Jan. 29, 1957 H. HOGEMAN 2,779,289

FUEL INJECTION APPARATUS FOR V TYPE ENGINES

Filed May 6, 1952 5 Sheets-Sheet 1

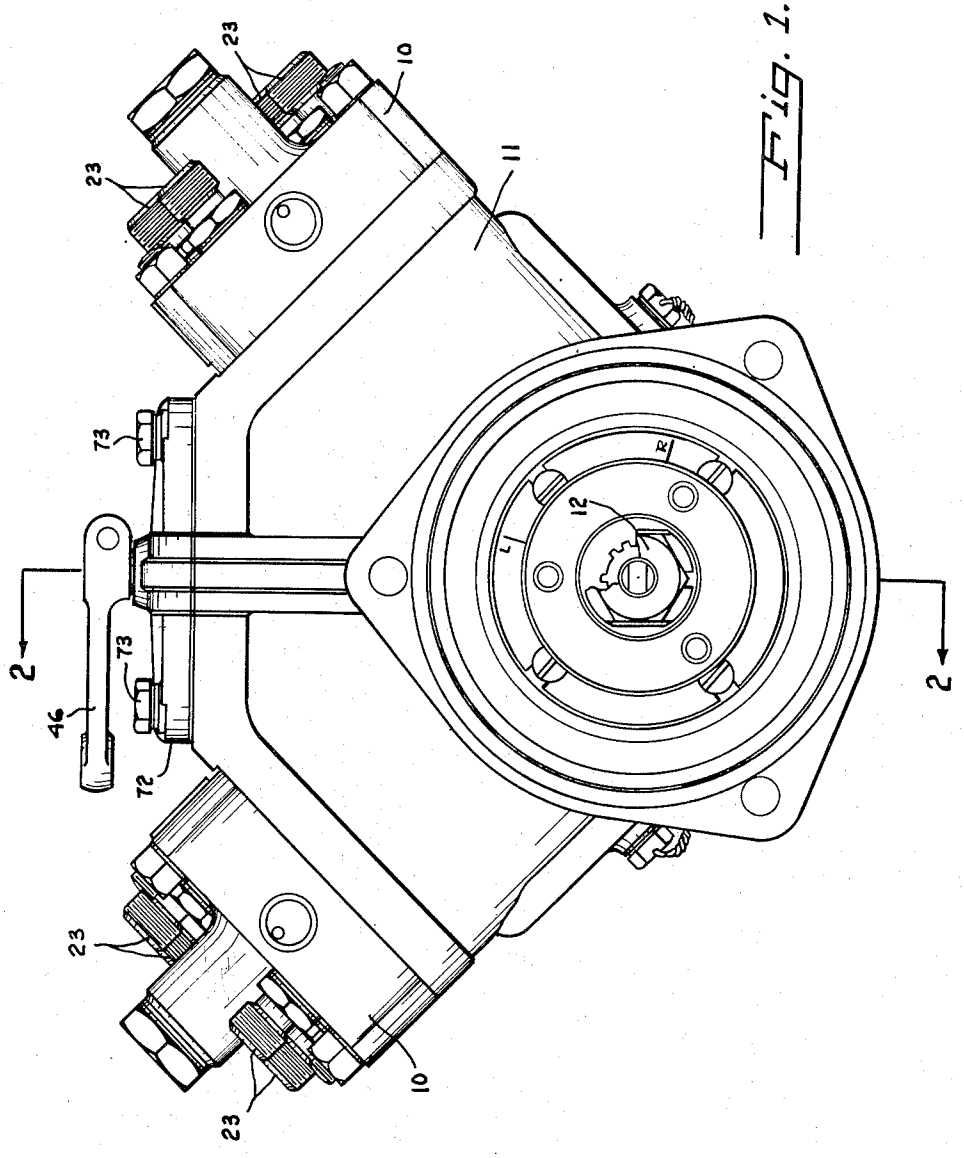


Fig. 1.

