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Oliver

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(54) **EXPLO-DYNAMICS™: A METHOD, SYSTEM, AND APPARATUS FOR THE CONTAINMENT AND CONVERSION OF EXPLOSIVE FORCE INTO A USABLE ENERGY RESOURCE**

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(21) Appl. No.: **11/880,741**

(22) Filed: **Jul. 24, 2007**

Related U.S. Application Data

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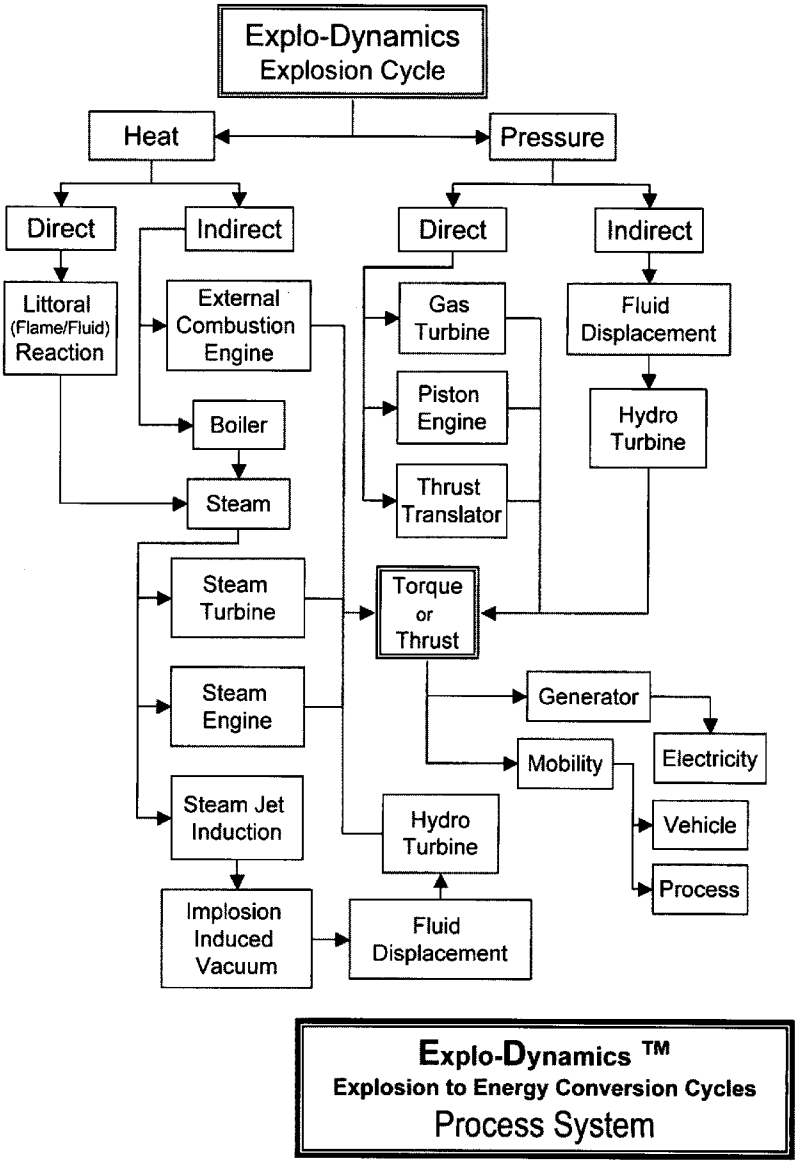
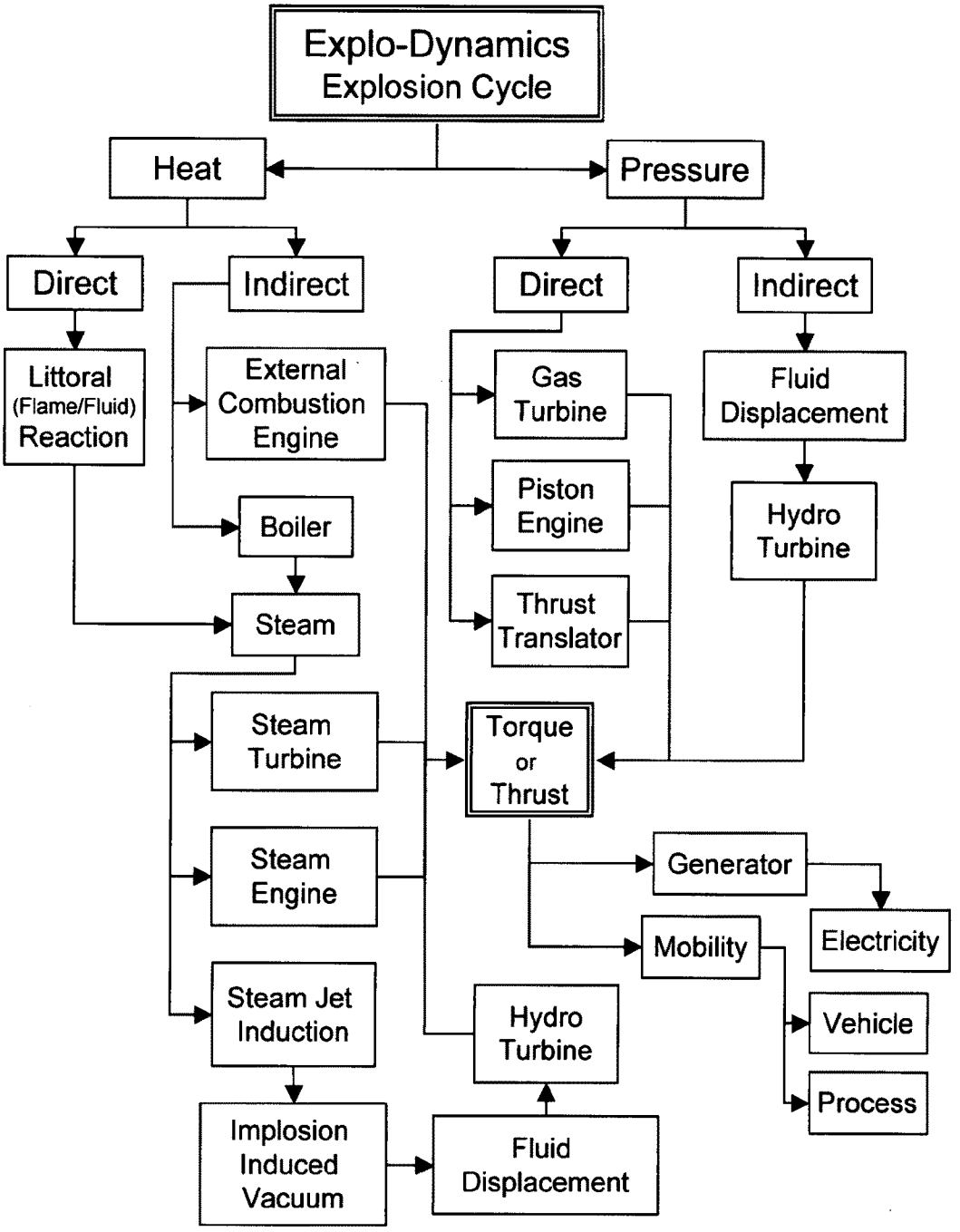
(52) **U.S. Cl.** **60/698**; 44/504

(57) **ABSTRACT**

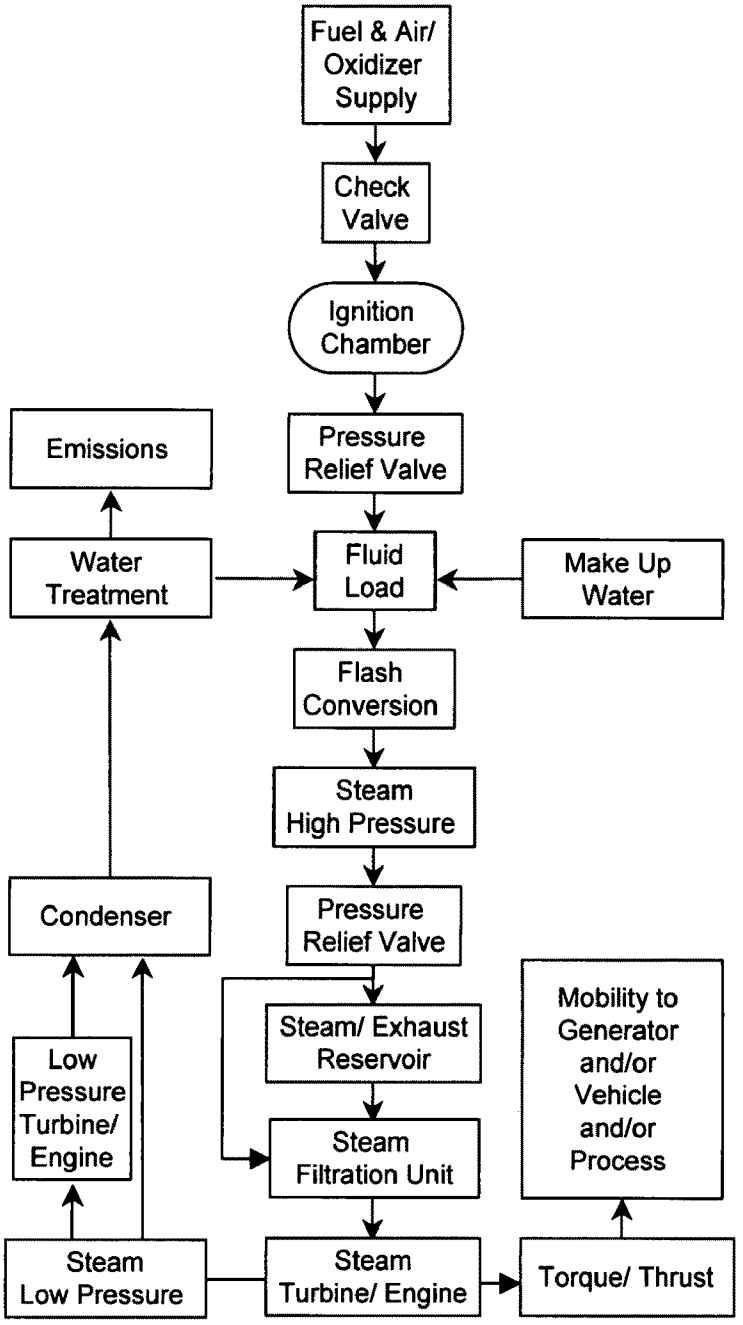
Methods, systems, and apparatus for generating energy from a process contained series of explosion cycles is provided. The Explo-Dynamics™ energy generating system includes several embodiments for stimulating the heat and pressure release episodes of the process configurations and translating the released forces into torque, thrust, motive force, and/or super-heat impulses. The methods and systems of the present invention include a comprehensive arrangement of process configurations and components as well as a means of operation.





Explo-Dynamics ™
Explosion to Energy Conversion Cycles
Process System

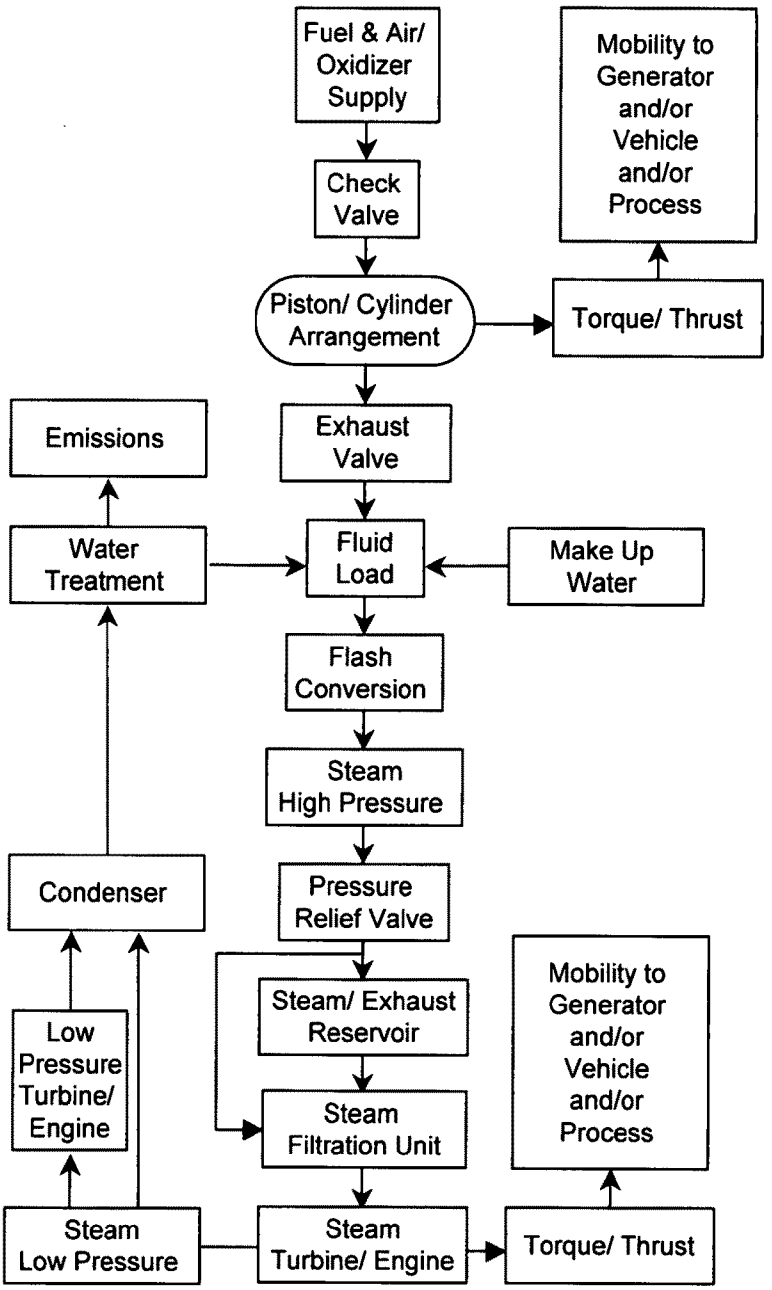
Fig. A



System & Protocol
Direct Heat Cycle

Fig. B -1

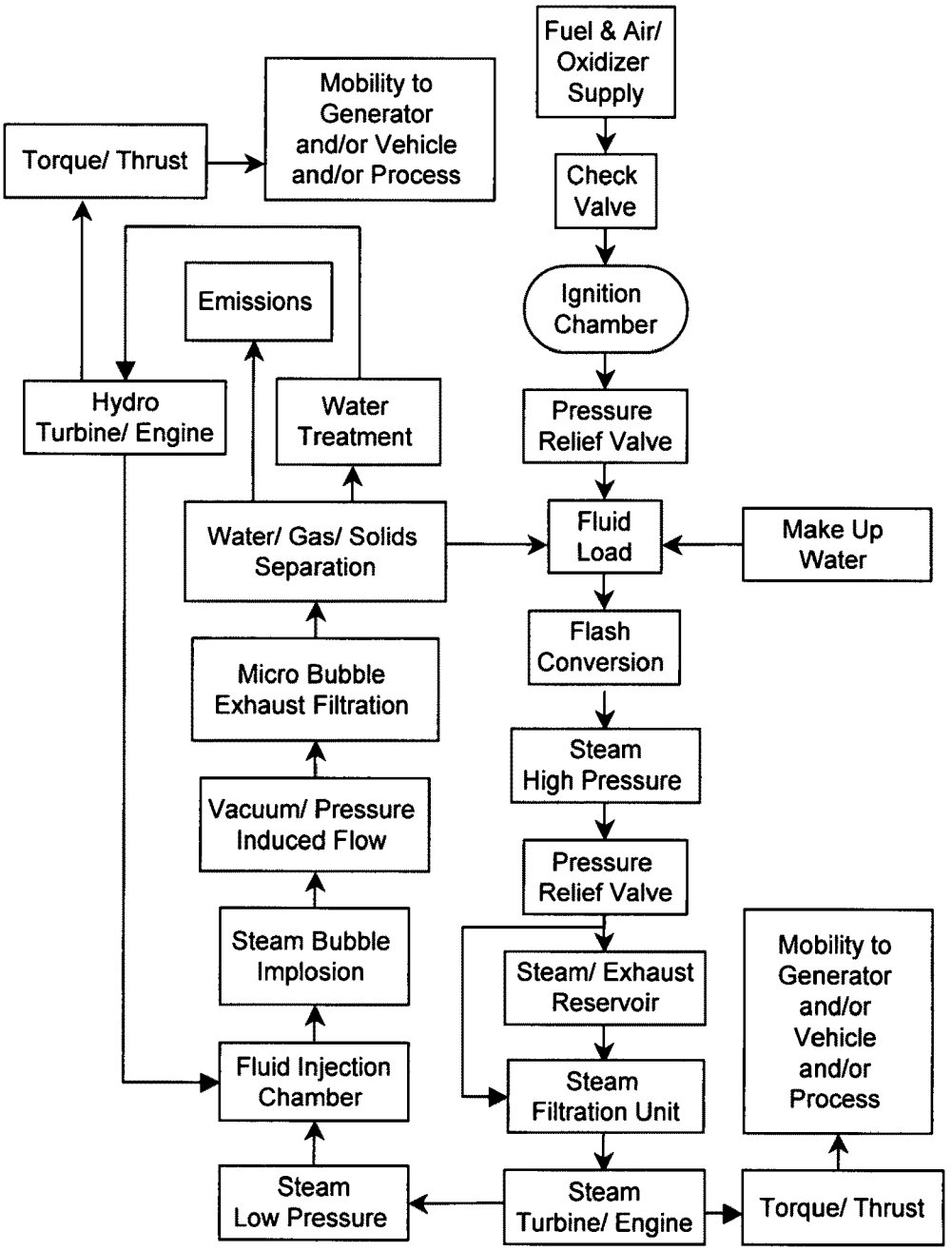
Explo-Dynamics ™
Energy Conversion Cycles
System & Protocol



System & Protocol
Direct Heat/
Direct Pressure Cycle

Fig. B-2

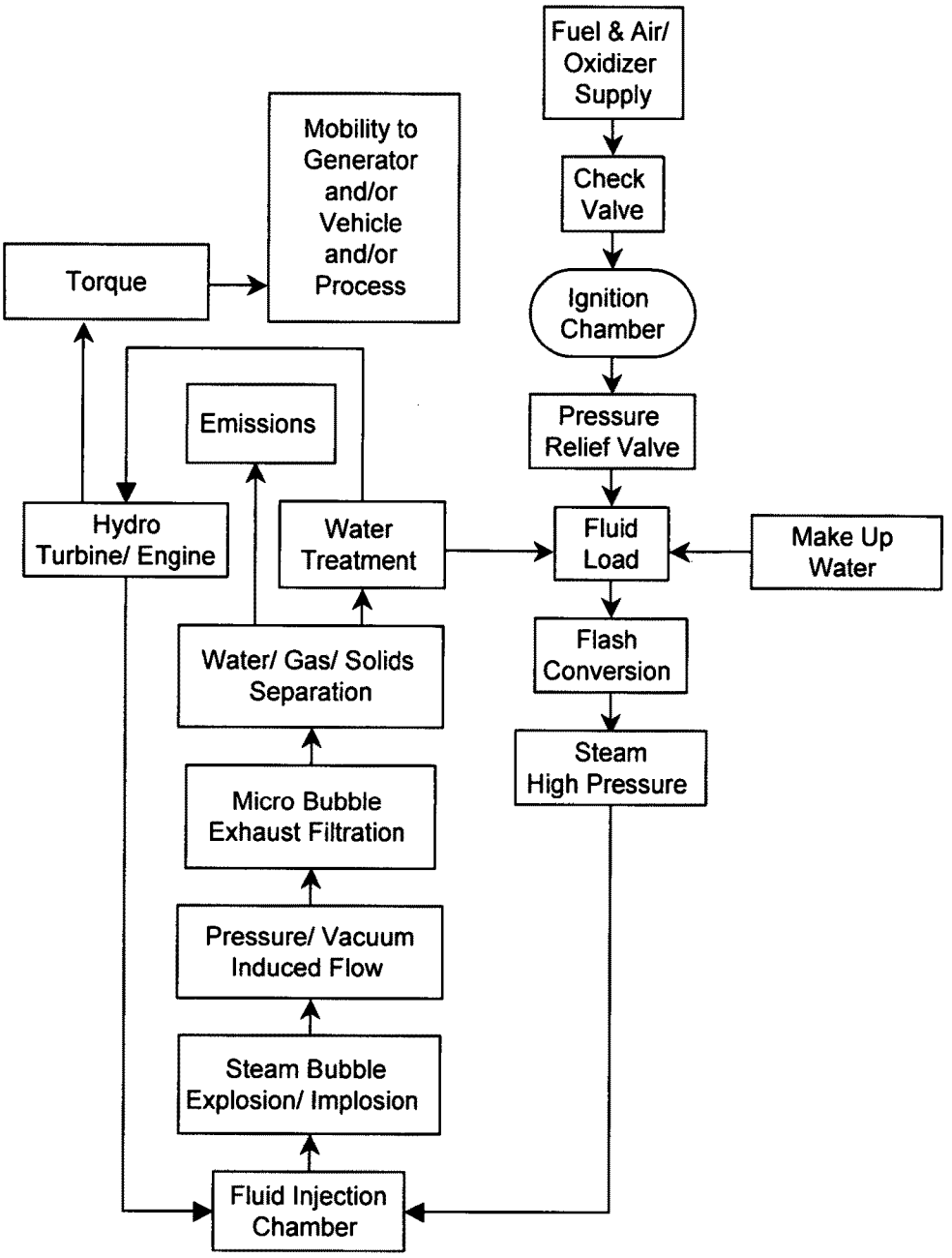
Explo-Dynamics ™
Energy Conversion Cycles
System & Protocol



System & Protocol
Direct Heat/
Direct & Indirect
Pressure Cycle

Fig. B-3

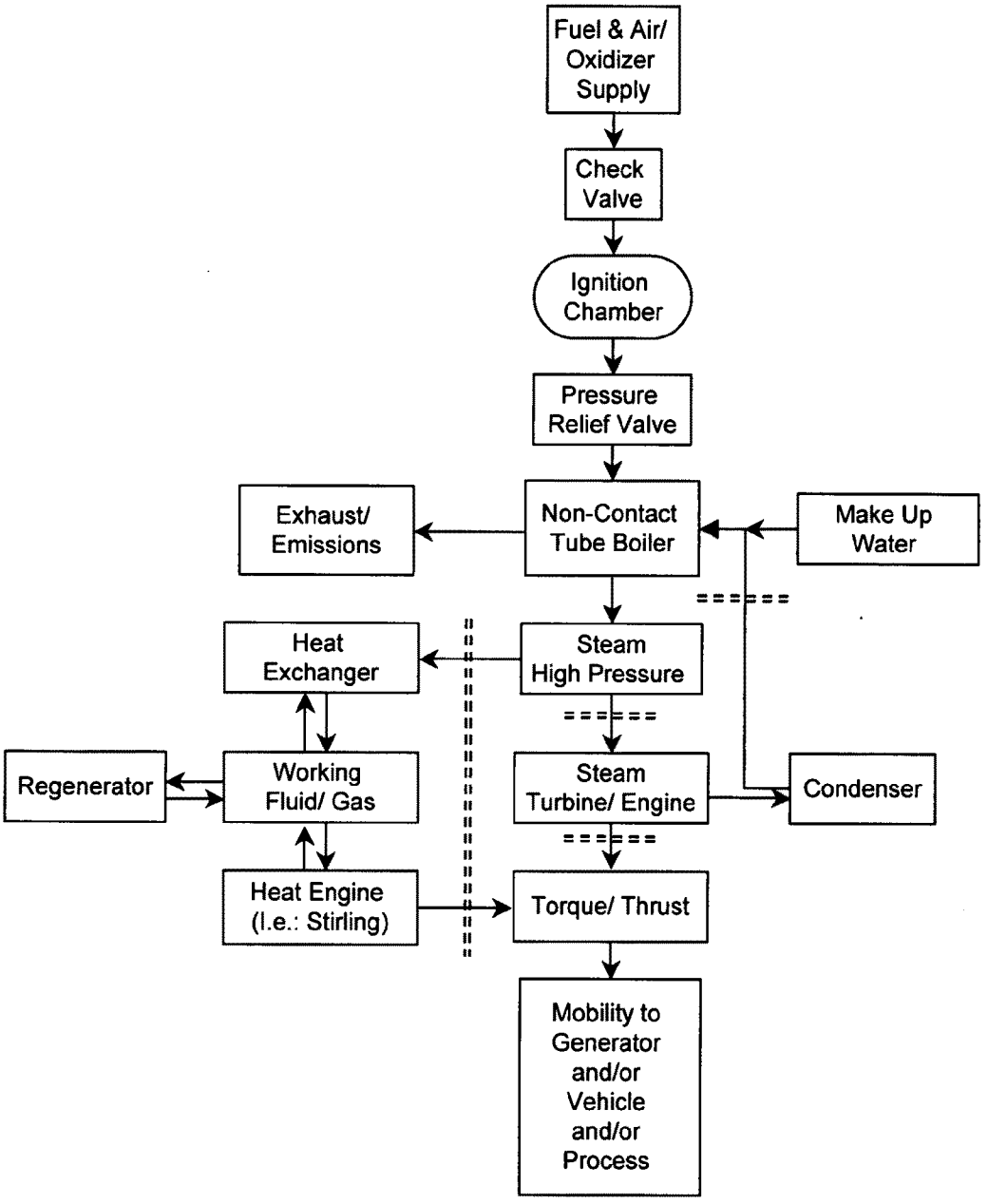
Explo-Dynamics ™
Energy Conversion Cycles
System & Protocol



System & Protocol Indirect Pressure Cycle

Fig. B-4

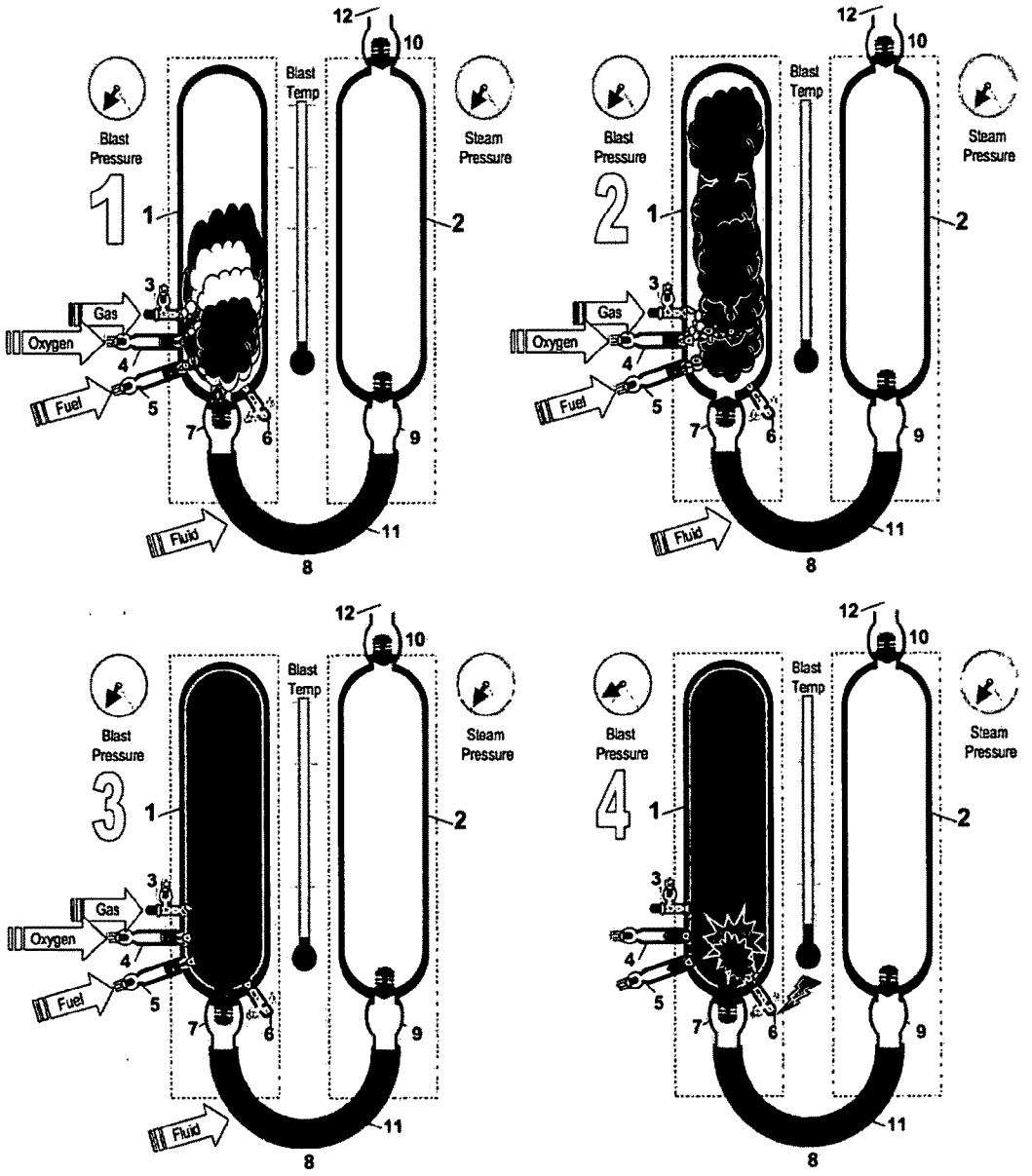
Explo-Dynamics ™
Energy Conversion Cycles
System & Protocol



System & Protocol
Indirect Heat Cycle

Fig. B-5

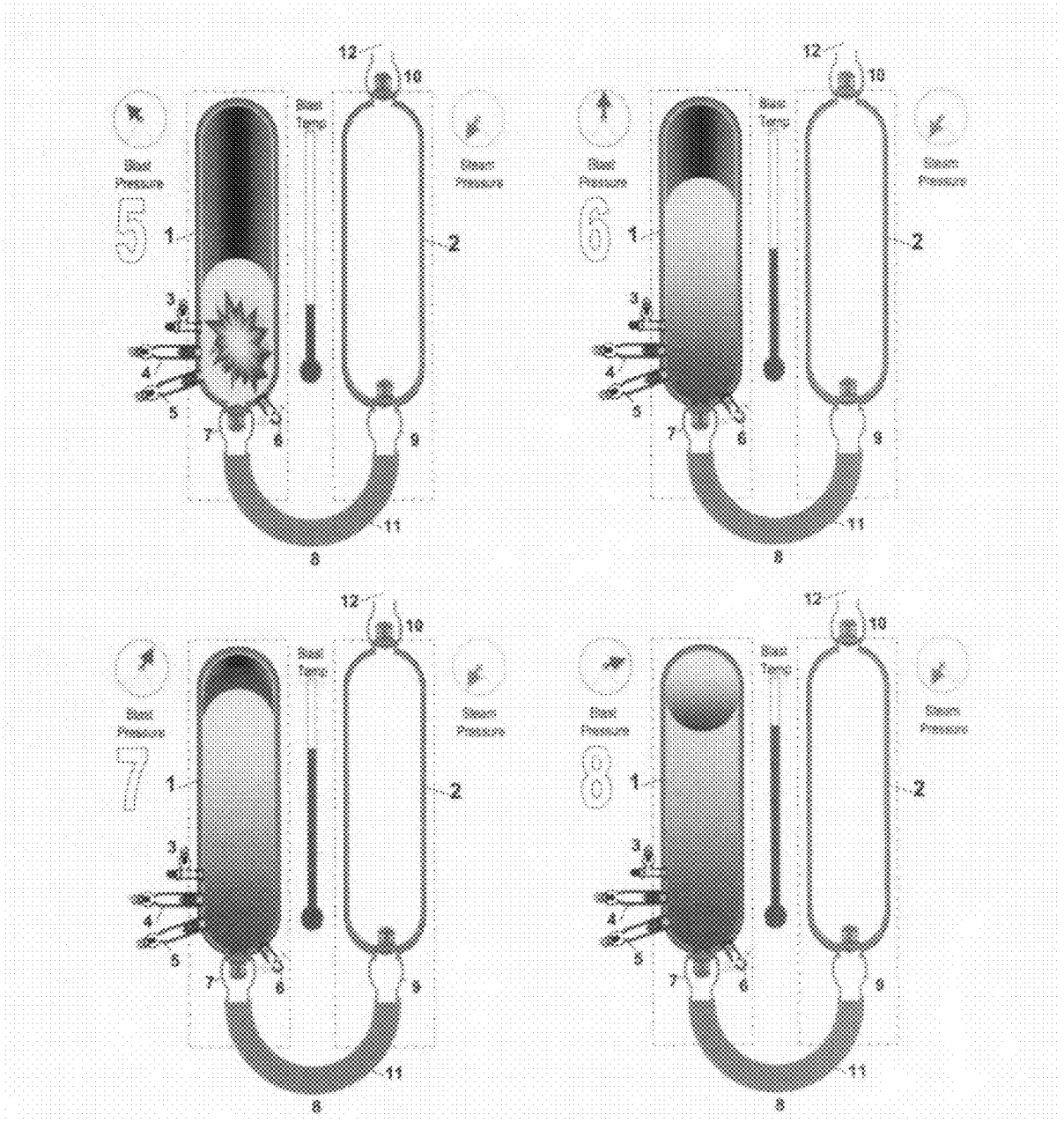
Explo-Dynamics ™
Energy Conversion Cycles
System & Protocol



