Nov. 27, 1951 F. M. EVANS 2,576,334

LIQUID FUEL PUMP

Filed Aug. 15, 1949 2 SHEETS—SHEET 1

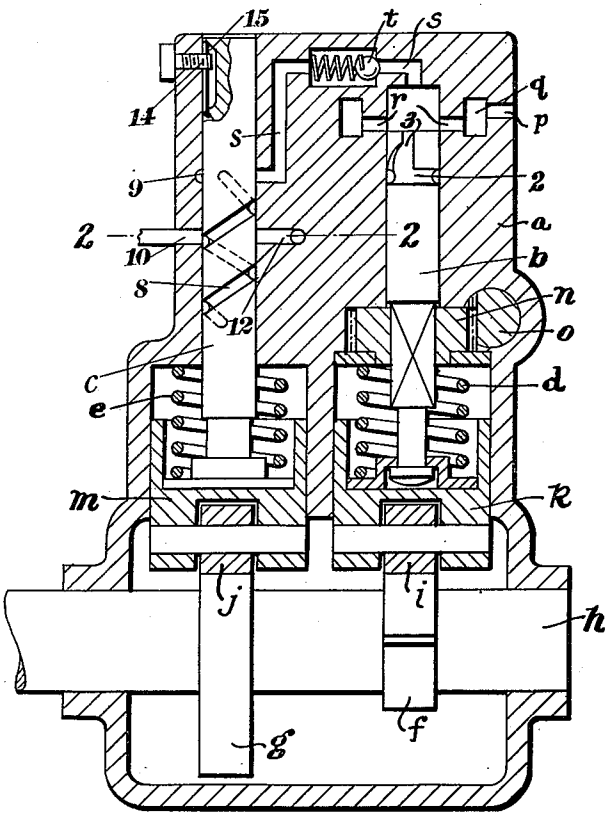


Fig.1

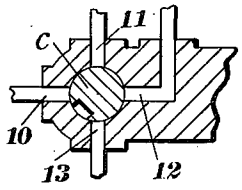


Fig.2

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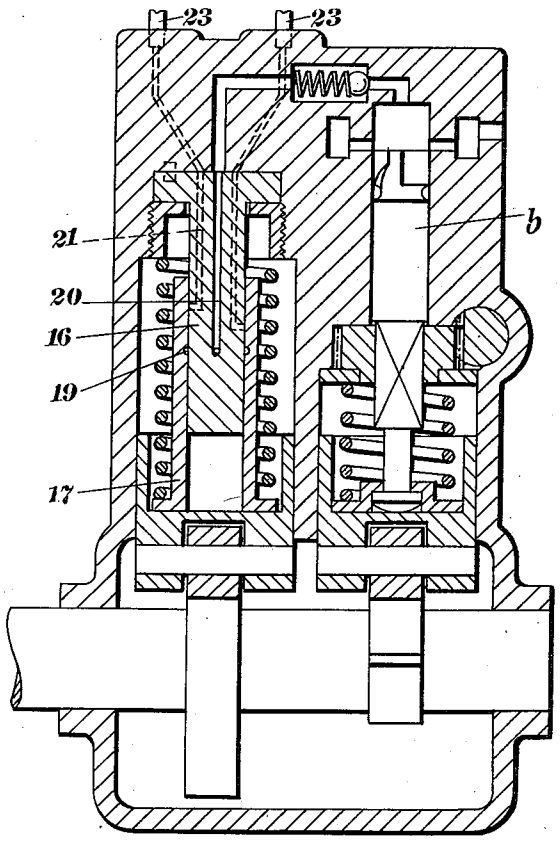


Fig. 3

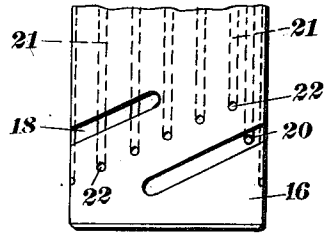


Fig. 4

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Patented Nov. 27, 1951 2,576,334

UNITED STATES PATENT OFFICE

2,576,334

LIQUID FUEL PUMP

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Application August 15, 1949, Serial No. 110,428
In Great Britain August 21, 1948

3 Claims. (Cl. 103—2)

1

This invention has for its object to provide an improved reciprocatory pump for supplying liquid fuel to the cylinders of a multicylinder engine.

In the accompanying drawings:

Figures 1 and 3 are sectional side elevations illustrating two typical embodiments of the invention.

Figure 2 is a sectional plan on the line 2—2 of the distributor shown in Figure 1.

Figure 4 is a developed or diagrammatic view illustrating the passages in the distributor plunger shown in Figure 3.

Referring to Figures 1 and 2, there are formed in a body part *a* a pair of bores, these being arranged parallel with each other. In each bore is arranged a reciprocatory and spring loaded plunger. The plunger *b* serves as the pump plunger, and the plunger *c* serves as the distributor plunger. These plungers are respectively loaded by springs *d*, *e*.

The working strokes of the plungers are effected by cams *f*, *g* on a driving shaft *h* which receives its motion from any convenient source (usually the engine). The cam *g* acting on the distributor plunger is a single lobe cam, whilst the cam *f* acting on the pump plunger has a number of lobes appropriate to the number of engine cylinders. For a four-cylinder engine a four-lobe cam is used. The cams act on rollers *i*, *j* carried by hollow cylindrical slippers *k*, *m* through which motion is transmitted from the cams to the plungers, the return strokes of the plungers being effected by the springs *d*, *e*.

For rotating the pump plunger, a pinion *n* is arranged in the body part, and a portion of the plunger (made of square or other suitable section) extends through a corresponding central hole in the pinion, the latter being suitably held against axial movement by the associated spring. The pinion is engaged by a slidable rack *o*, and the latter is responsive to the action of a governor or may be manually operated.

