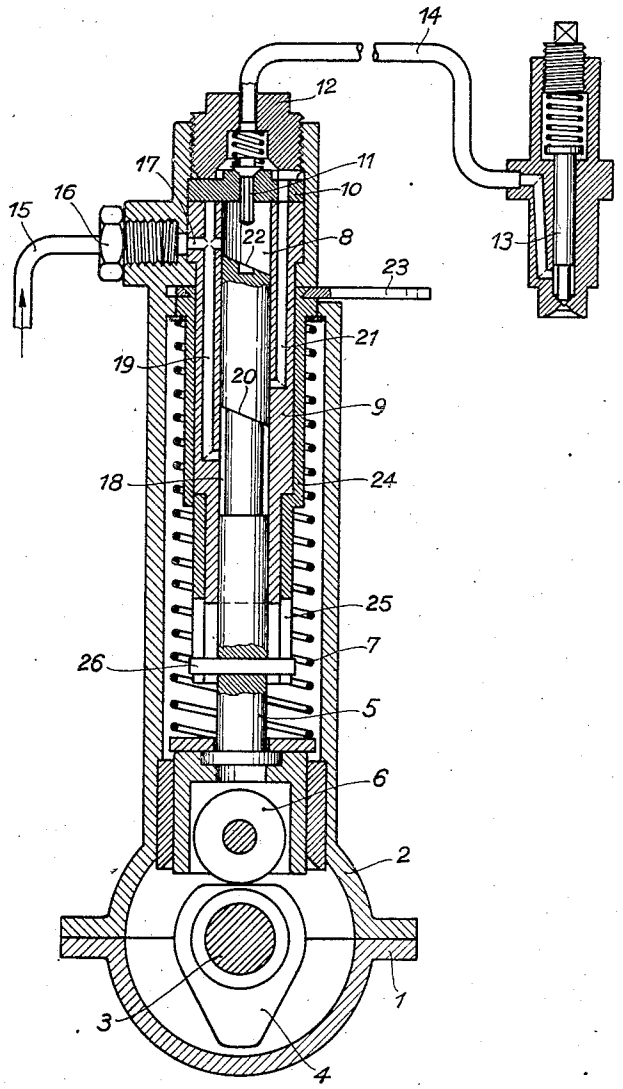
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FUEL PUMP

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FUEL PUMP

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This invention relates to a fuel pump to be used in connection with oil motors operating with self-ignition of the fuel which is injected through a nozzle that operates without air. The nozzle is supplied with the fuel through a delivery pipe which is relieved so that a part of the fuel is permitted to flow back through a channel controlled by an edge.

Now, according to this invention, the injection-end is also shifted at the same time, also by means of said edge, the arrangement being such that the delivery pipe relieving edge serves also for shifting the injection end and serves, therefore, also for regulating the amount to be delivered. The respective arrangement and combination of parts is very simple and allows of an easy assembly. It is illustrated diagrammatically and by way of example on the accompanying drawing on which is shown an axial section through the same.

The pump casing consists of a small member 1 and a large member 2, and where these members join one another there they form bearings for a shaft 3 provided with a cam 4 by which the piston 5 is intermittently lifted. This is effected by the intermediary of a roller 6 inserted into a separate enlarged foot of the piston. The roller 6 is constantly pressed against the cam 4 by a helical spring 7. The piston is guided in an axial bore 8 of a sleeve 9, and the free end of said bore is closed by a cover 10 holding a spring-actuated valve 11. The cover 10 and the spring are kept in place by a threaded plug 12, from the centre portion of which extends a pipe 14 to the injection nozzle 13.

The fuel is supplied to the pump through a pipe 15 terminating in a threaded plug 16 screwed into the pump casing 2. The sleeve 9 is provided with a longitudinal channel 19 communicating at its upper end by a lateral bore 17 with the pipe 15, and at its lower end with a shallow, but comparatively long circumferential groove 18 of the piston 5. The bore 17 extends through the wall of the cylinder into the bore 8, of the same, where its orifice is controlled by the oblique upper end surface 22 of the piston 5. Also one of the piston edges at the groove 18, viz. the upper edge 20, is oblique, its slope corresponding to that of the upper end surface 22, or to the edge of this surface respectively. Another channel 21 of the sleeve 9 terminates opposite the upper portion of the piston (at least in the position shown in the figure) and communicates at its upper end with the fuel delivery pipe, as shown. In a certain position of the lifted piston the channel 21 communicates also with the groove 18, and, therefore, with the channel 19, too, as well as with the fuel supply pipe 15, the pipes 15 and 14 being then also in communication with each other. As long as this communication exists, the fuel pressed by the piston through the valve 11 into the pipe 14 will flow back on the way 21 18 19 17 16 15, and the pipe 14 will be relieved so that the nozzle 13 can be closed quickly and tightly by its appertaining spring.

The piston 5 can be turned by means hereinafter described, and the position of the sloping edges 20 and 22 relatively to the inner ends of the passages 17 and 21 can, therefore be varied, that is to say, they will be opened and closed earlier or later according to the degree of turning of the piston, and the supply of the fuel to the nozzle can be controlled in this way. In the position of the piston as shown in the figure the amount of fuel supplied to the nozzle will be the largest possible.

