June 28, 1960 A. W. ZUB 2,942,861

VENTED ACCELERATING PUMP

Filed Nov. 3, 1958 2 Sheets-Sheet 1

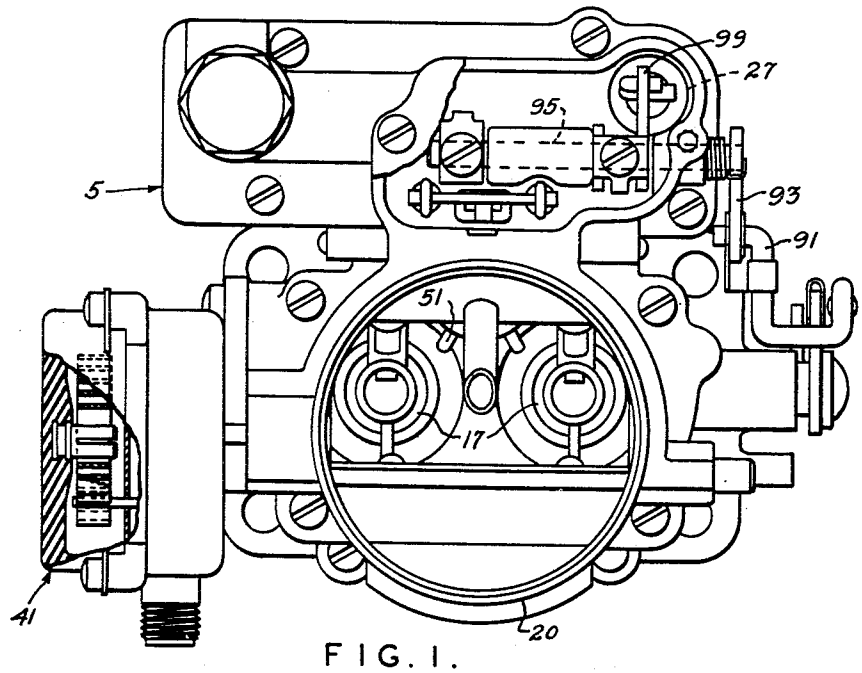


FIG. 1.

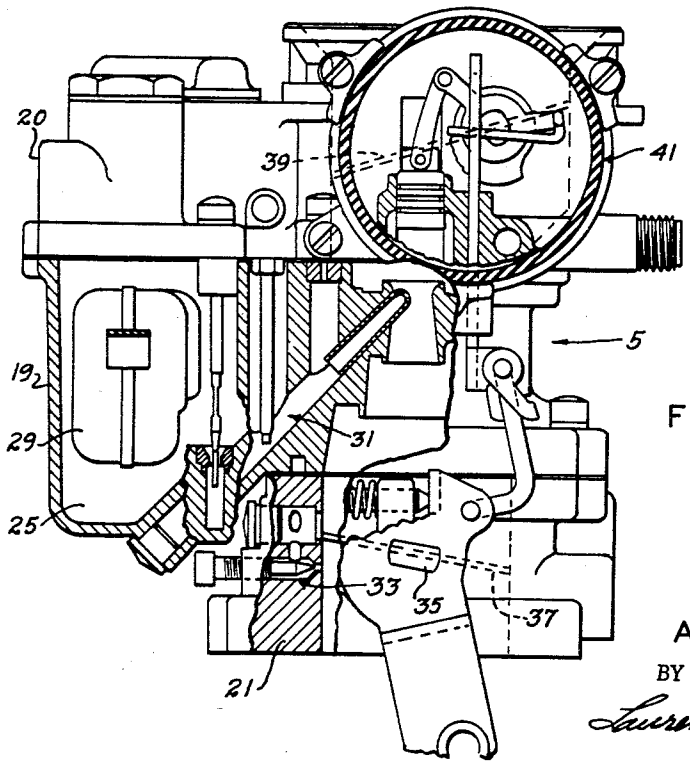


FIG. 2.

