hose coupling mounted on the generator and coupled to second fuel line 70. Second end 50b of the quick-connect hose coupling is coupled to the outlet of second fuel source 30, and the first end 50a mates with second end 50b to quickly attach propane or LPG tank 68 to second fuel line 70. Fuel lockout apparatus 58 may also hold mechanical fuel lockout switch 38 in second position 38(b) when the propane or LPG tank 68 is coupled to the engine via the ends 50a, 50b of the quick-connect hose coupling.

Fuel cut solenoid 63 couples to carburetor 62 to regulate liquid fuel flow through the carburetor as described with respect to FIG. 4A. FIG. 4B shows electrical switch 67 opened to interrupt power and close fuel cut solenoid 63 for LPG mode when mechanical fuel lockout switch 38 is in second position 38(b).

FIGS. 4A and 4B depict an embodiment where mechanical fuel valve 54 operates along first fuel line 66 to provide a flow path for first fuel source 28 to carburetor 62 when the valve is in first position 38(a). That is, mechanical fuel valve 54 may control a single fuel line that runs through the valve while operating fuel lockout apparatus 58 to control fuel flow through second fuel line 70. Embodiments of the invention also contemplate mechanical fuel valve 54 configured to operate along second fuel line 70 to provide a flow path for second fuel source 30 to carburetor 62 when the valve is in second position 38(b). Mechanical fuel valve 54 may be configured to control multiple fuel lines that run through the valve according to embodiments of the invention.

Referring now to FIG. 5, a perspective view of fuel delivery system 22 for dual fuel generator 20 of FIG. 1 is shown, in accordance with an embodiment of the invention. Fuel delivery system 22 includes a mounting arrangement for fuel regulator system 39. The mounting arrangement includes regulator mounting bracket 46 for mounting fuel regulator system 39. Regulator mounting bracket 46 extends around the outer periphery of collar 136 on pressurized fuel container 34. Regulator mounting bracket 46 has securing mechanism 48 to secure to collar 136. In one embodiment, securing mechanism 48 is a rigid component that extends inward from regulator mounting bracket 46 with a slot for receiving collar 136 to hold regulator mounting bracket 46 to collar 136.

Regulator mounting bracket 46 provides mounting locations for pressure regulators. In one embodiment, regulator mounting bracket 46 is made of sheet metal bent in two locations to provide a central panel 138, a first outer panel 140, and a second outer panel 142 for mounting the regulators. The panels may be angled from each other such that regulator mounting bracket 46 fits around collar 136. Primary pressure regulator 42 mounts on first outer panel 140 and secondary pressure regulator 44 mounts on second outer panel 142. The panels are sized according to their respective regulators. Accordingly, second outer panel 142 is larger than first outer panel 140 if secondary pressure regulator 44 is larger than primary pressure regulator 42. Panels 140, 142 have fasteners or openings to receive fasteners to couple respective regulators 42, 44 to the panels. Regulator mounting bracket 46 rests on top of pressurized fuel container 34

and engages the periphery of collar 136 to support fuel regulator system 39 on the container.

In one embodiment of the invention, primary pressure regulator 42 couples to two ninety degree elbows 144, 145 to reach around collar 136 in order to couple to service valve 40. The two elbows 144, 145 are joined by a hose or pipe 146 that leads from elbow 144 at service valve 40 to elbow 145 at the outer periphery of collar 136. The outlet of primary pressure regulator 42 couples to a hose 148 that extends to another ninety degree elbow 150 coupled to the inlet of secondary pressure regulator 44. Secondary pressure regulator 44 couples to LPG supply hose 36. Pressurized fuel container 34 may be strapped to a dolly 152.

