Feb. 26, 1957 B. J. GEORGIAS 2,782,719

FUEL PUMP

Filed July 7, 1954 3 Sheets-Sheet 1

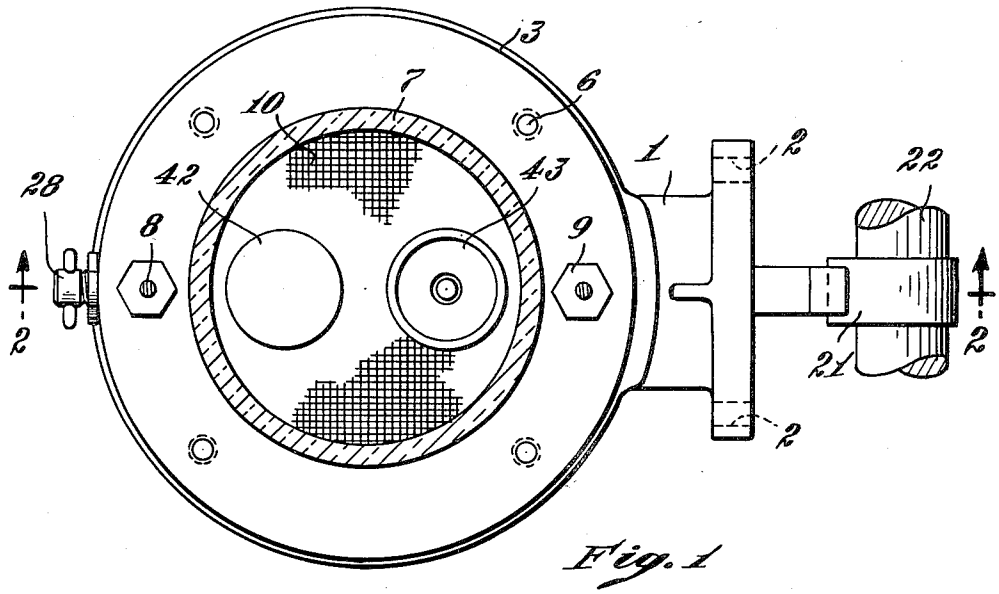


Fig. 1

