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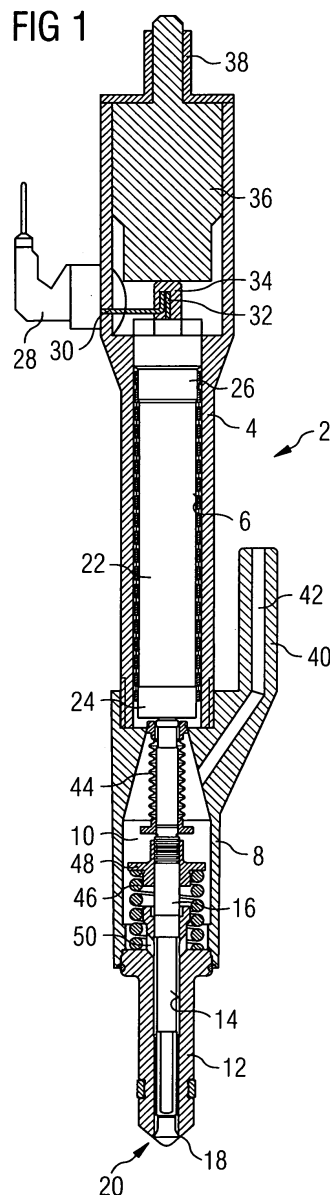
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(54) **Injector for dosing fluid**

(57) An injector (2) for dosing fluid comprises an injector body (4) having a recess (6) of the injector body (4) and a needle body having a recess of the needle body and an injection nozzle (18). A needle (16) is arranged in the recess of the needle body movable in axial direction. The needle (16) prevents a fluid flow through the injection nozzle (18) in a closed position of the needle (16). Otherwise, the needle (16) enables the fluid flow through the injection nozzle (18). An actor (22) is arranged in the recess of the injector body (4) and is coupled to the needle (16). A fluid inlet (40) for supplying the injector (2) with fluid is arranged at the needle body. The fluid inlet (40) has a fluid line (42) which leads to the recess of the needle body.

FIG 1



## Description

**[0001]** The invention relates to an injector for dosing fluid. The injector comprises an injector body having a recess of the injector body and a needle body. The needle body has a recess of the needle body and an injection nozzle. A needle is arranged in the recess of the needle body movable in axial direction. The needle prevents a fluid flow through the injection nozzle in a closed position of the needle and otherwise enables the fluid flow through the injection nozzle. An actor is arranged in the recess of the injector body and is coupled to the needle.

**[0002]** Modern injectors for dosing fluid have to enable the dosing of fluid in a very precise way. In particular, an injector for dosing fuel into a combustion chamber of an internal combustion engine has to enable a very precise dosing of the fuel, in order to achieve stringent emission laws. Further, for achieving the stringent emission laws, the fuel may be dosed with the injector with high pressure up to 500 bar. The need for the precise dosing of fluid and the need for guiding the fluid under the high pressure may lead to an expensive production of the injector.

**[0003]** It is an object of the present invention to create an injector for dosing fluid which enables a guidance of fluid to an injection nozzle of the injector in a very easy way.

**[0004]** The object of the invention is achieved by the subject matter of the independent claim 1. Advantageous embodiments of the invention are given in the subclaims.

**[0005]** The invention is distinguished by an injector for dosing fluid. The injector comprises an injector body and a needle body. The injector body has a recess of the injector body. The needle body has a recess of the needle body and an injection nozzle. A needle is arranged in the recess of the needle body movable in axial direction. The needle prevents a fluid flow through the injection nozzle in a closed position of the needle. Otherwise, the needle enables the fluid flow through the injection nozzle. An actor is arranged in the recess of the injector body and is coupled to the needle. A fluid inlet for supplying the injector with fluid is arranged at the needle body and has a fluid line which leads to the recess of the needle body.

**[0006]** The fluid inlet at the needle body enables to create the injector body in a very simple way. Further, the injector body may be formed very simple, because no fluid, in particular, no fluid under high pressure is guided through the injector body. Further, a proper coupling between the injector body and the needle body may be achieved in a very simple way because the coupling area has not to be sealed against the fluid. This enables to decrease the costs for producing the injector compared to an injector in which the fluid is guided through the whole injector.

