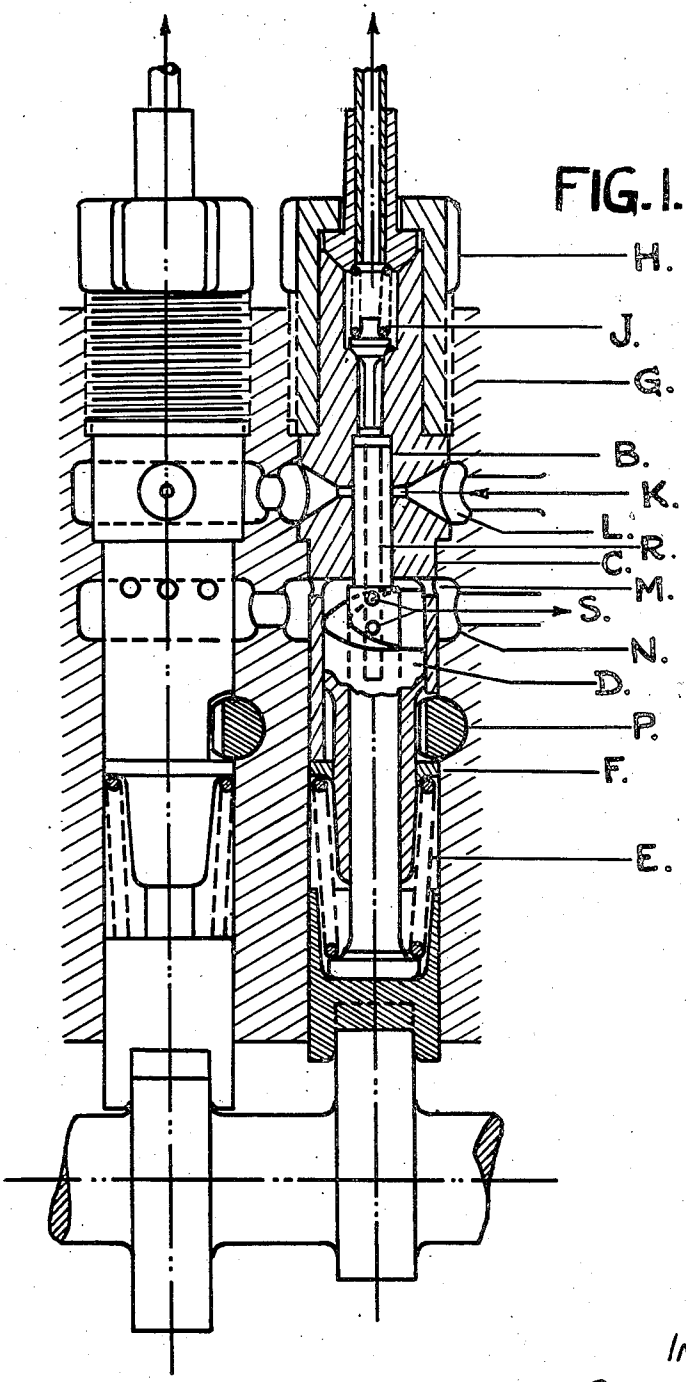
Nov. 8, 1932. S. ALDER 1,886,930

INJECTION PUMP FOR DIESEL ENGINES

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FIG. 1.



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FIG.2.

