

CARBON REMOVAL DEVICE

BACKGROUND OF THE INVENTION

[0001]1. Field of the Invention

5 [0002]The present invention relates to a carbon removing device, particularly a carbon removing device which uses a hydrogen storage case to provide hydrogen inside an internal combustion engine or any other engine, which increases the combustion temperature and achieves the effect of carbon removal.

[0003]2. Description of Related Art

10 [0004] Taiwan patentNo. I271487, which is granted to the present applicant, discloses a portable hydrogen supply system which safely stores hydrogen atoms and offers hydrogen in gas form to a hydrogen-using device. The hydrogen supply system includes at least a hydrogen-storing canister which contains hydrogen-storage alloy, a control valve, and a gas entry/exit port. After all
15 hydrogen-storing canisters of the hydrogen supply system have been filled with hydrogen, the hydrogen supply system is connected to a hydrogen-using device, providing stable-pressure hydrogen gas via the entry/exit port to the hydrogen-using device. The pressure of the hydrogen gas provided by the hydrogen supply system can be regulated by the control valve.

20 [0005] Taiwan Utility ModelNo.M380993 discloses an adjustable carbon removal device that is used to remove carbon accumulation inside of engines. The carbon removal device includes a hydrogen-oxygen generating unit, a pipeline unit, and a gas intake unit. The gas intake unit has a first input section for importing hydrogen and oxygen, a second input section for importing outside air, and
25 anoutput section which connects the first and second input sections. The outside

air imported by the second input section is used to maintain a certain proportion between hydrogen-oxygen gas and air which are flowing into the output section from the first and second input section to reduce the hydrogen-oxygen gas content flowing into the engine and reduce the amount of moisture resulting from condensation of the hydrogen-oxygen gas entering the engine so as to avoid the possibility that an excessively damp engine affecting the carbon removal process. [0006] Taiwan Patent No. I271487 discloses an equipment which removes carbon accumulation in an internal combustion engine, and the equipment includes a pure-water generating unit, a water storage unit, a water electrolysis cell unit, a gas-water separation unit, a power and control unit, and an engine flameout detection unit. The pure-water generating unit takes in raw water and generates pure water which is temporarily stored in the water storage unit, then transported to the water electrolysis cell unit for the water electrolysis process. The hydrogen gas generated in the process then passes through the gas-water separation unit, and further is input to the engine. This improves the combustion effect and achieves the effect of removing carbon from the engine.

[0007] The carbon removal devices disclosed by the above two Taiwan patent references both require using a water electrolysis unit to generate hydrogen and oxygen gas, and it is difficult for both to separate gas from water, making it impossible to avoid damages to the cylinder caused by liquid lockout. There is also no way to control the flow velocity of the hydrogen gas entering the engine, that is, the same type of carbon removal device cannot be effectively paired and used with engines with different cylinder sizes.

SUMMARY OF THE INVENTION

[0008] In order to make the carbon removal device in internal combustion engines and engines more convenient, as well as to let the carbon removal device obtain hydrogen gas through a portable manner, the present invention is proposed.

[0009]The primary object of the present invention is to provide a carbon removal device that includes a hydrogen storage case, a first pipe,a flow controller, a second pipe and a control unit. The first pipe is the hydrogen outlet end of the hydrogen storage device; The flow controller is connected to both the first pipe and the second pipe; The second pipe is connected to a device awaiting decarbonization, such as an internal combustion engine or any other an engine; The hydrogen storage case is used to provide the hydrogen gas required for the carbon removal process,which means it is not necessary to perform processes of electrolyzing water and water separating before the hydrogen can be obtained; This avoids the phenomenon of hydrolock, which is caused by the water being not easily separated from gas, which in turn can damage the cylinder of the device awaiting decarbonization. In practice, it is much simpler than the conventional carbon removing device.

[0010] Another object of the present invention is to provide a carbon removal device which, depending on the size of the device awaiting decarbonization, uses the control unit to output electric control signal to the flow controller. This allows the flow controller to control flow velocity of hydrogen outward via the first pipe from the hydrogen storage case, and further allows the hydrogen-which has a flow velocity corresponding to the size of the device awaiting decarbonization-to enter the device awaiting decarbonization via the second

pipe. The flow velocity of the hydrogen gas can therefore be controlled in accordance to the size of the device awaiting decarbonization, resulting in an economic and effective carbon removal process.

