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(54) Fuel treatment device.

(57) A fuel treatment device for an internal combustion engine includes a mounting 12 which carries a part 10 defining a fuel treatment chamber. The mounting defines inlet and outlet ports 14, 16 for connection into the engine fuel system and also a priming pump 18 which is operated by a powered actuating device 32 conveniently an electrical solenoid.

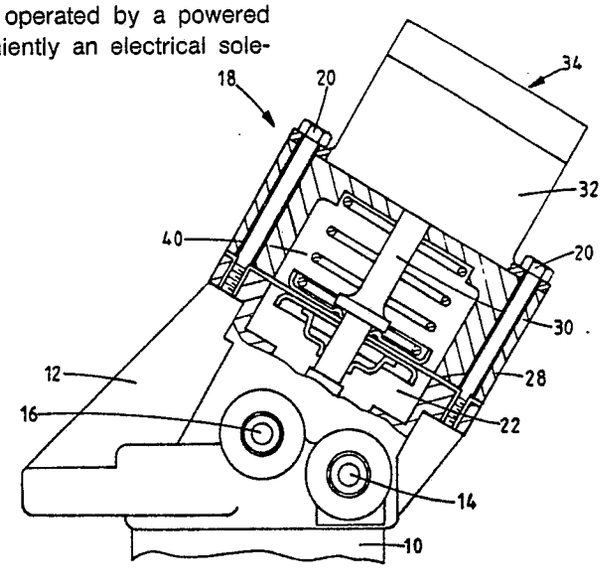

FIG. 1.

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FUEL TREATMENT DEVICE

This invention relates to a fuel treatment device for incorporation into the fuel system of an internal combustion system, e.g. a compression ignition engine for an agricultural vehicle.

The fuel treatment device may include a fuel filter element through which fuel is drawn to remove solid contaminant from the fuel, or a sedimentation device for removal of solids from the fuel by sedimentation, or a combination of both. The device may further include a fuel heater. In each case, the device includes an inlet port and an outlet port for connection into the fuel system, the inlet and outlet ports conveniently being located within a mounting of the device. It is well known that, when the fuel tank associated with the system is drained by operation of the associated engine, air is drawn into the system and that the air in the system must be purged before a satisfactory fuel flow can be obtained. It is known to provide a hand operable priming pump for this purpose, but hand priming the fuel system is laborious and can also be difficult if the hand priming pump is mounted in a relatively inaccessible position.

It is an object of the present invention to obviate or mitigate the above disadvantages.

According to the present invention, there is provided a fuel treatment device for incorporation into the fuel system of an internal combustion engine, said device comprising a mounting whereby the device can be mounted on a support in use, a fuel treatment chamber defined in a part adapted to be secured to the mounting, inlet and outlet ports communicating with the fuel treatment chamber whereby the device can be connected into the fuel system, a fuel priming pump carried on the mounting and communicating with the inlet and outlet ports, and a powered actuating device operably connected with the priming pump, said powered actuating device being carried on said mounting.

The powered actuating device may be an electrically-, pneumatically-, hydraulically-, and/or vacuum-operated actuator.

In a preferred embodiment, the powered actuating device is an electrically-operated actuator such as a solenoid.

In a particularly convenient embodiment, the priming pump is a diaphragm pump operated by an electric solenoid mounted on the diaphragm pump which in turn is secured to said mounting.

Also according to the present invention, there is provided a fuel system of an internal combustion engine including a fuel treatment device according to the present invention.

An embodiment of the present invention will now be described, by way of example, with reference to the accompanying drawing, in which:-

Fig. 1 is a part sectional view of the top part of a fuel treatment device according to the present invention, and

Fig. 2 is a schematic illustration of a fuel system of an internal combustion engine incorporating a fuel treatment device according to the present invention.

Referring now to Fig. 1, the fuel treatment device illustrated therein takes the form of a fuel filter device for filtering fuel being supplied to a compression igniton engine. Such a device comprises a filter element 10 (only partly shown) having a form which is known per se and which is secured to the underside of a mounting 12 which is commonly referred to as a filter head. Such a mounting 12 is adapted to be mounted at a convenient location on a motor vehicle (e.g. an agricultural tractor or the like) in a manner which is known per se and which need not be described in detail herein. The mounting 12 includes a fuel inlet port 14 and a fuel outlet port 16.