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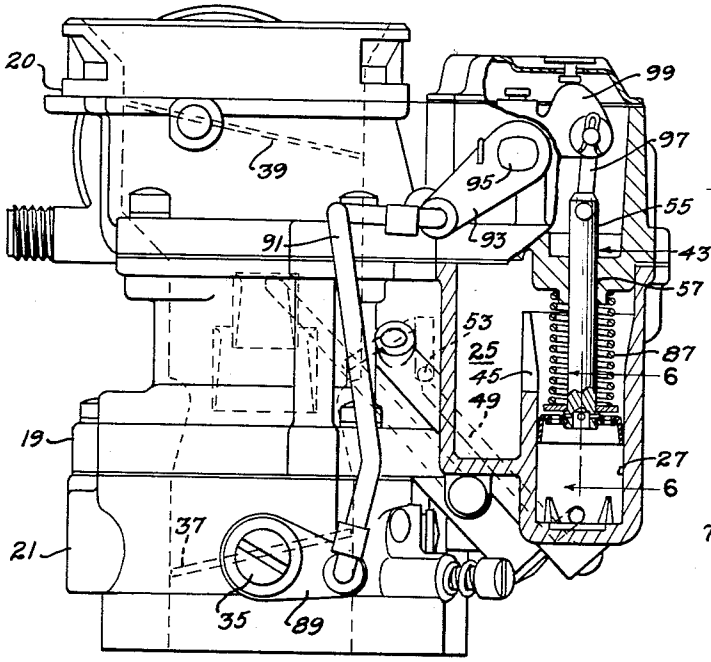


FIG. 3.

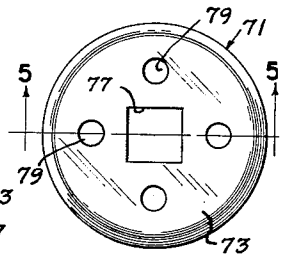


FIG. 4.

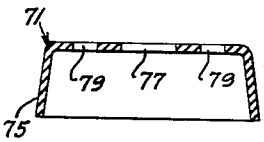


FIG. 5.

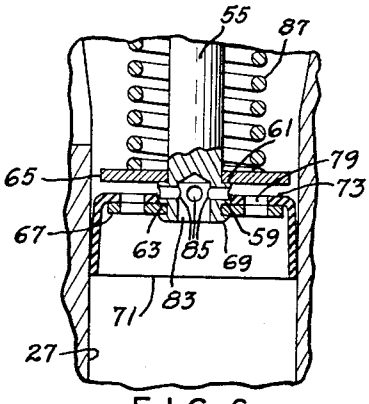


FIG. 6.

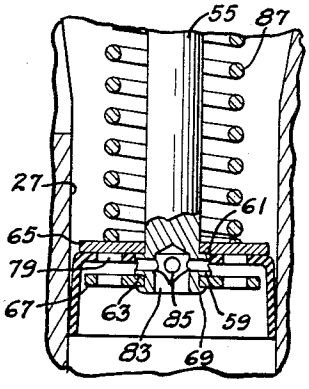


FIG. 7.

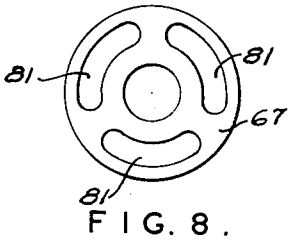


FIG. 8.

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VENTED ACCELERATING PUMP

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Filed Nov. 3, 1958, Ser. No. 771,304

8 Claims. (Cl. 261—34)

This invention relates to pumps, and more particularly to accelerating pumps such as are used in carburetors for automotive engines.

It will be understood that a carburetor for an automotive engine may be provided with an accelerating pump for pumping fuel into the mixture conduit of the carburetor when the throttle of the carburetor is opened. Such a pump usually comprises a generally vertical pump cylinder and a pump plunger slidable in the cylinder, the plunger being controlled by the throttle of the carburetor in such manner that when the throttle is opened, the plunger is driven downward through a discharge stroke to force-feed fuel into the mixture conduit, and as the throttle is closed, the plunger is returned upward through an intake stroke to draw in fuel from the fuel bowl of the carburetor. It is desirable that such a pump be so constructed as to be capable of venting fuel vapor such as may collect in the lower end of the pump cylinder each time the plunger is returned, and it is an object of this invention to provide an economical, reliable construction for this purpose which, while assuring venting on each return stroke of the plunger, provides a tight seal against leakage of fuel past the plunger on discharge strokes. A feature of the invention is that a single member is made to serve both as a packing member for sealing purposes and as a valve member for fuel vapor venting purposes, the valve function of this member being realized simply in response to reciprocation of the plunger. In general, the plunger comprises a rod which is provided with spaced upper and lower heads. Slidable on the rod between these heads is a special packing member made of flexible resilient material of inverted cup shape having a top wall provided with a central opening slidably receiving the portion of the rod between the heads and having an annular depending skirt in sliding sealing engagement with the internal surface of the cylinder. The heads are spaced a distance greater than the thickness of the top wall of the packing member, and the packing member is axially slidable on the rod between a raised position relative to the rod engaging the upper head and a lower position relative to the rod engaging the lower head. The top wall has a vent hole located radially outward from its central opening. The arrangement is such that when the rod moves upward through an intake stroke, the packing member slides down to its lower position or its central portion is pulled up, thereby opening up the vent hole to vent fuel vapor from the lower end portion of the cylinder. This action occurs because of friction between the skirt and the internal surface of the cylinder. When the rod is driven downward through a discharge stroke, the packing member assumes its upper position in which the vent hole therein is closed by the upper head, thereby sealing against escape of fuel past the plunger. Additionally, the rod may be provided with a passage extending upward from its lower end and a lateral port opening from

