

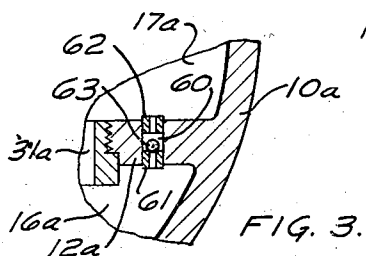
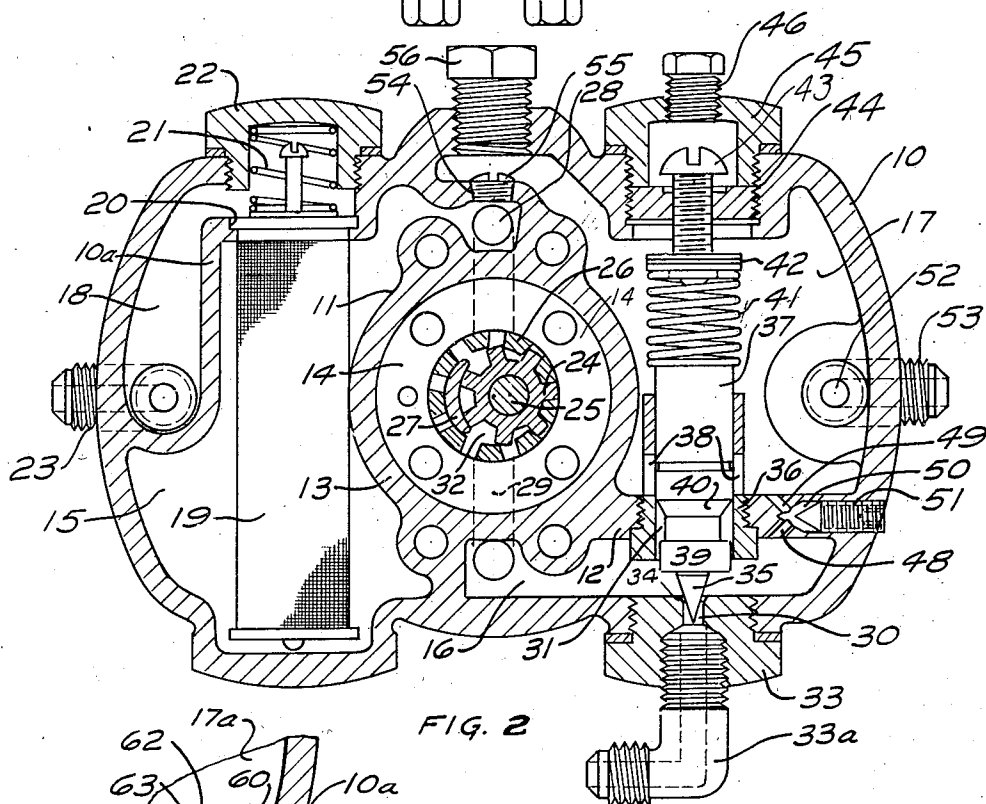
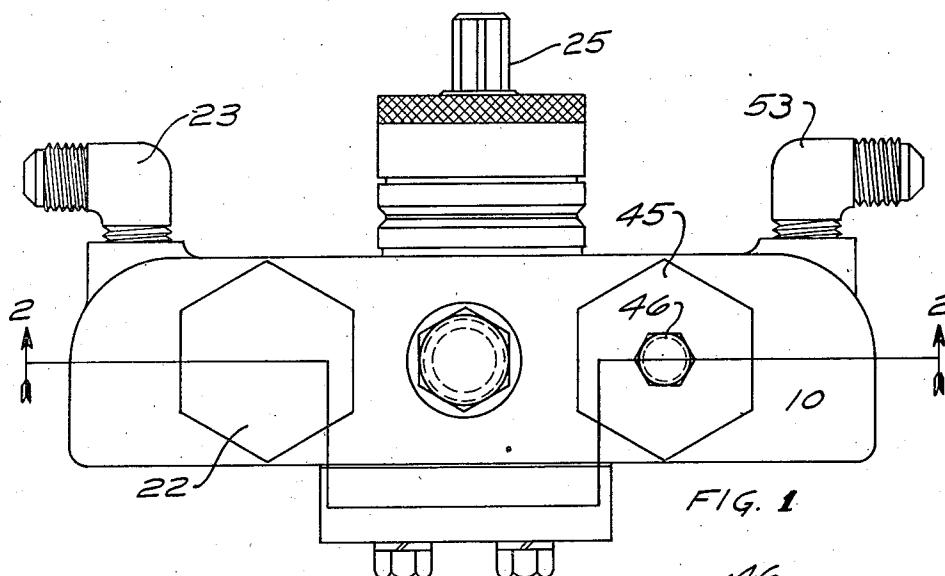
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FUEL PUMP

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FUEL PUMP

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7 Claims. (Cl. 103—42)

This invention relates to fuel pumps for supplying liquid fuel to oil burners, and more particularly to devices for bleeding air from the pump housing.

