## REMARKS

Upon entry of the above amendments, claims 1, 2, 7, and 20-22 are pending and claim 1 is the independent claim. Various claim amendments have been made to now even more clearly and definitely set forth Applicants' claimed invention. Various claims have been previously withdrawn, and Applicants reserve the right to rejoin the withdrawn claims upon identification of allowable subject matter. In particular, claims 3-6, and 8-19 were previously withdrawn without any prejudice or disclaimer. Applicants request entry of the above amendments.

### *Prior Claim Election/ Restriction*

Applicants respectfully acknowledge the withdrawal of the species restriction requirement in paragraph 2 of the Office Action.

### *Drawing Objections*

The Office Action at page 2 in paragraphs 3 and 4, objects to the drawings for allegedly not showing each and every claimed component. Applicants respectfully note that the Drawings have been sought to be amended, and the amendments are fully supported by the Original Specification and Claims. In almost all cases, the claimed components already appear in the drawings. In the case of alternative embodiments, not all alternative permutations and combinations of features may be shown, however, it will be apparent to those skilled in the relevant art, where such alternative components could be placed in an example system, based on the Figures and Specification, as set forth, and based on the claims. Any replacement sheets have been appropriately labeled as such.

With reference to 37 CFR §1.121(d), the Office Action asserts drawing sheets are required to show every claimed component and every feature of the invention specified in the claims, or an explanation can be provided of where each claimed component is found in the figures. Replacement drawing sheets are enclosed for sheets 1, 3 and 5 of 14 sheets. Replacement sheet 1 of FIG. 1A labels the reaction chamber (122) consistent with FIG. 1D and FIG. 2A, and indicates by an arrow the location of the header (120) shown in FIG. 1B, and discussed in the specification. Replacement sheet 3 indicates an example region for location of a

thermoelectric generator(s) discussed in paragraph 00072 of the specification as would be apparent to those skilled in the relevant art. Replacement sheet 5 deletes incorrectly placed reference numeral 122 in FIG. 2B, which should have indicated 214 (see FIG. 2A), .

Review of the drawings and specification indicates that the following additional changes should be made. Paragraph 0070 of the specification is amended above, replacing "FIG. 2D" with "FIG. 2C". Paragraph 0074, replaces "FIG. 2 B" with "FIG. 1A", as would be apparent to those skilled in the art, when reading the other Figures and claims together.

***Objections to the Specification***

The Office Action beginning at page 3 in paragraphs 6 through 18, objects to the Specification as filed for being directed to an allegedly inoperable device, and later rejects the claims as allegedly failing to include a proper written description, and as allegedly failing to include a sufficiently enabling disclosure to allow persons having ordinary skill in the relevant art to make and use the claimed invention, both of the latter under 35 U.S.C. Section 112(a). Applicants respectfully disagree and provide the following analyses addressing in particular the objections noted. Applicants respectfully traverse.

Patent Application 14/815,935 relates to low energy nuclear reaction (LENR) or cold fusion technology, and is submitted particularly for the purpose of supporting industrialization of modular LENR or cold fusion systems. The March 22, 2016 USPTO Office Communication indicates a concern by some that cold fusion cannot be operative because it claims exothermic fusion of hydrogen isotopes in a laboratory environment, and thus that cold fusion inventions or systems cannot be operative. It is important to note, therefore, that the results of many separate scientific experiments worldwide have demonstrated that fusion can be made to occur in a laboratory environment; the fusion rate is low at low energies. Logically, therefore, cold fusion inventions or systems can be made to be operative, although this has proved to be difficult conventionally, that does not mean the process is inoperative generally. The fact that it was conventionally difficult to get humans to fly, did not mean that the Wright brothers' flyer was inoperative. A number of U.S. patents on cold fusion have been issued (e.g., "System and Method for Generating Particles," by Pamela Mossier-Boss et al., US 8,419,919 dated April 16,

2013). The National Defense Authorization Act for Fiscal Year 2017 Report of the Committee on Armed Services House of Representatives on H.R. 4909 dated May 4, 2016 directed the Secretary of Defense to provide a briefing on the military utility of recent U.S. industrial base LENR advancements to the House Committee on Armed Services by September 22, 2016. These considerations are further evidence that cold fusion technology can be made to be operative, and is proper subject matter for patenting.