Flash Steam Conversion Sequences 1 thru 4

Fig. C-1

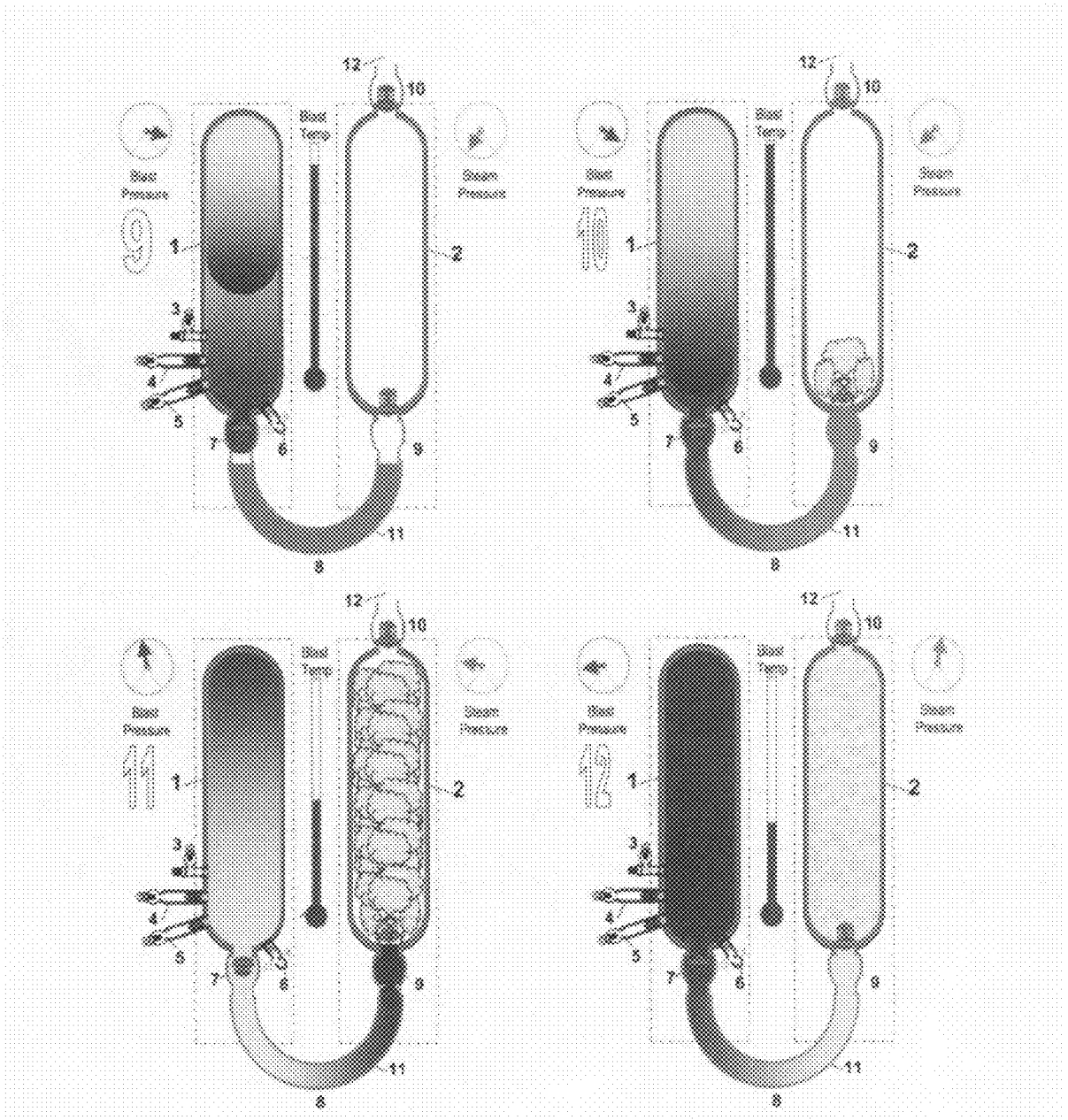
Explo-Dynamics ™
Flash Steam Conversion Cycles
System & Protocol



Flash Steam Conversion Sequences 5 thru 8

Fig. C-2

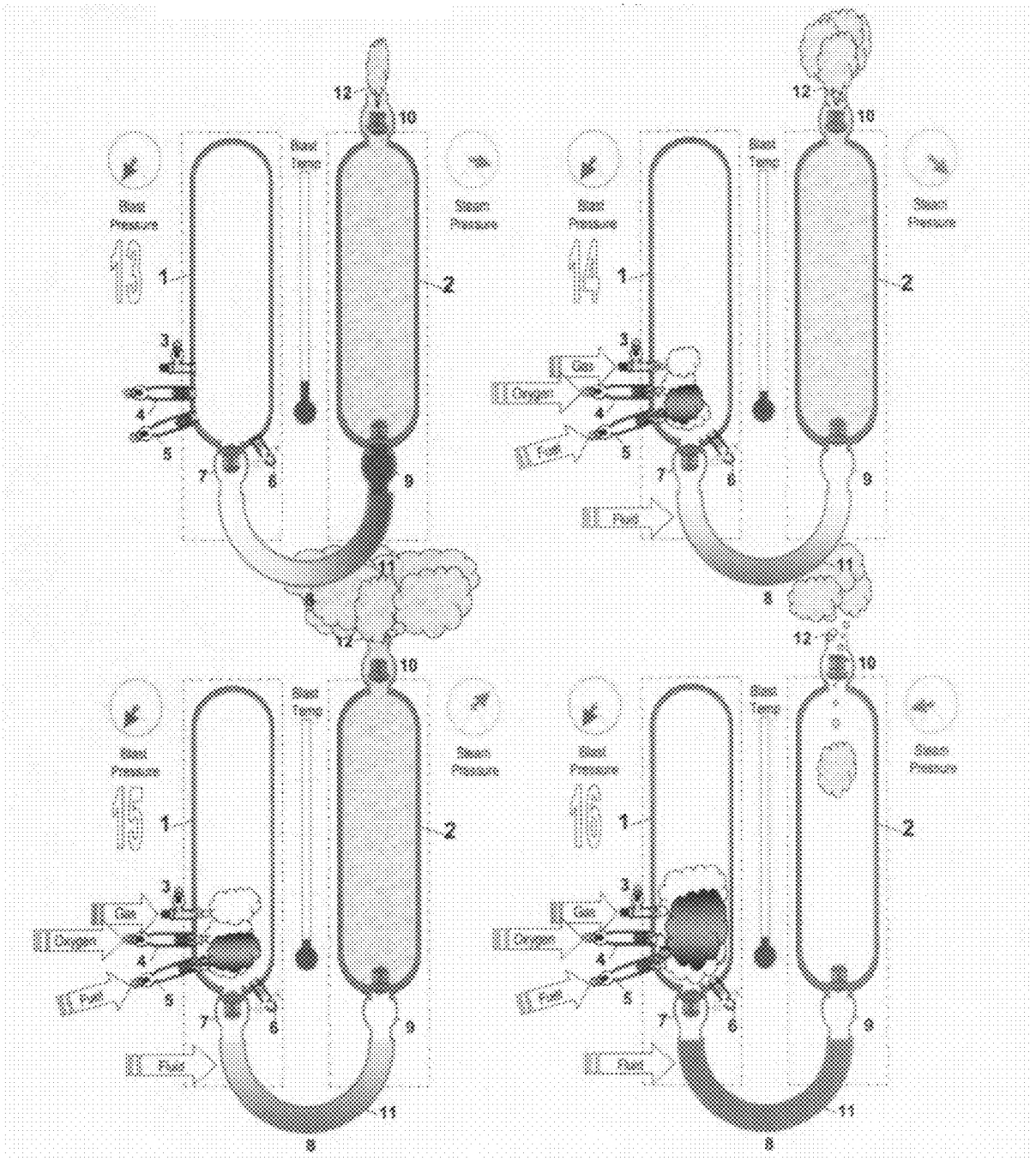
Explo-Dynamics ™
Flash Steam Conversion Cycles
System & Protocol



Flash Steam Conversion Sequences 9 thru 12

Fig. C-3

Explo-Dynamics ™
Flash Steam Conversion Cycles
System & Protocol


13
14
15
16
Flash Steam Conversion Sequences 13 thru 16
Fig. C-4
Explo-Dynamics ™
Flash Steam Conversion Cycles
System & Protocol

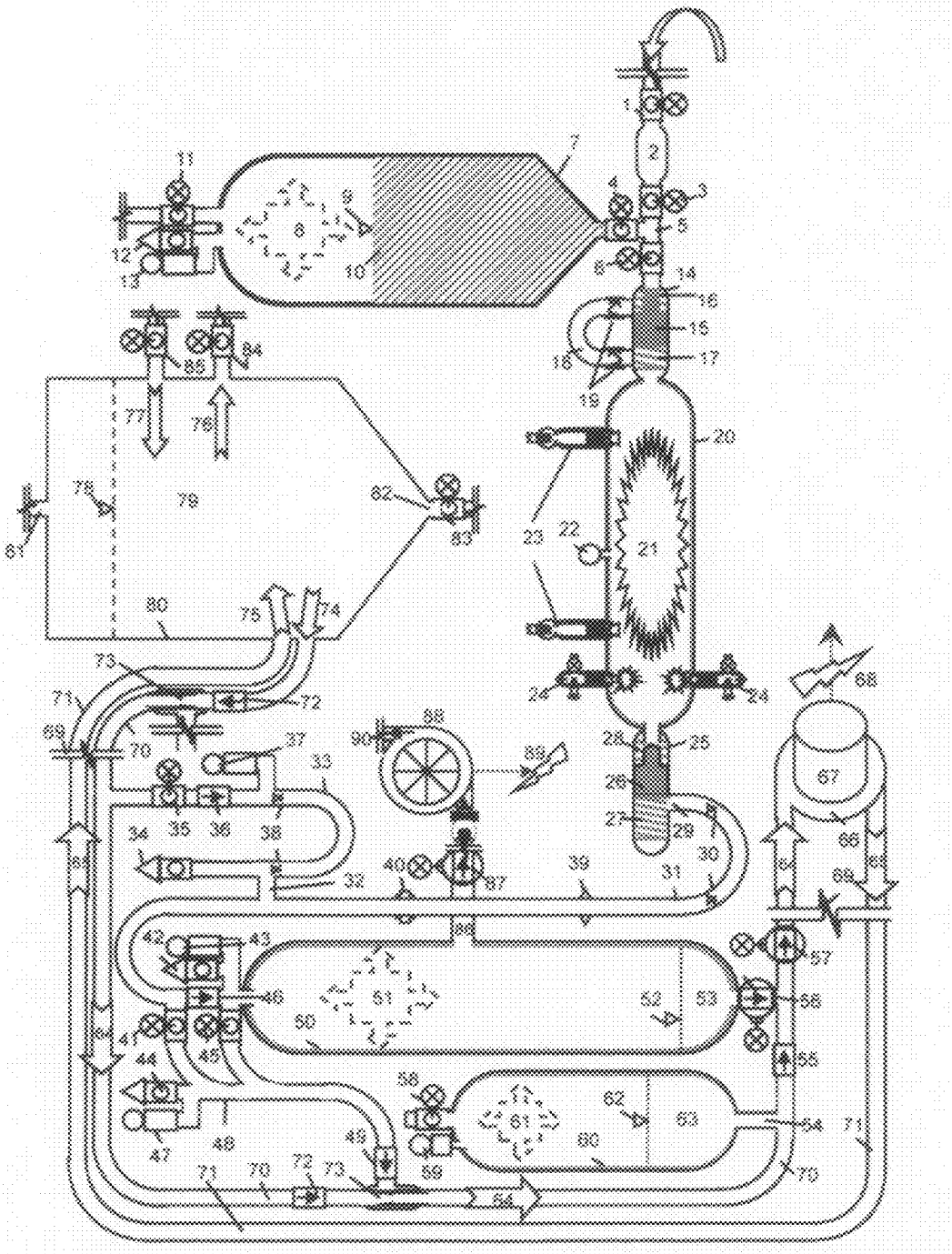

Explo-Dynamics™
Direct Heat/ Indirect Pressure
Process Arrangement

Fig. D

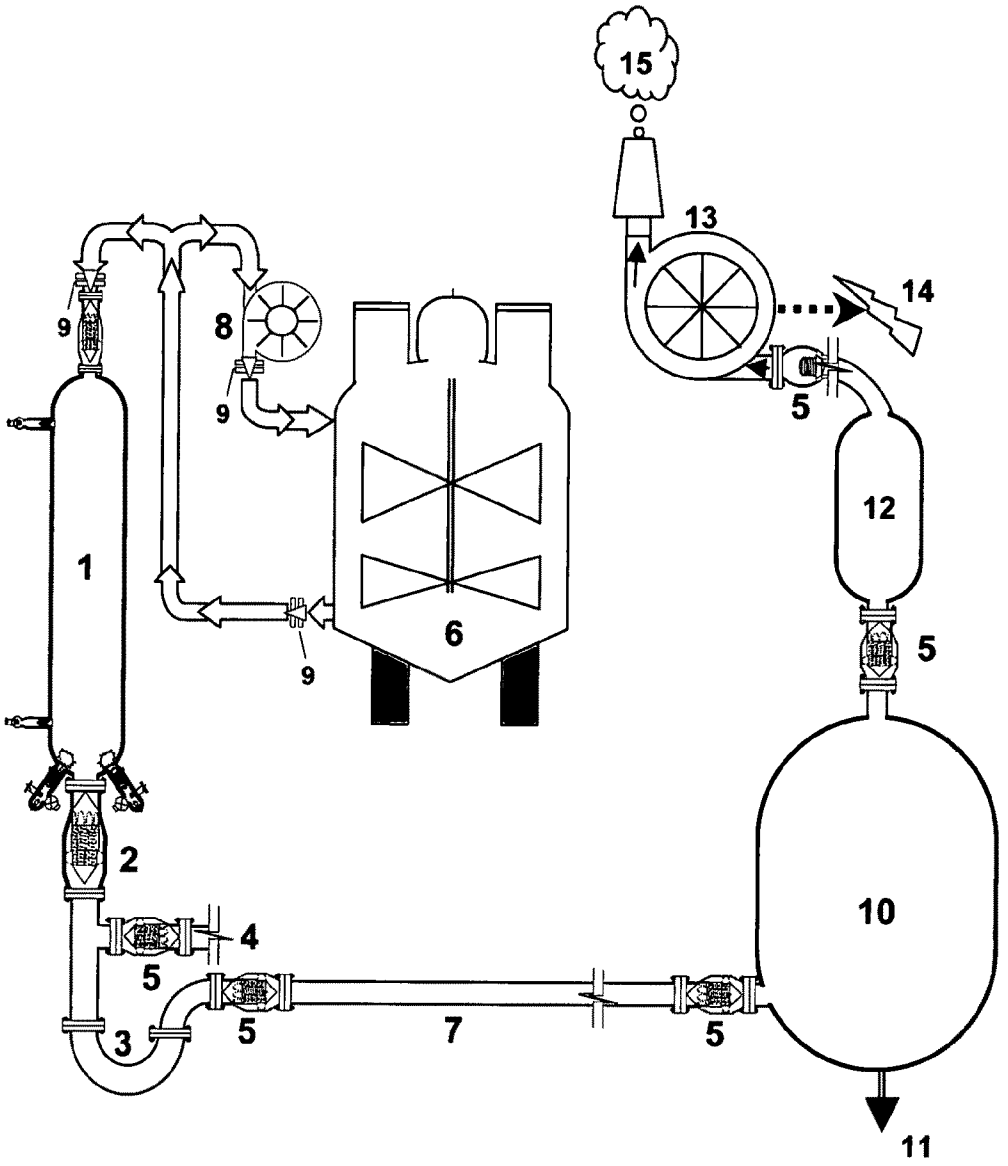


Fig. E

Explo-Dynamics ™

Direct Heat to Steam

Process Arrangement

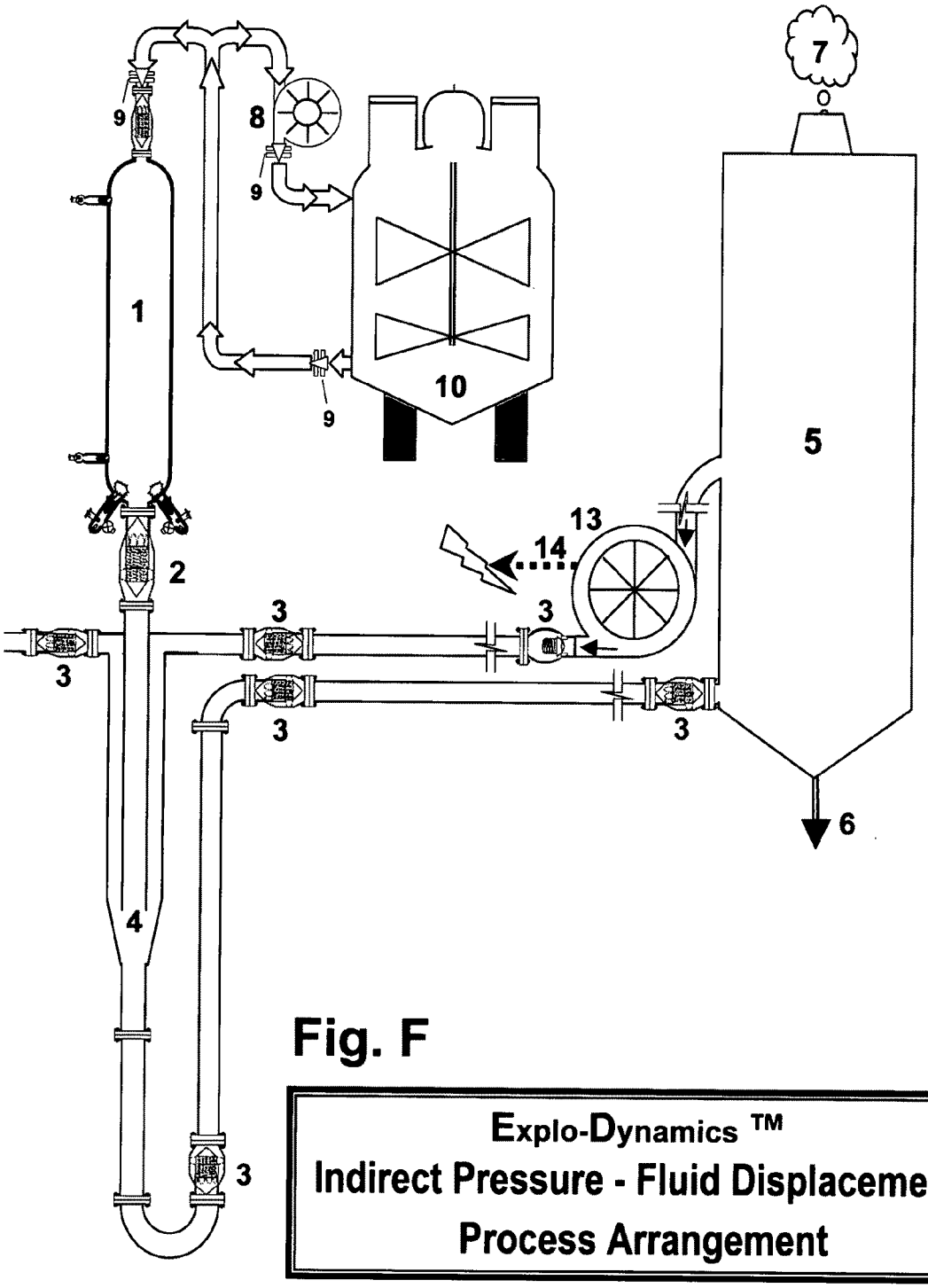
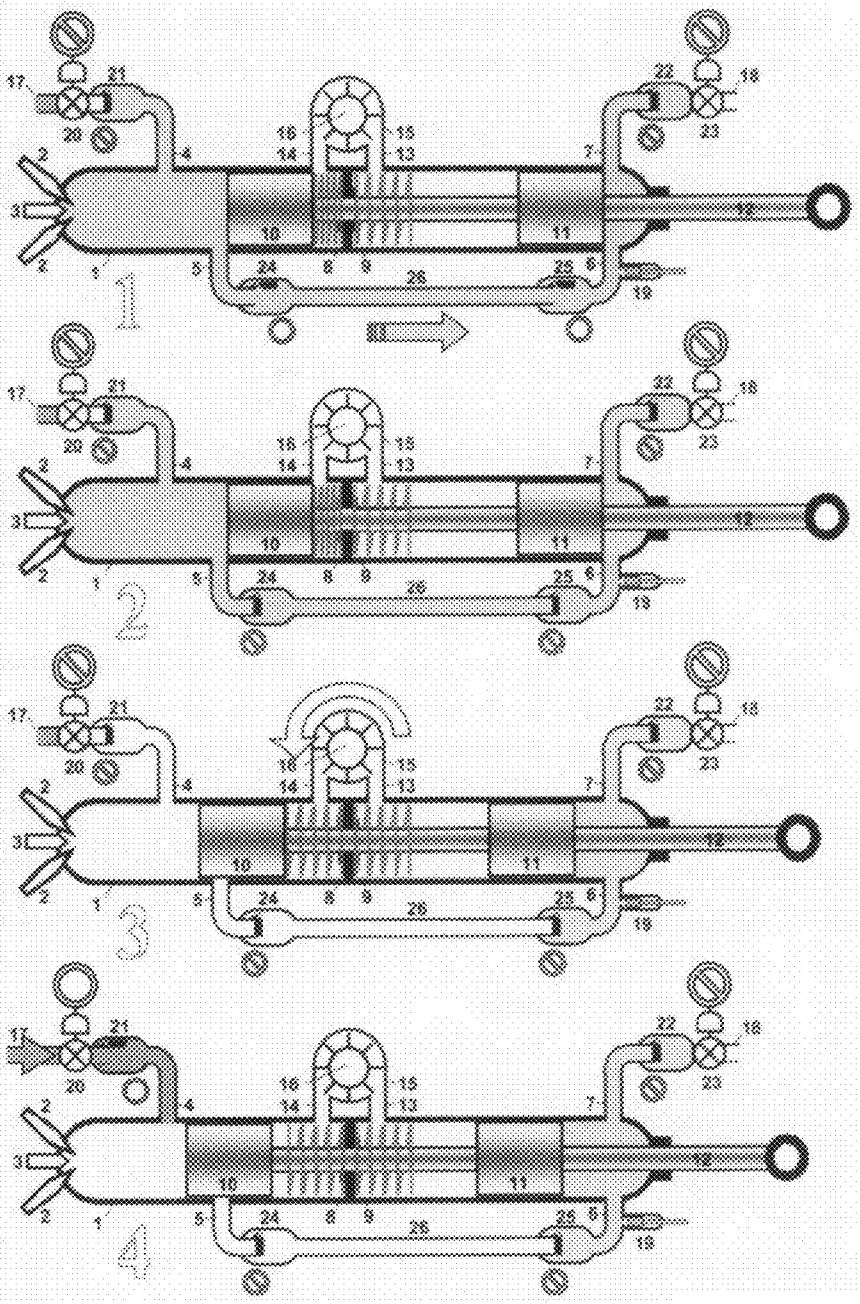


Fig. F

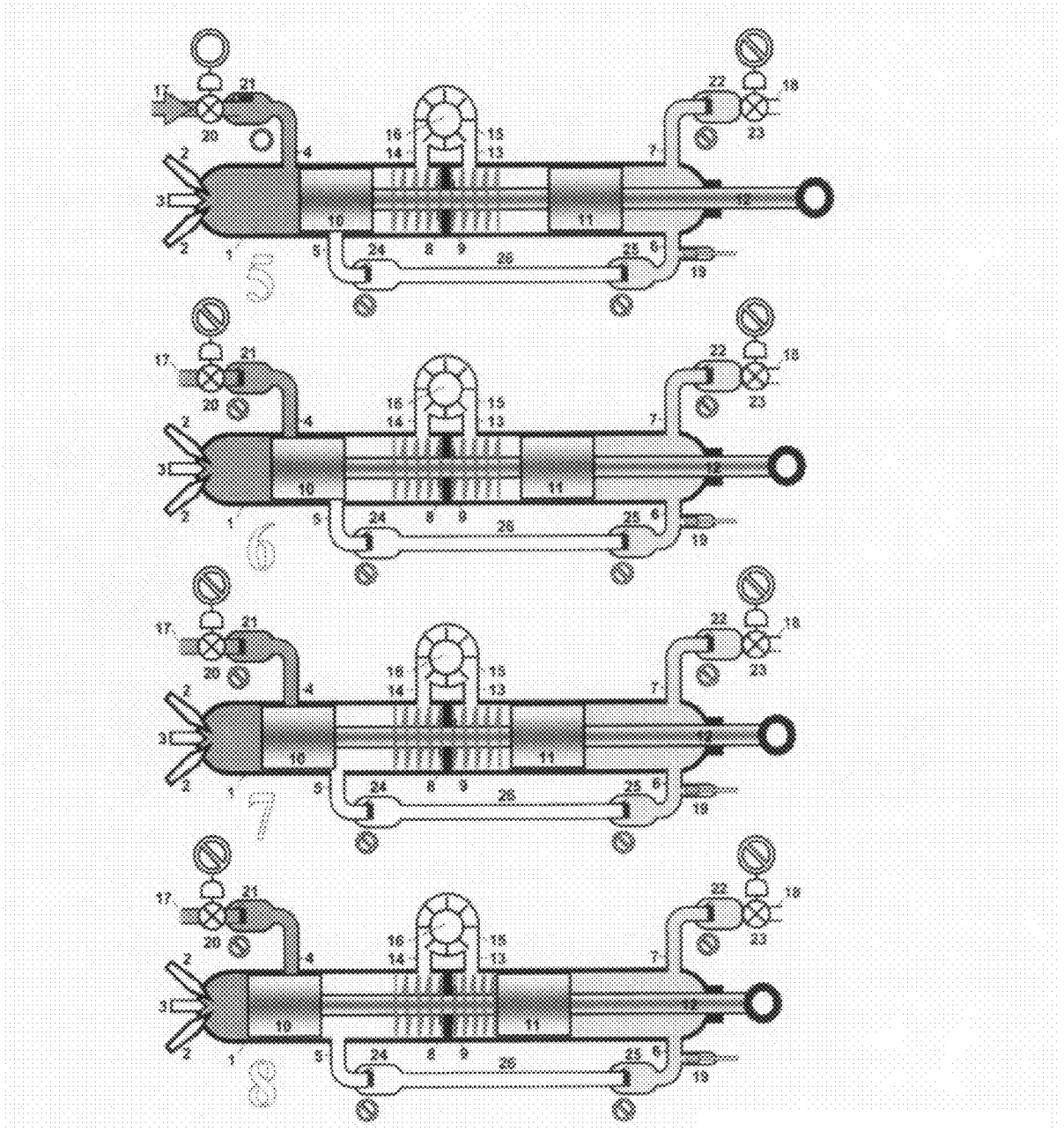
Explo-Dynamics ™
Indirect Pressure - Fluid Displacement
Process Arrangement



Free Piston Engine Configuration
Sequence 1 thru 4

Fig. G - 1

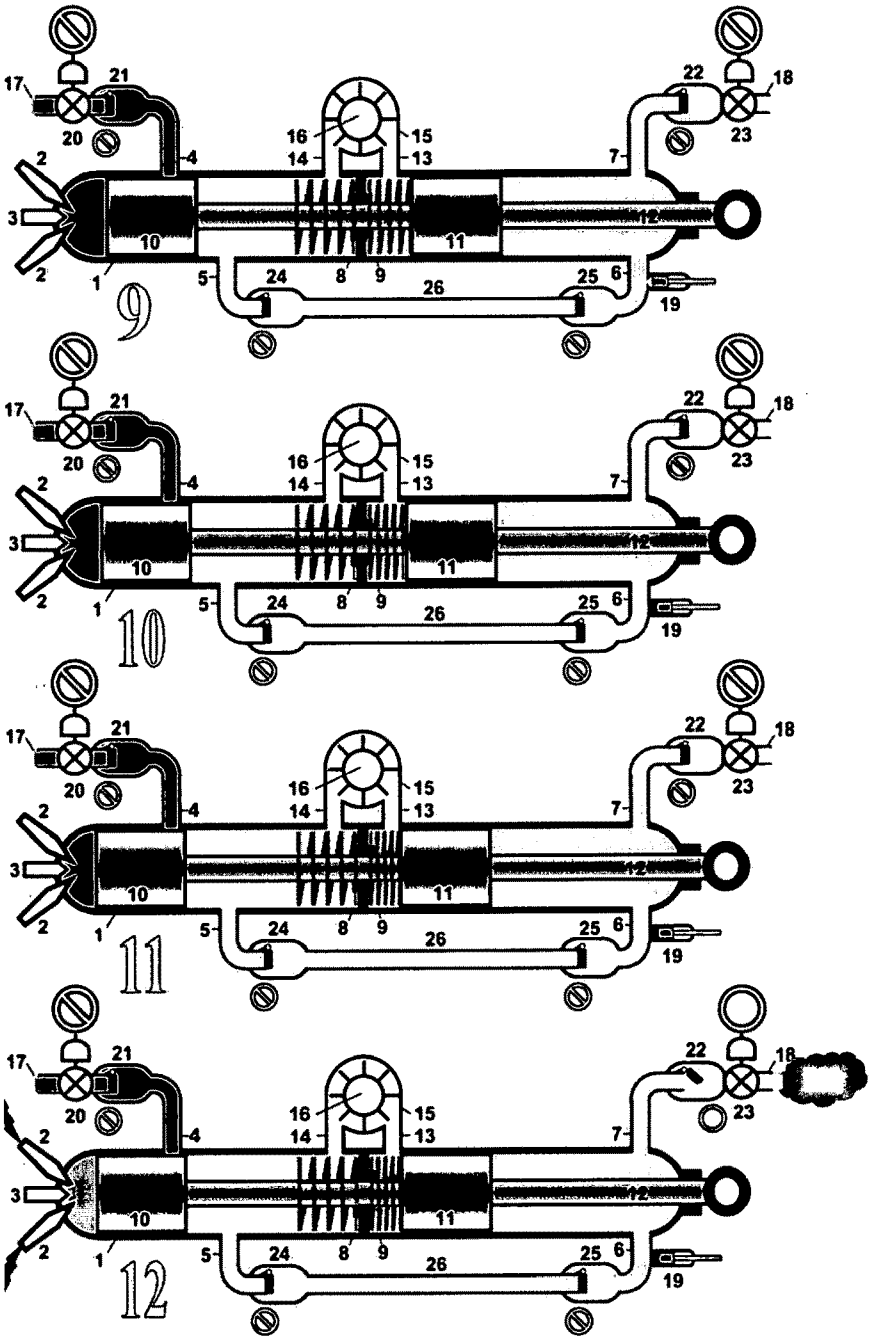
Explo-Dynamics ™
Direct Pressure/ Direct Heat Cycle
Process Sequence



