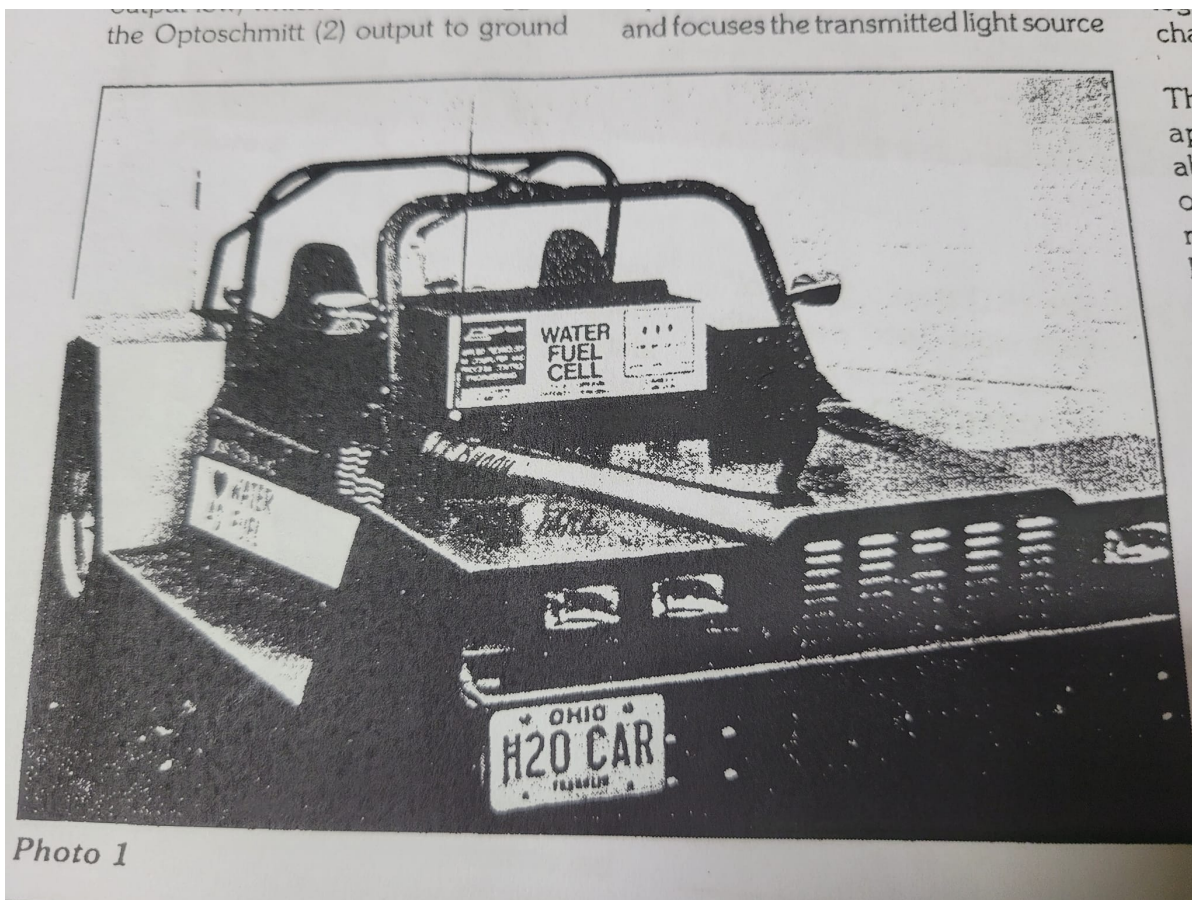


# ENERGY of the FUTURE - R&Z - Vol 2 No. 3, 1991

## ENERGY of the FUTURE

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### WFC Hydrogen Gas Management System - Part I

The WFC Hydrogen Gas Management System encompasses many processing patents into a full system-engineering approach to help give a viable answer to the energy problem...by using "Water" as a new Fuel-Source.

The WFC Hydrogen Gas Management (GMS) System not only economically produces "Hydrogen-Fuel" on demand from water but, also, renders Hydrogen-Fuel safer than natural gas allowing existing cars, trucks, or even jets to run on or be powered by Water.

