Oct. 9, 1934. F. A. THAHELD 1,976,151

FUEL PUMP FOR INTERNAL COMBUSTION ENGINES

Filed June 19, 1931

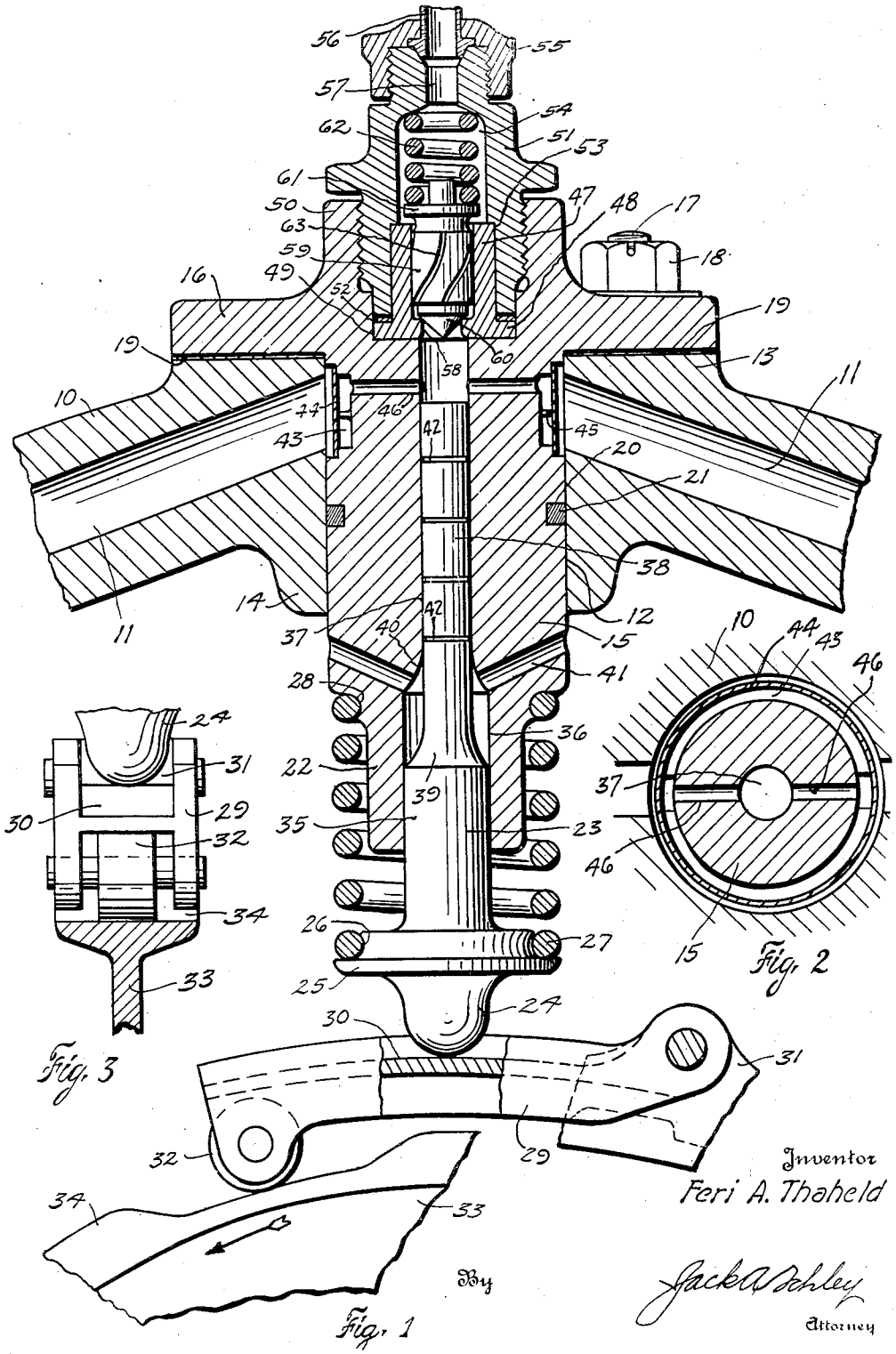

Fig. 3

Fig. 2

Fig. 1

Inventor
Feri A. Thaheld

By Jack A. Ashley
Attorney

Patented Oct. 9, 1934

1,976,151

UNITED STATES PATENT OFFICE

1,976,151

FUEL PUMP FOR INTERNAL COMBUSTION ENGINE

Feri A. Thaheld, Austria, Tex., assignor, by mesne assignments, to Guiberson Diesel Engine Company, Dover, Del., a corporation of Delaware

Application June 19, 1931, Serial No. 545,461

5 Claims. (Cl. 103—154)

This invention relates to new and useful improvements in fuel pumps for internal combustion engines.

The invention has particularly to do with pumps such as are used for forcing the fuel oil to and through the injectors of engines firing under the heat of compression.