A concern was indicated that a person of ordinary skill would doubt operability of cold fusion because it is not supported by known and existing laws of nature. Due to the complexity of technology, "a person of ordinary skill" is one who necessarily is regarded to possess detailed knowledge, skills and abilities about a technology. A scientist in one discipline may not be a person of ordinary skill in a different discipline; and, knowledge, skills and abilities about a combination of disciplines may be needed for a person to have "ordinary skill" in a particular art. A beginner in a discipline would not normally be considered a person of ordinary skill, whereas a certain number of years or concentrated devotion would be expected. The same logic can be applied here. Popular journal writers, general technology managers and the like would not be considered to have the appropriate knowledge, skills and abilities to be considered a person of ordinary skill. By comparison, those who possess detailed knowledge, skills and abilities in an appropriate discipline and have devoted many years to the technology would be. The U.S. government apparently considers basic research in cold fusion to be unclassified. Many scientists and engineers in the U.S. and other countries have detailed knowledge, skills and abilities in the technological area of LENR or cold fusion. A few examples are the following: Dr. Mike McKubre, who has been performing detailed experiments in this area of technology at Stanford Research Institute for many years; Dr. Dave Nagel, who worked on this technology at the Naval Research Laboratory and recently organized a worldwide LENR/cold fusion association; and, Dr. Ed Storms, who worked on this technology at Los Alamos National Laboratory and continues to work in this technology area as a separate enterprise. Many other reputable scientists throughout the world fit these criteria. Such persons who have knowledge, skills and abilities about LENR/cold fusion and have devoted many years of research work to the technology do not doubt operability of LENR/cold fusion. They would believe that this technology is supported by known and existing laws of nature. A person of ordinary skill,

therefore, would not doubt operability of cold fusion and would not find it unsupported by known and existing laws of nature.

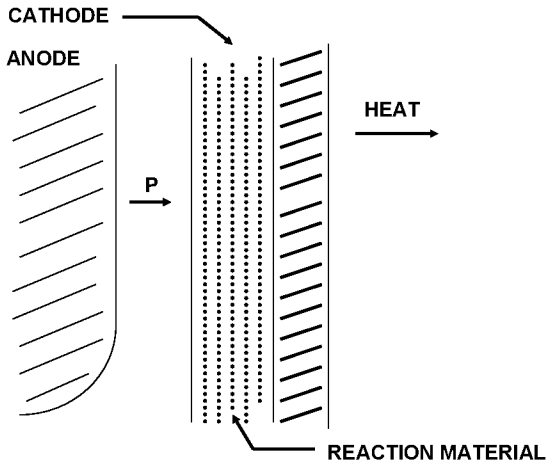
The March 22, 2016 USPTO Office Communication asserts that the invention in Patent Application 14/815,935 appears to be derived from the process embodied by the "e-Cat" device, purported to be a nuclear fusion reactor which exposes nickel powder to hydrogen gas at modest pressure (around 2 bar) and temperature (between 150-500$^{o}$C), and asserts it is believed not to work (e.g., by transmutation where energy is derived from the mass difference between reactants and product nuclei). The instant disclosure or invention in Patent Application 14/815,935, however, is *not* claimed to be derived from this information understood about the e-Cat device. The e-Cat is *not* reported to use deuterium in addition to hydrogen (protium) gas and its individual components do not appear to be modular in the same degree. Patent Application 14/815,935 is *not* claimed to be derived from information discussed in application US2014/0332087A1 by Godes et al., dated November 13, 2014. That application also does *not* appear to use deuterium and focuses on using a cover gas (e.g., argon) with hydrogen.

***Technical Background:***

The cathode is the central focus of the system and the location where LENR/cold fusion energy producing reactions can be made to occur. Technical objectives in scale-up and industrialization of modular LENR/cold fusion systems include: the cathode reaction material needs to be robust or not change as reactions occur; the fuel quantity supplied to the reaction material needs to be controlled to limit the reaction rate in each unit cell of the reaction material; and, heat must be removed efficiently. The system disclosed in the claimed invention in Patent Application 14/815,935 is designed to support these objectives and produce up to 200 kilowatts of energy. The reaction chamber has a replaceable anode and cathode and is designed to be connected to gas manifolds that control gas flow. Valves and temperature and pressure sensors connected to an electronic control system are used to continuously monitor and control reactor operation. Several special control techniques are implemented in the electronic control system due to the very small quantities of deuterium and hydrogen required to flow through the manifolds to support planned power levels.

The system is designed from a very top specification level to take advantage of electric

fields, gas pressures (P) and thermal diffusion within the reactor to transfer hydrogen and deuterium gas into its cathode reaction material, as depicted in the following figure from "Critical Factors in Transitioning from Fuel Cell to Cold Fusion Technology," written by T. F. McGraw and R. R. Davis for the 33rd Intersociety Engineering Conference on Energy Conversion (IECEC-98-1271) in Colorado Springs, CO, August 2-6, 1998. This subject matter was made by some of the same parties in a joint research activity that made the invention in Patent Application 14/815,935.




**TYPICAL ELECTRODE CONFIGURATION**

The cold fusion reactions are believed to occur in the cathode reaction material (see image above) as described, for example, in "A Theoretical Model for Low-Energy Nuclear Reactions in a Solid Matrix," by K.P. Sinha, Infinite Energy, 1999 (Issue 29). This influenced work to continue development of a robust cathode design for the prototype system and also planning appropriate electronic control steps to be applied during system operation. Several researchers have indicated a possibility of providing about 200 watts of heat per cubic centimeter (10 kW per 50 cm3) of reaction material. One way to consider this possibility is to imagine reaction material as being divided into unit cells to help define the length of a channel, void or crevice. With 4000 atoms of reaction material on a side, and atoms separated by about 2.5 Angstroms, a channel would be a micron in length, but with the understanding that other estimates can also be attempted. The channel is assumed to be sparsely populated with several

hundred hydrogen and deuterium atoms/molecules, and each of these attempting to move with kinetic energy related to temperature of the surrounding material. At some instant, a two-component reaction is believed to occur where one of the atoms gains an electron from the reaction material or local environment while one loses an electron. Velocity of the two ions attracted by Coulomb forces can be estimated by applying Coulomb's equation, along with Newton's law, $F = ma$, and the equation for velocity under constant acceleration , $v^2 = 2ad$, with initial velocity assumed to be zero. This results in an estimated velocity of $0.5 \times 10^5$ cm/sec. From the standpoint of the equations used, this is possible due mainly to the very small mass of ions (e.g., protons) in the channel.

