

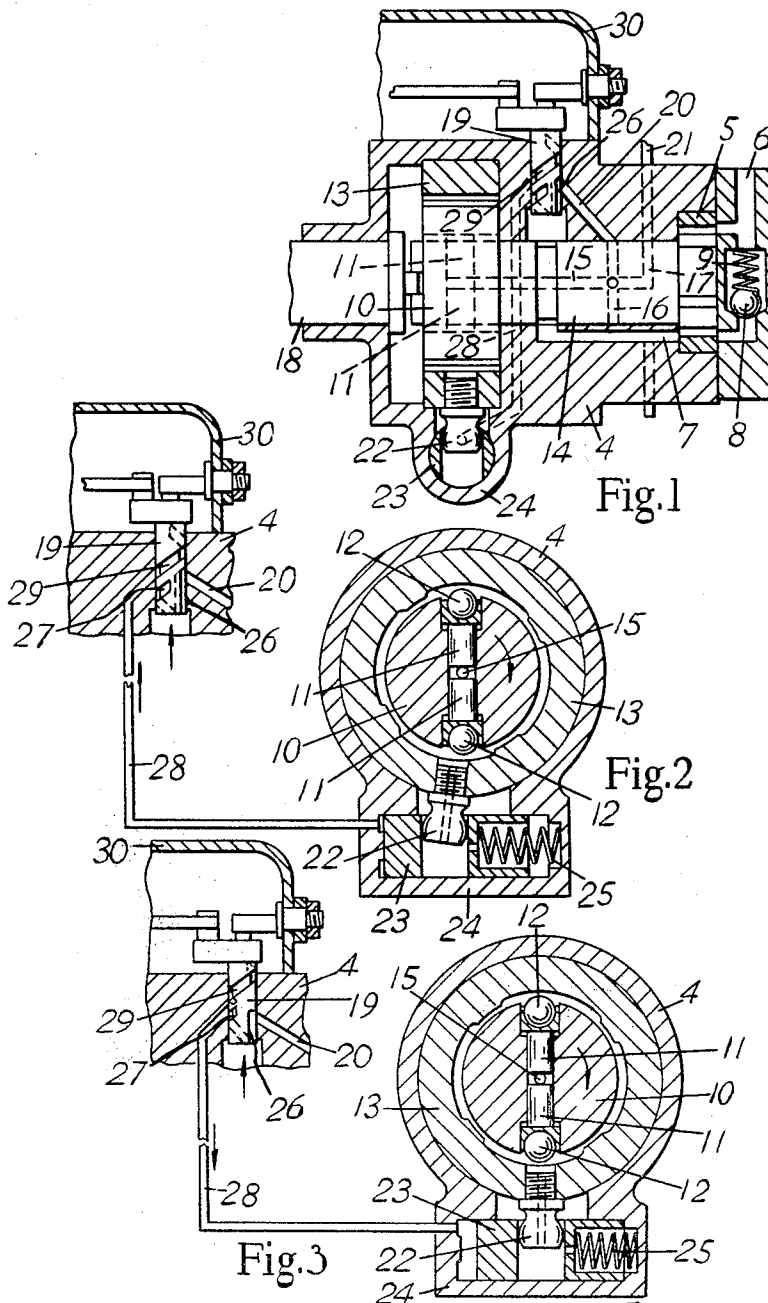
Dec. 8, 1959

K. A. W. KEMP

2,916,029

LIQUID FUEL INJECTION PUMPS FOR INTERNAL COMBUSTION ENGINES

Filed April 18, 1958



Inventor
K. A. W. Kemp
By *Glascoth Downing Leebold*
Attys.

1

2,916,029

LIQUID FUEL INJECTION PUMPS FOR INTERNAL COMBUSTION ENGINES

Kenneth Albert Walters Kemp, Ealing, London, England,
assignor to C.A.V. Limited, London, England

Application April 18, 1958, Serial No. 729,309

Claims priority, application Great Britain April 25, 1957

2 Claims. (Cl. 123—139)

This invention relates to liquid fuel injection pumps for internal combustion engines, of the kind which is supplied with fuel by a feed pump through an adjustable throttle, and comprises a rotary body having therein a transverse bore, a pair of plungers in the bore, an annular and angularly adjustable cam for imparting inward discharge movements to the plungers, and a timing plunger for imparting angular adjustments to the cam, said timing plunger being contained in a cylinder adjacent the cam, and being movable in one direction against the action of a spring by pressure of fuel in a by-pass controlled by said throttle.

The purpose of the angular adjustability of the cam is to enable the timing of the pump discharges to be advanced from a normal position to suit different engine speeds or load conditions. Moreover the throttle which is adapted to control both the supply of fuel to the pump, and the by-pass is arranged so that when fuel is supplied to the pump at maximum rate, the supply of fuel to the by-pass is cut-off.

At a low-rate of fuel supply the by-pass is open, and the timing is advanced by the action of the fuel on the plunger against the action of the spring. When, however, the throttle is moved abruptly from a low-rate position to the full-rate position, the consequent closing of the by-pass prevents the spring from moving the timing throttle promptly to its normal position owing to the fact that fuel is then entrapped in the end of the cylinder remote from the spring, and the spring can only move the plunger at a rate determined by the leakage of the entrapped fuel around the plunger.