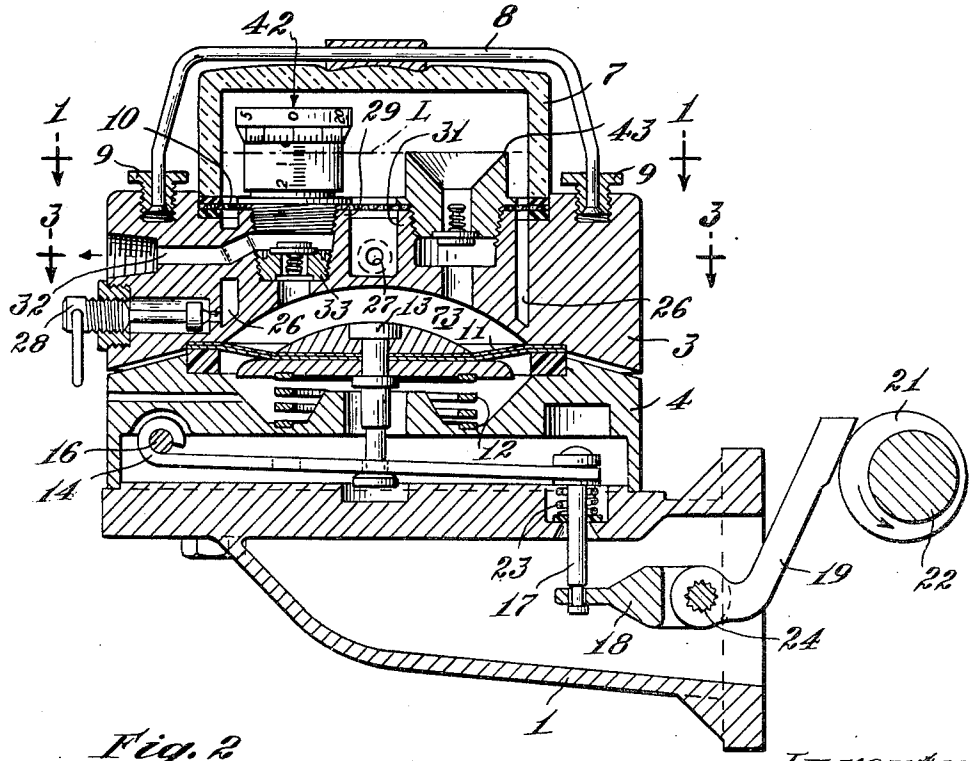


Fig. 2

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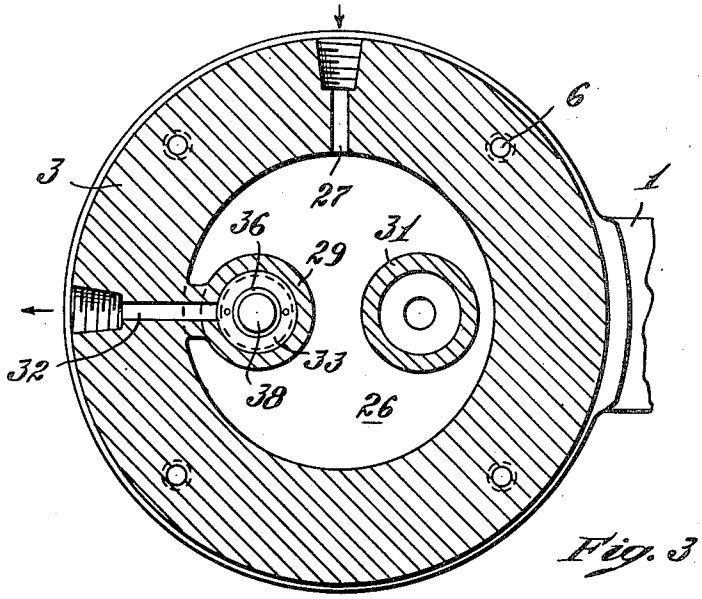


