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AUTOMATIC FUEL VALVE

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Fig. 1.

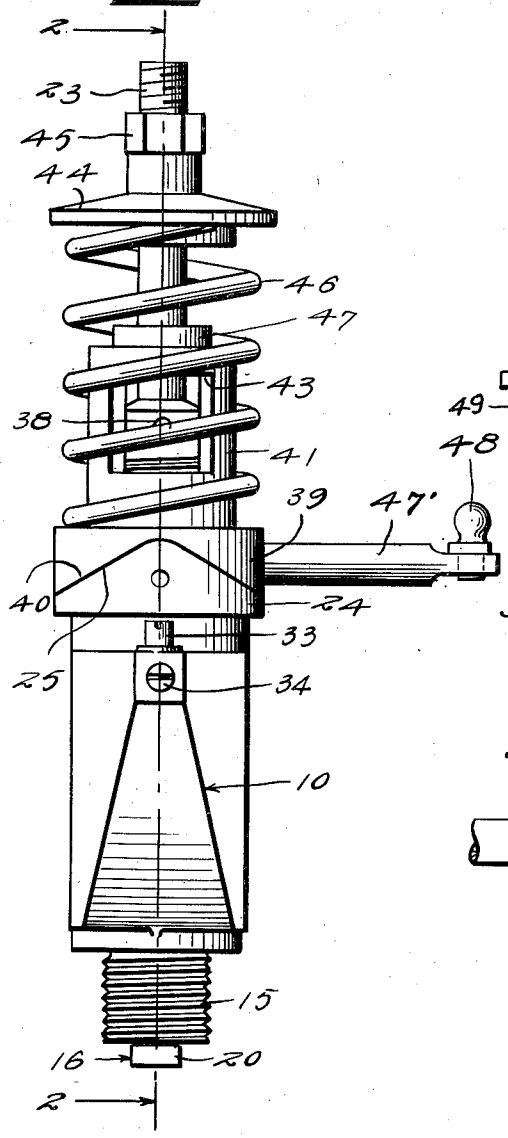
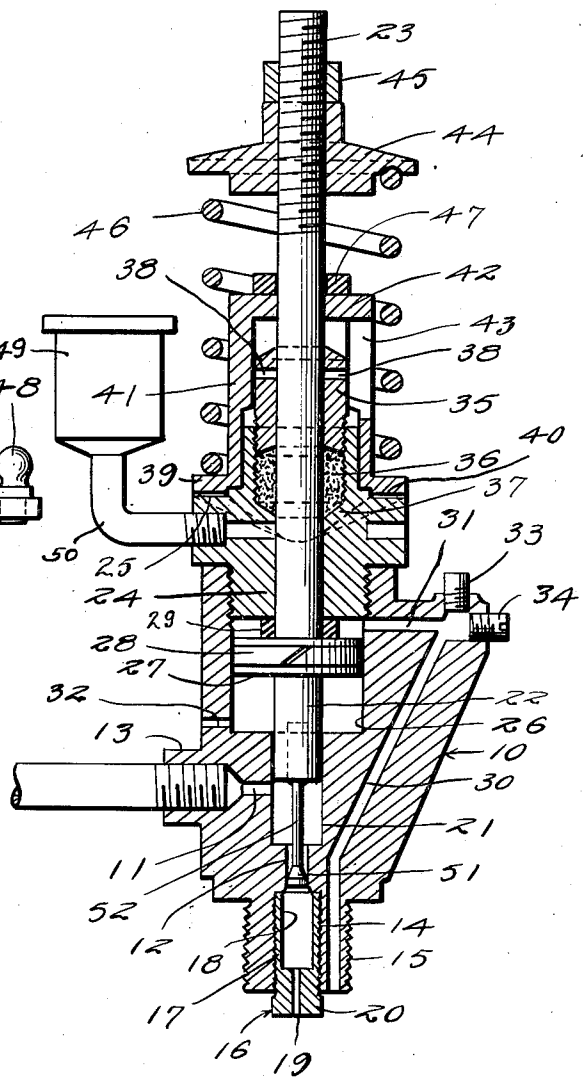


Fig. 2.



