(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number : **0 454 351 A2**

(12) # EUROPEAN PATENT APPLICATION

(21) Application number : **91303425.2**

(51) Int. Cl.[5] : **F23D 11/24**, F01N 3/02

(22) Date of filing : **17.04.91**

(30) Priority : **27.04.90 GB 9009519**

(43) Date of publication of application :
30.10.91 Bulletin 91/44

(84) Designated Contracting States :
DE ES FR GB IT

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(54) **Burner devices.**

(57) A burner device suitable for use in a vehicle includes a fuel injector (1) for connection to the pressurised fuel supply contained in the fuel tank of the vehicle. An electromagnetically controlled valve (19 to 35) is arranged to regulate the flow of fuel through the injector (1) into a combustion can (3). The operation of the electromagnetically controlled valve is controlled in dependence on the required heating effect of the device. The device is suitable for use as a cab heater for the vehicle, or for burning off carbon deposits formed in an exhaust trap fitted in a diesel vehicle.

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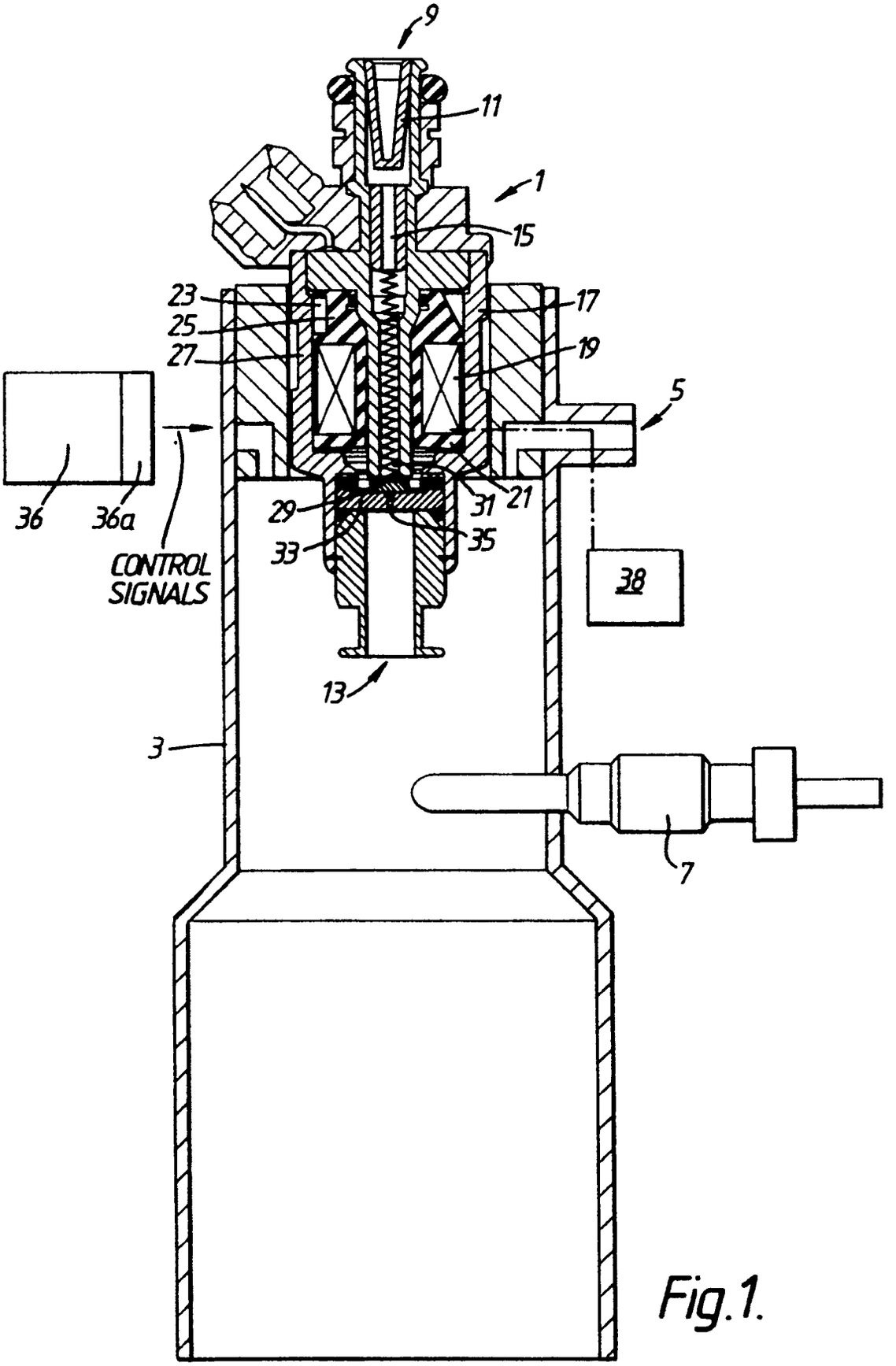
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Fig.1.