The piston 5 carries near its lower end a cross-pin 26, which projects at both ends and engages slots 25 of a rotatory sleeve 24 enclosing the stationary sleeve 9 and being encompassed by the helical spring 7. The piston and said rotatory sleeve are coupled with each other by said pin 26, irrespective of whether the piston is lifted or not, and as the sleeve 24 can be turned more or less by a lever 23 firmly connected with it, it follows that also the piston can be turned more or less by said lever.

The shaft of the valve 11 extends into the bore 8 so that the valve is opened positively near the end of the delivery stroke whereby a reliable ventilation and evacuation of the pump cylinder is warranted.

The places where the channels 19 and 21

communicate with the groove 18 are so located that this groove when having been filled with fuel from the pipe 14 cannot run empty. In this way a simple and reliable tightening of the delivery space of the pump is attained, especially as regards the prevention of air entering along the piston wall.

In order to fill the pump cylinder securely also when the pump is running quickly, the cam 4 is so designed and arranged that the suction stroke of the piston continues a little when the control edge 22 has already fully opened the bore 17.

With the constructional form shown by way of example the control edges for the commencement and the termination of the injection have been drawn as straight lines located obliquely with respect to the pump axis, and also in the claims pertaining to this specification the control edges have been stated to extend obliquely with respect to said axis. It is, however, a matter of course that they may have a curved configuration and I wish it to be understood that I consider such constructional forms as falling within the scope of my claims. There may be conditions of service necessitating curved control edges; these latter are no departure from this invention.

Besides, although I have shown the two control edges located at the piston, this arrangement is not indispensably necessary in that it is as well possible to provide any one of said edges, or even both, in the wall of the cylinder or in an intermediate sleeve.

If the two control edges are provided at two members of the pump instead of at one and the same, as in the drawing, it is rendered possible to adjust the commencement of the injection perfectly independent of the termination of the same. This is, however, impossible, if said edges are located at one member.

I claim:

1. In a fuel pump having a piston and an intake passage and a discharge passage, a discharge valve controlling said discharge passage, and means providing a communication between the discharge side of the discharge valve and said intake passage, said piston formed to provide valve means controlling said intake passage and such communication.

2. In a fuel pump having a piston and an intake passage and a discharge passage, a discharge valve controlling said discharge passage, means providing a communication between the discharge side of the discharge valve and said intake passage, said piston formed to provide valve means controlling said intake passage and such communication, and means for adjusting the position of said piston to control the time of operation of such valve means.

3. In an internal combustion engine, a fuel pump having a piston, a discharge valve, an injection nozzle, a conduit connecting said discharge valve and said injection nozzle, said piston formed to provide an overflow valve connected to said conduit between the discharge valve and said nozzle, said overflow valve operable to periodically relieve the pressure in said conduit, and means for adjusting said piston by rotation only to control the time of operation of said overflow valve.

4. In a fuel pump for internal combustion engines, a pump piston, an intake port, a discharge valve, an injection nozzle, a pressure conduit connecting said discharge valve and said injection nozzle, a second conduit communicating with said pressure conduit and adapted to relieve the pressure therein, said piston having inclined edges and adapted to open and close said intake port and said second conduit, and means for rotating said piston about its axis to control the point of opening and closing of said intake port and said second conduit.

5. A fuel injection pump comprising a cylinder, a piston plunger slidable therein and extending outwardly therefrom, said piston covering and uncovering a port in the cylinder at a time dependent upon the angular position of the piston with respect to the cylinder, a sleeve rotatably mounted on the cylinder and extending axially beyond the end of the cylinder, and a non-rotatable but slidable connection between the extension of said sleeve and said plunger comprising a pin in one of said parts and a longitudinal slot in the other of said parts, whereby angular adjustment of said sleeve produces a corresponding change in the angular position of the piston plunger with respect to the cylinder.

6. A fuel injection pump comprising a casing, a cylinder within said casing having its upper end rigidly secured to the upper part of the casing and its lower end spaced apart from the inner walls of said casing, a piston plunger in said cylinder adapted to cover and uncover a port in the cylinder at a time dependent upon the angular position of the piston with respect to the cylinder, a cam shaft rotatably mounted in the lower part of the casing, a tappet roller engaging the cam on said shaft, a housing for said roller slidably mounted in said casing and operatively connected to said piston plunger, a sleeve rotatably mounted on the lower end of the cylinder and a non-rotatable but axially slidable connection between the lower part of said sleeve and the piston plunger located between the lower end of said cylinder and said housing whereby angular adjustment of said sleeve produces a corresponding change in the angular position of the piston plunger with respect to the cylinder.

7. A fuel injection pump comprising a cylinder, a piston plunger slidable therein and extending outwardly therefrom, said piston covering and uncovering a port in the cylinder at a time dependent upon the angular

position of the piston with respect to the cylinder, a sleeve rotatably mounted on the cylinder and extending axially beyond the end of the cylinder, a non-rotatable but slidable connection between the extension of said sleeve and said plunger, whereby angular adjustment of said sleeve produces a corresponding change in the angular position of the piston plunger with respect to the cylinder, a helical spring surrounding said rotary sleeve, one end of said spring pressing against a collar on said sleeve to prevent longitudinal displacement of said sleeve, and the other end of said spring engaging said piston plunger and serving to drive said plunger on its suction stroke.

In testimony whereof I have hereunto affixed my signature.

FRANZ LANG.