

FUEL SUPPLY APPARATUS FOR INTERNAL COMBUSTION ENGINES

CROSS REFERENCE TO RELATED APPLICATION

This application is a continuation-in-part of my earlier application Ser. No. 485,498 filed July 3, 1974 abandoned.

BACKGROUND OF THE INVENTION

This invention relates to internal combustion engines. More particularly it is concerned with a fuel supply apparatus by means of which an internal combustion engine can be run on a fuel comprised of hydrogen and oxygen gases generated on demand by electrolysis of water.

In electrolysis a potential difference is applied between an anode and a cathode in contact with an electrolytic conductor to produce an electric current through the electrolytic conductor. Many molten salts and hydroxides are electrolytic conductors but usually the conductor is a solution of a substance which dissociates in the solution to form ions. The term "electrolyte" will be used herein to refer to a substance which dissociates into ions, at least to some extent, when dissolved in a suitable solvent. The resulting solution will be referred to as an "electrolyte solution".

Faraday's Laws of Electrolysis provide that in any electrolysis process the mass of substance liberated at an anode or cathode is in accordance with the formula

$$m = z q$$

where m is the mass of substance liberated in grams, z is the electrochemical equivalent of the substance, and q is the quantity of electricity passed, in coulombs. An important consequence of Faraday's Laws is that the rate of decomposition of an electrolyte is dependent on current and is independent of voltage. For example, in a conventional electrolysis process in which a constant current I amps flows to t seconds, $q = It$ and the mass of material deposited or dissolved will depend on I regardless of voltage, provided that the voltage exceeds the minimum necessary for the electrolysis to proceed. For most electrolytes, the minimum voltage is very low.

There have been previous proposals to run internal combustion engines on a fuel comprised of hydrogen gas. Examples of such proposals are disclosed in U.S. Pat. Nos. 1,275,481, 2,183,674 and 3,471,274 and British specifications Nos., 353,570 and 364,179. It has further been proposed to derive the hydrogen from electrolysis of water, as exemplified by U.S. Pat. No. 1,380,183. However, none of the prior art constructions is capable of producing hydrogen at a rate such that it can be fed directly to internal combustion engines without intermediate storage. The present invention enables a fuel comprised of hydrogen and oxygen gases to be generated by electrolysis of water at such a rate that it can sustain operation of an internal combustion engine. It achieves this result by use of an improved electrolysis process of the type generally proposed in the parent application hereof.

As disclosed in my aforesaid parent application the prior art also shows electrolytic reactions employing DC or rectified AC which necessarily will have a ripple component; an example of the former being shown for instance in Kilgus U.S. Pat. No. 2,016,442 and an example of the latter being shown in Emich al. U.S. Pat.

No. 3,485,742. It will be noted that the Kilgus Patent also discloses the application of a magnetic field to his electrolyte, which field is said to increase the production of gas at the two electrodes.

SUMMARY OF THE INVENTION

The apparatus of the invention applies a pulsating current to an electrolytic solution of an electrolyte in water. Specifically, it enables high pulses of quite high current value and appropriately low voltage to be generated in the electrolyte solution by a direct input supply to produce a yield of electrolysis products such that these products may be fed directly to the internal combustion engine. The pulsating current generated by the apparatus of the present invention is to be distinguished from normal variations which occur in rectification of AC current and as hereinafter employed the term pulsed current will be taken to mean current having a duty cycle of less than 0.5.

It is a specific object of this invention to provide a fuel supply apparatus for an internal combustion engine by which hydrogen and oxygen gases generated by electrolysis of water are mixed together and fed directly to the internal combustion engine.

A still further object of the invention is to provide, for use with an internal combustion engine having inlet means to receive a combustible fuel, fuel supply apparatus comprising:

a vessel to hold an electrolyte solution of electrolyte dissolved in water;

an anode and a cathode to contact the electrolyte solution within the vessel;

electrical supply means to apply between said diode and said cathode pulses of electrical energy to induce a pulsating current in the electrolyte solution thereby to generate by electrolysis hydrogen gas at the cathode and oxygen gas at the anode; gas collection and delivery means to collect the hydrogen and oxygen gases and to direct them to the engine inlet means; and

water admission means for admission of water to said vessel to make up loss due to electrolysis.

In order that the invention may be more fully explained one particular example of an automobile internal combustion engine fitted with fuel supply apparatus in accordance with the invention will now be described in detail with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of part of the automobile with its engine bay exposed to show the layout of the fuel supply apparatus and the manner in which it is connected to the automobile engine;

FIG. 2 is a circuit diagram of the fuel supply apparatus;

FIG. 3 is a plan view of a housing which carries electrical components of the fuel supply apparatus;

FIG. 4 is an elevation view of the housing shown in FIG. 3;

FIG. 5 is a cross-section on the line 5—5 in FIG. 3;

FIG. 6 is a cross-section on the line 6—6 in FIG. 5;

FIG. 7 is a cross-section on the line 7—7 in FIG. 5;

FIG. 8 is a perspective view of a diode heat sink included in the components illustrated in FIGS. 5 and 7;

FIG. 9 illustrates a transformer coil assembly included in the electrical components mounted within the housing;