

[54] LIQUID FUEL INJECTION PUMPING APPARATUS

[75] Inventors: **Kenneth Albert Walters Kemp**, London; **Dorian Farrar Mowbray**, Burnham, both of England.

[73] Assignee: **C.A.V. Limited**, Birmingham, England

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[56]

References Cited

UNITED STATES PATENTS

2,779,289	1/1957	Hogeman	123/139 R
3,496,880	2/1970	Wolff	417/273
3,667,437	6/1972	Dreisin	139/139 AE
2,018,975	10/1935	Schvtzniedrig	123/139 AC
2,322,181	6/1943	Vincent	417/273
2,870,759	1/1959	Aldridge	417/273

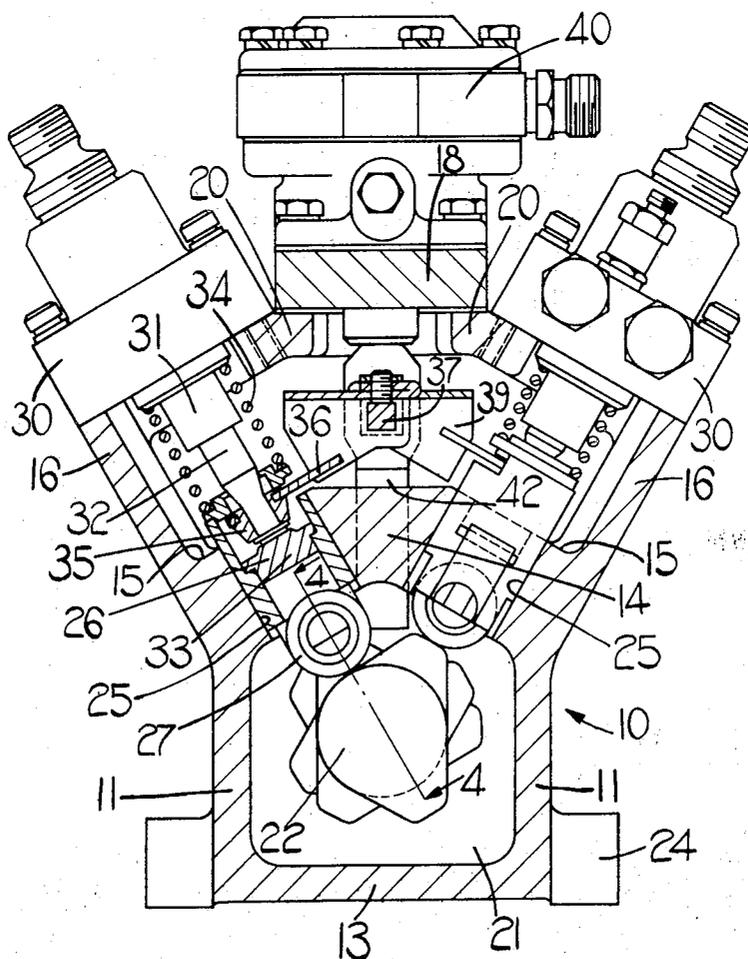
Primary Examiner—William L. Freeh
Attorney—Holman & Stern

[57]

ABSTRACT

A fuel injection pumping apparatus includes a plurality of injection pumps disposed in Vee formation. The injection pumps are actuated by cams and are controlled by a control rod disposed between the two banks of injection pumps.