This invention relates to burner devices, and has particular, although not exclusive relevance to burner devices for use in vehicles, such as lorries.

Where it is necessary to incorporate a burner device in a vehicle, for example as a cab heater, it is convenient for the burner to be fuelled by fuel from the main fuel tank for the vehicle. This requries, however, the use of a flow modulator to control the flow of pressurised fuel from the tank to the burner device. Hitherto the flow modulator has taken the form of a pump, having a variable pumping rate. There are, however, difficulties with the variable rate DC motors incorporated in such pumps.

It is an object of the present invention to provide a burner device suitable for use in a vehicle but wherein the use of such complex flow modulators is avoided.

According to the present invention there is provided a burner device comprising: a fuel conduit having an inlet into which fuel may be admitted, and an outlet by which fuel may exit, an electromagnetic valve for regulating the flow of fuel from the inlet to the outlet, means for igniting the fuel exiting from the outlet, and means for controlling the electromagnetic valve in dependence on the required heating effect of the device.

The device suitably incorporates a means for introducing combustion gas into the flow of fuel exiting from the outlet. The combustion gas preferably is arranged also to provide cooling of at least part of the conduit. The device may incorporate a nozzle means communicating with the outlet, the means for introducing combustion gas being arranged to mix pressurised combustion gas with fuel in the nozzle means such that the nozzle means is effective to emit atomized fuel.

Two embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings of which: -

Figure 1 shows a schematic longitudinal sectional view of part of the first embodiment, and

Figure 2 shows a schematic longitudinal sectional view of the second embodiment.

Referring firstly to Figure 1 the first embodiment to be described includes a fuel injector, indicated generally as 1, mounted in a combustion can 3. The combustion can 3 is also provided with a combustion air inlet 5 and an ignitor 7, the ignitor being of conventional design, for example a hot wire glow plug. The fuel injector 1 includes a fuel inlet 9 in which is fitted a filter 11, and a fuel outlet 13, the inlet and outlet being connected by a longitudinal passage 15 formed within a housing 17. The passage of fuel through the fuel injector 1 is controlled by an electromagnetically controlled valve comprising an electromagnet including a solenoid coil 19 supported on coil former 21. The coil former 21 is located inside an annular cavity 23 defined by concentric parts 25 and 27 of the housing 17. Both parts 25 and 27 are made of a magnetizable material, thus providing a magnetic circuit round the solenoid coil 19. The valve further includes a valve plate 29, also made of magnetizable material, which is urged by a coil spring 31 into contact with a valve seat in the form of a disc 33 in which is formed an aperture 35. The valve plate 29, when in the position shown in Figure 1, thus blocks the aperture 35 in the disc 33, thereby preventing the flow of fuel from the fuel inlet 9 through the passage 15 to the fuel outlet 13.

Upon energization of the solenoid coil 19, the valve plate 29 is magnetically attacted towards the adjacent end face of part 23 thus unblocking the aperture 35 in disc 33. Fuel is then able to pass around the valve plate 29 and through the aperture 35 to the fuel outlet 13. Upon de-energization of the solenoid coil 19 the valve plate 29 is returned by the action of the spring 31 into contact with the disc 33 thereby blocking the flow of fuel through the aperture 35.

Thus in use of the device the fuel inlet 9 is connected to the fuel tank of a vehicle (not shown)from which fuel is supplied to the inlet 9 under pressure. On energization of the solenoid coil 19 fuel, which may be liquid or gaseous, passes through the injector 1 into the chamber 3 where it is ignited by the ignitor 7. Auxiliary combustion air, pressurised to typically 5 to 10 psi, is admitted via the inlet 5 into the chamber 3 to aid air/fuel miring and also to provide cooling of the injector during and after operation of the burner device.

Where the device is to be used as a heating device for the cab of a truck there is also provided a temperature sensing device, shown schematically as 36, whose output is an electrical signal corresponding to the sensed temperature. Signals from the temperature sensing device 36 are used to control the electromagnetic valve so as to regulate the time intervals during which the solenoid coil 19 is energized and fuel can pass from the inlet to the outlet of the injector 1. Means 36a are provided such that the control signals are pulsed, the mark to space ratio, the width of the signals, or the frequency of the signals being variable so as to control the temperature of the cab of the truck.