This information led to further understandings that in order to industrialize LENR/cold fusion technology: the cathode reaction material must not change as reactions occur; the fuel quantity supplied to the reaction material needs to be controlled to limit the reaction rate in each unit cell of the reaction material; and, heat must be removed efficiently. If the reaction material were to change, then, after some period of operation, the cathodes would need to be replaced.

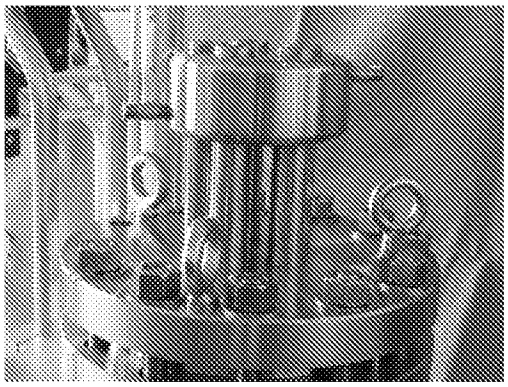
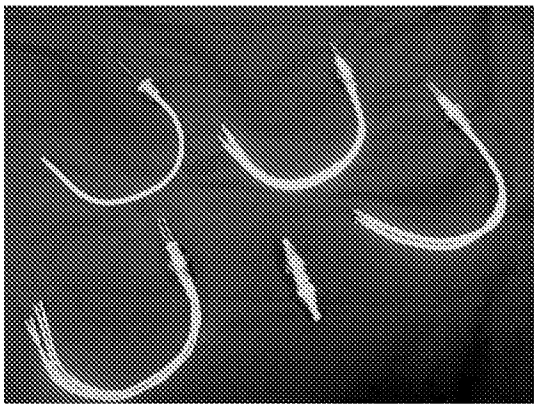
The March 22, 2016 USPTO Office Communication indicates a concern that there is no physical or chemical impetus that would cause hydrogen or deuterium gas in the device described in Patent Application 14/815,935 to undergo electrolysis as for water where hydrogen and oxygen are produced in a liquid cell containing an anode and cathode, since providing an electric current would have no effect because electrons must be removed from hydrogen molecules to produce protons. The word "electrolysis" is used in the instant application and in US Patent 6,248,221 B1 as a derivation of the Greek words for electron and dissolution. Some of the same chemistry principles are at work when power is provided to gas cells containing an anode and cathode, but here, the electric field, pressure and thermal diffusion are all applied in an effort to get hydrogen and deuterium to enter into and travel through the reaction material in the cathode. Disassociation mechanisms and loading of the cathode can also be described in terms of chemical potentials, as described in Section II of the paper on "Critical Factors in Transitioning from Fuel Cell to Cold Fusion Technology" and other references in the technical literature.

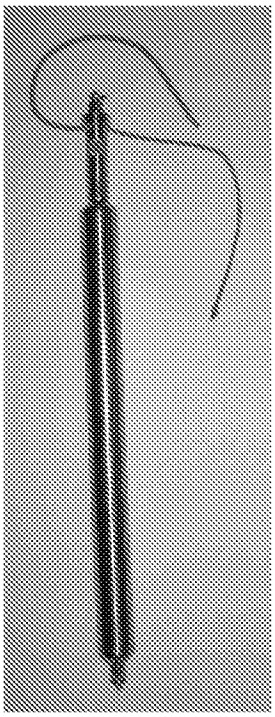
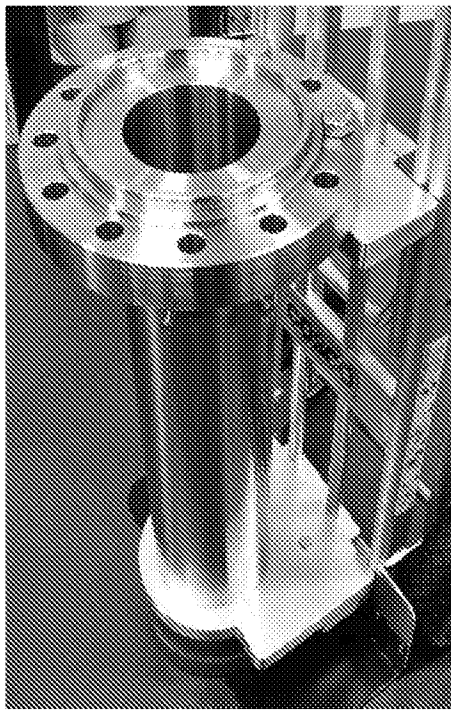
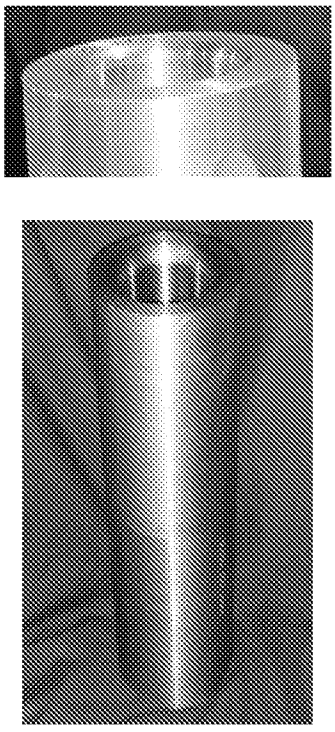
***Claim Rejections under 35 USC Section §112(a)***

