Dec. 6, 1960 R. W. RICHARDSON 2,963,283

FUEL INJECTION SYSTEM ANTI-SIPHON DEVICE

Filed Nov. 3, 1958 2 Sheets-Sheet 1

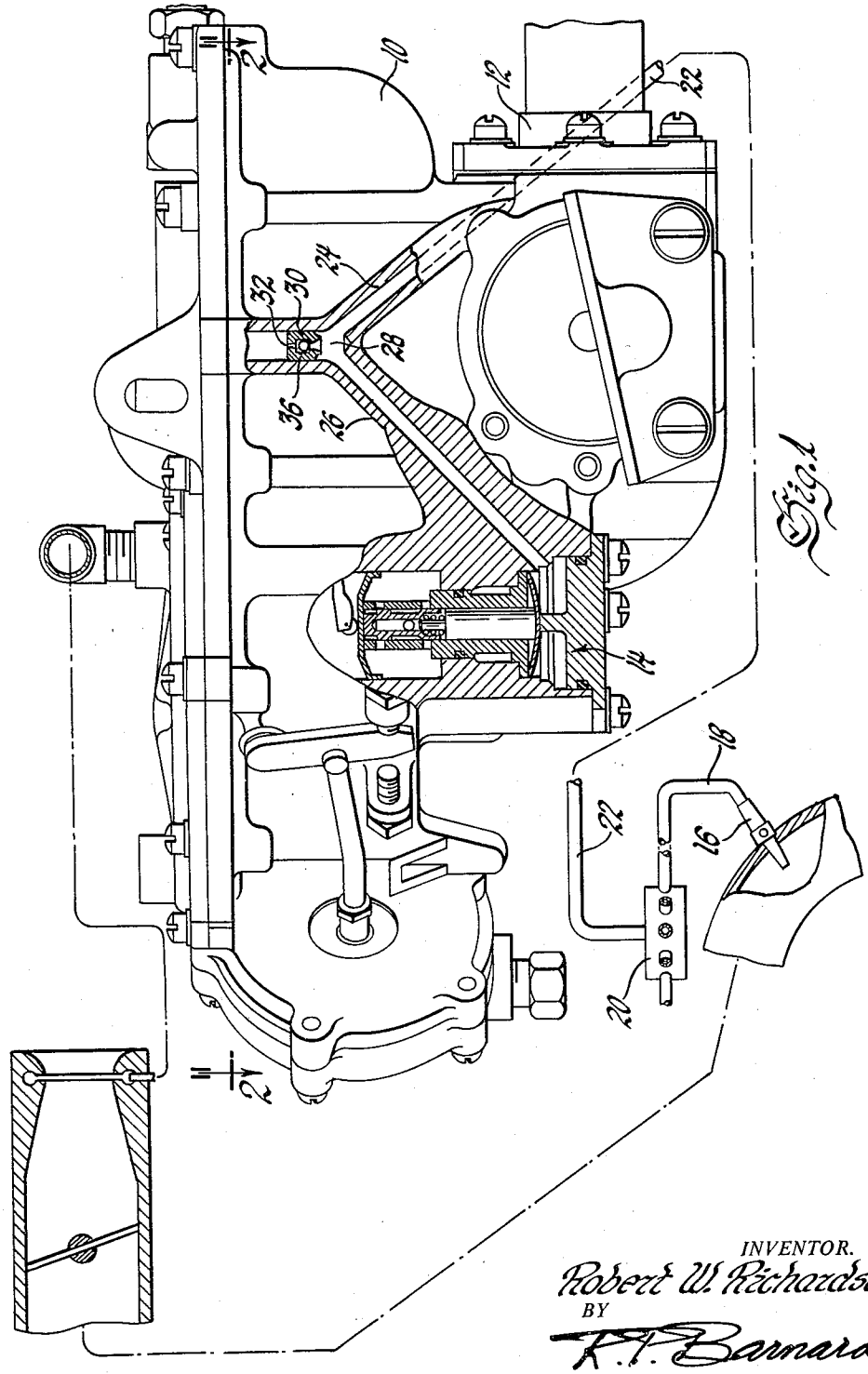


Fig. 1

INVENTOR.
Robert W. Richardson
BY
R. F. Barnard
ATTORNEY

Dec. 6, 1960 R. W. RICHARDSON 2,963,283

FUEL INJECTION SYSTEM ANTI-SIPHON DEVICE

Filed Nov. 3, 1958 2 Sheets-Sheet 2

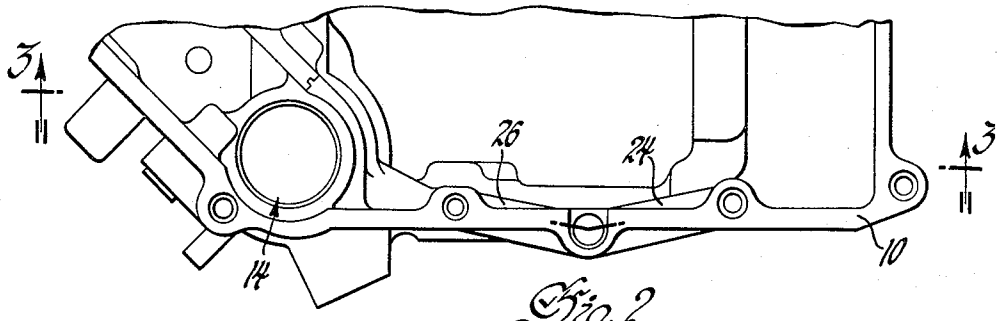


Fig. 2

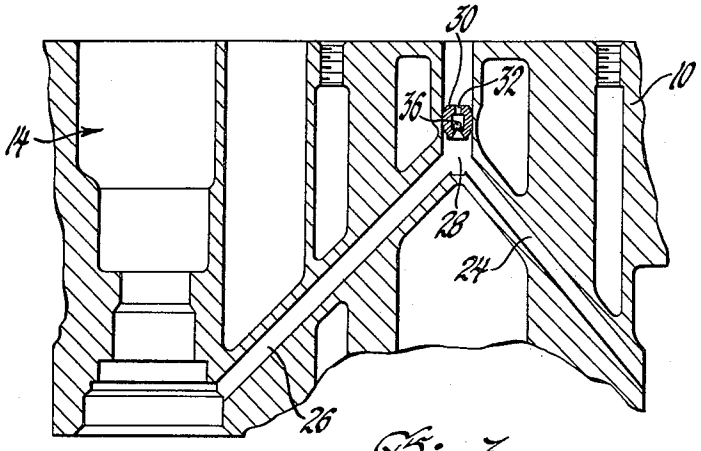


Fig. 3

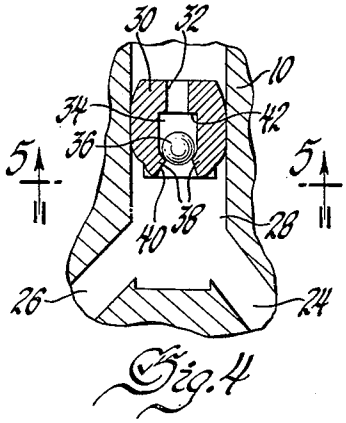


Fig. 4

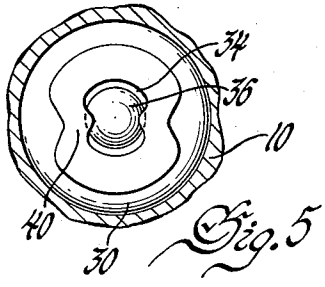


Fig. 5

INVENTOR.
Robert W. Richardson
BY
R. F. Barnard
ATTORNEY

United States Patent Office

2,963,283

Patented Dec. 6, 1960

2,963,283

FUEL INJECTION SYSTEM ANTI-SIPHON DEVICE

Robert W. Richardson, Birmingham, Mich., assignor to General Motors Corporation, Detroit, Mich., a corporation of Delaware

Filed Nov. 3, 1958, Ser. No. 771,575

4 Claims. (Cl. 261—38)

The present invention relates to an anti-siphon device adapted particularly for use with a fuel injection system of the type shown in Serial No. 591,889, Dolza, filed June 18, 1956. In the aforenoted fuel injection system the individual cylinder nozzles are located below the main fuel metering mechanism as a consequence of which there is a tendency to set up a siphoning action through the nozzles as a result of which the fuel continues to flow draining the fuel lines after the system has been shut off.

Various mechanisms have been provided in the past to overcome this difficulty. While several of these devices have performed satisfactorily they have had many disadvantages including those of cost and complication. In addition, where siphoning has been prevented by the use of a relatively heavy weighted member that is moved by fuel flow and adapted to block the fuel passage due to gravity when such flow was stopped, a serious calibration problem was created which is overcome by the present simplified anti-siphoning device.

In the present device a siphon break passage is provided and includes a pair of upwardly inclined legs and a light ball check valve disposed at the juncture of these legs. The check valve is normally raised to block an atmospheric vent passage when fuel is flowing from the fuel supply pump to the fuel metering valve. The ball check valve being extremely light provides no problem of calibration. On the other hand, when fuel flow ceases the ball check valve drops communicating the anti-siphon passage at atmosphere and thereby interrupting any tendency toward siphoning.

Further details as well as other objects and advantages will be apparent from a perusal of the detailed description which follows.

