Feb. 8, 1966 S. T. SMITH 3,233,550

HIGH PRESSURE FUEL PUMPS

Filed April 24, 1963 2 Sheets-Sheet 1

Fig. 1.

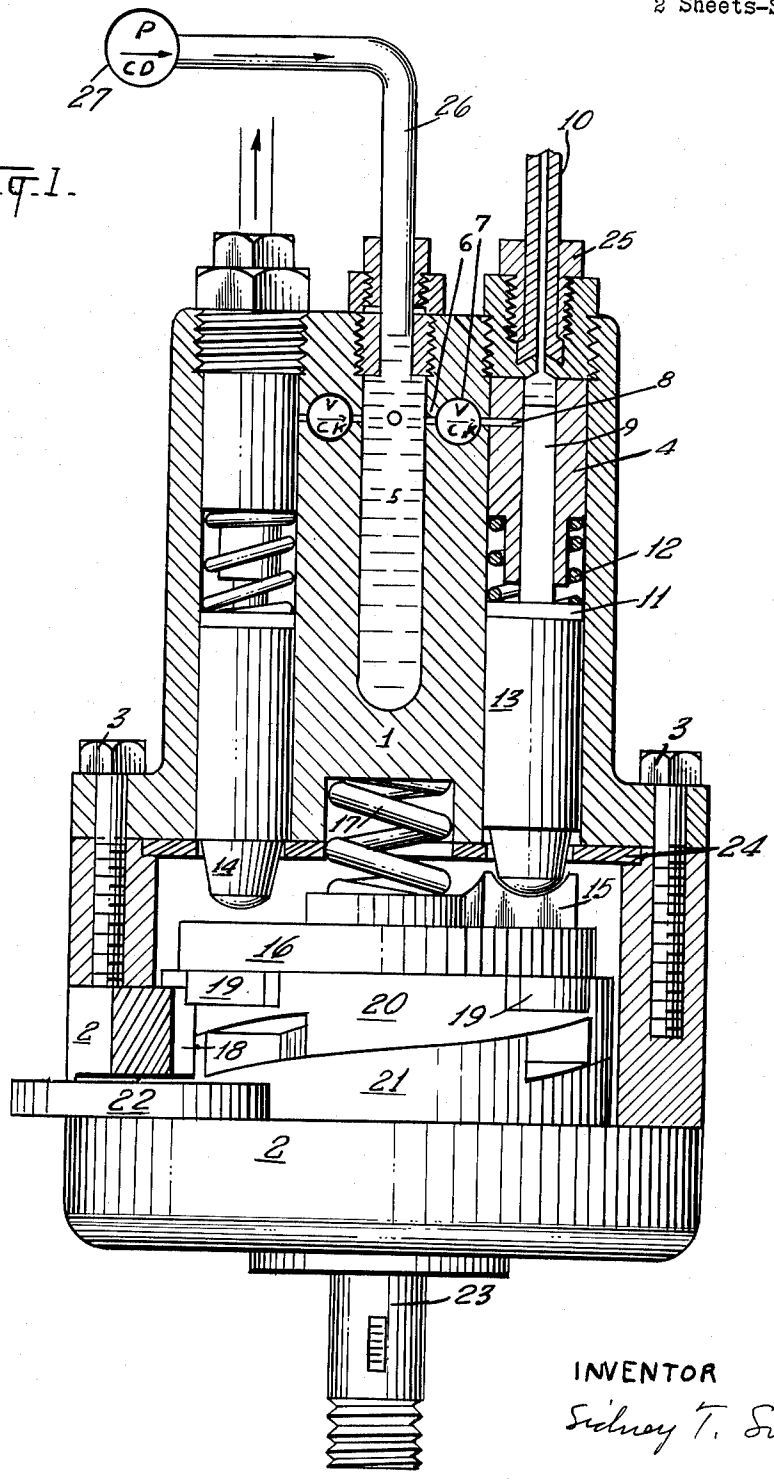

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Fig. 2.

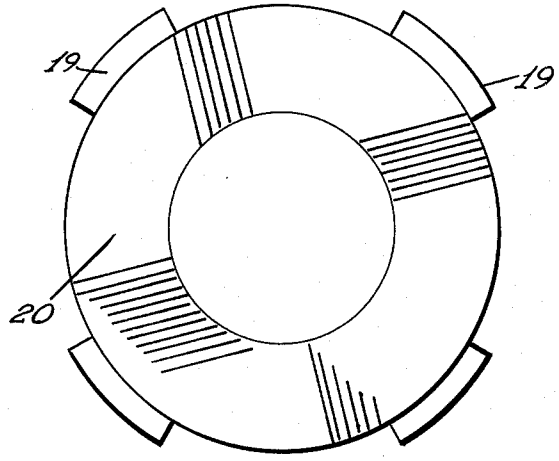


Fig. 3.