The WFC Hydrogen Gas management (GMS) System is systematically activated and performed in the following way as a retrofit energy-system...defining "Mode of Operability"...on how to use "Water" Fuel.

Related Patents: 4,265,224, 1,213,671, 4,465,455, 4,798,661, 4,826,581, 4,613,304, 1,235,669, 4,275,950 , 1,234,774, 3,970,070 , 1,234,773

## WFC Hydrogen Gas Management (GMS) System

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## Illustrations

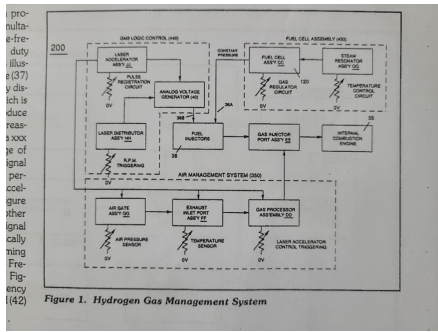


Figure 1. Hydrogen Gas Management System

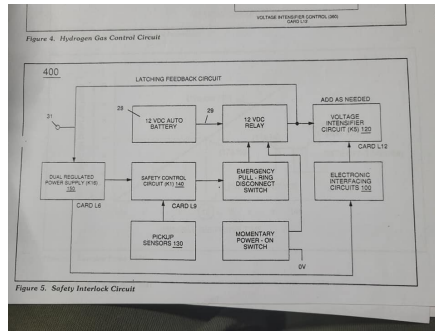


Figure 5. Safety Interlock Circuit

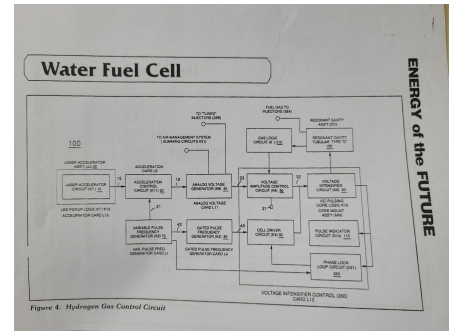


Figure 4. Hydrogen Gas Control Circuit

