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FUEL INJECTOR FOR ENGINES

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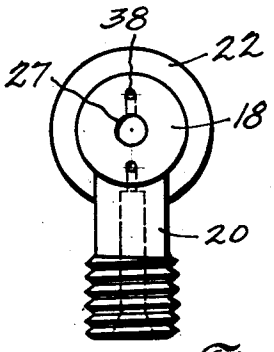


Fig. 5

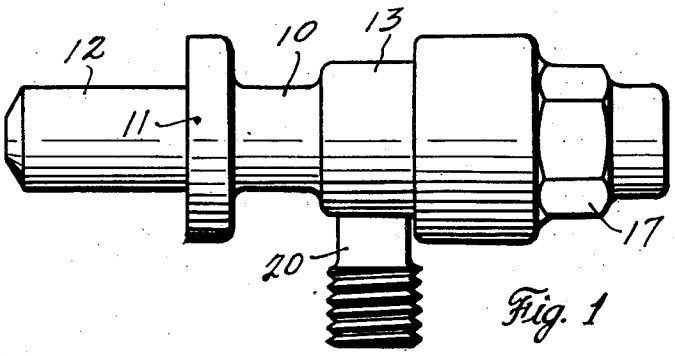


Fig. 1

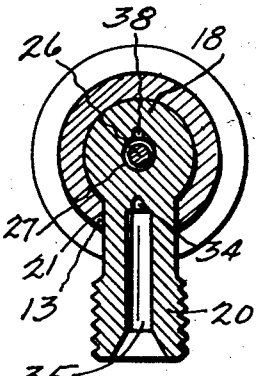


Fig. 4

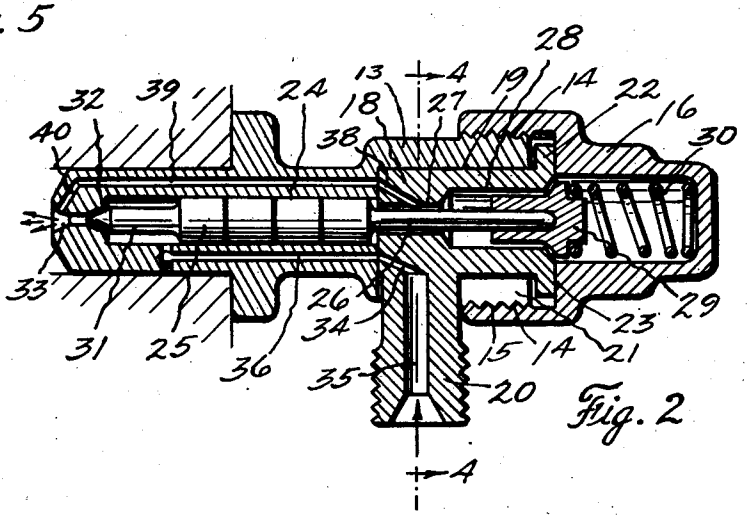


Fig. 2

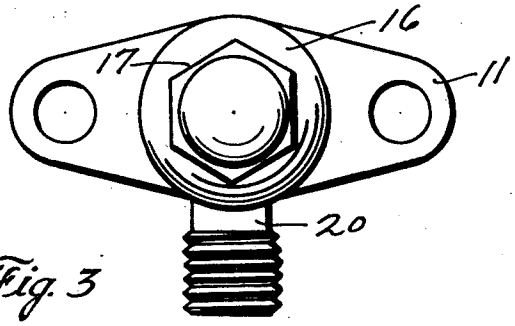


Fig. 3

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UNITED STATES PATENT OFFICE

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FUEL INJECTOR FOR ENGINES

Application filed October 20, 1930. Serial No. 490,003.

This invention relates to new and useful improvements in fuel injectors for engines.

A particular object of the invention is to provide an injector or jet for a combustion engine of the Diesel type.

One of the objects of the invention is to provide a bypass whereby the oil which is trapped behind the valve plunger may be expelled and carried forwardly to the nozzle of the injector, thus not only disposing of the trapped oil but doing away with the use of exterior conductors for carrying this trapped oil to a storage point as is the common practice.

Another object of the invention is to provide means for removing a surplus of oil from the bypass so as to prevent dripping at the nozzle.

Still another object of the invention is to provide a removable bushing for connection with the fuel supply line, together with means for aligning and positioning said bushing, whereby it is held against rotation and its ports caused to register with the ducts of the injector body.