Fig. 3

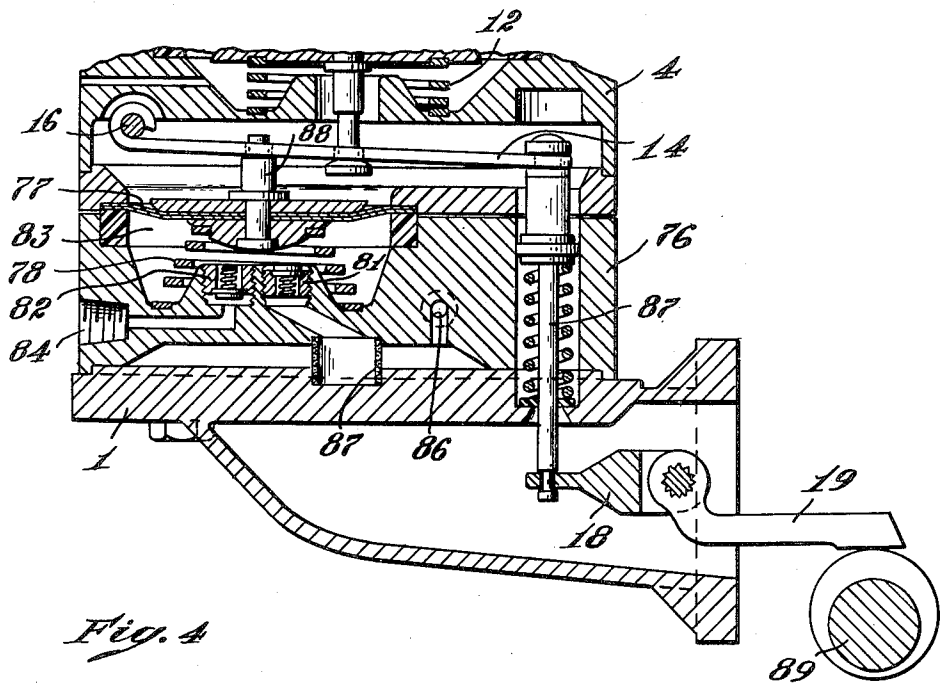


Fig. 4

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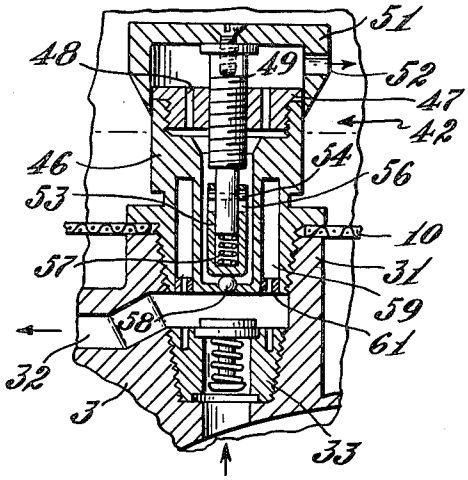


Fig. 5

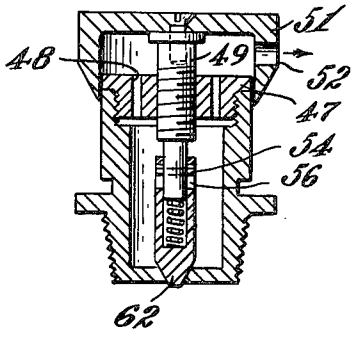


Fig. 6

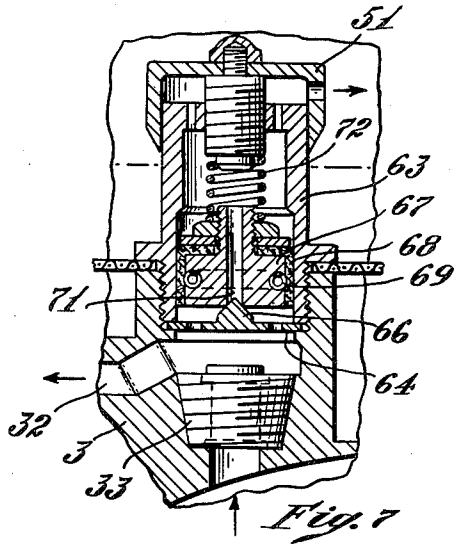


Fig. 7

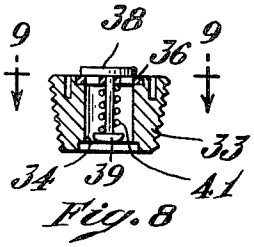


Fig. 8

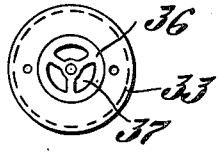


Fig. 9

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FUEL PUMP

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Application July 7, 1954, Serial No. 441,828

4 Claims. (Cl. 103—42)

This invention relates to fuel pumps for internal combustion engines and particularly to pumps for delivering fuel to engines through carburetors.

Objects of the invention are to provide apparatus which delivers the fuel at a predetermined pressure, which can readily be adjusted to change the pressure, which avoids waste of fuel, which affords smooth operation of the engine, which is simple and economical in construction, which can be installed easily and quickly, which can be used either with or without an air pump, which cannot become fouled with oil from the crank-case either when used with an air pump or when used without an air pump and which is durable and reliable in use.

According to the present invention the apparatus has a supply chamber for connection to a source of supply and a delivery conduit for connection to the engine, together with means for pumping fuel from the supply chamber to the delivery conduit, a relief conduit leading from the delivery conduit to the supply chamber and a relief valve in the relief conduit to keep the pressure in the delivery conduit from rising above the predetermined pressure for which the relief valve is set. Preferably the supply chamber is a vacuum chamber, the relief valve is located inside this chamber and a portion of the wall of the chamber is transparent so that the setting of the valve may be observed without opening the chamber. In the preferred embodiment the chamber has a movable cover to afford access to the adjusting means, the cover having a transparent portion through which the setting of the valve may be observed without removing the cover.

