Nov. 9, 1948. J. H. CLARK 2,453,196

FUEL CONTROL SYSTEM FOR DIESEL ENGINES

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FIG. 1.

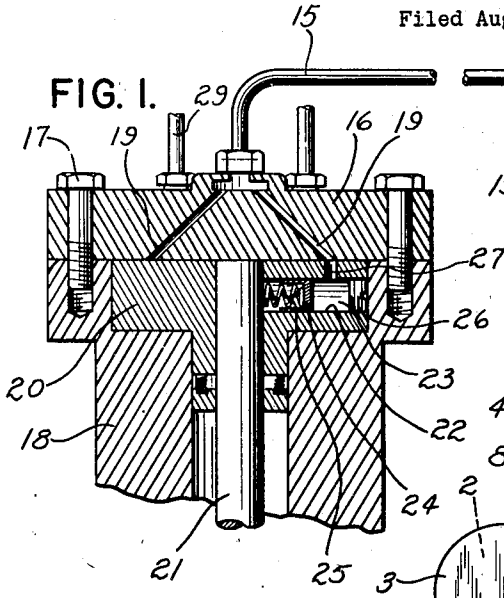


FIG. 3.

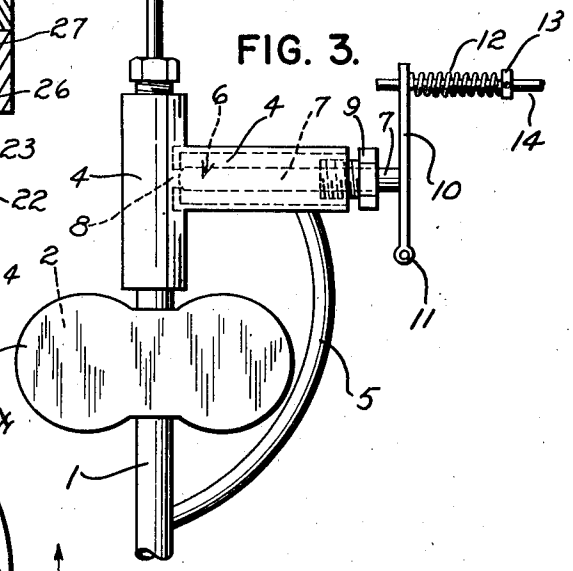


FIG. 2.

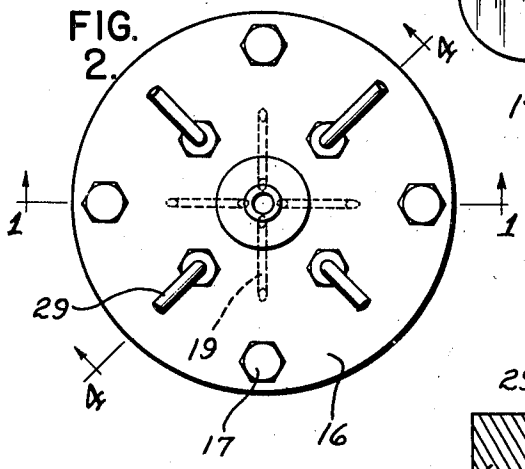
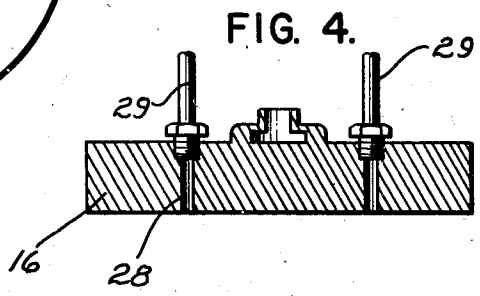


FIG. 4.



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FUEL CONTROL SYSTEM FOR DIESEL ENGINES

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3 Claims. (Cl. 123—138)

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This invention relates to a fuel control system, and more particularly to a fuel control system for Diesel engines.

The problem of feeding fuel oil to a Diesel engine has long been recognized. The fuel is forced under pressure to the high-pressure injector pumps but there has been inadequate control of the fuel feed. It is therefore a major object of this invention to provide an improved fuel control system embodying a pressure system in which the fuel is metered and in which a greater or lesser amount of fuel is fed as needed.

