

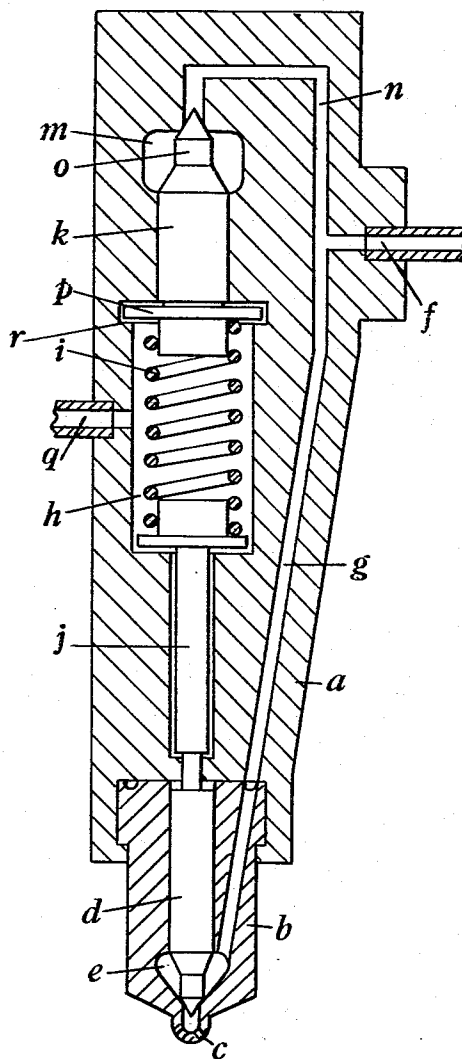
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LIQUID FUEL INJECTION NOZZLE FOR INTERNAL-COMBUSTION ENGINES

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LIQUID FUEL INJECTION NOZZLE FOR
INTERNAL-COMBUSTION ENGINES

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1 Claim. (Cl. 299—107.6)

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This invention relates to liquid fuel injection nozzles, for internal combustion engines, of the kind in which the discharge orifice of the nozzle is controlled by a valve, the latter being loaded by a spring whose pressure can be supplemented by pressure of the liquid fuel supplied to the nozzle by a pump.

The object of the invention is to provide an improved nozzle construction enabling the liquid fuel pressure to be operative on the valve in each cycle of action of the nozzle.

The invention comprises a nozzle having in combination with its body part, a main valve which controls the discharge end of the nozzle, a spring acting on the valve, a plunger having a restricted range of movement for transmitting fluid pressure to the end of the spring remote from the said valve, and a second valve combined with the plunger, the second valve being of smaller diameter than the plunger and being adapted to control a by-pass leading to the plunger from a main fuel passage in the body part.

The accompanying drawing illustrates diagrammatically one embodiment of the invention.

Referring to the diagram, we employ a hollow body part *a* having at its inner end a nipple *b* in which is formed a discharge orifice or orifices *c*. The valve *d* is in the form of a plunger slidable in a cylindrical bore in the nipple *b*, and having the end which co-operates with an annular seating adjacent to the said orifice, of smaller diameter than the part which occupies the bore. Also there is formed in the nipple between the said seating and bore a small chamber *e* which communicates with the main liquid fuel supply passage *f* by way of a passage *g*.

In another part of the body *a* is formed a chamber *h* which contains the spring *i* for exerting pressure on the valve *d*, the pressure of the spring being transmitted to the adjacent end of the valve through an intermediate stem *j*. At the opposite end of the spring to the said stem there is formed in the body another cylindrical bore which is occupied by a plunger *k* adapted to be moved by the liquid fuel pressure in the direction for supplementing the pressure exerted by the spring. Also adjacent to one end of the plunger is formed a chamber *m* having an inlet orifice coaxial with the plunger. This orifice communicates with a by-pass *n* from the main fuel passage. Also on the said end of the plunger is formed a second valve *o* of smaller diameter than the plunger *k* for controlling the said orifice. The plunger *k* is supported on the spring *i* by a shoulder *p*.

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The arrangement is such that when the nozzle is not in action, both valves are closed. When (in each action of the fuel supply pump) liquid fuel is delivered to the nozzle, the initial relatively low pressure of the liquid in the chamber *e* is sufficient to lift the valve *d* off its seating against the action of the spring *i* and so allow liquid to pass through the discharge orifice. With increase of the fuel pressure, the fuel in the by-pass *n* moves the valve *o* off its seating, thereby allowing liquid from the by-pass to enter the chamber *m* and act on the associated plunger *k* over the whole of the area of the adjacent end of the plunger for supplementing the pressure exerted by the spring *i* on the valve *d*, and so suitably regulating the continued discharge of fuel through the discharge orifice, the extent of movement of the plunger *k* being suitably restricted as, for example, by a shoulder *r* in the body part co-operating with the shoulder *p*. Towards the end of the delivery stroke of the pump the delivery pressure drops, and the valves *d*, *o* then re-close in succession, the above described operation being repeated in each operative stroke of the pump. Liquid which may seep into the chamber *h* past the valves is drained off by a passage *g*.

By this invention the required supplementing of the spring pressure on the valve *d* associated with the discharge orifice, by the liquid fuel pressure in each cycle of action is obtained in a very simple and convenient manner without preventing the valve *d* from being initially lifted off its seating by relatively low fuel pressure. The invention is not, however, restricted to the example described, as details of construction or arrangement may be modified to suit different requirements.

Having thus described our invention what we claim as new and desire to secure by Letters Patent is:

A liquid fuel injection nozzle comprising in combination a hollow body part having at one end a nipple provided with a fuel discharge outlet, a fuel inlet passage, a chamber provided in said nipple and communicating with said inlet passage, a main valve arranged in said nipple to control communication between said chamber and discharge outlet, said main valve having a part exposed to the interior of said chamber so that fuel supplied under pressure from said inlet passage to said chamber can impart inward opening movement to said main valve, a plunger arranged in said body part at a position remote from said nipple and having a restricted range of movement, a spring arranged between and acting on said valve and plunger, a by-pass commu-

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nicating at one end with said fuel inlet passage, a second chamber provided in said body part at the end of said plunger remote from said main valve, said end of said plunger being exposed to the interior of said second chamber, and a second valve of smaller diameter than and provided on said end of said plunger to control communication between said second chamber and the end of said by-pass remote from said inlet passage, whereby fuel admitted under increasing pressure to said inlet passage serves first to open said main valve and then to open said second valve.

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