April 19, 1938. W. L. SCRIBNER 2,114,986

FUEL INJECTOR

Filed May 14, 1937

Fig. 1.

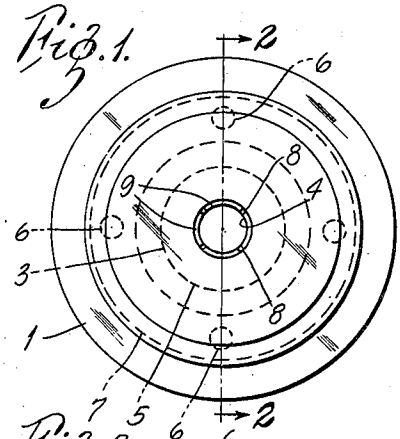


Fig. 2.

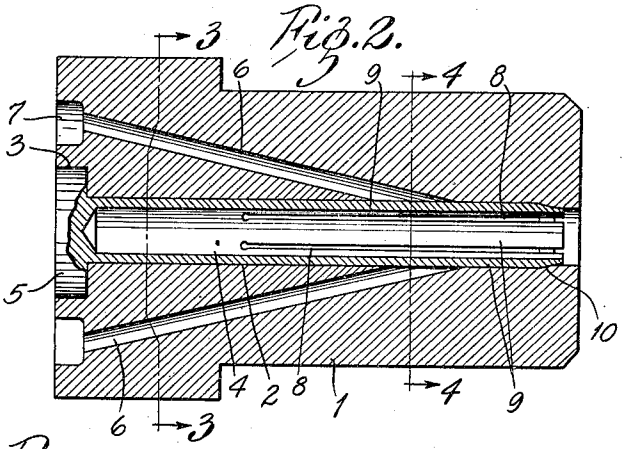


Fig. 3.

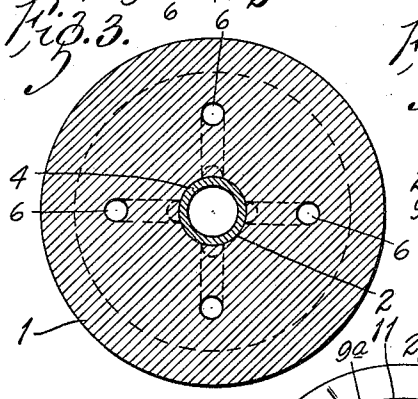


Fig. 4.

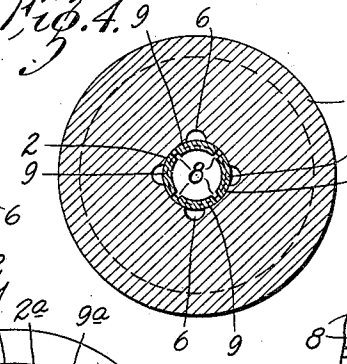


Fig. 5.

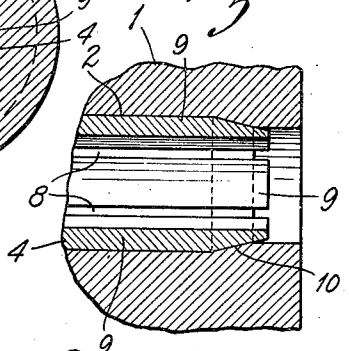


Fig. 8.

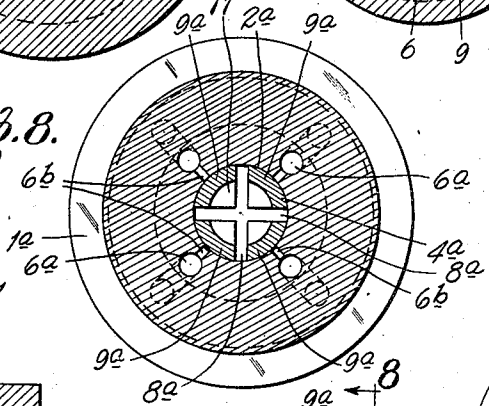


Fig. 7.