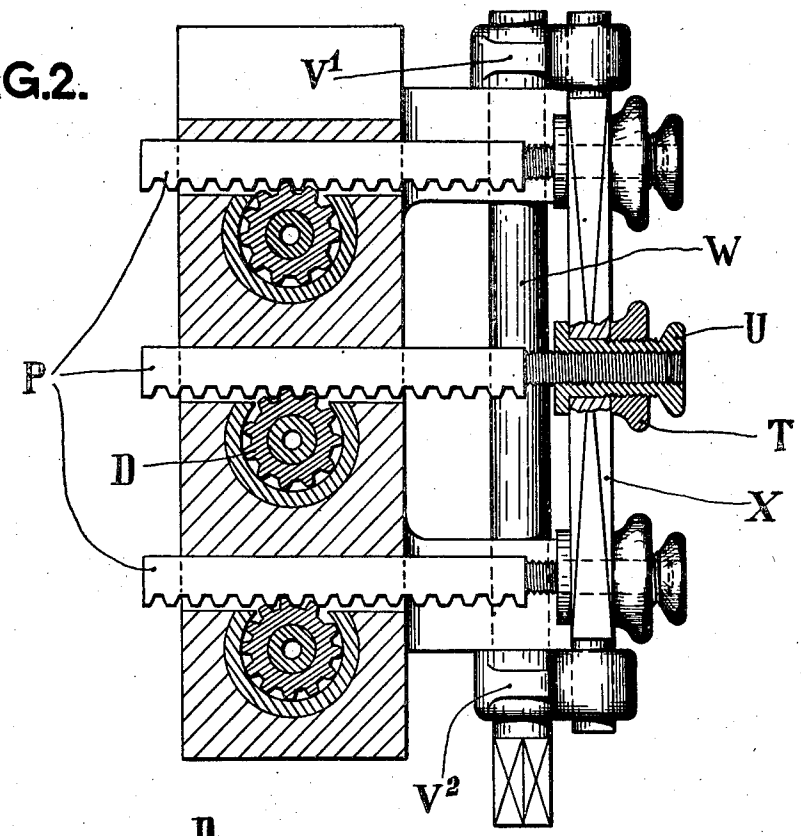
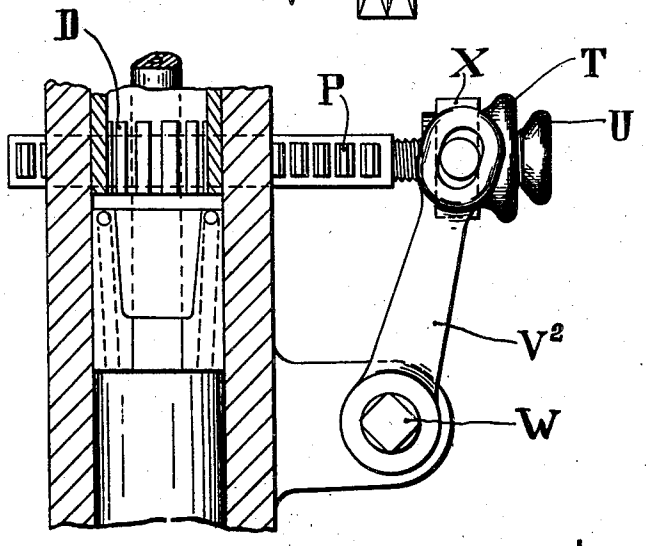


FIG.3.



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UNITED STATES PATENT OFFICE

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INJECTION PUMP FOR DIESEL ENGINES

Application filed October 20, 1930, Serial No. 490,069, and in Great Britain October 22, 1929.

This invention relates to fuel injection pumps for Diesel engines and the like of the type in which capacity is varied by relatively rotating the piston and a sleeve in which the piston is guided, and has for its object to provide an improved pump control means giving a more delicate control than hitherto, while at the same time giving a quicker cut off with a larger effective stroke for the same movement of the plunger as hitherto. Another object of the invention is to provide means for independently adjusting each unit of a multi-cylinder pump. A further object of the invention is to provide means whereby the moving parts may be quickly removed when desired.

According to the present invention, means are provided for effecting relative rotation between the plunger and sleeve up to 360°, while the sleeve has an inclined edge extending up to 360° and cooperating with a plurality of release apertures in the plunger which apertures are arranged along a helix corresponding with the inclined edge on the sleeve.

With this arrangement the several apertures are uncovered simultaneously, thus giving a more rapid initial fall in pressure than is possible with a single aperture whose area is equal to the sum of the areas of the apertures in the present invention. Then again, each aperture is preferably a fraction of the area of the plunger bore, so that its diameter is less than where one aperture is used, and as a result it requires less travel of the plunger to cover and uncover it. Hence the effective stroke of the plunger is increased.

The incoming fuel oil is led to the plunger through one passage, while the rejected fuel oil is led away by a separate passage, so that there is no mixing of the two, and a fuel charge of unvarying consistency is thus always provided.

