April 15, 1930. A. E. L. CHORLTON 1,754,936

INJECTION NOZZLE

Filed March 21, 1928

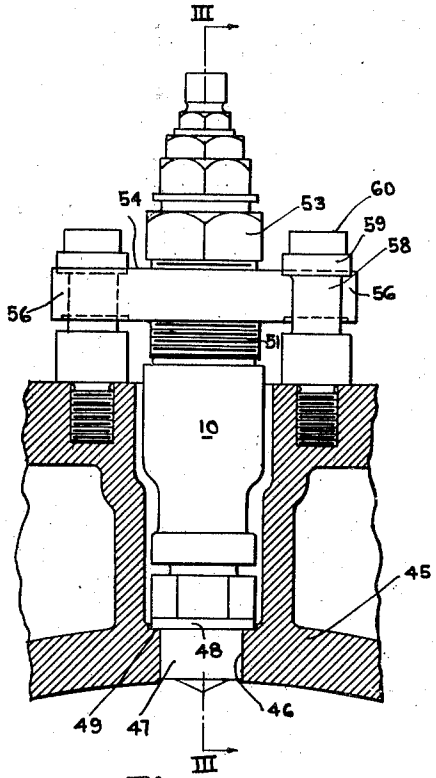


Fig. 1.

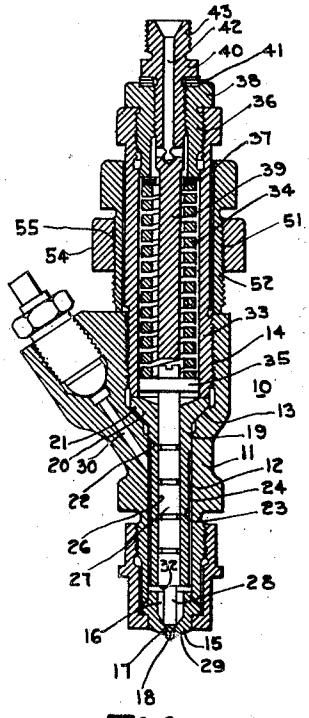


Fig. 3.

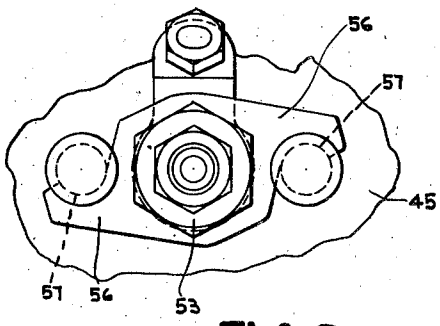


Fig. 2.

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Patented Apr. 15, 1930 1,754,936

UNITED STATES PATENT OFFICE

ALAN ERNEST LEOFRIC CHORLTON, OF LONDON, ENGLAND

INJECTION NOZZLE

Application filed March 21, 1928. Serial No. 263,419.

My invention relates to fuel injection devices and more particularly to the type used for solid or airless injection of fuel into Diesel or compression ignition engine cylinders and it has for its object to provide improved mounting means therefor, whereby an injection device may be quickly mounted and demounted without disturbance of its component parts.

With injection devices of the character referred to, it is desirable that the nozzles or injection devices be occasionally removed for cleaning. In my application Serial No. 263,418, filed Mar. 21, 1928, I have disclosed and claimed a unitary type of nozzle construction wherein the parts are so arranged that the construction may be taken apart and cleaned and reassembled with the preservation of the original spring setting and limit of valve lift, the maintenance of these adjustments, after having been carefully made, being desirable for best atomization of fuel and combustion. It is advantageous to have an engine provided with spare nozzle or injection devices, so that one may be replaced whenever required. In accordance with my present invention, I provide improved mounting means for facilitating the installation and removal of fuel injection devices or nozzles.

These and other objects are effected by my invention as will be apparent from the following description and claims taken in connection with the accompanying drawings, forming part of this application, in which:

Fig. 1 is a view showing an injection nozzle and its mounting means in side elevation with a fragment of an engine cylinder shown in section;

Fig. 2 is a top plan view of the apparatus shown in Fig. 1; and

Fig. 3 is a vertical sectional view of the fuel injection device taken along the line III—III of Fig. 1 and viewed in the direction of the arrows.

Referring now to the drawings and to so much of the fuel injection nozzle as will give a clearer understanding of the mounting means, in Fig. 3, I show a nozzle, at 10, including a body 11 having an axial bore 12 joined by a conical seat 13 to a threaded counterbore 14. A nozzle tip 15 is secured to the inner end of the body, the tip having an inlet passage 16 separated by a seat 17 from the discharge passage 18.