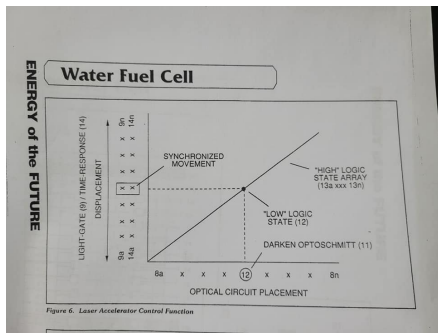


Figure 6. Laser Accelerator Control Function

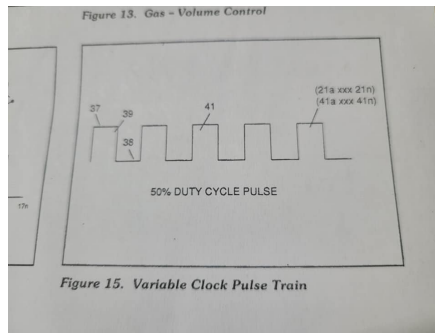


Figure 15. Variable Clock Pulse Train

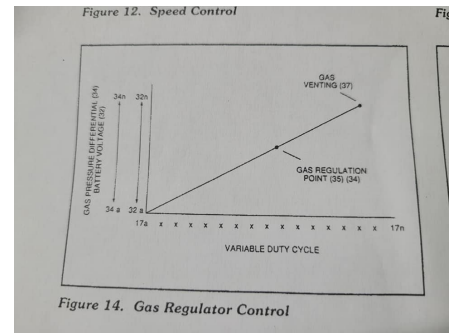


Figure 14. Gas Regulator Control

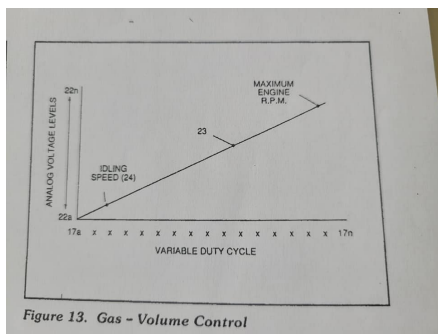


Figure 13. Gas - Volume Control

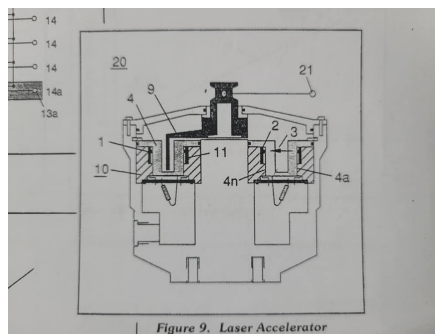
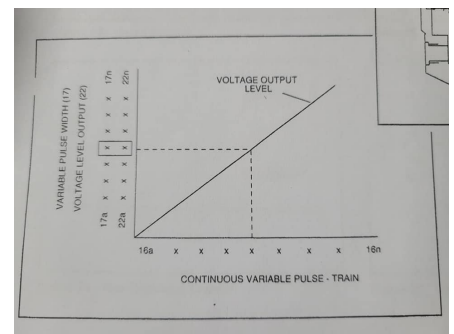
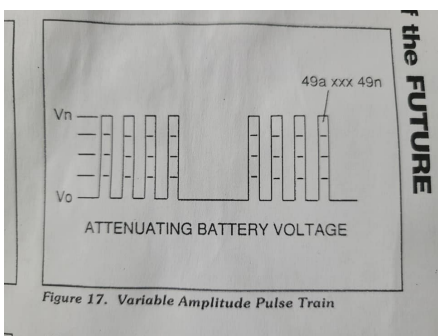
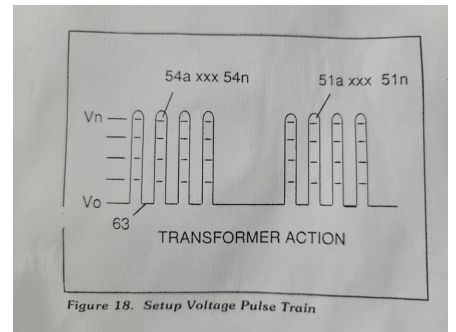
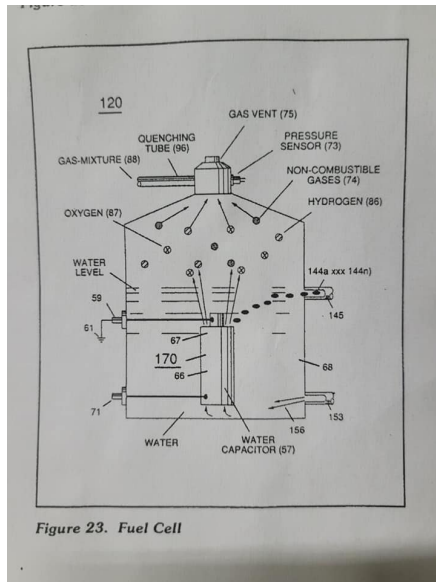
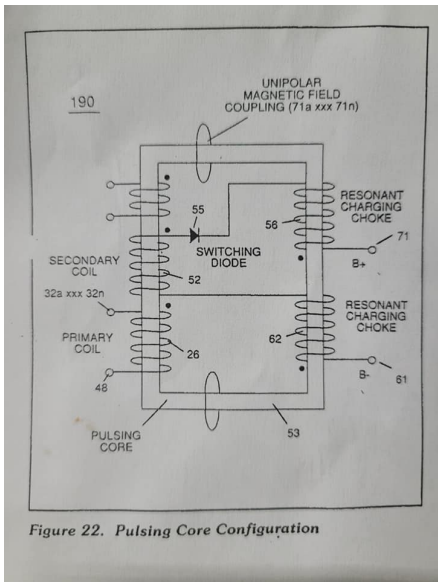
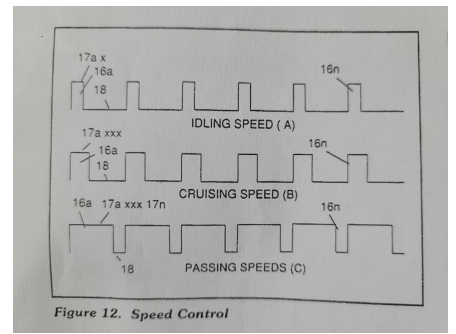
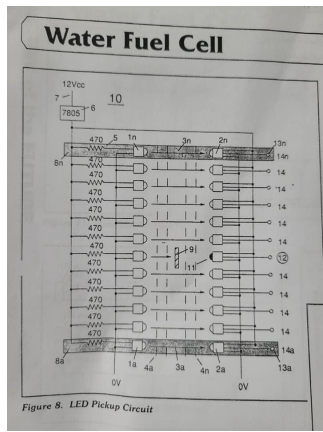
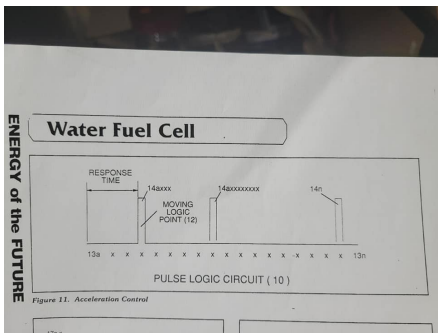


