PUBLISHED
MAY 11, 1943.
BY A. P. C.

O. ARCHAOULOFF
AUTOMATIC PUMP FOR FUEL INJECTION ACTUATED BY THE COMPRESSION OF GAS IN THE CYLINDER OF AN INTERNAL COMBUSTION ENGINE
Filed Feb. 14, 1940

Serial No.
318,940

Fig. 2

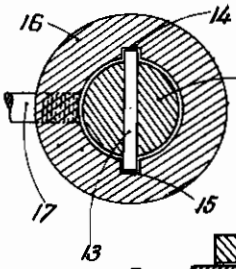


Fig. 1

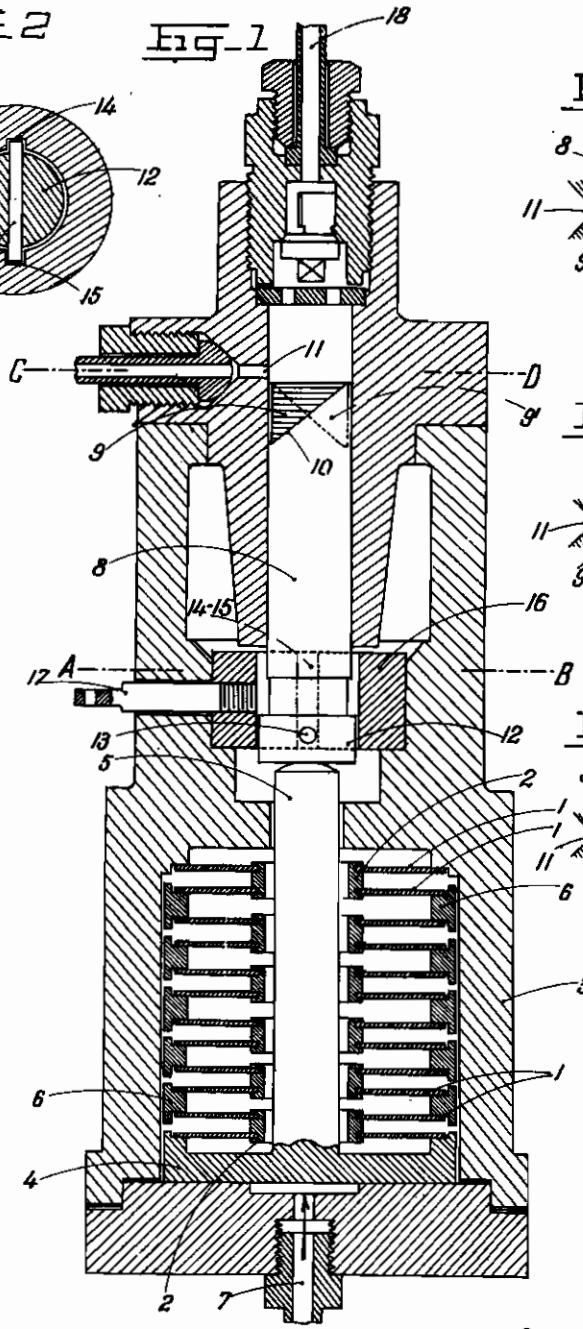


Fig. 3

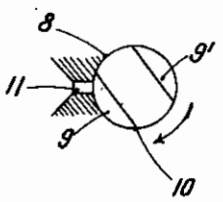


Fig. 4

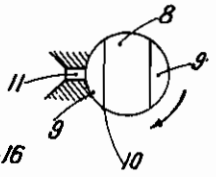
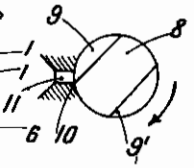


Fig. 5



Inventor,
O. Archaouloff

By: Glascock Downing & Seebold
Attys.

Published May 11, 1943 Serial No. 318,940

ALIEN PROPERTY CUSTODIAN

AUTOMATIC PUMP FOR FUEL INJECTION ACTUATED BY THE COMPRESSION OF GAS IN THE CYLINDER OF AN INTERNAL COMBUSTION ENGINE

Oleg Archaouloff, Paris, France; vested in the Alien Property Custodian

Application filed February 14, 1940

The present invention relates to pneumatic pumps for injection, and chiefly to the pumps specified in U. S. Patent application No. 1,435,787, filed on November 14, 1922, in the name of Vadime Archaouloff.

It is a known fact that this very simple construction will readily afford very high pressures of fuel injection, which is a most important condition for a perfect combustion.

After long and serious researches and practical tests, and as a result of numerous intsallations in normal operation upon large marine engines of different types, at well-known German and Swedish docks, the direct injection known by the name of Archaouloff is recognized as one of the best.

However, it must be admitted that this system, in its present state, is not well adapted for engines of moderate power and high speed.

The difficulties are due to the small size of the pneumatic piston, which prevent its proper automatic lubrication, this being the essential feature for its regular working and its fluid-tight conditions.