5 The presence of air in a fuel pump disturbs the operation thereof and reduces its efficiency. For that reason prior fuel pumps usually have been supplied with a port in a wall of the high pressure section through which the air may be removed. Such a port is closed by a removable screw plug and in order to purge the pump of air it is necessary to remove the plug and operate the pump until oil flows out, thereby indicating that the air is completely expelled. Naturally the fuel 10 which escapes before the plug can be reinserted in the port flows out over the housing. If this is allowed to remain it creates a dangerous fire hazard, as well as giving the pump an unsightly appearance. Also, wiping off the oil is a disagreeable task.

15 It is the primary object of this invention to eliminate the above objections by providing a port within the interior of the housing to allow the air which may become trapped within the high pressure chamber of the pump to escape through the return line to the source of fuel supply. Another 20 object of the invention is to provide a means for bleeding air from the pump which will be simple and economical to manufacture, and which will be positive in its operation.

25 These and other objects ancillary thereto will become more apparent in the following specification when read in the light of the accompanying drawing which forms a part thereof. In the 30 drawing:

35 Figure 1 is a plan view of a pump embodying this invention;

Figure 2 is a cross-sectional view taken on substantially the line 2—2 of Figure 1; and

40 Figure 3 is a fragmentary cross sectional view similar to Figure 1 but showing a modified form of port for bleeding air from the high pressure chamber of the pump.

45 The pump shown in Figures 1 and 2 comprises a housing 10 which is divided into four chambers by partitions 10a, 11 and 12. These four chambers are the inlet chamber 18, the filter chamber 15, the high pressure chamber 16 and the relief chamber 17. The inlet chamber 18 and the filter 50 chamber 15 together comprise what may be termed the low pressure chamber of the pump.

55 The partition 10a has an opening 20 extending through it and seated in the opening 20 is the upper end of a porous filter screen 19. The latter extends downwardly into the filter chamber 15

and is so arranged that all fuel entering the filter chamber from the inlet chamber 18 must pass through the screen. The screen is held in the opening by means of a spring 21, one end of which is seated in a cup-shaped plug 22 threaded 5 into a hole in the housing 10.

The major part of the partition 11 is enlarged at 13 in order to receive a pump casing 14, the latter being pressed into a bore in said enlargement. Within the pump casing is a pump chamber 32. An inlet duct 28 extending through the 10 partition 11 and pump casing 14 connects the pump chamber 32 with the filter chamber 15, in order that fuel may enter the pump chamber from the filter chamber.

15 The pump chamber houses the two moving parts of a rotary pump. These two moving parts are the gear 24 which is secured to the pump drive shaft 25, and the notched ring 26. The gear 24 and ring 26 are located eccentrically with respect to each other and are separated at one side 20 by a partition lug 27 which is preferably integral with the pump casing. Rotary pumps of this type are well known in the art and it is believed to be unnecessary to describe the pump in detail.

25 The high pressure chamber 16 has an inlet duct 29 connecting it with the pump chamber 32 and three outlets, a main outlet 30, a relief outlet 31, and an air bleeding outlet consisting of two connecting ports 48 and 49. The main outlet 30 is 30 formed in a plug 33 which is threaded into the housing 10. The mouth of the outlet 30 is tapered to form a valve seat 34.

35 The relief outlet 31 is formed in a sleeve 36 threaded into an opening in the partition 12 directly above the main outlet 30. The sleeve 36 extends upwardly into the relief chamber and has ports 38 in its sides just above the partition 12.

40 A valve plunger 37 is slidably received in the sleeve 36, the upper part of which forms a guide for the plunger. The lower portion of the plunger 36 is reduced in diameter, thereby forming a shoulder 40. The lower end 39 of the plunger, though larger than the portion immediately above 45 it, is also smaller than the sleeve in order to allow fuel to flow past said end under certain conditions. The lower end of the plunger carries a conical valve 35 which seats in the valve seat 34 when the pump is inoperative or there is air in 50 the high pressure chamber 16.

55 The plunger 37 is biased downwardly by a helical spring 41 located between washers 42 and the upper end of the plunger 37. The washers are secured to a screw 43 threaded into a support 44

which in turn is threaded into the top of the housing. The support is covered by a threaded cap 45 provided with a threaded plug 46. The latter is readily removable to afford access to the screw 43. By adjusting the screw 43 the tension of spring 41 may be easily regulated.