this passage to the space between the heads, with the arrangement such that when the packing member is in its lowered position, the port is opened up to the space above the top wall of the packing member for venting fuel vapor from the lower end portion of the cylinder. Other objects and features will be in part apparent and in part pointed out hereinafter.

The invention accordingly comprises the constructions hereinafter described, the scope of the invention being indicated in the following claims.

In the accompanying drawings, in which one of various possible embodiments of the invention is illustrated,

Fig. 1 is a plan view of the carburetor, with parts broken away and shown in section;

Fig. 2 is a left side elevation of Fig. 1, with parts broken away and shown in section;

Fig. 3 is a right side elevation of Fig. 1, with parts broken away and shown in section;

Fig. 4 is a plan view of the packing member per se;

Fig. 5 is a vertical section taken on line 5—5 of Fig. 4;

Fig. 6 is an enlarged vertical section taken on line 6—6 of Fig. 3;

Fig. 7 is a section corresponding to Fig. 6 showing a moved position of parts; and

Fig. 8 is a plan view of a lower washer or head per se.

Corresponding reference characters indicate corresponding parts throughout the several views of the drawings.

Referring now to the drawings for a better understanding of the invention, the carburetor has a fuel bowl section **19** above which is an air horn section **20** and below which is a throttle body section **21** (see Figs. 2 and 3). An air filter **23** is mounted on the air horn section.

The fuel bowl section **19** is formed to provide a fuel bowl **25** and an accelerating pump cylinder **27** in the fuel bowl adjacent one end of the fuel bowl. It will be understood that the fuel bowl is supplied with fuel via the line **15**, a substantially constant level of fuel being maintained in the bowl by means of a float-controlled needle valve as is usual. The float is indicated at **29** in Fig. 2. Fuel is supplied from the bowl **25** to the mixture conduits **17** via the usual high speed and low speed circuits such as are indicated at **31** and **33** in Fig. 2. At **35** is indicated the usual throttle shaft of the carburetor carrying the usual throttle valves **37** for the mixture conduits. At **39** is indicated the choke valve for the carburetor, and at **41** is indicated the usual automatic choke control.

A plunger **43** is reciprocable in the accelerating pump cylinder **27**. The cylinder **27** is adapted to be primed with fuel from the bowl **25** through an intake slot **45** in the cylinder when the plunger moves upward through an intake stroke. Fuel is discharged by the plunger on a downward discharge stroke thereof from the lower end of the cylinder through a discharge passage **49** which leads to a jet cluster **51** (see Fig. 1) discharging into the mixture conduits **17**. A discharge check valve **53** is provided adapted to open for flow of fuel through passage **49** on a discharge stroke.

The plunger **43** comprises a cylindrical rod **55** extending down into the pump cylinder **27** from the air horn section **20** through a hole **57** in the bottom of the latter (see Fig. 3). Adjacent its lower end the rod **55** is formed with an enlarged cylindrical portion **59** which provides an upwardly facing shoulder **61** and a downwardly facing shoulder **63** (see Figs. 6 and 7). A flat metal washer **65** is provided on the rod **55** bearing on the upwardly facing shoulder **61**. This washer **65** constitutes an upper head on the rod **55**. Its diameter is appreciably less than the internal diameter of the pump cylinder **27**. Another flat metal washer **67** of somewhat

smaller diameter than washer 65 is provided on the lower end of the rod 55 bearing against the downwardly facing shoulder 63. This washer 67 constitutes a lower head on the rod 55 spaced from the upper head 65 a distance corresponding to the height or thickness of enlarged portion 59 of the rod. The lower washer or head 67 is held against shoulder 63 by swaging the lower end of the rod 55 as indicated at 69.