One object of the invention is to provide an improved pump wherein the plunger is formed with a shank and reduced stem, together with lubricating openings in the pump barrel, whereby oil admitted to the barrel is displaced longitudinally of the stem by the shank and also whereby the enlarged shank takes the side thrust, thus saving the stem.

A further object of the invention is to provide the pump barrel with a head gasket for packing against the crank case or other support, and also with an annular gasket engaging in the bore of the barrel support thus packing off the barrel and at the same time permitting a swelling of the annular gasket without displacing the barrel or causing a leak.

Among other objects of the invention are, the provision of a returning spring for the plunger attached to both the plunger and the barrel to prevent separation of these parts when the pump is removed from its support, and a supporting projection for preventing collapsing of the fuel screen.

A still further object of the invention is to construct the valve chamber of the pump as to eliminate the trapping or pocketing of air therein.

An important object of the invention is to provide a valve member having helical grooves which tend to cause the fluid to whirl, whereby entrapped fluids are washed out of the valve chamber, and also whereby the valve is induced to rotate, thus becoming self-grinding or self-seating.

A construction designed to carry out the invention will be hereinafter described together with other features of the invention.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawing in which an example of the invention is shown, and wherein:

Figure 1 is a vertical sectional view of a pump constructed in accordance with the invention,

Figure 2 is a horizontal cross-sectional view through the fuel screen and by-pass, and

Figure 3 is a front elevation of the tripping lever.

In the drawing the numeral 10 designates the outer wall of the crank case of an internal combustion engine, as for instance, one of the Diesel type, or any other style of engine which fires under the heat of compression, or requires fuel to be injected into the cylinder thereof. As is shown in my co-pending application Serial No. 498,351, the wall of the crank case is provided with a fuel duct or line 11, whereby the fuel oil is conducted to the pump and also by-passed around said pump. The wall is provided with a cylindrical opening or bore 12 which is surrounded by an outer boss 13 and an inner boss 14, whereby the bore is given sufficient length to snugly receive and hold a cylindrical pump barrel 15. The barrel is provided with an annular overhanging collar 16, which is integral therewith. The collar 16 is secured to the boss 13 by studs such as 17, each of which receives a nut 18. A head gasket 19 is interposed between the boss and the collar. The barrel is provided with an annular groove 20, and a packing ring 21 is seated in this groove. The outer face of the ring engages the surface of the bore 12, and this prevents fluids from passing the ring in either direction. It will be seen that if the ring should swell it will not in any way disturb the head gasket 19, or the mounting of the collar 16. This is an advance over the packing shown in my co-pending application Serial No. 498,351.

The pump barrel 15 extends inwardly beyond the boss 14 and terminates in a reduced neck 22. A pump plunger 23 is mounted in the barrel and projects from the neck 22. On the lower end of the plunger is provided a ball head 24 extending from an annular collar 25. The collar is provided with a concaved groove 26 in which one end of a coiled spring 27 is seated. The opposite end of the coiled spring is seated in a groove 28 formed in the shoulder between the barrel and the neck, which latter the spring surrounds. By this arrangement the plunger is connected to the pump barrel by the spring, and when the pump is removed from the crank casing, the plunger can not drop out.

For tripping the plunger I have illustrated a lever 29 having a concaved groove or channel 30 in its upper side in which the head 24 engages. The lever is pivoted to a support 31 and carries a roller 32 at its opposite end. This roller travels on a cam disk 33 in the path of cams 34. When the disk is revolved the cams engage the roller and swing the lever upwardly, whereby the plunger 23 is forced into the barrel under the tension of the spring 27. When the roller rides off of the

cam the spring will return the parts to their starting positions. The pump plunger could, of course, be operated by other means.

The plunger 23 is provided with an enlarged cylindrical shank 35, which is snugly slidable in an axial bore 36 formed in the neck 22. The bore 36 is merged into a reduced bore 37 which receives the reduced stem 38 of the plunger. The lower end of the stem is merged into the shank by a curved fillet 39, and when the plunger reaches the inner end of its stroke, this fillet engages a complementary shoulder 40 connecting the bores 36 and 37.

In order to lubricate the plunger inclined ports 41 extend from the shoulder 40 through the wall of the barrel toward the boss 14. Oil which is thrown up by the crank (not shown) will be splashed into these ports and thus conducted to the bore 36. When the plunger is reciprocated this oil will be forced along both the shank and the stem owing to its displacement by the shoulder 39. The stem is provided with oil grooves 42 which act as fluid seals. The enlarged shank gives sufficient bearing surface to take the side thrust, and thus protect the stem. Owing to the reduced size of the stem, the plunger may have a comparatively long stroke and thus be less sensitive in its action.

An annular groove 43 in the outer surface of the barrel provides a circular passage for fuel oil. A screen 44 is seated in this groove and supported by semi-circular ribs 45, which prevent its collapsing. Fuel oil flowing through the ducts 11 may either pass through the screen or around the groove from one duct to the other. Radial ports 46 extend from the groove to the bore 37 beyond the end of the stem 38. The fuel oil thus fills the bore beyond the piston stem.