In the drawings:

Figure 1 represents a fuel injection system embodying the subject invention;

Figure 2 is a partial plan view of Figure 1;

Figure 3 is a view along line 3—3 of Figure 2;

Figure 4 is an enlargement of the ball check vent valve; and

Figure 5 is a view along line 5—5 of Figure 4.

The fuel injection system is housed in a casing indicated generally at 10. Save insofar as will be specifically pointed out hereinafter, the fuel injection system does not, per se, constitute a part of the present invention. A fuel pump 12 is adapted to supply fuel under pressure to a fuel metering valve indicated generally at 14. The operation of the fuel metering valve is set forth in detail in the aforenoted Dolza application. Briefly, however, it might be noted that the fuel metering valve in the subject system is controlled in accordance with mass air flow as measured through venturi and which valve is adapted to supply increased quantities of fuel to nozzles 16 as such air flow increases. Each nozzle 16 is supplied with fuel from a conduit 18 leading from a distributor 20 which is supplied from metering valve 14 by conduit 22.

It is to be noted that nozzles 16 are located below the fuel metering system casing 10 and hence below pump 12. As a consequence, there is a tendency for the nozzles to siphon the fuel out of lines 18 and 22 in which case fuel will continue to flow and drain the system after the engine has been shut off. To prevent this occurrence an anti-siphon passage is provided between pump 12 and metering valve 14. The anti-siphon passage includes a pair of upwardly inclined legs 24 and 26 formed in casing 10. A chamber 28 is formed at the juncture of legs 24 and 26. Thus, fuel in being delivered from pump 12 to metering valve 14 must flow through leg passages 24 and 26 and in so doing pass through chamber 28. The upper side of chamber 28 opens to atmosphere.

A valve body 30 having an opening 32 therethrough is disposed in atmospheric vent chamber 28. Seat passage 32 is enlarged at 34 to receive a light ball check valve 36. The lower end of valve body 30 is crimped or otherwise formed to provide supporting fingers 38 to retain valve 36 within passage enlargement 34. As best seen in Figure 5, the lower end 40 of passage 32 is sufficiently larger than ball valve 36 that even with the latter seated on fingers 38 air may flow therearound and communicate with passages 24 and 26. A seat 42 is formed at the upper end of body 30. Thus when fuel is forced to flow through passages 24 and 26 the pressure thereof will act against ball check valve 36 causing the same to move against seat 42 and preventing fuel from discharging out of vent passage 32. When, on the other hand, pump 12 ceases to pump fuel through passages 24 and 26, the drop in fuel pressure will permit ball check valve 36 to drop under the influence of gravity and atmospheric pressure against fingers 38 thereby uncovering seat 42 in valve body 30 and permitting air under atmospheric pressure to pass valve 36. Thus any tendency of the fuel in passages 24 and 26 as well as in conduits 18 and 22 to continue to flow after the system has been shut off is interrupted by the opening of the atmospheric vent.

By preventing siphoning of the fuel lines, the latter remain charged with fuel in order that the system may begin to function quickly to supply fuel to the engine's cylinders when the system is again made operative. In addition flooding of the manifold with fuel is eliminated.

I claim:

1. A charge forming device for an internal combustion engine comprising means for supplying metered quantities of fuel to the engine, a source of fuel under pressure, passage means communicating said fuel source with said metering means, nozzle means disposed vertically below said metering means and said fuel source, and conduit means communicating said metering means with said nozzle means, said passage means including at least a portion disposed vertically above said metering means and said fuel source means, said passage portion communicating with an atmospheric passage, and a ball check valve member disposed within said portion and normally seated by the fuel under pressure in said passage means to block said atmospheric passage, said ball check valve being adapted to open under the influence of gravity and atmospheric pressure when the pressure in said fuel passage drops below a predetermined value to admit atmospheric air to said passage.

2. A charge forming device as set forth in claim 1 in which said passage means comprises a pair of inclined passages which intersect at a point vertically above the fuel source and metering means and a passage extending upwardly from said point of intersection to communicate with the atmosphere.

3. A charge forming device as set forth in claim 2 in which a valve body is disposed within said upwardly extending passage, a passage within said body adapted

to communicate the passage means with atmosphere, and a ball valve disposed within said body passage, fuel flow through the passage means induced by the fuel pressure source seating the valve to block communication of the passage means with the atmosphere, said valve communicating atmosphere to the passage means when said source is inoperative to supply fuel under pressure.

4. A charge forming device as set forth in claim 3 in which said valve body passage extends longitudinally

of the body, said passage including an enlarged section intermediate its ends, said ball valve member being disposed within said section, a seat formed in said passage, said valve member being adapted to coact with said seat to block admission of atmospheric air to the passage, and a pair of radial fingers adapted to retain said valve within said section.

No references cited.