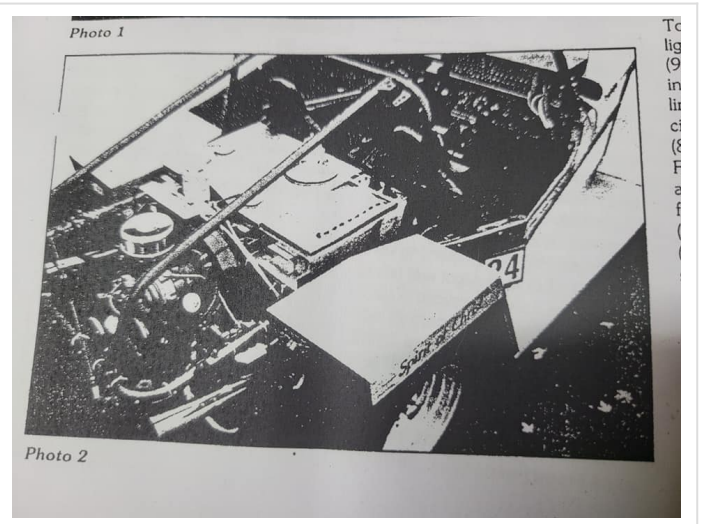
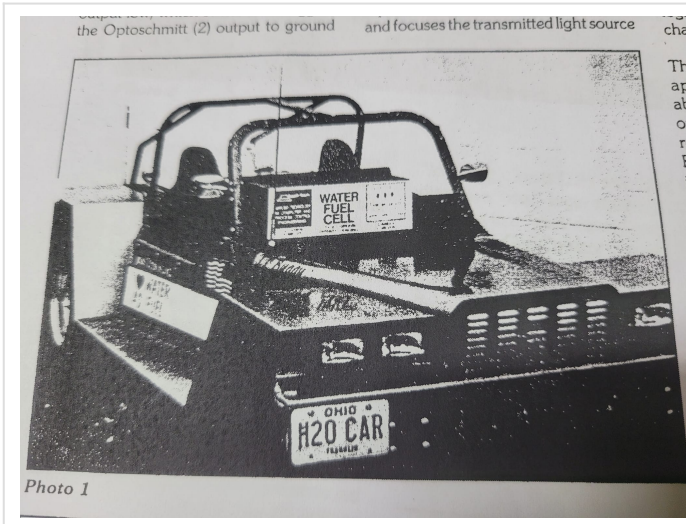
Figure 9. Laser Accelerator





Water Fuel Cell

(4) which is a component part of Laser Accelerator Assembly (20) of Figure (9) uses a GaAs infrared emitting diode (of figure (8) to trigger a SDP8611 Optoschmitt light receiver (2) of Figure (5) from quiescent state (output logic high. B-) (13) to on-state (the minimum irradiance that will switch the output low) which switches or triggers the Optoschmitt (2) output to ground state (zero (12). The peak wave-length (3) of Figure (8) being transmitted from the infrared emitting diode (ed) (1) to the Optoschmitt receiver (2) is typically (935 nm) and allows the Optoschmitt (2) clock frequency (the speed by which the Optoschmitt changes logic state) to be (100 khz). Optical lens (4) of Figure (9) redirects and focuses the transmitted light source