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AUTOMATIC FUEL VALVE

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7 Claims. (Cl. 103—50)

This invention relates to fuel valves and more particularly to an automatic fuel valve.

An object of this invention is to provide an automatic intake valve which is so constructed as to permit the passage of a predetermined quantity of fuel into the engine cylinder.

Another object of this invention is to provide an automatic intake valve including an injecting means to forcibly discharge the fuel into the combustion chamber of the engine so that a relatively low gravity fuel can be used in the engine.

A further object of this invention is to provide an automatic valve of this kind which is so constructed that it can be used with either a high or a low compression engine.

The above and various other objects and advantages of this invention will in part be described and in part be understood from the following detailed description of the present preferred embodiment, the same being illustrated in the accompanying drawing wherein:—

Figure 1 is a view in elevation of the device embodying the present invention;

Figure 2 is a longitudinal sectional view taken substantially upon the line 2—2 of Figure 1.

Referring to the drawing wherein like numerals of reference designate corresponding parts throughout the several views, the numeral 10 designates generally a housing which is adapted to be mounted on an internal combustion engine, which housing is provided with an intake port or passage 11 and an outlet or exhaust passage 12. The intake passage 11 terminates at one side of the housing 10 in a nipple 13 so that a fuel supply line may be connected to the housing 10. The exhaust passage or outlet 12 terminates in an enlarged opening or passage 14 provided with a threaded sleeve 15. A fuel nozzle generally designated as 16 is threaded into the enlarged exhaust passage 14. This nozzle 16 comprises a sleeve 17 provided with an enlarged passage 18 on the inner portion thereof, which passage terminates in a relatively small passage 19.

The outer end of the nozzle 16 has an outstanding flange 20 abutting against the lower end of the lug or threaded member 15. The housing 10 is provided with a cylinder 21 which is in communication with the intake passage 11 and also with the exhaust passage 12. A plunger or piston 22 is slidable in the cylinder 21 and the upper end of the plunger or ram 22 extends above the top of the housing 10 and is threaded as at 23. A guide member 24 is threaded or otherwise disposed in the housing 10 and the plunger or ram 22 slides vertically through this guide member 24. The guide member 24 is provided with cam faces 25, the purpose for which will be hereinafter described.

The housing 10 is provided at a point above the cylinder 21 with a second cylinder 26 which is positioned concentrically of the piston 22. A second piston 27 is secured to or formed with the piston 22 and is slidable in the upper cylinder 26. A sealing ring 28 is mounted in a groove provided in the upper piston 27 and is adapted to seal this piston in the cylinder 26 so as to prevent the passage of any compression as will be hereinafter described.

A gasket or cushioning member 29 is disposed about the piston 22 and engages against the top of the piston 27 so as to cushion the upward movement of this piston 27. The housing 10 is provided with a passage 30 which communicates at one end with the cylinder or engine head through the lug or threaded member 15.

The passage 30 extends vertically and at an oblique angle through the housing 10 and terminates in a substantially horizontal passage 31 opening into the cylinder 26 at a point adjacent the bottom of the guide member 24 so that there will not be any trapping of air in the upper side of the cylinder 26 when the piston 27 moves upwardly. The housing 10 is also provided with a passage 32 communicating at one end with the lower portion of the cylinder 26 and at the other end with the atmosphere so that the air in the lower portion of the cylinder 26 below the piston 27 can be forced out or drawn in without impeding the movement of the pistons 22 and 27. In order to form the passages 30 and 31 the housing is drilled by a relatively large drill and this hole formed by the large drill is closed by a plug 33. Likewise the opening or passage 31 is formed by drilling the housing through from one side and closing this opening by means of a plug 34.

A packing gland 35 is threaded into the upper end of the guide member 24 and a packing member 36 is disposed between the lower end of the gland 35 and engages a seat 37 formed in the guide member 24. This gland 35 is provided with recesses 38 at a point above the top of the guide member 24 which provides means for engagement with a wrench or the like so that the gland 35 can be tightened and the packing 36 compressed about the piston 22.