Adjacent to the closed end of the pump bore is provided a fuel inlet *p*. This leads to an annular passage *q* surrounding the plunger bore, and from this passage extend radial ports *r* leading to the pump bore at a position adjacent to that occupied by the inner end of the plunger at the commencement of its working stroke. At the inner end of the bore is provided an outlet passage *s* containing a spring-loaded delivery valve *t*, and this passage leads to a series of ports *u*.

For enabling the output to be varied, the pump

2

plunger has formed around it at an appropriate distance from its inner end an annular groove 2, from which extends to the said end a longitudinal groove 3. One edge of the latter groove is inclined to the other so that the wider end of the groove is adjacent to the annular groove. The grooving is so arranged that the plunger can control the inlet ports, and when rotated can (during the working stroke) re-establish at a variable position the communication with the inlet ports for varying the pump output, the regulation of output being effected by angular movement of the plunger about its longitudinal axis in response to the governor or to manual operation.

The reciprocatory distributor plunger *c* has formed around it a wide-pitched helical groove 8 which is closed at both ends and which extends along a large part of the length of the plunger. In the bore of the cylinder in which the plunger slides, is formed an annular groove 9 in communication with the passage *s* to which fuel is supplied from the pump, and fuel is free to flow from the said annular groove into the helical groove. At an appropriate position along the bore are formed outlet passages 10, 11, 12, 13 (see Figure 5) of about the same diameter as the width of the helical groove 8, these passages being adapted to be connected by pipes to the various cylinders of the engine. The arrangement is such that the pressure of the liquid in the helical groove 8 serves to balance the plunger *c* and avoid the setting up of lateral pressure between the plunger and the containing bore. Longitudinal movements of the plunger cause each in turn of the outlet passages to be exposed to the helical groove and so allow fuel to enter the passages from the groove 8 in the desired sequence. Rotation of the plunger *c* about its longitudinal axis is (in the example shown) prevented by a key 14 engaging a groove 15 in the plunger.

In the modification shown by Figures 3 and 4, a stationary distributor plunger 16 is surrounded by a reciprocatory sleeve 17. Around the plunger is formed a helical groove 18, and in the sleeve is formed an annular groove 19. In the plunger are formed a plurality of longitudinal passages. The passage 20 is the fuel inlet passage, and this opens into the helical groove. The other passages 21 are outlet passages and correspond in number to the cylinders in the engine. These passages open into orifices 22 situated at appropriate distances apart and in different planes along the plunger. The arrangement is such that the annular groove 19 is charged with liquid

fuel from the helical groove 18, and reciprocation of the sleeve moves the annular groove into communication with each in turn of the outlet orifices 22, for enabling fuel to be supplied thereto from the annular groove. From the passages associated with the orifices 22 the fuel is conveyed to the engine cylinders through the outlet passages 23. In other respects this pump is similar to that above described.

By this invention fuel pumps for multi-cylinder engines can be provided in a simple and convenient form. The invention is not, however, restricted to the examples described, and subordinate details 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:

1. A pump for supplying liquid fuel to the cylinders of a multicylinder engine, comprising in combination a body part having a fuel inlet and a fuel outlet in communication with a bore in the body part, a pump plunger slidable in said bore to admit fuel from said inlet to said bore, and to discharge fuel from said bore to said outlet, said plunger being also capable of angular adjustment for varying the pump output, a plurality of spaced fuel delivery passages, a distributor having a pair of relatively movable parts by which said outlet is successively connectible to said delivery passages, said relatively movable parts being respectively provided with annular and helical circumferential grooves which are arranged to co-operate with each other for controlling communication between said outlet and said delivery passages, a rotary member provided with cams for imparting reciprocatory motion to said pump plunger and to one of said relatively movable parts of said distributor, and means for imparting angular adjusting movements to said pump plunger.

2. A pump for supplying liquid fuel to the cylinders of a multicylinder engine, comprising in combination a body part having a fuel inlet and a fuel outlet in communication with a bore in the body part, a pump plunger slidable in said bore to admit fuel from said inlet to said bore, and to discharge fuel from said bore to said outlet, said plunger being also capable of angular adjustment for varying the pump output, a plurality of spaced fuel delivery passages, a distributor plunger which is slidable in a second bore in said body part, and by which said outlet is successively connectible to said delivery passages, said distributor plunger being formed with a helical circumferential groove for co-operating with said delivery passages, and said second bore being formed with an annular circumferential groove which communicates with said outlet and co-operates with said helical circumferential groove, a rotary member provided with cams for imparting reciprocatory motion to said pump plunger and distributor plunger, and means for imparting angular adjusting movements to said pump plunger.

3. A pump for supplying liquid fuel to the cylinders of a multicylinder engine, comprising in combination a body part having a fuel inlet and a fuel outlet in communication with a bore in the body part, a pump plunger slidable in said bore to admit fuel from said inlet to said bore, and to discharge fuel from said bore to said outlet, said plunger being also capable of angular adjustment for varying the pump output, a plurality of spaced fuel delivery passages, a distributor by which said outlet is successively connectible to said delivery passages, and which comprises a stationary plunger having a reciprocatory sleeve thereon, said stationary plunger having said spaced delivery passages formed therein, and being formed with a helical circumferential groove and a passage connecting said groove to said outlet, and said sleeve being formed internally with an annular circumferential groove for co-operating with said helical groove and spaced delivery passages, a rotary member provided with cams for imparting reciprocatory motion to said pump plunger and sleeve, and means for imparting angular adjusting movements to said pump plunger.

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