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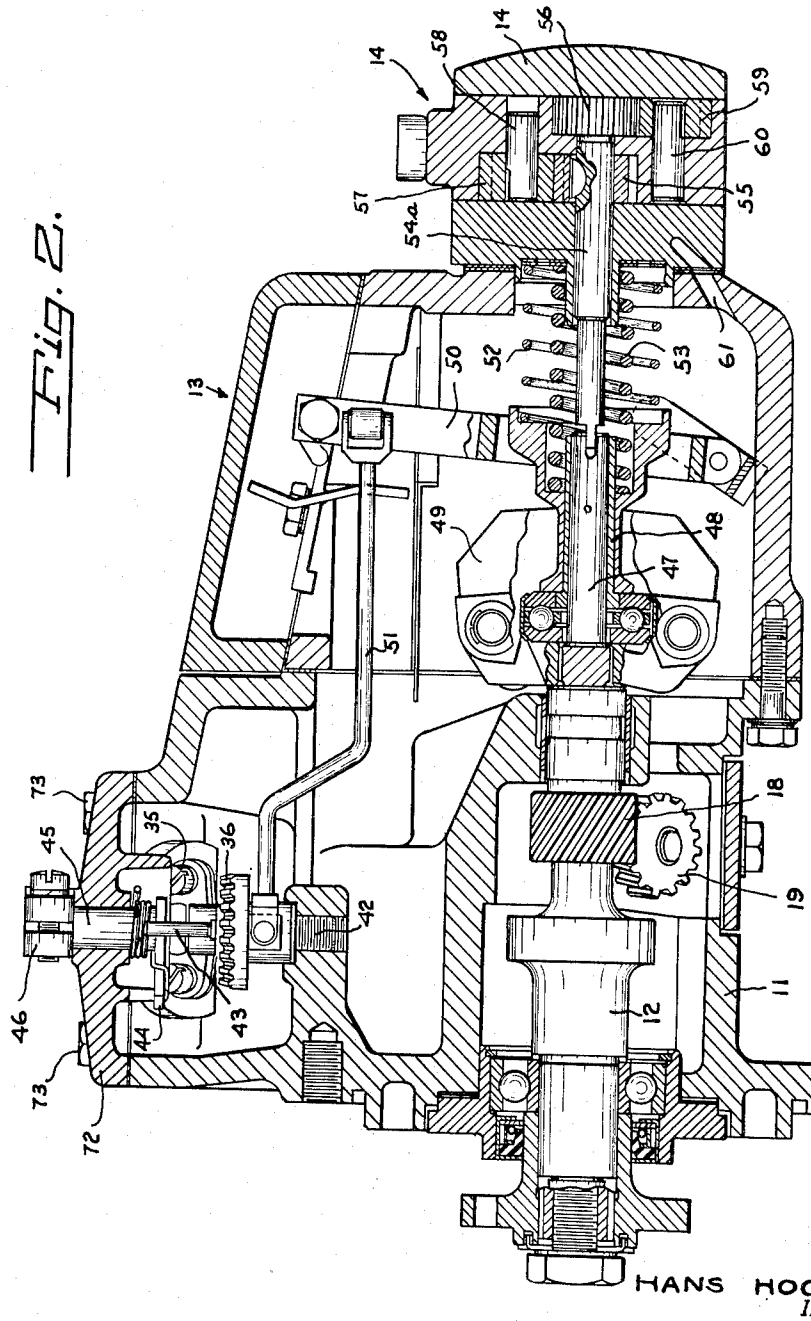
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FUEL INJECTION APPARATUS FOR V TYPE ENGINES

Filed May 6, 1952 5 Sheets-Sheet 2

Fig. 2.