Free Piston Engine Configuration
Sequence 5 thru 8

Fig. G - 2

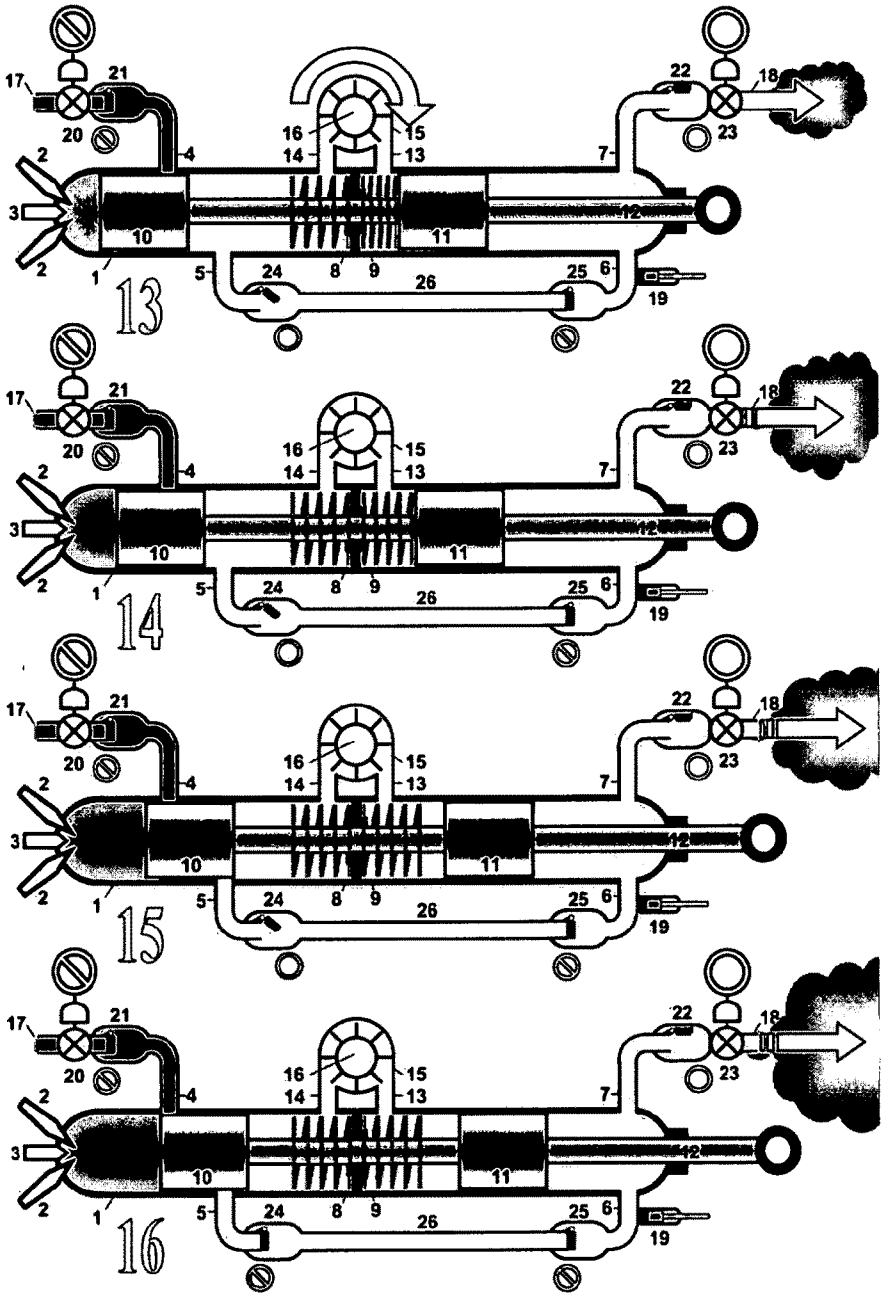
Explo-Dynamics ™
Direct Pressure/ Direct Heat Cycle
Process Sequence



Free Piston Engine Configuration
Sequence 9 thru 12

Fig. G - 3

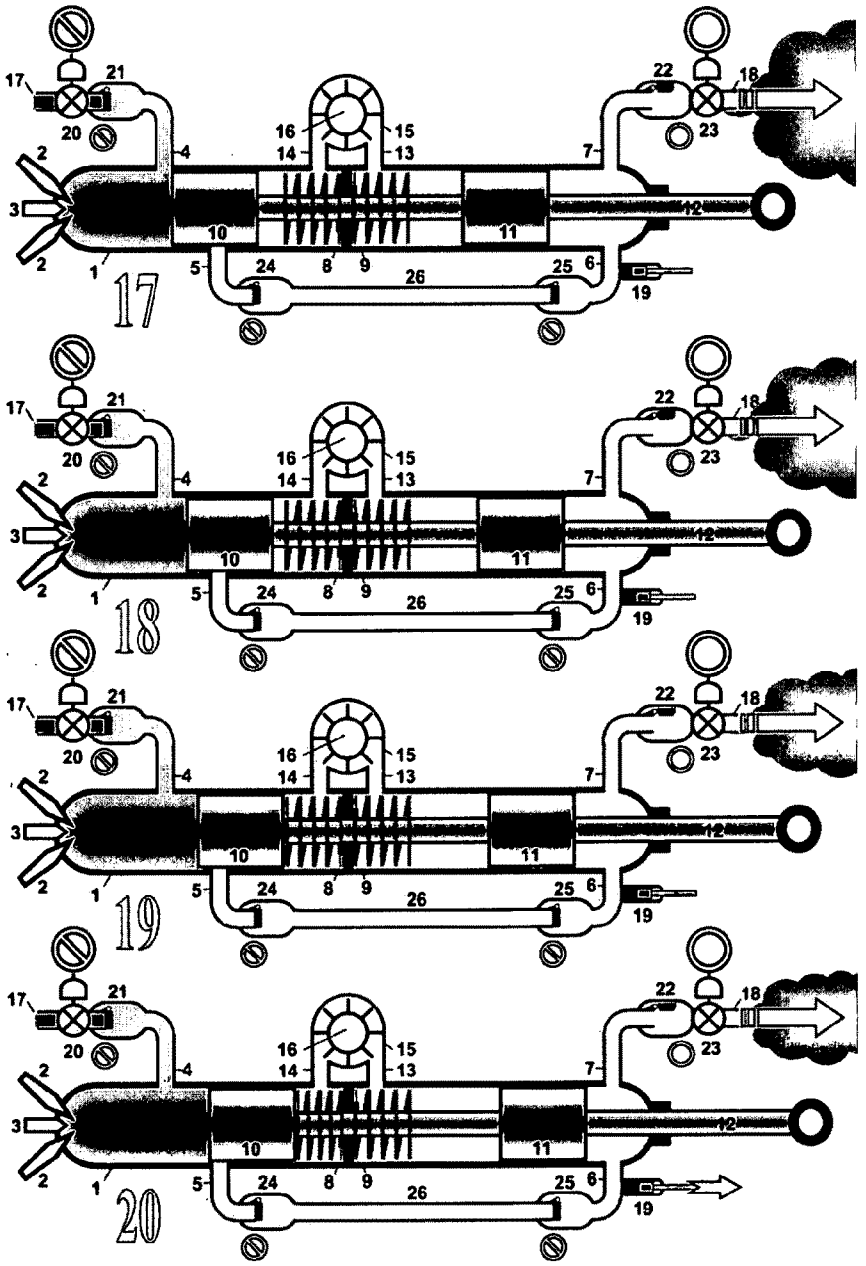
Explo-Dynamics ™
Direct Pressure/ Direct Heat Cycle
Process Sequence



Free Piston Engine Configuration
Sequence 13 thru 16

Fig. G - 4

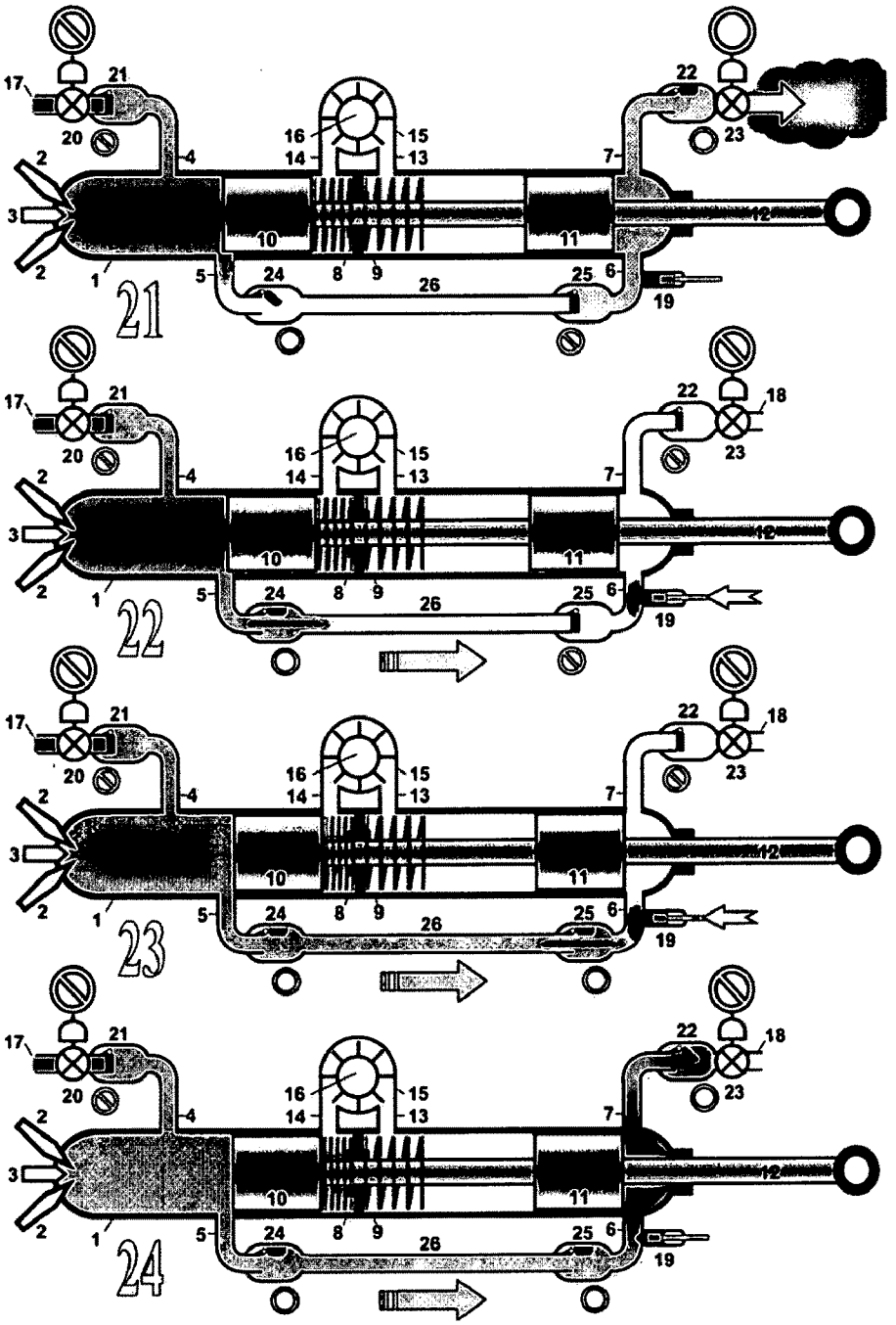
Explo-Dynamics ™
Direct Pressure/ Direct Heat Cycle
Process Sequence



Free Piston Engine Configuration
Sequence 17 thru 20

Fig. G - 5

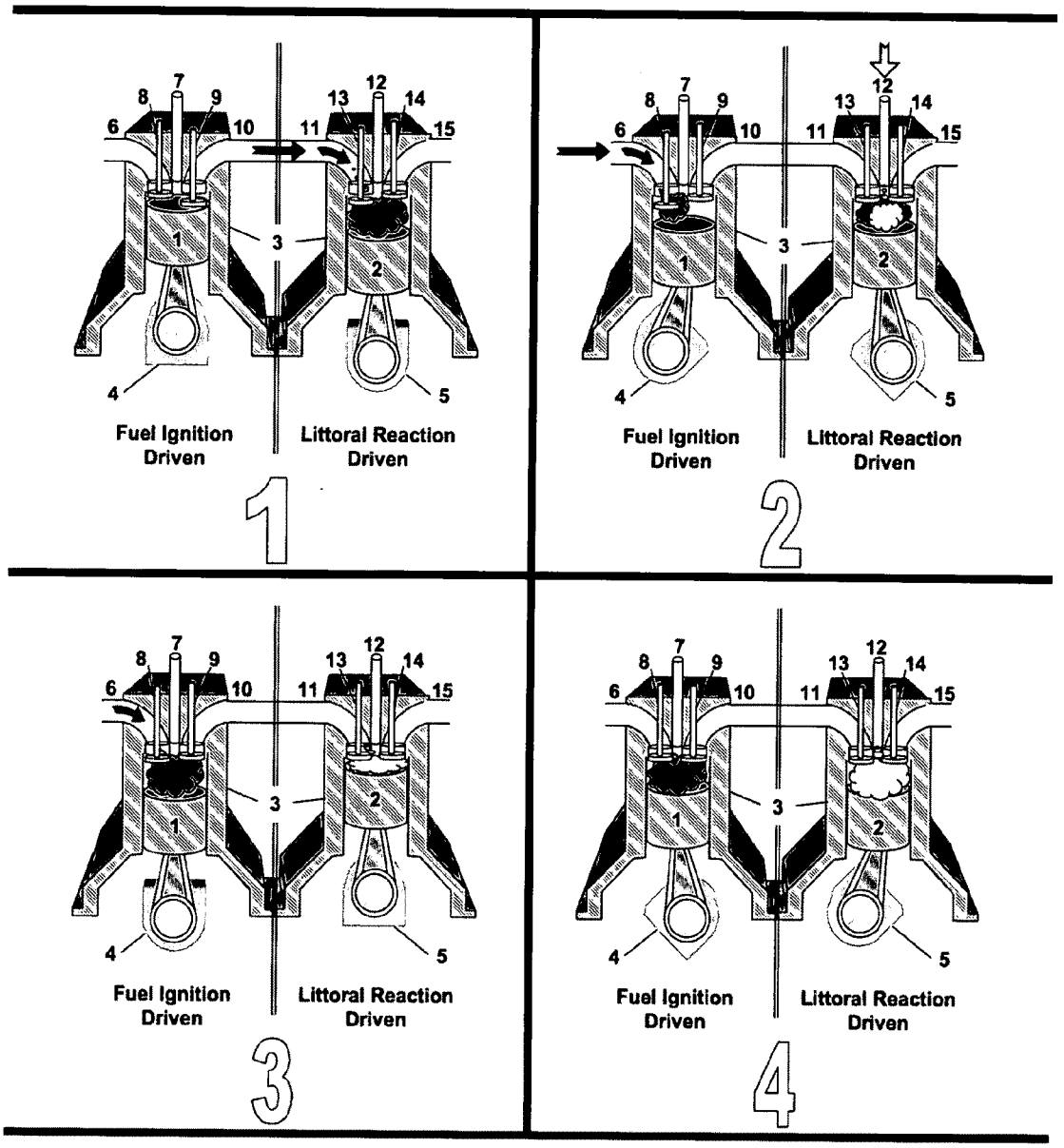
Explo-Dynamics ™
Direct Pressure/ Direct Heat Cycle
Process Sequence



Free Piston Engine Configuration
Sequence 21 thru 24

Fig. G - 6

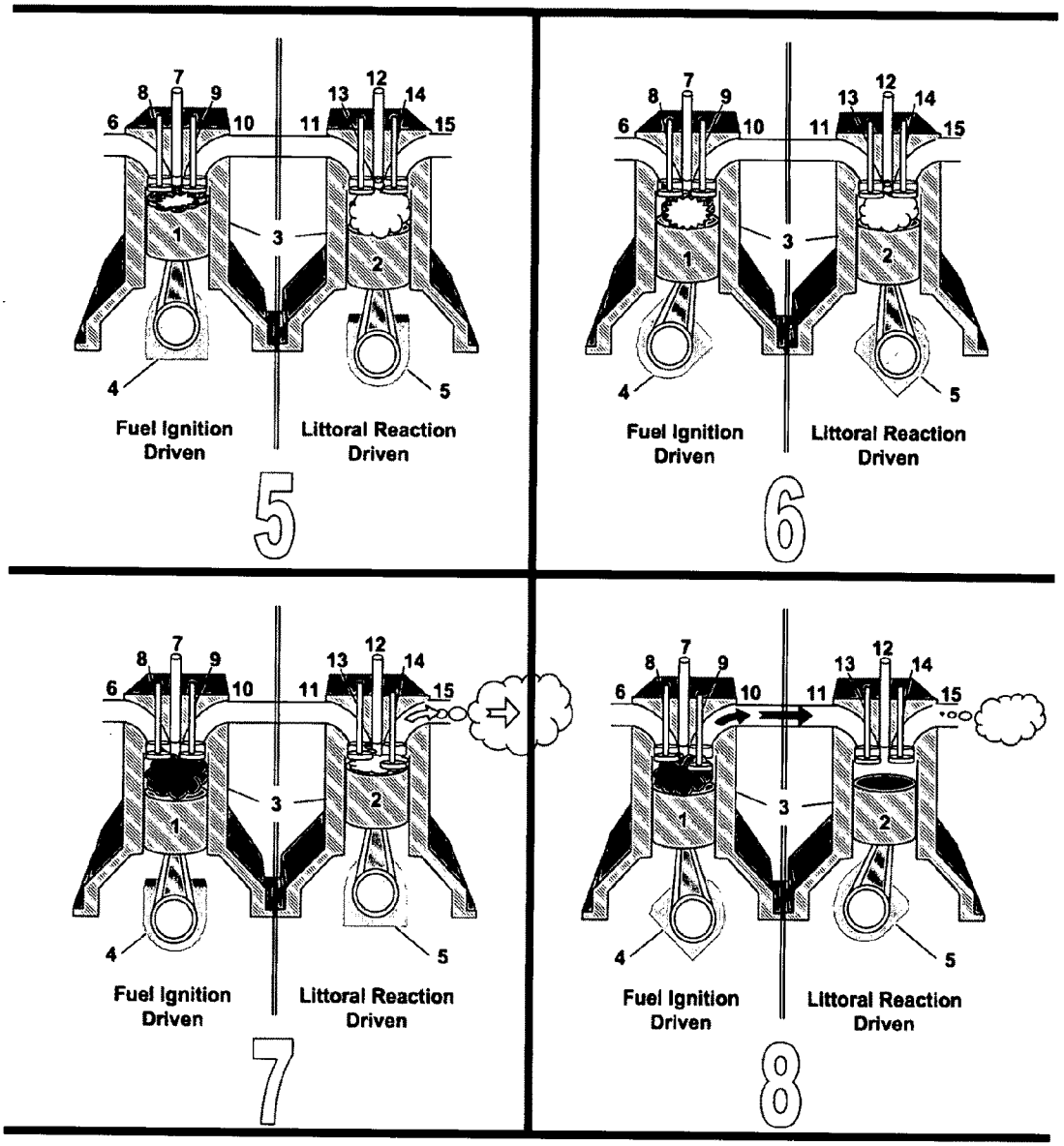
Explo-Dynamics ™
Direct Pressure/ Direct Heat Cycle
Process Sequence



Combination Internal Combustion & Steam Engine

Fig. H -1

Explo-Dynamics ™
Direct Pressure – Direct Heat Cycle Configurations
System & Method



Combination Internal Combustion & Steam Engine

Fig. H -2

Explo-Dynamics ™
Direct Pressure – Direct Heat Cycle Configurations
System & Method

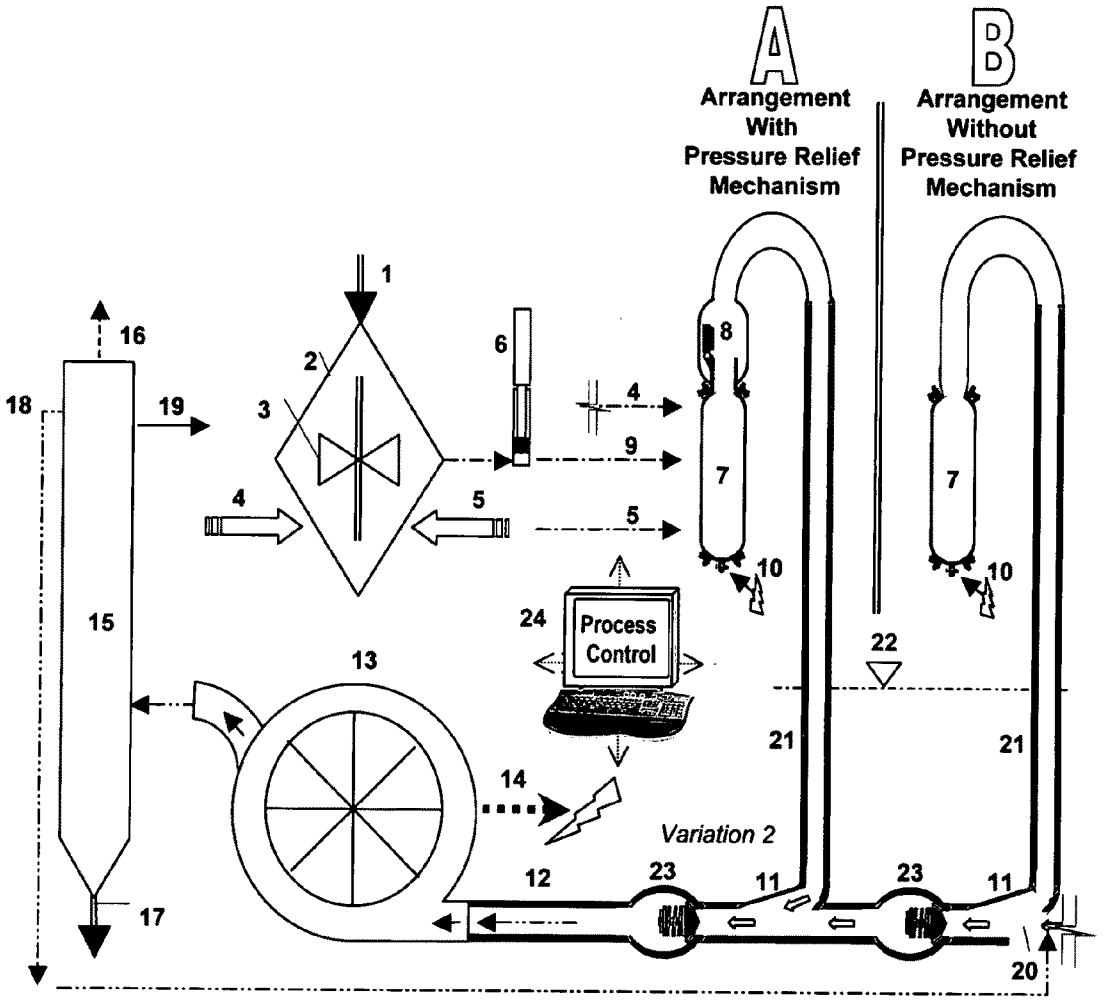


Fig. I

Explo-Dynamics ™
Indirect Pressure - Fluid Displacement Configuration Process System

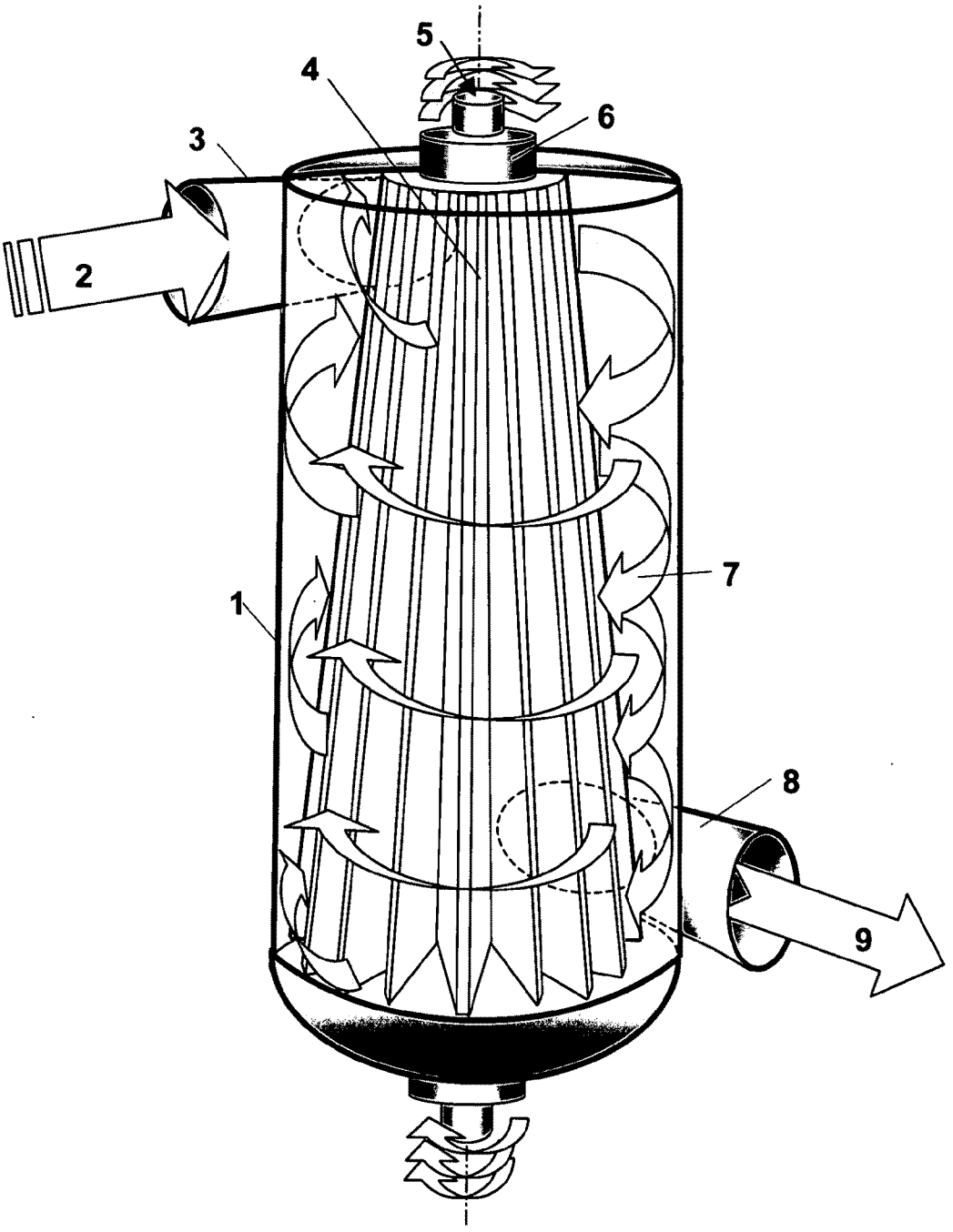
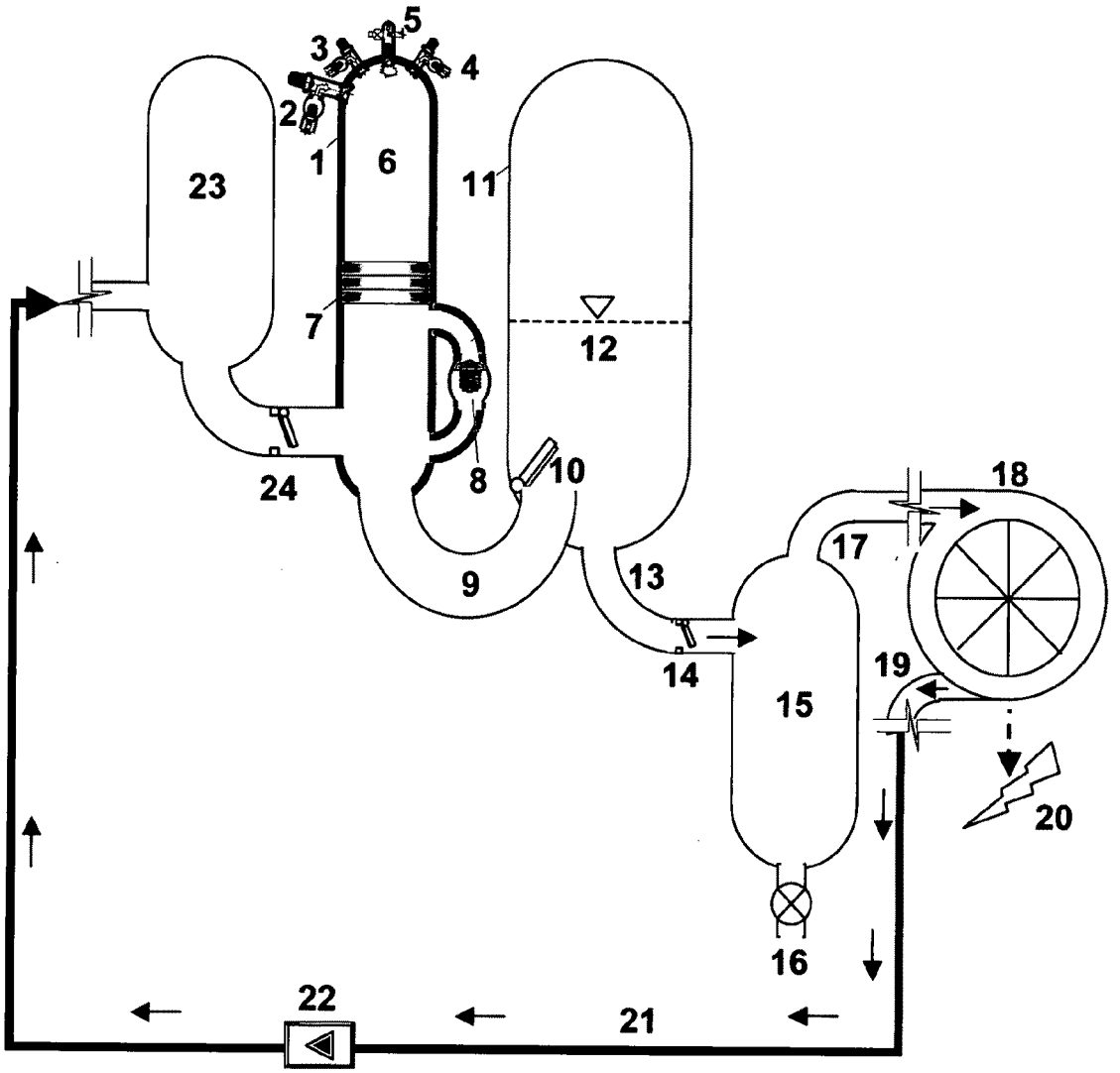


