May 15, 1945. W. V. FALCON 2,375,906

ENGINE FUEL PUMP

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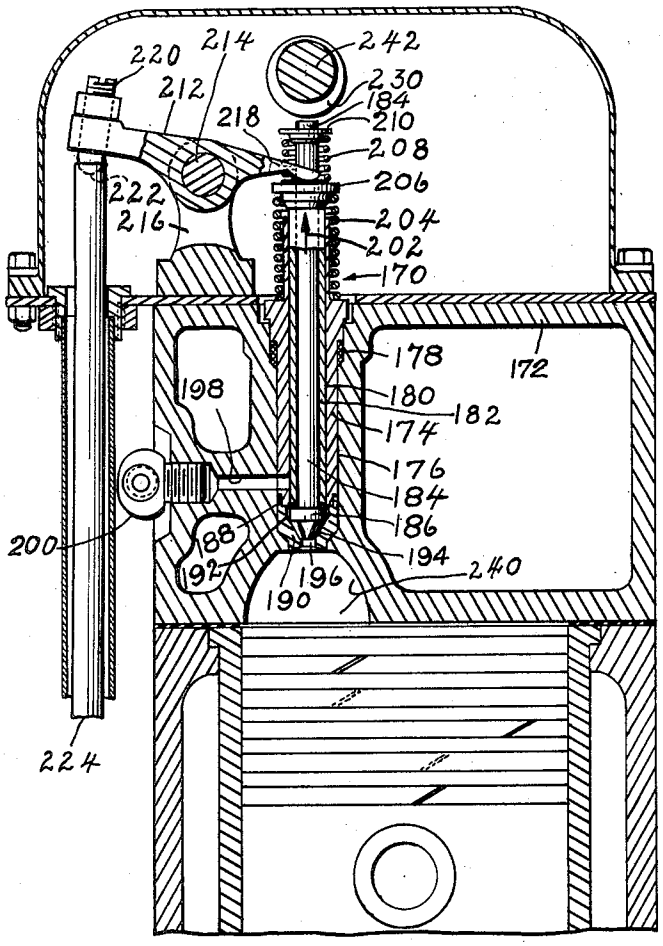



Fig_1_

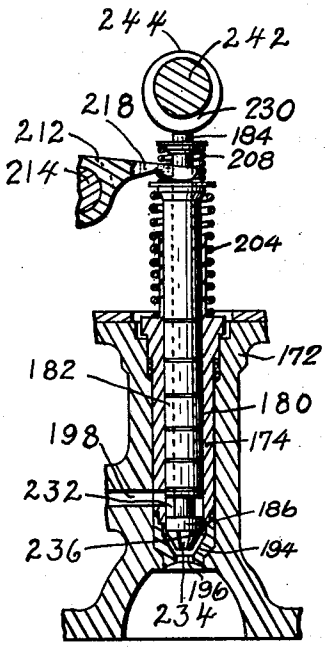



Fig_2_

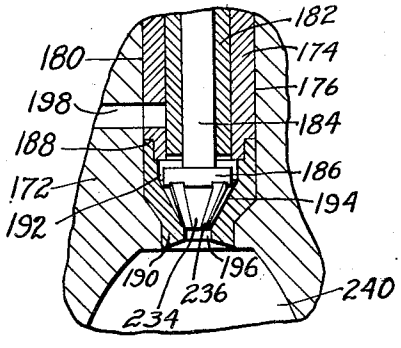



Fig_3_

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# UNITED STATES PATENT OFFICE

2,375,906

## ENGINE FUEL PUMP

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Application May 14, 1942, Serial No. 442,951

2 Claims. (Cl. 299—107.2)

This invention relates generally to compression ignition engines and more particularly to fuel pumps therefor.

It is the primary aim and object of the present invention to provide a simple and sturdy controller for a fuel pump which may be readily manipulated at any time to vary the fuel quantity delivered by said pump for the purposes of starting, stopping, and changing the speed of, a compression ignition engine.

It is another object of the present invention to provide a controller which starts ejection of fuel from the pump progressively earlier in a piston cycle the larger the quantity of each fuel charge becomes, so that the fuel ejection terminates for all intents and purposes at substantially the same period in each piston cycle regardless of the speed of the engine.

The foregoing and other objects of the invention, together with means whereby the latter may be carried into effect will best be understood from the following description of an illustrative embodiment shown in the accompanying drawing, in which:

Fig. 1 is a fragmentary section through an engine having a fuel pump and a controller therefor which embodies the present invention.

Fig. 2 is a section through the fuel pump and controller shown in Fig. 1, showing certain elements thereof in a different relative position.

Fig. 3 is an enlarged fragmentary section through the fuel pump and controller shown in Figs 1 and 2.