In another aspect the apparatus comprises a hollow bracket fitting the side of a crank-case with means extending through the hollow bracket for driving the pumping means by the engine.

In still another aspect the apparatus includes an air pump fitting on the aforesaid bracket under the fuel pump, the bases of both pumps being alike so that the fuel pump also fits the bracket. Thus the fuel pump may be mounted on the bracket alone or the air pump may be mounted on the bracket and the fuel pump mounted on the air pump. In either case the pumps are above the oil level in the crank case so that they do not become fouled by oil through the aforesaid hollow bracket.

For the purpose of illustration a typical embodiment of the invention is shown in the accompanying drawings in which

Fig. 1 is a section on line 1—1 of Fig. 2;

Fig. 2 is a section on line 2—2 of Fig. 1;

Fig. 3 is a section on line 3—3 of Fig. 2;

Fig. 4 is a section like Fig. 2 showing an air pump mounted between the fuel pump and the aforesaid hollow bracket;

Fig. 5 is a vertical section through the relief valve taken on the line 2—2 of Fig. 1;

Fig. 6 is a similar view of a modified relief valve;

Fig. 7 is a similar view of another modified relief valve;

Fig. 8 is a section of the check valve between the pump chamber and the delivery conduit taken on the same line as in Figs. 2 and 5; and

Fig. 9 is a section on line 9—9 of Fig. 8.

The particular embodiment of the invention chosen for the purpose of illustration comprises a hollow bracket 1 having bolt openings 2 for mounting it on the side of a crank case, a pump casing comprising upper and lower parts 3 and 4 secured together by bolts extending through openings 6 and a transparent cover secured to the upper part of the casing by means of a bail 8 and screws 9. Clamped between the part 3 and cover 7 is a filter 10. Clamped between the upper and lower parts of the casing is a diaphragm 11 which is urged upwardly by a spring 12 and is pulled down against the action of the spring by means of a rod 13 and arm 14 pivoted at 16, another rod 17, an arm comprising two parts 18 and 19, and cam 21 on the cam shaft 22 of the engine. The rod 17 is urged upwardly by a spring 23 which holds the arm 19 against the cam 21 either with or without the assistance of the spring 12. The arms 18 and 19 are interconnected by a serrated bolt 24 which interlocks the arms together in any desired angular relationship, the ends of the serrated bolt being pivotally mounted on the bracket 1 to permit the arms 8 and 9 to oscillate back and forth as a unit in response to the cam 21.

The upper part 3 of the casing has a hollow space 26 on its upper side which communicates with the source of fuel supply through an inlet 27. At the bottom of this space on one side of the casing is a clean-out opening normally closed by a plug 28. Projecting up into the space 26 are two cylindrical flanges 29 and 31. Communicating with the interior of the flange 29 is a delivery conduit 32 for connection to the carburetor. Mounted in the bottom of the flange 29 is a check valve 33 which is shown in detail in Figs. 8 and 9. This valve comprises a threaded nipple having an axial opening 34. Fast in a recess in the top of the nipple is a ring 36 having openings 37. The valve comprises a disk 38 covering the opening 37, a headed stem 39 and a spring 41 seating at its upper end against the valve seat 36 and at its lower end against the head of the stem, thereby yieldingly to hold the valve 38 against the seat. Threaded into the upper end of the flange 29 is a relief valve 42 described hereinafter. Threaded into the flange 31 is another check valve 43 similar to the check valve 33 but facing in the opposite direction.

As shown in Fig. 5 the relief valve 42 comprises a cylindrical casing 46 having its lower end threaded into the flange 31 with a flange seating on the screen 10. Threaded into the upper end of the sleeve 46 is a nut 47 having fuel passages 48. Threaded through the nut 47 is a stem 49 and mounted on the upper end of the stem is a cap 51 which telescopes over the casing 46 and has a fuel outlet 52. The lower end of the stem 49 is reduced in diameter and fitting over this reduced end is a cap 53 secured on the stem by a pin 54 extending through slots 56 in the cap. Inside the cap is a compression spring 57 yieldingly to urge the ball valve 58 against the seat in the lower end of the sleeve 46. To adjust the pressure of the spring 57 on the valve the cap 51 is turned, the spring is accurately calibrated and the cap and sleeve are marked accordingly as shown in Fig. 2 to indicate the adjustment. Thus the device affords a micrometer adjustment.