**[0007]** In this context, it is very advantageous if the injector body is made of one single tube. The single tube only has to accommodate the actor of the injector and it may accommodate a compensation assembly for compensating a thermal expansion of the injector. This con-

tributes to a simple design of the injector, in particular, of the injector body. This contributes to a low-cost production of the injector and it may contribute to a precise and easy assembling of the injector. This may contribute to a precise dosing of fluid by the injector.

**[0008]** In a further advantageous embodiment of the injector, the injector body is fixed to the needle body by a press fit. This enables a proper coupling of the injector body to the valve body in a simple way.

**[0009]** In a further advantageous embodiment of the injector, the injector body is screwed onto the needle body. This contributes to a proper coupling of the injector body to the needle body in a very simple way.

**[0010]** The invention is explained in the following with the aid of schematic drawings.

**[0011]** These are as follows:

figure 1 a first embodiment of an injector,

figure 2 a second embodiment of the injector.

**[0012]** Elements with the same design or function that appear in the different illustrations are identified by the same reference characters.

**[0013]** An injector 2 (Figure 1) comprises an injector body 4 having a recess 6 of the injector body 4 and a needle body having a recess of the needle body. Preferably, the needle body comprises a valve body 8 having a recess 10 of the valve body and a nozzle body 12 having a recess 14 of the nozzle body 12. The valve body 8 is arranged between the injector body 4 and the nozzle body 12 in axial direction. The injector 2 may be used for dosing fluid. Preferably, the injector 2 may be used for dosing fuel into a combustion chamber of an internal combustion engine. In this embodiment the injector is of an outward opening type. In an alternative embodiment the injector 2 may be of an inward-opening type.

**[0014]** Preferably, the injector body 4 is made of a single tube. The single tube may comprise two or more different radii and it may comprise one or more steps. Preferably, the injector body 4 is coupled to the needle body and, in particular, to the valve body 8 by a press fit. Alternatively, the injector body 4 may be screwed onto the valve body 8.

**[0015]** A needle 16 is arranged in the recess 10 of the valve body 8 and protrudes to the recess 14 of the nozzle body 12. The needle 16 is arranged movable in axial direction. If the needle 16 is in its closed position, it prevents a fluid flow through an injection nozzle 18 at a tip 20 of the nozzle body 12. If the needle 16 is outside of its closed position, the needle 16 is moved away from the injector body 4 and a cylindrical gap is formed between the needle 16 and the nozzle body 12. This cylindrical gap forms the injection nozzle 18.

**[0016]** An actor 22 is arranged in the recess 6 of the injector body 4. Preferably, the actor 22 is a piezo-electric actuator. The actor 22 comprises a ground plate 24 and a top plate 26. The ground plate 24 is coupled to the

needle 16 for moving the needle 16.

**[0017]** An electrical connector 28 is arranged at the injector body 4 for electrically connecting the actor 22. A terminal 30 of the electrical connector 28 is electrically coupled to a pin 32 of the actor 22. Preferably, a second terminal of the electrical connector 28 is coupled to a second pin of the actor 22.

**[0018]** If the actor 22 gets energized via the electrical connector 28, the actor 22, in particular, the piezo-electric actuator, increases its length in a few microseconds. In this way, the actor 22 applies a force on the needle 16 against its closing direction. Preferably, the actor 22 gets energized by applying a voltage on the terminal 30. If the actor 22 gets deenergized, the actor 22 decreases its axial length.

**[0019]** Preferably, a compensation assembly 36 is arranged in the injector body 4 and is coupled to the actor 22 via a rod 34 of the actor 22. The compensation assembly 36 is prevented from moving away from the injector body 4 by a closing body 38. The compensation assembly 36 is arranged for compensating a different thermal expansion of the injector body 4 relative to the actor 22.

**[0020]** A fluid inlet 40 is arranged at the needle body and, in particular, at the valve body 8 or at the nozzle body 12. A fluid may flow through a fluid 42 of the fluid inlet 40, with the fluid line 42 leading to the recess 10 of the valve body 8 or, respectively, to the recess 14 of the nozzle body 12. Bellows 44 prevent the fluid from leaking into the recess 6 of the injector body 4.

**[0021]** A spring 46 is arranged between a spring washer 48 and the nozzle body 12. The spring washer 48 is rigidly coupled to the needle 16.

