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FUEL INJECTION OR SPRAY VALVE

Filed Jan. 14, 1931

Fig. 1.

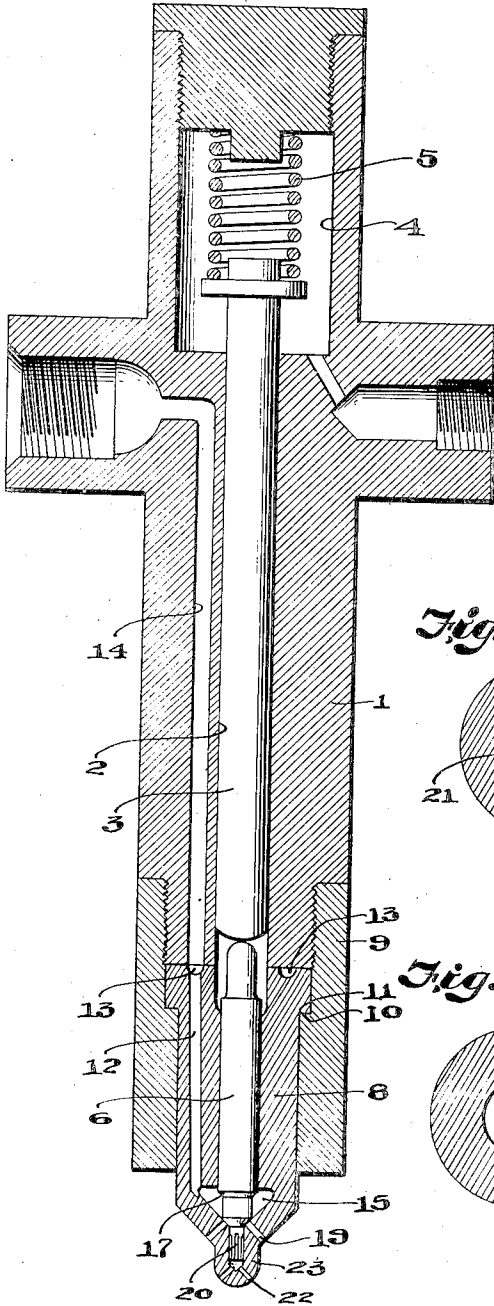


Fig. 2.

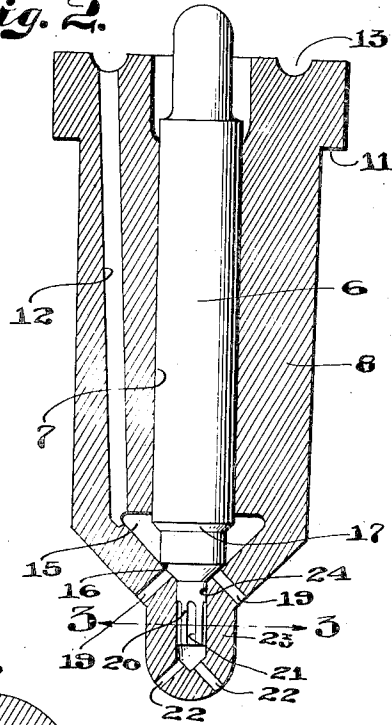


Fig. 3.

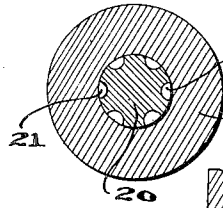


Fig. 4.

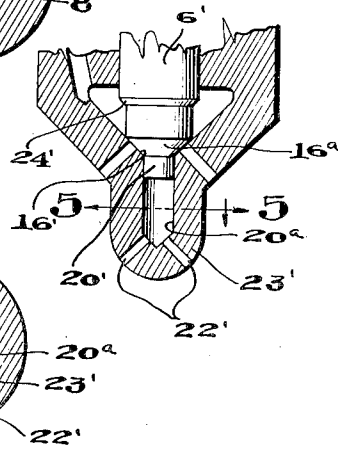
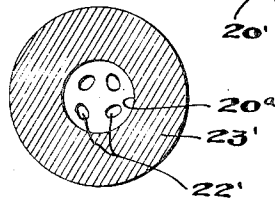


Fig. 5.



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FUEL INJECTION OR SPRAY VALVE

Application filed January 14, 1931. Serial No. 508,577.

This invention relates to fuel injection or spray valves for use in injecting fuel into internal combustion engines of the solid injection Diesel type and an object of the invention is to provide a spray valve which will produce sufficient variation in the rate of fuel injection into the cylinder to take care of the change in piston speed during combustion.

A further object of the present invention is to provide a spray or fuel injection valve which allows of use of comparatively low fuel pump pressures and of varying sprayer area by means of which the injection of the fuel oil which is burned when the piston is near top centre, is comparatively slow and the oil injected later very fast or at an increased speed. This tends to give a constant pressure combustion line with perfect combustion and eliminates the necessity of high combustion pressures to obtain good fuel consumption.

With these and other objects in view, as may appear from the accompanying specification, the invention consists of various features of construction and combination of parts, which will be first described in connection with the accompanying drawings, showing spray valves of the preferred form embodying the invention, and the features forming the invention will be specifically pointed out in the claims.

In the drawings:—

Fig. 1 is a longitudinal section through the improved spray valve.

