June 12, 1951 H. ALFARO ET AL 2,556,356

ACCUMULATOR TYPE INJECTOR NOZZLE

Filed April 26, 1946 2 Sheets-Sheet 1

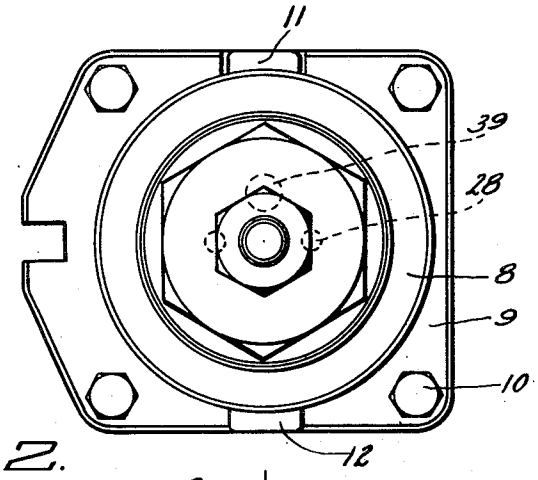
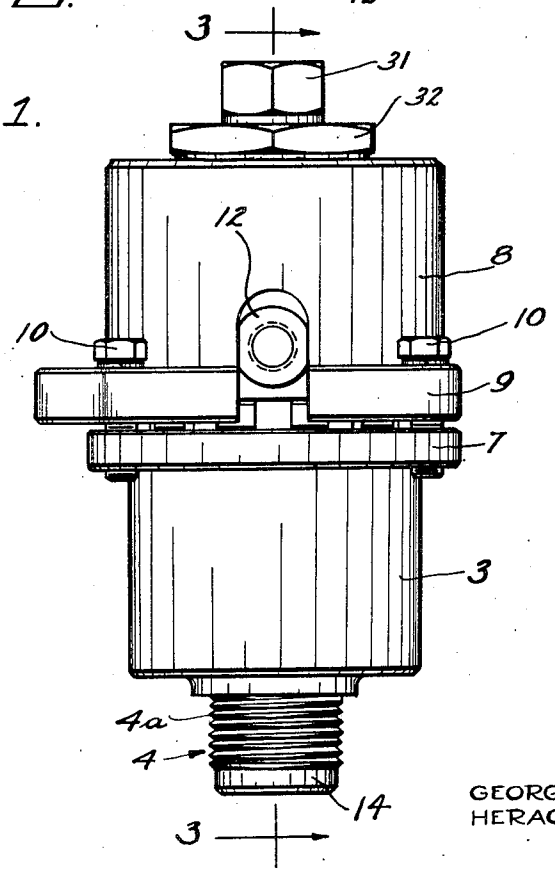


Fig. 2.

Fig. 1.



GEORGE B. WOOD JR.
HERACLIO ALFARO
INVENTORS.

BY Raymond A. Taquin
ATTORNEY.