Another object of this invention is to provide an improved fuel feed system for Diesel engines in which there is included a by-pass valve for by-passing a greater or lesser amount of fuel to vary the fuel pressure and the amount of fuel fed to the injectors.

A further object of this invention is to provide in a fuel pressure system for Diesel engines, a pressure pump for feeding the fuel to a metering pump which feeds a charge of fuel to each of the injector pumps and in which the size of the charge is controlled by the amount of pressure and in which a by-pass valve is provided to vary the amount of the pressure.

Still another object of this invention is to provide a fuel control system for Diesel engines in which a rotary metering pump is provided in association with a distributor cap so that charges of fuel are metered to the cylinder heads as the pump rotates and in which the size of the charges is controlled by an operator through the foot accelerator or equivalent means.

It is also a further object of this invention to provide a fuel pressure system for Diesel engines in which the fuel is forced under pressure into a metering device and in which the pressure is controlled by a by-pass valve to thereby control the operation of the metering device.

Other objects of this invention will appear from the following specification and claims and from the accompanying drawing illustrating the invention, wherein:

Figure 1 is a sectional view of part of the fuel pressure system, including the distributor cap and metering pump, and taken on line 1—1 of Figure 2;

Figure 2 is a plan view of the distributor cap;

Figure 3 is an elevational view of part of the fuel pressure system, showing the fuel pressure pump, the by-pass valve, and the control for the by-pass valve; and

Figure 4 is a sectional detail, taken on line 4—4 of Figure 2, and showing the distributor cap.

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Referring to the drawing, the tube 1 conducts fuel from the fuel supply (not shown) to the pressure pump 2 included in housing 3. The pressure pump 2 may be of any conventional type. Above the pressure pump 2 is located a pressure regulator valve fitting 4, having a by-pass tube 5 for directing by-passed fuel back to the tube 1. The fitting 4 includes a pressure regulator valve 6, including a valve stem 7 and a valve opening 8 communicating with the tube 1 above the pressure pump 2. The valve stem 7 is slidably mounted in the bushing 9 and has its outer end in contact with the lever 10, pivoted at 11, and normally urged to the left, in Figure 3, by a coil spring 12, having one end bearing against lever 10 and the other end fastened to a boss 13 on a rod 14. The rod 14 is reciprocated from a conventional foot accelerator, governor, or hand throttle (not shown) to vary the pressure exerted by spring 12 on lever 10, and thereby vary the pressure on the valve stem 7 and its position relative valve opening 8. Thus control of rod 14 will control the valve 6 to vary the amount of fuel, under pressure from pump 2, that will be by-passed through fitting 4 and by-pass tube 5. In normal operation the pressure of the fuel at opening 8 will oppose the pressure of the spring 12 and varying the pressure of spring 12 through rod 14 will vary the size of the valve opening 8 and the amount of by-passed fuel. It is evident that the greater the amount of fuel by-passed, i. e., the larger the opening 8, the less fuel pressure there will be in tube 15, communicating with tube 1 above the valve fitting 4. Thus when rod 14 is moved to the left, valve stem 7 will be moved to the left to decrease the size of the opening 8, less fuel will be by-passed, and the greater will be the fuel pressure in tube 15. Conversely, when rod 14 is moved to the right, the size of valve opening 8 will increase and more fuel will be by-passed and less fuel pressure will be evident in tube 15.

The fuel from tube 15 passes into a distributor cap 16; bolted at 17 to a mounting 18. As shown in Figure 1, the distributor cap 16 has a plurality of passageways 19, communicating with the tube 15, and diverging downwardly. Rotatably mounted beneath the distributor cap 16 is a distributor disc 20, mounted on a rotatable shaft 21. The distributor disc 20 is indexed in timed relation to the engine so that fuel will be fed, as described hereinafter, in synchronism with the engine.

The disc 20 is provided with a metering pump 22 composed of a cylinder 23, a piston 24, normally urged outwardly by a coil spring 25, and a

screw 26 closing off the cylinder 23. A passageway 27 has one end communicating with cylinder 23 and its other end in the circular path of the lower ends of passageways 19 so that as the disc 20 is indexed in synchronism with the motor, a charge of fuel under pressure will pass from passageway 19, through passageway 27 and into the cylinder 23. The size of each charge will vary depending on the fuel pressure since the greater the fuel pressure, the greater the pressure on piston 24, the more spring 25 will yield and the greater will be the size of the cylinder chamber. As the disc 20 rotates it will receive a charge from each passageway 19.