Fig. J

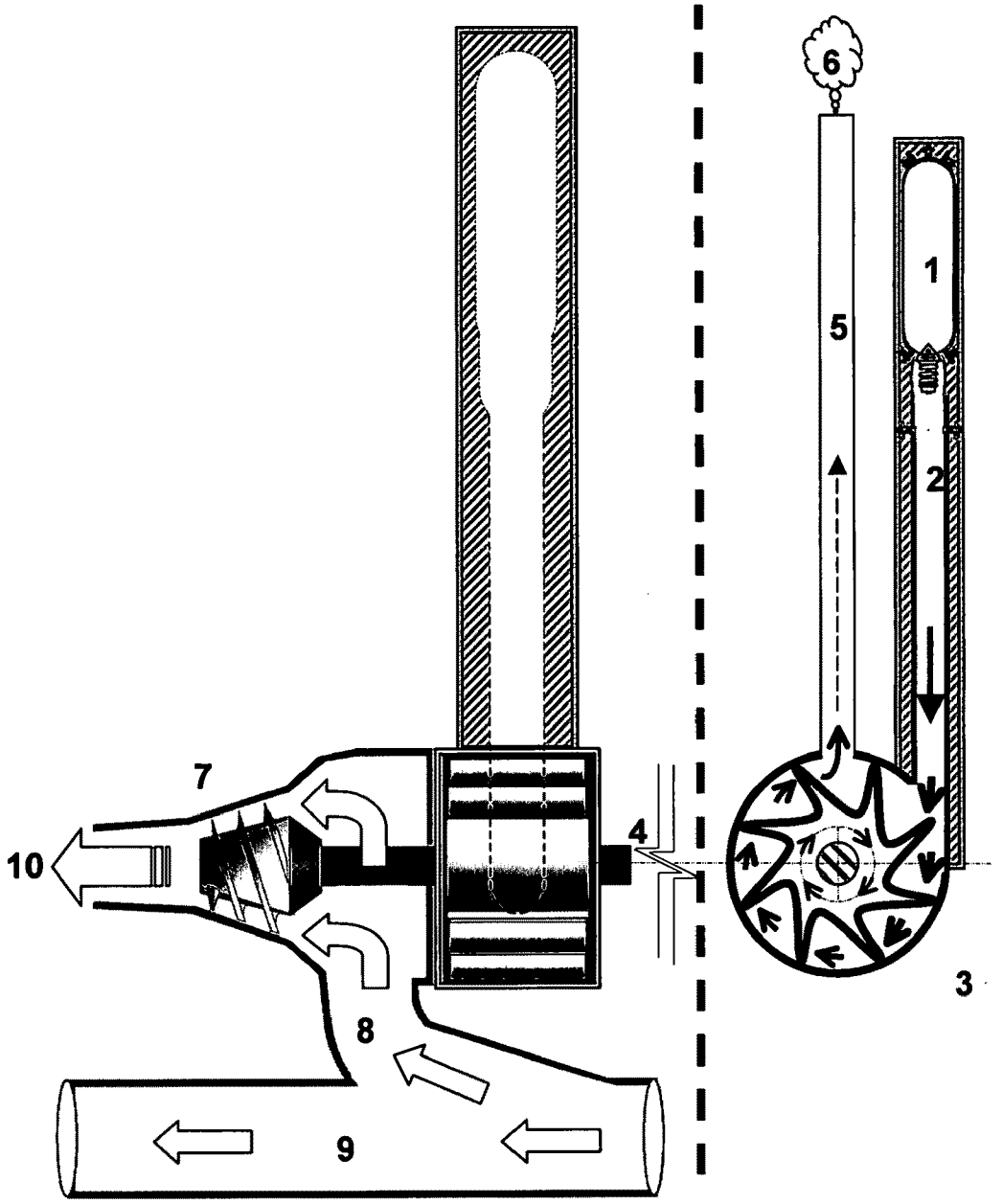
Explo-Dynamics ™
Pulse Converter Assembly
Process Component Systems



Pressure/
Gas Drive
Configuration

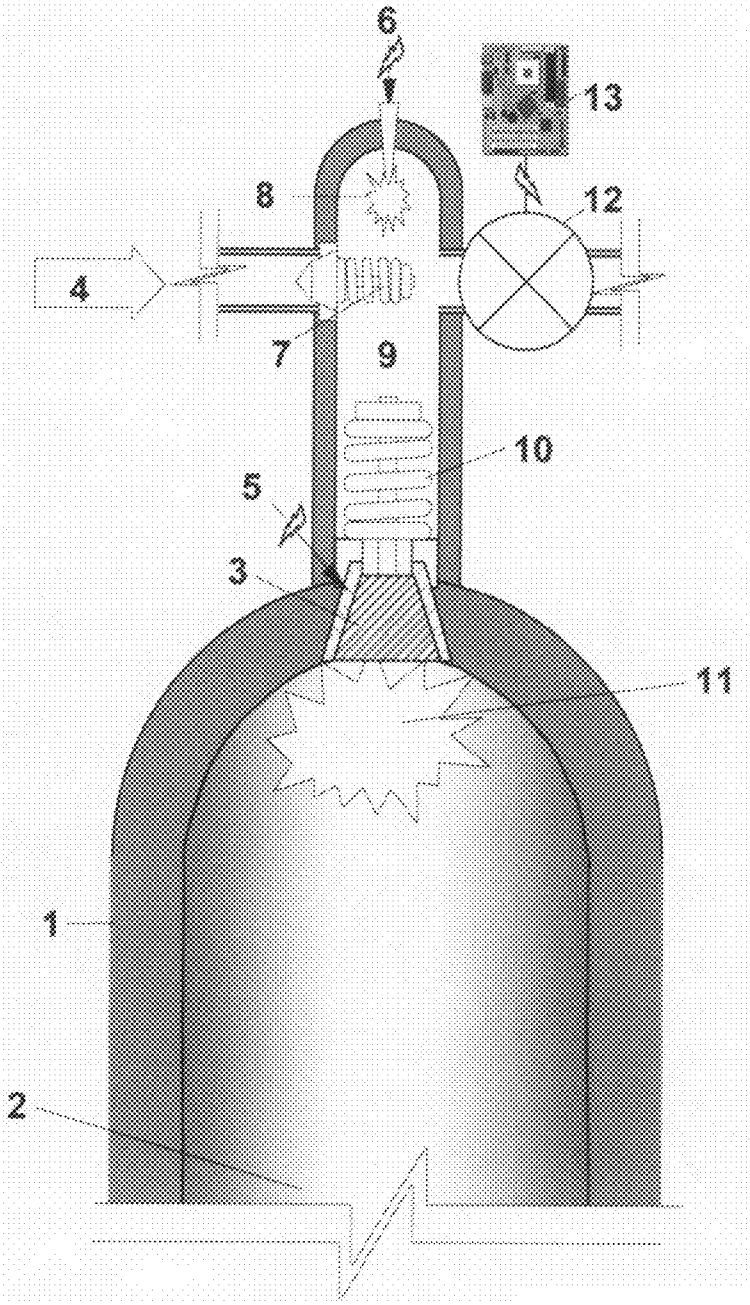
Fig. K

Explo-Dynamics™
Direct Pressure – Fluid Displacement
with Gas Drive Configuration
Process Arrangement



Explo-Dynamics ™
Thrust Translator Profile
Process Component Systems

Fig. L



Explo-Dynamics™
Ignition Chamber – Igniter Profile
Process Component Systems

Fig. M

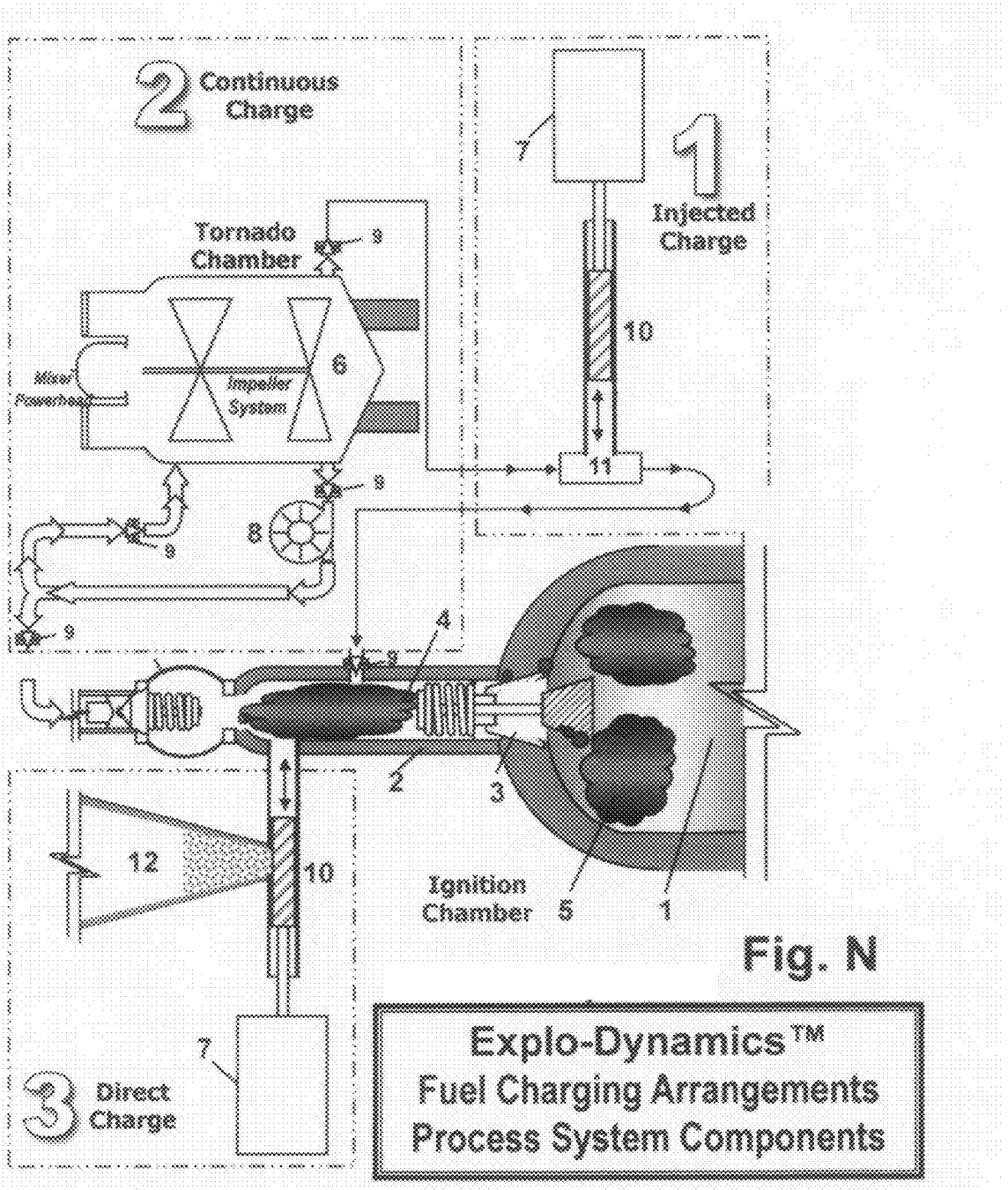

2 Continuous Charge
1 Injected Charge
Tornado Chamber
Impeller System
Mixer Powerhead
Ignition Chamber
3 Direct Charge
Explo-Dynamics™
Fuel Charging Arrangements
Process System Components

Fig. N

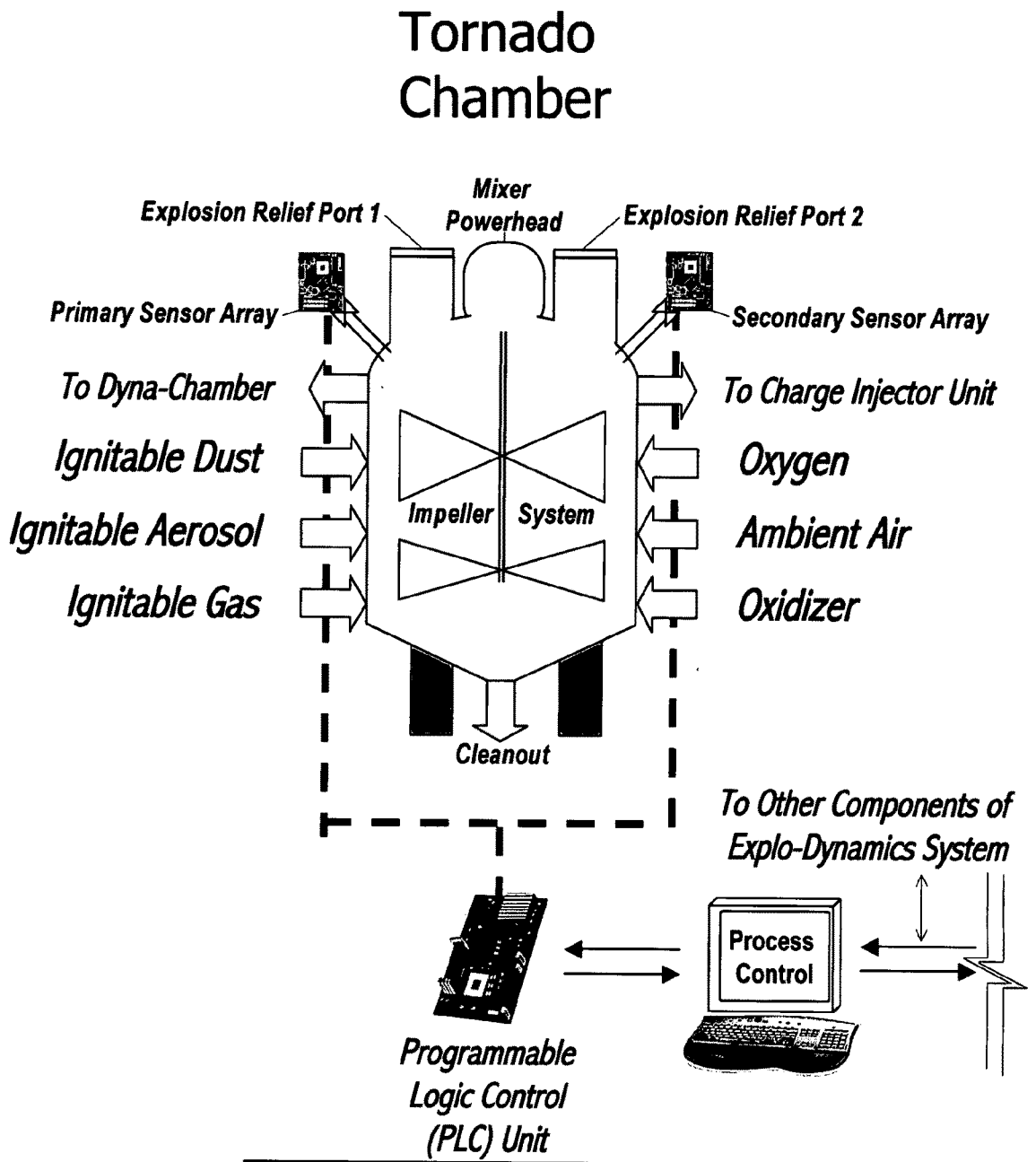

Tornado Chamber
Mixer Powerhead
Explosion Relief Port 1
Explosion Relief Port 2
Primary Sensor Array
Secondary Sensor Array
To Dyna-Chamber
Ignitable Dust
Ignitable Aerosol
Ignitable Gas
To Charge Injector Unit
Oxygen
Ambient Air
Oxidizer
Impeller System
Cleanout
To Other Components of Explo-Dynamics System
Process Control
Programmable Logic Control (PLC) Unit
Explo-Dynamics™
Tornado Chamber Profile
Process System Components

Fig. O

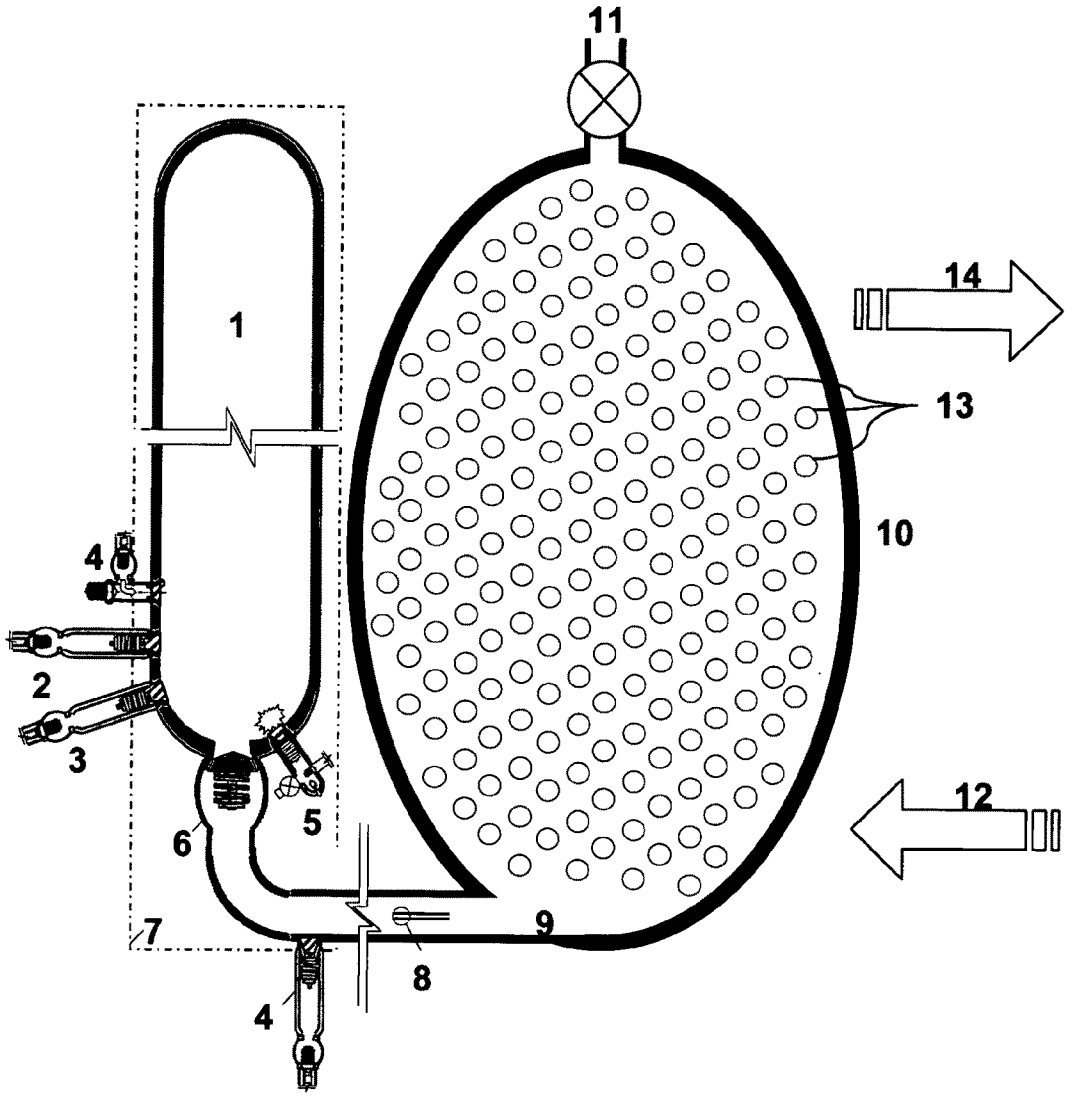


Fig. P

Explo-Dynamics™
Explo-Indirect Steam Generation Arrangement
Process System Configurations

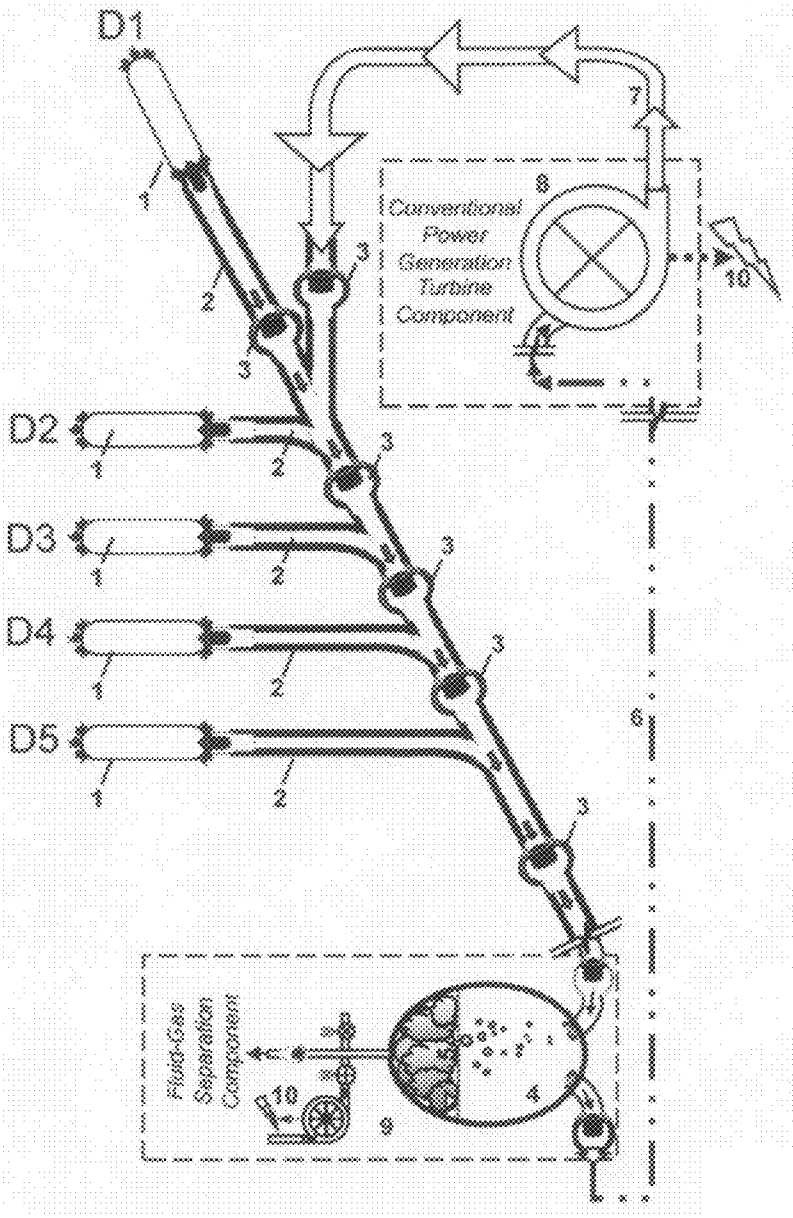


Fig. Q

Expio-Dynamics™
Alternate Fluid Displacement/ Gas Drive
Process System Configuration

EXPLO-DYNAMICS™: A METHOD, SYSTEM, AND APPARATUS FOR THE CONTAINMENT AND CONVERSION OF EXPLOSIVE FORCE INTO A USABLE ENERGY RESOURCE

PRIORITY CLAIMS

[0001] The invention of the present application claims priority based on U.S. Provisional Application Ser. No. 60/832,585, filed on Jul. 24, 2006, entitled, "EXPLO-DYNAMICS: A Method, System, Protocol and Apparatus for the Containment and Conversion of Explosive Force into a Usable Energy Resource," the entire disclosure of which is incorporated herein by reference.

[0002] Additionally, U.S. Provisional Application Ser. No. 60/852,641, filed on Oct. 18, 2006, entitled "EXPLOGEN: An Energy Development Resource Method, System, Protocol, and Apparatus for the Thermo-Dynamic Generation, Dissociation, and/or Conversion of Steam," is a commonly owned, co-pending application, which is related to the present application and portions of which are also incorporated herein by reference.

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FIELD OF THE INVENTION

[0059] The present invention relates to energy producing systems and methods. More particularly, but not by way of limitation, the present invention relates to power generation systems and methods; in which, a series of process contained and controlled explosion events generate heat and pressure episodes, which are harnessed to deliver a smooth delivery of power output for generating electricity or providing mobility to a vehicle or process system. Still more particularly, the present invention relates to a method of using a wide variety of fuel substances in either singular or combined mixtures; whereas, these fuel resources are suspended in the process system as a dispersed airborne fuel cloud, which may be comprised of pulverized solids and/or gases and/or aerosol droplets in a broad range of mixture scenarios designed to stimulate and maximize the desired reaction with the least amount of fuel being consumed.

BACKGROUND OF THE INVENTION

Prior Art

[0060] Dust explosions have destroyed life and property for centuries and have established themselves as an enemy to the welfare of mankind. The intent of the present invention is to harness this unique manner of force and transform its output pulse power into a safe and efficient energy resource.

[0061] In 1893, Dr. Rudolf Diesel set forth on a German financed mission to develop an engine to burn a surplus of coal dust stockpiles, which were common in that period of world history. Dr. Diesel injected coal dust into the combustion chamber of his experimental engine prototype and the engine subsequently exploded thus ending Diesel's attempts at using coal dust as a fuel source.

[0062] Since Diesel's failed attempt toward developing a dust fuel engine, most efforts at harnessing the power potential of solid dust fuels have revolved around the conventional methodology of either liquefying the dust in a solution with another liquid fuel source (U.S. Pat. Nos. 5,313,915, 5,271,357, and 4,335,684), changing the physical state of the fuel to a gas (U.S. Pat. No. 4,907,565), or by trying to adapt a piston engine to fire the dust in a variation somewhat similar to the manner regular liquid fuels are processed in an internal combustion engine. (Reference U.S. Pat. Nos. 4,809,503; 4,393,818; 4,359,970; 4,336,771; 4,300,482; 4,077,367; 4,070,997; 4,056,080; 4,052,963; 2,396,524; 1,921,132; 1,914,672; 1,897,819; 1,861,379; 1,696,475; 1,645,836; and 1,191,072).

[0063] The science of airborne dust explosions is still relatively new. In 1910, at the U.S. Bureau of Mines' Pittsburgh Mining Experiment Station, it was discovered that airborne dust alone could propagate an explosion. Prior to this discovery, mining history held to a popular belief that it took a mixture of methane and coal dust to initiate an explosion.

[0064] Most attempts at harnessing the power potential of explosive force have been to divert the explosive force into a spring-loaded or other stored force mechanism for controlled release into an energy generating mechanism. U.S. Pat. No. 5,161,377 issued in November 1992, explained a BLEVE mechanism for generating power via an explosion of a flammable liquid droplet as it rises as a bubble through a heated column of denser inert liquid.

[0065] U.S. Pat. No. 4,209,983, issued in July 1980, explained a mechanism for using electrical arc explosions to expand liquids and drive a turbine. The invention proposed herein is does not rely upon electrical energy as a fuel or driving force, but only utilizes electrical energy to initiate a firing sequence and is dependant upon a fuel resource to provide the explosive thrust and thus drive the power generation componentry.

[0066] Otherwise to date, the only universally recognized use of explosive energy for power is in the area of propulsion such as missile or rocket (U.S. Pat. No. 6,349,538)

[0067] The invention proposed herein is unique and has notable differences easily recognizable to those skilled in the art.

PROBLEMS WITH CURRENT ART

[0068] For a wide variety of reasons well understood by all, alternative energy resources are greatly desired throughout the world at large. Energy resources that offer both economical and environmental benefits have universally sought after for decades.

[0069] Historical attempts at developing solid-fueled engines have been less than successful. Further, conventional hydrocarbon-based electrical energy production technologies have long been substantial contributors to the global pollution scenario.

[0070] The vast majority of all research, relative to explosive dust, was designed to prevent, not to propagate, explosions. The present invention has taken great benefit from the vast libraries of dust explosion research that has been conducted over the past half century in particular. Even in the early 1960s, the Bureau of Mines had conducted thousands of experiments on hundreds of different materials relative to the ignitability and explosivity reaction mechanics of various types of dust clouds.

[0071] Several of the major reasons explosive dusts have not been previously harnessed as an energy resource is that:

[0072] 1. the dust concentrations were unpredictable;

[0073] 2. the energy released from such explosion events was too violent and powerful to be safely contained within conventional internal combustion engines; and

[0074] 3. there was no suitable method available to translate pulse explosive power into a stable output of energy.

[0075] The present invention, herein referred to as "Explo-Dynamics," accounts for, and overcomes these historical obstacles with a novel arrangement of methods and apparatus. Further, the present invention offers an energy production system that is safe, environmentally friendly, economical, and reliable.

SUMMARY OF THE INVENTION

Introduction

[0076] The present energy technology invention is based upon using a series of process contained and controlled explosion events to generate heat and pressure episodes, which are harnessed in and through the process to deliver a smooth

delivery of power output for generating electricity or providing mobility to a vehicle or process system.

[0077] This energy technology invention is also based upon using a wide variety of fuel substances in either singular or combined mixtures. These fuel resources are suspended in the Ignition Chamber of the process system as a dispersed airborne fuel cloud, which may be comprised of pulverized solids and/or gases and/or aerosol droplets in a broad range of mixture scenarios designed to stimulate and maximize the desired reaction with the least amount of fuel being consumed.

[0078] Although, this invention can be used in either a variation of an internal combustion engine or as an external combustion engine power source configuration, it will most likely be used in a dual or combined role configurations, which possesses certain attributes of several embodiment variations presented herein.

[0079] This invention is herein described and referred to as the ExploDynamics™ technology or energy system. The Explo-Dynamics process differs from other prior art endeavors because the basic intent of this invention was not to make the fuel source or the explosive reaction comply with the engine, but rather to develop an engine or power production mechanism to use the unique energy produced in an explosion event and convert this pulse energy into a safe, smoothly consistent, and economical means of generating power.

[0080] Through the various embodiments described herein, it is the aim of the present invention to provide an energy production system that addresses one or more problems of the prior art. It is also an aim of the present invention to provide explosive reaction driven energy generation methods and describe several embodiments incorporated said energy system and well as demonstrate several apparatus components contained therein.

[0081] It is yet another aim of particular embodiments of the present invention to provide an energy production method, which derives all or part of its fuel supply from pulverized particulate substances suspended in an airborne atmosphere within the process system.

[0082] It is an aim of particular embodiments of the present invention to provide an explosion-based process system; whereas, the heat and/or pressure release episode of each explosion cycle is used to transform an impulse of stimulated force into a usable source of power providing torque or thrust for powering a generator or providing motive force to a vehicle or process.

Explosive Energy

[0083] The process of combusting an ignitable dust substance is well known and understood. However, the science of creating an explosion of a suspended airborne ignitable dust cloud in a confined process is not generally well known or understood. The present invention focuses upon this little known and less understood explosive energy phenomena. Whereas, under these circumstances, a relatively insignificant amount of fuel can generate a surprisingly powerful release of force. In this process arrangement arena, many common substances, such as coal or grain dust, can deliver more explosive force, per given unit of weight, than an equivalent weight of TNT explosive.

[0084] Although the Explo-Dynamics technology was originally focused upon the base concept of inducing an explosion within a contained and controlled process system fueled by an airborne ignitable dust cloud, the Explo-Dynamics process can use a variety of gaseous, vapor, or aerosol fuels in a wide variety of mixture scenarios. This fuels blending component allows the explosion dynamics of the process to be fine-tuned to deliver more output force per unit of input fuel.

