United States Patent [19]

Geres

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[54] **CALCIUM HYDRIDE GAS GENERATOR**

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[52] **U.S. Cl.** **23/282**, 48/31, 48/37, 423/657

[51] **Int. Cl.** **B01j 7/02**, C10h 5/00

[58] **Field of Search** 23/282; 423/657; 48/31, 37

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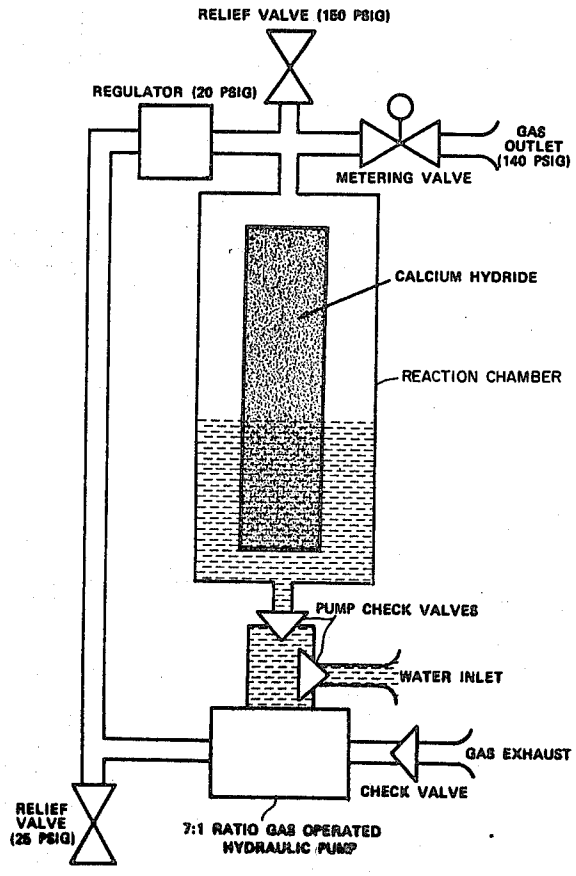
Primary Examiner—Barry S. Richman

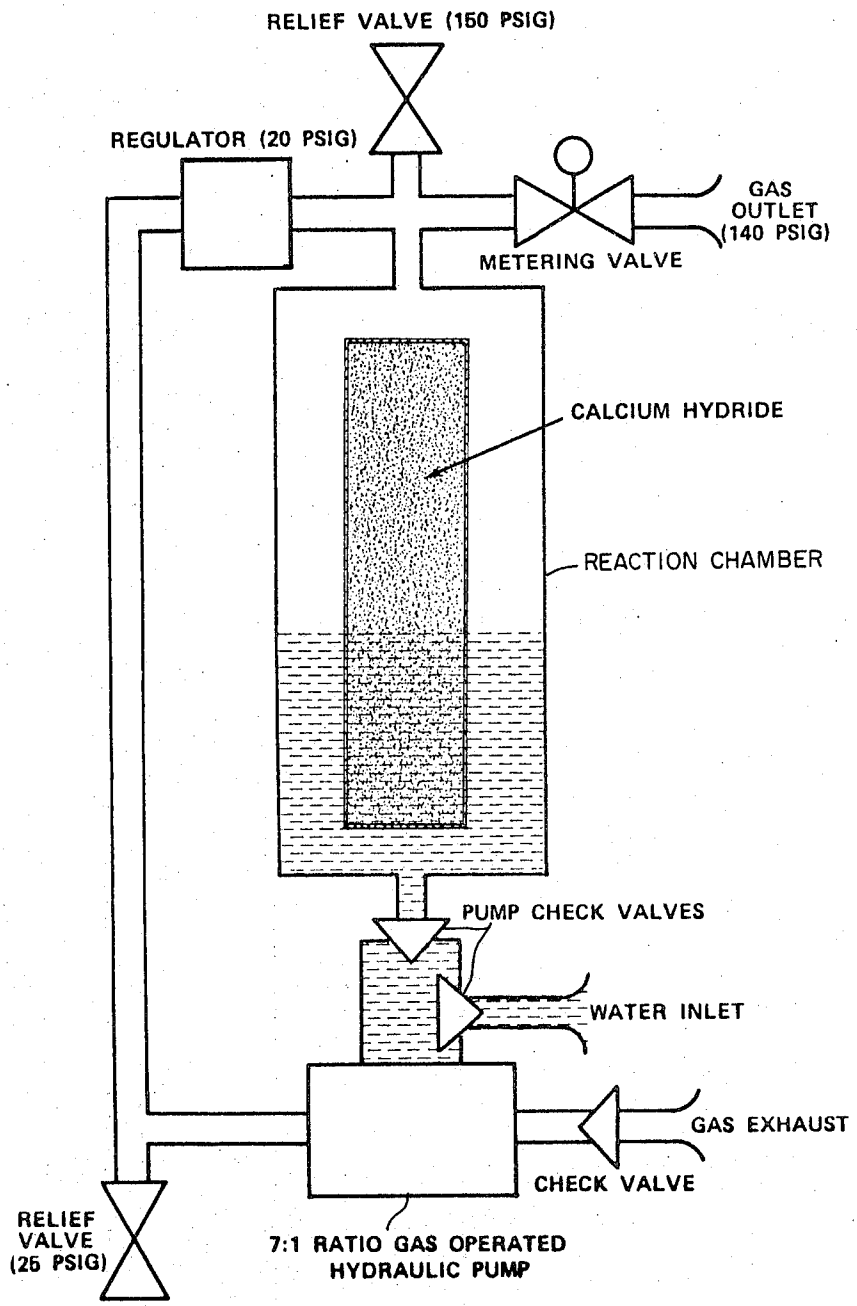
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[57] **ABSTRACT**