June 12, 1951 H. ALFARO ET AL 2,556,356

ACCUMULATOR TYPE INJECTOR NOZZLE

Filed April 26, 1946 2 Sheets-Sheet 2

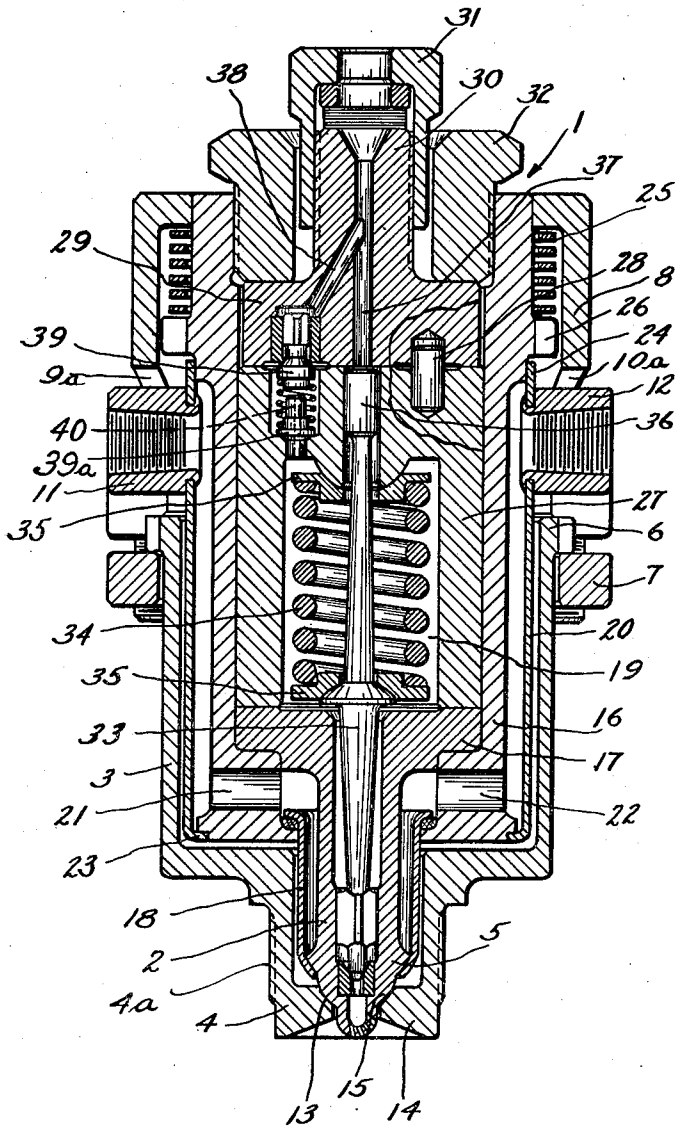


Fig. 3.

GEORGE B. WOOD, JR.
HERACLIO ALFARO
INVENTORS

BY Raymond A. Paquin
ATTORNEY

Patented June 12, 1951 2,556,356

UNITED STATES PATENT OFFICE

2,556,356

ACCUMULATOR TYPE INJECTOR NOZZLE

Heraclio Alfaro and George B. Wood, Jr., Springfield, Mass., assignors to American Bosch Corporation, Springfield, Mass., a corporation of New York

Application April 26, 1946, Serial No. 665,284

2 Claims. (Cl. 299—107.5)

1

This invention relates to fuel injection devices for engines or the like and has particular reference to a new and improved accumulator nozzle construction particularly adapted for use with free piston power gas generators although it is also capable of employment in other liquid fuel burning devices, and also to new and improved means for mounting such a nozzle on the engine or the like.

An object of the invention is to provide a new and improved accumulator type fuel injection nozzle.

Another object of the invention is to provide a new and improved nozzle of the type set forth which is capable of withstanding considerable heat and also of producing high injection pressures and short injection duration and deep penetration of the spray.

Another object of the invention is to provide a new and improved means for mounting a fuel injection nozzle on an engine.

Other objects and advantages of the invention will be apparent from the following description taken in connection with the accompanying drawings. It will be understood that many changes may be made in the details of construction and arrangement of parts without departing from the spirit of the invention as expressed in the accompanying claims, as the preferred form has been given by way of illustration only.

In providing fuel injection devices for free piston power gas generators or the like wherein air is compressed by opposed pistons working into the cylinder and is ignited by the high temperature of the air, we have found it desirable to employ an accumulator type fuel injection system, because any positive mechanical drive of the injection pump plungers works in phase with the pistons and, therefore, stops moving when the pistons stop moving, which is just about the time when the fuel should be injected into the engine cylinder. By employing an accumulator type injection system, the fuel is delivered to the nozzle as the pump plunger moves in, but is not delivered until the line pressure is tripped by the plunger spill which is arranged to occur very near the end of the plunger stroke.

We have also found that because of the high output at which the engine is expected to operate, that means must be provided for preventing overheating of the nozzle.

In addition to the above, we have found that it is desirable to provide a construction wherein the fuel spray will be properly aligned in the combustion chamber and wherein the force by which the nozzle is pressed against its seat is controlled.