3 Claims, 5 Drawing Figures



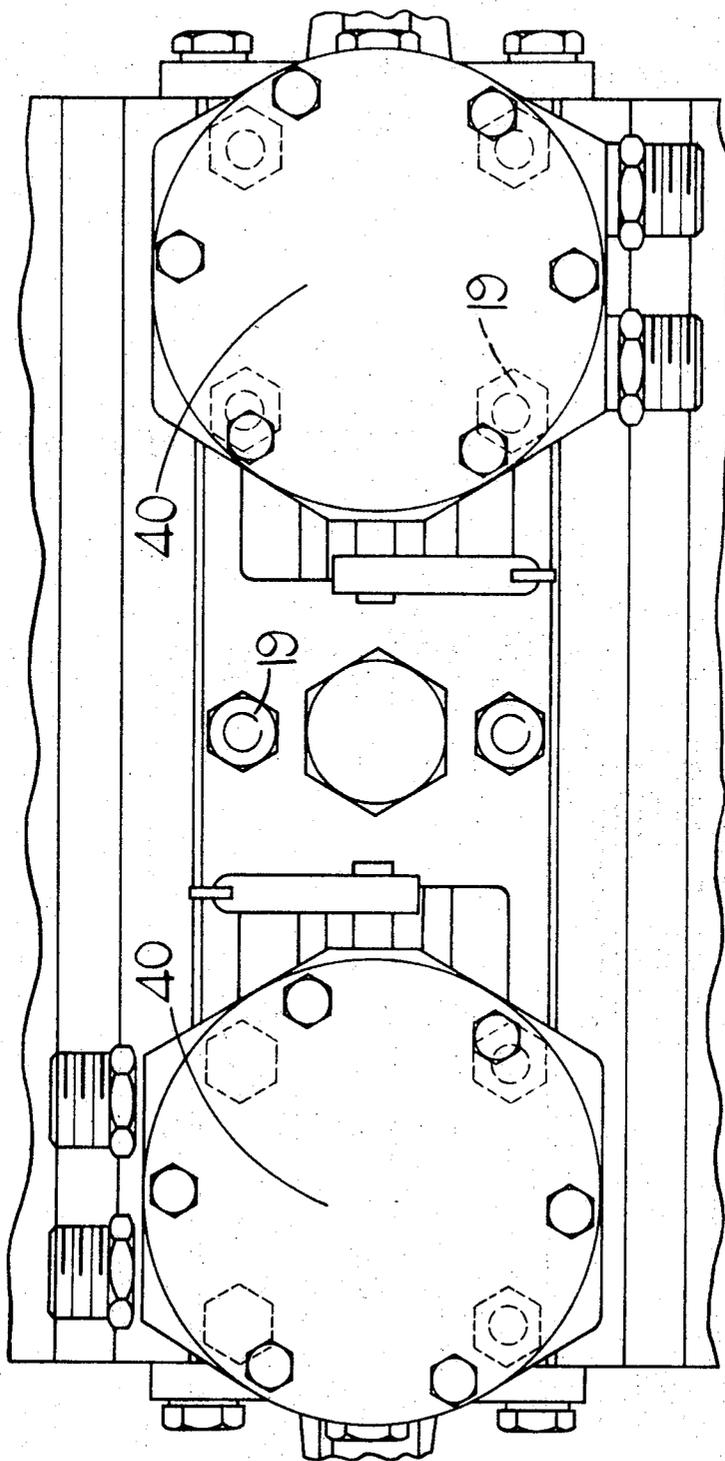