The invention will now be described with reference to the accompanying drawings in which Fig. 1 shows two units of a multi-cylinder pump in section and elevation. Fig. 2 is a plan view partly in section, and Fig. 3 is an elevational view partly in section showing means for adjustment of the racks.

The plunger B, pump liner C and rotatable guide or sleeve D with helical end, together with the plunger's return-spring E and abutment washer F are all assembled within a housing G, the pump liner C being extended to embrace the rotatable sleeve D in order to ensure correct alignment of these parts with the bore of the pump.

This whole internal assemblage may be withdrawn from the housing G by unscrewing the clamping nut H, and removing the adjusting rack P.

The drawings (Fig. 1) also show the non-return discharge valve J and its spring, the oil inlet ports K and inlet belt L, the oil release ports M and oil release belt N.

The axis of the toothed rack P is placed transversely to the axis of the cam shaft and each rotatable guide has its own rack, so that independent adjustment of each unit of the multi-cylinder pump may be effected. Figs. 2 and 3 illustrate an example of adjustable connection of the racks P to a common cross bar X, the said racks being screw threaded at their ends to engage with adjusting nuts U carrying lock-nuts T. Adjustment is effected by turning a nut U until its respective rack P has turned the sleeve D to the desired position, and then locking by means of the nut T. The ends of the cross bar X engage in slots in the end of arms V^1, V^2 on the end of the control shaft W. The engine throttle is connected to the several racks. The rack engages with teeth cut on the external surface of the rotatable guide D.

The plunger has one relief duct R drilled along its axis and terminating in smaller holes S, the axes of which lie along a helix of the same pitch as that of the helical edge of the guide D, thus ensuring that they will be uncovered simultaneously by the said helical edge as the plunger B reciprocates.

The plunger B is formed with two diameters, the upper part being kept to a small diameter suitable for the required displacement of oil needed for engine injection, while the lower part, which is surrounded by the sleeve, is of more robust construction on ac-

count of the weakening effect of the radial holes. The increased diameter of the lower portion of the plunger B also presents a larger wearing surface to the guide sleeve.

The action of the pump is as follows:—In the downward movement of the plunger B incoming fuel oil enters through the port K. In the first part of the upward movement of the plunger B, the oil is forced past the valve J into the cylinder. In the latter part of the upward movement of the plunger B, the position of the guide D having been adjusted by movement of the rack P, the small transverse holes in the plunger are uncovered by the edge of the helix as they emerge from the guide, and the oil under compression in the pump is free to escape by way of the ducts R and S into the oil belt N, and thence to the supply tank.

I claim:—

1. A fuel injection pump comprising a pump housing, a pump chamber in said housing, a pump inlet communicating with said pump chamber, a sleeve in said housing, an inclined edge on said sleeve, a plunger adapted to reciprocate in said sleeve and in said pump chamber, a central bore in said plunger, said bore opening at one end into said pump chamber, a pump by-pass in said pump housing, a plurality of release apertures in said plunger communicating with said bore on the one hand and said pump outlet on the other hand, said apertures being arranged along a helix corresponding with said inclined edge and adapted to cooperate with said inclined edge to effect the fuel release, and means for effecting relative rotation up to 360° between said plunger and sleeve.

2. A fuel injection pump according to claim 1, wherein the release apertures in the plunger are arranged at equal distances around the periphery of the plunger.

3. A fuel injection pump according to claim 1, wherein the total cross sectional area of the release apertures is at least equal to that of the bore of the plunger.

4. A fuel injection pump comprising a pump housing, a pump liner in said housing, a pump chamber in said liner, a pump inlet communicating with said pump chamber, a sleeve in said liner, an inclined edge on said sleeve, a plunger adapted to reciprocate in said sleeve and in the pump chamber, a central bore in said plunger, said bore opening at one end into said pump chamber, a pump by-pass in said pump liner, a plurality of release apertures in said plunger communicating with said bore on the one hand and said pump by-pass on the other hand, said apertures being arranged along a helix corresponding with said inclined edge and adapted to cooperate with said inclined edge to effect the fuel release, means for effecting relative rotation up to 360° between said plunger and sleeve, an abutment on said plunger, a spring between said abutment and said sleeve, and a screw threaded member adapted to hold said liner in said housing.

In witness whereof I have signed this specification.

STANLEY ALDER.