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DEVICE FOR THE AUTOMATIC ELIMINATION OF SMOKE AND NOXIOUS GASES OF INTERNAL COMBUSTION ENGINES

Filed Jan. 10, 1966 2 Sheets-Sheet 1

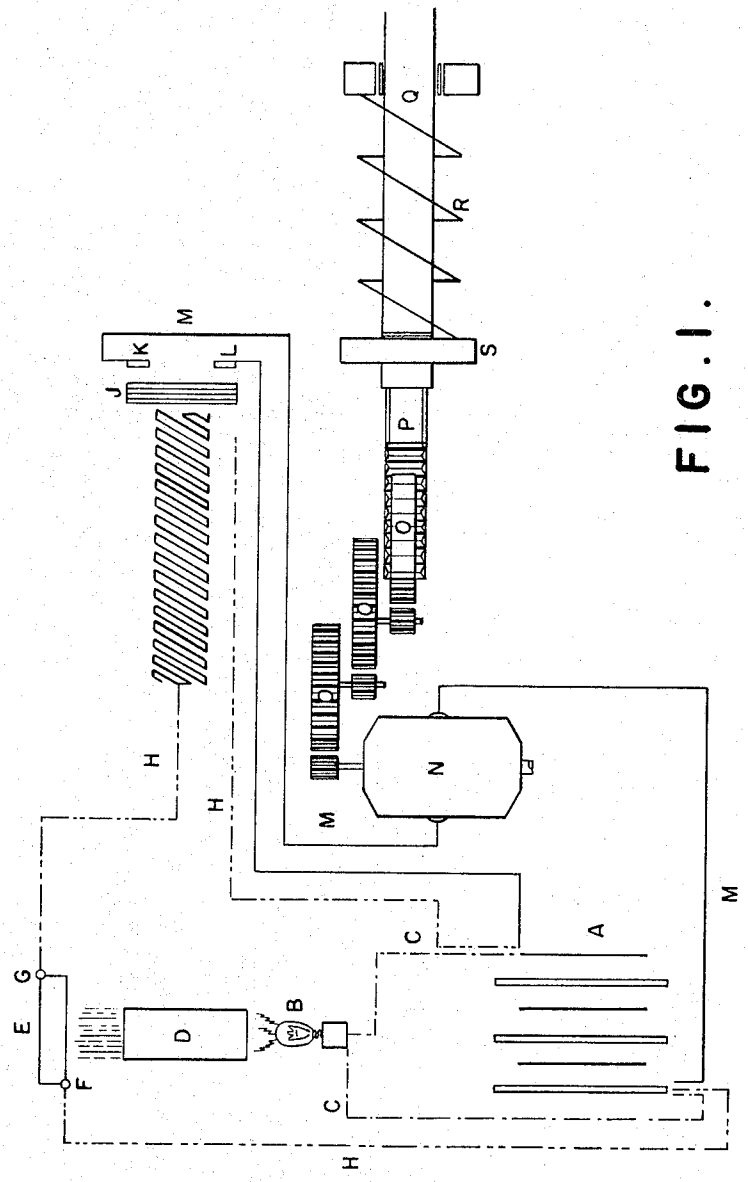


FIG. 1.

