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LIQUID FUEL PUMPS FOR INTERNAL COMBUSTION ENGINES

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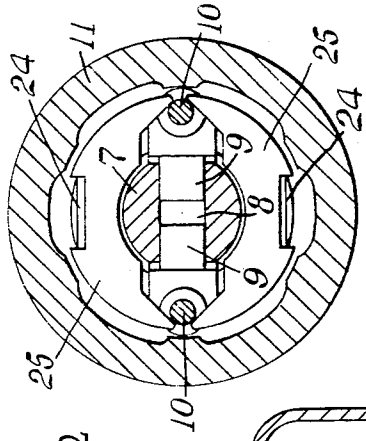


Fig. 2

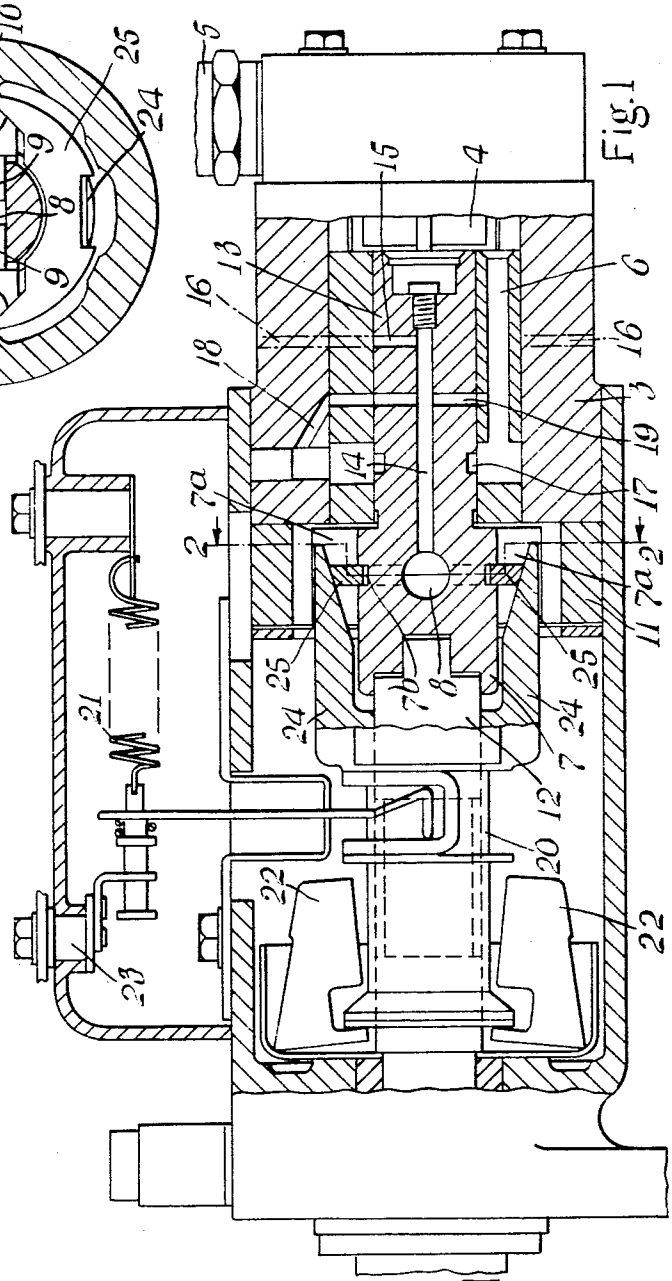


Fig. 1

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LIQUID FUEL PUMPS FOR INTERNAL COMBUSTION ENGINES

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This invention relates to liquid fuel pumps for internal combustion engines, and of the kind comprising an injection pump for supplying fuel to the engine, a feed pump for supplying fuel to the injection pump, and a rotary distributor for conveying fuel from the injection pump to each in turn of the engine cylinders, said injection pump including a pair of plungers mounted within a diametrical bore in a rotary head, and an annular stationary cam for actuating the plungers as the head rotates.

The object of the present invention is to provide in such a fuel pump convenient means for varying the quantity of fuel delivered to the engine cylinders by the injection pump.

According to the invention in a liquid fuel pump of the kind specified adjustable means is provided between the head and the annular cam for determining the amount of outward movement permitted to the plungers.

More specifically a liquid fuel pump of the kind specified and according to the invention comprises a pair of members embracing the head and shaped to coact with the outer ends of the plungers or parts carried thereby so as to determine the permitted outward movements of the plungers, and a fork rotatable with, and movable axially relative to the head, said fork having inclined surfaces co-operating with complementary surfaces on said members whereby axial movement of the fork will effect a radial setting of the members.