We have also provided a construction wherein it is impossible to tighten the nozzle in its holder to such an extent as to distort the nozzle and,

2

also, which arrangement always provides the same tightening load and alignment of the nozzle in its holder and wherein the nozzle is so held in its holder that expansion and contraction of the nozzle or the holder do not materially change the seating pressure of the nozzle in its holder.

It is the object of the present invention to provide a new and improved accumulator nozzle and holding means for positioning and retaining the same in position on an engine which will contain the desirable characteristics outlined above.

Referring to the drawings:

Fig. 1 is a side view of a nozzle and nozzle holder embodying the invention;

Fig. 2 is a top or plan view thereof; and

Fig. 3 is a sectional view taken on line 3—3 of Fig. 1, looking in the direction of the arrows.

Referring more particularly to the drawings wherein similar reference characters designate corresponding parts throughout the several views, the embodiment of the invention shown comprises the nozzle assembly 1 and the nozzle body 2.

The nozzle assembly 1 comprises the mounting sleeve 3 having the reduced extension 4 adapted to be inserted into an opening in the cylinder wall of the combustion chamber of the engine. This reduced extension 4 has the threaded portion 4a adapted to be threaded into the opening in the cylinder wall of the engine.

Within the mounting sleeve 3 is positioned the nozzle assembly 1 with the nozzle 5 extending into the reduced extension 4 on the mounting sleeve 3.

The upper edge of the mounting sleeve 3 is provided with the integral peripheral flange 6 adapted to be seated on the clamping ring 7. The cover 8 has the flange 9 through which the bolts 10 extend and are threaded into threaded openings in the clamping ring 7.

The cover or nozzle mounting 8 is provided with a pair of oppositely opposed openings 9a and 10a through which extend the fittings 11 and 12 respectively for connection to a supply of liquid cooling medium such as water.

The inner annular surface 13 on the flange 14 in the lower end of the reduced extension 4 of the mounting sleeve 3 is formed with a conical seat adapted to receive the spherical tip 15 on the nozzle assembly.

The nozzle assembly 1 comprises the cylindrical sleeve 16 into which is fitted the nozzle body 2 having the flange 17 seated on a flange on the sleeve 16. Surrounding the nozzle 2 is provided the coolant sleeve 18 adapted to allow the passage of the cooling liquid to cool the nozzle as hereinafter described.

The sleeve 16 forming the accumulator chamber 19 is surrounded by the sleeve 20 which is in spaced relation with the sleeve 16 only at the

opposite sides thereof so as to allow the passage of the cooling fluid which enters through fitting 11 or fitting 12 between the sleeves and this fluid then passes through the space between the sleeve 18 and the nozzle 2 by means of the opening 21 or opening 22 and then through the other of said openings and out the other fitting 11 or 12. The sleeve 20 has the fittings 11 and 12 secured thereto adjacent its upper end and said sleeve 20 is secured to the nozzle body 16 by means of the flange 23 which is secured to said body 16 and the upper end 24 of said sleeve 20 is secured to the nozzle body in a like manner.

Within the cover 8 is positioned the spring 25 which may be a flat formed with waves or may comprise a series of springs in superimposed position and is adapted to rest on the flange 26 of the sleeve 16 and to resiliently mount the nozzle body within its holder as hereinafter described.

Between the mounting sleeve 3 and the sleeve 20 is a space which is open at the top to allow the exhausting of gases and fluids accumulating in the opening surrounding the sleeve 18 and within the reduced extension 4. In this manner the engine cylinder gas cannot leak into the nozzle and the nozzle coolant cannot leak into the engine cylinders.

The check valve holder assembly 29 is fitted within the sleeve 16 above the accumulator chamber sleeve 27 and is retained in alignment therewith by means of the dowel pin 28. The check valve holder member 29 has the reduced extension 30 adapted to be connected to a fuel supply line by means of the fitting 31. The securing nut 32 is provided in threaded engagement with the interior surface of the upper end of the sleeve 16 to retain the nozzle body in assembled relation.