The plunger has a packing member generally designated 71 retained thereon by the washers or heads 65 and 67. This packing member 71 (shown per se in Figs. 4 and 5) is made of a flexible resilient elastomeric material in the form of an inverted cup, having a substantially flat circular top wall 73 and an annular skirt portion 75 of downwardly flaring conical form. The top wall 73 is provided with a central hole 77 shown as a square hole, the cylindrical enlarged portion 59 of the rod 55 being freely slidably received in the hole 77. The packing member is preferably formed from sheet material composed of polymerized tetrafluoroethylene such as is sold under the trade designation Teflon, having a thickness less than spacing of the washers or heads 65 and 67 (the height of the enlarged portion 59 of the rod 55). The sheet material is formed to the cup-shape shown in Fig. 5. The packing member is mounted on the enlarged portion 59 of the rod 55 with its annular skirt portion 75 extending downward surrounding the lower washer or head 67. The dimensions of the packing member are such that the skirt 75 has a sliding sealing fit in the cylinder 27. The packing member being made of the polymerized tetrafluoroethylene material, the skirt tends to return to flat condition so as to hug the internal surface of cylinder 27 to provide a fuel-tight seal.

The top wall 73 of the packing member 71 is provided with vent holes 79, four such holes being shown, located radially outward from its square center hole 77. The top wall 73 of the packing member 71 is slidable on the enlarged portion 59 of the rod 55 between the relatively raised position in which it is shown in Fig. 7 in flatwise engagement with the upper washer or head 65 and the lowered position in which it is shown in Fig. 6 in flatwise engagement with the lower washer or head 67. In the raised position, holes 79 are closed by the upper washer or head 67. The lower washer or head 67 is provided with an annular series of arcuate slots 81 (see Fig. 8) with which the vent holes 79 register when the top wall 73 is in the lowered position. The rod 55 has an axial passage 83 extending up from its lower end and transverse holes traversing its enlarged portion 59 and intersecting passage 83 providing lateral ports 85 opening from passage 83 to the space between the washers or heads 65 and 67.

The plunger 43 is biased downward by a coil compression spring 87 surrounding the rod 55 reacting from the bottom of the air horn section 20 against the upper washer or head 65. This also holds the upper washer or head 65 against the shoulder 61. The rod 55 is linked to the throttle shaft 35 to be pulled up against the bias of the spring 87 when the throttle valves are opened by means of a linkage such as shown in Fig. 3 including an arm 89 on the throttle shaft, a link 91 connecting arm 89 to an arm 93 on a shaft 95, and a link 97 connecting another arm 99 on shaft 95 to the upper end of the rod 55.

Operation is as follows:

When the throttle valves 37 are opened (swung counterclockwise as viewed in Fig. 3), link 91 is raised to swing arms 93 and 95 clockwise as viewed in Fig. 3. This drives the plunger 43 downward, assisted by the spring 87. Upon downward movement of the rod, the packing member 71 occupies its raised position shown in Fig. 7 in which its top wall 73 is in engagement with the upper washer or head 65. Under these circumstances, the vent holes 79 in the top wall 73 of the packing member are closed, and the plunger acts to force fuel from the lower end of the cylinder 27 out through the discharge passage 49 to the jet cluster 51. When the throttle valves 37 are closed, the rod 55 is pulled up against the bias of spring 87. As it is pulled up, the packing member 71 tends to lag behind by reason of the friction between the depending skirt 73 of the packing member. Usually the flat top wall 71 of the packing member will slide to its lowered position in which it is shown in Fig. 6. This opens up the vent holes 79 for venting fuel vapor from the lower end portion of the cylinder via slots 81 in washer 67 and holes 79 in top wall 73 and around the edge of the upper washer 65. Fuel vapor is also vented via the passage 83 and the lateral ports 85 to the space between the washers 65 and 67, and thence around the edge of the upper washer 65. If it should happen that the central portion of the top wall 73 of the packing member should tend to cling to the enlarged portion 59 of the rod and thereby held from readily sliding down to its lower position of Fig. 6, the central portion of the top wall 73 will be pulled up relative to its margin to open up the vent holes 79 for venting fuel vapor from the lower end portion of the cylinder.