The air bleeding outlet is composed of two small ports 48 and 49 which enter a horizontally extending bore 50 tapered at its inner end. This bore is threaded for the reception of an Allen head set screw 51, having a tapered point fitting the end of the bore 50. The bore 50 extends longitudinally of the partition 12 and communicates with the exterior of the housing, whereby the set screw 51 may be entirely removed, if desired, to afford direct communication between the high pressure chamber 16 and the atmosphere.

The pump housing is adapted to be connected to the supply tank and oil burner by means of suitable pipes and pipe fittings. In order for it to be so connected the housing is provided with nipples 23, 33a and 53, threaded into openings therein. The nipple 23 connects the supply line to the inlet chamber, nipple 33a connects the outlet 30 to the oil burner line, and nipple 53 connects the relief chamber 17 through an opening 52 to the supply tank. The latter nipple allows air and excess fuel to escape from the housing back to the tank.

The operation of the device is as follows:

When the pump proper is not being rotated, or when the pump is rotating but there is air in either the pump chamber or the high pressure chamber, the outlet valve 35 will be held against its seat 34 by means of the spring 41 because the pressure in the high pressure chamber will not be great enough to raise this valve from its seat. In order to rid the high pressure chamber of air the pump is started and the set screw 51 is backed out of the bore sufficiently to uncover the two ports 48 and 49. The air trapped in the high pressure chamber will then flow out through these ports into the relief chamber 17 and thence through the outlet 52, nipple 53 and the return line to the supply tank. As soon as the high pressure chamber 16 is rid of air the set screw 51 is threaded home in its seat, closing the ports 48 and 49.

When the ports 48 and 49 are closed the pump will soon build up the pressure in the chamber 16. The pressure will act on the lower end of the plunger 37 and shoulder 40, raising it, and the needle valve 35 with it, thereby opening the outlet port 30. Fuel may then flow to the oil burner.

If the pressure in chamber 16 becomes greater than that required during the normal operation of the burner, the plunger 37 will be lifted still further, thereby uncovering the ports 38. Excess fuel will then escape through these ports to the relief chamber 17 from which it may flow back to the supply tank through the outlet 52.

It will be seen from the foregoing that this invention provides a simple and positive means for venting the high pressure chamber when desired, and thus ridding it of air. It will also be apparent that it is unnecessary to entirely remove any plug from the pump housing in order to bleed air from the interior thereof, and therefore, there is no possibility of fuel escaping from the pump housing.

The pump just described is constructed so that it may be used in a system in which it is impossible or undesirable to employ a return line for returning excess fuel to the supply tank. In

order that the pump may be employed in such a system it is provided with an opening 54 in partition 11 just above the pump inlet duct 28. This opening is normally closed by a threaded plug 55. A removable plug 56 is threaded into the housing 10 above the plug 55 in order to afford access to the latter.

When used in a so-called one line system, that is, without a return line, the opening 52 is closed by a suitable plug and plug 55 is entirely removed. The set screw 51 is entirely removed and the pump is run until oil appears in the bore 50. This indicates that all air is purged from the pump housing. The set screw is reinserted and threaded home. The pump then acts in the manner previously described, except that fuel which escapes through the relief outlet 31 into the relief chamber 17 flows through the opening 54 to the low pressure side of the pump instead of through opening 52 back to the supply tank.

Figure 3 shows a modified form of the invention. In general the pump is identical with that previously described, but instead of having a manually controlled air bleeder outlet it is provided with an automatic valve, whereby whenever air appears in the high pressure chamber it is automatically released into the relief chamber.

In this device the wall 12a of the high pressure chamber 16a is provided with a bore 60. Inserted in the bore are two valve seats 61 and 62, each having a small opening therethrough. The valve seats 61 and 62 are spaced apart to accommodate a ball check valve 63 which rests on the lower seat 61 due to its own weight as long as there is no fluid pressure in the chamber 16a. When the pump is operated the ball 63 will be lifted slightly to allow air to leak past the ball. As soon as the high pressure chamber 16a is full of oil, however, the pressure in the chamber 16 will rise, and ball 63 will be lifted from its seat 61 and held against seat 62, thereby closing the air bleeding outlet. Any further increase in oil pressure will be compensated for by escape of oil through the relief outlet 31a, as in the previously described device.

The scope of the invention is indicated in the appended claims.

I claim:

1. A liquid fuel pump comprising a casing, a low pressure chamber in said casing having an inlet opening for the supply of liquid fuel thereto, a high pressure chamber in said casing having an outlet opening for the discharge of liquid fuel therefrom, a pump positioned between the two chambers for transmitting fuel from the low pressure chamber to the high pressure chamber, a valve associated with the outlet opening in the high pressure chamber adapted to be opened by the pressure of the fuel within the high pressure chamber, a relief chamber in said casing having an outlet opening for the discharge of air and fuel therefrom, means for purging the high pressure chamber of air comprising a passageway between the high pressure chamber and the relief chamber, and a valve operable independently of said first mentioned valve for opening and closing said passageway.