A liner or bushing 47 is provided with an outwardly directed annular flange 48 at its bottom, and is seated in a socket 49 formed in the head of the barrel at the base of a box 50. A nipple 51 is screwed into the box which is internally screw-threaded and bears at its lower end a packing gasket 52 seated on the flange 48. The nipple has a counter bore 53 in which the bushing 47 has a snug fit. Above the bushing the nipple is provided with an axial bore or spring chamber 54. A cap 55 is screwed on the upper reduced end of the nipple for fastening thereto the fuel pipe 56 which leads to the fuel injector (not shown). A port 57 connects the chamber 54 with the pipe.

The bushing 47 has an annular valve seat 58 at its bottom disposed concentrically over the end of the bore 37 of the pump barrel. A cylindrical valve 59 is slidably mounted in the bushing, and is provided with a reduced conical point 60 at its lower end engaging in the seat 58. Above the bushing the valve is provided with an outwardly directed flange 61 which supports the lower end of a coil spring 62 confined in the chamber 54. The valve is displaced upwardly against the tension of this spring.

A very important feature is the provision of helical grooves 63 in the outer surface of the valve 59. These grooves provide for the upward passage of the fuel oil, which is displaced by the stem 38 when the valve is unseated. These grooves divide the oil or liquid into a plurality of fine streams and being helical impart a whirling motion to such streams. The whirling streams being discharged into the chamber 54 will thoroughly scour the same and drive out through the port 57, any oil or air which may be trapped in said chamber. The helical shape of the grooves also tends to rotate the valve 59 thus causing the point 60 to clean and grind the seat 58. It will be noted that there are no internal ports in the valve and the shape of the chamber 54 is such as to offer little opportunity for the trapping of oil and gas therein.

When the lever 29 is tripped the plunger 23 will be displaced inwardly against the tension of the spring 27. The reduced stem 38 will be moved toward the valve 59, and after covering the ports 46 will displace the liquid in the bore 37 through the valve seat 58 after unseating the valve 59. The oil will be forced through the groove 63 whereby it will be caused to whirl and finally discharge into the pipe 56 from the chamber 54 through the port 57. When the roller 32 rides off of the cam 34 the lever 29 will be released, and the spring 27 will restore the plunger and force the lever onto the surface of the disk 33. At the same time, the spring 62 which has been compressed, will seat the valve 59.

It will be noted that the plunger 38 will travel a short distance before closing the ports 46, and the opening of the valve 59 will be resisted by the spring 62 until sufficient force is built up by the plunger stroke to overcome said spring. This action will be positive and steady, and the usual sensitiveness present in devices of this type will be eliminated. Any air which may be present after the ports 46 are closed will be expelled and discharged into the pipe 56. Upon the return stroke of the plunger, oil will be drawn in through the ports 46 and there will be little chance for air to enter the bore 37, except that which is entrained with the supply of fuel oil from the ducts 11, or that which might leak past the packings.

Various changes in the size and shape of the different parts, as well as modifications and alterations, may be made within the scope of the appended claims.

What is claimed is,

1. In a fuel pump, a pump barrel having a large bore and a reduced bore and also having an open lubricating port extending through its wall substantially at the junction between its bores for admitting lubricating oil splashed against the barrel, and a plunger working in the barrel and having portions engaging in said bores and arranged to displace said lubricating oil into said bores.

2. The combination with the crank case of an engine, of a pump having a barrel mounted in the wall of said case and projecting inwardly therefrom, the barrel having a bore with a reduced portion, said barrel having inlet ports extending through the wall to its bore for admitting lubricating oil splashed on said barrel, and a plunger working in the bore of the barrel and acting to displace said lubricating oil, said barrel also having inlet ports connected with its bore for admitting fuel oil thereto.

3. In a fuel pump, a barrel having a bore and a reduced bore extending axially thereof, the barrel also having a shoulder between its bores, said barrel also having splash ports extending through its wall from said shoulder, and a plunger having a shank fitting in the bore and a reduced stem fitting in the reduced bore of the barrel, said plunger also having a portion between its shank and stem for displacing lubricating oil admitted through said ports, the barrel having a fuel oil inlet at the outer end portion of its barrel.

4. In a fuel pump, a pump barrel having a

large bore and a reduced bore connected with each other, the barrel having inclined lubricating ports extending from its outer surface to points at the junction of the two bores, and a plunger working in the barrel and having portions engaging in said bores, the outer ends of the lubricating ports being constantly open to receive oil cast upon said barrel.

5. In a fuel pump, a pump barrel having a large bore and a reduced bore, an internal annular shoulder connecting the ends of the bores of the barrel, ports extending through the wall of the barrel from the outer surface thereof to the shoulder thereof, a plunger working in the barrel having a shank fitting in the large bore and a stem fitting in the reduced bore, and an annular shoulder between the shank and the stem of the plunger co-acting with the shoulder of the barrel and also co-acting with the ports for self-lubrication.

FERI A. THAHELD.