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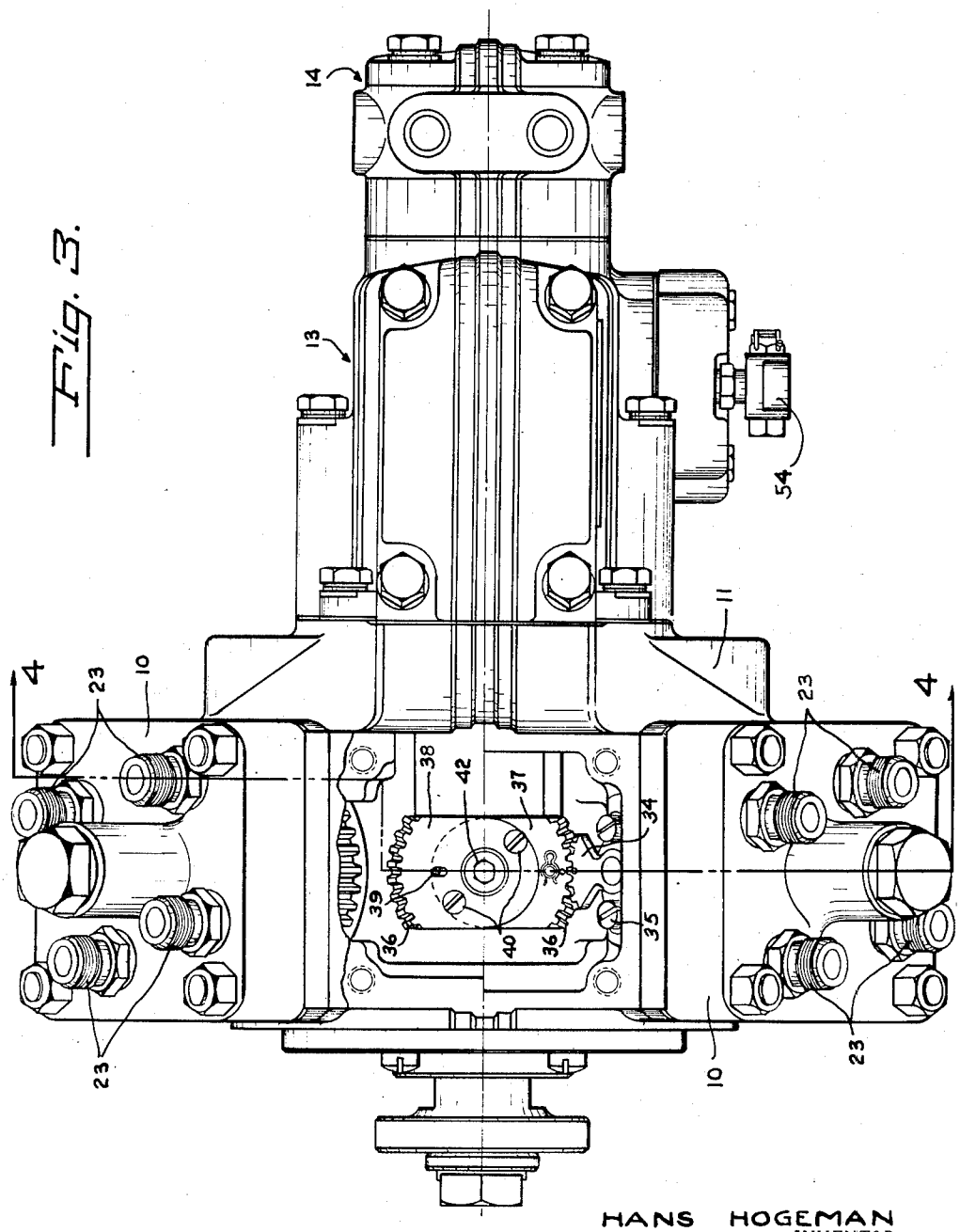
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FUEL INJECTION APPARATUS FOR V TYPE ENGINES

Filed May 6, 1952 5 Sheets-Sheet 3

Fig. 3.