Referring now to FIG. 6, a side view of another fuel delivery system 22 for dual fuel generator 20 of FIG. 1 is shown, in accordance with an embodiment of the invention. Fuel delivery system 22 includes a mounting arrangement for fuel regulator system 39. The mounting arrangement includes a regulator mounting structure 154 for mounting fuel regulator system 39 to pressurized fuel container 34. Regulator mounting structure 154 includes a cylinder 156 that surrounds the circumference of pressurized fuel container 34 to secure regulator mounting structure 154 radially along the circumference of pressurized fuel container 34. Cylinder 156 couples to a dome 158 to support cylinder 156 relative to the top of pressurized fuel container 34. Dome 158 has a central opening 160 through which collar 136 of pressurized fuel container 34 extends. Collar 136 of pressurized fuel container 34 extends through dome 158 so that service valve 40 is easily accessible from above regulator mounting structure 154 and so that dome 158 sits on pressurized fuel container 34 around collar 136.

Regulator mounting structure 154 supports pressure regulators around the outer circumference of cylinder 156. In some embodiments of the invention, a dual stage pressure regulator 162 functions as both a primary pressure regulator and a secondary pressure regulator in a single integral component, and dual stage pressure regulator 162 may be mounted on regulator mounting structure 154. In other embodiments of the invention, primary pressure regulator 42 (FIG. 5) is mounted to service valve 40 while secondary pressure regulator 44 (FIG. 5) is mounted on regulator mounting structure 154. Alternatively, both primary pressure regulator 42 (FIG. 5) and secondary pressure regulator 44 (FIG. 5) may be mounted on regulator mounting structure 154.

Fuel regulator system 39 may be coupled to service valve 40 by a flexible connector called a pigtail 164. Pigtail 164 absorbs shock in the system from pressure surges and from movement of downstream components. Pigtail 164 can be looped to conserve space and therefore pressurized fuel container 34 is referred to as an LPG pig. Accordingly, regulator mounting structure 154 is referred to as a pig hat because it fits on the LPG pig. Pressurized fuel container 34 may be secured to a platform or mobile cart 64 for stability or transportation. In another embodiment, a regulator mounting device, including regulator mounting structure 154 or regulator mounting bracket 46 (FIG. 5), is secured directly to a platform or a mobile cart.

Beneficially, embodiments of the invention provide for a mechanical fuel lockout switch to ensure that two fuels are not simultaneously delivered to a dual fuel internal combustion engine. Embodiments of the invention also provide for a dual fuel generator with a remotely mounted gaseous fuel regulator system.

Therefore, according to one embodiment of the invention, a mechanical fuel lockout switch for a dual fuel engine

11

includes a mechanical fuel valve actuatable between a first position and a second position to selectively control fuel flow to the dual fuel engine from a first fuel source through a first fuel line and a second fuel source through a second fuel line. The mechanical fuel valve may be configured to allow communication between the first fuel source and the dual fuel engine and prevent communication between the second fuel source and the dual fuel engine while in the first position, and prevent communication between the first fuel source and the dual fuel engine while in the second position. The mechanical fuel lockout switch may also include a fuel lockout apparatus coupled to the mechanical fuel valve and configured to prevent the second fuel source from coupling to the second fuel line while the mechanical fuel valve is in the first position, and permit the second fuel source to couple to the second fuel line while the mechanical fuel valve is in the second position.

According to another embodiment of the invention, a mechanical fuel lockout switch for a dual fuel engine includes a mechanical fuel valve actuatable between a first position and a second position to selectively control fuel flow to the dual fuel engine from a first fuel source through a first fuel line and a second fuel source through a second fuel line. The mechanical fuel valve may be configured to allow communication between the first fuel source and the dual fuel engine and prevent communication between the second fuel source and the dual fuel engine while the first position, and prevent communication between the first fuel source and the dual fuel engine while in the second position. The mechanical fuel lockout switch may also include a fuel lockout apparatus coupled to the mechanical fuel valve and configured to prevent actuation of the mechanical fuel valve to the first position when the second fuel source is in communication with the dual fuel engine.

