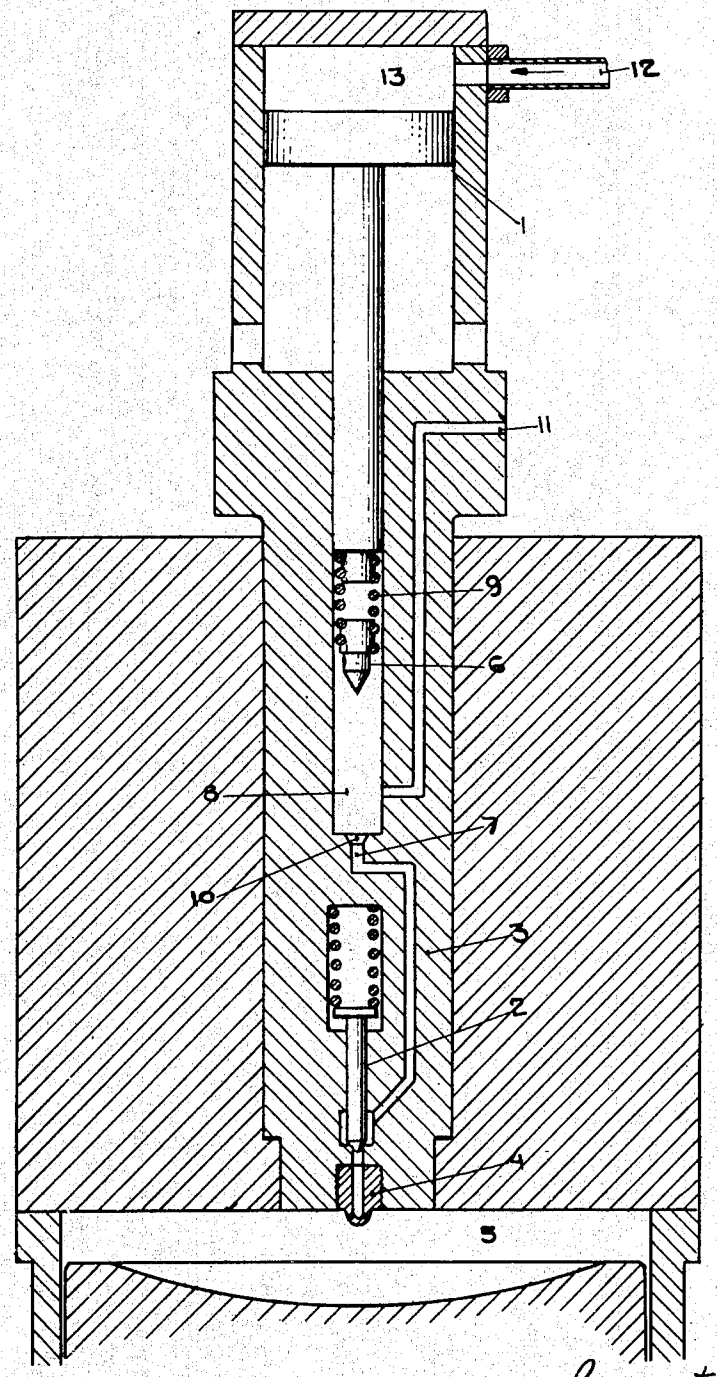
Oct. 1, 1935. T. EEK 2,015,887

FUEL INJECTION MEANS FOR COMPRESSORLESS INTERNAL COMBUSTION ENGINES

Filed Jan. 8, 1935



Inventor:
THORLEIF EEK
By E. F. Henderson
Atty

Patented Oct. 1, 1935 2,015,887

UNITED STATES PATENT OFFICE

2,015,887

FUEL INJECTION MEANS FOR COMPRESSORLESS INTERNAL COMBUSTION ENGINES

Thorleif Eek, Oslo, Norway, assignor to Kockums Mekaniska Verkstads Aktiebolag, Malmo, Sweden, a corporation of Sweden

Application January 8, 1935, Serial No. 907
In Sweden November 13, 1934

3 Claims. (Cl. 299—107.2)

The present invention refers to fuel injection means for internal combustion engines having no fuel compressor. More specifically the invention refers to such compressorless internal combustion engines in which the high fuel pressure required for the injection is brought about by means of a piston pump driven by a compressed fluid, and wherein the injection is performed by means of a nozzle controlled by a needle valve.

In injection means of this kind, the invention has for its primary object to improve the working conditions of the high pressure fuel pump so as to obtain an efficient fuel injection.