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FUEL INJECTION APPARATUS FOR V TYPE ENGINES

Filed May 6, 1952 5 Sheets-Sheet 4

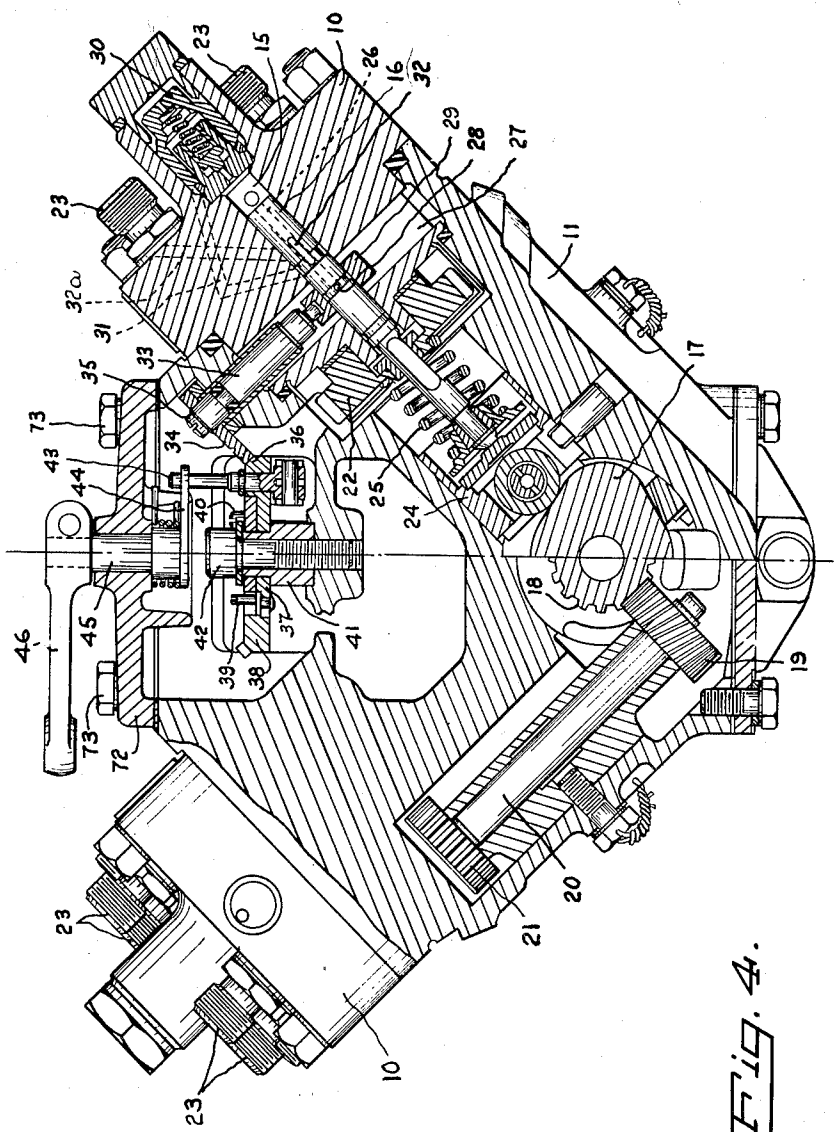


Fig. 4.

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Jan. 29, 1957 H. HOGEMAN 2,779,289

FUEL INJECTION APPARATUS FOR V TYPE ENGINES

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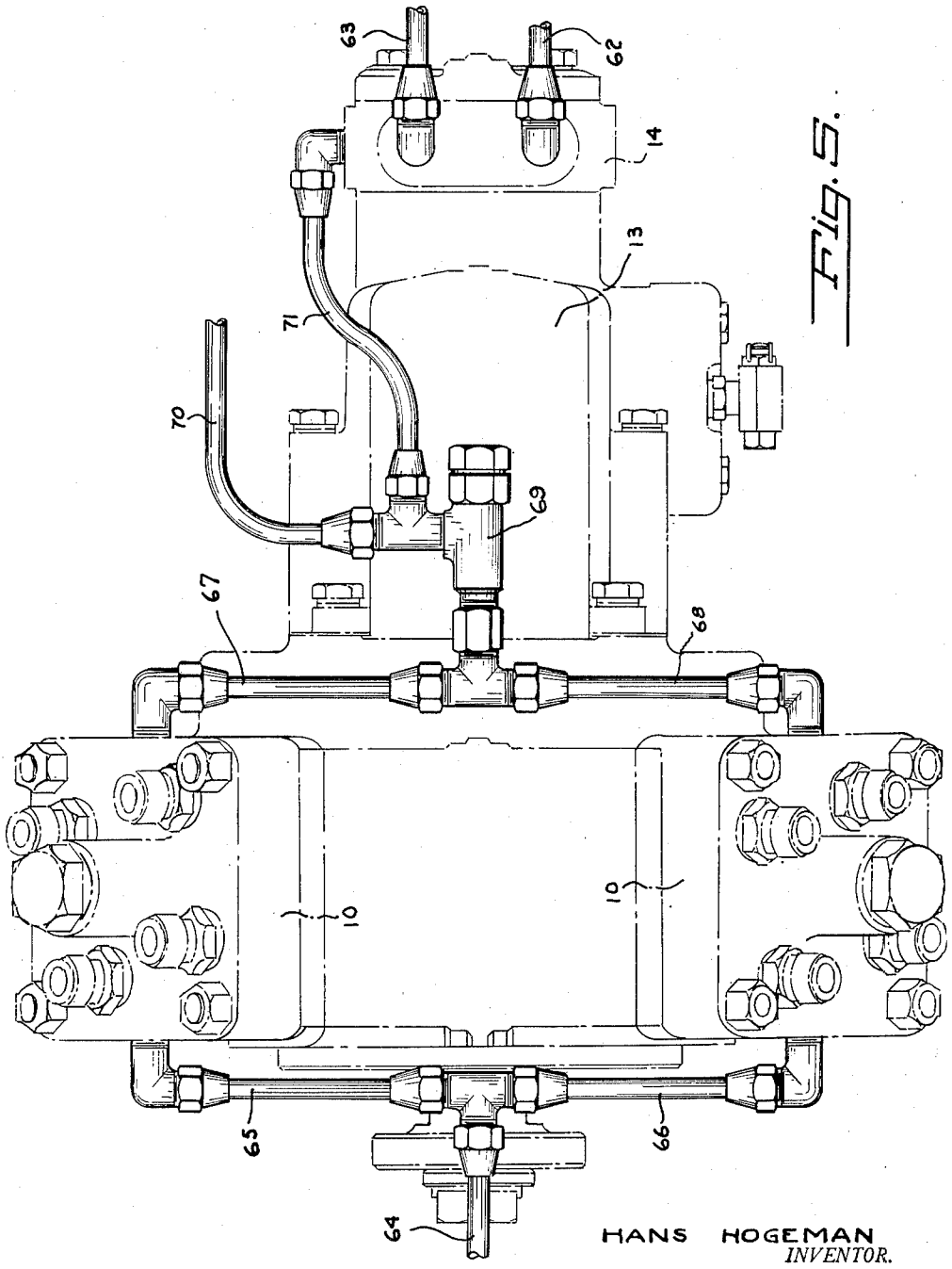