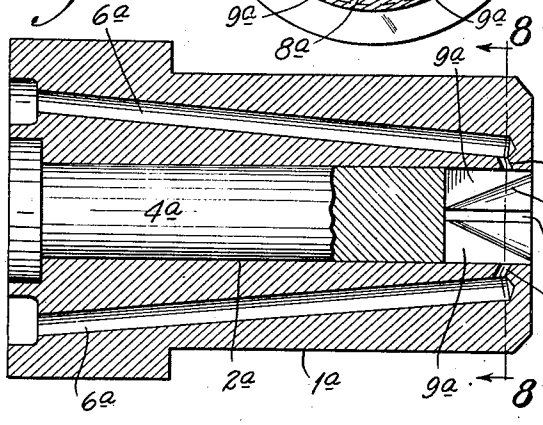
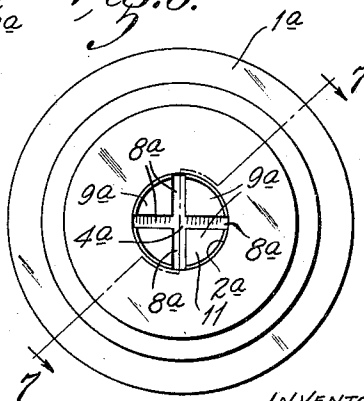


Fig. 6.



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UNITED STATES PATENT OFFICE

2,114,986

FUEL INJECTOR

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Application May 14, 1937, Serial No. 142,635

7 Claims. (Cl. 299—107.3)

This invention relates to fuel injectors, particularly hydraulically operated fuel injectors for internal combustion engines of the Diesel type. It has for its principal objects to provide a simple and efficient injection nozzle of economical construction and to obtain other objects hereinafter appearing. The invention consists in the fuel injector and in the construction, combinations and arrangements of parts hereinafter described and claimed.

In the accompanying drawing, which forms part of this specification and wherein like symbols refer to like parts wherever they occur,

Fig. 1 is a view of the outer or discharge end of a fuel injector embodying my invention,

Fig. 2 is a central longitudinal section on the line 2—2 in Fig. 1,

Figs. 3 and 4 are cross-sections on the lines 3—3 and 4—4, respectively, in Fig. 2,

Fig. 5 is an enlarged fragmentary central longitudinal sectional view of the outer or discharge end portion of the injector,

Fig. 6 is a view of the outer or discharge end of a modified form of fuel injector,

Fig. 7 is a central longitudinal section on the line 7—7 in Fig. 6; and

Fig. 8 is a cross-section on the line 8—8 in Fig. 7.

The fluid pressure operated fuel injector shown in Figs. 1 to 5, inclusive, comprises a cylindrical nozzle member or portion 1 having a cylindrical axial bore 2 extending therethrough from end to end thereof and provided at the inner end of said nozzle with a flat bottomed enlargement or counterbore 3. The nozzle is provided with a valve member in the form of a thin-walled cylindrical tube 4 that has a light press-fit in the bore 2 of said nozzle and has its inner end closed by an enlarged cylindrical head portion 5 that seats within the counterbore 3 at the inner end of said bore. Fuel under pressure from a suitable injection pump or other device (not shown) is supplied to the bore 2 of the nozzle through one or more inlet passageways 6 that lead from an annular grove 7 in the inner or inlet end of said nozzle and open into said bore intermediate the ends thereof.

The tubular valve member 4 is slit inwardly, as at 8, from its outer end to points located inwardly of the discharge ends of the fuel inlet passageways 6 to form a series of resilient sections or fingers 9. As shown in the drawing, there are four inlet passageways 6 and the tubular valve member has a corresponding number of spring fingers 9 that are disposed opposite the discharge ends of said fuel inlet passageways and thus serve to normally close the same. The tubular valve member 4 preferably terminates short of the outer or discharge end of the bore 2 of the nozzle and has its outer end tapered to engage a tapered seat 10 provided therefor adjacent to said end of said bore.

By the arrangement described, when sufficient pressure is exerted by the fuel on the spring sections 9 of the tubular valve member 4, said sections are forced by such pressure inwardly away from the discharge ends of the inlet passageways 6, thereby opening up an annular clearance space or passageway to the discharge end of the nozzle between the wall of the bore 2 thereof and said spring sections. When the pressure is relieved, the spring fingers or valve sections 9 spring back against the wall of the bore of the nozzle and thus cut off communication between the inlet passageways 6 and said bore. The pressure required to deflect or force the spring section 9 inwardly and thus open the inlet passageways 6 may be determined by the diameter and thickness of the tubular valve 4 and the length and number of spring sections thereof; and the taper of the outer end of the valve and bore may be varied to obtain the desired spray characteristics.