A barrel member 19 has an outer flange 20 having a conical seat 21 fitting the seat 13, a short portion 22 fitting the bore 12, and a major portion 23 of smaller diameter than the bore 12 and providing, with the latter, a passageway 24 leading to the tip inlet passage 16.

The barrel member is provided with an axial bore 26 within which there is arranged a valve stem 27, having a lower portion 28 of reduced diameter provided with a conical or needle valve 29 cooperating with the seat 17.

Liquid fuel is supplied under suitable pressure to the passage 30 in the body and from which it passes to the passageway 24 and enters the inlet passage 16 of the tip, the pressure of fuel acting on the piston face 32 to raise the valve 29 to a predetermined extent and against a predetermined pressure, as will be described immediately.

A sleeve 33 is threaded within the counterbore 14 and it has its lower end abutting the flange 20, clamping the latter so that the conical seat 21 fits closely the seat 13. The sleeve encloses a spring 34 having its lower end abutting a flange 35 on the valve stem 27. A bushing 36 is threaded to the interior of the outer end of the sleeve 33 and adjustable spacing means, for example, a shim pack 37, is interposed between the outer end of the spring and the bushing, whereby, when the bushing is screwed entirely home with respect to the sleeve with the flange 38 of the bushing abutting the outer end of the sleeve, a predetermined degree of compression will exist in the spring.

As already pointed out, it is desirable to limit the lift, or degree of opening, of the valve 29. To this end, I show a stem 39 having its inner end closely spaced with respect to the outer end of the valve stem 27, the amount of clearance determining the extent of lift of the valve 29. The stem 39 is threaded interiorly of the bushing 36 and it has a flange 40 between which and the outer end of the bushing there is interposed adjustable

spacing means, for example, a shim pack 41. As some fuel oil will escape by the parts to the sleeve 33, I provide a passage 42 in the stem 39 and communicating with the nipple 43 to which a return line may be attached.

Having now described the fuel injection device, referred to its unitary character, and pointed out how it may be taken apart and reassembled without disturbing the predetermined spring setting or the valve lift, I will now describe my improved mounting means for the injection device, at 10. Referring now to Figs. 1 and 2, I show engine cylinder head structure 45 having an opening 46 within which is arranged the tip clamping sleeve 47, the latter being provided with a flange 48 abutting the seat 49 disposed about the outer end of the opening 46.

Rotatable about the sleeve 33, there is a compression sleeve 51 having exterior threads 52 and a wrench engaging portion 53. A cross bar 54 has a central opening 55 threaded to the sleeve 51 and it has arms 56 provided with arcuate portions 57 arranged to engage the shanks 58 and underneath the heads 59 of stud bolts 60 connected to the cylinder structure 45.

If it is desired to remove the nozzle structure, at 10, a wrench is applied to the portion 53 and the sleeve 52 is backed off sufficiently with respect to the cross bar 54 to loosen the latter with respect to the studs 60, whereupon the cross bar may be cleared of the studs and the nozzle removed. When it is desired to replace a nozzle, the nozzle is inserted and the cross bar 54 turned to bring the arms 56 underneath the heads 59 of the studs and then the sleeve 51 screwed down, the lower end abutting the body 11 of the nozzle and gripping the latter with respect to the seat 49 on the cylinder structure.

While I have described the nozzle, at 10, in detail, this has been done merely to indicate the usefulness of the mounting means. It will be obvious that other types of nozzles may be used so long as they may accommodate a compression member cooperating with a member anchored to the cylinder structure and capable of adjustment so as to grip or to hold the nozzle structure in compression with respect to the cylinder structure.

While I have shown my invention in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications, without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are imposed by the prior art or as are specifically set forth in the appended claims.

What I claim is:—

1. The combination with an engine cylinder having an opening for a fuel injection nozzle, of a fuel injection nozzle having a tip portion fitting in said opening, a shoulder fitting against the exterior of the cylinder, a second shoulder spaced outwardly from the first shoulder, and a cylindrical portion extending outwardly from the second shoulder; and anchorage means for the nozzle including tension members carried by the cylinder, an abutment member held fixedly in place with respect to the cylinder by the tension members, and an adjustable sleeve surrounding said cylindrical portion, threaded to and movable with respect to said abutment member, and having its inner end engaging said second shoulder.

