May 28, 1963 F. M. EVANS ETAL 3,091,230

LIQUID FUEL PUMPS FOR INTERNAL COMBUSTION ENGINES

Filed May 4, 1961

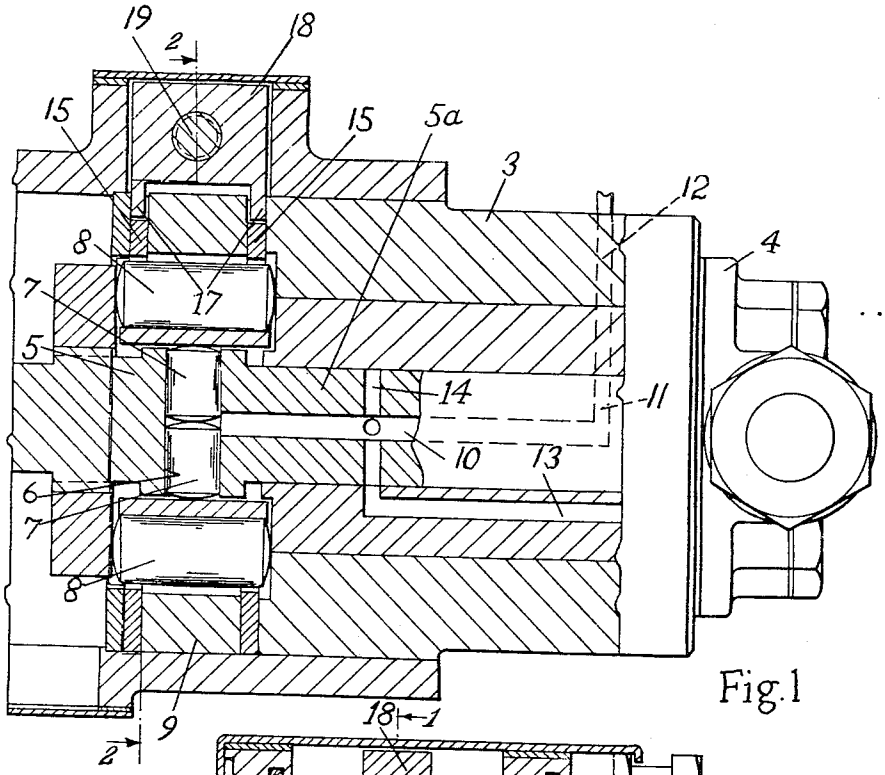


Fig.1

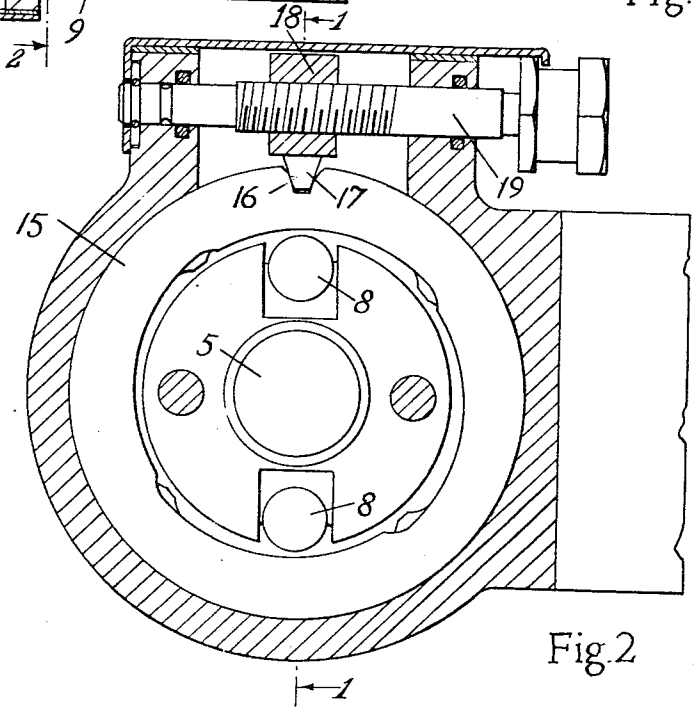


Fig.2

United States Patent Office

3,091,230
Patented May 28, 1963

3,091,230

LIQUID FUEL PUMPS FOR INTERNAL COMBUSTION ENGINES

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Filed May 4, 1961, Ser. No. 107,854
4 Claims. (Cl. 123—139)

This invention relates to liquid fuel pumps for internal combustion engines, and of the kind comprising a rotary head in which is formed a transverse bore, at least one plunger in the bore, and annular cam surrounding the head, said cam being adapted to impart inward movements to the plunger or plungers as the head rotates, and a distributor rotatable with the head and having formed therein passages through which fuel is conveyed to and from the bore in the head.

In such pumps the plunger or plungers are moved outwardly by the fuel fed to the bore in the head, and the displacement of fuel by the inward movements of the plunger or plungers causes fuel to be injected to the engine cylinders in turn through the distributor as the latter rotates. Moreover, it is usual to provide stops on the rotary head for limiting the outward movements of the plunger or plungers, thereby limiting the strokes of the plunger or plungers and determining the maximum quantity of fuel which can be fed to the engine. Such stops have usually been adjustable, but it has been necessary to dismantle the pump at least in part to effect such adjustment.

The object of the present invention is to provide in a pump of the kind specified convenient means whereby the predetermined maximum quantity of fuel which can be fed to the engine can be adjusted without dismantling the pump.

