United States Patent

[11] 3,620,456

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[21] Appl. No. **55,173**
[22] Filed **July 15, 1970**
[45] Patented **Nov. 16, 1971**
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[32] Priority **July 23, 1969**
[33] **Germany**
[31] **P 19 37 419.7**

[54] **FUEL INJECTION NOZZLE FOR INTERNAL COMBUSTION ENGINES**
4 Claims, 2 Drawing Figs.

[52] **U.S. Cl.** **239/533,** 239/584
[51] **Int. Cl.** **B05b 1/30**
[50] **Field of Search** 239/533, 584

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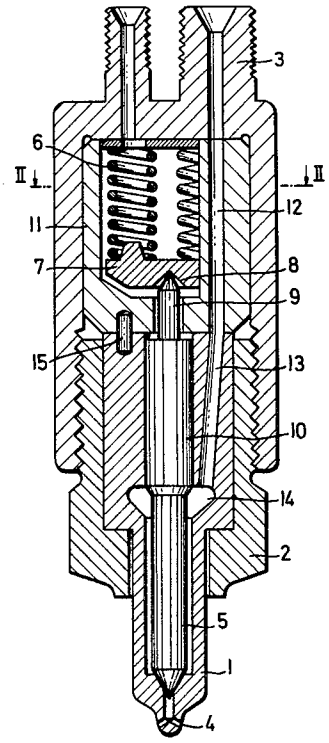
ABSTRACT: An injection nozzle for fuel injection engines with a nozzle needle acted upon by a plurality of springs, in which the resultant of the spring forces is conveyed through a universally journaled spring dish upon the nozzle needle the axis of which is in substantially axial alignment with said resultant.



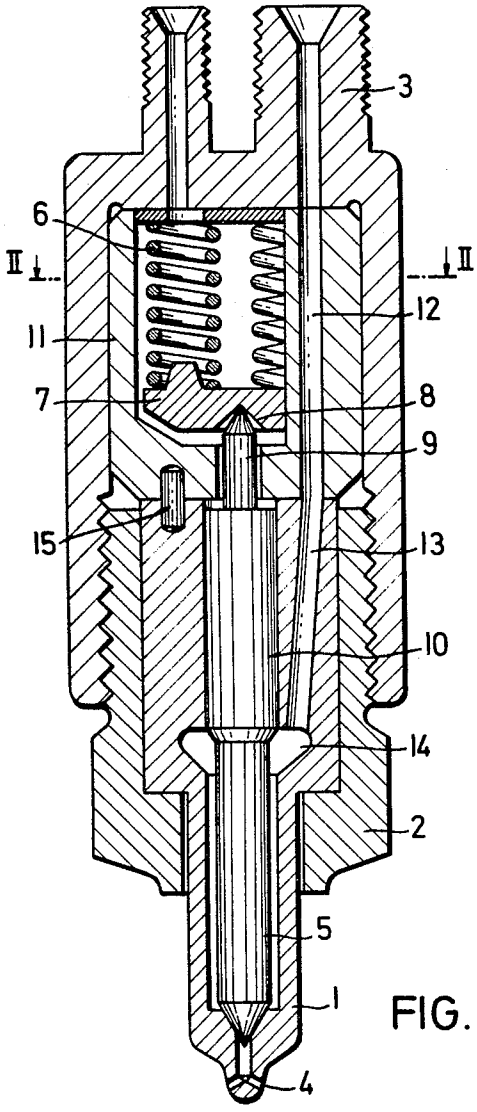


FIG. 1

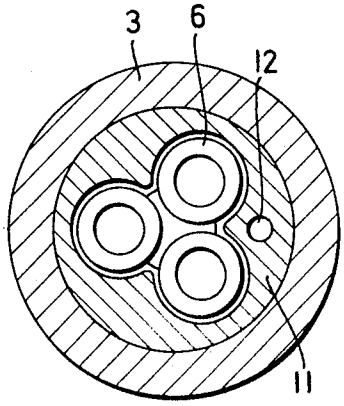


FIG. 2

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FUEL INJECTION NOZZLE FOR INTERNAL COMBUSTION ENGINES

The present invention relates to a fuel injection nozzle for fuel injection combustion engines with a spring-loaded nozzle needle. With fuel injection internal combustion engines, it is known to place the nozzle needle under the load of a spring. By given opening pressures, the pressure spring acting upon the nozzle needle will with heretofore known nozzles require a receiving chamber of relatively great diameter and length in the nozzle holder. A further increase in the diameter becomes necessary in view of the necessary thickness of the material around the fuel passages leading past the spring chamber to said nozzle.

