Sept. 11, 1934. K. E. LYMAN 1,973,215

INJECTOR

Filed Dec. 5, 1932

FIG. 1.

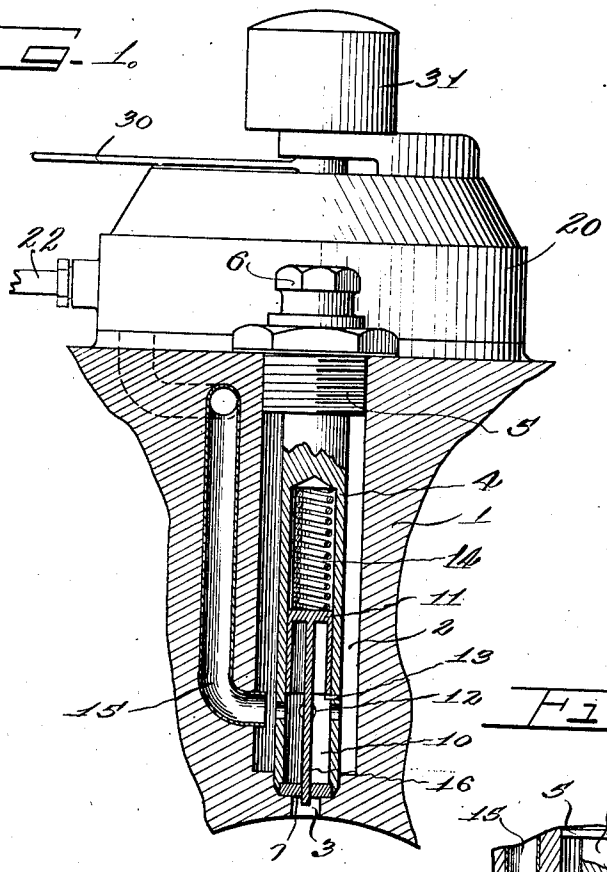


FIG. 2.

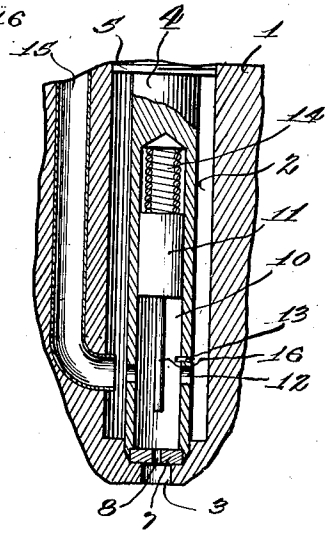
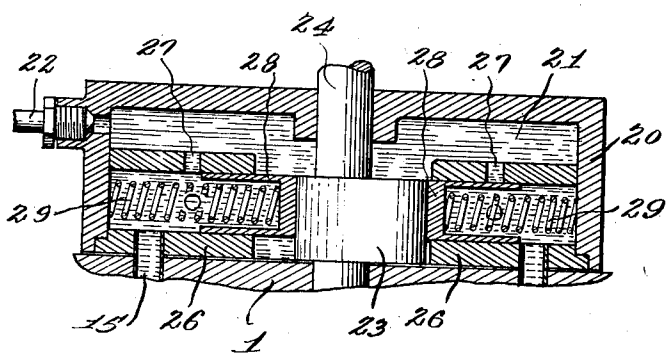


FIG. 3.



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UNITED STATES PATENT OFFICE

1,973,215

INJECTOR

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Application December 5, 1932, Serial No. 645,728

2 Claims. (Cl. 299—107.6)

This invention relates to a self-cleaning injector nozzle for use in internal combustion engines and the like.

More specifically this invention relates to a fuel injector nozzle having a cleaning mechanism for the injector orifice which is automatically brought into operation when the fuel supply pressure is reduced.

It is well known that the bleeder holes or injector orifices of fuel injector nozzles become carbonized or otherwise obstructed during the normal course of operation. The bleeder hole is usually of a very small diameter, being of a capillary size in some instances, and it is readily apparent that the forcing of a fluid through such a small orifice will eventually cause dirt and other foreign materials entrained in the fuel to become deposited at the orifice thereby clogging the discharge.

Furthermore in the case of internal combustion engines the injector nozzles open into the combustion chamber of the engine and readily become clogged with carbon formed by incomplete combustion within the cylinder of the engine.

I have now devised a fuel injector which is self-cleaning and which eliminates the clogging heretofore universally encountered in fuel injectors.

It is therefore an object of this invention to provide an injector nozzle having an automatic cleaning device for the discharge orifice.

It is a further object of this invention to provide a self-cleaned fuel injector for use in internal combustion engines and the like.

A more specific object of this invention is to provide a fuel injector having a discharge orifice which is periodically cleaned by automatic means brought into operation when the fuel pressure becomes lowered beyond a predetermined point.

The specific object of this invention is to provide a fuel injector nozzle for internal combustion engines having a discharge orifice which is reamed automatically after each explosion in the cylinder of the engine.

Other and further objects of this invention will become apparent as the description proceeds.

On the drawing:

Figure 1 represents a cross sectional view of an internal combustion engine block or cylinder head having a well therein provided with an injector nozzle according to this invention. The parts shown in elevation mounted on top of the engine block are fuel distributing means.

Figure 2 is an enlarged broken view showing the cleaning device of the injector nozzle in detail.

Figure 3 is a cross sectional view of the fuel feed mechanism preferably used for supplying fuel to the improved injector nozzle.

As shown on the drawing:

The reference numeral 1 indicates the engine block or cylinder head of an internal combustion engine having a well 2 drilled therein with a restricted opening 3 leading to the combustion zone above a piston in the motor (not shown).