2. A liquid fuel pump comprising a casing, a low pressure chamber in said casing having an inlet opening for the supply of liquid fuel thereto, a high pressure chamber in said casing having an outlet opening for the discharge of liquid fuel therefrom, a pump positioned between the two

chambers for transmitting fuel from the low pressure chamber to the high pressure chamber, a valve associated with the outlet opening in the high pressure chamber adapted to be opened by the pressure of the fuel within the high pressure chamber, a relief chamber in said casing having an outlet opening for the discharge of air and fuel therefrom, means for purging the high pressure chamber of air comprising a passageway between the high pressure chamber and the relief chamber, and means operable from the exterior of the casing for opening and closing said passageway.

3. A liquid fuel pump comprising a casing, a low pressure chamber in said casing having an inlet opening for the supply of liquid fuel thereto, a high pressure chamber in said casing having an outlet opening for the discharge of liquid fuel therefrom, a pump positioned between the two chambers for transmitting fuel from the low pressure chamber to the high pressure chamber, a valve associated with the outlet opening in the high pressure chamber adapted to be opened by the pressure of the fuel in the high pressure chamber, a relief chamber in said casing having an outlet opening for the discharge of air and fuel therefrom, said relief chamber and high pressure chamber having a common wall extending laterally from a side wall of said casing, means for purging the high pressure chamber of air comprising a passageway extending through said common wall between the high pressure chamber and the relief chamber, and manually operable means for closing said passageway.

4. A liquid fuel pump comprising a casing, a low pressure chamber in said casing having an inlet opening for the supply of liquid fuel thereto, a high pressure chamber in said casing having an outlet opening for the discharge of liquid fuel therefrom, a pump positioned between the two chambers for transmitting fuel from the low pressure chamber to the high pressure chamber, a valve associated with the outlet opening in the high pressure chamber adapted to be opened by the pressure of the fuel in the high pressure chamber, a relief chamber in said casing having an outlet opening for the discharge of air and fuel therefrom, said relief chamber and high pressure chamber having a common wall extending laterally from a side wall of said casing, means for purging the high pressure chamber of air comprising a passageway extending through said common wall between the high pressure chamber and the relief chamber, a bore extending through said side wall into said common wall and intersecting said passageway, the axis of said bore lying in the plane of said common wall, and means movable axially of said bore for opening and closing said passageway.

5. A liquid fuel pump comprising a casing, a low pressure chamber in said casing having an inlet opening for the supply of liquid fuel thereto, a high pressure chamber in said casing having

an outlet opening for the discharge of liquid fuel therefrom, a pump positioned between the two chambers for transmitting fuel from the low pressure chamber to the high pressure chamber, a valve associated with the outlet opening in the high pressure chamber adapted to be opened by the pressure of the fuel in the high pressure chamber, a relief chamber in said casing having an outlet opening for the discharge of air and fuel therefrom, said relief chamber and high pressure chamber having a common wall extending laterally from a side wall of said casing, means for purging the high pressure chamber of air comprising a passageway extending through said common wall between the high pressure chamber and the relief chamber, a bore extending through said side wall into said common wall and intersecting said passageway, the axis of said bore lying in the plane of said common wall, and a threaded valve in said bore movable axially thereof for opening and closing said passageway.

6. A liquid fuel pump comprising a casing, a low pressure chamber having an inlet opening for the supply of liquid fuel thereto, a high pressure chamber having an outlet opening for the discharge of liquid fuel therefrom, a pump positioned between the two chambers for transmitting fuel from the low pressure chamber to the high pressure chamber, a valve associated with the outlet opening in the high pressure chamber adapted to be opened by the pressure of the fuel within the high pressure chamber, a relief chamber having an outlet opening for the discharge of air and fuel therefrom, means for purging the high pressure chamber of air comprising a passageway between the high pressure chamber and the relief chamber, and a valve associated with said passageway adapted to close said passageway only when the high pressure chamber is completely filled with fuel.

7. A liquid fuel pump comprising a casing, a low pressure chamber having an inlet opening for the supply of liquid fuel thereto, a high pressure chamber having an outlet opening for the discharge of liquid fuel therefrom, a pump positioned between the two chambers for transmitting fuel from the low pressure chamber to the high pressure chamber, a valve associated with the outlet opening in the high pressure chamber adapted to be opened by the pressure of the fuel within the high pressure chamber, a relief chamber having an outlet opening for the discharge of air and fuel therefrom, means for purging the high pressure chamber of air comprising a passageway between the high pressure chamber and the relief chamber, and an automatically operated check valve associated with said passageway adapted to close said passageway only when the high pressure chamber is completely filled with fuel.

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