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COOLED ATOMIZER FOR SOLID INJECTION ENGINES

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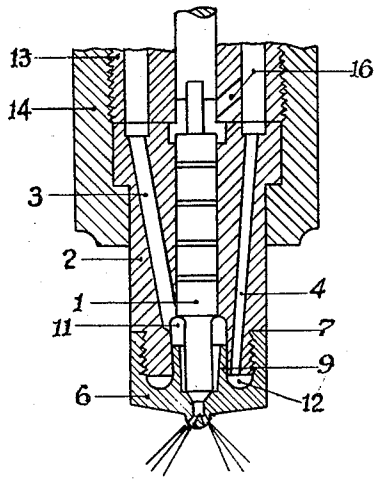


Fig. 1

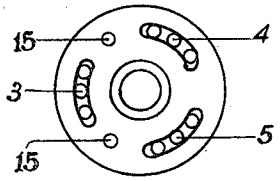


Fig. 2

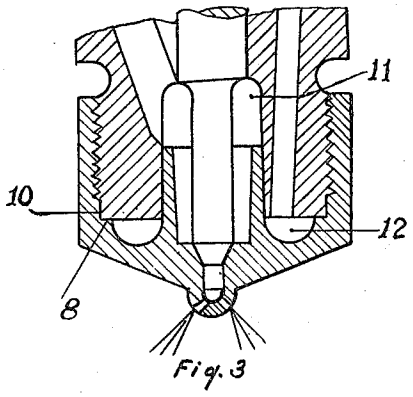


Fig. 3

Inventor:
Johannes Jan Broeze,
By H. Birch
Attorney.

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COOLED ATOMIZER FOR SOLID INJECTION ENGINES

Johannes Jan Broeze, Delft, Netherlands, assignor to Shell Development Company, San Francisco, Calif., a corporation of Delaware

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5 Claims. (Cl. 299—107.1)

The invention relates to cooled atomizers for solid injection engines and more in particular to such atomizers in which an injection nozzle containing a space for cooling liquid is fitted against a valve housing containing the usually spring-loaded injection valve or needle.

The object of the invention is to obtain in a simple manner a reliable seal between the fuel space of the valve body—in which during the injection period a very high pressure prevails—and the space for the cooling liquid.

According to the invention this is achieved by providing the injection nozzle with a part extending into the fuel space of the valve housing, said part being cylindrical on the outside engaging with the cylindrical inside of the fuel space.

The invention will now be explained in more detail with reference to the drawing.

Fig. 1 is a longitudinal section through an atomizer according to the invention.

Fig. 2 shows the valve housing of Figure 1, seen from above.

Fig. 3 shows a modified construction of the injection nozzle on a larger scale.

With the atomizer according to Figures 1 and 2 the spring-loaded injection valve or needle 1 is guided in the needle housing 2 which is provided with a fuel supply duct 3 and, further, with cooling medium supply and discharge ducts 5 and 4 respectively. As cooling medium preferably oil is used, viz. the oil serving at the same time as fuel. The cooling liquid is circulated through the cooling space 12 formed by a groove or recess in the injection nozzle 6, which recess is sealed by the end of the valve housing, against which the injection nozzle is affixed, for instance screwed.

A satisfactory seal between the cooling space and the outside can be obtained, for instance, by welding the nozzle to the housing 2 along the seam 7 or by means of a sealing face 8 as shown in Figure 3. The nozzle 6 contains also the seat for the needle 1.

According to the invention the seal between the fuel space 11 and the cooling space 12 is obtained by means of the part 9 of the injection nozzle, which part is cylindrical on the outside and precision-fitted into the bottom part of needle housing 2. This jacket or sleeve 9 made preferably of steel, just as the nozzle 6, is sufficiently deformed under the influence of the high fuel pressure, which may amount to 100–400 atm., to press so tightly against the inside of the needle housing as to form a perfect seal. The jacket or sleeve may also be used for centering, but this may also be effected by means of a special centering edge 10 (see Fig. 3).

It is remarked that in case fuel oil is used for cooling a leakage of fuel to be injected into the cooling space, if under certain conditions this should occur, would not result in contamination of the cooling liquid. When fuel is used as cooling medium any oil leaking along the needle may be carried off through the cooling oil discharge line; to this end the duct 16 may be provided in the atomizer holder (see Fig. 1).

The ducts 3, 4 and 5 terminate at the top of the needle housing 2, as shown in Fig. 2, in recesses drilled or milled into said top which is ground so as to fit accurately the underside of the atomizer holder 13 against which it is tightened by means of the nut 14. Set pins 15 ensure the correct connection of the ducts 3, 4 and 5 to their extensions in the atomizer holder 13.

The nozzle 6 may be constructed with one or more orifices, or as a nozzle for a so-called "pintle atomizer".