[0011] A carbon removal device according to the present invention is comprised of:

a hydrogen storage case, used to store and output hydrogen gas;

a first pipe, combined with the hydrogen storage case, is the hydrogen outlet end of the hydrogen storage case;

a second pipe;

a flow controller, which connects the first and second pipes;

a control unit, electrically connected to the flow controller;

wherein the second pipe is used to connect and communicate with interior of a device awaiting decarbonization, according to different sizes of cylinders of the device awaiting decarbonization, the control unit is utilized to output corresponding electric control signal to the flow controller, allowing the flow controller to control the hydrogen storage case and release hydrogen via the first pipe with a flow velocity corresponding to the device awaiting decarbonization, and the hydrogen with the flow velocity enters the device awaiting decarbonization via the second pipe; the hydrogen then mixes and burns with fuel vapor within the device awaiting decarbonization, achieving the effect of removing carbon accumulation within the device awaiting decarbonization.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] Further benefits and advantages of the present invention will become apparent after a careful reading of the detailed description with appropriate

reference to the accompanying drawings.

[0013] Fig. 1 is a schematic diagram of the present invention of a carbon removal device.

5 DETAILED DESCRIPTION OF THE INVENTION

[0014] As shown in Fig. 1, a carbon removal device 1 according to the present invention comprises a hydrogen storage case 11, a first pipe 12, a flow controller 13, a second pipe 14, a control unit 15, a convection unit 16, a monitoring unit 17 and a detection unit 18.

10 [0015] The hydrogen storage case 11 is used to store and output hydrogen gas, and can be the aforementioned portable hydrogen supply system disclosed in Taiwan patent No. I27147; there are several hydrogen-storing canisters 111 contained therein with hydrogen-storage alloy disposed in each of the hydrogen-storing canisters 111. When the respective hydrogen-storing canister
15 111 has been depleted of the hydrogen gas, they can either be refilled or replaced with another hydrogen-storing canister 111 that has already been filled with hydrogen gas. This allows the hydrogen storage case 11 to continue output hydrogen gas. Each hydrogen-storing canister 111 is connected to the first pipe 12 via pipeline 112.

20 [0016] The first pipe 12 is combined with the hydrogen storage case 11 and is the hydrogen outlet end of the hydrogen storage case 11; the flow controller 13 is connected to the first pipe 12 and the second pipe 14 to control the flow velocity of the hydrogen gas going from the first pipe 12 to the second pipe 14.

[0017] The second pipe 14 can be connected to a device awaiting decarbonization
25 2 such as internal combustion engine or any other engine, allowing the hydrogen

gas stored in the hydrogen storage case 11 to flow into the device awaiting decarbonization 2; the flow velocity with which hydrogen gas flows into the device awaiting decarbonization 2 is controlled by the flow controller 13; for example if the device awaiting decarbonization 2 has a large-size cylinder, the hydrogen flow velocity is faster; when the device awaiting decarbonization 2 has a small-size cylinder, the hydrogen flow velocity is slower. The hydrogen flow velocity is controlled to accommodate the size of the cylinder of the device awaiting decarbonization 2.

[0018] The control unit 15 is electrically connected to the flow controller 13 to output electric control signals to control the flow controller 13 for the flow velocity of the hydrogen flowing from the first pipe 12 to the second pipe 14 being controlled by the flow controller 13 to in accordance with the electric control signal. The control unit 15 can be an industrial computer or a common personal computer, which includes a touchscreen or non-touchscreen capable of being manually operated or has a preset program automatically outputting the electric control signals to the flow controller 13 to control the flow velocity corresponding to what is needed.

[0019] The convection unit 16 is disposed at the lateral side of the hydrogen storage case 11 to perform heat exchange with the hydrogen storage case 11 to prevent temperature of the hydrogen storage case 11 from rapidly dropping and affecting release of hydrogen. The convection unit 16 further includes a fan to create airflow for heat exchange with the hydrogen storage case 11 (including heat radiating and maintaining at constant temperature).