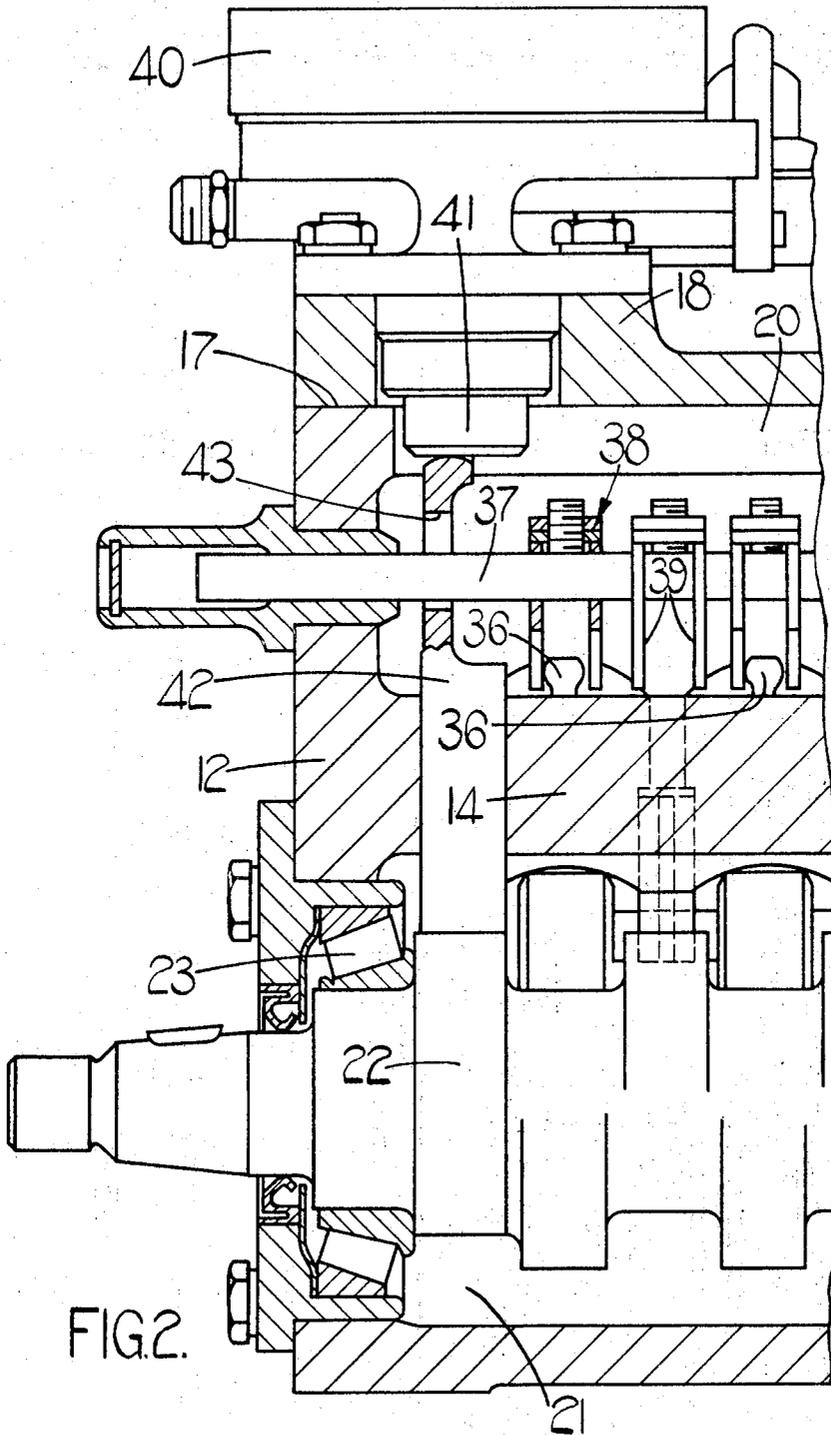