According to yet another embodiment of the invention, a dual fuel generator and fuel delivery system includes a dual fuel generator configured to operate on a liquid fuel supplied from a liquid fuel source through a liquid fuel line and a gaseous fuel supplied from a pressurized fuel source through a gaseous fuel line, and a fuel regulator system located off board the dual fuel generator. The fuel regulator system may include a primary pressure regulator couplable to a service valve of the pressurized fuel source and configured to regulate the gaseous fuel supplied from the pressurized fuel source to a reduced pressure, and a secondary pressure regulator couplable to the primary pressure regulator and configured to regulate the gaseous fuel supplied from the primary pressure regulator to a desired pressure for delivery through the gaseous fuel line to operate the dual fuel generator. The dual fuel generator and fuel delivery system may also include a mechanical fuel valve actuatable between a first position and a second position to selectively control fuel flow to the dual fuel generator from the liquid fuel source through the liquid fuel line and the pressurized fuel source through the gaseous fuel line, the mechanical fuel valve configured to open and close the liquid fuel line to selectively control fuel flow from the liquid fuel source to the dual fuel generator. A fuel lockout apparatus may couple to the mechanical fuel valve configured to prevent the pressurized fuel source from coupling to the gaseous fuel line while the liquid fuel line is open, and permit the pressurized fuel source to couple to the gaseous fuel line while the liquid fuel line is closed by the mechanical fuel valve.

This written description uses examples to disclose the invention, including the best mode, and also to enable any person skilled in the art to practice the invention, including

12

making and using any devices or systems and performing any incorporated methods. The patentable scope of the invention is defined by the claims, and may include other examples that occur to those skilled in the art. Such other examples are intended to be within the scope of the claims if they have structural elements that do not differ from the literal language of the claims, or if they include equivalent structural elements with insubstantial differences from the literal languages of the claims.

What is claimed is:

1. A mechanical fuel lockout switch for a dual fuel engine comprising:

a mechanical fuel valve actuatable between a first position and a second position to selectively control fuel flow to the dual fuel engine from a first fuel source through a first fuel line and a second fuel source through a second fuel line, the mechanical fuel valve configured to:

allow communication between the first fuel source and the dual fuel engine and prevent communication between the second fuel source and the dual fuel engine while in the first position, and

prevent communication between the first fuel source and the dual fuel engine while in the second position; and

a fuel lockout apparatus coupled to the mechanical fuel valve and configured to:

prevent the second fuel source from coupling to the second fuel line while the mechanical fuel valve is in the first position, and

permit the second fuel source to couple to the second fuel line while the mechanical fuel valve is in the second position.

2. The mechanical fuel lockout switch of claim 1 wherein the fuel lockout apparatus prevents actuation of the mechanical fuel valve to the first position when the second fuel source is in communication with the dual fuel engine.

3. The mechanical fuel lockout switch of claim 1 wherein the fuel lockout apparatus comprises a flange rigidly coupled to the mechanical fuel valve and configured to:

cover an inlet of the second fuel line while the mechanical fuel valve is in the first position, and

uncover the inlet of the second fuel line while the mechanical fuel valve is in the second position.

4. The mechanical fuel lockout switch of claim 3 wherein the mechanical fuel valve is configured to rotate between the first position and the second position and the flange is configured to rotate transversely across the inlet of the second fuel line.

5. The mechanical fuel lockout switch of claim 3 further comprising:

a first end of a quick-disconnect hose coupling attached to the inlet of the second fuel line; and

a second end of the quick-disconnect hose coupling configured to mate with the first end of the quick-disconnect hose coupling to couple the second fuel source to the second fuel line.

6. The mechanical fuel lockout switch of claim 1 wherein the mechanical fuel valve and the fuel lockout apparatus operate together to ensure that fuel from the first fuel source and fuel from the second fuel source are not simultaneously delivered to the dual fuel engine.

7. The mechanical fuel lockout switch of claim 6 wherein the mechanical fuel valve is configured to:

provide liquid fuel from a liquid fuel tank of the first fuel source to the dual fuel engine while in the first position, and

13

provide gaseous fuel from a pressurized fuel container of the second fuel source to the dual fuel engine while in the second position.