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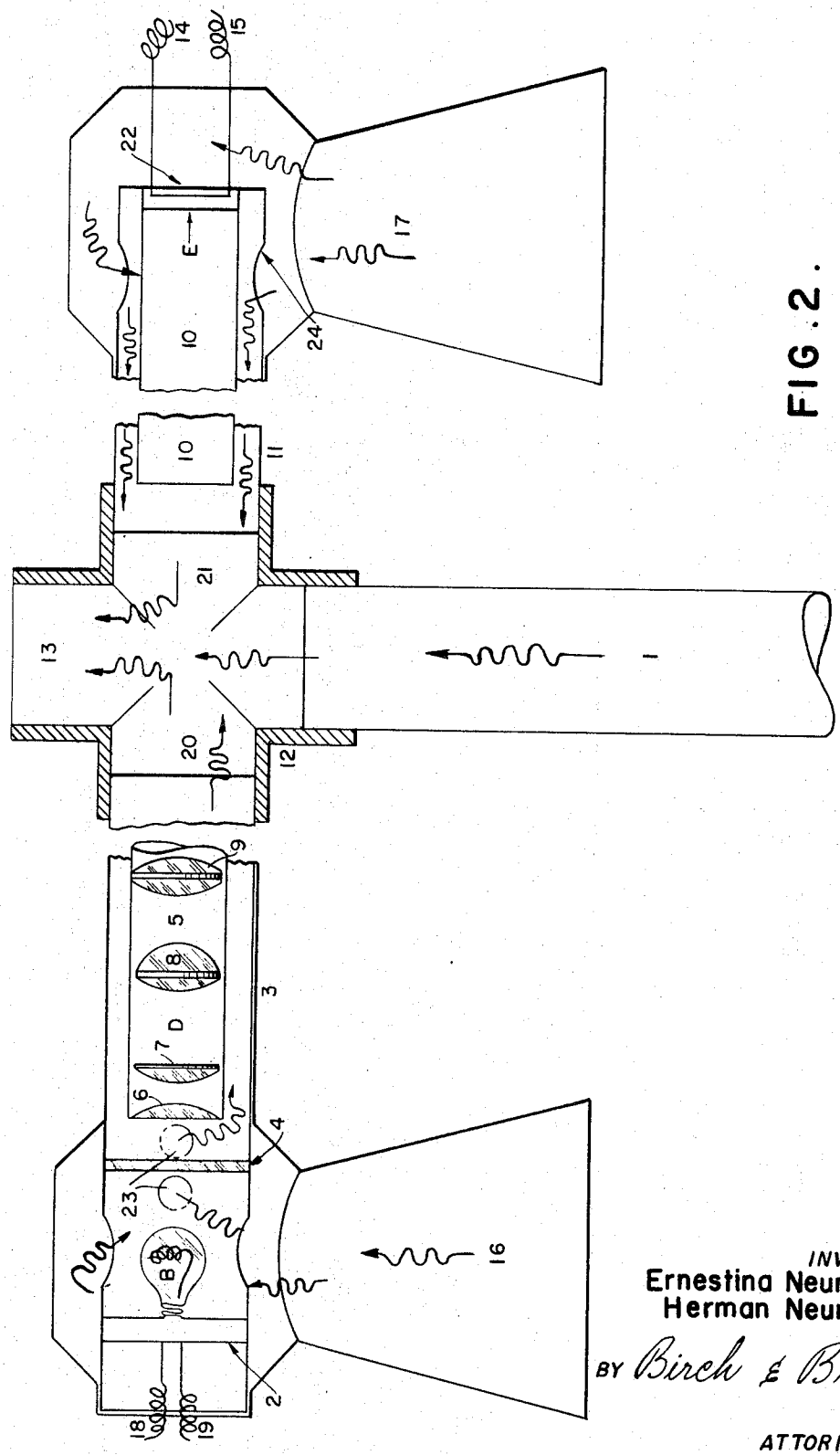


FIG. 2.

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DEVICE FOR THE AUTOMATIC ELIMINATION OF SMOKE AND NOXIOUS GASES OF INTERNAL COMBUSTION ENGINES

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7 Claims. (Cl. 123—140)

This invention relates to a new way of automatically eliminating the formation of smoke and poisonous gases produced by some motors of internal combustion when used in vehicles traveling on mountain roads where the altitude over sea level varies and, consequently, the burden of oxygen contained in the atmosphere changes per cubic unity absorbed by the motor to sustain the combustion of the fuel. If the road goes upward, the oxygen contained in the air drops, and vice versa if the road goes downward; however, the quantity of fuel transported by the injection system remains unaltered and if in excess of the oxygen present, suboxygenation must result.

The object of the invention is to obtain a uniform and complete cremation of all the fuel injected into the combustion chambers by the fuel injection system so that no part of it suffers suboxidation due to lack of oxygen.

Another object of the invention is to obtain a fully satisfactory utility of the thermic value of the fuel burned in the motors by means of a complete oxidation of all the carbon molecules in the fuel. This will be clear if the fact is considered that 1 kg. carbon of any hydrocarbonic compound produces 8080 thermic units if burned to carbon dioxide, but if oxidized to carbon monoxide merely, the production will be only 2437 thermic units.

This invention, consisting of the combined employment of several elements in specific coordination, will be better understood from a consideration of the following detailed description, in view of the drawings that form part of the specification.