As shown in Fig. 5 the lower end of the sleeve 46 is provided with a cylindrical opening 59 partially closed at its lower end by a perforated ring 61, thereby to cushion any hydraulic hammering which tends to develop.

The modified relief valve shown in Fig. 6 is like that shown in Fig. 5 except in that the ball valve **58** is replaced by conical valve **62** and the anti-hammer space **59** is omitted.

The modified relief valve shown in Fig. 7 differs from those shown in Figs. 5 and 6 in the following respects. Clamped between casing **3** and the sleeve **63** is a perforated disk **64** having a conical valve **66**. Seating on this valve is a piston **67** having a covering **68** formed of leather or the like. Mounted in a peripheral groove in the piston is a coil spring **69** to press the sleeve **68** outwardly to make a snug fit. The piston has an axial opening **71** through which fuel may flow when the piston lifts off the valve **66** in response to fuel pressure in the delivery conduit **32**. Normally the piston is held against the valve to prevent flow by means of a spring **72**, the pressure of which is adjusted by the micrometer cap **51**.

From the foregoing it will be evident that the space **26** and the space within the cap **7** constitute a supply chamber to receive fuel from a suitable tank through the inlet opening **27**. As the diaphragm **11** moves up and down the air is pumped out of the supply chamber to create a partial vacuum therein. In response to this reduced pressure fuel flows from the supply tank through the inlet **27** into the supply chamber below the screen **10** and thence upwardly through the screen until it reaches the level L in Fig. 2, whereupon it overflows into the check valve **43**. Then when the diaphragm descends it draws fuel past the check valve into the pump chamber **73** and on the up-stroke of the diaphragm liquid is forced past the check valve **33** into the delivery conduit **32**. When the pressure in the delivery conduit reaches the value at which the relief valve **42** is set, the relief valve opens and enough liquid is by-passed from the delivery conduit **32** to the supply chamber **26** to keep the pressure from rising substantially above the value at which the relief valve is set.

In Fig. 4 an air pump **76** is interposed between the fuel pump and the bracket **1**, the lower end of the air pump **76** being shaped to fit the bracket **1** the same as the fuel pump and the upper end of the air pump being shaped like the bracket **1** to fit the fuel pump. The air pump comprises upper and lower parts with a diaphragm **77** clamped therebetween, the diaphragm being urged upwardly by a spring **78**. Mounted in the casing **76** are two check valves **81** and **82**, the check valve **81** permitting air to flow upwardly into the chamber **83**, but preventing reverse flow and the check valve **82** permitting down-flow from the chamber **83** to the outlet **84** while preventing reverse flow. Thus as the diaphragm moves up and down air is pumped through the inlet **86**, thence through screen **87**, thence into the chamber **82** and thence through the outlet **84**.

When using the air pump **76** the stem **17** is replaced by a longer stem **87**, the diaphragm **77** being actuated by a stem **88** extending into an opening in the pivoted arm **14**.

In Fig. 4 the cam shaft **89** is shown at a lower level to illustrate how the two arms **18** and **19** may be adjusted relatively to each other to accommodate engines of different makes.

As shown in Fig. 2 the top of the transparent cover increases in thickness from the periphery toward the center thereby serving as a lens to magnify the appearance of the relief valve and other parts in the supply chamber. While only the outside surface is curved in the drawing, of course it will be understood that either surface or both surfaces may be convex.

It should be understood that the present disclosure is for the purpose of illustration only and that this invention includes all modifications and equivalents which fall within the scope of the appended claims.