[0085] The Explo-Dynamics system brings potential for greater efficiency and economy to the science of extracting energy from fossil fuels and . . . . Explo-Dynamics opens up a whole new series of alternate fuel supply and renewable energy possibilities.

[0086] The Explo-Dynamics system is unique; in that, its processes are efficient for large-scale fuel-to-energy conversion application and yet Explo-Dynamics has great potential for application in small-scale or micro-power generation facilities in remote areas where hydrocarbon fuels are not available or affordable. For these applications, the flexibility offered by the Explo-Dynamics system allows rather simple processes to be employed at comparable minimal capital and operational cost.

[0087] Some feedstocks, like coal, have a marketable value; other feedstocks either do not have a marketable value or even have a disposal cost liability. By being able to use and process non-typical fuel stocks, the Explo-Dynamics invention brings a new range of fuel source possibilities within reach.

The Explo-Dynamics™ Process System

[0088] The two foundational principles of the Explo-Dynamics technology are:

[0089] Principle 1—To use explosive force in a contained process as a means of performing one or more of the following functions:

[0090] a. provide a means of accelerated thermal heat to provide for steam conversion to generate energy via a conventional steam turbine electrical generation process;

[0091] b. provide a direct means of pressure impulse thrust to a system designed to convert said pulse energy into a more stable energy source;

[0092] c. provide a force means for displacing a fluid and thereby creating propulsion flow of fluid through a process system designed to capture energy from said flow; and/or

[0093] d. provide a means of supplying accelerated thermal heat to conventional as well as non-conventional energy conversion and/or industrial process operations.

[0094] Principle 2—To mix and suspend a concentration of ignitable nano-particles and micro-particles, and/or aerosols, vapors, or gasses, in a turbulent airborne fuel cloud and thereby propagate an explosion of this fuel cloud as a means of generating force for subsequent energy conversion purposes.

Foundational Process Considerations

[0095] There are several key process considerations involved in the process mechanics of the Explo-Dynamics system. They are:

[0096] As the particle size decreases the specific surface area will increase.

[0097] The violence of the dust explosion increases as the particle size decreases.

[0098] The ease of ignition increases as the particle size decreases.

[0099] The explosion severity increases as the required ignition energy decreases.

[0100] The explosion severity increases as LEL and/or MEC decreases.

[0101] During an explosion event the shockwave travels faster than the face of the combustion flame front.

[0102] In certain process configurations, the explosion shockwave acts as a piston to drive an air-gas compression episode ahead of the ensuing flame front.

[0103] The ratio of absolute pre-explosion pressure to maximum explosion pressure remains consistent; therefore, as pre-explosion Ignition Chamber pressures are elevated, the resultant MEP is exponentially increased as well.

[0104] Confined explosions generate heat pulses, which exceed the normally achievable combustion temperature of the fuel by means of adiabatic enhancement and shockwave turbulence.

PROBLEMS SOLVED

[0105] In accordance with the present invention, the above, and other problems, are solved by the following:

I. Advantages of Efficiency and Economy

A. Hyper-Thermodynamic Stimulation Methods

[0106] It is generally understood that explosions occurring within a confined vessel generate an impulse of pressure and heat; whereas, the temperatures achieved in the impulse moment exceed those associated with the normal combustion of the fuel. The pressure of the confined explosion episode is a component of this increase.

[0107] Recent research findings have shown that manipulated impulse temperatures can almost double the normal heat of combustion for a certain fuel-air mixtures. In fact, many fuel mixtures can be stimulated to exceed 4,000° Fahrenheit and some studies have demonstrated impulse spikes above 7,500° F. These impulse events are short duration events usually measured in milliseconds; therefore the respective containment vessel is not melted by the episode as would quickly be the case in the event these temperatures were constant over longer durations.

[0108] The present invention makes use of this unique energy impulse opportunity by matching the output of the thermodynamic release episode to the work (steam conversion load) to be accomplished. This impulse occurs so quickly that normal heat losses to the cylinder walls or system componentry are not as pronounced as those attributable to these components within a regular internal combustion engine. Thus in one or more of the embodiments of this invention, the power generated is rapidly and more efficiently translated into the conversion of steam.

[0109] In several embodiments of this energy production invention, the process system and the procedure employed, collectively stimulate an accelerated reaction of the explosion episode and raise the heat impulse of the reaction's output. Several process mechanisms participate in this function:

[0110] 1. Adiabatic Influence

[0111] As air is compressed, it heats up in proportion to the force of compression. This compression heat phenomena, commonly referred to as adiabatic pressure, provides the fuel ignition mechanism for regular diesel engines. Adiabatic influence is an integrated component of the Explo-Dynamics process as well; however, the adiabatic stimulation role in this invention does not serve primarily as an ignition mechanism, but rather as a super-heating mechanism. When an explosion occurs inside a contained process system, in an instant much compression occurs thus additional heat is added to the reaction. This phenomenon is commonly referred to as pressure piling or pre-compression. Accordingly, this invention is designed to adiabatically influence an increase in the thermal output of each explosion cycle, which translates into more impulse heat per unit of fuel consumed.

[0112] Adiabatic compression forces are difficult to calculate given the many configuration options available, but it should be noted that combustion heat increases of 1,000° F. are not at all uncommon for most contained explosion events; even still, attention to explosion chamber configuration details and blast wave reflection patterns can boost this induced adiabatic shock compression temperature increase substantially and accelerate the violence of the explosion event as well. The compression efficiency is a process configuration related variable and has many possibilities for increasing fuel input-to-energy output process efficiencies and is, in effect, a measure of the strength of the imploded shock wave. Other factors such as the angle and depth of the reflection components as well as the nature of the fuel source mixture, also contribute to the acceleration and intensity of the adiabatic reaction.

2. Shockwave Acceleration Influence

[0113] Although the shockwave episode of an explosion is an integrated component of the adiabatic influence inside the process system by acting as impulse piston of sorts, the shockwave mechanics themselves contribute to the rate of the explosion's reaction and the violence thereof. Accordingly, an explosion's violence is the recognized measure of the maximum rate of the explosion's pressure rise at a constant volume. This violence characteristic responds to stimulation mechanics and accelerates the reaction's speed, heat, and power.

[0114] Inside a typical confined explosion episode many mechanisms are occurring simultaneously which impact the output of the explosion's heat and pressure. The expansion of reactants as they are combusted to form products is referred to as volumetric dilatation, which occurs when a deflagration causes compression waves to emanate from the explosion's front. These compression forces coalesce into shock waves ahead of the flame front, which causes temperature, pressure, and velocity increases in the unreacted gas zone. While some flames accelerate as the pressure increases, others will decelerate; however, increasing temperature generally causes an acceleration of the flame front.

[0115] The speed of the particle velocities induced by the shock compression episode also acts to raise the Reynolds number of the unreacted flow into which the flame front quickly propagates. As the Reynolds number increases sufficiently, the explosion's flow will transition from laminar to turbulent with a synergistic increase in flame velocity and energy release rate due to turbulent structures created in the episode.

[0116] Reflected shockwaves interact with the flame front giving rise to Rayleigh-Taylor interface instability, which causes a distortion of the flamefront. Shock-flame interaction is typically found in confined situations and small changes in the process system's geometry can change the explosion output scenario significantly.

[0117] In one or more embodiments of this invention, the compression waves generated by the flame front reflect off of solid boundaries within the process system and both the surface area of the flame front increases as well as the energy release rate as the flame front accelerates. The distorted pattern of the explosion episode gives rise to increased turbulence, which, in turn, further accelerates the flame front.

[0118] In one or more embodiments of this invention, obstacles are added to the internal confines of the process system to transform the kinetic energy of the explosion flow into large-scale turbulence, which cascades into smaller and finer scales. These large-scale turbulent structures cause an even greater increase in flame front surface area; whereas, the smaller structures enhance the thermal transport processes by inducing an episode of turbulent mixing at the molecular level. Collectively, these mechanisms result in a net increase to the energy release rate as well as the effective propagation velocity of the flame front.

3. Deflagration to Detonation Transition (DDT)

[0119] Deflagrations are subsonic explosions and detonations are supersonic explosions. A DDT process episode occurs when an explosion's speed rises from a deflagration to a detonation, which is the natural result of the enhanced adiabatic and shockwave influences previously outlined. In one or more embodiments of this invention, stimulation of Deflagration to Detonation Transition (DDT) explosion episodes is possible given the respective fuel mixture scenario. Although, the characterization of the 'state' of a dust cloud is far more complicated than characterizing the 'state' of a premixed quiescent gas mixture, a mixed fuel DDT initiation event can be accomplished with a particle-laden fuel cloud, even if it becomes necessary (due to the nature of a particular fuel mixture) to add small amounts of a gas such as hydrogen or methane to the fuel cloud atmosphere. Accordingly, a DDT reaction cycle offers certain energy output advantages over that of a regular deflagration explosion because very high-pressure loads can be achieved through this phenomenon (in the order of 50 bars), which translates into a super-heated output scenario.

B. Use of Natural Force Mechanisms

[0120] Energy is generated when a force acts through a distance. The Explo-Dynamics technology offers both a means and method for creating energy through the containment and conversion of explosive force.

[0121] It stands that the concept of combusting a given unit of fuel is much different than process of exploding the same fuel unit. Explosions are very unique events and generally not well understood. Only recently has equipment been developed to accurately measure the temperature spikes of an explosion episode.

[0122] In one or more embodiments of this invention the natural force mechanics of the explosion episode are used in a novel process arrangement.

1. Blast Wave Theory Mechanics

[0123] In blast wave theory, an explosion in air causes a blast wave to propagate outwards from the source at supersonic speed for detonations and at subsonic speed for deflagrations. This blast wave has two distinct phases—a positive and negative. The positive the blast pressure wave moves outward from the point of detonation or deflagration and delivers a charge of violent force to everything lying within its path. This positive impulse lasts a relatively short period of time and delivers the highest pressures and velocity of the explosion event. Conversely, the following negative impulse, which is more descriptively known as the suction or vacuum phase, is usually at least three times longer in duration and of less intensity than the positive impulse blast wave. It is not uncommon for this vacuum phase to be one-third of the amplitude of the pressure wave. (i.e.: For instance, a positive pressure wave of 60 psi with a suction phase wave of 20 psi vacuum.) See Table 1 for more information.

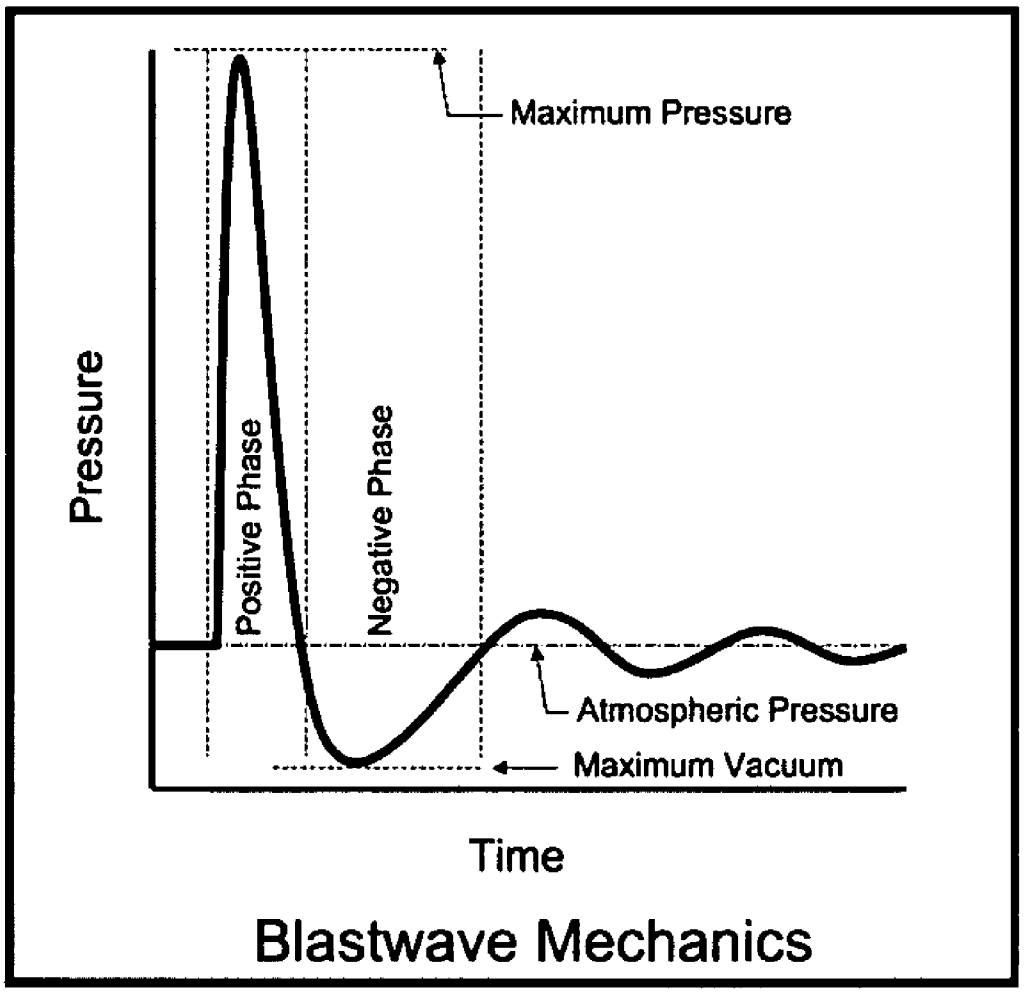


TABLE 1 - Blast Wave Theory

[0124] A negative impulse vacuum is formed when the out rushing air is compressed and forms a vacuum at the point of detonation or deflagration. The vacuum causes a pressure reversal mechanism where the displaced gas reverses its movements. Again, the duration of this negative impulse vacuum event is several times longer than the explosion event and can involve significant vacuum pressures in proportion to the magnitude of the positive impulse pressure. The vacuum actually produced is influenced by the particular geographical arrangement of the contained explosion scenario as well as the fuel-oxygen loading of the driving explosive charge.

[0125] In the various embodiments of this invention, both the positive blast phase of an explosion event cycle and the negative blast phase are incorporated into the fundamental design of the process system. The positive blast phase forms the process environment for stimulating a thermally charged impulse with higher pressures. The negative blast phase forms the vacuum effect for which the fuel-air/oxidizer components are recharged into the Ignition Chamber (and in certain embodiments the fluid recharge as well) thus allowing for a more reliable, simple, and economical mode of system operation.

2. Littoral Reaction Process

[0126] In certain Explo-Dynamics process configurations, a process contained and controlled explosion cycle is directed into a body of fluid for the purpose of inducing a flash conversion episode. The heat-fluid interface point is subject to the fuel-coolant interaction (FCI) forces released when the explosion's flame front violently reacts with the designated fluid target.

[0127] Water's volume expands over 1,675 times when it is converted into steam at atmospheric pressure. Inside a confined chamber, this aspect of steam conversion can represent substantial pressures when even a small quantity of water is flash converted into steam.

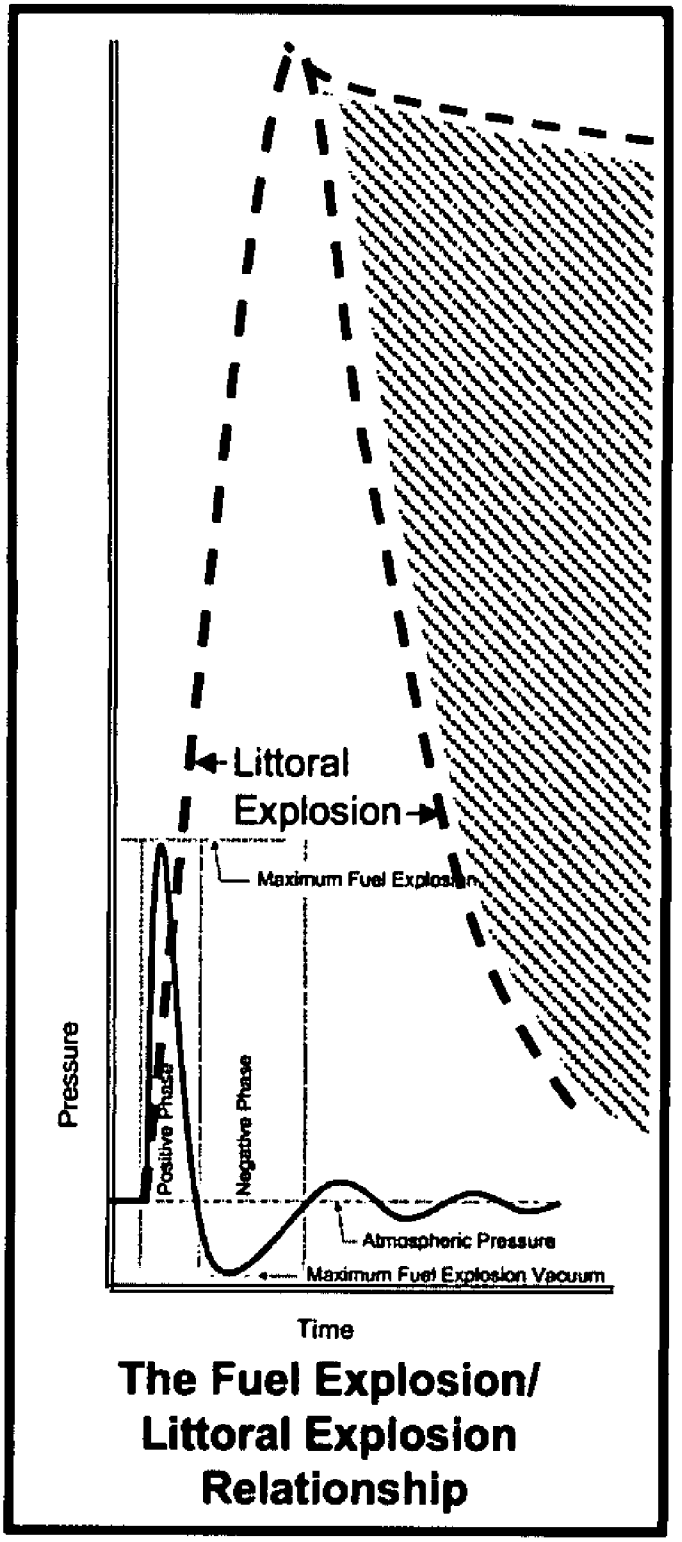
[0128] The present invention is based upon several novel concepts, one of which being the premise of matching the force of the explosion's heat release episode to the steam conversion heat energy requirement of the target fluid's volume. This flame-to-fluid force balance allows the present invention to operate efficiently and deliver an impressive degree of output energy in respect to the amount of fuel being consumed.

[0129] The double explosion dynamics of an initial thermodynamic release of force driving a secondary littoral explosion are such that the two episodes occur within milliseconds of each other with the second explosion generating a high pressure impulse of mixed steam and exhaust gasses, which is usually much higher in amplitude and duration than that of the initial explosion.

[0130] This method of matching heat energy output to steam conversion loading allows the present invention's energy generating system to operate at greater efficiency by maximizing the ratio of steam generated per unit of fuel consumed.

3. Double Explosion Dynamics

[0131] A steam explosion is usually a highly violent boiling or flash vaporization episode of water being transformed into steam. When an explosion instantly superheats water, it converts from a liquid to a gas with extreme speed and has a dramatic increase in volume, which relates to an exponential pressure building event within a closed process system.



The Fuel Explosion/ Littoral Explosion Relationship

TABLE 2 – Double Explosion Dynamics

[0132] In various embodiments of this invention, this steam conversion episode typically builds much more pressure than the initial exothermic reaction of the fuel/gas explosion. As explained earlier, the positive impulse dynamics of an explosion occur and the pressure drops almost as rapidly as it rises. The steam explosion counteracts this pressure drop effect and does not reduce the pressure as quickly, even when rapid condensation does occur. Thus the present invention's process mechanics work to keep the propulsion dynamic in play longer and allows for a displacement of force to occur, which can be harnessed into a more stable form of energy thus being more conducive to generating electricity or usable torque.

[0133] In one or more embodiments of this invention where the process intent is for the heat of the blast to directly engage a fluid, the violent heat and gas expansion of the blast wave meets a quench front of fluid resistance. When the heat and fluid interaction takes place, within virtually milliseconds, steam pressure builds so rapidly it is a fair description to refer to the event as an explosion. In essence, certain embodiments of this invention provide a two-for-one explosion episode with both events occurring so quickly it appears to be one interaction, when in fact, two separate dynamics are occurring; where in the first, fuel meets fire—and in the second, heat meets fluid.

4. Blast Propagation Mechanics

[0134] Dust explosions are a progression of micro-steps whereas devolatilisation, gas phase mixing and gas phase combustion occurs in rapid succession. From bituminous coal dust explosion experimentation it is known, that from the point of ignition, less than one twentieth of a second or only 0.045 seconds elapse before the explosion generates a maximum explosion pressure (MEP) episode of approximately 90 psi. The rate of pressure rise in this explosion is typically around 2,000 psi per second. In most open-air coal dust explosions, the air speed exceeds 200 miles per hour. Comparatively, most flammable gas explosions reaches a MEP of 115-270 psi, but it takes much longer for this reaction to occur (up to several seconds in some cases). Although, they normally take longer to initiate, gas explosions typically accelerate to a flame speed of several thousand miles per hour.

[0135] There are dramatic differences between explosions involving vapor clouds and high explosives at close distances. For a given amount of energy, a conventional high explosive blast overpressure is much higher, and the blast impulse is much lower, than that generated from a vapor cloud explosion event. The shockwave from a TNT or dynamite explosion has a relatively short duration, while the blast wave produced by an ignitable dust cloud explosion has a relatively long duration.

[0136] In one or more embodiments of this invention, the process design manipulates the normal blast propagation mechanics to physically and chemically stimulate explosion episodes for effectively and efficiently performing the desired process function. For instance, deflagrations (or subsonic explosions) tend to push, as opposed to a detonation's tendency to shatter, and have longer durations. This is the principle behind modern Thermobaric weapon systems; whereas, certain bomb arrangements release a cloud of ignitable particulates and such weapons proceed to ignite an airborne dust cloud explosion creating greater heat intensities and longer pressure episodes than most of their high explosive counterparts.

[0137] By extending the pressure moment duration and increasing the heat intensity of the explosion episodes, the present invention essentially blends the explosion's character to fit the desired task of the process and optimizes the output work to be performed.

5. Fuel Considerations—Particle Size Influence

[0138] Most organic materials, many metals and even several non-metallic inorganic materials can generate explosive dust clouds. Dust explosions can involve particle sizes ranging from a few microns to hundreds of microns and the primary factor influencing the ignition sensitivity and the violence of a dust cloud explosion is the particle size or specific surface area, which is the total surface area per particle unit volume or the unit mass of the dust particle.

[0139] Particle size primarily influences the devolatilisation rate; whereas, a higher specific surface area allows for a faster devolatilisation rate. The relationships with particle size are not linear and, at least for some of the parameters, the effect plateaus at the smaller particle sizes. Therefore, if the gas phase combustion is the slowest of the three micro-explosion propagation steps, increasing the devolatilisation rate by decreasing the particle size beyond this particle size plateau will not increase the overall combustion rate.

[0140] The available data regarding particle size influence upon the minimum ignition energy (MIE), which is the minimum energy required to ignite the dust cloud, indicates a very strong dependence and nearly exponential relationship, with no obvious 'plateauing' of the relationship even when particle size is decreased down to a few microns.

[0141] In experiments conducted by the US Mine Safety and Health Administration (MSHA) have shown that coal particles, which pass through a U.S. standard 20-mesh sieve (841 microns or about 0.03 inch to pass), can participate in a coal dust explosion. In coal, as in most other ignitable dusts, the larger the mesh size, or the smaller the particle size, the greater the explosivity hazard. In fact, coal fines passing a U.S. standard 200-mesh sieve (with openings of 74 microns or about 0.003 inch) are relatively common to the coal industry and have been the source of much injury, death and damages throughout the years.

[0142] The upper explosive limit (or UEL) is not well defined for particulate dust clouds and experiments have shown that a coal dust loading of 3.8 ounces per cubic foot would propagate a low-velocity explosion and that an even richer 5.0 ounces per cubic foot loading would quench itself within 10 feet of ignition. A rough rule of thumb is that explosive clouds cannot be generated from dusts composed of particles greater than about 500 microns. Conversely, no lower particle size limit has been established below which dust explosions cannot occur.

[0143] The present invention focuses primarily upon the use of 100 micron and less particle fuel mixtures with a preference for 50 micron and less particle fuel blends for maximum performance. However, in certain embodiments fuel and inert substance blends, such as coal slurry impoundment solids, with a wide range of particle size variations may be processed in blends outside this range to reduce material handling costs; even though, a loss of process efficiency will result.

[0144] Particle size reduction technology and pulverization systems have also advanced to a point where very specific sizes and grades of ignitable dusts can be separated and processed. Therefore, the Explo-Dynamics process control

domain extends to even the fuel processing stage so optimum system performance can be accomplished without devoting excessive time and energy resources toward particle size reductions with no appreciable impact. By calculating the fuel-stock mixture variables in advance and estimating the power of the force generated from multiple possible fuel charge mixture scenarios, the present invention's energy generating system can efficiently select and process fuels and have complete control over the process from start to finish. This process control capability was not been technologically possible prior to this point and invariably has been the primary reason this manner of fuel-to-energy conversion technology has not been explored more deeply in generations past.

6. Explosion Mechanics: Oxygen Content

[0145] This oxygen concentration factor is known as the limiting oxygen concentration (or LOC). Typically the minimum oxygen concentration values for supporting explosions organic dust explosions range from about 11% to 15% volume to volume. The Explo-Dynamics process control system monitors the chamber oxygen content and stimulates the addition of ambient air and/or enriched oxidizing substances into the fuel charge mixture to allow MEP to be maintained and cycle times to continue with a reliable frequency.

[0146] Recent research studies have demonstrated new evidence that confined explosions are usually prematurely quenched from reaching maximum intensity by a lack of oxygen. Various embodiments of this invention make use of pre-ignition phase increases in air pressure loading and/or oxidizing substance addition to prevent this quenching action and thus allow the explosion episode to reach its maximum efficiency.

7. Explosion Mechanics: Steam Carryover/Moisture Impact

[0147] When system arrangements allow steam or moisture pressure to enter and accumulate in the Ignition Chamber, the effect is much like the vapors are acting as a heat sink. Research studies have demonstrated that moisture loads of 10% have little or no negative effect upon the explosion episode power output. Further, these studies demonstrate that significant reductions in explosion episode over-pressures are not generally realized until the water concentration reaches approximately 35% by weight. Thus the present invention will process higher water content concentrations with greater efficiency than a conventional combustion process. Further, the Explo-Dynamics process control component will measure this impact and, if necessary, will trigger a process reaction to these considerations resulting in the addition of a small volume of combustible gas and air or oxygenation substances to the fuel charge in order to offset this impact.

[0148] 8. Fluid Displacement Mechanisms

[0149] In certain embodiments of the present invention, direct pressure and heat of a contained process explosion are used to drive a fluid for energy recovery purposes. Following are different mechanical aspects of this process that have been incorporated into the present invention:

A. Positive Impulse Pressure Wave

[0150] An explosion event, which occurs within the confines of a fluid containing process, induces a pressure wave episode that is partly due to the positive impulse blast pressure and predominantly due to the explosive steam generation episode, which results when the thermally stimulated explosive energy come sin contact with a quantity of fluid and rapidly vaporizes said fluid into steam pressure.

[0151] On fluid displacement system variations where no piston is utilized, the released explosive force rapidly drives the fluid in the direction of the blast wave's propagation, but the surface tension of the fluid column yields to the overwhelming force of the blast energy and cavitation occurs. Cavitation will result in fluids erratically moving in a variety of similar and dissimilar directions by clinging to walls and structures to allow the vapor charge energy to escape in the path of least resistance.

[0152] Propelled blast vapor slugs within the fluid path act to force the fluids in the desired manner and direction, creating a system flow dynamic that allows multiple Explo-Dynamics chamber units to work in controlled unison and create a stable flow from a timed series of pulsed propulsion events. Moreover, as the steam and exhaust vapor bubbles collapse, they can produce very large pressure spikes, which add to the dynamic transport of the fluid being displaced.

[0153] As a blast force propels itself through the process piping and vessel system, the fluid column also becomes subject to the gas drive effect mechanism generated by the blast force. The displaced fluids are routed in a desired manner and a series of check valves are employed to assure that the flow of fluids proceeds in the desired direction and the overall reservoir flow pattern remains consistent. The heat of the gas is transferred into the liquid and rapidly a quantity of steam is produced, which also yields to drive the fluids into the desired flow pattern and increases the force of the gas drive effect.

B. Negative Impulse Pressure Wave

[0154] When an explosion event has surpassed its positive impulse phase, a negative impulse reaction ensues that is several orders of magnitude slower than the positive phase and can contain up to a third of the pressure formerly released in a negative context as a vacuum event. This effect translates into an implosion of in-process gas bubble slugs as a concentrating force reversing the expansion and drawing vacuum on the voids created by the pressure. The check valve arrangement prevents a retreat of the displaced fluids back to the point of origin thus trapping the concentration event into the process; whereas, fluids are drawn or pulled forward into the flow pattern created by both the pressure and the vacuum. In this manner, a push pull effect is on-going with each explosion episode and multiple timed explosions in the process arrangement provide for a steady force of fluids being displaced by the energy released in the series of process driving explosions episodes.

C. Steam Pressure Impulse

[0155] When the flow of pressurized heat contacts a liquid, a heat transfer process occurs and water, which is subject to explosive conversion into steam, experiences a 1675× increase in its volume displacement at regular atmospheric pressure. Some underwater mine weapons utilize this principle to explosively create large sub-sea steam bubbles that lift the target watercraft and the imploding secondary reaction drops the watercraft often structurally breaking the hull and/or capsizing and sinking the watercraft in the violent displacement episode. This steam volume increase and fluid displacement phenomena also adds to the gas drive effect of the

Explo-Dynamics process and, like the explosion pressure impulse force, is also subject to the push pull mechanics of expanding and compressing forces of the secondary implosion episode, which provides energy to draw or otherwise propel the displaced fluid flow into and through an energy conversion and recovery process, such as a hydroelectric turbine generation process to produce electricity.

II. Environmental Advantages

[0156] England's Sir William George Armstrong, (1810-1900) built an electrostatic boiler in 1842 due to his fascination with electrically charged steam. Later in 1887, Richard von Helmholtz discovered that small, electrically charged, particles possessed a remarkable ability to condense steam around them. Still several years later in 1894, Nobel Prize winner Sir J. J. Thomson further studied this phenomenon and developed the framework for much of our current understanding of the interaction between charged particles and steam.