2. The combination with an internal combustion engine cylinder having an opening and a seat for fuel injection means, of a fuel injection nozzle having an inner portion fitting against said seat for discharging fuel into the cylinder, studs carried by the cylinder and disposed at opposite sides of said opening and provided with outer overhanging fixed abutments, a member having portions engageable underneath and disengageable with respect to said abutments, and adjustable compression means cooperating with said member and with the nozzle to clamp the latter in place with respect to said seat.

3. The combination with an internal combustion engine cylinder having an opening and a seat for fuel injection means, of a fuel injection nozzle having an inner portion fitting against said seat for discharging fuel into the cylinder, studs carried by the cylinder and disposed at opposite sides of said opening and provided with outer overhanging fixed abutments, a member having a portion encompassing the nozzle and portions engageable underneath and disengageable with respect to said abutments, and adjustable compression means cooperating with said member and with the nozzle to clamp the latter in place with respect to said seat.

4. The combination with an internal combustion engine cylinder having an opening and a seat for fuel injection means, of a fuel injection nozzle having an inner portion fitting against said seat for discharging fuel into the cylinder, studs carried by the cylinder and disposed at opposite sides of said opening and provided with oppositely directed fixed abutments, a member having a portion encompassing the nozzle and portions engageable underneath and disengageable with respect to said abutments by angular movement, and adjustable compression means cooperating with the encompassing portion of said member and with the nozzle to clamp the latter in place with respect to said seat.

5. The combination with an internal combustion engine cylinder having an opening and a seat for fuel injection means, of a fuel injection nozzle having an inner portion fitting against said seat for discharging fuel into the cylinder, studs carried by the cylinder and disposed at opposite sides of said

opening and provided with outer and oppositely directed fixed abutments and inner and adjacent round shanks, a member having a portion encompassing the nozzle and having oppositely directed portions provided with concave seats fitting the shanks and engageable underneath and disengageable with respect to said abutments by angular movement of the member, and adjustable compression means cooperating with the encompassing portion of the member and with the nozzle to clamp the latter in place with respect to said seat.

6. The combination with an internal combustion engine cylinder having an opening and a seat for fuel injection means, of a fuel injection nozzle having an inner portion fitting against said seat for discharging fuel into the cylinder, studs carried by the cylinder and disposed at opposite sides of said opening and provided with outer overhanging abutments, a member having a portion encompassing the nozzle and portions engageable underneath and disengageable with respect to said abutments, and threaded means cooperating with the encompassing portion of said member and with the nozzle for clamping the latter in place with respect to said seat.

7. The combination with an internal combustion engine cylinder having an opening and a seat for fuel injection means, of a fuel injection nozzle having an inner portion fitting against said seat for discharging fuel into the cylinder, studs carried by the cylinder and disposed at opposite sides of said opening and provided with outer overhanging abutments, a member having a portion encompassing the nozzle and having portions engageable underneath and disengageable with respect to said abutments, and a sleeve surrounding the nozzle and threaded to the encompassing portion of said member for clamping the nozzle in place with respect to said seat.

8. The combination with an internal combustion engine cylinder having an opening and a seat for fuel injection means, of a fuel injection nozzle having an inner portion fitting against said seat for discharging fuel into the cylinder, a pair of studs carried by the cylinder and disposed at opposite sides of said opening and provided with oppositely directed outer overhanging abutments, a cross member having a portion encompassing the nozzle and provided with oppositely directed portions engageable underneath and disengageable with respect to said abutments by angular movement of the cross member, and a sleeve surrounding the nozzle and having threaded engagement with respect to the encompassing portion of said cross member for clamping the nozzle in place with respect to said seat.

9. The combination with an internal combustion engine cylinder having a smooth-walled opening and a seat surrounding the opening, of a fuel injection nozzle having an inner tip portion fitting the opening and provided with a flange fitting said seat, said nozzle having an outwardly facing abutment spaced outwardly from said flange, a pair of studs carried by the cylinder and having oppositely directed overhanging abutments, a cross member having a portion encompassing the nozzle outwardly of said outwardly facing abutment and provided with arms having oppositely directed portions engageable underneath and disengageable with respect to said overhanging abutments by angular movement of the cross member, and a sleeve surrounding the nozzle and threaded to the encompassing portion of said cross member for engagement with said outwardly facing abutment in order to clamp the nozzle in place with its flange fitting said seat.

In testimony whereof I have hereunto subscribed my name this twenty-fourth day of February, 1928.

ALAN ERNEST LEOFRIC CHORLTON.