The material of which the packing member is composed, while being flexible and resilient, is sufficiently rigid to be form-retaining and does not require any auxiliary support. Accordingly, the combined sealing and vent valve action is attained with relatively few parts, and these parts are easily assembled, making for an economical construction.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As various changes could be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. In a carburetor having a mixture conduit, a fuel bowl, a generally vertical accelerating pump cylinder, a fuel intake for admission of fuel from the bowl to the cylinder, a check-valved fuel discharge passage leading from the lower end portion of the pump cylinder to the mixture conduit, and a pump plunger vertically reciprocable in the pump cylinder, said plunger comprising a rod, spaced upper and lower heads on the rod, a packing member made of flexible resilient material of inverted cup shape having a top wall provided with a central opening slidably receiving the portion of the rod between said heads and having an annular depending skirt in sliding sealing engagement with the internal surface of said pump cylinder, said heads being spaced a distance greater than the thickness of said top wall of said packing member and said packing member being axially slidable on the rod between a raised position relative to the rod engaging the upper head and a lowered position relative to the rod engaging the lower head, and said top wall having a vent hole located radially outward from its central opening adapted when said packing member is in lowered position to vent fuel vapor from the lower end portion of the cylinder, and said vent hole being closed by the upper head when the packing member is in its raised position.

2. In a carburetor as set forth in claim 1, said packing member being formed of polymerized tetrafluoroethylene sheet material and the skirt thereof thereby having a tendency to return to flat condition so as to hug the internal surface of the pump cylinder.

3. In a carburetor having a mixture conduit, a fuel bowl, a generally vertical accelerating pump cylinder, a fuel intake for admission of fuel from the bowl to the cylinder, a check-valved fuel discharge passage leading from the lower end portion of the pump cylinder to the mixture conduit, and a pump plunger vertically recip-

rocable in the pump cylinder, said plunger comprising a rod, spaced upper and lower heads on the rod adjacent its lower end, said heads being of smaller diameter than the internal diameter of said cylinder, said rod having a passage extending up from its lower end and a lateral port opening therefrom to the space between the heads, a packing member made of flexible resilient material of inverted cup shape having a normally substantially flat top wall provided with a central opening slidably receiving the portion of the rod between said heads and having an annular depending skirt extending downward surrounding the lower head in sliding sealing engagement with the internal surface of said pump cylinder, said heads being spaced a distance greater than the thickness of said top wall of said packing member and said packing member being axially slidable on the rod between a raised position relative to the rod engaging the upper head and a lowered position relative to the rod engaging the lower head wherein said port is open to the space above said top wall for venting fuel vapor from the lower end portion of the cylinder, and said top wall having a vent hole located radially outward from its central opening adapted either when said packing member is in lowered position or when the central portion of said top wall is pulled up relative to the margin of the top wall to vent fuel vapor from the lower end portion of the cylinder, and said vent hole being closed by the upper head when the packing member is in its raised position.

4. In a carburetor as set forth in claim 3, said packing member being formed of polymerized tetrafluoroethylene sheet material and the skirt thereof thereby having a tendency to return to flat condition so as to hug the internal surface of the pump cylinder.

5. In a carburetor having a mixture conduit, a fuel bowl, a generally vertical accelerating pump cylinder, a fuel intake for admission of fuel from the bowl to the cylinder, a check-valved fuel discharge passage leading from the lower end portion of the pump cylinder to the mixture conduit, and a pump plunger vertically reciprocable in the pump cylinder, said plunger comprising a rod, said rod having an enlarged portion adjacent its lower end providing an upwardly facing shoulder and a downwardly facing shoulder, an upper washer held on the rod engaging the upwardly facing shoulder, a lower washer held on the rod engaging the downwardly facing shoulder, said washers being of smaller diameter than the internal diameter of said cylinder, said rod having a passage extending up from its lower end and a lateral port opening therefrom to the space between the washers, a packing member made of flexible resilient material of inverted cup shape having a normally substantially flat top wall provided with a central opening slidably receiving said enlarged portion of the rod and having an annular depending skirt extending downward surrounding the lower washer in sliding sealing engagement with the internal surface of said pump cylinder, said washers being spaced a distance greater than the thickness of said top wall of said packing member and said packing member being axially slidable on said enlarged portion of the rod between a raised position relative to the rod engaging the upper washer and a lowered position relative to the rod engaging the lower washer wherein said port is open to the space above said top wall for venting fuel vapor from the lower end portion of the cylinder, and said top wall having a vent hole located radially outward from its central opening adapted either when said packing member is in lowered position or when the central portion of said top wall is pulled up relative to the margin of the top wall to vent fuel vapor from the lower end portion of the cylinder, and said vent hole being closed by the upper washer when the packing member is in its raised position.