The invention has for its object to overcome such drawbacks, while eliminating all lubrication and all friction of the pneumatic piston, this being replaced by an elastic device consisting of a set of independent units, each comprising a pair of flat metal discs of small thickness, which are inserted into a central ring.

The accompanying drawings show by way of example which is indicative but not limitative, a constructional form of a new pump for fuel injection provided with the elastic piston, the object of the present application, in order to set forth the remarkable consequences resulting from the entire elimination of the friction of the pneumatic piston.

Fig. 1 is a vertical section of the pneumatic pump according to the invention.

Fig. 2 is a section on the line A—B of fig. 1.

Figs. 3, 4 and 5 are sections on the line C—D of fig. 1, showing the three positions of the upper end of the pump plunger.

The principal part of the injection pump, the subject-matter of the present invention, is the elastic piston which is shown in section in fig. 1.

In this figure, 1, 1, are flat metal discs which are inserted in pairs into a central ring 2, thus forming separate units which can be readily removed from the elastic piston. These units are separated from one another by T-shaped rings 6, which are in loose contact with the outer edges of the discs 1. The conduit which makes constant connection between the pneumatic cylinder 3 and the combustion chamber of the engine cylinder is shown at 7. The disc forming the outer surface of the piston is shown at 4, and the axial rod 5 of the piston, whose end traverses the end of the cylinder, bears against the head 12 of the feeding plunger 8 of the injection pump properly so called. The gas delivered from the compression chamber of the engine cylinder exerts a constantly-increasing pressure upon the elastic piston, and this latter, by its rod 5, imparts the thrust to the plunger of the injection pump, thus compressing the charge of fuel until the time of the injection, at which the disc units, which are compressed, drive this fuel with great force through the injector into the combustion chamber of the engine cylinder. The maximum deflection of each unit of the piston, when compressed, should not exceed a certain limit, depending upon the distance between the rings 6.

The exact fluid-tight conditions for the said elastic piston are obtained exclusively by the proper insertion and the careful fitting of the discs 1, and also by the external pressure of the gas.

It is evident that the present construction for pneumatic piston is well adapted for engines of any power, and will in all cases provide for a remarkably simple construction and operation of the injection pump, as will be further described.

The Archaouloff process for direct fuel injection comprises two pumps in all cases, one operating at very high pressure and the other at a lower pressure and adapted for a proportional feed of fuel to the first pump, as specified in U. S. patents dated November 15th, 1922 nº 1,435,787, and June 21st, 1927, nº 1,633,158.

However, the individual pumps for the proportional feeding of the fuel to each engine may be entirely eliminated, together with their regulating mechanism, in connection with the load on the engine, owing to the complete absence of friction of the disc type of pneumatic piston.

The function of the proportional feeding of the fuel, in this new construction, is fulfilled by the plunger 8.

The said plunger is provided at its upper end with two oppositely-situated beveled parts 9 and 9' (figs. 1, 3, 4 and 5). The feeding plunger 8 is driven, in its forward stroke, and during the injection of the fuel, by a strong thrust of the elastic piston due to the action of the gas compressed in the combustion chamber of the engine cylinder, and in its return stroke, by a moderate pressure exerted by the fuel upon its end.

When the inclined edge 10 of the bevel 9, during the injection, covers the orifice 11 leading to the injector, the plunger 8 will instantly stop, and the injection ceases.

From the preceding considerations, it will be understood that this stopping of the plunger will depend upon its angular position relatively to the orifice 11.

Figs. 3, 4 and 5 show by way of example three consecutive angular positions of the bevel 9.

In fig. 3, the distance between the edge 10 of the bevel 9 and the orifice 11, in the vertical direction, is a maximum, as well as the stroke of the plunger 8 and the charge of injected fuel.

In fig. 4, this distance has a medium value, as well as the stroke of the plunger and the charge of fuel.

In fig. 5, this distance is a minimum, as well as the stroke of the plunger and the charge of fuel.

In order to bring the plunger into any angular position corresponding to the desired charge of fuel to be injected, fig. 1 shows a mechanism consisting of a pin 13 passing through the head of the plunger 8, its ends being slidable in vertical grooves 14 and 15 provided in a ring 16. This latter can be actuated by hand by means of a small lever 17, or by a centrifugal governor of small power, in order to bring the said plunger, and hence its bevels 9 and 9', into the desired angle with reference to the orifice, thus causing the injection of a quantity of fuel corresponding to load on the engine.

It will be noted that owing to the double bevel, there will be no lateral pressure upon the end of the plunger, and that all wear and friction of the said plunger are entirely eliminated.

Accordingly, a very slight pressure of the fuel delivered by the pipe 18 of a fuel tank mounted at a suitable height, will be sufficient to return the said plunger to its initial position.

In this manner, all individual fuel pumps will be superfluous.

OLEG ARCHAOULOFF.