I claim:

1. For supplying fuel to an engine at a predetermined pressure, a device having a vacuum chamber for connection to a source of supply and a delivery conduit for connection to the engine, a pump chamber intermediate the vacuum chamber and delivery conduit, means associated with the pump for drawing fuel from the vacuum chamber and forcing it into the delivery conduit, a duct leading from the vacuum chamber to the pump chamber, the inlet end of said duct being located above the bottom of the vacuum chamber, a check valve in said duct to check flow from the pump chamber to the vacuum chamber, a check valve between the pump chamber and the delivery conduit to check flow from the delivery conduit to the pump chamber, a relief conduit leading from the delivery conduit to the vacuum chamber, a relief valve in the relief conduit to keep the pressure in the delivery conduit from rising above said predetermined pressure, and means inside the supply chamber for adjusting the relief valve, a portion of the wall of the supply chamber being transparent so that the setting of the valve may be observed without opening the chamber, said portion being substantially flat on one side and convex on the other side so as to magnify the valve setting.

2. For supplying fuel to an engine at a predetermined pressure, a device having a vacuum chamber for connection to a source of supply and a delivery conduit for connection to the engine, a pump chamber intermediate the vacuum chamber and delivery conduit, means associated with the pump for drawing fuel from the vacuum chamber and forcing it into the delivery conduit, a duct leading from the vacuum chamber to the pump chamber, the inlet end of said duct being located above the bottom of the vacuum chamber, a check valve in said duct to check flow from the pump chamber to the vacuum chamber, a check valve between the pump chamber and the delivery conduit to check flow from the delivery conduit to the pump chamber, a relief conduit leading from the delivery conduit to the vacuum chamber, a relief valve in the relief conduit to keep the pressure in the delivery conduit from rising above said predetermined pressure, a removable cover for the supply chamber, and means under the cover for adjusting the relief valve, the cover having a transparent portion through which the setting of the valve may be observed without removing the cover, said portion being substantially flat on one side and convex on the other side so as to magnify the valve setting.

3. For supplying fuel to an engine at a predetermined pressure, a body having a relatively flat upper surface, seating on said surface an inverted cup-shaped cover, sealing means between the surface and cover so that the space under the cover can be used as a vacuum chamber, said body having an inlet and an outlet, a duct leading from the inlet through said surface into the vacuum chamber, a pump chamber in said body, a conduit extending from the pump chamber through said surface and projecting into the vacuum chamber above said surface so that liquid must rise to the level of the upper end thereof before it can flow to the pump chamber, a delivery conduit leading from the pump chamber to said outlet adjacent said surface, a threaded opening through said surface from the delivery conduit, and a relief valve comprising a cylindrical base threaded into said opening and projecting into the vacuum chamber, the base having an upwardly facing valve seat, a valve on the seat, a spring for yieldingly holding the valve on its seat, a stem threaded axially through the base for adjusting the pressure of the spring, and an inverted cup-shaped cap fast to the upper end of the stem with its side wall telescoping over the base so that the telescoping parts may carry cooperating micrometer calibrations, and means for detachably securing said cover, whereby the relief valve may be adjusted by removing the cover accurately to regulate the pressure of fuel delivered through said outlet.

4. For supplying fuel to an engine at a predetermined pressure, a body having a relatively flat upper surface, seating on said surface an inverted cup-shaped cover, sealing means between the surface and cover so that the space under the cover can be used as a vacuum chamber, said body having an inlet and an outlet, a duct leading from the inlet through said surface into the vacuum chamber, a pump chamber in said body, a conduit extending from the pump chamber through said surface and projecting into the vacuum chamber above said surface so that liquid must rise to the level of the upper end thereof before it can flow to the pump chamber, a delivery conduit leading from the pump chamber to said outlet adjacent said surface, a threaded opening through said surface from the delivery conduit, and a relief valve comprising a cylindrical base threaded into said opening and projecting into the vacuum chamber, the base having an upwardly facing valve seat, a valve on the seat,

a spring for yieldingly holding the valve on its seat, a stem threaded axially through the base for adjusting the pressure of the spring, and an inverted cup-shaped cap fast to the upper end of the stem with its side wall telescoping over the base so that the telescoping parts may carry cooperating micrometer calibrations, and means for detachably securing said cover, said cover being transparent and shaped to serve as a lens for use in reading the setting of said cap.

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