The Office Action at pages 7 and 8 reject claims 1-22. Applicants respectfully traverse.

With reference to 35 USC 112 (a) and pre-AIA 35 USC § 112 (1st paragraph), the specification is required to set forth the manner and process for making and using the invention in full, clear, concise, exact terms to enable it to be made and used (i.e., without undue experimentation) and to set forth the best mode contemplated for carrying out the invention. For this application, the state of the prior art, level of skill in the art, and predictability of the art it has been asserted require disclosure of a specific device (working example), operating parameters, and scientific evidence of its success in order for one skilled in the art to make the invention.

In regard to these asserted requirements, it is noted that a great amount of knowledge and skill in the art for this technology area resides within the U.S. and worldwide technical community, as evidenced by current and past laboratory research and development activities in both industry and the government. The level of scientific and engineering skill in the art is fairly sophisticated and is believed to be sufficient for those skilled in the art to apply data in the application's specification and drawings to make the invention as set forth in the disclosure. The degree of technical detail of patents is often less by comparison to that required for engineering build-to specifications and flow-down of system specifications, test plans and operational plans. Undue experimentation would not be required of a skilled artisan in making and using Applicant's claimed invention, as set forth herein. Confidence in this approach to development is demonstrated by physical examples in the following photographs for the header, electrical feedthoughs, anode, reaction chamber, reaction material and separator valve built by U.S. industry.

| | |
|---|---|
|  |  |
| Top Outside of Header | Feedthroughs |

| | | |
|---|---|---|
|  |  |  |
| Anode | Reaction Chamber | Reaction Material |

Separator Valve Component

The header is an important component of the claimed invention as it enables feedthroughs to be cooled so that the apparatus can be operated for longer times between maintenance periods and also enables the apparatus to be serviced when internal components require maintenance or replacement. The high temperature feedthroughs are developed to withstand high pressures inside the reaction chamber; ceramic tube insulators are shown around their conductors. A photograph of a prototype high-voltage, high-temperature anode based on the disclosure shows insulated wiring extending from its internal heater. Photographs for exemplary reaction material (a key part of the cathode) indicate a central cavity for the anode. Reaction material specifications and manufacturing prescriptions, other than statements in the application, are export controlled. Separator valve components enable quantities of reaction gas to be measured; the photograph shows an electronic interface for matter output (EIMO) according to the claimed invention.

A concern was expressed in the Office Action in reference to 35 USC §101, 35 USC §112(a) and pre-AIA 35 USC §112, that when utility is based upon allegations that would not be

readily accepted by a substantial portion of the scientific community or border on the incredible, then sufficient substantiating evidence must be provided of its operability. The above technical description and details in the specification and drawings of the Patent Application 14/815,935 indicate that the allegations would likely be accepted at this point of time by the scientific community composed of persons with ordinary skill in the technology. The description and details demonstrate that key modular components of the disclosed system have been actually reduced to practice.

***Claim Rejections under 35 USC Section §112(b)***

The Office Action at pages 10-16 reject various claims for alleged lack of clarity or definiteness. Applicants respectfully traverse. Applicants note that most of the rejections are moot, in view of the above amendments. Withdrawal of the rejections is therefore respectfully requested.

In reference to 35 USC §112(b) and pre-AIA 35 USC §112, second paragraph, a concern was expressed that the claims appear to contain an abundance of alternately useable species that could prevent one of ordinary skill in the art to select a combination of components that would produce the desired result. Applicants respectfully disagree. The subject matter regarded as the invention is required to be particularly set forth, and distinctly claimed so the scope is clear to one of ordinary skill in the art. Applicants agree, and respectfully believe that the claims, as amended, and as set forth herein are believed to meet this requirement. The application clearly discloses and sets forth various exemplary embodiments of the claimed invention. The fact that various optional dependent claims can depend from an independent claim, do not render those claims indefinite. There is nothing wrong with claiming an idea broadly. Claim 1 sets forth specifically an example embodiment of the invention. Various permutations and combinations of other claimed features are possible within the scope of that claimed embodiment. The use of Markush Groups is an established and well known, extensively used technique of claiming various optional features of a claimed invention. The fact that various combinations of features can be used in various embodiments, does not render indefinite a claimed invention. The claims have been amended to address the various areas objected to in the Office Action, and Applicant

respectfully notes that the claims now even more clearly set forth the metes and bounds of Applicants' claimed invention. Withdrawal of the objections and rejections is respectfully requested.