[0157] In several embodiments of this energy invention, direct heat-to-fluid reactions occur, which generate littoral explosions of steam as the target fluid is flash converted by the overwhelming influence of the thermodynamic impulse associated with the initiating explosion episode. In these process arrangements, the direct mixing of exhaust and steam under both a natural and artificial electrostatic influence is an integrated element of the explosion-to-energy conversion process and constitutes a novel approach toward reducing the toxicity of the emissions. Thus this energy production technology invention will offer a range of benefits as an environmentally friendly energy resource method for the conversion of conventional hydrocarbon fuels as well as a multiplicity of alternate fuels substances. This aspect of the present invention constitutes an improvement of the current state-of-the-art and has heretofore been unachievable with conventional hydrocarbon energy conversion systems.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

FIG. A	Sheet # 1 of 30	Explo-Dynamics- Explosion to Energy Conversion Cycles: Process Systems
FIG. B-1	Sheet # 2 of 30	Explo-Dynamics Process System & Protocol: Direct Heat Cycle
FIG. B-2	Sheet # 3 of 30	Explo-Dynamics Process System & Protocol: Direct Heat/Direct Pressure Cycle
FIG. B-3	Sheet # 4 of 30	Explo-Dynamics Process System & Protocol: Direct Heat/Direct & Indirect Pressure Cycle
FIG. B-4	Sheet # 5 of 30	Explo-Dynamics Process System & Protocol: Indirect Pressure Cycle
FIG. B-5	Sheet # 6 of 30	Explo-Dynamics Process System & Protocol: Indirect Heat Cycle
FIG. C-1	Sheet # 7 of 30	Explo-Dynamics Process System & Protocol: Flash Steam Conversion Sequences 1 thru 4
FIG. C-2	Sheet # 8 of 30	Explo-Dynamics Process System & Protocol: Flash Steam Conversion Sequences 5 thru 8

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BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

FIG. C-3	Sheet # 9 of 30	Explo-Dynamics Process System & Protocol: Flash Steam Conversion Sequences 9 thru 12
FIG. C-4	Sheet # 10 of 30	Explo-Dynamics Process System & Protocol: Flash Steam Conversion Sequences 13 thru 16
FIG. D	Sheet # 11 of 30	Explo-Dynamics Process Arrangement: Direct Heat/Indirect Pressure
FIG. E	Sheet # 12 of 30	Explo-Dynamics Process Arrangement: Direct Heat to Steam
FIG. F	Sheet # 13 of 30	Explo-Dynamics Process Arrangement: Indirect Pressure-Fluid Displacement
FIG. G-1	Sheet # 14 of 30	Explo-Dynamics Process Arrangement: Direct Pressure/Direct Heat Cycle Free Piston Engine Configuration Sequence 1 thru 4
FIG. G-2	Sheet # 15 of 30	Explo-Dynamics Process Arrangement: Direct Pressure/Direct Heat Cycle Free Piston Engine Configuration Sequence 5 thru 8
FIG. G-3	Sheet # 16 of 30	Explo-Dynamics Process Arrangement: Direct Pressure/Direct Heat Cycle Free Piston Engine Configuration Sequence 9 thru 12
FIG. G-4	Sheet # 17 of 30	Explo-Dynamics Process Arrangement: Direct Pressure/Direct Heat Cycle Free Piston Engine Configuration Sequence 13 thru 16
FIG. G-5	Sheet # 18 of 30	Explo-Dynamics Process Arrangement: Direct Pressure/Direct Heat Cycle Free Piston Engine Configuration Sequence 17 thru 20
FIG. G-6	Sheet # 19 of 30	Explo-Dynamics Process Arrangement: Direct Pressure/Direct Heat Cycle Free Piston Engine Configuration Sequence 21 thru 24
FIG. H-1	Sheet # 20 of 30	Explo-Dynamics Process Arrangement: Direct Pressure/ Direct Heat Cycle: Explo-Steam Internal Combustion/ Steam Engine Configuration Sequence 1 thru 4
FIG. H-2	Sheet # 21 of 30	Explo-Dynamics Process Arrangement: Direct Pressure/ Direct Heat Cycle: Explo-Steam Internal Combustion/ Steam Engine Configuration Sequence 5 thru 8
FIG. I	Sheet # 22 of 30	Explo-Dynamics Process Arrangement: Indirect Pressure- Fluid Displacement Configuration
FIG. J	Sheet # 23 of 30	Explo-Dynamics Process Component Systems: Pulse Converter Turbine Assembly
FIG. K	Sheet # 24 of 30	Explo-Dynamics Process Arrangement: Indirect Pressure-Fluid Displacement/Gas Drive Configuration
FIG. L	Sheet # 25 of 30	Explo-Dynamics Process Component Systems: Thrust Translator Profile
FIG. M	Sheet # 26 of 30	Explo-Dynamics Process Component Systems: Ignition Chamber-Igniter Profile
FIG. N	Sheet # 27 of 30	Explo-Dynamics Process Component Systems: Fuel Charging Arrangement Profile
FIG. O	Sheet # 28 of 30	Explo-Dynamics Process Component Systems: Tornado Chamber Assembly

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BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING		
FIG. P	Sheet # 29 of 30	Explo-Dynamics Process Configurations: Explo-Indirect Steam Generation Arrangement
FIG. Q	Sheet # 30 of 30	Explo-Dynamics Process Arrangement: Alternate-Fluid Displacement/Gas Drive Configuration

DETAILED DESCRIPTION OF THE INVENTION

[0158] During an explosive event, a violent exothermic reaction takes place and both pressure and heat are rapidly generated. This mechanism of contained force and its conversion into a useable energy resource comprise various embodiments of the invention presented herein. The present invention is based upon using both the heat and pressure released during a series of controlled and contained explosion events as a mechanism of force for producing energy, torque, thrust, motive force, or heat. (FIG. A)

[0159] The attached collection of drawings, illustrate several variations of these embodiments. Some process arrangements, herein illustrated, rely more upon one mechanism of explosive force than another, but all mechanisms relate to the fundamental science of using explosive force and converting that force into a usable form of energy. Each embodiment's process variation, or configuration shares one or more of the following basic characteristics of explosive force conversion:

[0160] 1. Direct Heat Cycle Configurations—Certain embodiments using the impulse heat episode of a contained explosive reaction to produce steam and therein provide force to an energy production or conversion mechanism;

[0161] 2. Indirect Heat Cycle Configurations—Certain embodiments using the impulse heat episode of a contained explosive reaction to provide thermal force to conventional heat-to-energy capture, production, and/or other conversion mechanisms;

[0162] 3. Direct Pressure Cycle Configurations—Certain embodiments using the pulse pressure episode of a contained explosive reaction provide direct displacement force to an energy production or conversion mechanism; and

[0163] 4. Indirect Pressure Cycle Configurations—Certain embodiments using the pulse pressure episode of a contained explosive reaction provide indirect displacement force (i.e.: fluid displacement) to an energy production or conversion mechanism.

Versatile Fueling Capabilities

[0164] This energy technology invention was originally designed to be fueled by pulverized dust fuels, which are suspended as a particulate dust cloud within the Ignition Chamber of the Explo-Dynamics process and ignited into a controlled explosion episode. However, the Explo-Dynamics process can make use of atomized liquids, vapor, and/or gaseous fuels in addition to, or instead of, the dust fuel suspensions. The ability to process an enormous variety of fuel types in a wide range of physical state conditions makes the Explo-Dynamics system very unique and its unusual capacity to process inert substances or contaminates mixed with the fuel is without equal among known energy production technologies.

[0165] Dust fuels are anticipated to be the Explo-Dynamics system's specialty because within this fuel classification arena lies a great variety of potential alternative energy fuel supplies. Virtually any organic substance, and many inorganic substances, is likely to form an explosive atmosphere when it is pulverized into a fine particle size mixture and thereby suspended in an airborne dust cloud.

[0166] The Explo-Dynamics process allows for fuels with different explosivity characteristics to be blended together to generate more pressure and heat over a longer blast episode duration period.

Hyper-Thermodynamic Stimulation Mechanisms

[0167] Several factors participate in this invention's ability to adiabatically influence a spike impulse discharge of super-heated gas. The present invention makes use of a variety of structural, procedural, and chemical mechanisms to stimulate a series of thermal pulse episodes designed to accelerate the inter-related adiabatic influence, violence, and pressure of the contained process explosion sequence and the subsequent heat release output thereof.

1. Structural

[0168] Internal Obstructions
[0169] Parabolic Reflection Panels/End Caps
[0170] Parabolic Focusing Rings/Walls
[0171] Multiple Ignition Source Scenarios
[0172] Tubular Ignition Chamber (Length Over Diameter)
[0173] Pressure Relief Blast Valves
[0174] Geometric Restriction Zones Within Process

2. Procedural

[0175] Pre-Pressurization of the Ignition Chamber and/or Process System
[0176] Convergence of Blast Patterns
[0177] Multiple Fuel Cloud Ignition Points
[0178] Induced Shockwave Collision Fronts
[0179] Manipulation and Control of System Operating Temperatures

3. Chemical

[0180] Blending of Fuels
[0181] Addition of Oxidizing Substances

[0182] Direct Heat Cycle Configurations (FIGS. B-**1**, B-**2**, B-**3**, C-**1** thru C-**4**, D, and E)

[0183] In a conventional steam generation process, a pound of water at 32° F. requires 180 BTUs of energy to bring its heat content, or enthalpy, up to 212° F. and begin to boil. From this boiling point on, another 970.3 BTUs of energy is required to convert the water into steam.

[0184] In certain embodiments of this invention, referred to herein as the Explo-Dynamics Direct Heat Cycle Process, the water-steam conversion is not conventional, nor is the heat gradually and consistently applied to the fluid. The reaction is violent, turbulent, and instantaneous.

[0185] The Explo-Dynamics technology can be configured as a direct heat cycle process to provide for the direct flash conversion of fluids into steam. In this arrangement, an intensified release of a super-heated blast wave is directed into a

target fluid body. The target fluid volume is matched to the calculated thermal output energy to optimize the efficiency of the conversion episode. Upon contact, a direct heat-to-fluid reaction cycle occurs and thus creates a littoral explosion of steam pressure. In this process arrangement, the explosion exhaust is combined directly with the generated steam volume and after passing through in-process filtration mechanisms (described herein), the steam is routed to a steam turbine unit, steam engine, other steam energy translating apparatus to capture the energy release of the cycle episode thus allowing another cycle to ensue.

Indirect Heat Cycle Configurations (FIGS. B-**5** and P)

[0186] The Explo-Dynamics technology can be configured as an indirect heat cycle process and serve as heat source for driving an external combustion engine. In this configuration, the enhanced thermal output from the Ignition Chamber and/or Reaction Chamber is exhausted through a pressure relief mechanism and thereby routed to the receiving process unit.

[0187] In this mode of operation, the present invention's energy generating system sends its hyper-stimulated thermal pulses into:

[0188] A. boiler units for steam generation purposes;

[0189] B. heat exchange units for heat engine energy arrangements such as the Stirling Engine or other such external combustion engine technology and/or reciprocating heat engine system;

[0190] C. Reaction Chambers for direct heat-to-electricity conversion purposes utilizing direct heat to energy conversion technology, such as the Thermionic conversion process, the Solid State Heat Engine (SSHE) technology, the Peltier—Seebeck thermoelectric effect, the Thermopile conversion method, and/or the vacuum gap tube process, and/or the solid-state thermal diode process; and

[0191] D. a direct heat source for other direct and/or indirect heat processes.

[0192] Direct Pressure Cycle Configurations

(FIGS. B-**2**, G-**1** thru G-**6**, H-**1** thru H-**2**, J, and L)

[0193] The Explo-Dynamics technology can be configured as a direct pressure cycle process. In this configuration, the Explo-Dynamics process delivers direct pressure thrust from the explosion cycle to provide displacement force to a conventional piston or turbine engine arrangement. However, the present invention's energy generating system best functions with power conversion configuration variations designed to handle the force of the impulse thrust episode and provide sufficient structural integrity and bulk to establish a stabilizing flywheel effect to the power output. Reference Drawings B-**2**, G-**1** thru G-**6**, and H-**1** thru H-**2**, J, and L for examples of these specialty configuration system components.

Indirect Pressure Cycle Configurations (FIGS. B-**3**, B-**4**, F, I, K, and Q)

[0194] The Explo-Dynamics technology can be configured as an indirect pressure cycle process and serve as a pumping mechanism to mobilize a flow of fluid. In this configuration, the high-pressure release episode of the Explo-Dynamics cycle reacts to provide displacement within the fluid reservoir. Although, cavitation and annular clingage occur in this arrangement, a significant force is applied to drive the fluid forward through the process system ahead of the explosion front pressures. Fluid propulsion also is incited by the post explosion vacuum episode where fluids are drawn into the system to recharge the voids created by the pressure episode.

Hybrid Configurations:

Direct Heat—Indirect Pressure Cycle Configurations (FIGS. B-**3** and D)

[0195] The Explo-Dynamics technology can be configured as hybrid direct heat and indirect pressure cycle process and serve as both a direct heat to steam pressure generation mechanism and also as a pumping mechanism to mobilize a flow of fluid for energy recovery purposes. In yet another variation of the Explo-Dynamics hybrid direct heat and indirect pressure cycle process, the blast wave is passed through a smaller process fluid target zone. This target fluid volume is flash vaporized into a supercritical water/steam release episode of high pressure, lower volume steam pressure, which is routed into a multi-stage steam turbine unit for energy transformation purposes. The lower pressure residual steam volume remaining in the process system, in addition to the de-energized effluent steam from the turbine, are routed into a steam pressure induction system to provide a fluid displacement thrust for energy recovery and fluid system recharge purposes. Reference Drawings B-**3** and D for examples of this configuration component.

Hybrid Configurations: Direct Pressure—Direct Heat Cycle Configurations (FIGS. B-**2**, G-**1** thru G-**6**, and H-**1** thru H-**2**)

[0196] The Explo-Dynamics technology can be configured as hybrid direct pressure and direct heat cycle process and serve as both a combination internal combustion engine and steam engine. In this arrangement, the Explo-Dynamics process utilizes a piston-cylinder type Ignition Chamber and the exhaust heat is used to vaporize an injected fluid load, which is transformed into a quantity of steam volume, which in turn, drives a piston in another sector of the engine system.

[0197] Reference Drawings G-**1** thru G-**6**, and H-**1** thru H-**2** for both free piston and piston-crankshaft arrangement examples of this configuration component.

Indirect Pressure Displacement Drive

[0198] As the aforementioned cycles of direct heat and indirect pressure are combined, an efficient fluid propulsion system is created from both the pressure and vacuum episodes of each explosion release cycle. In this configuration a direct heat-to-fluid reaction cycle occurs as the blast wave contacts the process fluid and thus creates a littoral explosion of steam pressure. Both the initial explosion pressure release episode and the ensuing steam explosion pressure provide forward displacing thrust to the fluid load in the process system's reservoir channeling mechanism. Accordingly, the newly created steam bubbles form rapidly and then condense and implode rapidly with substantial turbulence. This implosion episode creates a vacuum, which draws fluid from the inlet side of the process supply system. As this Explo-Dynamics process embodiment's cycle occurs, a continuous push-pull force effect drives the fluid rapidly through the process system where a hydro turbine unit transfers the energy into torque or thrust to drive an electrical generator and/or supply mobility to a vehicle, such as a watercraft, or provide force to a process system, such as a pump.

[0199] In system configurations where the process arrangement releases the pressure and heat of an explosive event into a fluid medium, (FIGS. B-**3**, B-**4**, F, I, K, and Q) the objective is to displace the fluid medium and convert the pulse energy of

the explosion event into a more stable and usable energy source. In this manner of application, explosive force is applied to a fluid column within a contained process.

[0200] Since water cannot be compressed, it will transmit energy much faster and farther than many other mediums. In fact, the incompressibility of fluid makes it an ideal hydraulic energy transfer medium. Conversely, the compressibility of gas combined with the fluid, allows the gas to assist in absorbing the shockwave of a long duration, low intensity explosive event.

[0201] Various embodiments of the Explo-Dynamics Indirect Pressure—Fluid Displacement process seek to:

[0202] 1. Initiate a controlled, contained series of explosion events in an explosion chamber.

[0203] 2. Absorb and buffer the explosive charge into a fluid medium in a Reaction Chamber

[0204] 3. Use backflow prevention devices to route the expansive energy forces in a desired direction.

[0205] 4. Use shock absorbing process configurations and in-line fluid-gas separation vessels to reduce the pulse energy release episode into a steady flow of force

[0206] 5. Harness the energy potential of the fluid-gas flow to drive the rotation of a turbine or otherwise produce an element of usable power.

[0207] 6. Use vacuum triggered mechanisms to harness the negative pressures from the contracting energy forces to reload the system with fluids and fuel for re-ignition of a repetitive series of cycles.

[0208] 7. Reload the explosion chamber fuel-air charge and recharge fluid process zones for sequential re-firing cycles.

Indirect Pressure Configurations:

Negative Impulse System Recharge Mechanisms

[0209] The Explo-Dynamics process makes use of the natural blast wave mechanics and the pressure-suction forces generated therein. This natural and artificial application of explosive force results in system configurations that are simpler and comparatively less expensive to install and operate and less prone mechanical failure or malfunction.

[0210] In this operational scenario, the Ignition Chamber's internal pressure will be close to zero before the explosion event is triggered. When the explosion event starts, the pressure will rise very rapidly and the maximum pressure will be reached within a fraction of a second. An accelerated flow of expanding gas pressure will depart from the Ignition Chamber and proceed through the Reaction Chamber area engaging the abrupt fluid resistance of the fluid medium. The fluids will respond to the overwhelming superiority of the force against them and begin to travel in the direction of least resistance offered by the process flow network. Extreme turbulence, cavitation, and the shock absorbing mechanisms of the process the fluid-gas flow will collectively work to smoothen the power delivery and drive the fluid flow pulse to its maximum mobility moment within short order. The pressure will then drop in the Ignition Chamber and the Reaction Chambers as the burning rate decreases from the explosion and the exothermic expanding gas volume is relieved through the system's piping network. Due to the inertia of the fluid-gas flow, the pressure of the burnt vapors in the post-explosive exhaust atmosphere will drop and at first trigger a closing of the pressure relief valves before continuing its drop to a point below the ambient pressure level creating a vacuum. The Explo-Dynamics process harnesses this vacuum force to allow for a greatly accelerated:

[0211] 1. fuel-gas recharge cycle and/or

[0212] 2. the reloading of fluids into the Reaction Chamber.

[0213] These mechanisms thus allow the Ignition Chamber to be re-fired more quickly into another blast cycle episode and also allow the process to operate with less moving parts in a far simpler, more economical, and with more reliable mode of power generation.

[0214] The negative impulse can be about ⅓ of the positive impulse phase, but this ratio is substantially dependent on the layout of the geometry where the explosion occurs and the various fuel mixture scenarios.

[0215] Pressure and heat waves travel away from the center of the blast equally in all directions. The blast pressure has two phases the positive and negative. In the positive phase the high-pressure gas, heat wave and any projectiles travel outward. During the negative phase a partial vacuum is produced thus drawing materials back towards the area of their origin. The reaction occurs at a high rate of speed, sometimes even faster than the speed of sound, which is 1250 feet per second.

[0216] Fluid Displacement/Gas Drive Process: Shock Wave Absorption/Pulse Energy

Conversion

[0217] The present invention's energy generating system allows for a progressive dampening of explosive pulse forces. When a fluid column has been displaced by an explosive blast event, violent force moves intermittent gas and fluid slugs through the process system. When confined air pockets, positioned above the water flow zone subject to the explosive forces, are applied to act as shock absorbing mechanisms within the system's network of flow piping, the explosive force of 90 psi being applied to the column of water will cause the air pockets to compress to up to 15% of their normal displacement volume. Explosion events generating higher pressure impulses will compress the air pockets even more.

[0218] The Explo-Dynamics—Fluid Displacement and/or Fluid-Gas Drive Process (FIG. K) features several pulse energy absorption and conversion mechanisms designed to reduce the shock wave forces of the explosion displacement episode. These mechanisms are:

[0219] 1. Ignition Chamber/Reaction Chamber Pressure Relief Valve—This valve is designed to withstand high-heat, high-pressure operation. The valve can be a conventional in-channel flow check arrangement or the spring mechanism can be external to the pipe/vessel and subject to the cooling system flow component.

[0220] 2. Fluid Column Resistance—The fluid load is adjusted to match the charge. The load can be staged in a top-down configuration scenario or a bottom-up scenario. The cavitation process allows the dynamically released energy episode to be contained within, and absorbed by, the Explo-Dynamics process system and the working fluids contained therein. Accordingly, the process control system monitors the fluid levels, fluid recharge rates, the force, and temperature conditions present during and after the pressure event.

[0221] 3. Process Shock Pockets—Within the process piping system one or more loops are employed to allow gas pockets to compress and absorb mass fluid jolts.

[0222] 4. Shock Chamber—Within the process piping network, flow-through vessels with arched inlet and out-

let portals are employed making use of an air pocket in the upper extremities of the vessel. This vessel will absorb the shock of the liquid impulse and buffer the effluent flow exiting the chamber.

[0223] 5. Fluid-Gas Separation Vessel—Essentially, this system component is a larger, system level, shock chamber, but the volumes of liquid/gas contained therein are larger and the gas pocket serves as a gas drive device for regulated fluid effluent discharge directly to a hydro turbine drive or indirectly to a reservoir for gravitational flow to a hydro turbine unit. The gas reservoir portion of the separator collects the system's gas/steam pressure, which can be likewise be released in a controlled manner to a steam or gas drive turbine.

[0224] 6. Pulse Converter Turbine (PCT)—Although a dry and wet version of this embodiment can be applied to various operational scenarios as the situation dictates, the fluid version of the PCT unit (FIG. J) is a heavy-duty in-line turbine designed to allow for regressive pulse force slippage through portions of the impeller system and circumferentially translate the pulse energy into torque. With different degrees of annular 'slip' applied, a series of pulse converters can be applied per given flow source to progressively dampen and stabilize pulse energy.

[0225] 7. Constricted Venturi Ports—Within various embodiments of the process flow system, venturi ports are applied to constrict the flow to a limited orifice dimension creating higher pressure and flow through this system process component and thus converting some of the energy force into vacuum, which will provide a measure of lift and will supply other fluids into the process volume flow stream.

Indirect Pressure Energy Recovery Method for Mixed Fuel/Inert Substance Blends

[0226] In one or more embodiments of the invention presented herein, and arrangement makes it possible to use non-typical fuels, which will are non-combustible by regular energy recovery methods. For instance, coal slurry impoundments contain millions of tons of coal mixed with shales, soils, and other such contaminants. To recover the usable coal from this slurry mixture is normally a complicated and expensive endeavor. The Explo-Dynamics process is an optimal solution for this, and many other challenging energy recovery problems where fuel substances are mixed with non-fuel substances. By crushing the entire slurry composition into a pulverized powder, the Explo-Dynamics process ignites an explosion episode from the fuel matter contained within the mixed substance fuel cloud. This explosive processing method is very effective with up to 70% inert substance concentrations by weight and its efficiency does not significantly diminish until inert substance concentrations exceed 80% of the overall dust cloud/fuel atmosphere's composition.

[0227] In these types of Explo-Dynamics process arrangements, it will now be possible to economically recover energy from oil shales, tar sands, mixed coal/shale strata and other non-typical rock strata containing hydrocarbon components as well as many other scenarios where fuel and inert substance mixtures are not feasible or possible to separate for conventional combustion based energy recovery methods.

Variable Process Configuration Applications

[0228] The Explo-Dynamics Indirect Pressure Fluid Displacement Process can be applied in a variety of configurations. A vertical Reaction Chamber column of fluid can be impacted by a top-down or bottom-up arrangement as well as multiple angled and looped variations thereof. The process system can be located under a body of water or even subterraneously-based in a well point configuration.

Various Process Configurations

Pressure/Gas Drive Configuration (FIG. K)

[0229] In certain embodiments of the Explo-Dynamics Process, herein referred to as Pressure/Gas Drive Configuration Method, fluids are displaced with either attached or free floating piston/cylinder arrangements driven by direct explosion reaction pressure. In the Pressure/Gas Drive Configuration process, the system and protocol of the embodiment are generally comprised in the following steps:

[0230] a) a quantity of fluid is recharged into the fluid thrust zone beneath the piston;

[0231] b) a pressurized burst of fuel and air is blown (or vacuum drawn) into the Ignition Chamber zone of the cylinder above the piston position;

[0232] c) an arc of electricity or other ignition mechanism is used to ignite the flammable atmosphere of the fuel cloud;

[0233] d) an explosion occurs and the piston is subjected to a downward force;

[0234] e) the piston drives downward in reaction to the force applied as the fluid beneath the piston yields to the force and passes through the pressure relieve valve into the pressure reservoir gas drive cylinder;

[0235] f) At Ignition Chamber a lower portion of the chamber a gas bypass/pressure relief mechanism allows explosion gasses to be relieved into the fluid body beneath said piston;

[0236] g) the pressure pulse is relieved in the Ignition Chamber, a negative pressure or vacuum results, and the vacuum allows the fuel, air/oxidizer, and/or gas valves to open permitting another fuel cloud to fill the Ignition Chamber and the system fluid recharge valve/s open in the lower cylinder fluid Reaction Chamber zone allowing pressurized fluid level to be recharged within the chamber;

[0237] h) the refilling of fluid raises the piston and satisfies the vacuum force presented to the Ignition Chamber; and

[0238] i) the Ignition Chamber is re-fired and another cycle ensues.

Direct Pressure/Direct Heat; Free Piston Engine Configuration (FIGS. G-**1** thru G-**6**)

[0239] In certain embodiments of the Explo-Dynamics Process, one of which herein referred to as the Free Piston Engine Configuration, a free-floating piston/cylinder arrangement is utilized. In said Free-Piston Engine Configuration process, the system and protocol of the embodiment are generally comprised in the following steps:

[0240] (a) (in the Ignition Segment) fuel is vacuum or pressure injected into Ignition Chamber segment of said engine chamber (FIG. G-**2**, Sequence 5); (in the Steam Segment) building steam pressure provides thrust to the steam piston propelling said steam piston toward its expansion stroke (FIGS. G-**1**, Sequences 1-4, G-**2**, Sequences 5-8, and G-**3**, Sequences 9-11);

[0241] (b) (in the Ignition Segment) the unified piston assembly compresses said fuel (FIGS. G-**2**, Sequences 6-8 and G-**3**, Sequences 9-11);

[0242] (in the Steam Segment) continuously expanding steam pressure provides thrust to the steam piston and it travels toward full expansion stroke (FIGS. G-**1**, Sequences 1-4, G-**2**, Sequences 5-8, and G-**3**, Sequences 9-11);

[0243] (c) (in the Ignition Segment) an ignition event is triggered by either the process control system acting through an ignition mechanism or by a pressure induced by steam pressure even proving thrust from the other piston front within the steam segment of said engine chamber (FIG. G-**3**, Sequence 12);

[0244] (in the Steam Segment) a release valve is process control or mechanically actuated allowing a rapid release of steam pressure and the steam driven piston reaches the full expansion position; whereas the pressures against the segment partition seal are relieved by discharging pressure into the other segment partition behind the ignition piston or by venting said pressures out of the engine and a shock absorbing/rebound mechanism relieves the residual thrust of the stroke as the piston begins the retraction process (FIG. G-**3**, Sequence 12);

[0245] (d) (in the Ignition Segment) explosively expanding gasses drive the unified piston assembly back toward the steam segment (FIGS. G-**4**, Sequences 13-16 and G-**5**, Sequences 17-20);

[0246] (in the Steam Segment) the steam pressures continues to escape the steam segment of said engine configuration and allows the depressurized steam piston to begin its retraction stroke in response to the ignition pressure exerted from the ignition segment (FIGS. G-**4**, Sequences 13-16, G-**5**, Sequences 17-20, and G-**6**, Segment 21)

[0247] (e) (in the Ignition Segment) one or more exhaust ports in the cylinder wall allow the expanding gas front to escape the Ignition Chamber segment and transfer the heat and pressure release to a linkage conduit connecting the steam segment (FIGS. G-**6**, Sequences 21-24 and G-**1**, Sequence 1); (in the Steam Segment) as full depressurization occurs, a quantity of fluid is injected into the steam sector and the linkage conduit transmits a heated exhaust burst from the ignition segment, which is flash converted into steam pressure (FIG. G-**6**, Sequence 24);

[0248] (f) (in the Ignition Segment) the piston reaches the full expansion position in the ignition segment and a shock absorbing/rebound mechanism relieves the residual thrust of the stroke as the piston begins the retraction process and the pressures against the segment partition seal are relieved by discharging pressure into the other segment partition behind the steam piston or by venting said pressures out of the engine; (FIGS. G-**1**, Sequence 1-2);

[0249] (in the Steam Segment) the flash converted steam pressures build an provide thrust against the steam piston driving said piston to compress the ignition segment piston into a compression stroke (FIGS. G-**1**, Sequence 1-3);

[0250] (g) (in the Ignition Segment) the ignition segment piston responds to the force exerted from the steam segment, and begins to travel toward another fuel compression stroke (FIGS. G-**1**, Sequence 2-4);

[0251] (in the Steam Segment) the building steam pressure provides thrust to the steam piston propelling said steam piston toward its expansion stroke (FIGS. G-**1**, Sequences 1-4, G-**2**, Sequences 5-8, and G-**3**, Sequences 9-11);

and thus these steps of system and protocol, which are repeated to deliver a means of thrust for energy conversion purposes, constitute a complete engine cycle.

Direct Pressure/Direct Heat: Internal Combustion/Steam Engine Configuration (FIGS. H-**1** thru H-**2**)

[0252] In certain embodiments of the Explo-Dynamics Process, one of which herein referred to as the Internal Combustion/Steam (Explo-Steam) Engine Configuration, a piston/cylinder and crankshaft arrangement is utilized. In said Explo-Steam Engine Configuration process, the engine system resembles a pair of four stroke internal combustion engines; whereas each engine segment can operate independently of the other or can be mechanically linked or otherwise configured in the same engine block system. The improvement being comprised in a means of using a heat engine operating off the principle of explosive power conversion and a steam engine operating off the littoral reaction method together and yet separate in the sense that each engine's structure, lubricants, cylinder displacements, configurations, etc. do not have to be identical. Thus the concept of using each engine in a separate, yet combined role allows for greater flexibility and an enhanced method of extracting the unique power potential available collectively through each engine's particular strengths and advantages.

[0253] The system and protocol of the Explo-Steam engine embodiment are generally comprised in the following steps:

[0254] (a) the ignition driven engine segment's piston reaches the full compression stroke of the exhaust phase and the exhaust valve releases the compressed exhaust heat gasses into the linkage manifold wherein said gasses enter the intake valve of the littoral reaction engine segment (FIG. H-**1**, Sequence 1);

[0255] (b) as the ignition driven engine segment's piston retracts, the exhaust valve closes and the intake valve opens allowing a fuel/air mixture to be drawn in said cylinder; likewise, the littoral reaction engine segment's piston begins a compression stroke against the input load of exhaust gasses (FIG. H-**1**, Sequence 2-3);

[0256] (c) as the ignition driven engine segment's piston compresses the fuel/air mixture, the littoral reaction engine segment's piston reaches a full compression stroke; whereas at or near this interval a quantity of working fluid is injected into said cylinder (FIGS. H-**1**, Sequence 3-4);

[0257] (d) as the ignition driven engine segment's piston reaches full compression stroke, the fuel/air mixture is heated to an explosion of said fuel mix; likewise, the littoral reaction engine segment's piston retracts in a full power stroke against the expanding steam pressure event (FIG. H-**2**, Sequence 5);

[0258] (e) as the ignition driven engine segment's piston retracts in a full power stroke against the expanding ignited gas pressure, the littoral reaction engine segment's exhaust valve opens as the piston begins a compression stroke against the released steam pressure event (FIG. H-**2**, Sequence 5-6);

[0259] (f) the ignition driven engine segment's piston reaches the full expansion stroke position the exhaust valve opens and the piston forces the exhaust pressures

out of said cylinder into the linkage conduit manifold phase and the exhaust valve releases the compressed exhaust heat gasses into the linkage manifold; wherein the littoral reaction engine segment's exhaust valve has closed and the intake valve has opened to receive the ignition driven engine segment's gaseous exhaust discharge (FIG. H-**2**, Sequence 7-8);

and thus a complete engine cycle is constituted by these steps of system and protocol, which are repeated to deliver a means of thrust for energy conversion purposes.