(3) of Figure (8) (traveling infrared light waves) to the Optoschmitt (2) by passing the light source through a series of concentric lenses (40 xxx 4n) of Figure (9) which become progressively smaller from the outer peripheral lens surface (4a) to the inner lens surface (4n). The spatially concentric lenses (4a xox 4n) of Figure (9) causes the beam angle of the light source to trigger the Optoschmitt (2) beyond the minimum irradiance that is needed to switch the Optoschmitt from quiescent state (high logic state/B+) to on-state (output changing to zero volts).

The Derate linearly of light intensity is approximately 125mW/degree C above 25 degree C at a spatial distance of 500 inches between the two infrared devices (1X2) of Figure (8) as to Figure (9). Transmitted light source (3) is turned-on when an electrical power source of 5 volts is applied to the led (1) through dropping resistor (5) by way of voltage regulator (6) connected to the car electrical system (7). Together, the matched infrared devices (1X2) with optical lens (4) forms optical circuit (8) of Figure (8). Grouping additional optical circuits (8a xxx 8n) in an in-line or linear arrangement, now, forms Led Pickup Circuit (10) of Figure (8), as shown in Figure assembly (20) of Figure (9).

To perform a switch-logic function, light-gate (9) of Figure (8) as to Figure (9) is inserted between the matched infrared devices (1X2) and moved in a linear displacement from one optical circuit (8x) to another optical circuit (8xx), as illustrated in Figure (8)(9) as to Figure (6). Once light-gate (9) blocks and prevents traveling light-bear (3) from reaching the matched Optoschmitt (8xx), the darkened Optoschmitt (11) (non-energized) changes output state since the irradiance energy level (3) is reduced to, or below the release point...triggering opposite logic state (12). As light-gate (9) advances to the next optical circuit (8xxx) a new and separate low-state logic function (12) occurs while the previous optical circuit (8xx) reverts back to high-state logic (13). Advancing light-gate

(9) still further performs the same opposite (alternate) logic-state switching in a sequential manner until the advancing light-gate (9) reaches the last optical circuit (8) Reversing the movement of light gate (9) performs the same high to low logic witch function but in reverse sequential order. Reversing the direction of the light gate (?) once again reinstates the original sequential switching order, as illustrated in Figure (6) and Figure

Longevity and reliability of component life is typically 100,000 hours since led pickup circuit (10) of figure (8) utilizes no mechanical contacts to perform the sequential logic switch function. Light gate (9) integrated with led pickup circuit (10) make up Laser Accelerator assembly (20), as shown in Figure (9) Light-gate (9) of Figure (9) is mechanically linked to the car acceleration pedal by way of cabling hookup (22)

Opposite placement of the matched infrared devices (1)(2) prevents bogus or false triggering of "low" logic state (12) during light-gate displacement (9a xxx 9n) of Figure (6)(7) and (8). If light emitting diodes (led) (1a xxxx 1n) of figure (8) are electrically disconnected from DC power supply (6), then Led Pickup Circuit (10) outputs are switched to "low" logic state (12a xxxx 12n) which disallows "low" logic state signal (12), resulting in a "shut-down" condition to Hydrogen Gas Control Circuit (200) of Figure (1) Disconnection of power supply (6) to Optoschmitt array (2a ox 2n) of Figure (8) results in a similar "shut down" condition to control cir cult (200), as further shown in Figure (1). This "shut-down" or "Switch-off" condition helps provide a fail-safe operable Fuel Cell (120) of Figure (19) by negating acceleration beyond driver's control.