A solenoid-operated diaphragm pump shown generally at 18 is secured by bolts 20 to the mounting 12. The solenoid-operated diaphragm pump 18 includes a pumping chamber 22 having a one-way inlet valve 24 (shown only in Fig. 2) and a one-way outlet valve 26 (also shown only in Fig. 2) which serve to permit fuel to pass in only one direction through the chamber 22 from the inlet to the outlet thereof. The inlet valve 24 communicates with the inlet port 14, whilst the outlet valve 26 communicates with the filter element 10 so that fuel which has passed through the outlet valve 26, is passed into the filter element 10 to be filtered and then leaves the device through the outlet port 16. The pump chamber 22 is closed by diaphragm 28 which is displaceably secured in a manner known per se to a plunger 30. The plunger 30 extends into and forms the movable core or armature of a solenoid (not shown) mounted in a body 32 which is secured to the mounting 12 by the bolts 20. The arrangement is such that, when the solenoid is energised, the plunger 30 is drawn upwardly so as to move the diaphragm in a direction which increases the volume of the pump chamber 22. A sensing element (indicated schematically at 34) which includes a position sensor 36 (Fig. 2) and electrical switch 38 (Fig. 2) is provided for de-energising the solenoid. When the solenoid is de-energised, the diaphragm is moved by means of a compression spring 40 so as to decrease the

volume of the pump chamber 22. In this way, fuel is drawn by the diaphragm pumping action in a manner known per se through the inlet port 14 to pass through the filter element 10 and be discharged through the outlet port 16. Such a pump is capable of pumping air and so is capable of priming the fuel system when air has been drawn into the fuel system.

If desired the pump can be operated in the opposite manner so that when the solenoid is energised the diaphragm is moved to reduce the volume of the pumping chamber with the spring acting to increase the volume of the pumping chamber to draw fuel through the inlet.

The fuel system illustrated in Fig. 2 includes fuel tank 42 having feed line 44 connected to the inlet port 14 and inlet valve 24. For the sake of simplicity, the fuel treatment device is illustrated in Fig. 2 with the various parts thereof shown schematically without illustrating the above-described mechanical juxtaposition. The fuel system further includes a fuel injection pump 46 which is fed with filtered fuel via line 48 connected with outlet port 16 of the fuel treatment device. The fuel injection pump 46 includes a low pressure transfer pump which supplies a high pressure pump. However, the transfer pump cannot provide the lift required to draw fuel from the tank 42. In the above described embodiment, the solenoid operated diaphragm pump 18 operates during normal pumping of fuel from the tank 42 to the fuel injection pump 46 and not just when priming of the fuel system is required after entry of air into the system.

Claims

1. A fuel treatment device for incorporation into the fuel system of an internal combustion engine comprising a mounting (12), a fuel treatment chamber defined in a part (10) adapted to be secured to the mounting, inlet and outlet ports (14, 16) communicating with the fuel treatment chamber whereby the device can be connected into the fuel system, a fuel priming pump (18) carried on the mounting and communicating with the inlet and outlet ports (14, 16) characterised by a powered actuating device (32) operably connected with the priming pump, said powered actuating device (32) being carried on said mounting.

2. A fuel treatment device according to Claim 1 characterised in that said powered actuating device (32) is a solenoid including an armature (30) which is coupled to a movable member of the priming pump (18).

3. A fuel treatment device according to Claim 2 characterised in that said priming pump includes a diaphragm (28) which is coupled to said armature (30).

4. A fuel treatment device according to Claim 3 characterised by a sensing element (34) responsive to the position of the armature (30) for de-energising the solenoid upon completion of the stroke of the armature, and a return spring (40) for returning the armature following de-energisation of the solenoid.