Components

[0260] The Explo-Dynamics process may be configured in a variety of arrangements. The components identified herein are not meant to be applied in every process configuration nor are they exclusively designated to be employed in a process arrangement exactly as they may have been illustrated in this patent application's drawings or description. Rather, the components identified herein are examples of embodiment configurations and represent several arrangement options that the Explo-Dynamics process may include.

Ignition Chamber (Explosion Chamber)

[0261] The Ignition Chamber is a vessel designed to handle both the heat and pressure of an explosive event and release that event in a controlled manner to a process system designed to contain and convert the impulse force release into a stable energy resource for electrical generation, motive force, heat supply source, or torque.

Reaction Chamber: (Fluid and/or Gas Load to be Displaced or Heat Receiving Process)

[0262] The Reaction Chamber is a place within the Explo-Dynamics process system where the force meets load. Generally in this component, the violence of an explosion event is first met with a resisting force designed to transfer the power of the blast wave into a mechanism for energy conversion and recovery.

[0263] The Explo-Dynamics Ignition Chamber and Reaction Chamber unit/s can be conventionally configured with cooling liquid jackets or tanks. For safety and convenience, these process components can be subterraneously buried for safety and sound suppression purposes. Also pursuant to these safety and sound suppression purposes, these Explo-Dynamics chamber units can be submerged under water or another fluid medium or configured within the confines of a well point.

Pulse Converter Turbine Unit (FIG. J)

[0264] The Pulse Converter Turbine makes use of the cyclone flow principle of routing flow around the interior circumference housing in a pattern designed to transfer the force of the incoming fluid and/or gas medium into rotational energy.

[0265] The Pulse Converter Turbine apparatus is a variation of a standard turbine arrangement whereas the annular space between the impeller vanes or flites and the turbine housing is greater at the entry inlet position and gradually tapers down to a closer distance and reduction of annular space near the out point.

[0266] The turbine size, specifications, and the annular blow-by cavity can be adjusted given the needs of the process scale to be employed. Additionally, the Pulse Converter Turbine can be used as a singular device or applied in a series of separate units to gradually suppress violent flow in stages.

[0267] The rotational energy generated from the Pulse Converter Turbine can be used to propel an electrical generation unit or it can be used to transfer power to another energy consuming device or process such as a pump, prop, wheel, gear unit, etc.

Process Control System

[0268] Recent advances in high speed microprocessor based computer systems allow a number of variables to be monitored, factored, calculated, controlled, measured, and adjusted much faster and more reliably than manual systems could have ever hoped to achieve.

[0269] The Explo-Dynamics process control component will be responsive to inconsistencies in fuel, gas, system temperature, loading, etc. and will trigger system changes to accommodate for the variables that may arise and either make pre-programmed process changes or shutdown the process until it is manually overrode and adjusted to solve the detected problem or potential problem. Additionally, fuel mixture ratios will be electronically monitored and the amount of power generated can be optimized per any given fuel scenario

Charge Injection Unit (FIG. N)

[0270] Charge Injection Unit (Example 1)—is comprised by a chamber or cylinder with process controlled inlet and outlet valves and a piston apparatus being driven by a pneumatic, hydraulic, magnetic, or electronic force; whereas the piston draws a slug or charge of fuel/gas mixture from the Tornado Chamber and forcefully propels said charge into the Explo-Dynamics blast chamber for ignition.

[0271] This Charge Injection Unit arrangement is further comprised by a injection chamber tank or cylinder with process controlled inlet and outlet valves and a piston apparatus being driven by a pneumatic, hydraulic, magnetic, or electronic force; whereas the injection chamber tank draws a slug or charge of fuel/gas mixture from the Tornado Chamber and via a high pressure release air burst, forcefully propels said charge into the Explo-Dynamics blast chamber for ignition. The are three components to this process:

[0272] 1. The Vacuum Component is comprised by a vacuum pump, a vacuum chamber tank, a process control actuated inlet valve,

[0273] 2. The Pressure Component is comprised by a compressor, compressed air tank, and a process control actuated outlet valve,

[0274] 3. The Charge Injection Component is comprised by a mixed fuel injection chamber tank. a process control actuated thrust valve, a high pressure charge tank

[0275] Charge Injection Unit (Example 2)—is comprised by a process piping arrangement; whereas a blower is used to propel a quantity of airborne fuel/air/gas mixture into the Ignition Chamber or fuel mix chamber for ignition.

[0276] Charge Injection Unit (Example 3)—is comprised by a hopper which gravity feeds powder into a cylinder chamber, which is subject to the force of a piston or driving pressure blast to propel the charge into a fuel chamber and then via pressurized air/gas flow on to the Ignition Chamber for explosion.

Managing Feedstocks: The Tornado Chamber (FIG. O and N)

[0277] The unpredictable nature of dust explosions is a historical problem related to particle size. Larger particle size

concentrations are more difficult to ignite and create less energy than smaller particle suspensions. The Explo-Dynamics process contains a system component known as the Tornado Chamber. The Tornado chamber (FIG. O) essentially comprises an airtight cyclone chamber with a powered impellor to create a turbulence of dust and/or aerosol particles in an airborne air and/or gas atmosphere. The Tornado Chamber contains portals that are electronically controlled via a programmable logic controller network, which is driven by a process computer system. Through these inlet and outlet portals, dust and/or aerosol feedstocks, flammable gas, oxidizing substances, and air are mixed in the turbulence created therein. The Tornado assembly makes use of explosion-proof electronics and a variety of static dissipating devices to prevent and discharge any potential static build-up that may occur within pursuant to the swirling effect of the impellor blades and the rotation of the suspended mixtures therein. Also, the Tornado Chamber contains pressure relief components necessary to safely vent an explosion should such accidentally occur.

[0278] The Tornado Chamber makes use of advanced electronic sensory devices for measuring airborne suspensions of particles and determining the size distribution thereof. With laser diffraction sensors and infrared optical sensors taking real time measurements within and from the chamber vessel and system componentry, the process computer can count particles and measure refractance accurately enough to predict the explosive reaction of the fuel cloud atmosphere. Additional ingredients can be electronically applied to the airborne mixture to achieve the desired levels of consistency and performance.

[0279] The Tornado Chamber also makes use of advanced electronic sensory devices for measuring airborne gas concentrations of flammable gases to ascertain the volume of said gases in the mixture as well as determine the relative ignitability of these suspended gases.

[0280] When Tornado Chamber's mixture payload meets the quality standard programmed into the process system, the process system triggers the Charge Injection Unit (FIG. N) to draw off a predetermined volume of the airborne mixture and rapidly force the charge volume into the appropriate Ignition Chamber and executes the firing sequence timing queue, which fires each respective chamber at the desired time interval episode.

[0281] By making use of sensors and microprocessor-based electronics, the Explo-Dynamics process overcomes the obstacles that formerly blocked development of this unique fuel as an energy resource.

[0282] Additionally, the tornado chamber contains a variety of static electricity dissipation benefits as the cyclone effect generates a static electricity charge. The Tornado Chamber is continuously monitored for static potential fields and process modifications can be made as necessary.

Pressure Direct Drive Components

Thrust Translator

[0283] In pressure direct drive configurations, the present invention's energy generating system relies upon the exothermic reaction of the explosion itself as an agent of force. The hot expanding gases generated by the explosive event directly provide for process thrust; whereas, the pressure pulse wave of these gasses acts as the motive force.

[0284] The Thrust Translator apparatus and method (FIG. L) is basically a heavy turbine that is moved by the positive blast impulse wave velocity. Small amounts of water are fed into this turbine structure as it rotates providing a steam drive boost from the explosion flame front as it reaches the exposed portion of the turbine wheel. The turbine benefits from a flywheel effect as the rotational momentum absorbs the impulse pressure naturally as the drive to the turbine is accelerated with each successive explosion event.

[0285] The load against the Thrust Translator can be applied by a variety of means. FIG. L also demonstrate the load configured as an impeller designed to move fluids to a position of gravitation head pressure for a steady, controlled flow feed to a fluid turbine electrical generation unit. Likewise, the load could have been met with a direct generation component connection.

[0286] Again by adding small amounts of fluid to the process system of this particular embodiment, the heat energy is converted into a high volume low pressure steam resource that helps drive the system flow and counteracts negative impulse pressure forces that would normally act as a braking mechanism to the flow patterns within the system. Additionally the steam acts as a heat dissipater to keep interior temperatures in a controlled operating range. The exhaust gasses are intermingled with the steam, which acts as a scrubbing device to remove emissions impurities and the low pressure steam energy can be recovered via other components and embodiments associated with the present energy generating system invention.

[0287] As is the case with certain embodiments of the Explo-Dynamics system, a liquid cooling jacket element is applied to prevent the overheating of the explosion containment chamber and process routing components.

[0288] As with other Explo-Dynamics embodiment configurations, the Thrust Translator process is readily adaptable to provide motion to a vehicle and particularly to a watercraft; whereas, the turbine resistance load can be carried by an open propeller or as an impeller in a jet drive mode.

Pressure-Influenced Thermal Steam Conversion Applications:

The Explo-Indirect Steam Generation Method

[0289] In pressure-influenced thermal steam conversion process configurations, the present invention's energy generating system relies upon process-induced adiabatic forces and shockwave turbulence mechanisms to boost the normal explosion event temperatures and accelerate the exothermic reaction of the explosion itself. In a boiler drive configuration, the process is designed to drive repeated, super-heated thermodynamic pulse energy bursts into a specially configured boiler where reinforced tubes or pipes carrying water are heated and convert the water flow into a pressurized steam flow. (Reference FIG. P)

[0290] With inlet energy from multiple firing chambers and ample chamber insulation, the boiler firebox chamber holds the heat energy from the repetitive series pulse events. The steam heat and pressure generated in the non-contact fluid tubes is routed to a steam turbine where the energy of the steam is converted into electricity or torque for a process or for the mobility of a vehicle.

The Explo-Gasification Process Component

[0291] The enhanced direct heat output of the present invention, as well as the indirect heat and/or hot water gen-

erated from the Explo-Dynamics component cooling processes or the system's energy conversion mechanisms, is a source of energy suitable for use as a heat source for the gasification of pulverized fuels.

[0292] Again, coal is only one fuel source possibility presented in the Explo-Dynamics system's wide range of possibilities; however, it is an ignitable dust fuel resource that readily exemplifies a principle inherent to this process embodiment.

Distillation Gasification

[0293] For instance, coal gas is a gas produced by several methods, which including simple destructive distillation. Experiments with coal have shown that 10 grams of fine coal dust can be mixed with heated water and produce almost three liters of coal gas, which contains approximately 50% hydrogen, 35% methane and 8% carbon monoxide. According to "Marks' Standard Handbook for Mechanical Engineers", 10th Edition, coal gas burns at about 3,590° F. (1'977° C.) under 100% air conditions.

[0294] In the Explo-Dynamics process, as it applies to coal dust fuels, the heat and steam generated from a series of contained explosion events is used to distill a particulate slurry of pulverized coal and thus produce a coal gas mixture off-gas consisting of hydrogen, methane, carbon monoxide, and other minute gaseous substances. This gas mixture is liberated as a supplemental benefit of the technology's heat component. The particulate slurry to be distilled contains gas molecules, which are adsorbed onto the micro-particle surfaces of the particulates and the fractures therein as well as the gas that is absorbed into the particle itself. The adsorbed gas is primarily liberated in this distillation and/or gasification process and the residual slurry material is still a viable solid fuel substance; although, these processes somewhat diminish its fuel value.

[0295] The liberated gas has a gross heating value of 500 to 550 Btu/ft^3 and is both a resource to be used to accelerate and enhance the performance of the Explo-Dynamics process as well as an independent fuel resource that can be used to fire a conventional gas turbine or steam boiler to generate steam pressure for driving a steam turbine.

Steam/Heat Gasification

[0296] The Explo-Dynamics process can produce liberal amounts of heat, pressure, and steam. Collectively these force components can accommodate various methods of coal gasification such as:

[0297] 1. Fixed bed gasification whereas the crushed, pulverized coal dust is fed from the top of the reactor vessel and steam, air or oxygen is blown upwardly to produce the gasification reaction.

[0298] 2. Fluidized bed gasification whereas the crushed, pulverized coal dust is "fluidized" by the steam, air or oxygen flows, which are piped through the gasification reaction vessel.

[0299] 3. Entrained bed gasification whereas the crushed, pulverized coal dust is blown into the reacting gas stream prior to entering the gasification reaction vessel. In this manner the coal dust particles are suspended in the gas phase, and are thus filtered and recycled until a gas with a suitable heating value is produced.

Pyrolysis Gasification

[0300] In the course of preparing pulverized and powdered fuels, the Explo-Dynamics heat resources can be used to generate even still another form of combustible gas by subjecting these dusts to pyrolysis or thermal breakdown, which occurs when these powdered fuels are subjected to heat sufficiently short of the auto ignition point. The off-gas produced from this process ranges from 100-300 Btu/cubic foot and primarily is used to supplement the Explo-Dynamics process' fuel-stock reaction quality. Also, the residual processed feedstocks from these gasification processes still have significant value in and of themselves.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A method of generating energy from a series of process contained explosive reactions, wherein the energy generating system comprises one or more: ignition chamber mechanism for containing and controlling said reactions; a fuel injection mechanism; an air and/or oxidizer injection mechanism, an ignition mechanism;

an injection portal check valve mechanism; a blast outlet pressure relief mechanism; a reaction chamber mechanism; a process control system; and one or more embodiments for transforming explosion release episode into a stable output of energy, wherein said energy generating system, a series of explosion cycles are propagated and stimulated to deliver an output force of heat and pressure, which is thereby transformed into torque or thrust for the purpose of generating electricity and/or providing motive force to a vehicle or a process generally described in FIG. A.

2. The method of claim **1**, wherein the fuel source for supporting said explosive reaction comprises a concentration of ignitable nano-particles and micro-particles and/or ignitable aerosol droplets and/or combustible gas, which is mixed and suspended in a turbulent airborne fuel cloud within said energy generating system for the purpose of propagating an explosion of said fuel cloud.

3. The method of claim **1**, wherein the ignition mechanism for initiating said explosive reaction (FIG. M) comprises one or more of the following: an electrical spark; a laser pulse; a jet tube; the compression force of a piston; the compression force of an explosion shockwave; the compression force of a decreasing annular void; a converging explosion-induced air or gas jet; a chemical reaction; and/or residual heat from a previous explosion cycle.

4. The method of claim **1**, wherein the Ignition Chamber mechanism, and/or the Reaction Chamber mechanism, for containing and controlling said explosive reaction is comprised as a tubular or cylindrical metal chamber with one or more inlet and outlet portals.

5. The method of claim **1**, wherein the Ignition Chamber mechanism and/or the Reaction Chamber mechanism is comprised with one or more fixed or removable spherical, circular, or conical end cap structures for the purpose of reflecting, focusing, and intensifying said explosion shockwaves, turbulence, and adiabatic influence.

6. The method of claim **1**, wherein the Ignition Chamber mechanism, and/or the Reaction Chamber mechanism, is comprised with one or more coils of metal tube or bar placed

circumferentially inside the Ignition Chamber for the purpose of inducing additional obstacle-based turbulence to an explosion reaction contained in, or passing through, said chamber/s.

7. The method of claim **1**, wherein the Ignition Chamber mechanism, and/or the Reaction Chamber mechanism, is comprised with one or more internal annular orifice focusing rings for the purpose of inducing additional obstacle-based turbulence to an explosion reaction contained in, or passing through, said chamber/s.

8. The method of claim **1**, wherein the Ignition Chamber mechanism, and/or the Reaction Chamber mechanism, is comprised with one or more parabolic focusing walls or end cap structures whereupon the explosion's shockwave forces an adiabatic shock reflection episode to occur upon an imploding air/fuel pocket, which has been adiabatically forced into the confines of the parabolic structure and is thus overcome by the ensuing flame-front of the explosion's propagation, which influences an acceleration of the violence and turbulence of the explosion event and the amount of heat generated by the explosion episode.

9. The method of claim **1**, wherein the Ignition Chamber mechanism, and/or the Reaction Chamber mechanism, is comprised with one or more internally positioned parabolic structures, to contain, concentrate, and reflect an explosion episode's shockwave and flame-front.

10. The method of claim **1**, wherein said energy generating system and is configured into one or more embodiments based upon the application of the energy produced by said explosion event in one or more arrangements as generally described in FIG. A and are comprised by the direct heat, direct pressure, indirect heat; and/or indirect pressure mechanisms of an explosion cycle and/or combined variations of these embodiments.

11. The method of claim **10**, wherein said energy generating system is comprised in one or more embodiments, as generally described in FIGS. B-**1**, C-**1** thru C-**4**, and E, and is based upon using the direct heat energy produced by said explosion event to influence a direct heat-to-fluid reaction resulting in a littoral explosion impulse of steam pressure.

12. The method of claim **10**, wherein said energy generating system is comprised in one or more embodiments, as generally described in FIGS. B-**5** and P and is based upon using the indirect heat energy produced by said explosion event to supply thermal energy to a boiler and/or an external combustion engine and/or any other heat or heat-to-energy process.

13. The method of claim **10**, wherein said energy generating system is comprised in one or more embodiments, as generally described in FIGS. B-**2**, G-**1** thru G-**6**, H-**1** thru H-**2**, J, and L, and is based upon using the direct pressure produced by said explosion event to provide thrust to a piston and/or thrust to a turbine and/or Thrust Translator components for energy production purposes.

14. The method of claim **10**, wherein said energy generating system is comprised in one or more embodiments, as generally described in FIGS. B-**3**, B-**4**, D, F, and I, and is based upon using the indirect pressure produced when an explosion's pressure and heat discharge meets a body of fluid within the process system causing an episode of fluid displacement as the fluid is propelled away from the blast force by the pressure and generated steam pressure wave of the quench front creating a second episode of fluid displacement, which also propels fluid volume forward initially and then, as condensation ensues, a vacuum phase draws fluid from the cavitation reaction of the imploding steam bubbles and thereby recharges the fluid reservoir with the vacuum induced water hammer effect of the fluids being drawn in to fill the cavitated voids thus providing for a flow of process fluids.

15. The method of claim **1**, wherein one or more embodiments of said energy generating system utilizes the negative phase of an induced explosion episode (or post explosion vacuum phase), which draws fuel, air, and/or other explosion supporting and/or propagating substances into the Ignition and/or Reaction Chamber/s to facilitate the initiation of another explosion event cycle.

16. The method of claim **1**, wherein one or more embodiments of said Ignition Chamber mechanism and/or the Reaction Chamber mechanism is comprised with one or more injection portals, whereas an applied pneumatic or mechanical force is used to thrust and propel an airborne concentration comprising one or more substances (including dust or suspended particles, air, oxygen, oxidizing substances, gas, vapor, and/or aerosol) through a pipe, hose, valve body, portal orifice, or other passageway into said Ignition Chamber and/or Reaction Chamber.

17. The method of claim **14**, wherein one or more embodiments of said energy generating system comprises arrangements with or without pressure relief and/or check valve mechanisms (FIG. I).

18. The method of claim **1**, wherein one or more embodiments of said energy generating system comprises one or more adjustable check valve mechanisms, which are used within the system's fluid and/or gas flow processing network to obtain the desired flow pattern and to assure that maximum efficiency is maintained throughout the process operations.

19. The method of claim **1**, wherein one or more embodiments of said energy generating system's pressure relief and check valve mechanisms are comprised as being mechanically or automatically actuated via the process control system by an electrical, magnetic, pneumatic, hydraulic, or other such mechanically actuated artificial or natural means or mechanism, which will operate to vent the fluid/gas pressure and thermal release episodes at the appropriate pressure moment in each explosion cycle.

20. The method of claim **1**, wherein one or more embodiments of said energy generating system comprises one or more adjustable relief pressure valve mechanisms, which are used within the system's Ignition Chamber and/or Reaction Chamber to relieve explosion pressures and obtain the appropriate measure of backpressure resistance.

21. The method of claim **2**, whereas the fuel source comprises a pulverized coal dust (including bituminous, subbituminous, anthracite, lignite and peat grades, Powder River Basin coals, brown coal, coal slurry, hydrocarbon fines, etc.), which is suspended in an airborne cloud within said energy generating system and thus ignited into a repetitive series of explosion cycles for the purposes energy and/or motive force.

22. The method of claim **2**, whereas the fuel source comprises pulverized grain dust (including corn, wheat, soybeans, rice, seed, nuts, hulls, etc.), which is suspended in an airborne cloud within said energy generating system and thus ignited into a repetitive series of explosion cycles for the purposes energy and/or motive force.

23. The method of claim **2**, whereas the fuel source comprises a pulverized biomass or vegetative dusts (including alfalfa, coffee, cocoa, tobacco, potato, cork, peels, shells, cellulosic matter, grass, biological matter, fungi, aquatic plant

life and algae, etc.), which is suspended in an airborne cloud within said energy generating system and thus ignited into a repetitive series of explosion cycles for the purposes energy and/or motive force.

24. The method of claim **2**, whereas the fuel source comprises pulverized foodstuff dusts (including sugar, starch, flour, spices, malt, cereal, soy protein, etc.), which is suspended in an airborne cloud within said energy generating system and thus ignited into a repetitive series of explosion cycles for the purposes energy and/or motive force.

25. The method of claim **2**, whereas the fuel source comprises pulverized agricultural by-product/waste (including corncob, wheat straw, animal meal, manure, etc.), which is suspended in an airborne cloud within said energy generating system and thus ignited into a repetitive series of explosion cycles for the purposes energy and/or motive force.

26. The method of claim **2**, whereas the fuel source comprises pulverized wood and/or paper dust particles (including, sawdust, bark, pulp, leaves, mulch, etc.), which is suspended in an airborne cloud within said energy generating system and thus ignited into a repetitive series of explosion cycles for the purposes energy and/or motive force.

27. The method of claim **2**, whereas the fuel source comprises pulverized plastic dust particles (including polyethylene, polypropylene, polyurethane, polystyrene, poly vinyl chloride [PVC], epoxy, etc.), which is suspended in an airborne cloud within said energy generating system and thus ignited into a repetitive series of explosion cycles for the purposes energy and/or motive force.

28. The method of claim **2**, whereas the fuel source comprises pulverized metal particle dust (including aluminum, magnesium, zinc, boron, tin, iron, silicon, etc.), which is suspended in an airborne cloud within said energy generating system and thus ignited into a repetitive series of explosion cycles for the purposes energy and/or motive force.

29. The method of claim **2**, whereas the fuel source comprises pulverized textile fiber and/or particle dusts (including cotton, rayon, nylon, etc.), which is suspended in an airborne cloud within said energy generating system and thus ignited into a repetitive series of explosion cycles for the purposes energy and/or motive force.

30. The method of claim **2**, whereas the fuel source comprises pulverized chemical dust particles (including cellulose acetate, ethyl acetate, etc.), which is suspended in an airborne cloud within said energy generating system and thus ignited into a repetitive series of explosion cycles for the purposes energy and/or motive force.

31. The method of claim **2**, whereas the fuel source comprises pulverized non-typical mineral and/or rock dusts (including coal-shale, oil-shale, tar sands, peats, petroleum solids, petrochemical and/or oil and gas products or byproducts, etc.), which is suspended in an airborne cloud within said energy generating system and thus ignited into a repetitive series of explosion cycles for the purposes energy and/or motive force.

32. The method of claim **2**, whereas the fuel source comprises pulverized waste material particle dusts (including solid waste, municipal waste, industrial waste, hazardous waste, shock sensitive and/or explosives waste, sewage, etc.), which is suspended in an airborne cloud within said energy generating system and thus ignited into a repetitive series of explosion cycles for the purposes energy and/or motive force.

33. The method of claim **2**, whereas the fuel source comprises an airborne suspension of one or more types of ignitable particulate dusts, which are used to propagate an explosion event within said energy generating system.

34. The method of claim **2**, whereas the fuel source comprises an airborne suspension of one or more ignitable gasses, which are used to propagate an explosion event within said energy generating system.

35. The method of claim **2**, whereas the fuel source comprises an airborne suspension of one or more ignitable aerosol liquids and/or vapors, which are used to propagate an explosion event within said energy generating system.

36. The method of claim **2**, whereas the fuel source comprises a pre-heated blend of ignitable particulate solids, and/or combustible gas, and/or an aerosol or vapor of flammable or combustible atomized liquid droplets.

37. The method of claim **2**, whereas the fuel source comprises the addition of air and/or one or more solid, liquid, and/or gaseous oxidizing substances.

38. The method of claim **2**, whereas the fuel source comprises an aspect of using gasses liberated by the distillation of coal, peat, shales, wood, oil, or vegetative substances as fuel and/or fuel enhancements within a process that converts explosive thermo-dynamic force into heart, steam, and/or direct pressure for energy utilization purposes.

39. The method of claim **1**, wherein one or more embodiments of said Ignition Chamber mechanism, and/or the Reaction Chamber mechanism, is comprised with a pre-fire air and/or gas pressure load, which is applied to said chamber's interior atmosphere prior to igniting the airborne fuel-gas suspension cloud; wherein the adiabatic pressure potential of the ensuing explosion event is influenced by the addition of this step and the flame-front temperature and pressure release of the subsequent exothermic reaction is boosted by the adiabatic kinetics thus creating a greater degree of pressure and/or heat.

40. The method of claim **1**, wherein one or more embodiments of said Ignition Chamber mechanism, and/or the Reaction Chamber mechanism, comprise a system for producing steam pressure by routing the thermodynamics release of said explosive reaction into a target fluid body for the purpose of flash vaporizing said quantity of fluid into steam pressure as generally described in FIGS. B-**1**, B-**3**, C-**1**, C-**2**, C-**3**, C-**4**, D, and E.

41. The method of claim **1**, wherein one or more embodiments of said energy generating system comprises of a means to initiate a process contained explosion event series for inducing pressure wave episodes, due to the very rapid episode steam generation, which occurs when the explosive energy directly contacts a quantity of fluid and vaporizes said fluid into steam pressure; whereas said pressure wave episode is used to drive a device or working fluid for the purpose of producing torque and/or thrust for generating energy, momentum, or motive force and/or heat for an process application as generally described in FIGS. B-**4**, E, I, K, P, and Q.

42. The method of claim **1**, wherein one or more embodiments of said energy generating system comprises a means of mixing explosion exhaust emissions with steam and said exhaust/steam mixture is thereby injected into a fluid body as generally described in FIGS. B-**3**, B-**4**, D, E, I, K and Q.

43. The method of claim **1**, wherein one or more embodiments of said energy generating system comprises a means of injecting generated steam into a process system fluid reservoirs to induce a steam implosion reaction for the purpose of creating a cavitation or vacuum of fluids in said system to

generate a flow of fluids for energy recovery and/or the reduction of emissions as generally described in FIGS. B-**3**, B-**4**, D, E, I, K and Q.

44. The method of claim **1**, wherein one or more embodiments of said energy generating system comprises a means of inducing an electrical current into the process system fluid zones and/or reservoirs subject to littoral reaction and/or steam implosion influence for the purpose of effecting an improved pollutant removal mechanism; whereby solid and gaseous contaminants are transferred to the fluid medium of the process reservoir and are thus subject to treatment activities.

45. The method of claim **1**, wherein in one or more embodiments the Ignition Chamber consists of a cylinder and piston configuration for accept the direct pressure force of the explosion episode and translate said explosive force into a direct displacement force.

46. The method of claim **45**, wherein in one or more embodiments of the cylinder and piston configuration consists of a free piston arrangement as described in FIGS. G-**1** thru G-**6**; wherein the piston is driven forward by the explosion episode and releases its heat and pressure at a port position in the cylinder wall, wherein the released energy is routed to another chamber within the same cylinder and flash converts a quantity of working fluid into steam pressure, which drives another piston also connected to the first piston by a connecting rod assembly back to the original starting position, thus allowing for a complete cycle of piston movement down the cylinder by the direct pressure of the blast episode and back again due to the steam expansion factor driving the other piston in a counter force arrangement thus translating both the heat and pressure release of said explosive force into a useable mode of thrust for energy recovery purposes.

47. The method of claim **45**, wherein in one or more embodiments of the cylinder and piston configuration consists of a piston and crankshaft arrangement as described in FIGS. H-**1** thru H-**2**; wherein two separate or combined piston and crankshaft configurations are connected and joined at the heat and pressure outlet of the first ignition engine segment and the intake portal of the second steam engine segment, whereas the released energy from the first cylinder and piston arrangement is routed to the second chamber which is located either within the same engine block assembly or arranged with two adjacent and/or connected block assemblies, wherein the first cylinder operates much like a standard combustion engine within the second cylinder being thus arranged to inject a volume of fluid or steam pressure at or near the full compression position of the piston where the heat and pressure of the exhaust gas load are maximized, whereas the injected fluid flash converts into steam pressure, which provides the pressure cycle for the second piston cylinder arrangement and thus completes a cycle of translation for both the heat and pressure release of said explosive force into a useable mode of thrust for energy recovery purposes.

48. The method of claim **14**, whereas one or more embodiments of said energy generating system, comprises of a process arrangement including one or more fluid-gas separation vessels or tanks are included in the system piping network designated to receive the exhausted and expelled fluid and/or gaseous force flow of the explosion event wherein these vessels function to contain air pocket reservoir in the upper cavity of the vessel and fluid in the lower cavity volume of the vessel, thus providing a means of absorbing the shockwave of displaced fluid/gas volumes using the gas compression mechanism offered by this in-line arrangement.

49. The method of claim **1**, wherein one or more embodiments of said energy generating system's steam conversion mechanism is comprised by one or more components, which may include a filtration device to be located between the point of steam generation and a steam turbine or other such energy translation apparatus, for the purpose of removing solid particles and other contaminants from the flow of mixed steam and exhaust.