8. A mechanical fuel lockout switch for a dual fuel engine comprising:

a mechanical fuel valve actuatable between a first position and a second position to selectively control fuel flow to the dual fuel engine from a first fuel source through a first fuel line and a second fuel source through a second fuel line, the mechanical fuel valve configured to:

allow communication between the first fuel source and the dual fuel engine and prevent communication between the second fuel source and the dual fuel engine while the first position, and

prevent communication between the first fuel source and the dual fuel engine while in the second position; and

a fuel lockout apparatus coupled to the mechanical fuel valve and configured to prevent actuation of the mechanical fuel valve to the first position when the second fuel source is in communication with the dual fuel engine.

9. The mechanical fuel lockout switch of claim 8 wherein the fuel lockout apparatus comprises a flange rigidly coupled to the mechanical fuel valve and configured to:

cover an inlet of the second fuel line while the mechanical fuel valve is in the first position, and

uncover the inlet of the second fuel line while the mechanical fuel valve is in the second position.

10. The mechanical fuel lockout switch of claim 9 wherein the mechanical fuel valve is configured to rotate between the first position and the second position and the flange is configured to rotate transversely across the inlet of the second fuel line.

11. The mechanical fuel lockout switch of claim 9 further comprising:

a first end of a quick-disconnect hose coupling attached to the inlet of the second fuel line; and

a second end of the quick-disconnect hose coupling configured to mate with the first end of the quick-disconnect hose coupling to couple the second fuel source to the second fuel line.

12. The mechanical fuel lockout switch of claim 8 wherein the mechanical fuel valve and the fuel lockout apparatus operate together to ensure that fuel from the first fuel source and fuel from the second fuel source are not simultaneously delivered to the dual fuel engine.

13. The mechanical fuel lockout switch of claim 12 wherein the mechanical fuel valve is configured to:

provide liquid fuel from a liquid fuel tank of the first fuel source to the dual fuel engine while in the first position, and

provide gaseous fuel from a pressurized fuel container of the second fuel source to the dual fuel engine while in the second position.

14. A dual fuel generator and fuel delivery system comprising:

a dual fuel generator configured to operate on a liquid fuel supplied from a liquid fuel source through a liquid fuel line and a gaseous fuel supplied from a pressurized fuel source through a gaseous fuel line;

a fuel regulator system located off board the dual fuel generator, the fuel regulator system comprising:

a primary pressure regulator couplable to a service valve of the pressurized fuel source and configured

14

to regulate the gaseous fuel supplied from the pressurized fuel source to a reduced pressure, and a secondary pressure regulator couplable to the primary pressure regulator and configured to regulate the gaseous fuel supplied from the primary pressure regulator to a desired pressure for delivery through the gaseous fuel line to operate the dual fuel generator;

a mechanical fuel valve actuatable between a first position and a second position to selectively control fuel flow to the dual fuel generator from the liquid fuel source through the liquid fuel line and the pressurized fuel source through the gaseous fuel line, the mechanical fuel valve configured to open and close the liquid fuel line to selectively control fuel flow from the liquid fuel source to the dual fuel generator; and

a fuel lockout apparatus coupled to the mechanical fuel valve and configured to:

prevent the pressurized fuel source from coupling to the gaseous fuel line while the liquid fuel line is open, and

permit the pressurized fuel source to couple to the gaseous fuel line while the liquid fuel line is closed by the mechanical fuel valve.

15. The dual fuel generator and fuel delivery system of claim 14 wherein the fuel lockout apparatus is further configured to prevent the mechanical fuel valve from opening the liquid fuel line while the fuel regulator system is coupled to the gaseous fuel line.

16. The dual fuel generator and fuel delivery system of claim 14 wherein the fuel lockout apparatus comprises a fuel inlet cover that actuates with the mechanical fuel valve to cover an inlet of the gaseous fuel line while the liquid fuel line is open and to uncover the inlet of the gaseous fuel line when the liquid fuel line is closed.