A differential area gas operated hydraulic pump used in a bootstrap mode to pump water into a reaction chamber. Water is pumped into the reaction chamber until the level reaches a quantity of calcium hydride (Cah_2) and reacts to produce just enough gas to exceed the operating pressure, whereupon the pump will stall. No further hydrolysis takes place until the chamber pressure is relieved at which time the pump again operates to raise the water level into contact with unreacted CaH_2.

5 Claims, 1 Drawing Figure




RELIEF VALVE (150 PSIG)
REGULATOR (20 PSIG)
GAS OUTLET (140 PSIG)
METERING VALVE
CALCIUM HYDRIDE
REACTION CHAMBER
PUMP CHECK VALVES
WATER INLET
GAS EXHAUST
CHECK VALVE
RELIEF VALVE (25 PSIG)
7:1 RATIO GAS OPERATED HYDRAULIC PUMP

CALCIUM HYDRIDE GAS GENERATOR

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention pertains to demand mode underwater reactant hydride gas generators.

2. Description of the Prior Art

In the past, gas generators have been designed which provide for pressure equalization during descent of the gas generator. However, these gas generators do not produce a pressure differential over ambient which is of course necessary for performing work at a given depth. The present invention produces a pressure differential over ambient.

Also the present invention provides for refueling through the use of loaded cartridges of CaH_2. These cartridges are easily inserted into and removed from the reaction chamber of the present invention. Prior art devices do not provide such ease in refueling.

SUMMARY OF THE INVENTION

The invention comprises a demand mode underwater CaH_2 gas generator in which a differential area gas operated hydraulic pump is used in a bootstrap or self-supporting mode to pump water into a reaction chamber. Water is pumped into the reaction chamber until the water level reaches the CaH_2 and reacts to produce enough gas just to exceed the operating pressure, whereupon the pump will stall. No further hydrolysis takes place until the chamber pressure is relieved and the pump again operates to raise the water level into contact with unreacted CaH_2. The cycle is thus repeated as gas is used from the generator. About 50 feet of depth pressure is required to start the generator.

BRIEF DESCRIPTION OF THE DRAWING

The drawing shows the invention in schematic form.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A differential area gas operated hydraulic pump is used in a bootstrap or self-supporting mode to pump water into the reaction chamber. Water is pumped into the reactor chamber until the level reaches the CaH_2 and reacts to produce enough gas to just exceed the operating pressure, whereupon the pump will stall. No further hydrolysis takes place until the chamber pressure is relieved and the pump again operates to raise the water level into contact with unreacted CaH_2. The cycle is thus repeated as gas is used from the generator. Operation of the generator would be completely demand and automatic. About 50 feet of depth pressure is required to start the generator. For operation at shallower depths the unit could be prepressurized.

The granular CaH_2 is contained in a cylindrical cartridge which consists of an outer wrap of stainless steel screen and an inner liner of fiberglass cloth. The diameter of the cartridges is limited to about 2 inches to insure that all of the CaH_2 will be reacted. A generator could therefore have several cartridges in the reactor chamber. In general the number of cartridges is a function of the gas generation rate, and the length of the cartridges a function of the total volume of gas required.

Refueling the generator is accomplished by simply replacing the individual CaH_2 cartridges. Loaded cartridges are stored in sealed containers and reloading performed in a relatively dry atmosphere. Also, the cartridges can be sealed so that refueling could be performed under any conditions even under water. Depleted cartridges can be disposed of in the sea.

The regulator serves to maintain a constant pressure of 20 psig downstream of the regulator when the upstream pressure is at least 20 psig. This assures that the 7:1 ratio pump will not exceed 140 psig downstream.

I claim:

1. A gas generator system comprising:
   - a reaction chamber;
   - a quantity of water reactant hydride located in said reaction chamber;
   - a water conduit;
   - a gas operated hydraulic pump connected to said chamber via said conduit for pumping water into said chamber; and
   - gas conveyance means connected to said chamber and said pump for conveying gas formed in said chamber to said pump for driving said pump;
   - whereby said hydride, after coming into contact with water, forms a gas which drives said pump in a bootstrap fashion.

2. The system of claim 1 further comprising means for operating said generator in a demand mode.

3. The system of claim 1 further comprising means to control said pump for pumping water into said chamber until the level reaches said hydride and reacts to produce sufficient pressure to cause said pump to stall until said pressure subsides.

4. The system of claim 1 further comprising regulator means located in said conveyance means for maintaining a constant maximum gas pressure entering said pump.

5. The system of claim 1 further comprising said hydride being in the form of a cartridge.

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