FIG. 1.

Kenneth Albert Walters Kemp & Dorian Farrow Mowbray

INVENTOR

ATTORNEYS



Kenneth Albert Walters Kemp & Dorian Farrow Howbray INVENTOR

ATTORNEYS

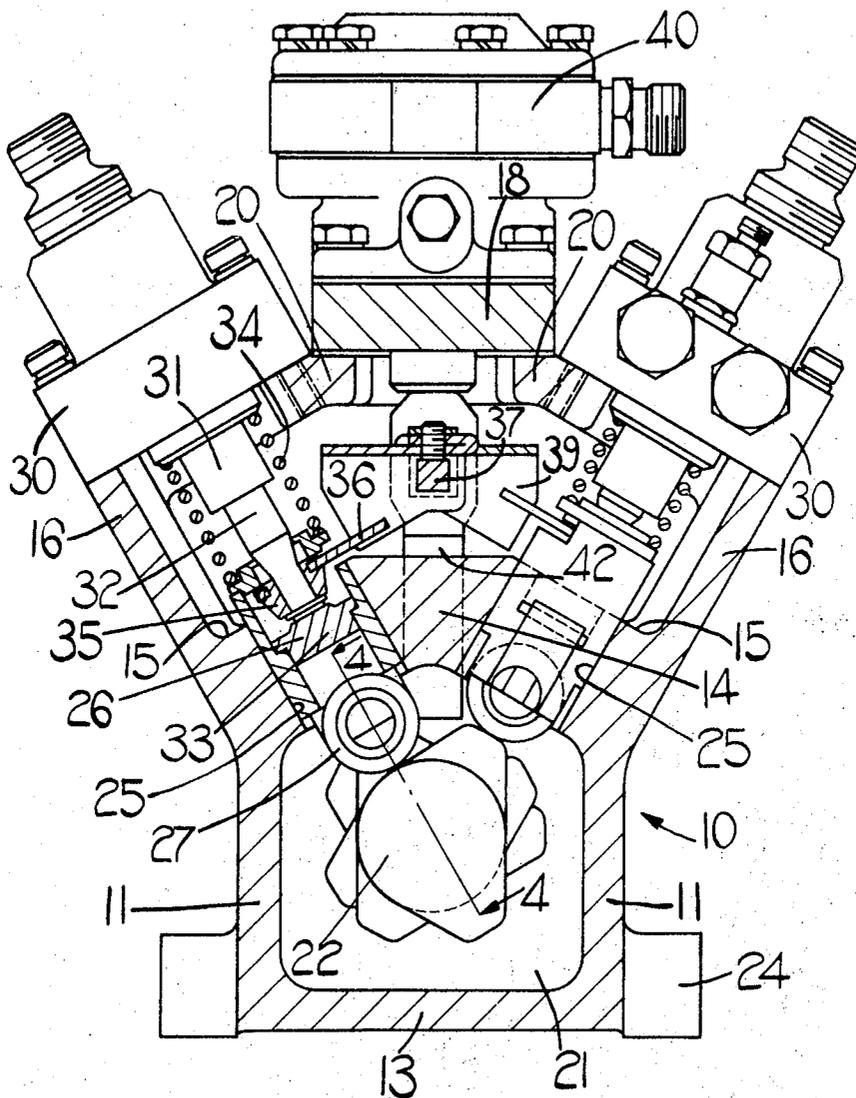


FIG. 3.

Kenneth Albert Walters Kemp & Dorian Farrar Mowbray

INVENTOR

ATTORNEYS

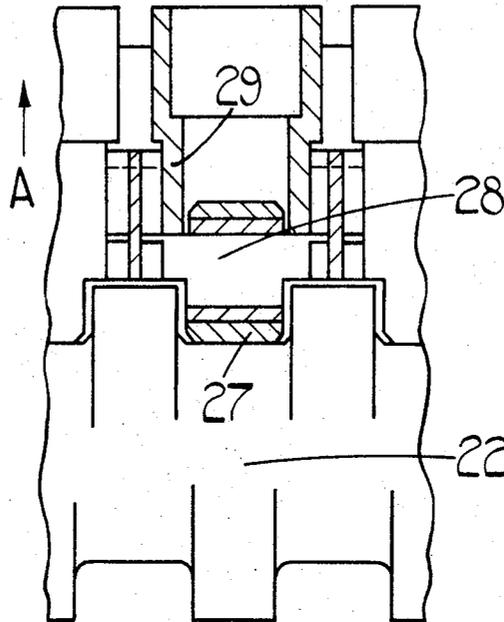


FIG. 4.

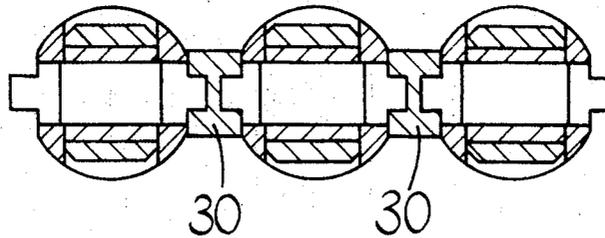


FIG. 5.

INVENTOR
Kenneth Albert Wallers Kemp & Dorian Ferrar Mowbray
ATTORNEYS

LIQUID FUEL INJECTION PUMPING APPARATUS

This invention relates to liquid fuel injection pumping apparatus of the kind comprising a plurality of individual injection pumps actuated by cams respectively located upon a cam shaft rotatable within a housing.

Such apparatus is very well known and is commonly referred to as an "in line" pump. In such apparatus it is the practice to mount the injection pumps in the housing and to provide bearings at the opposite ends of the housing to support the cam shaft. When such a pumping apparatus is made for supplying fuel to an engine having for instance more than four cylinders the housing becomes very long and in addition it has proved necessary to provide a centre bearing for the camshaft so that further length must be added to the housing.

It is an object of the present invention to provide a pumping apparatus of the kind specified for supplying fuel to an engine having more than four cylinders and which has a compact construction.

According to the invention in an apparatus of the kind specified the pumps are disposed in "V" formation, the pumps in the opposite banks of pumps being staggered to enable a cam to be provided for each pump and a control rod disposed between the banks of pumps, the control rod being respectively connected to each injection pump and being adjustable to determine the quantity of fuel supplied at each injection stroke of the injection pumps.

In the accompanying drawings:

FIG. 1 is a plan view of one example of a liquid fuel pumping apparatus in accordance with the invention,

FIG. 2 is a part sectional side elevation of the apparatus shown in FIG. 1,

FIG. 3 is a sectional end elevation of the apparatus shown in FIG. 1,

FIG. 4 is a part section on the line 4—4 of FIG. 3, and

FIG. 5 is a view in the direction of the arrow A shown in FIG. 4.

