June 2, 1953 A. MURASZEW 2,640,420

LIQUID FUEL INJECTION PUMP FOR INTERNAL-COMBUSTION ENGINES

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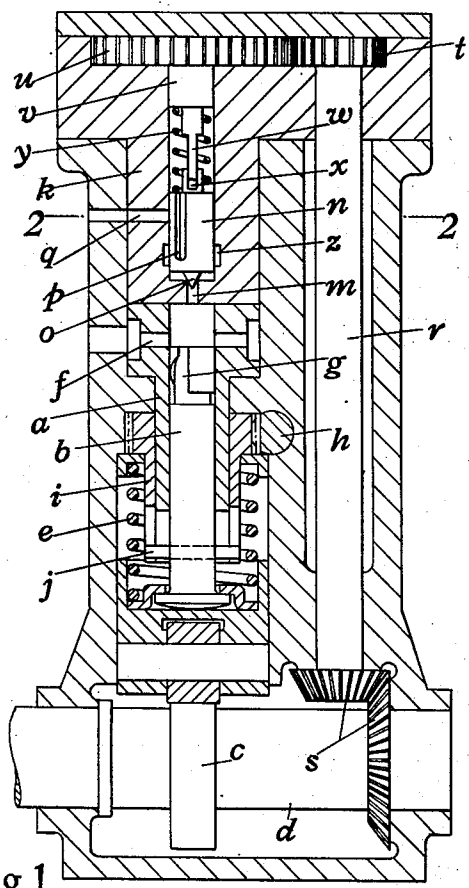


Fig.1

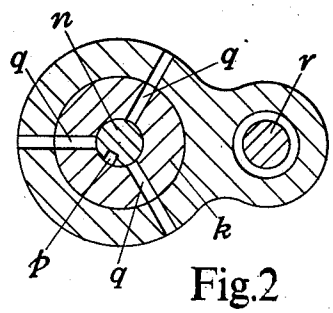


Fig.2

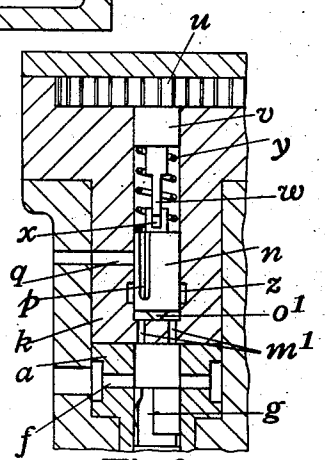


Fig.3

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LIQUID FUEL INJECTION PUMP FOR INTERNAL-COMBUSTION ENGINES

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4 Claims. (Cl. 103—2)

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This invention relates to liquid fuel injection pumps for multi-cylinder internal combustion engines, and has for its object to provide an improved pump of the kind comprising a single plunger reciprocable in a containing barrel, and a rotary distributor for directing the fuel discharged by the plunger from the barrel to each in turn of the engine cylinders.

The invention comprises a pump of the kind aforesaid, having combined therewith a spring-loaded reciprocatory and rotatable discharge valve which (by its reciprocatory motion) controls the outlet from the pump barrel, and which (by its rotary motion) serves as the distributor.

In the accompanying drawings:

Figure 1 is a sectional side elevation of a pump embodying the invention and

Figure 2 is a cross section on the line 2—2, Figure 1.

Figure 3 is a fragmentary view illustrating a modified form of the valve shown in Figure 1.

Referring to Figures 1 and 2, there is contained in the barrel *a* of the pump, a reciprocatory plunger *b*, the discharge strokes of which are effected by a cam *c* or eccentric on a rotary driving shaft *d*, and the suction strokes of which are effected by a spring *e*. In the barrel is provided a fuel inlet port *f* (or ports) situated adjacent to the position occupied by the inner end of the plunger when at the end of its suction stroke. Also this end of the plunger may be provided with a spill-passage *g* which, on rotation of the plunger in its barrel by any normal governing means, controls the volume of fuel delivered in each discharge stroke. In the example shown, the plunger is rotatable by a slidable control bar *h* in engagement with a toothed sleeve *i* which surrounds the barrel and is connected to the plunger by a cross piece *j*.