Fig. 2 is an enlarged longitudinal section through the tip or nozzle end of the valve.

Fig. 3 is a cross section through the nozzle taken on the line 3—3 of Fig. 2.

Fig. 4 is a fragmentary section through the nozzle end of a modified form of the valve structure and

Fig. 5 is a cross section taken on the line 5—5 of Fig. 4.

Referring more particularly to the drawings, the improved spray or fuel injection valve comprises the body 1, provided with a longitudinally extending bore 2 through which the stem 3 extends. The upper end of the stem 3 extends into the chamber 4 in

the body 1 and is engaged by a spring 5 which urges the stem 3 downwardly into engagement with the valve member 6. The valve member 6 is slidably mounted in the longitudinally extending bore 7 of the nozzle carrying tip 8 of the injection valve structure. The tip 8 is attached to the body 1 by means of a sleeve 9 which threads on the body 1 and has a shoulder 10 which clamps against the shoulder 11 of the tip 8. The tip 8 is provided with a longitudinally extending passage 12 which communicates at its upper end with an annular trough 13. The annular trough 13 receives the fuel oil which is to be injected into the engine (not shown) from the oil passage 14 formed in the body 1. The fuel oil leaves the passage 12 and enters the chamber 15 in the lower end of the tip 8.

When the fuel pump (not shown) which supplies the fuel oil to the spray valve and from the spray valve into the engine (not shown) starts on its discharge stroke, it builds up pressure in the fuel oil system and when the pressure is sufficient, it lifts the valve 6 off the seat 16 by means of the oil under pressure acting against the face 17 on the valve 6, overcoming the tension of the spring 5. When the valve is lifted off the seat 16 the injection of fuel immediately occurs through the openings or bores 19, providing injection of sufficient fuel oil into the engine, when the piston is near top centre and insuring the burning or combustion of substantially all of the fuel oil injected at such time.

As the fuel oil pump still further increases the pressure in the system, the valve 6 lifts further and moves the spindle 20 still further upwardly or outwardly until the grooves or slots 21 which are formed in the outer surface of the spindle 20 at properly spaced points, are brought into communication with the chamber 15, thus opening communication between this chamber and the fuel oil injection openings 22 which are formed in the tip of the nozzle 23.

When this takes place, the full fuel pump pressure then acts on both sets of nozzles or injection openings 19 and 22, injecting the oil at a very much faster rate with a small increase in the fuel pump pressure. The spin-

dle 20 at 24 has a lap fit preventing the passage of oil to the nozzle or injection openings 22 until the spindle has sufficient lift to bring the upper ends of the grooves 21 into communication with the chamber 15. The grooves are used so that the small part of the spindle 20 will never pull out of its guiding bore in the nozzle 23.

In Figs. 4 and 5 of the drawings, a slight modification of the valve structure is shown. In this modified form, the spindle 20' is much shorter than the spindle 20 and in fact is of substantially the same length as the section 24 of the spindle 20, the grooves 21 being eliminated so that upon the increasing of the fuel pump pressure after the valve 6 has been lifted off, the valve seat 16' will, by acting upon the surfaces 24' and 16A lift the valve 6' sufficiently to move the spindle 20 out of the bore 20A in the nozzle 23' so as to permit the fuel oil to pass out of the injection openings 22'.

It will be understood that the invention is not to be limited to the specific construction or arrangement of parts shown but that they may be widely modified within the invention defined by the claims.

What is claimed is:—

1. In a fuel injection valve for internal combustion engines, a nozzle provided with spaced fuel injection openings, and means operable by pressure of fuel in the injection valve for successively opening said injection openings for fuel passage therethrough.

2. In a fuel injection valve for internal combustion engines, a nozzle provided with spaced fuel injection openings, and means for normally closing said openings, said means operable to first open one of said openings and to open the other of said openings at a predetermined interval thereafter.

3. In a fuel injection valve for internal combustion engines, a nozzle provided with a plurality of spaced sets of fuel injection openings, and a valve controlling the opening and closing of said injection openings, said valve movable to first permit injection of oil from the injection valve at a relatively slow speed and later at a relatively fast speed.

4. In a fuel injection valve for internal combustion engines, a nozzle provided with a plurality of spaced sets of fuel injection openings, a valve controlling the opening and closing of said injection opening, said valve movable under various degrees of pressure of fuel oil for successively opening said spaced sets of fuel injection openings.

5. In a fuel injection valve for internal combustion engines, a nozzle provided with a plurality of spaced sets of fuel injection openings, and a valve controlling the opening and closing of said openings, said valve movable to first open one set of openings and later open the second set of openings.

6. In a fuel injection valve for internal

combustion engines, a nozzle provided with a plurality of spaced sets of fuel injection openings, a valve controlling the opening and closing of said openings, said valve movable to first open one set of the fuel injection openings, and a spindle on said valve for preventing passage of fuel to second set of openings when the first set is first opened.

7. In a fuel injection valve for internal combustion engines, a nozzle provided with a plurality of spaced sets of fuel injection openings, a valve controlling the opening and closing of said openings, said valve movable to first open one set of the fuel injection openings, and a spindle on said valve for preventing passage of fuel to second set of openings when the first set is first opened, said valve movable to successively open said second set of openings.

In testimony whereof I affix my signature.
CLARENCE S. KENWORTHY.