Fig. 5.

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2,779,289

FUEL INJECTION APPARATUS FOR V TYPE ENGINES

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Application May 6, 1952, Serial No. 286,345
4 Claims. (Cl. 103—2)

This invention relates to fuel injection apparatus and has particular reference to a new and improved fuel injection system particularly adapted for V type engine application.

An object of the invention is to provide a new and improved fuel pump and governor combination for V type engines which employ a pair of pumps and, wherein both pumps utilize the same governor and control means as well as a common drive means.

Another object of the invention is to provide a fuel injection apparatus for V type engines, which apparatus utilizes a pair of pumps and wherein the complication of expensive and troublesome flow dividers is eliminated.

Another object is to provide a new and improved relatively simple, economical, compact and lightweight fuel injection apparatus for V type engines.

Another object is to provide fuel injection apparatus for V type engines utilizing a pair of pumps adapted to be controlled by a single shutoff lever.

Another object is to provide new and improved lubricating means for fuel injection devices of the type set forth.

Another object is to provide new and improved means whereby relatively simple and economical distributor type fuel injection pumps may be adapted for use with V type engines.

Another object is to provide a new and improved apparatus of the type set forth with means whereby the multiple pumps may be so adjusted as to each provide the same fuel delivery to all outlets.

Another object is to provide an apparatus of the type set forth which is adapted to be driven by the engine crankshaft and which may be adapted for either engine speed or one-half engine speed operation.

Other objects and advantages of the invention will be apparent from the following description taken in connection with the accompanying drawings and it will be understood that changes may be made in the details of construction and arrangement of parts without departing from the scope of the invention, as set forth in the accompanying claims as the preferred form has been given by way of illustration only.

Referring to the drawings:

Fig. 1 is an end view, from the drive end, of the apparatus embodying the invention;

Fig. 2 is a sectional view taken on line 2—2 of Fig. 1, looking in the direction of the arrows;

Fig. 3 is a top or plan view partially in section of the apparatus embodying the invention;

Fig. 4 is a sectional view taken on line 4—4 of Fig. 3, looking in the direction of the arrows; and

Fig. 5 is a top or plan view of the apparatus of the invention showing the hydraulic connections.

Referring more particularly to the drawings wherein similar reference characters designate corresponding parts throughout, the apparatus shown embodying the invention comprises a pair of hydraulic heads 10 mounted on housing 11, with both heads being adapted to be operated by camshaft 12 adapted to be driven by the engine crankshaft through suitable connections and both the heads are controlled by means of the governor 13. The combined supply jump and scavange pump unit 14 is

also provided for supplying fuel to the injection pump heads, and also provides fuel oil for lubricating purposes and the scavange pump is adapted to exhaust or scavange any oil which collects in the housing and return the same to the supply tank.