Nevertheless, it is to be understood that the invention is not confined to the disclosure, being susceptible of such changes and modifications which shall define no material departure from the salient features of the invention as expressed in the appended claims.

In the drawings:

FIGURE 1 is a schematic diagram of the twenty-one elements marked A–U, which, acting jointly, reveal the presence of smoke and noxious gases and start operating in order to eliminate the same. This drawing also shows the mutual interpositions of all the elements.

FIGURE 2 is a vertical section of the upper part of the exhaust pipe with its two arms branching out from the center of the pipe, showing in its central part the outlet of the combustion gases to the atmosphere. To the left is shown the end of arm 3 with the light bulb B and the optical system D in the tube 5, and to the right is shown the end of arm 11 with the photoelectric cell E mounted in the pipe 10.

This figure also shows the ventilation system required to maintain the temperature low enough so as not to damage the optical and electronic parts of the device.

Referring particularly to the general arrangement shown in FIGURE 1, A designates an accumulator as customarily found in automotive vehicles; B is an electric light bulb connected to this accumulator by the circuit C; D is an optical system exposed to radiation from the light bulb B; E is a photoelectric cell which receives the projection from the optical system D; F is the connection point between the photoelectric cell and the accumulator A, and G is the point of connection of this

cell to the solenoid or relay I; H is the electronic circuit passing from the accumulator A by way of the photoelectric cell E and the solenoid or relay I back to the accumulator; J is an iron disk acting as a relay switch normally sustained by magnetic force, but if released, it drops by gravity on the contacts K and L, thus closing the electric circuit M and getting the motor N to start furnishing dynamic power to create the impulses which act upon the fuel injection system by means of the power transmission train O and the toothed bar P forming part of the stem Q. This stem is to be connected to the adjusting mechanism of the fuel injection system. Regarding this nothing is shown because the diverse manufacturers of interior combustion motors make their fuel injection systems all different.

The compression power inherent in the spiral spring R located on the stem Q and seated against the collar S acts reciprocating, balancing the movements when the motor N is without current.

FIGURE 2 shows the exhaust pipe 1 with the left and right side braches 3 and 11, respectively. The electric light bulb B is in the left side end and the head radiated from this bulb is partially broken by the heat resisting glass window 4 in order to protect the optical system D within the tube 5. This system consists of the lenses 6 and 7 for the concentration of the light rays and the lenses 8 and 9 for the projection of the concentrated light upon the surface of the photoelectric cell E located inside the end of the tube 10 in the right side branch 11 of the exhaust pipe. The focal points of the lenses are located on one and the same straight center line of the tubes 5 and 10 and the optical axis are therefore coincident.

Wire 14 connects point F of the photoelectric cell E to the negative pole of the accumulator A, and wire 15 from point G on the cell leads to the solenoid or relay I, thus completing the electronic circuit H (FIGURE 1). Wires 18 and 19 go to either pole of the accumulator to form the circuit C of the light bulb (FIGURE 1).

Further, this figure shows the ventilation system as consisting of the funnel-shaped appendixes 16 and 17, of conventional form and dimensions, mounted on the outside of the ends of the branches 3 and 11, respectively, adjustable to the angle of the exhaust pipe. These appendixes are intended to capture, compress and circulate the air through the ducts 23 and inside the arms of the exhaust pipe between these and the tubes 5 and 10, to be discharged through the openings 20 and 21 and the atmospheric outlet 13. This is possible because of the relative motion of the atmosphere due to the speed of the vehicle en route, and necessary in order to protect the optical and electronic systems against overheating.

Functions

The smoke, when developed in the motor, must pass through the exhaust pipe 1 to the cross 12 and between the opening 20 in the branch 3 and the opening 21 in branch 11, thus forming a curtain between these two openings, which are the path for the light rays projected by the lenses 8 and 9 in the tube 5 to the surface of the photoelectric cell E located in the extreme end of the tube 10 and, consequently, the illumination of this electronic body will be reduced or this body may be left in complete darkness for a moment (FIGURE 2).

All photoelectric cells, whether generative, emissive or conductive, are characterized by the property of losing some or all of these qualities if left in darkness, partially or totally.