Generally speaking, the main characteristic of the invention is that the fuel conveying conduit between the high pressure pump and the needle valve, or nozzle, is provided with a shut-off valve means adapted to coact with the movable members of the high pressure piston pump in such a manner that the said conveying conduit is closed at the conclusion of the injection stroke of the pump.

The result hereof will be that the fuel confined between the fuel piston of the high pressure pump and the injection nozzle then closed by the needle valve will act arresting on the high pressure piston and perform a soft stopping of the same at the conclusion of the injection stroke.

Hereby it is advantageous to connect the valve member adapted for closing of the fuel conveying conduit with the high pressure piston so that it is brought to move together with the latter, and special advantages are gained in case this connection is resilient. A resilient connection between the said valve member and the piston results in that the piston will be permitted to continue its injection stroke until the compression of the confined fuel is sufficient for effecting a complete stopping of the same, and in that the piston, after having been reversed at the end of the injection stroke, may perform a certain part of its suction stroke before the valve member is opened again, so that the pressure of the confined quantity of fuel has got time to decrease sufficiently for eliminating the risk of after-injection of fuel into the engine cylinder.

An embodiment of the invention is illustrated in the accompanying diagrammatical drawing which shows a longitudinal section of the upper portion of an engine cylinder equipped with the injection means according to the invention.

In the embodiment of invention shown, the high pressure piston pump is supposed to be provided with a differential piston 1 the larger piston member of which is adapted to be driven by a compressed fluid, whereas the smaller plunger member of the same is adapted to exert the required pressure on the fuel, such differential piston being reciprocably mounted within a housing 3 enclosing also the needle valve 2.

The highly compressed fuel is injected through the nozzle 4 into the combustion chamber 5 of the engine after having at first passed a communication conduit 7 connecting the needle valve and the nozzle with the fuel compression cylinder 8 of the high pressure pump.

The shut-off valve member 6 is connected with the free end of the high pressure plunger by means of a coil spring 9, and said valve member is adapted to coact with a seat 10 provided at the bottom end of the cylinder 8 and forming the inlet opening to the communication conduit 7. The fuel enters the cylinder 8 by means of an admission channel 11, and the driving fluid for the high pressure pump is admitted to the cylinder 13 by means of the pipe 12.

When the differential piston 1 is moved downwardly under influence from the pressure within the cylinder 13, the fuel is compressed within the cylinder 8 and injected into the engine cylinder by the intermediary of the communication conduit 7, the needle valve 2 and the nozzle 4. At the conclusion of the injection stroke of the pump, the valve member 6 approaches the seat 10 and is pressed against the same under compression of the spring 9, so that the inlet end of the conduit 7 becomes closed. The fuel confined between the lower end face of the fuel piston and the valve member 6 is thereafter compressed and arrests the movement of the piston. The valve member will be kept against its seat also during the first part of the suction stroke of the piston, and until the pressure within the cylinder 8 has got time to decrease in a sufficient degree for eliminating an after-injection.

What I claim and desire to secure by Letters Patent is:—

1. In a fuel injection means for internal combustion engines of the character described, a high pressure piston pump driven by a compressed fluid and adapted to raise the pressure on the fuel in a sufficient degree for injection into the working cylinder of the engine, an injection nozzle means mounted in connection with the engine cylinder and adapted for injection of the fuel therein, a valve means adapted for closing of said nozzle means, a communication conduit between said nozzle means and the high pressure fuel chamber of the piston pump, and a shut-off valve means resiliently connected with the piston of the high

pressure fuel pump and adapted for closing of the aforesaid communication conduit at the conclusion of the injection stroke of said pump.

2. In a fuel injection means for internal combustion engines of the character described, a high pressure fuel piston pump having a differential piston the larger piston member of which is adapted to be driven by a compressed fluid, whereas the smaller piston member of the same is adapted to exert the required pressure on the fuel, an injection nozzle means mounted in connection with the engine cylinder and adapted for injection of the fuel therein, a valve means adapted for closing of said nozzle means, a communication conduit between said nozzle means and the high pressure fuel chamber of the piston pump, and a shut-off valve means resiliently connected with the smaller piston member of the differential piston and adapted for closing of the said communication conduit at the conclusion of the injection stroke of the pump.

3. In a fuel injection means according to claim 2, the additional feature, that the shut-off valve means for the communication conduit is mounted at the free end of the smaller piston member of the differential piston and adapted to coact with a seat at the bottom of the cylinder within which said piston member moves, such seat forming the inlet end of said communication conduit.

THORLEIF EEK.