[0020] The monitoring unit 17 further comprises at least one of temperature and pressure monitors to monitor temperature and pressure of the entire device. The

detection unit 18 comprises at least one of detectors such as endoscope or
camerato detect the images related to condition of the device awaiting
decarbonization. The control unit 15 is electrically connected to the monitoring
unit 17 and detection unit 18 respectively to store the monitoring and detection
5 information output from the monitoring unit 17 and the detection unit 18. When
needed, the control signals are output corresponding to the stored information.

[0021]The present invention utilizes the control unit 15 to output the
corresponding electric control signals to the flow controller 13 in accordance
with the size of the cylinder of the device awaiting decarbonization 2 to allow the
10 flow controller 13 to control the hydrogen storage case 11 and release hydrogen
via the first pipe 12 with a flow velocity corresponding to the device awaiting
decarbonization 2, and the hydrogen with the flow velocity enters the device
awaiting decarbonization 2 via the second pipe 14 such thatthe hydrogen with
proper flow velocity then mixesand burns with the fuel vapor within the device
15 awaiting decarbonization 2, enhancing the combustion temperature and achieving
the effect of removing carbon accumulation within the device awaiting
decarbonization 2.

[0022] The present invention does not need to perform water electrolysis and
gas-vapor separation before hydrogen gas can be obtained to avoid the
20 phenomenon of hydrolockcaused by the water being not easily separated from the
gas, which in turn can damage the cylinder of the device awaiting
decarbonization; instead, the present invention uses the hydrogen storage case to
immediately provide the device awaiting decarbonization with the hydrogen gas
needed during carbon removal, as well the present invention can control the flow
25 velocity of the hydrogen gas in accordance with the different sizes of devices

awaiting decarbonization, which results in an economic and efficient carbon removal process. In practice, it is much moreeffectivethan the conventional carbon removing device.

[0023] While the invention has been described with reference to the preferred
5 embodiment thereof, it is to be understood that modifications or variations may be easily made without departing from the spirit of this inventiondefined by the appended claims.

10

15

20

25

What is claimed is:

1. A carbon removal device, comprising:

a hydrogen storage case storing and outputting hydrogen gas with an

5 hydrogen outlet end;

a first pipe being the hydrogen outlet end of the hydrogen storage case;

a second pipe;

a flow controller connecting with the first and the second pipe;

a control unit being electrically connected to the flow controller;

10 wherein the second pipe is used to connect and communicate with interior of a device awaiting decarbonization, according to different sizes of cylinders of the device awaiting decarbonization, the control unit is utilized to output corresponding electric control signal to the flow controller, allowing the flow controller to control the hydrogen storage case and release hydrogen via the
15 first pipe with a flow velocity corresponding to the device awaiting decarbonization, and the hydrogen with the flow velocity enters the device awaiting decarbonization via the second pipe; the hydrogen then mixes and burns with fuel vapor within the device awaiting decarbonization, achieving the effect of removing carbon accumulation within the device awaiting decarbonization.

20

2. The carbon removal device as defined in claim 1, wherein the hydrogen storage case contains at least one hydrogen-storing canister, and said hydrogen-storing canister is connected to the first pipe with pipeline.

25 3. The carbon removal device as defined in claim 2, wherein the

hydrogen-storing canister have hydrogen-storage alloy inside.

4. The carbon removal device as defined in claim 1, 2, or 3, further comprises a convection unit which is disposed at a lateral side of the hydrogen storage case to perform heat exchange with the hydrogen storage case so as to prevent temperature of hydrogen storage case from rapidly dropping during the release of hydrogen gas to affect continuing release of hydrogen.

5. The carbon removal device as defined in claim 4, wherein the control unit is manually operated or operated by a preset program to automatically output the electric control signal to the flow controller.

6. The carbon removal device as defined in claim 5, wherein the control unit is an industrial computer or a personal computer.

7. The carbon removal device as defined in claim 6, wherein one of the industrial computer and the personal computer further comprises a touch screen.

8. The carbon removal device as defined in claim 7, wherein the convection unit further comprises a fan to create airflow to perform heat exchange with the hydrogen storage case.

9. The carbon removal device as defined in claim 8 further comprises a monitoring unit to monitor at least the temperature or pressure of the entire device.

10. The carbon removal device as defined in claim 9 further comprises a detection unit to detect image condition of the device awaiting decarbonization.

5

10

15

20

25