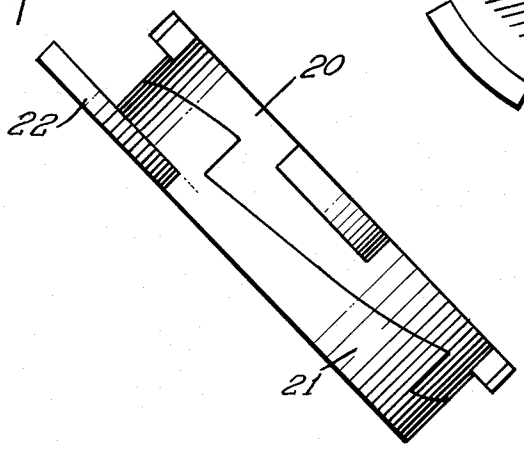


Fig. 4.

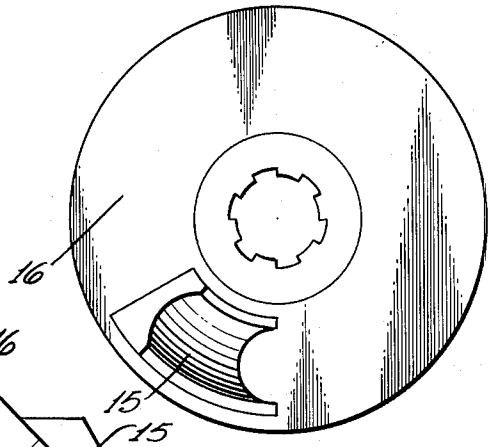
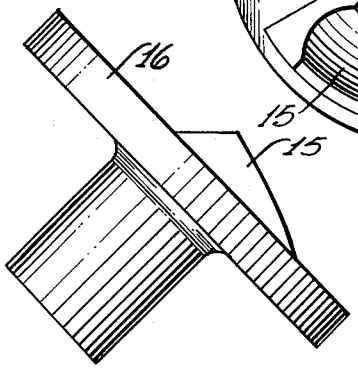


Fig. 5.



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HIGH PRESSURE FUEL PUMPS

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3 Claims. (Cl. 103—38)

This invention relates to improvements in high pressure fuel pumps such as are used on diesel motors. Several pumps of this type have been patented, differing mainly in their means of metering the fuel. This pump follows that pattern. In this device, the metering is accomplished by rotating one ring with inclined planed surfaces coaxially disposed around the pump axis against another ring of similar design but having the inclined planed surfaces slanted in the opposite direction and held stationary so as to force the two rings farther apart. This action raises the rotor and cam which when the motor is operating, produces a longer stroke in the pump barrel and results in a heavier charge of fuel to the engine cylinder being served.

This pump, if built in sufficiently substantial proportions and of proper materials, should endure the high pressures generated in a high pressure pump over long periods of service. Furthermore, the simplicity of design and low number of working parts should make for economy in manufacture.

In the drawings;

FIG. 1 is a vertical sectional view of a fuel pump in accordance with this invention.

FIG. 2 is an inverted view of the ring **20**.

FIG. 3 is a side view of the rings showing the outer edges of the inclined planed surfaces.

FIG. 4 is a top view of the rotor and cam assembly.

FIG. 5 is a side view of the rotor.

Referring now more particularly to the characters of reference in the drawings; this pump comprises a main body **1** of generally cylindrical form, such body including at the bottom, a collar for bolting on the lower body **2** which holds the driving and metering equipment. These include a drive shaft **23**, splined at the upper end, the rotor **16** with a slot in its center, splined to fit on the upper end of the drive shaft, and the two rings **20** and **21** with the inclined planed surfaces opposed.

The main body **1** is formed with a prescribed number of bores coaxially disposed and evenly spaced, which hold the pump barrels **4**, and the tappets **13**. The barrels **4** are threaded at the upper ends to receive the plugs **25** which hold the fuel lines **10** in place, which conduct fuel to engine cylinders. Cam advanced and spring retracted plungers **9** work in the barrels **4**, forced up by the tappets **13** and the cam **15**. Helical springs **12** surround the plungers **9** at their lower ends and, working between the lower end of the barrel and the guidehead **11** on the lower end of the plungers, serve to retract the plungers after the pressure stroke.

Each pump barrel **4** together with its enclosed plunger **9** and the related working parts form what may be termed a fuel metering and distributing unit. One of these units is allotted to each of the cylinders in the engine being served.

The body **1** contains in its center a fuel reservoir **5** fed by a constant delivery pump **27** of about twenty-five pounds pressure. From this reservoir the fuel is fed to the surrounding pump barrels thru check valves **7** and canals **6** and **8**. When the plunger **9** is retracted the low pressure fuel from the reservoir **5** is fed into the pump barrels **4** and on the succeding pressure stroke, when the motor is in operation, a charge of fuel is forced thru the fuel line **10** into the engine cylinder being served. The check valves **7** are not indispensible to the working efficiency of the pump. They serve only to make a shorter plunger stroke adequate.