Claim 1 sets forth, inter alia,

> A gaseous electrolysis apparatus, comprising:
> a header comprising at least one electrical connector or coupling;
> a cathode disposed within a reaction chamber;
> a heat exchanger in proximity to the reaction chamber, the reaction chamber coupled to said header, said heat exchanger configured to remove heat from a surface of the reaction chamber;
> a gas handling system mechanically coupled to the reaction chamber; and
> an electronic control circuit (ECC) mechanically coupled to said gas handling system, and coupled to said header.

Claim 1 sets forth a gaseous electrolysis apparatus. The claim's scope does not mention liquid electrolysis LENR/cold fusion systems. The claim is directed to an article of manufacture, clearly a proper subject matter for patentability. The claim is not directed to an abstract idea, but rather to a useful, concrete tangible resulting system of technologically electromechanical components.

Claim 1's scope is definite in that it includes: a header with electrical connection; a cathode within the reaction chamber; a heat exchanger that removes heat from the surface of the reaction chamber; a reaction chamber that is coupled to the header; a gas handling system that is connected to the reaction chamber by any of various example coupling mechanical devices; and an electronic control circuit (also referred to as a subsystem) is coupled to the gas handling system and the header.

Claims 2, 3, 4, 5, and 6 state that embodiments of the claimed invention include a header that is cooled and enables the apparatus to be opened orclosed. The scope does not include headers that are permanently mated to reaction chambers or headers that are not cooled. The scope is definite in that it also includes any of various optional, but also useful, features including, e.g.,: a high pressure gasket; an electrical connector (connection, coupling);

feedthrough(s); cooling apparatus (e.g., chamber, manifold, jacket, fin, fixture, plate). The feedthrough(s) can be built so the pressure side is toward the inside of the reaction chamber, it is welded into a thermal plate or threaded coupling and one end can be connected to the ECC.

Claims 7, 8, 9 and 10 state that the invention can include a header that can include any of various other example components integrated into embodiments of the header. The scope of these claims are clear, particular and definite as required and can include in certain embodiments: a temperature measurement device; gas detector (with gas volume); microwave antenna; ceramic insulators (internal isolation and support); reflector/heat shield/baffle; anode with electrical connection; and heater within the anode with electrical connection. The antenna can have a ceramic case (tube, stabilizer, protector) and be a loop antenna. The scope does not include headers without these components as part of the header.

Claims 11 and 12 state that these embodiments of the invention can include a cathode that is cylindrical and co-disposed in the reaction chamber and includes a coaxial, electrical(ly) coupling/connection to the reaction chamber, grounding coupling/connection to the reaction chamber, and consolidated metal powder with modular design, encased unit or a hollow-shaped cylinder with a central cavity configured to receive an anode. The scope is definite in that these claims also include: an outer metal or stainless steel sleeve; a base, top or ceramic insulator endcap where an endcap has holes for reaction gas to escape; modular/removeable design; and material that can include metal powder or particles; material of a shape to provide high packing density and enable consistent production; spherical powder/particles of small size (microns) with tight Gaussian size distribution; consolidated metal powder with high density or low porosity (0 to 20%); and one or more of the elements Fe, Ni, Cu, Mo, Cr, Co, Mg, Ag or W. The scope does not include cathodes that do not include these features as part of the cathode.

Claims 13, 14, 16, 17, 18 and 19 state that embodiments of the claimed invention can include a heat exchanger that is co-axial/co-disposed around the reaction chamber and includes a boiler (configured to provide coolant to the reaction chamber); a thruster port and spray nozzles. Claim 15 has been cancelled without prejudice or disclaimer. Claim 19, now depends from claim 18. The scope of these claims is clear and definite and includes: a relatively low volume boiler, flash boiler or coolant mist of coolant, liquid, gas or water; a steam pressure port and steam pressure regulator; coolant from header or gas handling system cooling chambers; and

coolant supply and high pressure water feed pump or electric valves, temperature and pressure sensors.

Claims 20 and 21 state that these embodiments of the claimed invention can include a gas handling system including of a hydrogen/deuterium gas supply manifold, an inert carrier gas manifold, a reaction gas product collection manifold and a gas measurement and evacuation manifold. Their scope does not include LENR/cold fusion systems that do not have these four manifolds. Their scope is definite in that the claims include: a safety tank/bottle (overpressure protection); cooling chambers/water jackets; gas compatible valves, pressure and temperature sensors; tanks/containers with known volumes; purge ports; a container to temporarily store reactant gas; and an acoustic interface or gas detector/reaction product sensor.