## Acceleration Control Circuit (30)

Moving light gate (9) of figure (8) in direct relationship to the physical placement of optical circuits (8a xxx 8n), sets up a time variable (14a xxx 14n) of Figure (6) from optical circuits (8x) to another optical circuit (8xxx) and/or (8xxxx) or to (8n) since the triggered low logic state (12) of Figure (6) and (7) moves in direct relationship to the displaced light-gate (9), as illustrated in Figure (11). Deflecting (moving) the light-gate (9) to position (8n) takes longer in response-time (14) than deflecting the light-gate to position (8x) and/or (8xx) or (8xxxx). This variable response-time (14axx...12...xx14n) or signal output (15) is now electrically transmitted to Acceleration Control Circuit (30) of Figure 4 since Laser Accelerator Assembly (20) of figure (9) converts mechanical displacement (9a xx 9n) to electrical time-response (14a xxx 14n) of Figure (6) by linearly moving (forward and/or reverse direction) "low" logic state signal (12) in an array of "high" logic state output signals (13a xxx 13n), as further illustrated in Figure (7) and Figure (11). In some case reverse signal-logic (12axxx...13...xx12n) is applicable by using SDP8601 Optoschmitt which switches logic state from Quiescent static (low" to "high" logic state when de-energized.

Since Led Pickup Circuit (10) of Figure (8) operates up to 100 Khz range or above, electrical sensitivity of Opto-circuit (8) provides an instantaneous response to Driver's acceleration, de-acceleration, or cruise control demands.

As signal output (15) of figure (4) (14 xxxx1214n) is being received by acceleration control circuit (30) of Figure (4) as to Figure (11), circuit (30) converts incoming timeresponse signal (140 x 12 x140) into a vari able time-base unipolar pulse (16), as shown in Figure (7) Circuit (30) electronically and automatically scans out put signal-array (14axxx 12 xx14) (15) until circuit (30)

locates, momentarily registers, and translates response-time (14a oxx... 12) into a variable unipolar pulse (17/18) of Figure (7) The sweeping action of the scanning circuit (30) always starts from position (9a) and moves point (8ax) to point (8axxx) of Figure (8)(11) until logic-point (12) is detected. Once logic signal (12) is detected, the sweeping action toggles and recycles back to start position (9a). This toggling (flip back) action electronically determines variable time-response (14a xxx) regardless of wherever logic point (12) is being momentarily displaced within circuit array (13a xxx 13n). Toggling action at full-scale deflection (13a xxx 13n) occurs in the range of (10) Khz or above and thus, allows instant response to Driver's acceleration demands.

Toggling-time (scanning-time) is directly synchronized to light-gate (9) displacement which, in turn, circuit (30) further sets up and establishes a given pulse shape (16) of Figure (7). Circuit (30) continues to increase pulse width (170) of Figure (7) as the monitored (detected by scanning) toggling-time (14a xxxxx.12) Increases when toggle-point (12) moves farther away from start-position (9a) to stop-position (9n), as further shown in Figure 12 as to Figure (11). Pulse width (17a xxx 17n) diminishes when logic-point (12) reverses direction to start position (9a). Finally, circuit (30) reproduces the variable controlled tube-shape (16) in a continuous repetitive manner (16a xxx 16n) of Figure (12) and electrically transmits the resultant pulse-train signal (19) to Analog Voltage Circuit (40), as shown in Figure (4).

In retrospect to engine performance (gas pedal attenuation) (21) of Figure 19), a wider pulse width (17a xxx) of Figure (120) increases (accelerates) engine R.P.M.; whereas, smaller pulse-width (17ax) reduces (decelerates) engine R.P.M. Cruising speed (128) of Figure (12) is simply accomplished when pulse width remains constant

Incoming clock pulse (21a xxx 21n) of Figure (15) originating from Pulse Frequency Generator (70) of Figure (4) sets up the scan rate (toggling) by which signal input (15) of Figure (4) is electronically scanned by circuit (30). The resultant clock pulse (21) of Figure (15) as to Figure (4) is always adjusted to exceed driver's response time to allow for instant acceleration control

## Analog Voltage Generator (40)

The generated digital signal (19) being electrically transmitted from accelerated control circuit (30) of Figure (4) is, now, electronically detected, translated, and converted into an analog voltage signal (22) which is continuously proportionate to Input signal (19) by analog voltage Generator Circuit (40) of Figure (4). The newly formed analog signal (22) of Figure (13) is a voltage level signal that varies continuously in both time and amplitude to produce a voltage level which is directly proportional to the physical change in pulse train (16a xxx 16n) of Figure (12). As pulse width (17ax) of signal (19) changes so does analog voltage level output (23) of Figure (13). Widening pulse width to stop-position (17a xxx 17n) of Figure (12) causes analog signal (22) to increase to higher voltage levels; whereas, analog voltage level (22) drops (becomes lower in value) in voltage level when pulse width decreases to start-position (17a). The resultant and varied voltage level (22a xx) varies smoothly over a continuous range of voltage values (22a xxx 22n) rather than in discrete steps, as illustrated in linear graph (23) of Figure (13).