17. The dual fuel generator and fuel delivery system of claim 14 further comprising:

a first end of a quick-connect hose coupling coupled to an outlet of the secondary pressure regulator; and

a second end of the quick-connect hose coupling coupled to an inlet of the gaseous fuel line and configured to mate with the first end of the quick-connect hose coupling to couple the secondary pressure regulator to the gaseous fuel line.

18. The dual fuel generator and fuel delivery system of claim 14 further comprising a regulator mounting device fixed to the pressurized fuel source; and

at least the secondary pressure regulator is mounted on the regulator mounting device.

19. The dual fuel generator and fuel delivery system of claim 18 wherein the primary pressure regulator is mounted on the regulator mounting device.

20. The dual fuel generator and fuel delivery system of claim 19 wherein the regulator mounting device is configured to attach onto a collar of a pressurized fuel container of the pressurized fuel source so that the primary and secondary pressure regulators are positioned adjacent each other along an outer periphery of the collar.

21. The dual fuel generator and fuel delivery system of claim 14 wherein:

the fuel regulator system comprises a dual stage pressure regulator; and

the primary and secondary pressure regulators are integral components of the dual stage pressure regulator.

* * * * *

EXHIBIT 1002



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/183,734	03/14/2023	Mark J. Sarder	CET1090.104	4292
26629	7590	02/20/2024	EXAMINER	
ZIOLKOWSKI PATENT SOLUTIONS GROUP, SC (ZPS)			LATHERS, KEVIN ANTHONY	
136 S WISCONSIN ST				
PORT WASHINGTON, WI 53074				
			ART UNIT	PAPER NUMBER
			3747	
			NOTIFICATION DATE	DELIVERY MODE
			02/20/2024	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

info@zpatents.com
jmf@zpatents.com
lje@zpatents.com

APPLICATION NO.	ISSUE DATE	PATENT NO.
18/183,734	20-Feb-2024	11905895

ZIOLKOWSKI PATENT SOLUTIONS GROUP, SC (ZPS)
136 S WISCONSIN ST
PORT WASHINGTON, WI 53074

EGRANT NOTIFICATION

Your electronic patent grant (eGrant) is now available, which can be accessed via Patent Center at <https://patentcenter.uspto.gov>

The electronic patent grant is the official patent grant under 35 U.S.C. 153. For more information, please visit <https://www.uspto.gov/electronicgrants>



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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/183,734	02/20/2024	11905895	CET1090.104	4292

26629 7590 01/31/2024
ZIOLKOWSKI PATENT SOLUTIONS GROUP, SC (ZPS)
136 S WISCONSIN ST
PORT WASHINGTON, WI 53074

ISSUE NOTIFICATION

The projected patent number and issue date are specified above. The patent will issue electronically. The electronically issued patent is the official patent grant pursuant to 35 U.S.C. § 153. The patent may be accessed on or after the issue date through Patent Center at <https://patentcenter.uspto.gov/>. The patent will be available in both the public and the private sides of Patent Center. Further assistance in electronically accessing the patent, or about Patent Center, is available by calling the Patent Electronic Business Center at 1-888-217-9197.

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Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment is 0 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Center (<https://patentcenter.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Patents Stakeholder Experience (OPSE), Stakeholder Support Division (SSD) at (571)-272-4200.