Each of the hydraulic heads 10 is provided with a bore 15 in which is positioned a plunger 16 adapted to be reciprocated and rotated in bore 15 for pumping and distributing fuel as hereinafter described.

While the present invention has been shown for the purpose of illustration as applied to an eight cylinder V type engine, it is understood that it is also capable of being applied to other V type engines such as V 12 or V 16 engines by anyone skilled in the art.

The camshaft 12 for the present pump is a two lobe camshaft having the cam lobes 17 180 degrees apart and adapted upon rotation of the camshaft to reciprocate each of the plungers 16 successively.

The camshaft 12 is also provided with the helical gear 18 adapted to mesh with a helical gear 19 for each hydraulic head, which through shafts 20 and gears 21 on said shaft 20 which mesh with gears 22 surrounding each of the plungers 16 and which are keyed thereto, are adapted to rotate each of the plungers 16 during the reciprocation thereof for effecting distribution of the fuel to be injected to the respective engine cylinders through the outlets 23 in the hydraulic heads 10, one of which outlets is provided for each engine cylinder or combustion chamber.

While the pumping or injection stroke of each of the plungers 16 is effected by the cam lobes 17 which engage tappets 24 to which the adjacent ends of the plungers are secured, the return or suction stroke of the plungers is effected through the force of the coil springs 25 aided by fuel supply pressure.

Each of the plungers 16 is provided with a bore 26 which communicates with a sump 27 through port 28 for controlling the quantity of fuel spilled or bypassed by the hydraulic head and thereby controlling the quantity of fuel injected through the outlets 23. The quantity of fuel bypassed or spilled through ports 28 is controlled by the adjustment of the sleeve control member 29 relative to the port 28.

Each of the plungers 16 is adapted to pump fuel in bore 15 through delivery valve 30 to fuel passage 31 through which fuel passes to the distributing groove 32 on the periphery of the plunger 16 and by which fuel is distributed to each of the ducts 32*a* communicating with its respective outlet 23, as the plunger 16 is rotated as previously described.

Each of the hydraulic heads is generally similar to the hydraulic heads shown and described in Patent 2,518,473 of August 15, 1950, to which reference is made for further disclosure of any of the details thereof.

Each of the sleeve members 29 for controlling the quantity of fuel injected is adapted to be adjusted by means of a shaft 33 to which the sleeves are eccentrically connected and rigidly secured to the ends of each of said shafts 33 is a gear sector 34 by means of screws or the like 35.

The gear sectors or segments 34 are adapted to mesh with the adjacent gear sectors or segments 36 of composite adjusting member consisting of two separate members 37 and 38, each having one of the gear segments or sectors with said members 37 and 38 angularly adjustable relative to each other by means of eccentric pin 39 and adapted to be locked in said adjusted position by means of the locking screws 40, whereby the segments 36 may be locked in such relative position as to maintain the two controlled units or hydraulic heads in phase, so that they can be controlled by a common governor through a single control rod connected to said governor.

The composite member formed of members 38 and 37 are maintained in position on housing 11 by means of bushing 41 and screw 42 for maintaining said bushing in position as shown in Fig. 4. The composite member is provided with control pin 43 to which is connected lever 44 on shaft 45, on which shaft is also positioned shutoff lever 46 for moving lever 44 and thereby effecting adjustment of pin 43, and the composite member for effecting adjustment of sectors 34 and shafts 33 to adjust sleeve control 29 to shutoff position.

A governor shaft is provided in alignment with shaft 12. This shaft may be an extension of shaft 12 or a saparate shaft operatively coupled thereto, as shown.

The governor shaft 47 is provided with the sleeve 48 adapted to be moved by means of the centrifical weight 49 as a function of speed of said shaft 47 to thereby adjust the position of governor lever 50, which is connected by control rod 51 to pin 43.

The governor is provided with the usual governor springs 52 and 53.

The governor is also provided with the usual governor control lever 54 which sets the governor lever 50 to desired position.

Connected to governor shaft 47 is another shaft 54*a* for operating the supply pump and scavange pump. Shaft 54*a* can be integral with shaft 47 or can be in the form of a separate shaft keyed to shaft 47, as shown. Keyed to shaft 54 is one of the gears 55 of the gear type supply pump and also one of the gears 56 of the gear type scavange pump in housing 14.