6. In a carburetor comprising a body, a mixture conduit in said body, a throttle valve in said mixture conduit, a fuel bowl in said body, a generally vertical accelerating pump cylinder in said body, a fuel intake for admission

of fuel from the bowl to the cylinder, a check-valved fuel discharge passage in said body leading from the lower end portion of the pump cylinder to the mixture conduit, and a pump plunger extending down through the top of the body vertically reciprocable in the pump cylinder, said plunger comprising a rod, means connecting said throttle valve and rod for driving the rod downward on opening the throttle valve and upward on closing the throttle valve, said rod having an enlarged portion adjacent its lower end providing an upwardly facing shoulder and a downwardly facing shoulder, an upper washer on the rod engaging the upwardly facing shoulder, a spring reacting from the top of the body engaging said upper washer, a lower washer held on the rod engaging the downwardly facing shoulder, a packing member made of flexible resilient material of inverted cup shape having a top wall provided with a central opening slidably receiving said enlarged portion of the rod and having an annular depending skirt in sliding sealing engagement with the internal surface of said pump cylinder, said washers being spaced a distance greater than the thickness of said top wall of said packing member and said packing member being axially slidable on said enlarged portion of the rod between a raised position relative to the rod engaging the upper washer and a lowered position relative to the rod engaging the lower washer, and said top wall having a vent hole located radially outward from its central opening adapted when said packing member is in lowered position or when the central portion of said top wall is pulled up relative to the margin of the top wall to vent fuel vapor from the lower end of the cylinder, and said vent hole being closed by the upper washer when the packing member is in its raised position.

7. In a carburetor comprising a body, a mixture conduit in said body, a throttle valve in said mixture conduit, a fuel bowl in said body, a generally vertical accelerating pump cylinder in said body, a fuel intake for admission of fuel from the bowl to the cylinder, a check-valved fuel discharge passage in said body leading from the lower end portion of the pump cylinder to the mixture conduit, and a pump plunger extending down through the top of the body vertically reciprocable in the pump cylinder, said plunger comprising a rod, means connecting said throttle valve and rod for driving the rod downward on opening the throttle valve and upward on closing the throttle valve, said rod having an enlarged portion adjacent its lower end providing an upwardly facing shoulder and a downwardly facing shoulder, an upper washer on the rod engaging the upwardly facing shoulder, a spring reacting from the top of the body engaging said upper washer, a lower washer held on the rod engaging the downwardly facing shoulder, said washers being of smaller diameter than the internal diameter of said cylinder, said rod having a passage extending up from its lower end and a lateral port opening therefrom to the space between the washers, a packing member made of flexible resilient material of inverted cup shape having a normally substantially flat top wall provided with a central opening slidably receiving said enlarged portion of the rod and having an annular depending skirt extending downward surrounding the lower washer in sliding sealing engagement with the internal surface of said pump cylinder, said washers being spaced a distance greater than the thickness of said top wall of said packing member and said packing member being axially slidable on said enlarged porton of the rod between a raised position relative to the rod engaging the upper washer and a lowered position relative to the rod engaging the lower washer wherein said port is open to the space above said top wall for venting fuel from the lower end portion of the cylinder, and said top wall having a vent hole located radially outward from its central opening adapted either when said packing member is in lowered position or when the central portion of said top wall is pulled up relative to the margin of the top wall to vent fuel vapor from the lower end portion of the cylinder, and

said vent hole being closed by the upper washer when the packing member is in its raised position.

8. A pump plunger for use in a pump cylinder comprising a rod, said rod having an enlarged portion adjacent one end providing oppositely facing shoulders, a pair of spaced washers held on the rod engaging the shoulder, a packing member made of flexible resilient material of cup shape having a circular wall provided with a central opening slidably receiving said enlarged portion of the rod and having an annular skirt for sliding sealing engagement with the internal surface of the pump cylinder, said washers being spaced a distance greater than the thickness of said wall of said packing member and said packing member being axially slidable on said enlarged portion of the rod between a first position relative to the rod engaging one washer and a second position relative to the rod engaging the other washer, and said wall having a hole located radially outward from its central opening adapted when said packing member is in its second position to provide a vent, said hole being closed by said one washer when the packing member is in its first position.

References Cited in the file of this patent

UNITED STATES PATENTS

2,493,804	Carlson	Jan. 10, 1950
2,775,436	Zub	Dec. 25, 1956