In terms of functionality and purpose, analog circuit (40) of Figure (4) provides a variable (controlled) voltage output (23) in direct relationship to light-gate (9) displacement which, in turn,

sets up and controls Resonant Action (160) of Figure (22) that produces Fuel Gases on demand. Analog circuit (40) also calibrates both engine response). Idling speed (22ax) and maximum engine R.P.M. (22a xxx 22n) by adjusting and maintaining a predetermined or given low (24) and high voltage levels respectively, as further illustrated In Figure (13). Voltage valves or levels (22a xxx 22n) simply controls the applied voltage potential across Resonant Cavity Assembly (120) of Figure (21) through voltage amplitude control circuit (50) of Figure (4) which is electrically linked to primary coil (26) of Figure (20) of Voltage Intensifier Circuit (60) of Figure (4).

## Voltage Amplitude Control Circuit (50)

Voltage amplitude control circuit (50) of Figure performs several functions simultaneously. First, regulates car battery electrical voltage potential (32) of Figure (14) being applied to primary coil (26) of Figure (20), and secondly, regulates gas pressure of Fuel Cell(120) of Figure (21), as graphically depicted in Figure (14). Each regulatory stage(27) and (28) works separately and independent of each other but are electronically linked or coupled together to produce a common analog signal (32) having a predetermined voltage level (32a xx), as further shown in Figure (14)

Regulator stage (27) of circuit (50) converts battery voltage potential (29) of Figure (5) via electrical terminal (31) of Figure (4) as to Figure (5) Into an analog voltage signal (32) of Figure (14) which corresponds to but is electrically isolated (crossover voltage from two separate power supplies) from incoming gas volume signal (23) of Figure (13), as shown in Figure (4). Variable voltage range (32a xxx 32n) from one (1) up to twelve (12) volts (regulating battery voltage) is applied across primary coil (26) of Voltage Intensifier Circuit (60) of Figure (20). Second regulator stage (28) simply acts and function as a gas regulator (33) by preventing Fuel Gas production beyond a predetermined gas pressure level (34) of Figure (14) during Fuel Cell operations and, as such, maintains constant gas pressure to Fuel Injectors (36) of Figure ( ) regardless of engine performance (R.P.M.

If for example, Fuel Gas production is greater than demand, then, analog signal (32) is reduced to proper voltage level (35) (voltage level directly determines gas pressure via Resonant Action) required to maintain gas pressure (34). Conversely, analog signal (32) is always allowed to exceed voltage level (35) during injection (36) of Figure ( ) until gas-point (34) is reached. In cases where linear voltage (32) drops (descending value) below gaspoint (35) then gas regulator stage (28) Increases voltage amplitude (32a xxx 32n) (analog voltage) to voltage point (35). If gas pressure (34a xx) should exceed gas point (35) during injector offtime, gas pressure release valve (75) of Figure (23) (gas venting 37 of Figure 14) expels Fuel gases (88) until gas point (34) is either reached or a delay timing circuit activates Safety Control Circuit (14) of Figure (5) which, in ham, switches off or disconnects applied electrical power (28) to Fuel Cell electrical system (400) of Figure (5)

Gas logic circuit (310) of Figure (4) supplies logic function to Voltage amplitude control circuit (50) to maintain proper gas pressure to gas injector (36) of Figure ( ) by electronically monitoring achieved gas pressure via pressure sensor (73) of Figure (23) In terms of operability, Laser Accelerator Assembly (20) of Figure (4) is, now, attenuating battery voltage potential (32a xxx 32n) which is electrically connected to voltage Intensifier Circuit (60) of Figure (4).