The reference numeral 4 indicates generally the injector nozzle of this invention which is mounted in the well 2 by means of a bushing 5 screwed into the member 1. A nut 6 is provided for properly seating the nozzle 4 into the well.

A member 7 containing the bleeder hole or discharge orifice 8 (Figure 2) is mounted at the bottom of the injector nozzle 4 as shown in Figures 1 and 2. The member 7 rests on the shoulder formed above the opening 3 and the bottom of the well 2 within the cylinder head.

The injector nozzle 4 is provided with a recessed chamber 10 extending back from the bottom of the nozzle to provide a cylinder for receiving a piston 11 which is slidably mounted therein.

Portholes 12 are provided through the walls of the nozzle entering into the chamber 10 for passages permitting fluid to enter into the chamber.

A pin or stop member 13 prevents the piston 11 from closing the portholes 12. A spring 14 normally forces the piston 11 downwardly against the pin 13.

The piston 11 is provided with an elongated pin member 16 adapted to snugly fit into the orifice 8 of the member 7 as shown in Figure 1. The pin 16 acts as a reamer to clean the discharge orifice 8 after each injection of fuel therethrough.

Fuel is fed to the well 2 and from thence into the chamber 10 preferably in intermittent charges through a pipe line 15 extending through the member 1 and entering the well at a point adjacent the ports 12.

While it is to be understood that any charging mechanism may be used to supply fuel to the pipe line 15 I prefer to use a hydraulic system such as is disclosed in Figures 1 and 3 and more fully described and claimed in my copending application Serial No. 645,727 filed of even date herewith.

As shown in Figures 1 and 3 the reference numeral 20 indicates a housing forming a reservoir for a head of fuel 21 (Figure 3). Fuel is fed to

the housing 20 through a pipe line 22 connected with a supply tank (not shown).

A plurality of piston pumps (one for each cylinder of the engine) are radially disposed around a cam 23 secured to a rotating shaft 24 extending through the housing 20.

The piston pumps as shown in Figure 3 comprise hollow cylindrical members 26 having portholes 27 through their walls permitting fuel from the reservoir 21 to fill the interior of the cylinder. Pistons 28 are slidably mounted in the cylinders and spring means 29 force the pistons against the cam 23 so that after the eccentric throw of the cam has depressed a piston and caused the fuel within the cylinder to flow to an injector nozzle the piston will return and allow additional fuel to enter the cylinder through the porthole 27.

As has already been indicated above, the eccentric throw of the cam 23 revolving on the shaft 24 depresses a piston 28 causing it to slide over the portholes 27 thereby closing the same from the reservoir 21. Obviously any further depression of the piston will force fluid in the cylinder through a pipe line 15 into the chamber 10 of the injector nozzle 4.

The fuel is forced into the chamber 10 under sufficient pressure to overcome the resistance of the spring 14 and raise the piston 11 in the chamber to compress the spring. The raising of the piston 11, of course, raises the pin 16 out of the discharge orifice 8 and permits fuel to enter into the combustion zone of the engine. As soon as the charge of fuel has been supplied to the engine the piston 11 is forced downwardly by the compressed spring 14 and the pin 16 again closes the orifice 8 as shown in Figure 1.

In Figure 1 the reference numeral 30 indicates a lever arm for controlling the amount of fuel fed to the injector nozzles in each charge. In gasoline engines the distributor head for the ignition system may conveniently be placed on top of the fuel reservoir tank 20 as shown at 31.

While my invention has been specifically described in connection with an internal combustion engine and particularly a gasoline engine such as is used in automobiles it is to be understood that the injector nozzle is readily adapted for use in any type of feed mechanism where a fluid is ejected through an orifice. Any curtailment of fuel supply to the orifice automatically brings the cleaning or reaming device into operation while simultaneously closing the orifice and protecting the same from damage.

I am aware that many changes may be made and numerous details of construction may be varied through a wide range without departing from the principles of this invention, and I therefore do not purpose limiting the patent granted hereon otherwise than necessitated by the prior art.

I claim as my invention:

1. A fuel injector adapted to be operatively inserted in a well provided in the cylinder head of an internal combustion engine having a restricted portion opening into the combustion chamber of the engine thereby forming a shoulder at the bottom of the well, comprising an elongated cylindrical member having an external diameter smaller than the internal diameter of the well, a recessed chamber in said cylinder, a piston slidable in said chamber, a pin extending from said piston, a replaceable circular disc having a discharge orifice in the center thereof seated on the shoulder at the bottom of the well and held into position by the end of the cylindrical member, a boss screwed into the cylinder head at the top of the well, a nut in screw-thread relation with said boss for holding said elongated cylindrical member in position, port holes through said elongated member forming passageways from the well to the recess chamber, spring means for forcing the piston downward so that the pin carried thereby is inserted into the orifice in the circular disc, and means for intermittently supplying a charge of fuel to the well whereby the fuel enters the recessed chamber through the port holes below the piston to raise the piston and remove the pin from the discharge orifice.

2. A fuel injector adapted for insertion in a well formed in the cylinder head of an engine, said injector comprising an elongated cylinder having an external diameter substantially smaller than the diameter of said well, said well having a bottom with an orifice and said injector having a cylindrical chamber with a closure seated upon the bottom of the well, rotatable means for pressing the injector against the bottom of the well, a spring pressed plunger in said cylindrical chamber having a pin, said closure having a restricted opening for receiving said pin, the wall of said elongated cylinder having openings below said plunger for receiving fluid from said well, and means for supplying fluid to said well.

KENNETH E. LYMAN.