According to the invention a pump of the kind specified includes at least one subsidiary cam ring surrounding the head, said cam ring being adapted to co-operate with the plunger or plungers in limiting the outward movement thereof while fuel is being fed to the bore in the rotary head, and means for imparting angular movement to said cam ring from the exterior of the pump.

In the accompanying drawings, FIGURE 1 is a part sectional side view, and FIGURE 2 is a sectional end view of an example of the invention, FIGURE 1 being taken on the line 1—1 of FIGURE 2, and FIGURE 2 being taken on the line 2—2 of FIGURE 1.

The illustrated example of the invention is shown as applied to a known form of pump comprising a body part 3 which at one end contains a feed pump 4. The pump 4 has inlet and outlet passages in the body part, and these passages may be interconnected through a spring-loaded relief valve which limits the maximum pressure which can be generated by the feed pump.

At the other end of the body part 3 is a fuel injection pump comprising a rotary cylindrical head 5 in which is formed a diametrical bore 6 containing a pair of reciprocatory plungers 7 which co-operate, through rollers 8 at their outer ends, with a surrounding annular cam 9.

The rotary parts of the feed and injection pumps which are adapted to be rotated by the engine, are interconnected by a spindle 5a which serves as a cylindrical distributor, and in the example shown the head 5 is formed integrally with one end of the distributor. In the distributor is formed an axial passage 10 which at one end is in communication with the bore 6 in the head, and at another position is in communication with a radial passage 11 in the distributor, the passage 11 being adapted to communicate in turn, as the distributor rotates, with

each of a plurality of angularly spaced passages 12 in the body part adapted for connection to the different cylinders of the engine.

The feed pump 4 is adapted to deliver fuel to a passage 13 in the body part, and which communicates in turn with each of a plurality of angularly spaced radial passages 14 in the distributor, these latter passages opening into the axial passage 10. In action, as the distributor and the rotary pump parts rotate, fuel fed to the axial passage 10 by the feed pump is discharged to the engine cylinders in turn by the inward movements of the plungers 7 of the injection pump under the action of the cam 9, the plungers being moved outwardly by the fuel fed to the distributor by the feed pump.

In applying the invention to such a pump, there are provided at opposite sides respectively of the annular cam 9 a pair of annular cam rings 15 which are coaxial with the annular cam, and, which serve to limit the outward movement of the plungers 7 by abutting against the end portions of the associated rollers 8 while fuel is being fed to the bore 6 in the rotary head 5. The pair of cam rings 15, which are similar, each has an inner peripheral cam surface which is divided into a plurality of equi-angular arcuate sections equal in number to the number of cylinders of the engine with which the pump is to be associated. Each section is similarly shaped and gradually increases in radius from one end to the other.

In the outer periphery of each ring 15 is formed a notch 16 with which is engaged a tooth 17 on a nut 18 transversible along a screw 19 extending tangentially relative to the rings and rotatable from the exterior of the body part of the pump. The inner peripheral cam surfaces of the two rings are provided at corresponding positions with the above mentioned sections, and it will therefore be appreciated that the angular setting of the rings 15 will determine the permitted outward movement of the plungers 7 of the injection pump, while any one of the passages 14 in the distributor 5a is in communication with the passage 13 in the body part, and thereby determine the maximum quantity of fuel which can be fed to the engine. Moreover, it will be understood that by rotating the screw 19 to traverse the nut 18 the angular setting of the rings 15 can be adjusted.

It will be understood that the invention is not limited to a construction employing a screw and nut mechanism as above described for imparting the angular movement to the rings 15, and that any other mechanism either manually or hydraulically or otherwise controlled from the exterior of the body part may be employed for this purpose.

By the present invention therefore, the maximum quantity of fuel which can be fed to the engine can be readily adjusted without dismantling any portion of the pump, and may in fact be effected whilst the engine is in operation.

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

1. A liquid fuel pump of the kind specified for supplying fuel to an internal combustion engine, and comprising in combination a rotary cylindrical distributor provided with an axial passage and with fuel inlet and outlet passages extending outwardly from the axial passage, a head which is provided on one end of said distributor so as to be rotatable therewith, and which has a transverse bore in constant communication with the axial passage in said distributor, at least one plunger mounted in the transverse bore in said head, an annular cam which surrounds said head, and through the medium of which said plunger is movable inwardly during rotation of said distributor, at least one subsidiary cam ring which also

surrounds said head, and has an inner peripheral cam surface through the medium of which the outward movement of said plunger is limited, and movable means engaging said cam ring, and operable from the exterior of the pump for imparting angular adjusting movement to said cam ring about the axis of said distributor so as to vary the distance through which said plunger is movable outwardly.

2. A liquid fuel pump according to claim 1, and having an additional subsidiary cam ring which also surrounds said head, and which serves in conjunction with the first mentioned cam ring to limit the outward movement of said plunger, the two cam rings being disposed coaxially with, and at opposite sides respectively of, said annular cam, and being in engagement with said movable means which serves to impart corresponding angular adjusting movements to both cam rings about the axis of said distributor, and the inner peripheries of said cam rings being provided at corresponding positions with a plurality of equi-angular and similar arcuate surfaces each of which gradually increases in radius from one end to the other.

3. A liquid fuel pump according to claim 1, in which the means for imparting angular adjusting movement to said cam ring is movable tangentially relative to said cam ring, and is provided with a tooth engaging an external notch in said cam ring.

4. A liquid fuel pump according to claim 3, wherein said means has the form of a nut in engagement with and traversable along, a rotatable screw extending tangentially relative to said cam ring.

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