It is also known to place the nozzle needle under the load of two coaxially arranged springs of which one becomes effective only after a portion of the complete opening stroke. Also, with this design, the same drawbacks occur with regard to the required space and the guiding of the fuel passages.

It is, therefore, an object of the present invention to provide a fuel injection nozzle which will require a minimum of space.

This object and other objects and advantages of the invention will appear more clearly from the following specification, in connection with the accompanying drawing, in which:

FIG. 1 illustrates a longitudinal section through an injection nozzle according to the invention.

FIG. 2 is a cross section through FIG. 1 taken along the line II—II of FIG. 1.

The injection nozzle according to the present invention is characterized primarily in that the springs are arranged adjacent to each other about the common center of the forces and convey the forces through one dish spring to the nozzle needle, the axis of which passes approximately through the center point of the forces.

In view of the arrangement of a plurality of small springs adjacent to each other while the spring forces are in an added-up manner conveyed through a spring dish to the nozzle needle, instead of a pressure spring, it will be appreciated that with the same diameter of the spring chamber and with the same spring strength, a considerably smaller height of construction is necessary. In order to avoid transverse forces which might occur in view of assembly tolerances, it is suggested according to a further development of the invention to journal the spring dish in a universal manner.

According to a still further development of the invention, it is suggested to adapt the spring dish and the inner contour of the housing surrounding the spring, to the outer contour of the spring, while providing a fuel passage within the range of the largest thickness of the wall of the housing. This fuel passage does not require an additional space.

Referring now to the drawing in detail, the arrangement shown therein comprises a nozzle body **1** which, by means of a screw cap or box nut **2**, is held in the injection nozzle housing **3**. The nozzle bores **4** of the nozzle body are closed by a nozzle needle **5**, which latter is under the load of a plurality of springs **6** which are arranged adjacent to each other about the common center of forces. The spring forces are through a spring dish **7** conveyed to the free end **9** of the nozzle needle **5**. The spring dish **7** which in the common center of forces of spring **6** includes a point bearing **8** is, in this way, journaled universally. The nozzle needle **5** is, by means of its cylindrical part **10**, axially guided in the nozzle body **1**.

The springs **6** are surrounded by housing **11**, the inner contour of which, is adapted to the outer contour of the springs **6** and within the region of the greatest wall thickness of the housing **11** has a fuel passage **12**. Passage **12** communicates through a passage **13** with an annular space **14** which surrounds the nozzle needle **5**. Instead of a fuel passage **12** and the passages **13**, it is also possible to provide a plurality of fuel passages which are evenly distributed over the circumference.

With the specific example shown in the drawing and comprising three parallel springs **6**, no difficulties would be encountered when providing two further fuel passages. The centering of the nozzle body **1** relative to the housing **11** surrounding the springs is effected by means of a centering pin **15**.

It is, of course, to be understood that the present invention is, by no means, limited to the particular showing in the drawing, but also comprises any modifications within the scope of the appended claims.

What I claim is:

1. An injection nozzle for fuel injection internal combustion engines which includes: nozzle-housing means having conduit means therein for connection to a fuel supply, nozzle body means connected to said nozzle-housing means and having passage means therethrough and also having an axial bore therethrough provided with nozzle opening means, nozzle needle means axially movable in said axial bore for controlling said nozzle opening means, said nozzle body having annular fuel-receiving chamber means surrounding said needle means and communicating with said nozzle-opening means, spring-housing means arranged within said nozzle-housing means and having conduit means therein establishing fuel fluid communication between said conduit means in said nozzle-housing means and said passage means in said nozzle body means, bearing means supported by said nozzle needle means and extending into said spring-housing means, spring dish means supported by said bearing means, and a plurality of spring means arranged within said spring-housing means and under preload having one end engaging said spring dish means, the resultant line of force of said plurality of spring means passing through said bearing means and being in substantially axial alignment with the axis of said needle means.

2. An injection nozzle according to claim 1, in which said spring dish means is self-adjustably and in a universal manner supported by said bearing means.

3. An injection nozzle according to claim 2, in which said bearing means includes a pointed pin having its point support said spring dish means.

4. An injection nozzle according to claim 1, in which said spring dish means and the inner contour of said spring housing means is in conformity with the outer contour of said plurality of spring means, and in which said conduit means of said spring housing means is arranged within the area of the greatest wall thickness of said spring housing means.

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