The device as thus described also finds application as a burner for periodically burning off carbon formed on the traps incorporated in the exhaust of a diesel vehicle to trap the carbon particulates emitted due to the combustion of diesel fuel during normal use of the diesel vehicle. The operation of the device will however be arranged to be initiated by, for example, a timing mean, shown schematically in Figure 1 as 38, so as to cause energization of the solenoid coil 19 and thus operation of the burner at appropriate time intervals depending on the accumulation of particulates in the trap. The burner device may also find application in an engine block heater.

Referring now to Figure 2, the second embodi-

ment to be described is a modification of the first embodiment, and thus corresponding features are correspondingly labelled and will not be described in detail. The combustion air inlet 5 formed in the combustion can 3 in the first embodiment is, in this embodiment, replaced by an adaptor 37 fitted to the housing 17 of the fuel injector 1 via an O-ring seal 39. An air inlet 41 is provided in the adaptor 37, this communicating with an outlet nozzle 43 into which fuel passing from the outlet 13 of the injector 1 passes. A source (not shown) of pressurised combustion gas is connected to the inlet 41, the outlet nozzle thus being effective to supply an atomized spray of fuel.

It will be appreciated that whilst a burner device in accordance with the invention finds particular application in a vehicle so as to use the fuel from the fuel-tank vehicle, a burner system in accordance with the invention is also applicable wherever it is necessary to modulate the fuel flow to the device, for example in an industrial or home heating furnace.

It will also be appreciated that as a burner device in accordance with the invention is, effectively, a closed loop system, the efficiency of the burner device will not be dependent on the accuracy of the control of the flow of fuel through the fuel conduit of the device. Thus it is not necessary for the burner device to be constructed to very close tolerances.

Claims

1. A burner device comprising a fuel conduit having an inlet (9) into which fuel may be admitted, an outlet (13) by which fuel may exit, and means (7) for igniting the fuel exiting from the outlet (13), the device being characterised in that it further comprises an electromagnetic valve (19 to 35) for regulating the flow of fuel from the inlet (9) to the outlet (13), and means for controlling the electromagnetic valve (19 to 35) in dependence on the required heating effect of the device.

2. A burner device according to claim 1 incorporating a means (5 or 41) for introducing combustion gas into the flow of fuel exiting from the outlet (13).

3. A burner device according to claim 2 in which the combustion gas is arranged also to provide cooling of at least part of the conduit.

4. A burner device according to claim 2 or claim 3 incorporating a nozzle means (43) communicating with the outlet (13), the means for introducing combustion gas (41) being arranged to mix pressurized combustion gas with fuel in the nozzle means (43) such that the nozzle means (43) is effective to emit atomized fuel.

5. A burner device according to any one of the preceding claims including a temperature sensing device (36) effective to produce signals for controlling the electromagnetic valve (19 to 35).

6. A burner device according to claim 5 including means (36a) for causing the signals produced by the temperature sensing device (36) to be pulsed, at least one of the characteristics of the pulsed signals being variable.

7. A burner device according to claim 6 in which the variable characteristic comprises the mark to space ratio.

8. A burner device according to claim 6 or claim 7 in which the variable characteristic comprises the width of the signals.

9. A burner device according to any one of claims 6 to 8 in which the variable characteristic comprises the frequency of the signals.

10. A burner device according to any one of the preceding claims including a timing means (38) effective to operate the electromagnetic valve (19 to 35) at appropriate time intervals depending on the accummulation of particulates in a particulate trap.