INVENTOR(s) (Please see PATENT CENTER site <https://patentcenter.uspto.gov> for additional inventors):

Mark J. Sarder, Waukesha, WI;
Aleko D. Sotiriades, Cedarburg, WI;
James J. Dehn, Brookfield, WI;
Leigh Jenison, Hartland, WI;

APPLICANT(s) (Please see PATENT CENTER site <https://patentcenter.uspto.gov> for additional applicants):

Champion Power Equipment, Inc., Santa Fe Springs, CA;

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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #
18/183,734RECEIPT DATE / TIME
01/08/2024 10:38:54 AM Z ETATTORNEY DOCKET #
CET1090.104

Title of Invention

DUAL FUEL LOCKOUT SWITCH FOR GENERATOR ENGINE

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	4292	FILED BY	Robyn Templin
PATENT CENTER #	63867487	FILING DATE	03/14/2023
CUSTOMER #	26629	FIRST NAMED INVENTOR	Mark J. Sarder
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Timothy Ziolkowski

Documents

TOTAL DOCUMENTS: 2

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
2024.01.08 Issue Fee.pdf	1	Issue Fee Payment (PTO-85B)	201 KB
2024.01.08 Comments on Reasons.pdf	2	Miscellaneous Incoming Letter	103 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
2024.01.08 Issue Fee.pdf	E1C71F52D6EB7C01F31B99C1B509A4CC3F66AA514C6E65929 7FFD057D74C104DB8DC67A529324E241B6216418798F015316 72573680FE4898A80229EB29BE9D5

2024.01.08 Comments on
Reasons.pdf

9642B32D473FFAA4D47ADE29A40E7EBFEB83AF0B7E4295613
D7A9C83EBAE4063AB762D78E928DED49677F8BD77880ACB7
3EB9383FB9DF0721CAE02C799EFD636

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National Stage of an International Application under 35 U.S.C. 371

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New International Application Filed with the USPTO as a Receiving Office

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ELECTRONIC PAYMENT RECEIPT

APPLICATION #
18/183,734RECEIPT DATE / TIME
01/08/2024 10:38:54 AM Z ETATTORNEY DOCKET #
CET1090.104

Title of Invention

DUAL FUEL LOCKOUT SWITCH FOR GENERATOR ENGINE

Application Information

APPLICATION TYPE Utility - Nonprovisional Application
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 4292

FILED BY Robyn Templin

PATENT CENTER # 63867487

AUTHORIZED BY Timothy Ziolkowski

CUSTOMER # 26629

FILING DATE 03/14/2023

CORRESPONDENCE
ADDRESS -FIRST NAMED
INVENTOR Mark J. Sarder

Payment Information

PAYMENT METHOD
CARD / 8631PAYMENT TRANSACTION ID
E202418A40129302PAYMENT AUTHORIZED BY
Robyn Templin

FEE CODE	DESCRIPTION	ITEM PRICE(\$)	QUANTITY	ITEM TOTAL(\$)
2501	UTILITY ISSUE FEE	480.00	1	480.00
TOTAL AMOUNT:				\$480.00

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If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage

Petitioner MWE Investments, LLC, et al.
Exhibit 1003, Page 194

submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

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PART B - FEE(S) TRANSMITTAL

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INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications. **Because electronic patent issuance may occur shortly after issue fee payment, any desired continuing application should preferably be filed prior to payment of this issue fee in order not to jeopardize copendency.**

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26629 7590 12/21/2023
ZIOLKOWSKI PATENT SOLUTIONS GROUP, SC (ZPS)
136 S WISCONSIN ST
PORT WASHINGTON, WI 53074

Robyn L. Templin	(Typed or printed name)
/Robyn L. Templin/	(Signature)
January 8, 2024	(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/183,734	03/14/2023	Mark J. Sarder	CET1090.104	4292

TITLE OF INVENTION: DUAL FUEL LOCKOUT SWITCH FOR GENERATOR ENGINE

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$480	\$0.00	\$0.00	\$480	03/21/2024

EXAMINER	ART UNIT	CLASS-SUBCLASS
LATHERS, KEVIN ANTHONY	3747	123-575000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/AIA/122 or PTO/SB/122) attached.