In the modification shown in Figs. 6 to 8, inclusive, the nozzle 1a has a straight cylindrical bore 2a and a plurality of fuel inlet passageways 6a that communicate with said bore through ports 6b adjacent to the outer end thereof. The valve member is in the form of a solid cylinder 4a that has a light press fit in the bore of the nozzle. The outer end portion of this valve member has a conical recess 11 therein and is notched, as at 8a, to a depth corresponding substantially to the depth of said recess to form a plurality of sector-shaped sections 9a that are disposed opposite the respective ports 6b and serve to normally close the same. In this construction, the pressure of the fuel on the sector-shaped sections 9a of the valve member 4a forces said sections away from the wall of the bore 2a, thereby opening up a passageway therebetween for the escape of the fuel. When the pressure is relieved, the valve sections spring back into normal position and stop the fuel discharge.

The above valve construction is simple and economical to manufacture; it permits a quick and easy replacement of the valve member; and it dispenses with the use of the more expensive spring-loaded plunger type valves, and thereby saves the cost thereof.

What I claim is:

1. A fuel injector comprising a nozzle having a bore therein and a fuel passageway adapted to be supplied with fluid fuel under pressure and opening at its discharge end into said bore through the wall thereof and a valve member mounted in said bore and covering the discharge end of said fuel passageway, the portion of said valve that covers the discharge end of said passageway being adapted to yield radially inward under a predetermined pressure of the fuel thereon and thereby permit passage of the fuel between said portion of said valve and the wall of said bore.

2. A fuel injector comprising a nozzle having a bore therein and a plurality of fuel passageways adapted to be supplied with fluid fuel under pressure and opening at their discharge end into said bore through the wall thereof, and a valve member mounted in said bore and having a longitudinally slit portion forming a plurality of sections that cover the discharge ends of the respective fuel passageways and are adapted to yield radially inward under a predetermined pressure of the fuel thereon and thereby permit the fuel to flow between said sections and the wall of said bore.

3. A fuel injector comprising a nozzle having a bore therein and a tubular valve member having a tight fit in said bore, said valve member being slit longitudinally to form a plurality of sections adapted to bear resiliently against the wall of said bore, said nozzle having a plurality of fuel inlet passageways opening at their discharge ends into said bore through the wall thereof opposite the respective sections and adapted to be supplied with fluid fuel under pressure sufficient to cause said sections to yield inwardly and thereby permit the fuel to flow from said inlet passageways into said bore.

4. A fuel injector comprising a nozzle having a bore therein and a plurality of inlet passageways opening at their discharge ends into said bore through the wall thereof intermediate the ends thereof, and a valve member mounted in said bore with a light press fit and having a plurality of sections normally covering the discharge ends of the respective inlet passageways, said inlet passageways being adapted to be supplied with fluid fuel under pressure sufficient to force said sections to move radially inward to uncover the discharge ends of said passageways and thereby permit passage of the fuel into said bore.

5. A fuel injector comprising a nozzle having a discharge bore therein and a plurality of annularly spaced inlet passageways opening at their discharge ends into said discharge bore through the wall thereof intermediate the ends thereof, and a tubular valve member having a fluid tight fit in said discharge bore and being slit inwardly from its outer end to form a plurality of circumferentially spaced fingers adapted to cover the discharge ends of the respective inlet passageways, said passageways being adapted to be supplied with fluid fuel under pressure sufficient to force said fingers to move radially inward to uncover the discharge ends of said inlet passageways and thereby permit the fuel to pass into said discharge bore.

6. A fuel injector comprising a nozzle having a discharge bore therein and a plurality of annularly spaced inlet passageways opening at their discharge ends into said discharge bore through the wall thereof intermediate the ends thereof, and a tubular valve member having a tight fit in said discharge bore and being slit inwardly from its outer end to form a plurality of circumferentially spaced fingers adapted to cover the discharge ends of the respective inlet passageways, said passageways being adapted to be supplied with fluid fuel under pressure sufficient to force said fingers to move radially inward to uncover the discharge ends of said inlet passageways and thereby permit the fuel to pass into said discharge bore, the discharge end of said bore and the corresponding ends of said fingers being adapted and arranged to obtain the desired spray characteristics.

7. A fuel injector comprising a nozzle having a cylindrical bore therein, and a solid cylindrical valve member having a tight fit in said bore and being slit longitudinally and recessed axially adjacent to the discharge end of said bore to form a plurality of segmental sections, said nozzle having a plurality of annularly spaced ports opening into said bore through the wall thereof adjacent to the discharge end thereof and adapted to be closed by the respective segments of said valve member, said ports being adapted to be supplied with fluid fuel under pressure sufficient to force said segments to move radially inward and uncover said ports and thereby permit passage of the fuel into said bore.

WILLIAM L. SCRIBNER.