The rings **20** and **21** with the inclined planed surfaces opposed constitute the basis of this device for which a patent is sought. The ring **20** is held from turning by the lugs **19** on its sides which are held by ribs **18** in the inside of the lower body **2**. When lever **22** is moved in a clockwise direction, as seen from its upper side, ring **21** moves with it and, by the action of the opposed inclined planed surfaces working against each other, forces ring **20**, which cannot turn, to a higher position. Rotor **16** and cam **15**, supported by ring **20**, are moved up with it and, when the pump is in operation, the tappet **13** and the plunger **9** are given a longer pressure stroke, resulting in a heavier charge of fuel to the engine cylinder being served. When the cam **15** passes the nub **14** the tappet **13** and the plunger **9** are pushed back to their lowest point by the spring **12** between the lower end of the pump barrel **4** and the guidehead **11**. The tappet **13** rests on the retainer plate **24** which limits the return stroke of the plunger **9** to a point just below canal **8**. When the lever **22** is moved counterclockwise, moving ring **21** with it, some pressure is taken off ring **20** and the spring **17** moves the rotor **16** and the ring **20** down against ring **21** which reduces the pressure stroke of the plunger **9**.

The pump is mounted at its base to the motor and has a drive gear (not shown) secured on the outer end of the drive shaft **23**. The drive gear is properly meshed and timed in the timing gear train so that the charges of fuel are delivered to the respective engine cylinders at the most efficient time.

The described fuel pump, while being relatively simple in its structure, is also quite rugged and provides a practical and efficient machine for the injection of high pressure fuels into engine cylinders.

From the foregoing description it should be evident that there has been produced such a device as substantially fulfills the objects of the invention as set forth herein.

While this specification sets forth in detail the preferred construction of the device, in practice deviations from such detail may be resorted to as do not form a departure from the basic elements of the invention as defined by the appended claims.

Having thus described the invention, the following is claimed as new and useful, and upon which Letters Patent is sought:

1. A fuel pump comprising a body having a cylinder therein, the cylinder having a head, a fuel outlet passage from said head, a fuel inlet passage checkvalve controlled outwardly, leading to the cylinder a distance from said head, a fuel pressure line leading to said inlet passage, a plunger slidable in the cylinder means to reciprocate the plunger thru a stroke of variable length, such latter means including a driven shaft, a rotary cam mounted in driving relation on the shaft and shiftable axially thereof, one end of the plunger riding a tappet which rides a cam, and applied to the cam means to shift the cam axially along the shaft in one direction whereby to alter the length of reciprocation of the plunger, said last named means comprising a non-rotatable ring movable axially on the shaft and on which the cam is rotatably mounted, the face of the ring opposite the cam being provided with inclined planed surfaces, coaxially disposed, riding another ring of similar design with the planed surfaces opposed, and means to turn the opposed ring.

2. A fuel pump comprising a body having a cylinder therein, the cylinder having a head, a fuel outlet passage from said head, a fuel inlet passage leading to the cylinder a distance from said head, a fuel pressure line leading to said inlet passage, a plunger slidable in the cylinder,

means to reciprocate the plunger thru a stroke of variable length, such latter means including a driven shaft, a rotary cam mounted in driving relation on the shaft and shiftable axially thereof, one end of the plunger riding said cam, and applied to the cam means to shift the cam axially along the shaft in one direction, whereby to alter the length of reciprocation of the plunger, said last named means comprising a non-rotatable ring, movable axially on the shaft and on which the cam is rotatably mounted, the face of ring opposite the cam being provided with inclined planed surfaces, coaxially disposed riding another ring of corresponding design with the planed surfaces opposed and means to turn the opposed ring.

3. A fuel pump comprising a body having a cylinder therein, the cylinder having a head, a fuel outlet passage from said head, a fuel inlet passage leading to the cylinder a distance from said head, a fuel pressure line leading to said inlet passage, a plunger slidable in the cylinder, means to reciprocate the plunger thru a stroke of constant length from below the inlet passage to a point beyond the passage, such latter means including a driven shaft, a rotary cam mounted in driving relation on the

shaft and shiftable axially thereof, one end of the plunger riding said cam, and applied to the cam means to shift the cam axially along the shaft in one direction, whereby to alter the range of reciprocation of the plunger, said last named means comprising a non-rotatable ring, movable axially on the shaft and on which the cam is rotatably mounted, the face of ring opposite the cam being provided with inclined planed surfaces, coaxially disposed, riding another ring of corresponding design with the planed surfaces opposed and means to turn the opposed ring.

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