Referring to Fig. 1, there is disclosed a fuel pump 170 which is mounted on top of an engine structure. The pump casing 174 fits into a bore 176 in the cylinder head 172 and is effectively sealed from the outside by a gasket 178. Reciprocable in a bore 180 in the pump casing is a sleeve plunger 182 in which the stem 184 of another plunger 186 in said bore is reciprocable. Also fitted into the bore 176 in the cylinder head and inter-engaged as at 188 with the lower end of the pump casing 174 is a nozzle 190 which has an annular recess 192 adjacent to, and of a slightly larger diameter than, the bore 180 in the pump casing, a frusto-conical recess 194 which is a continuation of the annular recess 192, and a discharge passage 196. Provided in the cylinder head 172 and the pump casing 174 is an inlet duct 198 which provides communication between the bore 180 in the pump casing and a conduit 200 which in turn is in communication with a supply of fuel that is preferably under a low pressure. The sleeve plunger 182 is normally urged in the direction of the arrow 202 by means of a compression spring 204 interposed between the pump casing 174 and a flange 206 on said sleeve piston, and the other plunger 186 is normally urged in the same direction by means of a compression spring 208 which is interposed between the flange 206 on the sleeve plunger and a conventional spring retainer 210 at the adjacent end of the valve stem 184. The spring 204 cooperates with a rocker 212 to reciprocate the sleeve plunger 182. The rocker 212 is journalled at 214 on a bracket 216 and has a forked end 218 which straddles the spring 208 and engages the flange 206 on the sleeve plunger. The other end of the rocker 212 is provided with a set screw 220 whose ball-shaped end 222 cooperates with a push rod 224 which is reciprocated through an invariable stroke from the crank shaft in any suitable manner. The sleeve plunger 182 will assume the position illustrated in Fig. 2 at the upper limit of its stroke, and will assume the position shown in Figs. 1 and 3, substantially flush with the adjacent end of the bore 180 in the pump casing, at the lower limit of its stroke. Above the stem 184 of the plunger 186 is a stop 230 against which said stem strikes when the sleeve plunger 182 moves into the upper end position of its stroke as shown in Fig. 2, thereby admitting the plunger 186 sufficiently into the bore 180 of the pump casing to intercept communication between said bore and the annular recess 192 in the nozzle 190. By virtue of the explained movements of the plungers 182 and 186, they also define in the bore 180 of the pump casing a ring shaped space 232 which is, moreover, in communication with the inlet duct 198 so that fuel is admitted into said space. The spring 208 is weaker than the spring 204 so that the sleeve plunger 182 will follow the rocker 212 upwardly throughout its operating range even though the stem 184 of the plunger 186 engages the stop 230 considerably before the sleeve plunger reaches the upper limit of its stroke On the following downward stroke the sleeve plunger displaces fuel from the ring-shaped space 232 into the inlet duct 198 until the same covers said inlet duct, whereupon the fuel charge trapped between the plungers becomes compressed and causes the plunger 186 to descend until the same slightly clears the bore 180 in the pump casing (Fig. 1). The plunger 186 is prevented from being lowered beyond slight clearance from the bore 180 by a frusto-conical crown 234 on said plunger which then becomes

seated on the frusto-conical recess 194 in the nozzle 190. The crown 234 of the plunger 186 is provided with a plurality of shallow grooves 236 through which the fuel charge must pass to the discharge passage 196. Hence, after the crown 234 of the plunger 186 has become seated on the frusto-conical recess 194 in the nozzle, and on continued descent of the sleeve plunger 182, the fuel charge is forced through the fine clearances between the plunger 186 and the annular recess 192 in the nozzle and then through the shallow grooves 236 in the crown 234 from which the fuel escapes at high velocity and finely atomized into the combustion chamber 240.

The stop 230 is preferably in form of an eccentric on a manually rotatable shaft 242, thus providing for axial adjustment of the plunger 186 (Fig. 2). Axial adjustment of the plunger 186 as explained results in a variation in the quantity of the fuel charge, as will be readily understood. Thus, little fuel may be admitted to the combustion chamber 240 for starting purposes, and more fuel may be admitted therein commensurate with speed and load conditions of the engine, by merely manipulating the eccentric shaft 242. On turning said shaft 242 so that the eccentric portion 244 is in operative alignment with the stem 184 of the plunger 186, the latter will remain in engagement with the sleeve plunger 182 throughout the reciprocation of the latter and no fuel will be delivered by the pump, causing the engine to stop.

I claim:

1. A fuel pump comprising a casing having a bore, an inlet duct leading into said bore, and a discharge nozzle provided by a diametrically enlarged end of said bore terminating in an apertured seat, a sleeve plunger slidably fitted in said bore, another plunger also slidably fitted in said bore and having a stem extending with a sliding fit through and beyond said sleeve plunger and a seating surface with a shallow depression forming the sole passage between said enlarged bore end and the aperture in said seat when said seating surface engages said seat, spring means normally retracting said sleeve plunger beyond said inlet duct, a stop engaged by the stem of said other plunger when the latter is between said discharge nozzle and inlet duct, spring means urging the stem of said other plunger into engagement with said stop, and means for reciprocating said sleeve plunger past said inlet duct, the enlarged bore end of said discharge nozzle and slidably fitted portion of the other plunger being so coordinated that the latter is wholly within said enlarged bore end when said seating surface engages said seat.

2. A fuel pump as set forth in claim 1, in which said stop is an angularly adjustable cam to vary the position of said other plunger when the stem of the latter engages said cam.

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