50. A system and protocol according to claim **1** herein described as the Explo-Dynamics Flash Steam Conversion Cycle and is comprised of the following steps:

a) A confined process system is configured and provided to supply and support the energy conversion process (FIG. C-**1** thru C-**4**, Component Items No: 1-12);

b) An ignitable fuel (solid, gaseous, and/or liquid or any singular or combination mixture thereof) is injected into the first stage (thermo-dynamic reaction) chamber of Flash Steam Conversion process (FIG. C-**1**, Component Items No: 4-5, Sequences: 1-3);

c) A quantity of air and/or another oxidizing substance is injected into the first stage (thermo-dynamic reaction) Ignition Chamber of the Flash Steam Conversion process (FIG. C-**1**, Component Items: 3 and/or 5, Sequence 1-3);

d) An ignition mechanism is triggered by a process control computer system to produce a spark or other ignition mechanism into the stage one chambers internal atmosphere (FIG. C-**1**, Component Item No. 6, Sequence 4);

e) The fuel cloud is ignited and an explosive reaction is initiated within the confines of the first stage (thermo-dynamic reaction) chamber of the Flash Steam Conversion process (FIG. C-**1** thru C-**2**, Component Item 1, Sequence 4-9);

f) The blast wave initiated within the confines of the first stage (thermo-dynamic reaction) chamber of the Flash Steam Conversion is stimulated by internal obstructions designed to increase turbulence (FIG. C-**1** thru C-**3**, Item 1, Sequence 4-10);

g) The shock wave initiated within the confines of the first stage (thermo-dynamic reaction) chamber of the Flash Steam Conversion process is used to simulate a piston effect by creating an imploding annular shock wave thereby compressing an air pocket ahead of the blast wave (FIG. C-**2** thru C-**3**, Component Item 1, Sequence 6-10);

h) The imploding air pocket is forced into one or more parabolic reflection structures within the reaction cylinder thus creating an adiabatically enhanced thermal output effect as the blast wave overcomes this zone of stimulation and retreats in the path of least resistance (FIG. C-**2**, Component Items 1 and 7, Sequence 6-7);

i) The intensified blast wave travels to and through a pressure relief mechanism (FIG. C-**3**, Component Item 7, Sequence 9-12);

j) The intensified blast wave travels to and through a confined fluid load zone within the system (FIG. C-**3** thru C-**4**, Component Item 8, Sequence 10-13);

k) The stimulated thermal energy pulse causes a flash conversion of the fluid load into a quantity of steam and excessive thermal forces within the ensuing blast wave dissociate a quantity of hydrogen and/or other gasses

contained within the target fluid (FIG. C-**3** thru C-**4**, Component Item 8, Sequence 10-13);

l) The steam and, dissociated hydrogen, oxygen and residual water vapor are propelled by the blast wave and are driven into and through a check valve into the second stage chamber of the Flash Steam Conversion process (FIG. C-**3** thru C-**4**, Component Items: 8, 9, and 2, Sequence 10-13);

m) The heat from the ensuing blast wave ignites the dissociated hydrogen gas and the liberated oxygen, which supports and enhances the thermal conversion of the residual fluid into additional steam pressure (FIG. C-**3** thru C-**4**, Items: 8, 9, and 2, Sequence 10-13);

n) The steam pressure generated in the Flash Steam Conversion process is discharged into a steam-to-energy mechanism for creating torque or thrust for generating electricity or motive force for the propulsion of a vehicle, watercraft, and/or process (FIG. C-**4**, Component Item 10, Sequence 13-16);

o) Once steam pressures are sufficiently relieved from the system, the next reaction sequence is initiated as multiple duplicated Explo-Dynamics process components are utilized as a sequenced means of combining the energy produced from each process unit to produce a smoother and greater delivery of energy (FIG. C-**4**, Component Items: 1-10, Sequence 13-16).

51. An apparatus according to claim **1**, whereas a certain embodiment, referred to herein as a Thrust Translator, an embodiment of which is generally described in FIG. L, is used for transforming an explosion release episode into a stable output of energy by means of direct pressure displacement, and thereby comprises a heavy turbine wheel arrangement (as noted in FIG. J) containing or receiving a small amount of fluid for steam drive boost to the rotation; whereupon the exhaust gasses and steam are expelled at a point in the rotation thus a rotation force is supplied and added to the flywheel effect established by the rotation of the turbine, which receives direct pulse explosion thrust force and thus drives an impeller, pump, or shaft to a generator unit for energy conversion of the explosive pulse episode into a rotational torque force.

52. An apparatus according to claim **1**, herein referred to as a Pulse Converter Turbine, an embodiment of which is generally described in FIG. J, whereas said apparatus may be configured in either fluid or gas operation mode and thereby is comprised a chamber with inlet and outlet orifices designed to route flows in a circumferential manner inside said chamber housing; wherein said Pulse Converter Turbine apparatus is a variation of a standard turbine arrangement; whereupon the annular space between the impeller vanes or flites and the turbine housing is greater at the entry inlet position and gradually tapers down to a closer distance and reduction of annular space near the out point thus transferring explosive displacement impulse forces of fluid-gas flow into rotational energy to turn and/or provide torque to a shaft.

53. An apparatus according to claim **1**, herein referred to as a Charge Injection Unit, an embodiment of which is generally described in FIG. N, Example 1, whereas said apparatus comprises of a chamber or cylinder with process controlled inlet and outlet valve mechanisms and a piston apparatus being driven by a pneumatic, hydraulic, magnetic, or electronic force; whereas the piston draws a slug or charge of fuel/gas mixture from the fuel mix cyclone assembly, or Tornado Chamber as referred to herein, and forcefully propels said charge into the Explo-Dynamics blast chamber for ignition.

54. An apparatus according to claim **1**, herein referred to as a Charge Injection Unit, an embodiment of which is generally described in FIG. N, Example 1, whereas said apparatus comprises of a chamber tank or cylinder with process controlled inlet and outlet valves and a piston apparatus being driven by a pneumatic, hydraulic, magnetic, or electronic force; whereas the injection chamber tank draws a slug or charge of fuel/gas mixture from the Tornado Chamber and via a high pressure release air burst, forcefully propels said charge into said energy generating system's blast chamber for ignition; whereupon there are three process sub-components to this component, which are:

(a) the Vacuum Component comprises: a vacuum pump, a vacuum chamber tank, a process control actuated inlet valve;

(b) the Pressure Component comprises: a compressor, compressed air tank, a process control actuated outlet valve; and

(c) the Charge Injection Component comprises: a mixed fuel injection chamber tank, a process control actuated thrust valve, and a high pressure charge tank.

55. An apparatus according to claim **1**, herein referred to as a Charge Injection Unit (FIG. N, Example 2) whereas said apparatus comprises of a process piping arrangement; wherein a blower is used to propel a quantity of airborne fuel/air/gas mixture into the fuel mix chamber and/or Ignition Chamber for subsequent ignition; whereas a manifold transport arrangement provides for a continuous forced air flow of fuel-laden air to the Ignition Chamber/s and a blow-by or return line leading said manifold line back to said Tornado Chamber thus constituting a closed loop network for providing a pre-mixed supply of fuel and air/oxidizer at the intake portal connection of said Ignition Chamber.

56. An apparatus according to claim **1**, herein referred to as a Charge Injection Unit, an embodiment of which is generally described in FIG. N, Example 3, whereas said apparatus comprises a piston, cylinder and hopper arrangement, which gravity feeds powder into a cylinder chamber, which is subject to the force of a piston or a driving pressure blast to propel the charge into the Ignition Chamber for fueling said explosion episode.

57. An apparatus according to claim **1**, herein referred to as a Tornado Chamber, an embodiment of which is generally described in FIG. O, whereas said apparatus comprises an airtight cyclone chamber with a powered impellor component within to create a turbulence of ignitable dust and/or aerosol particles and/or gasses within an airborne air and/or gas atmosphere; whereupon said Tornado Chamber contains portals that are electronically controlled via a programmable logic control network, which is driven by a process computer system, and through these computer process actuated inlet and outlet portals, dust and/or aerosol feedstocks, flammable gas, oxidizing substances, and/or air are mixed in the turbulence created therein and thus creates a controlled fuel mix supply for the energy generating system.

58. An apparatus according to claim **1**, herein referred to as the Explo-Indirect Steam Process, an embodiment of which is generally described in FIG. P, whereas said apparatus comprises an energy generating system in a certain embodiment; wherein an explosion event is introduced and thus drives an adiabatic implosion episode and increasing the heat and blast

violence by means of the shockwave stimulation of the blast wave; whereupon by means of a relief valve mechanism, the pressure influenced and accelerated thermal heat episode is discharged into a structurally reinforced boiler chamber containing tubes of piping filled with fluids for thermal conversion into a steam pressure supply source.

59. An apparatus according to claim **45**, wherein in one or more embodiments of the present invention comprise a free piston configuration, an embodiment of which is generally described in FIGS. G-**1** through G-**6**; wherein, the apparatus is comprised of a cylinder containing a unified connecting rod with two pistons allowing for thrust in a counter direction movement, a partition disk with a seal to allow the connecting rod to travel between the heat pressure and steam segment portion of the cylinder, portals with flow control valves to allow for fuel input, heat and pressure transfer, steam and exhaust output, and pressure differential transfer between the cylinder segment linkage conduits, as well as one or more process controlled igniter placements, a fluid injection point, portals for sensor array connections, a cylinder rod exit seal, and process controlled flow valves, and a process control system.

60. An apparatus of claim **1**, herein referred to as the Pressure/Gas Drive Configuration, an embodiment of which is generally described in FIG. K;

whereas said apparatus consists of a cylinder and chamber arrangement with a free piston floating upon a body of process contained fluid, wherein an explosive force is initiated which drives a floating piston downward against said fluid, which responds to the force applied and passes into another chamber thru a check valve mechanism; whereupon the in-coming fluids drive a gas pressure pocket into compression episode in the upper extremities of said gas separation chamber and therein a gas drive influence is created which drives the fluid from the reservoir chamber in a stabilized flow to a turbine or other mechanism for energy recovery and conversion.

61. The method of claim **14**, whereas one or more embodiments of said energy generating system consists of using the release of explosive pulse energy to propel a fluid through process system piping network up gradient to a reservoir for controlled gravitational release to drive a down gradient turbine for power generation purposes.

62. The method of claim **1**, wherein one or more embodiments of said Ignition Chamber mechanism, and/or the Reaction Chamber mechanism, for containing and controlling said explosive reaction comprises a process environment conducive to stimulating and controlling a deflagration to detonation (DDT) reaction for the purpose of magnifying the pressure and thermal output of a process contained explosion for energy production purposes.

63. The method of claim **1**, wherein one or more embodiments of said energy generating system is used as a heat production resource comprising a heat and steam generation mechanism, wherein this energy is used to distill a particulate slurry of pulverized coal and thus produce a methanol distillate and/or a coal gas mixture comprising hydrogen, methane, carbon monoxide, and other minute gaseous substances.

64. The method of claim **1**, wherein one or more embodiments of said energy generating system is used as a heat production resource comprising a heat and steam generation mechanism, wherein this energy is used to induce a distillation process upon a liquefied mixture of pulverized organic compounds thus producing a combustible gas and/or organic solvent liquid distillate.

65. The method of claim **1**, wherein one or more embodiments of said energy generating system is used as a heat and pressure production resource comprising a heat and steam generation mechanism, wherein this energy is used to provide thermal energy to support a chemical process such as a water gas shift reaction, a Fischer-Tropsch process, steam methane reforming (SMR) reaction, or another hydrocarbon reformation process for liberating gasses.

66. The method of claim **1**, wherein one or more embodiments of said energy generating system is used as a heat production resource comprising a heat and steam generation mechanism, wherein this energy is used to induce a distillation process upon a liquefied mixture of pulverized grains and/or other vegetative matter thus producing liquid distillate of ethanol and/or methanol and/or a combustible gas and/or other gaseous substances.

67. The method of claim **1**, whereas one or more embodiments of said energy generating system comprises a means of supplying heat and torque generated from excess gas and/or fluid drive pressures associated with the various fluid-gas separation components incorporated within the energy generating system; whereas said heat and/or pressure forces and/or other system surplus energies are used to pulverize and/or dry fuel stocks for powering said energy system.

68. The method of claim **1**, wherein one or more embodiments of said energy generating system is used as a means of producing torque or thrust thereby comprising the motive force necessary to drive a pump to displace and propel water or other fluid substances.

69. The method of claim **1**, wherein one or more embodiments of said energy generating system is used as a heat production resource comprising a heat and steam generation mechanism, wherein this energy resource is used to effect a thermal energy release into a heat-to-energy conversion process via one or more of the following methods: the thermionics method, the vacuum gap tube process, and/or the solid-state thermal diode process, Solid State Heat Engine (SSHE) technology, the Peltier—Seebeck thermoelectric effect, and/or Thermopile conversion.

70. The method of claim **1**, whereas one or more embodiments of said energy generating system is used to supply heat for external combustion engine cycles comprising one or more of the following cycles: Stirling, Rankine, Brayton, Ericsson, and/or Stoddard and/or any combination thereof.

71. The method of claim **1**, wherein one or more embodiments of said energy generating system is comprised an arrangement with steam pressure from one or more process units being routed into a multi-chamber steam turbine assembly to allow steam pressure impulses from multiple process reactions to flow independently and contribute to the generation of torque applied to a common shaft or motive force.

72. The method of claim **1**, wherein one or more embodiments of said energy generating system's process control mechanism is comprised by one or more components, which may include a microprocessor, programmable logic controller array, and/or computer system, which is used to support process control activities by monitoring fuel attributes, flows, inventories and thus triggering the transfer and ignition of said fuel in and through a series of multiple explosive reaction cycles whereupon the energy release is monitored and various process components are activated and deactivated according

to a pre-programmed sequence with limits of operation as well as providing for the monitoring and control of the subsequent energy conversion operations managed therein.

73. The method of claim **1**, wherein one or more embodiments of the energy generating system's process control system is comprised by one or more components, which may include a differential thermal analyzer (DTA) (and/or its functional equivalent), is used to monitor the exothermic reaction characteristics of an contained explosion event pursuant to a process for the conversion of explosive force into a usable energy resource.

74. The method of claim **1**, wherein one or more embodiments of the energy generating system's process control system is comprised by one or more components, which may include a condensation particle counter and/or a nano-particle aerosol counter (and/or their functional equivalents), are used to measure an airborne suspension of particles to be used as a fuel for a process.

75. The method of claim **1**, wherein the energy generating system's process control system is comprised by one or more components, which may include a high speed infrared pyrometer sensor and portal mount window utilizing a sapphire, quartz, or other heat and pressure resistant lens components (and/or their functional equivalents) to allow for process temperature monitoring and control.

76. The method of claim **1**, wherein the energy generating system's process control system is comprised by one or more components, which may include a high-pressure differential scanning calorimeter (HPDSC) (and/or its functional equivalent), which is used to monitor the exothermic reaction characteristics of an contained explosion event pursuant to a process for the conversion of explosive force into a usable energy resource.

77. The method of claim **1**, wherein the energy generating system's process control system is comprised by one or more components, which may include a laser photometer (and/or its functional equivalent) with real-time mass concentration measurement and data logging capability, which is used for measuring airborne fuel cloud concentrations.

78. The method of claim **1**, wherein the energy generating system's process control system is comprised by one or more components, which may include a mass flow meter (and/or its functional equivalent), which is used to monitor airborne dust composition and concentration for fuel mixtures.

79. The method of claim **1**, wherein the energy generating system's process control system is comprised by one or more components, which may include a probe emitting near-infrared radiation (and/or its functional equivalent), which monitors process atmospheres containing airborne fuel dust mixtures, whereas the infrared radiation is reflected from the dust's surface back to a silicon photodiode in the optical module thus measuring an airborne suspension of dust to be used as a fuel.

80. The method of claim **1**, wherein the energy generating system's process control system is comprised by one or more components, which may include a spectrometer (and/or its functional equivalent), which is used to determine the Aerodynamic Particle Size using high-resolution, real-time aerodynamic measurements of particle size distributions for measuring airborne fuel cloud concentrations.

81. The method of claim **1**, wherein the energy generating system's process control system is comprised by one or more components, which may include a spectrometric sensor (and/or its functional equivalent), which is used as a particle sizer to measure light-scattering intensity in the equivalent optical size range for the purposes of measuring and regulating airborne fuel cloud concentration levels.

82. The method of claim **1**, wherein the energy generating system's process control system is comprised by one or more components, which may include a thermo gravimetric analyzer (TGA) (and/or its functional equivalent), which is used to monitor the exothermic reaction characteristics of an contained explosion event pursuant to a process for the conversion of explosive force into an usable energy resource.

83. The method of claim **1**, wherein the energy generating system's control system is comprised by one or more components, which may include a laser particle counter (and/or its functional equivalent), which is used to monitor the airborne dust composition and concentration for fuel mixtures.

84. The method of claim **1**, wherein one or more embodiments of the energy generating system's process control system is comprised by one or more components, which may include a light scattering photometer (and/or its functional equivalent), which is used to monitor airborne dust composition and concentration for fuel mixtures.

85. The method of claim **1**, wherein one or more embodiments of the energy generating system's process control system is comprised by one or more components, which may include an Aerodynamic Particle Sizer spectrometer (and/or its functional equivalent), which is used to monitor airborne dust composition and concentration for fuel mixtures.

86. The method of claim **1**, wherein one or more embodiments of said Ignition Chamber mechanism, and/or the Reaction Chamber mechanism, for containing and controlling said explosive reaction is comprised with one or more piezoelectric pressure transducer sensor components (and/or its functional equivalent), to allow for process pressure monitoring and control.

87. The method of claim **14**, one or more embodiments of the energy generating system comprises a process arrangement using explosive pulse energy to propel a fluid into a closed vessel containing an air pocket in its upper extremities thereby creating a mechanism for compressing said air pocket and applying pneumatic pressure to drive a steady effluent stream of fluid out of said vessel into a turbine for power generation purposes as generally described in FIG. K.

88. The method of claim **45**, one or more embodiments of the energy generating system comprises an ignition mechanism utilizing one or more igniters, glow plugs, and compression ignition mechanisms for igniting said fuel as per the compression force of a piston or other compression device; whereas said arrangement offers the flexibility necessary to efficiently process multiple fuel states and mixture scenarios.

89. The method of claim **47**, one or more embodiments of the energy generating system comprises an improvement and allows for different lubrication reservoirs to be maintained for the separated fuel explosion cylinder and the steam explosion cylinder, which in itself further allows for different component materials to be used and different output power profiles to be maintained; wherein engine reliability, durability and power outputs can be optimized by said arrangement.

90. The method of claim **11**, one or more embodiments of the energy generating system's fluid body, which is subject to steam conversion, comprises a working fluid in a critical or supercritical fluid state or a conversion state wherein these critical working fluids are being depressurized, condensing, or otherwise in the process of being transformed into steam pressure.

91. The method of claim **1**, one or more embodiments of the energy generating system is used as a heat production resource comprising a heat and steam generation mechanism, wherein this energy is used to directly or indirectly support: fixed bed gasification, fluidized bed gasification, entrained bed gasification, pyrolysis gasification, and/or insitu gasification of coal, oil shale, tar sands, or other hydrocarbon containing substances.

92. The method of claim **1**, wherein one or more embodiments of the energy generating system is used as a heat source comprising a means of producing an enhanced thermal energy pulse for supporting a dissociation reaction for the thermolysis of water or other fluids and/or the dissociation of a gas such as hydrogen and/or methane.

93. The method of claim **1**, wherein one or more embodiments of the energy generating system is used as a heat source comprising a means of producing an enhanced thermal energy pulse for supporting direct thermal water-splitting or thermochemcial water-splitting processes.

94. The method of claim **1**, wherein one or more embodiments of the energy generating system, a method is comprised by process arrangements incorporating an aspect of fluid displacement and thereby utilizing a centrifugal water pump, or other electrically powered water pumping mechanism, and thus being configured and subjected to reverse flow conditions and therein providing a means for the motor to produce electricity instead of consuming electricity.

95. The method of claim **1**, wherein one or more embodiments of said energy generating system comprises multiple process units being collectively applied to produce a greater and more stable amount of heat and pressure forces for subsequent energy conversion purposes

96. The method of claim **1**, wherein one or more embodiments of said energy generating system is comprised with cooling mechanisms including water jacket arrangements, fluid sprays, heat exchangers, and/or radiators to provide for the continuous cooling of various process components.

97. The method of claim **43**, wherein one or more embodiments of the energy generating system's steam injection method comprises a mechanism for injecting steam and/or exhaust gasses into a pipe, conduit, chamber, or other fluid containing process system component; whereas said injection system may either consist of a outside border or circumferential port arrangement to inject steam and/or exhaust pressure into a stream of fluid from the outside border of the channel conduit, tube, pipe or other injection mechanism, or an arrangement to introduce a jet of steam and/or exhaust pressure to the inside of a moving fluid channel with channel fluid flows surrounding said injection jet assembly; wherein the purpose of these injection mechanisms is to create a flow of fluid for energy conversion and recovery purposes and/or to provide a means for treating and reducing exhaust emissions.

98. The method of claim **1**, wherein one or more embodiments of said energy generating system comprises a system operation practice of establishing and maintaining a heated process fluid reservoir temperature for the purpose of reducing the severity of the water hammer effect caused by steam implosion episodes induced within said process system reservoir associated with several embodiment variations of the present invention.

99. A system and protocol according to claim **1** herein described as the Free-Piston Engine Configuration and is generally comprised of the following steps:

(a) (in the Ignition Segment) fuel is vacuum or pressure injected into Ignition Chamber segment of said engine chamber (FIG. G-**2**, Sequence 5);
(in the Steam Segment) building steam pressure provides thrust to the steam piston propelling said steam piston toward its expansion stroke (FIGS. G-**1**, Sequences 1-4, G-**2**, Sequences 5-8, and G-**3**, Sequences 9-11);

(b) (in the Ignition Segment) the unified piston assembly compresses said fuel (FIGS. G-**2**, Sequences 6-8 and G-**3**, Sequences 9-11);
(in the Steam Segment) continuously expanding steam pressure provides thrust to the steam piston and it travels toward full expansion stroke (FIGS. G-**1**, Sequences 1-4, G-**2**, Sequences 5-8, and G-**3**, Sequences 9-11);

(c) (in the Ignition Segment) an ignition event is triggered by either the process control system acting through an ignition mechanism or by a pressure induced by steam pressure even proving thrust from the other piston front within the steam segment of said engine chamber (FIG. G-**3**, Sequence 12);
(in the Steam Segment) a release valve is process control or mechanically actuated allowing a rapid release of steam pressure and the steam driven piston reaches the full expansion position; whereas the pressures against the segment partition seal are relieved by discharging pressure into the other segment partition behind the ignition piston or by venting said pressures out of the engine and a shock absorbing/rebound mechanism relieves the residual thrust of the stroke as the piston begins the retraction process (FIG. G-**3**, Sequence 12);

(d) (in the Ignition Segment) explosively expanding gasses drive the unified piston assembly back toward the steam segment (FIGS. G-**4**, Sequences 13-16 and G-**5**, Sequences 17-20);
(in the Steam Segment) the steam pressures continues to escape the steam segment of said engine configuration and allows the depressurized steam piston to begin its retraction stroke in response to the ignition pressure exerted from the ignition segment (FIGS. G-**4**, Sequences 13-16, G-**5**, Sequences 17-20, and G-**6**, Segment 21)

(e) (in the Ignition Segment) one or more exhaust ports in the cylinder wall allow the expanding gas front to escape the Ignition Chamber segment and transfer the heat and pressure release to a linkage conduit connecting the steam segment (FIGS. G-**6**, Sequences 21-24 and G-**1**, Sequence 1);
(in the Steam Segment) as full depressurization occurs, a quantity of fluid is injected into the steam sector and the linkage conduit transmits a heated exhaust burst from the ignition segment, which is flash converted into steam pressure (FIG. G-**6**, Sequence 24);

(f) (in the Ignition Segment) the piston reaches the full expansion position in the ignition segment and a shock absorbing/rebound mechanism relieves the residual thrust of the stroke as the piston begins the retraction process and the pressures against the segment partition seal are relieved by discharging pressure into the other

segment partition behind the steam piston or by venting said pressures out of the engine; (FIGS. G-**1**, Sequence 1-2);

(in the Steam Segment) the flash converted steam pressures build an provide thrust against the steam piston driving said piston to compress the ignition segment piston into a compression stroke (FIGS. G-**1**, Sequence 1-3);

(g) (in the Ignition Segment) the ignition segment piston responds to the force exerted from the steam segment, and begins to travel toward another fuel compression stroke (FIGS. G-**1**, Sequence 2-4);

(in the Steam Segment) the building steam pressure provides thrust to the steam piston propelling said steam piston toward its expansion stroke (FIGS. G-**1**, Sequences 1-4, G-**2**, Sequences 5-8, and G-**3**, Sequences 9-11);

and thus a complete engine cycle is constituted by these steps of system and protocol, which are repeated to deliver a means of thrust for energy conversion purposes.

100. A system and protocol according to claim **1** herein described as the piston crankshaft configuration or the Explo-Steam engine embodiment and is generally comprised in the following steps:

(a) the ignition driven engine segment's piston reaches the full compression stroke of the exhaust phase and the exhaust valve releases the compressed exhaust heat gasses into the linkage manifold wherein said gasses enter the intake valve of the littoral reaction engine segment (FIG. H-**1**, Sequence 1);

(b) as the ignition driven engine segment's piston retracts, the exhaust valve closes and the intake valve opens allowing a fuel/air mixture to be drawn in said cylinder; likewise, the littoral reaction engine segment's piston begins a compression stroke against the input load of exhaust gasses (FIG. H-**1**, Sequence 2-3);

(c) as the ignition driven engine segment's piston compresses the fuel/air mixture, the littoral reaction engine segment's piston reaches a full compression stroke; whereas at or near this interval a quantity of working fluid is injected into said cylinder (FIGS. H-**1**, Sequence 3-4);

(d) as the ignition driven engine segment's piston reaches full compression stroke, the fuel/air mixture is heated to an explosion of said fuel mix; likewise, the littoral reaction engine segment's piston retracts in a full power stroke against the expanding steam pressure event (FIG. H-**2**, Sequence 5);

(e) as the ignition driven engine segment's piston retracts in a full power stroke against the expanding ignited gas pressure, the littoral reaction engine segment's exhaust valve opens as the piston begins a compression stroke against the released steam pressure event (FIG. H-**2**, Sequence 5-6);

(f) the ignition driven engine segment's piston reaches the full expansion stroke position the exhaust valve opens and the piston forces the exhaust pressures out of said cylinder into the linkage conduit manifold phase and the exhaust valve releases the compressed exhaust heat gasses into the linkage manifold; wherein the littoral reaction engine segment's exhaust valve has closed and the intake valve has opened to receive the ignition driven engine segment's gaseous exhaust discharge (FIG. H-**2**, Sequence 7-8);

and thus a complete engine cycle is constituted by these steps of system and protocol, which are repeated to deliver a means of thrust for energy conversion purposes.

101. The use of airborne particle clouds or dust suspensions as a fuel source for propagating an explosion event series wherein the explosive force is contained and transformed within a process system into a useable energy resource; whereas said dust suspensions are comprised of one or more types of organic and/or inorganic particulate fuel resource categories including:

a) coal dusts (including bituminous, sub-bituminous, anthracite, lignite and peat grades, Powder River Basin coals, brown coal, coal slurry, hydrocarbon fines, etc.);

b) grain dusts (including corn, wheat, soybeans, rice, seed, nuts, hulls, etc.);

c) biomass or vegetative dusts (including alfalfa, coffee, cocoa, tobacco, potato, cork, peels, shells, cellulosic matter, grass, biological matter, fungi, aquatic plant life and algae, etc.);

d) foodstuff dusts (including sugar, starch, flour, spices, malt, cereal, soy protein, etc.);

e) agricultural by-product/waste dusts (including corncob, wheat straw, animal meal, manure, etc.);

f) wood and/or paper particle dusts (including, sawdust, bark, pulp, leaves, mulch, etc.);

g) plastic particle dusts (including polyethylene, polypropylene, polyurethane, polystyrene, poly vinyl chloride [PVC], epoxy, etc.);

h) metal particle dusts (including aluminum, magnesium, zinc, boron, tin, iron, silicon, etc.);

i) textile fiber and/or particle dusts (including cotton, rayon, nylon, etc.);

j) chemical particle dusts (including cellulose acetate, ethyl acetate, etc.);

k) non-typical mineral and/or rock dusts (including coal-shale, oil-shale, tar sands, peats, petroleum solids, petrochemical and/or oil and gas products or byproducts, etc.); and

l) waste material particle dusts (including solid waste, municipal waste, industrial waste, hazardous waste, shock sensitive and/or explosives waste, sewage, etc.)

102. A means of using airborne particle clouds or dust suspensions as a fuel source for propagating an explosion event series wherein the explosive force is contained and transformed within a process system into a useable energy resource; whereas said dust suspensions are comprised of one or more types of organic and/or inorganic particulate fuel resource categories including:

a) coal dusts (including bituminous, sub-bituminous, anthracite, lignite and peat grades, Powder River Basin coals, brown coal, coal slurry, hydrocarbon fines, etc.);

b) grain dusts (including corn, wheat, soybeans, rice, seed, nuts, hulls, etc.);

c) biomass or vegetative dusts (including alfalfa, coffee, cocoa, tobacco, potato, cork, peels, shells, cellulosic matter, grass, biological matter, fungi, aquatic plant life and algae, etc.);

d) foodstuff dusts (including sugar, starch, flour, spices, malt, cereal, soy protein, etc.);

e) agricultural by-product/waste dusts (including corncob, wheat straw, animal meal, manure, etc.);
f) wood and/or paper particle dusts (including, sawdust, bark, pulp, leaves, mulch, etc.);
g) plastic particle dusts (including polyethylene, polypropylene, polyurethane, polystyrene, poly vinyl chloride [PVC], epoxy, etc.);
h) metal particle dusts (including aluminum, magnesium, zinc, boron, tin, iron, silicon, etc.);
i) textile fiber and/or particle dusts (including cotton, rayon, nylon, etc.);
j) chemical particle dusts (including cellulose acetate, ethyl acetate, etc.);
k) non-typical mineral and/or rock dusts (including coal-shale, oil-shale, tar sands, peats, petroleum solids, petrochemical and/or oil and gas products or byproducts, etc.); and
l) waste material particle dusts (including solid waste, municipal waste, industrial waste, hazardous waste, shock sensitive and/or explosives waste, sewage, etc.)

103. A method of using airborne particle clouds or dust suspensions as a fuel source, wherein the improvement comprises propagating an explosion event series whereupon the explosive force is contained, controlled, thermally stimulated and enhanced, and thereby transformed within said energy generating system's process into a useable energy; whereas said dust suspensions are comprised of one or more types of organic and/or inorganic particulate fuel resource categories including a few representative examples of each:

a) coal dusts (including bituminous, sub-bituminous, anthracite, lignite and peat grades, Powder River Basin coals, brown coal, coal slurry, hydrocarbon fines, etc.);
b) grain dusts (including corn, wheat, soybeans, rice, seed, nuts, hulls, etc.);
c) biomass or vegetative dusts (including alfalfa, coffee, cocoa, tobacco, potato, cork, peels, shells, cellulosic matter, grass, biological matter, fungi, aquatic plant life and algae, etc.);
d) foodstuff dusts (including sugar, starch, flour, spices, malt, cereal, soy protein, etc.);
e) agricultural by-product/waste dusts (including corncob, wheat straw, animal meal, manure, etc.);
f) wood and/or paper particle dusts (including, sawdust, bark, pulp, leaves, mulch, etc.);
g) plastic particle dusts (including polyethylene, polypropylene, polyurethane, polystyrene, poly vinyl chloride [PVC], epoxy, etc.);
h) metal particle dusts (including aluminum, magnesium, zinc, boron, tin, iron, silicon, etc.);
i) textile fiber and/or particle dusts (including cotton, rayon, nylon, etc.);
j) chemical particle dusts (including cellulose acetate, ethyl acetate, etc.);
k) non-typical mineral and/or rock dusts (including coal-shale, oil-shale, tar sands, peats, petroleum solids, petrochemical and/or oil and gas products or byproducts, etc.); and
l) waste material particle dusts (including solid waste, municipal waste, industrial waste, hazardous waste, shock sensitive and/or explosives waste, sewage, etc.)

In view of the preferred embodiments described above, it should be apparent to those skilled in the art that the present invention may be embodied in forms other than those specifically described herein without departing from the spirit or central characteristics of the invention. Thus, the specific embodiments described herein are to be considered as illustrative and by no means restrictive.

The above description is that of a preferred embodiment of the invention. Multiple modifications and variations are possible in light of the above teachings. It is therefore to be understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically described. Any reference to claim elements in the singular, e.g. using the articles "a," "an," "the," or "said" is not construed as limiting the element to the singular.

Further, it is to be understood that the present invention is not limited to the embodiments described above, but encompasses any and all embodiments within the scope of the preceding claims. None of the above inventions and patents, taken either singly or in combination, is seen to describe the instant invention as claimed.

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