Referring to the drawings the apparatus comprises a housing 10 having elongated side walls 11, end walls 12 a lower wall 13, and an upper wall 14. The upper wall 14 defines inclined faces 15 and extending upwardly from the faces 15 and forming continuations of the side walls 11, are outer walls 16. The end walls 12 are integrally formed with the outer walls 16 and define ledges 17 to which is secured a mounting plate 18. The mounting plate serves as a closure for the housing and at intervals is secured by bolts 19 to longitudinal members 20 formed integrally with the end walls 12 of the housing.

The lower portion of the housing defines a cavity 21 for a cam shaft 22 which is carried by bearings 23 mounted within the end walls 12 of the housing. The cam shaft 22 is provided with extensions at its opposite ends whereby it can be driven in timed relationship with the associated engine. Moreover, the housing is provided with mounting lugs 24 whereby it can be secured to the associated engine.

The upper wall 14 is bored at staggered intervals to define bores 25 which accommodate tappet assemblies 26, each tappet assembly including a roller 27 for co-operation with the associated cam on the shaft 22. The roller 27 is mounted about a pin 28 which projects beyond the roller into engagement with a tappet 29 and the pin over its projecting portions, is recessed to pro-

vide clearance for the adjacent cams. Moreover, the pin is slidably accommodated within guides 30 so as to prevent angular movement of the tappet assembly.

Secured to the outer wall 16 and the longitudinal members 20 are a pair of housings 30 respectively, each of which mounts four individual injection pumps of the reciprocating plunger type. The injection pumps include a barrel 31 in which is located a reciprocable plunger 32. The plunger bears upon a cross member 33 carried within the tappet 29 and a spring 34 is provided which bears upon the tappet to urge the roller in to contact with the associated cam and also to effect outward movement of the plunger 32 when the roller has moved over the crest of the cam lobes. The plunger is provided with a bush 35 to which it is non-rotatably secured and extending from the bush 35 is an actuating lever 36.

Slidably mounted within the housing is a control rod 37 and at one end this projects from the housing for connection to a governor mechanism (not shown). The control rod is axially movable and is of square section. At intervals along the control rod and corresponding to the spacing of the injection pumps, there are provided members 38 which include a pair of side plates 39 between which is accommodated the end of the associated actuating lever 36. The members 38 are adjustably mounted upon the control rod to permit the output of each injection pump to be adjusted for a given setting of the control rod 37.

Mounted upon the mounting plate 18 are a pair of feed pumps 40 which supply liquid fuel under pressure to each bank of injection pumps respectively. The feed pumps 40 are each provided with an actuating element 41 which is contacted by an actuating member 42. The member 42 is slidably accommodated within a bore formed in the upper wall 14 of the housing and the cam shaft is provided with cams respectively for actuating said members. Since the feed pumps 40 are centrally disposed the actuating members 42 are apertured at 43 to permit the control rod 37 to pass therethrough. The connections between the feed pumps and the injection pumps are by way of pipes (not shown).

By the construction described an extremely compact pumping apparatus is provided for supplying fuel to an eight cylinder engine. Since individual cams are provided for each injection pump the pump can provide fuel for a V type engine or an engine having the cylinders in line. It is merely necessary to modify the provision of the cams upon the cam shaft. Moreover, by locating the feed pumps within the trough defined by the banks of injection pumps the width of the apparatus at its lowest point is considerably reduced moreover, the fact that the cam shaft is short means that only two bearings are required to support it moreover, the crank shaft is better able to withstand torsional deflection.

We claim:

1. A liquid fuel injection pumping apparatus comprising a housing, a plurality of individual injection pumps arranged in two aligned banks on the housing, said banks being disposed in "V" formation, a cam shaft rotatable within the housing, cams on the cam shaft for actuating the injection pumps, the injection pumps in the opposite banks being staggered relative to the axis of the cam shaft, to enable a cam to be provided on the cam shaft for each pump, a control rod disposed between the banks of pumps, the control rod being respectively connected to each injection pump and being

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adjustable to determine the quantity of fuel supplied at each injection stroke of the injection pumps, a feed pump disposed between the two banks of pumps, a further cam mounted on the cam shaft, an actuating member which co-operates with said further cam to actuate the feed pump, and an aperture in said actuating member through which said control rod extends.

2. An apparatus as claimed in claim 1 including a plu-

rality of members mounted on said control rod, each of said members defining a pair of spaced side plates between which is located an actuating lever associated with the respective injection pump.

3. An apparatus as claimed in claim 2 in which each injection pump includes a reciprocable plunger, said actuating lever being secured to said plunger.

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