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1 Ziolkowski Patent
Solutions Group, SC
2
3

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

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Santa Fe Springs, CA

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☐ Applicant asserting small entity status. See 37 CFR 1.27

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Authorized Signature /Timothy J. Ziolkowski/

Date January 8, 2024

Typed or printed name Timothy J. Ziolkowski

Registration No. 38,368

Customer No. 26629
Confirmation No. 4292

Patent
Attorney Docket No. CET1090.104

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of : Sarder et al.
Serial No. : 18/183,734
Filed : March 14, 2023
For : DUAL FUEL LOCKOUT SWITCH FOR GENERATOR ENGINE
Group Art No. : 3747
Examiner : Kevin A. Lathers

CERTIFICATION UNDER 37 C.F.R. §§1.8(a) AND 1.10

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P.O. Box 1450
Alexandria, VA 22313-1450

**COMMENTS ON STATEMENT
OF REASONS FOR ALLOWANCE**

Dear Examiner Lathers:

Responsive to the Notice of Allowability mailed December 21, 2023, Applicant submits the following remarks responsive to the Examiner's Statement of Reasons for Allowance.

REMARKS

In response to the Examiner's Reasons for Allowance, Applicant believes that a separate Statement of Reasons for Allowance is unnecessary in the present case as the file history sufficiently sets forth the patentable distinctions of claims 1-21.

The patentability of claims 1-21 lies in each claim as a whole. That is, a single particular element or feature of a claim does not define the claim's patentability, but rather, it is the combination of elements and the interconnection therebetween that define the invention. The claims cannot be considered to be limited in scope based on this brief statement by the Examiner. Applicant stands by its position previously set forth in the file history.

Applicant does not acquiesce to the accuracy of the Examiner's statements in the Reasons for Allowance or the Examiner's partial paraphrasing of the claim elements.

Applicant appreciates entry of these remarks and cordially invites the Examiner to respond, should the Examiner disagree.

Respectfully submitted,

/Timothy J. Ziolkowski/

Timothy J. Ziolkowski
Registration No. 38,368
Direct Dial 262-268-8181
tjz@zpatents.com

Dated: January 8, 2024
Attorney Docket No.: CET1090.104

P.O. ADDRESS:
Ziolkowski Patent Solutions Group, SC
136 South Wisconsin Street
Port Washington, WI 53074
262-268-8100



UNITED STATES PATENT AND TRADEMARK OFFICE

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NOTICE OF ALLOWANCE AND FEE(S) DUE

26629 7590 12/21/2023
ZIOLKOWSKI PATENT SOLUTIONS GROUP, SC (ZPS)
136 S WISCONSIN ST
PORT WASHINGTON, WI 53074

EXAMINER	
LATHERS, KEVIN ANTHONY	
ART UNIT	PAPER NUMBER
3747	

DATE MAILED: 12/21/2023

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/183,734	03/14/2023	Mark J. Sarder	CET1090.104	4292

TITLE OF INVENTION: DUAL FUEL LOCKOUT SWITCH FOR GENERATOR ENGINE

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$480	\$0.00	\$0.00	\$480	03/21/2024

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 40% the amount of undiscounted fees, and micro entity fees are 20% the amount of undiscounted fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via the USPTO patent electronic filing system.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications. **Because electronic patent issuance may occur shortly after issue fee payment, any desired continuing application should preferably be filed prior to payment of this issue fee in order not to jeopardize copendency.**

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via the USPTO patent electronic filing system or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/183,734	03/14/2023	Mark J. Sarder	CET1090.104	4292

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nonprovisional	SMALL	\$480	\$0.00	\$0.00	\$480	03/21/2024

EXAMINER	ART UNIT	CLASS-SUBCLASS
LATHERS, KEVIN ANTHONY	3747	123-575000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/AIA/122 or PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

1 _____

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

2 _____

3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. Fees submitted: ☐ Issue Fee ☐ Publication Fee (if required)

4b. Method of Payment: (Please first reapply any previously paid fee shown above)

☐ Electronic Payment via the USPTO patent electronic filing system ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. Change in Entity Status (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____

Date _____

Typed or printed name _____

Registration No. _____