Coaxially wtih the discharge end of the pump barrel is arranged a part *k* having therein a port *m* with which co-operates the control valve. This latter comprises a cylindrical spring-loaded plug *n* slidable and rotatable in a bore in the part *k*. At one end the valve is formed with a conical or like part *o* adapted to seat on the adjacent end of the said part. Also along an appropriate part of its length it is formed with a longitudinal groove *p* which (on rotation of the valve) establishes communication with each in turn of a plurality of delivery passages *q* adapted to be connected to the engine cylinders.

Rotation of the valve is effected at an appropriate rate by a spindle *r* arranged parallel with the pump plunger. At one end this spindle is

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connected through a pair of pinions *s* with the driving shaft and at the other end it is connected with the valve by a pair of pinions *t*, *u*, the pinion *u* having extending from it a short spindle *v* formed with a tongue *w* which is slidable in a slot *x* in the adjacent end of the valve, the latter being loaded by a spring *y*.

The arrangement is such that during the suction stroke, the valve *n* is held on the discharge port *m* by its spring *y*. During the delivery stroke the valve is moved off its seating against the action of the spring by the pressure of the fuel, and the fuel is delivered through the particular passage *q* then in communication with the groove *p* in the valve. Preferably the portion of the valve immediately adjacent to the part *o* which co-operates with the port *m* occupies the adjacent portion of the bore in which the valve is located. Also in the bore above this part is formed an annular groove *z* with which communicates one end of the groove *p*. The annular groove *z* is isolated from the port *m* by the said portion of the valve when the latter closes, and so effects a slight suction in the then open delivery passage *q* which prevents dribbling at the discharge nozzles in the engine cylinders.

In Figures 3 there is shown an alternative form of the valve *n*. This comprises a cylindrical plug as above described, but differs in that instead of the conical part *o* adapted to co-operate with a discharge port *m*, it is provided with a short projection o^1 which can rest on a plain portion of the end of the bore in the part *k*, and around the said portion are formed a plurality of discharge ports m^1.

By the use of a single valve member as above described, which serves both for isolating the plunger barrel from the delivery passages during the suction strokes and for establishing communication with the appropriate delivery passages during the discharge strokes, a pump of the kind specified can be provided in a very simple form.

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

1. A liquid fuel injection pump for a multi-cylinder engine comprising, in combination, a single plunger reciprocable in a containing barrel, means for reciprocating the plunger, means associated with the plunger for controlling the volume of fuel delivered at each discharge stroke, a single spring-loaded and longitudinally reciprocable discharge valve controlling an outlet from the pump barrel to a plurality of delivery pas-

sages, means for rotating said discharge valve about its longitudinal axis, and means associated with said discharge valve for distributing fuel in turn to said delivery passages as determined by the rotation of the valve.

2. A pump according to claim 1, in which the discharge valve comprises a cylindrical plug formed at one end to control by its longitudinal reciprocation the outlet from the pump barrel, said plug having a longitudinal groove adapted to establish communication between the said outlet and each in turn of the delivery passages.

3. A pump according to claim 1, in which the discharge valve comprises a cylindrical plug occupying a cylindrical bore, the valve being formed at one end to control by its longitudinal reciprocation the outlet from the pump barrel, the said cylindrical bore having therein an annular groove which is isolated from the discharge end of the pump barrel by the valve when the said valve is in its closed position, the said plug having a longitudinal groove which is in communication at one end with the aforesaid annular groove and which is adapted to establish communication,

through the annular groove, between the said outlet and each in turn of the delivery passages.

4. A pump according to claim 1, comprising a rotatable spindle for driving the discharge valve, a gear wheel on said spindle, a second gear wheel meshing with the first gear wheel and having its axis aligned with the longitudinal axis of the discharge valve, a driving coupling between the said second gear wheel and the said valve adapted to permit relative axial movement of the valve, and a valve-loading spring associated with the coupling.

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