The object of the present invention is to enable the above disadvantage to be obviated in a simple manner, and the invention consists of a throttle such that, when moved to the full-rate position it connects the by-pass to a drain, and so enables the spring to move the plunger quickly to its normal position.

In the accompanying drawings Figure 1 is a sectional side elevation of one form of combined feed and injection pump of the kind for which the present invention is required, whilst Figures 2 and 3 are sectional end views of the injection pump showing a diagrammatic connection with the throttle which is shown in side elevation and in two alternative positions in the two figures respectively.

Referring to Figure 1 there is provided a body part 4 which at one end contains a feed pump of the kind comprising a rotary impeller 5 provided with vanes. Fuel is conveyed to this pump through an inlet passage 6, and is discharged to a passage 7 which latter may be connected to the inlet passage 6 by a relief valve 8 loaded by a spring 9 which limits the pressure which can be generated by this pump. At the other end of the body part 4 is contained the fuel injection pump. This comprises a rotary body part 10 having a transverse bore containing a pair of reciprocating plungers 11 which (through rollers 12 at their outer ends) co-operate with a surrounding annular cam 13.

2

The rotary parts of the feed and injection pumps are interconnected by a spindle 14 which serves as a distributor and has formed in it an axial passage 15 and radial passages 16, 17. The spindle 14 together with the rotary parts of the two pumps are driven by the engine through a shaft 18, and the arrangement is such that liquid fuel from the feed pump is discharged along the passage 7 and through an adjustable throttle 19 and a passage 20 to the radial ports 16 in the spindle 14, and thence to the injection pump. During inward movements of the plungers 11 of the injection pump under the action of the cam 13, fuel is discharged along the passage 15 and through the radial port 17 to each in turn of passages 21 leading to the different cylinders of the engine.

The annular cam 13 is mounted in the body part with angular freedom of movement, and from one side of the cam extends a short arm 22 which at its outer end occupies a gap in a reciprocating plunger 23 contained in a cylinder 24 which is closed at both ends and forms part of the body part 4. In one end of this cylinder 24 is contained a spring 25 which urges the plunger 23 in the direction for imparting to the cam 13 an angular movement in the direction of rotation of the part 10.

The throttle 19 consists of a cylindrical member which is angularly movable about its axis either manually or by a speed governor. In one side of this member is formed a rectangular or other axially disposed groove 26 through which the fuel supplied by the feed pump can pass to the injection pump through the passages 20 and 16, the rate of supply being variable by angular movement of the said groove 26 relatively to the entrance of the passage 20. At the opposite side of the throttle is formed a helical or oblique groove 27 through which fuel can flow to a by-pass 28 connected to the cylinder 24 at the side of the plunger 23 remote from the spring 25, the disposition of this groove being such that with increase of the rate of fuel supply to the pump the rate of flow to the by-pass is diminished.

In applying the invention to such a pump there is provided in the throttle 19 an additional helical or oblique groove 29 which communicates with the interior of a cover 30 from whence the fuel can drain. The groove 29 is so positioned that it is exposed to the entrance of the by-pass 28 when the throttle is turned to its full-rate position. By this expedient, the fuel which would otherwise be entrapped in the cylinder 24 is released when the throttle is moved to the full-rate position, so enabling the spring 25 to move the plunger 23 freely and thereby move the cam 13 promptly to its normal position.

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 supplying fuel received from a feed pump to an internal combustion engine, comprising in combination a rotary body provided with a transverse bore, a pair of injection plungers slidably mounted in opposite ends of the bore, an adjustable throttle for controlling the rate of supply of liquid fuel from the feed pump to the part of the bore at the inner ends of the injection plungers, an angularly adjustable annular cam situated around the rotary body to co-operate with the plungers for imparting inward movements thereto during rotation of the said body, a timing plunger having an operative connection with the cam, a cylinder in which the timing plunger is slidably mounted, a loading spring arranged in one end of the cylinder and acting on the corresponding end of the timing plunger, and a by-pass through which liquid fuel from the feed pump is admissible under the control of the throttle to the opposite end of the cylinder for moving the timing plunger against the action of the loading spring, and thereby imparting angular adjusting movement to the cam, and a drain to which the by-pass is connectible by

3

the throttle, for enabling the timing plunger to be moved quickly by the loading spring, when the throttle is moved to a position for permitting maximum fuel supply to the bore in the rotary body.

2. A liquid fuel injection pump according to claim 1, wherein the throttle has the form of a cylindrical member which is angularly adjustable about its axis, and which is provided with two obliquely disposed peripheral grooves, through one of which fuel from the feed pump has access to the by-pass when the throttle is set to provide a low rate of fuel supply to the bore in the rotary

4

body, and through the other of which fuel can flow from the by-pass to the drain when the throttle is set to provide a maximum fuel supply from the feed pump to the said bore.

References Cited in the file of this patent

UNITED STATES PATENTS

2,660,992	Roosa	Dec. 1, 1953
2,833,263	Evans	May 6, 1958