In the accompanying drawings FIGURE 1 is a sectional side view of an example of the invention, and FIGURE 2 is a section on the line 2—2 of FIGURE 1 with portions of the head omitted for the purpose of clarity.

Referring to the drawings the pump comprises a body part 3 which at one end contains a feed pump 4 of the kind comprising a rotary impeller provided with vanes. This pump 4 has an inlet 5 and an outlet passage 6 in the body part, and inlet and outlet passages may be interconnected through a spring-loaded relief valve (not shown) which limits the pressure which can be generated by the pump.

At the other end of the body part 3 is a fuel injection pump comprising a rotary cylindrical head 7 in which is formed a diametrical bore 8 containing a pair of reciprocatory plungers 9 which co-operate, through rollers 10 at their outer ends, with a surrounding annular cam 11.

The rotary parts of the feed and injection pumps which are adapted to be rotated by the engine through a coaxial driving shaft 12 connected to the head 7, are interconnected by a spindle 13 which serves as a distributor, and which may be formed as an integral part of the head. In the spindle 13 is formed an axial passage 14 which at one end is in communication with the diametrical bore 8 in the head, and at another position is in communication with a radial passage 15 in the spindle, which communicates (as the spindle rotates) in turn with each of a plurality of angularly spaced passages 16 in the body part leading to the different cylinders of the engine.

The feed pump 4 is adapted to deliver fuel to an annular groove 17 in the spindle, and thence to another passage 18 in the body part which communicates in turn

with each of a plurality of angularly spaced radial passages 19 in the spindle, these passages 19 opening into the axial passage 14.

In action, as the spindle and rotary pump parts rotate fuel fed to the axial passage 14 by the feed pump is discharged to the engine cylinders in turn by the inward movements of the plungers 9 of the injection pump under the action of the cam 11.

The pump so far described follows known practice but in applying the invention to such a pump, surrounding the driving shaft 12 is a sleeve 20 which is movable axially against the action of a spring 21 by a centrifugal governor 22, or by manual means 23. At one end of the sleeve is a fork 24 the limbs of which extend into slots 7a in the head 7 at positions angularly removed by 90° from the plungers 9. The inner surfaces of these limbs are inclined and co-operate respectively with complementarily inclined surfaces on a pair of arcuate members 25 also disposed between the annular cam and the head, and embracing the latter, the members being carried in a circumferential groove 7b in the head. The opposite ends of each arcuate member engage with inclined surfaces formed on the plungers 9. Moreover, the ends of the members 25 are shaped to coact with the plungers in determining the permitted outward movement of the latter. To allow clearance for the tips of the members 25, the rollers may be formed with circumferential grooves.

In FIGURE 1 the sleeve 20 is shown in a position into which it is movable by the centrifugal governor 22 when the driving shaft 12 is rotated by the engine at a predetermined speed. In this position of the sleeve 20 the arcuate members 25 serve under the action of the fork 24 to prevent actuation of the plungers 9 by the surrounding cam 11, with the result that no fuel is delivered by the injection pump.

When the sleeve 20 is moved axially from the position shown in FIGURE 1 to the extreme left hand limit of its travel, the plungers 9 can move outwardly to their fullest extent with the result that the maximum quantity of fuel will be fed to the cylinders of the engine at each inward stroke of the plungers under the action of the cam. However, as the sleeve is moved axially from its extreme left hand position to the right against the action of the spring 21 in response to a rise in engine speed or otherwise, the action of the fork 24 on the members 25 will cause the latter to move radially inwards. As a result these members will prevent the plungers from moving outwards to their fullest extent, thereby shortening their strokes and reducing the quantity of fuel supplied to the engine.

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

1. Means for supplying liquid fuel to a multi-cylinder internal combustion engine, comprising in combination an injection pump having a rotary member provided with a diametrical bore, a stationary annular cam surrounding said rotary member, a pair of plungers mounted within and extending from opposite ends of said bore so as to be movable inwardly by said cam during rotation of said rotary member, a feed pump for supplying fuel to said bore between said plungers, a rotary distributor rigid with said rotary member and provided with passages for distributing fuel from said injection pump to each in turn of the engine cylinders, radially adjustable members which are situated between said rotary member and said annular cam, and which embrace opposite sides of said rotary member and have end parts arranged to serve as stops for limiting outward movements of said plungers,

and a fork rotatable with, and movable axially relative to, said rotary member, said fork and radially adjustable members having complementary inclined surfaces which serve by contact with each other to enable the positions of said radially adjustable members at which said stops limit the outward movements of said plungers to be varied by axial movement of said fork.

2. Means according to claim 1 and having in combination spring-loaded means acting on said fork, a centrifugal governor for imparting axial movement to said fork against the action of said spring loaded means, and manually operable means for imparting axial movement to said fork through the medium of said spring-loaded means independently of said governor.

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