Claim 22 states that an embodiment of the claimed invention can include an electronic control circuit/subsystem with a controller subsystem that is connected to an anode power supply, anode heater, separator valve subsystem, thermocouples and pressure sensors, microwave generator, heat exchanger cooling valve and nuclear radiation sensor. The claim's scope does not include electronic control subsystems that are not sufficiently robust to support these functions. The claim's scope is definite in that it includes: a single board computer with supporting components (e.g., control area network, memory, input and output modules and ports; power supplies); software instructions and algorithms (e.g., Pulsed Chamber Pressurizer; start-up and shutdown procedures); and is configured to control a fail-safe exhaust valve and provide other operational functions such as human interface.

The intent has been to set forth the most important characteristics of various example embodiments of the claimed invention, in a precise, clear, correct and an unambiguous manner, while not unduly limiting alternatively usable species. The fact that there can be various, many, or even countless variations, still does not render the claimed invention somehow unworthy of patent protection. The previous restriction has already restricted out many of Applicants' claimed embodiments, and the continued complaint that there are too many variations, is improper. Use of the Markush group for claiming various example embodiments actually makes it easier for an examiner to reject a claim, by needing to only reject a single species of the Markush group, and thus, Applicants assert that the claims, as amended, hopefully address the objections cited. Withdrawal of the objections and rejections is respectfully requested.

For example, the ECC could be considered to be an electronic circuit by some or an electronic subsystem by others. Some can choose to connect it electrically (e.g. hard wired), while others can choose to connect it electronically (e.g., by the addition of radio communication). The fact that the claims set forth such language, actually made them more particular and definite, than without that language, as requested by the Office Action. The language was removed from some claims to advance prosecution, but Applicants assert the objections to be unfounded. Further, objection to the use of the term "at least one" with respect to a claim element, and arguments that this somehow makes the claim indefinite is respectfully noted to be incorrect, since the use of "comprising" and the definite article "a" amounts to a construction identical to one or more of the claim element, or therefore, at least one, thus Applicants respectfully request withdrawal of the objections. For the feedthroughs, some can choose preferably to have the high-pressure side on the inside of the reaction chamber. Some can choose to weld it into place, or threads can be used. These alternative embodiments all are examples of Applicants' invention, but the set forth embodiments provide example implementations that can be provided in specific example embodiments. The fact that there are many possible variations possible, does not some how make them not proper. The alternative technical terms for components and technical parameters in the claims can be used to assist the reader in considering processes for making the components and developing future improvements to initially produced units. The alternative descriptions can be used to enhance the ability of one of ordinary skill in this process and are not believed to interfere with future development. While other alternative descriptions could be provided, the intent was to focus on those of most advantage.

The claimed invention is an electromechanical invention, using an electronic control system to control valves of a gas handling system, thus its nature is predictable, and thus its embodiments are sufficiently enabled.

In response to the request for working examples, the statute does not require testing of all embodiments, only sufficent disclosure to meet the requirements of section 112 (a). The mere fact that there are multiple combinations of features that may properly be used in embodiments of an invention, does not necessarilyt render claims unclear. The claims as amended are now

believed to even more clearly set forth the claimed embodiments of Applicants' claimed disclosure.

With respect to paragraph 25, 26, 27, 28 and 29 of the Action, a mere logical or operation does not render a claim indefinite, Use of a Markush group is proper and a well known, extensively used method of claim drafting. When a Markush group is used, an examiner need only reject one member of the group, and so actually a Markush group claim is actually easier for an Examiner to reject. Applicants' respectfully note that the Office Action has taken extensive time to calculate, using the laws of probability and statistics all the possible permutations an combinations of features on page 11, however, the time spent calculating the number of devices would perhaps better serve the public, being used to search the features that are allegedly not obvious, to determine the novelty of those features. With all due respect, with all the time spent counting combinations of variations, it appears that few of those claim features were searched, and a rather conclusory rejection of obviousness over Applicants' own publications was the best references that could be found as a result.

With respect to paragraph 31, there is substantial caselaw distinguishing between the use of the terms connect and couple, connect generally covering direct connections, and coupling, indirect connection, thus the use of either term is clear and not indefinite.

Applicant respectfully notes that the statute does not require detailed blueprints, and fully flushed out detailed parts lists of all components to allow one to claim an invention. As will be apparent to those skilled in the art, not all details need to be provided, and indeed the statute requires that you not include all details that would be apparent to those skilled in the art. Instead, you need only ensure that the person having ordinary skill in the relevant art be provided sufficient disclosure to avoid a need for undue experimentation. Applicants' extensive disclosure has certainly met this requirement. The fact that various alternative embodiments of various optional features have been claimed, does not render those variations indefinite, unenabled, or insufficiently disclosed. Indeed if Applicants believe that these variations of the claimed invention provide the best modes of practicing the claimed invention, they are required to include them under section 112(a) and it is thus improper to reject the claims for including these claimed features.

Paragraph 31 objects to the use of functional language, however, the quoted language makes clear the structures supporting the function, namely for claim 4, the feedthrough is the structure, for claim 8, insulators are a type of material (not a conductor) that electrically isolate, heater and heat exchanger of claim 13, and spray nozzles of claim 18 and a PLC or processor have been added to further clarify. Applicants have amended the claims extensively and believe that as amended the claims now even more clearly and definitely set forth the claimed invention with requisite particularity and clarity.