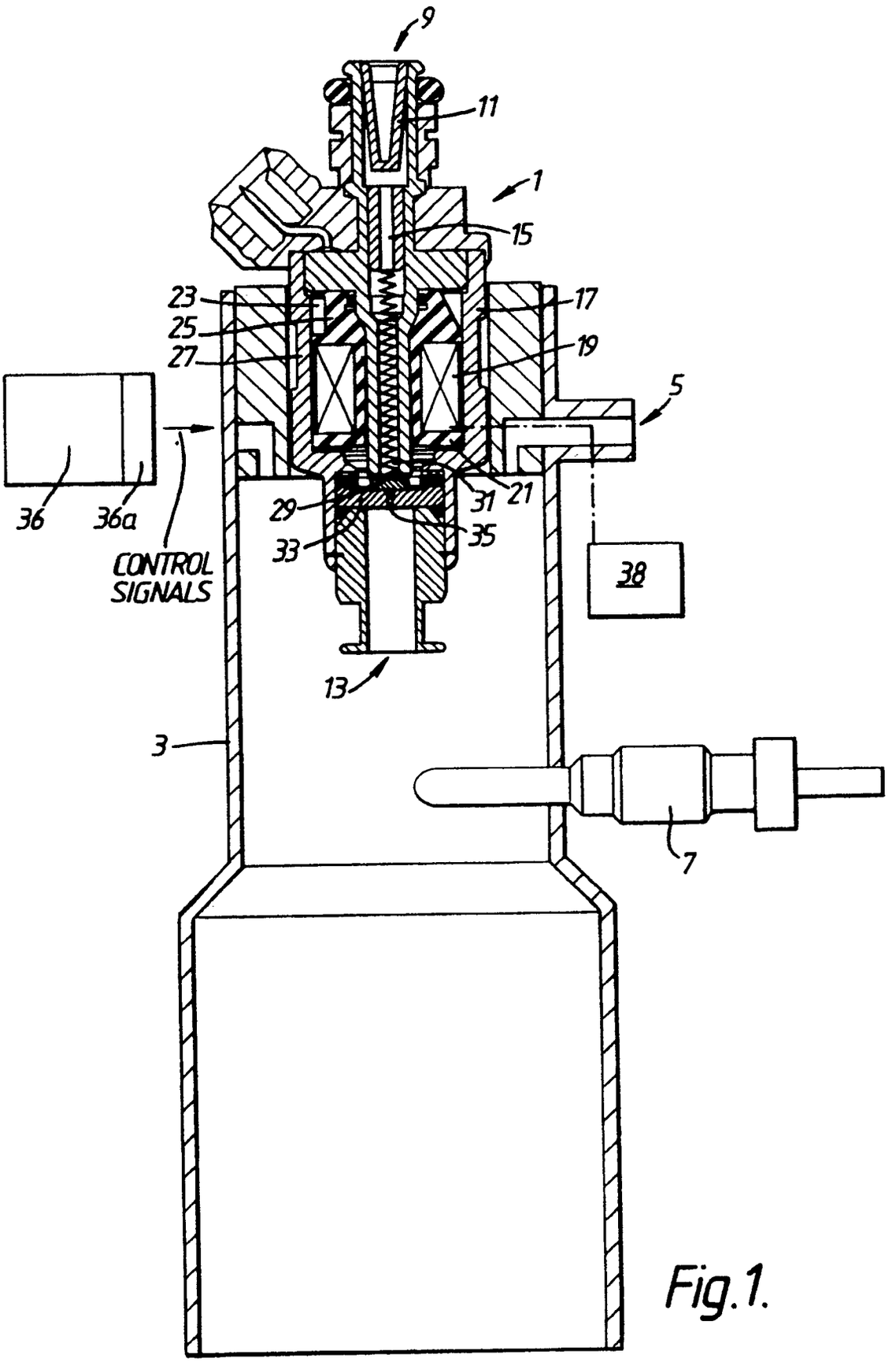
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Fig.1.

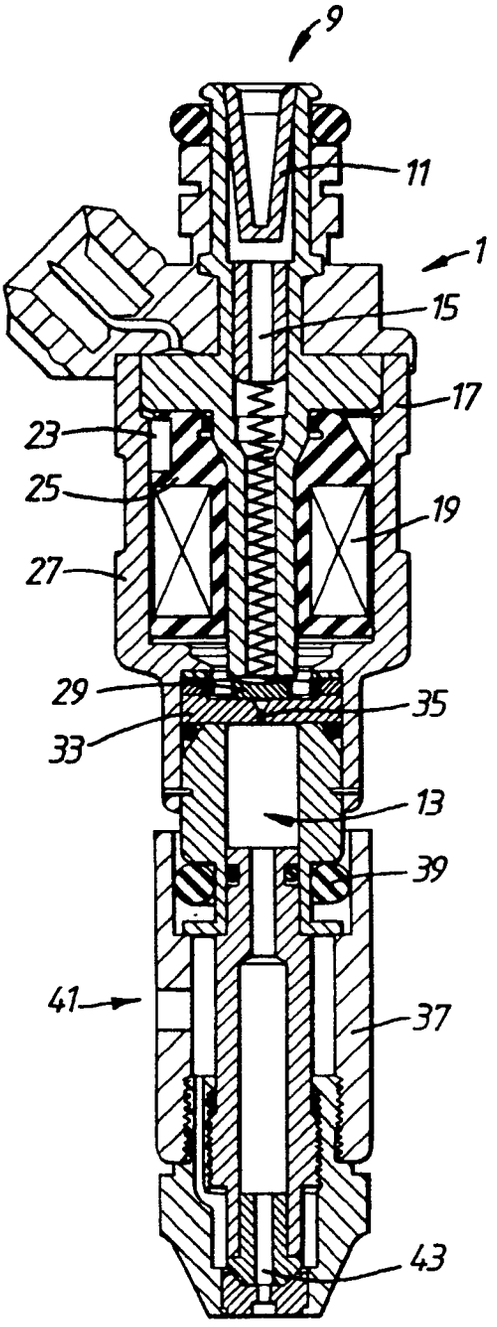

Fig.2.