A construction designed to carry out the invention will be hereinafter described together with other features of the invention.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawing in which an example of the invention is shown, and wherein:

Figure 1 is an elevation of an injector constructed in accordance with the invention,

Figure 2 is a longitudinal sectional view of the same,

Figure 3 is a rear elevation of the injector,

Figure 4 is a transverse sectional view taken on the line 4—4 of Figure 2, and

Figure 5 is a partial front elevation of the bushing.

In the drawing the numeral 10 designates the cylindrical body of the injector having laterally directed ears 11 integral therewith. The ears are utilized for securing the injector to the cylinder, as is indicated in Figure 2. That portion of the body extending forwardly of the ears constitutes a nozzle 12. At the rear the body is formed with an enlarged boss 13 having external screw threads 14 for receiving the internal threads 15 of a cap 16. The cap telescopes over the boss and is provided with wrench faces 17, whereby it may be turned.

A cylindrical bushing 18 is inserted and snugly fitted in a socket 19 in the boss 13. This bushing has a depending nipple 20 at its forward end which is rectangular in cross-section, so as to fit in a longitudinal slot 21 in the bottom of the boss. By this arrangement the nipple depends from the body and the bushing is held against rotation. The bushing is provided with an outwardly directed flange 22 on its rear end which abuts a shoulder 23 in the cap and by tightening the cap the bushing is firmly held in its socket.

The body 10 forwardly of the socket 19, has an axial cylindrical bore 24 which receives a plunger 25 mounted to slide therein in the usual manner. The plunger is provided with a rearwardly directed stem 26 which extends through a counterbore 27 in the bushing. The counterbore, being of less diameter than the bore 24, permits the bushing to act as a stop to limit the rearward movement of the plunger. The stem extends through an enlarged axial bore 28 in the bushing and fits into a flanged cap nut 29, which has its forward end telescoping into said bore. A coiled spring 30 confined in the cap 16 has its forward end surrounding said nut. The spring impels the plunger forwardly.

The plunger 25 has an axial needle valve 31 extending forwardly in the bore 24 so that its tapered end or point engages in a complementary seat 32. A Venturi port 33 extends axially of the nozzle from the seat to the outer end of said nozzle. The spring 30 acts to hold the valve seated against back pressure until the tension of the spring is overcome.

The bushing 18 has an inclined port 34 extending forwardly from the upper end of the bore 35 of the nipple 20. This port registers with a duct 36 in the body 10, as is shown in Figure 2. The forward end of the duct discharges into the forward end of the bore 24 forwardly of the plunger 25. The fuel is supplied to the nipple by suitable means and is

forced through the bore 35, port 34 and duct 36 into the bore 24. The fuel accumulating in the forward end of the bore 24 provides a sufficient fuel charge. When sufficient pressure is built up in the bore the tension of the spring 30 will be overcome, whereby the plunger 25 will be displaced rearwardly and the needle valve 31 withdrawn from its seat 32. This will cause the charge of fuel oil to be discharged through the Venturi port 33 and injected into the cylinder in a spray, as is customary.

It is obvious that the operation will be intermittent and rapid. As soon as the pressure in the bore 24 is reduced the spring 30 will of course close the valve and as a high pressure is built up the reciprocation of the plunger will be rapid. Owing to the high pressure there will be a leakage of oil along the plunger 25 and this oil will be trapped in the bushing 18 and the cap 16. Unless this trapped oil is released it would soon interfere with the operation of the plunger. It is customary to carry off this trapped oil through exterior pipes or by other means, and one of the features of the invention is to avoid such connections.

An inclined port 38 extends from the counterbore 27 and registers with a duct 39 extending forwardly in the body 10 above the bore 24. This duct has a downwardly inclined extension 40 at its forward end opening into the front end of the port 33. By this arrangement a bypass is formed and when the plunger 25 moves rearwardly it will expel the trapped oil through the bypass so that it will be discharged through the Venturi port 33. When the plunger is moved forwardly a slight suction will be created in the counterbore 27, which will draw a certain amount of oil out of the bypass, thus preventing dripping at the forward end when the valve 31 is closed.

By removing the cap 16 and the bushing 18 the plunger may be withdrawn and the parts cleaned, replaced, repaired, or otherwise worked upon without disconnecting the body of the injector from the engine cylinder. The whole device is compact and all of its parts are readily accessible.

Various changes in the size and shape of the different parts, as well as modifications and alteration, may be made within the scope of the appended claims.