***Claim Rejections under 35 USC §101***

The Office Action at page 17 rejects claims 1-22 as allegedly lacking utility. Applicants respectfully traverse. For at least the reasons noted above, the claims are believed to set forth requisite utility and meet the requirements of section 101 of the statute. Applicants disagree with the assertion that the claimed invention is inoperable, is not usefull, lacks utility, and/r is incredible. As set forth above, the claimed invention is directed to an article of manufacture and as such includes requisite utility to meet the statute's requirements. Withdrawal of the rejection is respectfully requested.

***Claim Rejections under 35 USC §103***

The Office Action at pages 17-20 rejects claim 1 as allegedly obvious in view of Applicants' prior patent in view of a combination of Applicants' prior publications. Applicants respectfully traverse.

The Office Action at page 18 with reference to 35 USC §103, rejects Claim 1 as allegedly obvious in over US Patent 6,248,221 by Davis et al. and/or in a paper entitled, "Critical Factors in Transitioning from Fuel Cell to Cold Fusion Technology," by T. F. McGraw and R. R. Davis, August 2-6, 1998. Applicants respectfully traverse. Applicants assert that the claimed invention includes subtantial differences over the applied references. The originally patented invention did not have an anode disposed within a cathode, which was disposed within a reaction chamber. Rather, the '221 patent included an inner cathode and an anode surrounding the cathode, with water and steam running through the inner cathode. There is substantial similarity between the

claimed invention and Applicants' prior invention, and those differences would not have been obvious to a person having ordinary skill in the art.

Steps in the process for determining obviousness include: determining the scope and contents of the prior art; ascertaining the differences between the prior art and the claims at issue; resolving the level of ordinary skill in the pertinent art; and considering objective evidence present in the application indicating obviousness or non-obviousness.

Claim 1 is independent and sets forth the broadest embodiment of the claims. Claim 1 states the elements (bounds) of the claimed invention: a header with an electrical connection; a cathode within the reaction chamber; a heat exchanger that removes heat from the surface of the reaction chamber; a gas handling system connected to the reaction chamber; and an electronic control circuit (subsystem) coupled to the gas handling system and the header.

Applicants respectfully assert reviewing the alleged combination of Applicants' own prior publications, being asserted in the rejection, even combining the two references, one does not obtain the claimed invention of claim 1. Need for the particular claimed, physical elements of claim 1, would not appear to be obvious in a general sense for all electrolysis apparatus, nor for all LENR/cold fusion systems. Language in the specification and dependent claims for Patent Application 14/815,935 can be used to ascertain differences with regard to the prior art described in the referenced technical literature and patents listed in the application. These differences are emphasized in view of the objective of enabling industrialization of modular systems.

Paragraphs 45-46 in the March 22, 2016 USPTO Office Communication asserts that Patent 6,248,221 discloses a gaseous electronic apparatus comprising a cathode in the reaction chamber, a heat exchanger, a gas handling system and electronic control circuit (coupled to the header), but does not disclose a gas header. The Communication indicates that the Critical Factors paper discloses a header in Figure 3 of the paper, and that the gas mixing chamber in the Critical Factors paper includes a header (a conduit into which other conduits and gas feeds) that also contains at least one electrical connector (one for a temperature sensor). Because the electronic control circuit and temperature sensor are connected, the Action asserts that those are connected to the header in the Critical Factors paper. The question therefore, is whether one of ordinary skill in the art would have found it obvious to combine the header in the Critical Factors paper into the device in Patent 6,248,221 to allegedly obtain a structure into which multiple

gases could flow before entering the reaction chamber.

In the instant disclosure or application of Applicants' claimed invention of claim 1, however, the header is ***not*** claimed to be a structure into which multiple gases could flow before entering the reaction chamber. Instead, the header is a structure that allows electrical connections to be made between the electronic control circuit and electrical elements within the reactor.

Paragraphs 47-48 assert that the Critical Factors paper discloses a gaseous electrolysis apparatus comprising a cathode, a heat exchanger, a header (the gas mixing chamber includes a header (a conduit into which other conduits and gas feed)), a reaction chamber coupled to the header, a gas handling system coupled to the reaction chamber and the electronic control circuit coupled to the gas handling system (the electronic control circuit is connected to the reactor which is connected to the gas handling system at the gas mixing chamber). Paragraph 49 asserts that the Critical Factors paper discloses a temperature sensor. The argument, therefore, is that one of ordinary skill in the art would have found it obvious to use electrically operated valves for coupling the components, and to address a need for electrical connection between the electronic control circuit and the header to provide user-controlled valve actuation.

In the instant disclosure or application of Applicants' claimed invention, however, electrical connections between the electronic control circuit and the header allow electrical connections to be made between the electronic control circuit and electrical elements within the reactor. Separate connections between the electronic control circuit and electrically operated valves in the gas manifolds are used to provide user-controlled valve operation.

Paragraph 50 of the Office Action indicates that the Critical Factors paper does not disclose the cathode disposed within the reaction chamber, but asserts that Patent 6,248,221 for a similar device teaches a cathode in a protective jacket. The question, therefore, is whether one of ordinary skill in the art would have found it obvious to dispose the cathode in the Critical Factors paper within the reaction chamber, and also prevent cathode maintenance by untrained persons.