The second gear 57 of the gear type supply pump is provided on shaft 58 and the second gear 59 of the gear type scavange pump is provided on shaft 60. The inlet 61 is provided from the interior of the governor housing 13 to the scavange pump, as shown in Fig. 2.

As shown in Fig. 5, the gear type supply pump is adapted to receive fuel from the fuel tank through fuel inlet line 62 and to discharge said fuel through fuel line 63 from which the fuel may pass through a suitable filter to the inlet line 64 having the branches 65 and 66 for each of the hydraulic heads respectively.

The fuel bypassed or spilled as well as the overflow fuel is returned through the branches 67 and 68 through pressure regulating valve 69 which is adapted to maintain fuel under desired pressure within the hydraulic heads to return line 70, which returns such fuel to the fuel supply tank. Any fuel drawn out of the housing by the scavange pump through the inlet 61 is returned through line 71 to return line 70.

If it is desired to adjust the sectors 36 so as to maintain the two hydraulic heads in phase to allow their control by the common governor and so that both hydraulic heads deliver the same amount of fuel, this adjustment may be made while the pump is in operation by removing cover plate 72 from the body 11 to which it is secured by the screws 73, which allows access to loosen locking screws 40 and adjustment of eccentric pin 39 after which adjustment said locking screws 40 may be again tightened and cover plate 72 replaced.

It will be seen that as this adjustment may be made while the pump is in operation, that it is possible to get accurate, precise adjustment of the phasing of the two hydraulic heads.

In the present embodiment of the invention shown for the purpose of illustration only, the two hydraulic heads are placed at a 90 degree V, that is, at a 90 degree angle relative to each other, and the cam lobes are at 180 degrees relative to each other, as previously stated. This arrangement is, however, for a V 8 engine. In the case of a V 6 or a V 12 engine, the angular relation between the hydraulic heads could be 60 degrees by providing a three lobe cam with the cam lobes 120 degrees apart.

In such case, however, the V 6 pump would have to be operated at one-half engine speed.

In operation the hydraulic heads 11 operate in their usual manner to pump and distribute fuel to each of the outlets and thereby to the engine cylinders or combustion chambers in desired sequence, and the fuel quantity is controlled through the common governor, as previously described.

Also because of the arrangement described, a single shutoff lever controls both hydraulic heads.

It will be seen from the foregoing that with the present invention a relatively simple, economical and compact arrangement is provided whereby the two hydraulic heads function and are controlled substantially as a unit, thereby providing an arrangement which is relatively simple, inexpensive and trouble free without the complications of expensive flow dividers and similar arrangements proviously believed necessary in such constructions.

From the foregoing, it will be seen that I have provided new and improved means for obtaining all of the objects and advantages of the invention.

I claim:

1. In a fuel injection apparatus for V type engines, a pair of distributor type fuel injection pumps, each of said pumps including a bore, a pumping and distributing member in said bore, and a plurality of outlets communicating with said bore and adapted to successively receive fuel from said pumping and distributing member and control means including a rotatable shaft for varying the pump output, cam means operating said distributor pumps and common means connected to both of said control means providing control for both of said pumps, said control means on each of said pumps including a gear sector mounted on said rotatable shaft and said common means comprising angularly adjustable gear portions engaging said gear sectors on said control means for actuating said control means to adjust the output of the two pumps relative to each other.

2. In the fuel injection apparatus of claim 1 a control pin mounted on said common means and a shut-off lever engageable with said control pin whereby both pumps may be simultaneously shut off.

3. In a fuel injection apparatus for V type engines, a pair of distributor type fuel injection pumps, each of said pumps including a bore, a pumping and distributing member in said bore, and a plurality of outlets communicating with said bore and adapted to successively receive fuel from said pumping and distributing member, cam means to operate both said distributor pumps, an engine driven governor, control means including a rotatable shaft on each of said pumps, common means connected to both said control means and providing a single control for simultaneously controlling the operation of both of said pumps, said control means on each of said pumps including a gear sector mounted on said rotatable control shaft and said common means having adjustable gear portions engaging said gear sectors on said control means for actuating said control means, a governor, and a governor rod connecting said governor and said common means.

4. In the fuel injection apparatus of claim 3, a control pin mounted on said common means and a shut-off lever engageable with said control pin whereby both said pumps may be simultaneously shut off.

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