Within the nozzle body is provided the valve 33 having a portion extending into the nozzle body 2 and adapted to be operated by means of the spring 34 within the accumulator chamber 19 and having its opposite ends resting against the spring seats 35. The valve 33 has the piston portion 36 at its upper end adapted to close the fuel line 37 when the nozzle is in raised position.

Connecting the fuel line 37 with the accumulator chamber 19 is the line 38 in which is check valve 39 and which line extends through an opening 40 in lower valve member 39*a*.

To assemble the nozzle in its holder, the threaded portion 4*a* of the reduced extension 4 of the mounting sleeve 3 is first screwed into the engine cylinder and then the complete nozzle assembly is placed in the mounting sleeve 3 and the spring 25 placed in position. The cap 8 is then placed over the spring 25 and drawn down against the spring by means of the four screws 10.

The spherical tip on the nozzle body 2, which is seated on the conical seat 13 on the flange 14, aligns the nozzle body with the opening in the reduced end 4 of the mounting sleeve 3.

The fuel line may then be connected to the upper end of the nozzle and inlet and outlet lines of the cooling fluid connected to the fittings 11 and 12.

With the nozzle seated in its holder by the means described above, the nozzle will be resiliently held on its seat by the spring 25 so that expansion and contraction of the nozzle and/or of the holder or cap do not materially change the seating pressure of the nozzle in its holder.

The accumulator nozzle functions in the usual manner, that is, when the accumulator chamber 19 is filled with fuel and the line pressure is relieved, the nozzle or valve will lift from its seat

in the nozzle body 2 and allow the fuel to spill into the combustion chamber of the engine.

Fuel enters accumulator chamber 19 through fuel line 38, check valve 39 and an opening 40 in lower valve member 39*a*. So long as the fuel pressure is maintained in the lines 37 and 38, the needle 33 is held down on its seat by the combined action of fuel pressure and force of spring 34.

When the fuel pressure in fuel lines 37 and 38 is relieved by the injection pump or other suitable means, check valve 39 closes and fuel pressure in chamber 19, acting on the underside of piston 36, lifts needle 33 from its seat and allows the accumulated pressure in chamber 19 to spray fuel through the nozzle tip into the combustion chamber until the pressure in the accumulator chamber 19 drops to a point where it is overbalanced by the force of spring 34 which forces the needle into closed position. This cycle is repeated for every injection.

From the foregoing it will be seen that we have provided simple, efficient and economical means for obtaining all of the objects and advantages of the invention.

Having described our invention, we claim:

1. An accumulator type nozzle comprising a nozzle portion, a fuel supply line and an accumulator chamber intermediate said nozzle portion and said fuel supply line, a bore between said accumulator chamber and said fuel supply line, a valve member having a fuel control portion in said nozzle portion and a piston portion in said bore and a connecting portion extending through said accumulator chamber and connecting said piston and fuel control portions, and a fuel supply passageway connecting said fuel supply line beyond said piston and bore with said accumulator chamber for supplying fuel from said line to said accumulator chamber and a check valve in said fuel supply passageway.

2. An accumulator type nozzle comprising a nozzle portion, a fuel supply line and an accumulator chamber intermediate said nozzle portion and said fuel supply line, a bore between said accumulator chamber and said fuel supply line, a valve member having a fuel control portion in said nozzle portion and a piston portion in said bore and a connecting portion extending through said accumulator chamber and connecting said piston and fuel control portions, and a fuel supply passageway connecting said fuel supply line with said accumulator chamber for supplying fuel from said line to said accumulator chamber, said fuel supply passageway being connected to said fuel supply line beyond the junction of said bore and said fuel supply line, and a check valve in said fuel supply passageway.

HERACLIO ALFARO.
GEORGE B. WOOD, JR.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,585,277	Bell	May 18, 1926
1,701,089	Von Salis	Feb. 5, 1929
2,075,949	Lemon	Apr. 6, 1937
2,117,367	Schlatter	May 17, 1938
2,175,450	Thege	Oct. 10, 1939
2,283,725	Eichelberg	May 19, 1942
2,434,329	Meitzler	Jan. 13, 1948