What I claim is:

1. A cooled atomizer for internal combustion engines employing solid injection of fuel comprising a valve housing, a spring loaded injection valve therein responsive to periodical increases in the fuel pressure, a fuel space in said housing surrounding said valve, a duct through said housing for supplying fuel to said space, a nozzle of cap-like shape, a recess in said nozzle constituting a continuation of said fuel space, a seat in said nozzle co-operating with the injection valve, an orifice in said nozzle at the bottom of said recess for admitting fuel into the engine cylinder in cooperation with said valve, an inner sleeve integral with said nozzle surrounding said recess and extending into the fuel space having a cylindrical outside to engage the cylindrical inside of said fuel space so as to provide a seal between said inner sleeve and the valve housing, an outer sleeve also integral with said nozzle for affixing the nozzle to the end of the valve housing and a recess in said nozzle between said sleeves having supply and discharge ducts through said housing for circulating cooling liquid through said recess.

2. A fuel cooled atomizer for internal combustion engines employing solid injection of fuel comprising a valve housing, a spring loaded injection valve therein responsive to periodical increases in the fuel pressure, a fuel space in said housing surrounding said valve, a duct through said housing for supplying fuel to said space, a nozzle of cap-like shape, a recess in said nozzle constituting a continuation of said fuel space,

a seat in said nozzle cooperating with the injection valve, an orifice in said nozzle at the bottom of said recess for admitting fuel into the engine cylinder in cooperation with said valve, an inner sleeve integral with said nozzle surrounding said recess and extending into the fuel space having a cylindrical outside to engage the cylindrical inside of said fuel space so as to provide a seal between said inner sleeve and the valve housing, an outer sleeve also integral with said nozzle for affixing the nozzle to the end of the valve housing, and a recess in said nozzle between said sleeves having supply and discharge ducts through said housing for circulating cooling fuel through said recess.

3. A cooled atomizer for internal combustion engines employing solid injection of fuel comprising a valve housing, a spring loaded injection valve therein responsive to periodical increases in the fuel pressure, a fuel space in said housing surrounding said valve, a duct through said housing for supplying fuel to said space, a nozzle of cap-like shape, a recess in said nozzle constituting a continuation of said fuel space, a seat in said nozzle cooperating with the injection valve, an orifice in said nozzle at the bottom of said recess for admitting fuel into the engine cylinder in cooperation with said valve, an inner sleeve integral with said nozzle surrounding said recess and extending into the fuel space having a cylindrical outside to engage the cylindrical inside of said fuel space so as to provide a seal between said inner sleeve and the valve housing, an outer sleeve also integral with said nozzle for affixing the nozzle to the end of the valve housing, a recess in said nozzle between said sleeves having supply and discharge ducts through said housing for circulating cooling liquid through said recess and a welded seam along the upper edge of said sleeve to form a seal between said recess and the outside.

4. A cooled atomizer for internal combustion engines employing solid injection of fuel comprising a valve housing, a spring loaded injection valve therein responsive to periodical increases in the fuel pressure, a fuel space in said housing surrounding said valve, a duct through said housing for supplying fuel to said space, a nozzle of cap-like shape, a recess in said nozzle constituting a continuation of said fuel space, a seat in said nozzle cooperating with the injection valve, an orifice in said nozzle at the bottom of said recess for admitting fuel into the engine cylinder in cooperation with said valve, an inner sleeve integral with said nozzle surrounding said recess and extending into the fuel space having a cylindrical outside to engage the cylindrical inside of said fuel space so as to provide a seal between said inner sleeve and the valve housing, an outer sleeve also integral with said nozzle for affixing the nozzle to the end of the valve housing, a recess in said nozzle between said sleeves having supply and discharge ducts through said housing for circulating cooling liquid through said recess and a face in the inner wall of the outer sleeve cooperating with a corresponding face at the bottom portion of the valve housing to form a seal between said recess and the outside.

5. A cooled atomizer for internal combustion engines employing solid injection of fuel comprising a valve housing, a spring loaded injection valve therein responsive to periodical increases in the fuel pressure, a fuel space in said housing surrounding said valve, a duct through said housing for supplying fuel to said space, a nozzle of cap-like shape, a recess in said nozzle constituting a continuation of said fuel space, a seat in said nozzle cooperating with the injection valve, orifices in said nozzle at the bottom of said recess for admitting fuel into the engine cylinder in cooperation with said valve, an inner sleeve integral with said nozzle surrounding said recess and extending into the fuel space having a cylindrical outside to engage the cylindrical inside of said fuel space so as to provide a seal between said inner sleeve and the valve housing, an outer sleeve also integral with said nozzle for affixing the nozzle to the end of the valve housing and a recess in said nozzle between said sleeves having supply and discharge ducts through said housing for circulating cooling liquid through said recess.

JOHANNES JAN BROEZE.