In these cases, the electronic circuit H is immediately affected and the magnet of the relay or solenoid I loses its power and capacity to hold and sustain the iron dish J, which, due to gravity, then drops on the two contacts K and L, thus closing the electric circuit M and starting

the electric motor N. This impulse of the dynamic transmission train O on the rack P and the stem Q is sufficient to act upon the adjusting mechanism of the fuel injection system by reducing the quantity of fuel injected just sufficiently to eliminate that portion thereof which, due to deficit of oxygen in the air momentarily absorbed, cannot be fully oxidized.

The moment that the combustion motor does not receive fuel in excess of the quantity that can be perfectly oxidized in accordance with the quantity of oxygen absorbed with the air, the smoke and noxious gases disappear, and with them the obstacle to the full illumination of the photoelectric cell E by the rays of light from the bulb B. Instantly the photoelectric cell E recovers its particular electronic quality as generator, emissary or conductor and the electronic circuit H regains power to activate the magnet of the relay or solenoid I, attracting and picking up the disk J from the contacts K and L, thus breaking the current of the circuit M and paralyzing the motor N.

When the dynamic elements are paralyzed electrically, the stem Q is subjected to the pressure inherent in the spiral spring R under contra-pressure against the seat S, and therefore it tends to reciprocate the foregoing movement in the adjusting mechanism of the fuel injection system, by and by, as long as there is no smoke to interfere with the projection of the light from the bulb B (FIGURE 1).

What is claimed is:

1. In an internal combustion engine including variable capacity fuel injection means and a combustion product exhaust system, control means minimizing the amount of non-oxidized combustion products exhausted from said engine comprising sensing means generating control signal in response to the presence of non-oxidized combustion products in said exhaust system, and motive means responsive to said control signal and interconnected with said fuel injection means modulating the capacity of said injection means to vary the amount of fuel injected into said engine to minimize the amount of non-oxidized combustion products exhausted from said engine.

2. The invention defined in claim 1, wherein said sensing means comprises a source of radiant energy, a power source, a radiant energy responsive means in circuit with said power source, and optical means optically coupling radiant energy from said source through a portion of said exhaust system with said radiant energy responsive means, the degree of transmittance of said optical means with respect to said radiant energy being a direct function of the amount of non-oxidized combustion products present in said exhaust system.

3. The invention defined in claim 2, wherein said radiant energy responsive means comprises a variable impedance photoelectric cell and a solenoid winding in series with said power source.

4. The invention defined in claim 1, wherein said control means includes a power source and said motive means comprises a motor, power control means interconnecting said motor and said power source in response to said control signal, energizing said motor for the duration of said control signal, displaceable output means on said motor means interconnected with said fuel injection means modulating the capacity thereof as a function of the displacement of said output means, and bias means interconnected with and opposing the displacement of said output means acting to reverse the displacement of said output means in the absence of said control signal.

5. The invention defined in claim 4, wherein said power source comprises an electric power source, said motor comprises a rotary electric motor, said power control means comprises a relay acting to connect said motor in circuit with said power source, said output means comprises a rotary-to-reciprocating mechanical movement including a reciprocating output shaft, and said bias means comprises a compression spring acting on said output shaft in opposition to a displacement thereof by said motor.

6. The invention defined in claim 1, wherein said sensing means comprises a source of radiant energy, a power source, a radiant energy responsive means in circuit with said power source, and optical means optically coupling radiant energy from said source through a portion of said exhaust system with said radiant energy responsive means, the degree of transmittance of said optical means with respect to said radiant energy being a direct function of the amount of non-oxidized combustion products present in said exhaust system; and wherein said motive means comprises a motor, power control means interconnecting said motor and said power source in response to said control signal, energizing said motor for the duration of said control signal, displaceable output means on said motor means interconnected with said fuel injection means modulating the capacity thereof as a function of the displacement of said output means, and bias means interconnected with and opposing the displacement of said output means acting to reverse the displacement of said output means in the absence of said control signal.

7. The invention defined in claim 6, wherein said radiant energy responsive means comprises a variable impedance photoelectric cell and a solenoid winding in series with said power source; and wherein said power source comprises an electric power source, said motor comprises a rotary electric motor, said power control means comprises a relay acting to connect said motor in circuit with said power source, said output means comprises a rotary-to-reciprocating mechanical movement including a reciprocating output shaft, and said bias means comprises a compression spring acting on said output shaft in opposition to a displacement thereof by said motor.

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