A movable cam member generally designated as 39 is rotatably carried by the guide member 24 and this movable cam member 39 is provided with cam faces 40 which are complimentary to the cam faces 25 provided in the guide member

24. A sleeve 41 is integral with the cam member 39 and extends outwardly and about the gland 35 and this sleeve 41 has a top plate 42 engaging about the piston 22. The sleeve 41 has an opening 43 therethrough at a point relative to the recesses 38 to permit the projection of a tightening tool or wrench into the recesses 38. A cap or plate 44 is threaded onto the upper end of the piston 22 and is locked in adjusted position by means of a lock nut 45. An expanding spring 46 engages one end against the lower face of the plate 44 and at the other end against the upper side of the cam member 39 and is loosely disposed about the sleeve 41. This spring 46 constantly urges the piston 22 and the piston 27 into uppermost position.

A cushioning washer 47 is disposed about the stem of the piston 22 and engages against the top of the plate 44 and the sleeve 41 and is adapted to cushion the downward movement of the piston 22. A cam adjusting arm 47' is carried by the cam 39 and extends laterally thereof and is provided with a knuckle or ball member 48 for attachment to a cam controlling means so that the movement of this cam 39 can be controlled and thereby the length of the stroke of the piston 22 can be manually or mechanically controlled. A lubricating cup 49 is connected to the removable cam member 39 by means of a conduit 50.

In the use and operation of this automatic valve or fuel injecting means, the controlling lever 47 can be suitably adjusted so as to raise the cam 39 and the sleeve 41. When the engine is on the compression stroke the piston 22 is moved downwardly and as the lower end of the piston 22 passes the intake passage 11 the fuel is cut-off and the quantity of fuel in the cylinder 21 below the piston 22 is forced downwardly through the outlet passage 12. It is, of course, understood that the fuel in the line attached to the nipple 13 is under pressure so that when the lower end of the piston 22 is above the inlet passage 11 the fuel will be forced into the cylinder 21. In order to prevent the passage into the engine cylinder of the fuel when the piston 22 is in uppermost position, I have provided a check valve 51 which is slidable in the exhaust passage 12 and is provided with a stem 52 which is secured at the upper end to the piston 22. This stem 52 is smaller than the head of the valve 51 so that when the piston 22 moves downwardly into ejecting position the fuel in the cylinder 21 will be forced downwardly about the stem 52 and at this time the head 51 will be disposed in the enlarged discharge chamber 18 of the jet member 16.

When the fuel in the cylinder or fuel chamber 21 has been discharged through the jet 16 into the engine cylinder, the spring 46 will return the piston 22 to uppermost or intake position.

It will be obvious that the turning of the cam member 39 will change the length of the stroke of the piston 22 inasmuch as when the cam member 39 is turned so as to move the cam faces 40 out of register with the cam faces 25 the sleeve 41 will be raised and the plate or head 44 will strike the cushioning member 47 at such a position as to shorten the stroke of the piston 22. The passages 30 and 31 permit the compressed air or gases in the cylinder of the engine to force the piston 27 downwardly so that the fuel in the fuel chamber 21 will not be ejected into the cylinder of the piston until the air in the engine cylinder is compressed to the desired degree.

As the compression piston 27 is larger in diameter than the piston 22 and as passages 30 and 31 are larger in diameter than the diameter of the discharge opening 19 in the jet 16, the pressure on the upper side of the compression piston 27 will force the plunger or piston 22 downwardly into ejecting position and eject the fuel in the chamber 21 into the compressed air in the engine cylinder, thereby igniting the fuel. When the fuel has been ignited the pressure of the gases in the engine cylinder will hold the piston 27 downwardly and the piston 22 in discharging position so that the intake passage 11 will be cut-off. After the engine passes the power stroke and the piston of the engine is moving in its return to the top of the cylinder the release of the pressure of the burned gases in the engine cylinder will permit the return of the piston 27 through the medium of the spring 46.

It is, of course, understood that various changes and modifications may be made in the details of construction and design of the above specifically described embodiment of this invention without departing from the spirit thereof, such changes and modifications being restricted only by the scope of the following claims.