In the instant disclosure or invention of Applicants' claimed invention of claim 1, however, the cathode is not claimed to be disposed in a protective jacket to prevent cathode maintenance by untrained persons, but is both a structure within the reaction chamber and one designed to facilitate maintenance. The cathode in Patent Application 14/815,935 is modular

and removable as a component; a metal sleeve, in some embodiments, is used to encase the reaction material and its porosity is stated to be an important parameter. The cathode in Patent 6,248,221, on the other hand, is ***not*** a removable component.

Applying a similar process to information in other technical literature and patents indicates that the invention in this application is both novel, as already conceded, and nonobvious to one of ordinary skill in the art prior to the time that Patent Application 14/815,935 was filed. A brief review of the references listed in the Information Disclosure Statement by Applicant include those that are referenced in the text for Application 14/815,935, those from the earlier Patent 6,248,221, references to patents that cite the earlier patent, and references on other apparatuses that have a LENR/cold fusion purpose. Others in this field of technology do ***not*** appear to have published, disclosed, taught, conceived of, or suggested the elements of claim 1 of the claimed invention of the 14/815,935 Patent Application, prior to filing of the application. The invention in Patent Application 14/815,935 was made by parties in joint research activities that include some of the same parties for the Critical Factors paper and Patent 6,248,221. However, the only similarity relates to the people, but the applied references fail to teach or suggest the presently claimed invention. Thus, the applied references, alone or in combination, fail to teach or suggest all the elements of the claimed invention, as set forth in Applicants' claims. Further, it is improper to combine two references without a teaching of, or a suggest of a proper motivation to combine. Here, the authors are the Applicants and there is no suggestion of a motivation to combine, and even if there was, combining the two documents results in a combination that fails to include all the claim's features. Further, the invention is ***not*** obvious because it depends upon unique technical concepts in its design that were ***not*** either derived from common sense or that were previously self evident, e.g., to include from the Critical Factors paper and Patent 6,248,221. As indicated above, the claimed invention is ***not*** achieved by using a known technique to improve a similar device in the same way and was not created by applying a known improvement or technique in a way that would yield predictable results. Applicants' claimed invention was not achieved from choosing a finite number of identifiable, predictable solutions that have a reasonable expectation to succeed. It is not a product of combining prior art elements to yield predictable results. Applicants' claimed invention was not created through substitution of one known element for another to obtain predictable results. Applicants' claimed

invention does not include predictable variations that a person of ordinary skill could implement, prompted by design incentives/market forces. Further, there has been no known teaching, suggestion or motivation by others to combine the above and/or other references, alone, or in combination in the manner described in the application, to somehow reach Applicants' claimed invention. These have been discussed within the present development team who have maintained tight information control over the proprietary nature of its discussions and work. Thus, claim 1 is believed to be not only novel, and useful, but also nonobvious over the applied references, and references of record, including those being resubmitted in the IDS, which were previously cited in Applicants' former patent application. Thus, claim 1 is believed to be patentable. Applicants respectfully request withdrawal of the rejection of claim 1, and passage to allowance of the claim.

For at least the reasons noted above with reference to claim 1, the dependent claims are also believed to be allowable over the applied references of record. Further, each of the pending dependent claims 1-22 are believed to be allowable over the applied references and references of record. Applicants respectfully request allowance of the claims.

Should an interview be considered helpful, Applicants stand ready to discuss the claims, references and distinguishing features with the Examiner at her convenience.

***Objections to Prior Information Disclosure Statement (IDS)***

Applicants respectfully submit the foreign patent and non-patent literature (NPL) previously cited in the application in an IDS dated March 14, 2016. The references were largely from the related patent's file history, of common assignee to the present application.

A copy of each additional foreign patent, non-patent literature (NPL) and other reference material cited on the Information Disclosure Statement considered 14 March 2016 is enclosed in accordance with 37 CRF 1.98(a)(2). See Enclosure 2. Please note that [BG] EP0568118 B1 is provided with EP0568118 A2; [BE] WO2007096120 A3 with WO 2007096120 A2; and, [BF] WO2007130156 A3 with WO 2007130156 A2. For reference [CC], only the title and agenda pages are provided due to the large number of pages in the complete workshop/short course handout.

***Common Ownership:***

The subject matter of the various claims of the application was commonly owned by the individual inventors and as a group as of the effective filing date.

## CONCLUSION

Prompt and favorable consideration of this Amendment is respectfully requested. Applicant believes that the present application is in condition for allowance. If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is hereby invited to telephone the undersigned at the number provided. The inventors would be happy to provide a pre-examination interview, should the Examiner determine it would be helpful to discuss the subject matter of the Application in advance of examination on the merits. Should the examiner determine that any shortage in fees exists, in connection with the filing of this paper, notice to that effect to the undersigned is respectfully requested, so payment may be made by credit card.

Dated: June 22, 2016

Respectfully submitted,

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Enclosures:
1. Replacement drawing sheets 1, 3 and 5.
2. Reference Material (listed below).