Having illustrated and described a preferred form of the invention, what I claim, is:

1. In an injector for an internal combustion engine, a body having a bore and a spray outlet at its forward end, a plunger slidable in the bore, and a valve connected with the plunger, the body having a by-pass for conducting fluids from in rear of the plunger to the spray outlet at the front end of the body in advance of the valve, so as to discharge said fluids with the spray of fuel.

2. In an injector for an internal combustion engine, a body having a nozzle and a longitudinal bore, a plunger in the bore, a valve operated by the plunger and seating in the nozzle, a spring impelling the valve, and means for by-passing fuel fluid trapped behind the plunger to the bore of the nozzle beyond the valve.

3. In an injector for an internal combustion engine, a body having a nozzle and a longitudinal bore, a plunger in the bore, a valve operated by the plunger and seating in the nozzle, a spring impelling the valve, a chamber at the rear of the body and also located at the rear of the plunger for trapping fuel fluid, and means in the body for by-passing the fluid trapped in said chamber from said chamber to the mouth of the nozzle beyond the valve.

4. In an injector for an internal combustion engine, a body having an elongated bore, a plunger in the bore of the body, the body having a socket in rear of the bore, a bushing fitting in the socket, means for fastening the bushing in the socket, the bushing having a fuel fluid passage connected with the bore of the body, the socket having a longitudinal slot, and a nipple depending from the bushing through the slot.

5. In an injector for an internal combustion engine, a body having a bore, a plunger in the bore of the body, the body having a socket at the rear of the bore, a bushing fitting in the socket, means for fastening the bushing in the socket, a chamber at the rear of the bushing, the body having a fuel fluid passage connecting with the bore, a by-pass for conducting fluids from the chamber in rear of the plunger to the front end of the body, the socket having a longitudinal slot, a nipple depending from the bushing through the slot, the bushing having a port registering with the fuel passage for connecting the same with the nipple, and the bushing also having a port registering with the by-pass for connecting the same with the chamber.

6. In an injector for an internal combustion engine, a body having a nozzle and a longitudinal bore, a plunger in the bore, a valve operated by the plunger and seating in the nozzle, a chamber at the rear of the body for trapping fluid behind the plunger, a fluid by-pass extending from the chamber to the bore of the nozzle, whereby the trapped fluid is by-passed through the body and discharged through the nozzle when the valve is opened, also when the valve is closed a certain portion of the fluid will be drawn out of said by-pass by suction created in the chamber, thus preventing dripping at the nozzle.

7. In an injector for an internal combustion engine, a body having a longitudinal bore

and a nozzle, a plunger slidable in the bore, the nozzle having a Venturi discharge port and a valve seat inwardly of the port, an axial needle point valve extending from the plunger and engaging the seat, a spring impelling the plunger, the body having a socket, the socket having a longitudinal slot, a bushing fitting in the socket, a nipple depending from the bushing through the slot, a fuel passage connecting the nipple with the longitudinal bore in front of the plunger, a chamber in the bushing in rear of the plunger, and a by-pass connecting the chamber with the Venturi discharge port.

8. In an injector for an internal combustion engine, a body having a longitudinal opening therethrough provided with a spray nozzle at its front end, a valve for closing the inner end of the bore of the nozzle, a plunger connected with said valve for opening and closing the same, and means for by-passing fluids from the opening of the body in rear of the plunger to the bore of the nozzle outwardly of the valve.

9. In an injector for internal combustion engines, a body having a fuel fluid inlet and a fuel passage connected with said inlet, said body also having a spray outlet at its forward end, a valve for said outlet having an operating plunger, and means for by-passing through the body to the spray outlet when the valve is opened, fuel fluid trapped about said plunger.

10. In a fuel injector for internal combustion engines, a body having an elongated bore extending longitudinally thereof, a nozzle at the front end of the body connected with the bore, the body having an enlarged socket at its rear end open to the bore, a plunger working in the bore of the body, a valve connected with the plunger and coacting with the nozzle, a bushing slidable into the socket and forming a stop for limiting the rearward movement of the plunger, and means for removably securing the bushing in the socket and upon the removal of which the bushing may be removed.

11. In a fuel injector for internal combustion engines, a body having an elongated bore extending longitudinally thereof, a nozzle at the front end of the body connected with the bore, the body having an enlarged socket at its rear end open to the bore, a plunger working in the bore of the body, a valve connected with the plunger and coacting with the nozzle, a bushing slidable into the socket, and means for removably securing the bushing in the socket and upon the removal of which the bushing may be removed, the bushing having a fuel passage and the body having a fuel passage connected to the first fuel passage and also connected to the bore.

In testimony whereof I affix my signature.

FERI A. THAHELD.