

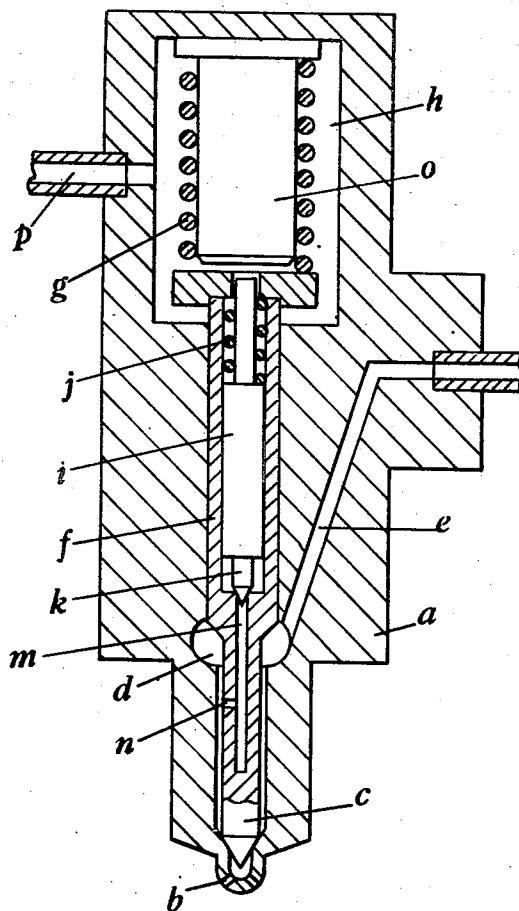
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LIQUID FUEL INJECTION NOZZLE FOR INTERNAL-COMBUSTION ENGINES

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LIQUID FUEL INJECTION NOZZLE FOR
INTERNAL-COMBUSTION ENGINESWilfrid Edward Walter Nicolls, Pinner, England,
assignor to C. A. V. Limited, London, EnglandApplication February 28, 1949, Serial No. 78,682
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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 spring loaded valve.

The object of the invention is to provide an improved nozzle whereby each injection is effected in two separate stages, the discharge in the second stage being at a higher pressure than that in the first stage.

The invention comprises the combination of a hollow body part having a discharge outlet at one end, a valve controlling the said outlet, a hollow spring loaded plunger associated with the said valve, and a second valve, with associated spring loaded plunger, in the first plunger, the second valve controlling a passage between the interior of the first plunger and the region of the body part containing the first valve, and the arrangement being such that the first valve can (in each stroke of the fuel supply pump) be initially opened by a moderate fuel pressure, this action being followed by re-closing and subsequent re-opening of the valve when the fuel pressure reaches a predetermined higher amount.

The accompanying diagram illustrates one embodiment of the invention.

Referring to the diagram, I employ a hollow body part *a* having a discharge outlet *b* at one end. This outlet *b* (which may be a single hole or a group of holes) is controlled by a valve *c* contained in a chamber *d* to which the liquid fuel can be supplied by a pump through a passage *e* formed in the body part. In association with this valve is provided a hollow plunger *f* of larger diameter than the valve. The plunger is preferably formed integrally with the valve, but may be made as a separate and connected part. The plunger is contained in a bore of corresponding diameter in the body part and is loaded by a spring *g* contained in a chamber *h* at the end of the body part remote from the discharge orifice.

In the bore of the plunger is arranged a plunger *i* which is loaded by a spring *j*, and which at one end has associated with it an integral or separately formed valve *k* of smaller diameter, this valve serving to control a passage *m* in the first valve *c* leading by way of a port *n* to the chamber containing the first valve.

The arrangement is such that a moderate pressure of fluid admitted along the passage *e* suffices, by acting on the plunger *f*, to open the valve *c* against the action of the spring *h*, thus enabling the required initial discharge to be effected. At the same time fluid from the passage *e* has access through the port *n* to the passage *m* in the valve *c*, and acts on the underside of the valve *k*. When the increasing fuel pressure reaches an amount determined by the spring *j* acting on the valve *k* the latter opens allowing fuel to enter the interior of the plunger *i* and

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move the plunger *i* against its spring *j* into contact with a stop *o*. The fluid pressure in the bore of the plunger *f* combined with the pressure of the spring *g* thereupon causes momentary re-closing of the valve *c*, and later when the fuel pressure reaches a still higher value the valve *c* is re-opened by the action of the fuel on the lower end of the plunger *f*, to enable the final discharge to be effected. With the subsidence of the fuel pressure both valves re-close under the actions of their loading springs *g*, *j*, and the above described sequence of actions is repeated during each discharge stroke of the pump. Any leakage of fuel past the plungers is drained away through an outlet *p*.

By this invention two-stage discharge of fuel from the nozzle at different pressures is obtained in a very simple and satisfactory manner. The invention is not, however, restricted to the example described, as subordinate details of construction or arrangement may be varied to suit different requirements.

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

A liquid fuel nozzle comprising in combination a hollow body having a fuel discharge outlet at one end of a chamber formed by a part of said body, a fuel inlet passage formed in said body and communicating with said chamber, a main valve arranged in said chamber and controlling said outlet, a hollow main plunger slidably arranged in said hollow body and provided at one end with said main valve, said main plunger being of larger diameter than said main valve and having a part of said end exposed to the interior of said chamber, a spring acting on said main plunger in the direction for closing said main valve, a second valve in said main plunger, a second plunger slidably arranged in said main plunger and provided at one end with said second valve, a second spring acting on said second plunger in the direction for closing said second valve, and a passage connecting the interior of said main plunger with said chamber under the control of said second valve, and exposing said second valve to the pressure in the interior of said chamber, whereby fuel admitted under increasing pressure to said chamber serves first to open, then to close, and finally re-open said main valve.

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