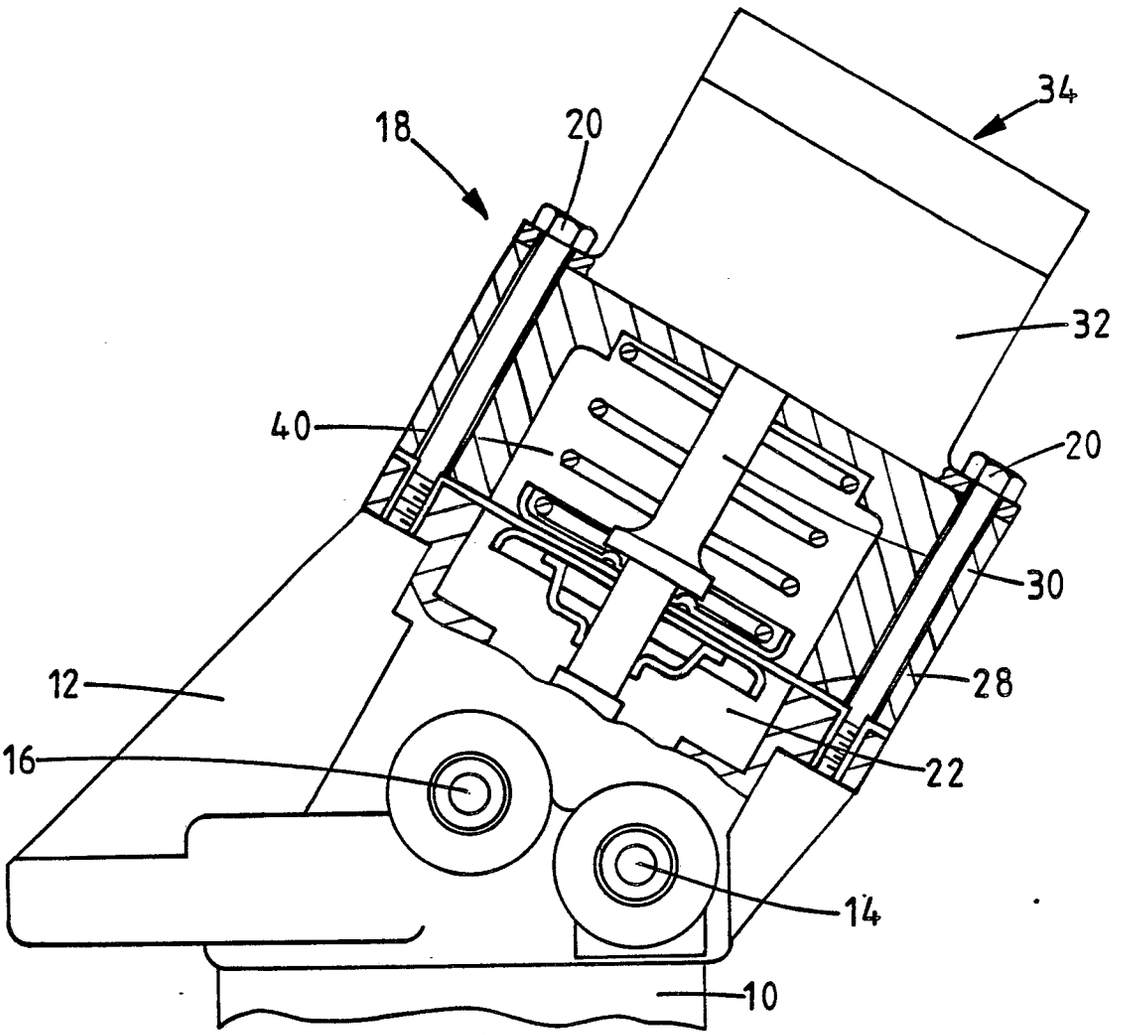
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FIG. 1.

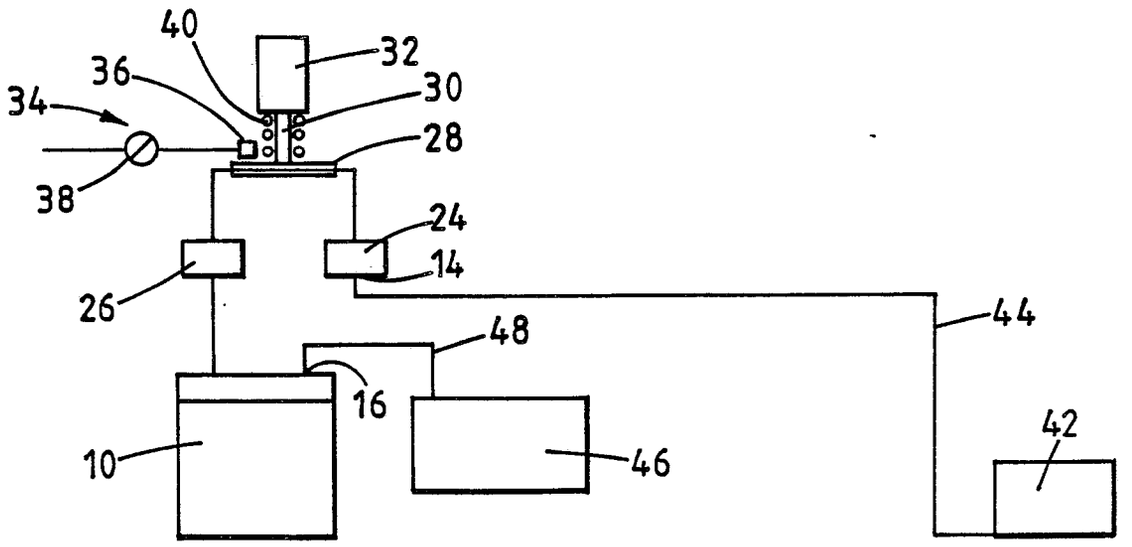
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FIG. 2.