I claim:—

1. A pressure operated fuel injecting means for an internal combustion engine, comprising a housing having a threaded sleeve for threadably mounting the housing on a cylinder of the engine, said housing having a normally open intake port and an elongated exhaust passage, a plunger slidable in the housing, pressure controlled plunger operating means, said plunger upon movement into ejecting position closing said intake port, a valve carried by said plunger and disposed in said passage for closing the exhaust passage when the plunger is in inoperative position, and yieldable means for returning the plunger to inoperative position.

2. A pressure operated fuel injecting means for an internal combustion engine, comprising a housing having a fuel chamber therein, a threaded sleeve carried by the housing for threadably mounting the housing on a cylinder of the engine, said housing having a normally open intake port and an elongated exhaust passage, a plunger slidably carried by the housing and movable in said fuel chamber, pressure controlled plunger operating means, said plunger upon movement into ejecting position closing said intake port, a valve carried by the plunger and disposed in said passage for closing the exhaust passage when the plunger is in inoperative position, and yieldable means for returning the plunger to inoperative position.

3. A pressure operated fuel injecting means for an internal combustion engine, comprising a housing, a fuel chamber in the housing, a threaded sleeve carried by the housing, said housing having a normally open intake port and a relatively small elongated exhaust port, a plunger slidable in the fuel chamber and adapted upon movement thereof into ejecting position to close said intake port, a valve member for said exhaust passage, means for securing the valve member to the plunger for movement therewith, said valve member being normally disposed within said passage and moving into open position simultaneously with the movement of the plunger into ejecting position, pressure controlled plunger operating means, and yieldable means for returning the plunger to inoperative position.

4. A pressure operated fuel injecting means

for an internal combustion engine, comprising a housing, a cylindrical fuel chamber in the housing, a sleeve carried by the housing for mounting the housing on a cylinder of the engine, said housing having a normally open intake port for said fuel chamber and an elongated exhaust passage disposed coaxially of said fuel chamber, a plunger slidable in said fuel chamber, pressure controlled operating means for said plunger, a valve member for said exhaust passage, means for securing said valve member coaxial of said plunger for movement therewith, said valve member being disposed in closed position entirely within said passage when the plunger is in inoperative position and moving into open position upon movement of the plunger into ejecting position, yieldable means for returning the plunger to inoperative position, and means for controlling the length of stroke of the plunger.

5. A pressure operated fuel injecting means for an internal combustion engine, comprising a housing, a cylindrical fuel chamber in the housing, means for mounting the housing on the cylinder of an engine, said housing having a normally open intake port discharging into said fuel chamber and an elongated exhaust passage, a sleeve secured to the inner end of the housing coaxial of said fuel chamber, pressure controlled plunger operating means, said housing having a passage communicating at one end with the plunger operating means and at the other end opening through said housing mounting means, a valve member for closing said exhaust passage and means for fixedly securing said valve member to the plunger for movement therewith, said valve member being normally within said passage, said sleeve having a reduced fuel passage at its inner end.

6. A means for injecting fuel into an internal combustion engine under the compression in the cylinder, comprising a housing, a threaded sleeve secured to the housing and adapted to engage in an opening in the cylinder, said sleeve having a fuel discharging opening therethrough and a reduced passage parallel with said discharge opening, a member having a reduced passage therethrough mounted in said sleeve, a fuel chamber in the housing, a plunger slidable in said chamber, said chamber having a normally open intake port and a discharge port communicating with said sleeve, a pressure cylinder in the housing, a piston slidable in said cylinder and secured to said plunger, said housing having a passage communicating with said reduced passage and with the cylinder on one side of the piston, a check valve secured to said plunger for closing said discharge port, a member fixed to the piston and extending outwardly of the housing, a plate mounted on the member, a spring about the member for returning the piston and plunger to inoperative position, and cam means for controlling the stroke of the piston and plunger.

7. In a fuel injecting means for an internal combustion engine including a housing and a part within the housing and movable under the compression of the engine, a cam member fixed relative to the housing, a movable cam member engaging the first cam member, means carried by said movable cam member and engageable with said part to limit the movement of said part, and means for moving said movable cam member relative to said first cam.

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