## Variable Pulse Frequency Generator (70)

Circuit (70) of Figure (4) is a multi pulse-frequency generator which produces several clock pulses (simultaneously) having different pulse-frequency but maintaining a 50% duty cycle pulse (39) configuration, as illustrated in Figure (15). Pulse on-time (37) and pulse off-time (38) are equally displaced to form duty pulse (39) which is duplicated in succession to produce pulse train (41) of Figure (15). Increasing the number of duty pulses (39a xxxx 39n) up to pulse frequency range of 10Khz or above now forms clock signal (21) of Figure (4) which, in turn, performs the scanning function of Acceleration Control Circuit (30) of Figure (4) Circuit (70) also produces another Independent and separate clock signal (41a xxx 41n) which is electrically transmitted to and become incoming clock signal (42) for Gated Pulse Frequency Generator Circuit (80) of Figure (4). In both cases, pulse frequency range of each clock signal (21) and (42) can be altered or changed (controlled Independent of each other) to obtain peak performance of Fuel Cell System (100) of Figure (4).

## Gated Pulse Frequency Generator (80)

Gated Pulse Circuit (80) of Figure (4) switches "off" and "on" sections of Incoming clock signal (42) to form gated pulse (45) which is, in turn, duplicated in succession to produce gated pulse train (46a xxx 46n) of Figure (16). Together pulse train (44a xxxx 44n) and pulse off-time (43) forms gated pulse duty cycle (45). Pulse train (44a xxx 44n) is exactly the same as pulse train (41a xxxx 41n) and its established pulse frequency (number of pulse cycles per unit of time) changes uniformly when pulse generator (70) of Figure (4) is calibrated and adjusted for system operations.

Newly formed gated duty pulse (45) is proportional to the physical change in pulse train (44 xxx 44n) when circuit (80) is adjusted for calibration purposes. Pulse train (440 xxx 44n) becomes wider while pulse off-time width (43) becomes smaller, simultaneously Conversely, opposite pulse shaping occurs when circuit (80) of Figure (4) is calibrated in reverse order.

## Cell Driver Circuit (90)

In either case, the resultant or varied pulse train (47a xxx 47n) (calibration of 448 xxx 44n) becomes incoming gated pulse signal (48) of Figure (4) to cell driver circuit (90) of Figure (4) which performs a switching function by switching "off" and "on" electric ground being applied to opposite side (48) of primary coil (26) of Figure (18). The resultant pulse wave form (49a xxxx. 49n) of Figure (17) superimposed onto primary coil (26) is exact duplicate of proportional pulse train (47a xxxx 47n). However, each pulse train (47) (49) are electrically isolated from each other. Only voltage cross-over from regulated power supply (150) of Figure (5) to battery supply (28) occurs, as illustrated in Figure (5).

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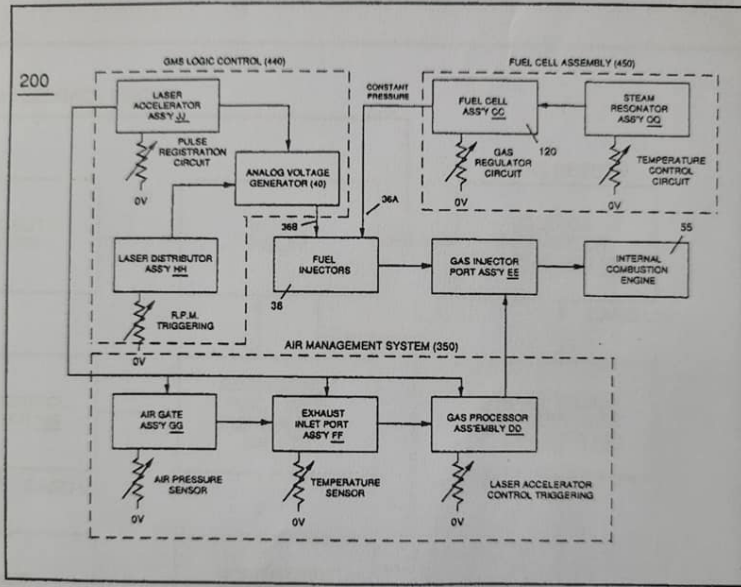


Figure 1. Hydrogen Gas Management System

Revision #6

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