Now intermediate the passageways 19, the distributor cap 16 is provided with passageways 28, shown in Figure 4. Now as the passageway 27 reaches each passageway 28, the charge of fuel in the cylinder 23 will be forced out of the cylinder by the pressure of spring 25 on piston 24 and into the passageway 28. Thus charges are alternately picked up when passageway 27 is in communication with one of the passageways 19 and discharged when passageway 27 is in communication with the next succeeding passageway 28.

Each passageway 28 is in communication with a tube 29, each of which leads to a high-pressure injector pump (not shown) for forcing the charge of fuel into a cylinder head. Thus each cylinder receives a charge of fuel and since the distributor disc is indexed in synchronism with the engine, each cylinder will receive its charge from one of the tubes 29 at the proper moment.

Also when the engine is operating at full load, movement of rod 14 to the left by the driver, or otherwise, will decrease the amount of fuel bypassed, will increase the fuel pressure in passageways 19, and thereby increase the size of each charge and thus more fuel, as needed, will reach the engine cylinder. Thus there is a regulation of the fuel as needed by controlling the by-pass, and the fuel is metered accurately to each engine cylinder insuring a smoother operating motor, and eliminating motor racing or running out of control when air leaks occur in the fuel lines.

The fuel system of this invention can be used on high speed automotive type engines or on stationary engines. It is evident that there has been provided a simple positive means of metering the fuel to each cylinder as required depending on the speed and load conditions.

The distributor cap illustrated is for a four-cylinder engine since there are four passageways 19 and four passageways 28. However it is within the purview of this invention to utilize a greater or lesser number of passageways depending on the number of cylinders in the engine.

While a certain specific embodiment of this invention has been shown, it will be understood that various modifications may be made within the spirit of the invention. Therefore no limitations on the invention are intended other than are imposed by the scope of the appended claims.

What is claimed is:

1. A fuel control system for Diesel engines comprising a fuel pipe; means for pumping fuel under pressure through said pipe; a distributing and metering means communicating with said pipe for forming charges of fuel and feeding said charges to the Diesel engine cylinders in synchronism with engine speed; and means controllable from the engine accelerator for varying the fuel pressure in said pipe; said distributing and metering means comprising an indexing disc, a cylindrical chamber in said disc, a piston reciprocable in said chamber to vary the size of said chamber, a coil spring normally urging said piston outwardly to decrease the size of said chamber, and a passageway leading from said pipe to said chamber whereby when the fuel pressure is varied the pressure on said piston against said spring will vary to vary the size of said chamber.

2. A fuel control system for Diesel engines comprising a fuel pipe, means for pumping fuel under pressure through said pipe, a distributing and metering means communicating with said pipe for forming charges of fuel and feeding said charges to the Diesel engine cylinder in synchronism with engine speed, and means controllable from the engine accelerator for varying the fuel pressure in said pipe, said last-mentioned means comprising a T-fitting in said pipe, a by-pass tube connected to said T-fitting for by-passing fuel from said pipe to decrease the fuel pressure, a valve in said T-fitting for controlling the amount of fuel by-passed and the amount of fuel pressure, said distributing and metering means comprising an indexing disc, a cylindrical chamber in said disc, a piston reciprocable in said chamber to vary the size of said chamber, a coil spring normally urging said piston outwardly to decrease the size of said chamber, and a passageway leading from said pipe to said chamber whereby when the fuel pressure is varied, the pressure on said piston against said spring will vary to vary the size of said chamber.

3. A fuel control system for Diesel engines comprising a fuel pipe, means for pumping fuel under pressure through said pipe, a distributing and metering means communicating with said pipe for forming charges of fuel and feeding said charges to the Diesel engine cylinder in synchronism with engine speed, and means controllable from the engine accelerator for varying the fuel pressure in said pipe, said distributing and metering means comprising an indexing disc mounted for rotation about a vertical axis, a transversely-extending cylindrical chamber in said disc, a piston reciprocable in said chamber to vary the size of said chamber, resilient means normally urging said piston outwardly to decrease the size of said chamber, and a passageway leading from said pipe to said chamber whereby when the fuel pressure is varied, the pressure on said piston against said resilient means will vary to vary the size of said chamber.

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