**[0022]** Whether the needle 16 is in its closed position or not depends on a force balance. A first force against the closing direction of the needle 16 may be applied on the needle 16 by the actor 22. A second force in closing direction is applied on the needle 16 by the spring 46. A third force on the needle 16 may be applied by the fluid in the recesses of the valve body 8 and/or the nozzle body 12. If the forces against the closing direction of the needle 16 are stronger than the forces of the needle 16 in closing direction, the needle 16 is moved away from its closed position and a fluid flow from the fluid inlet 40 through a fluid path 50 of the valve body 12 and through the injection nozzle 18 is enabled.

with the needle (16) preventing a fluid flow through the injection nozzle (18) in a closed position of the needle (16) and with the needle (16) otherwise enabling the fluid flow through the injection nozzle (18),

- an actor (22) which is arranged in the recess of the injector body (4) and which is coupled to the needle (16),

- a fluid inlet (40) for supplying the injector (2) with fluid being arranged at the needle body and having a fluid line (42) which leads to the recess of the needle body.

2. Injector (2) in accordance with claim 1 with the injector body (4) being made of one single tube.

3. Injector (2) in accordance with one of the preceding claims with the injector body (4) being fixed to the needle body by a press fit.

4. Injector (2) in accordance with one of the preceding claims with the injector body (4) being screwed onto the needle body.

5. Injector (2) in accordance with one of the preceding claims with

- the needle body comprising a valve body (8) having a recess (10) of the valve body (8) and comprising a nozzle body (12) having a recess (14) of the nozzle body (12) and an injection nozzle (18),

- the valve body (8) being arranged between the nozzle body (12) and the injector body (4) in axial direction,

- the fluid inlet (40) being arranged at the valve body (8) or the nozzle body (12).

## Claims

1. Injector (2) for dosing fluid comprising

- an injector body (4) having a recess (6) of the injector body (4),

- a needle body having a recess of the needle body and an injection nozzle (18),

- a needle (16) which is arranged in the recess of the needle body movable in axial direction,

FIG 1

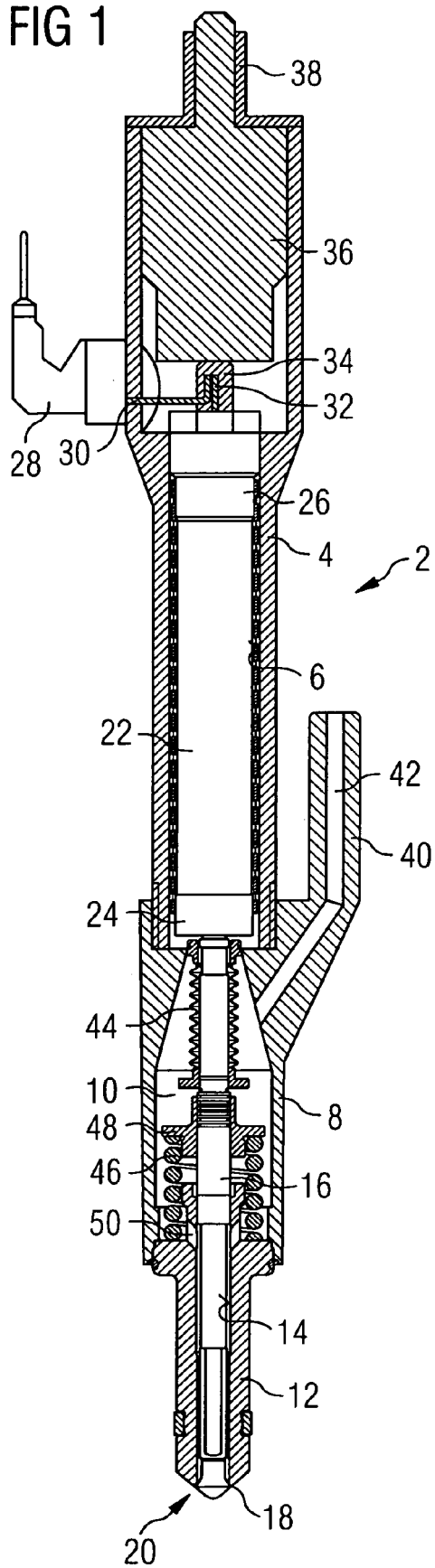
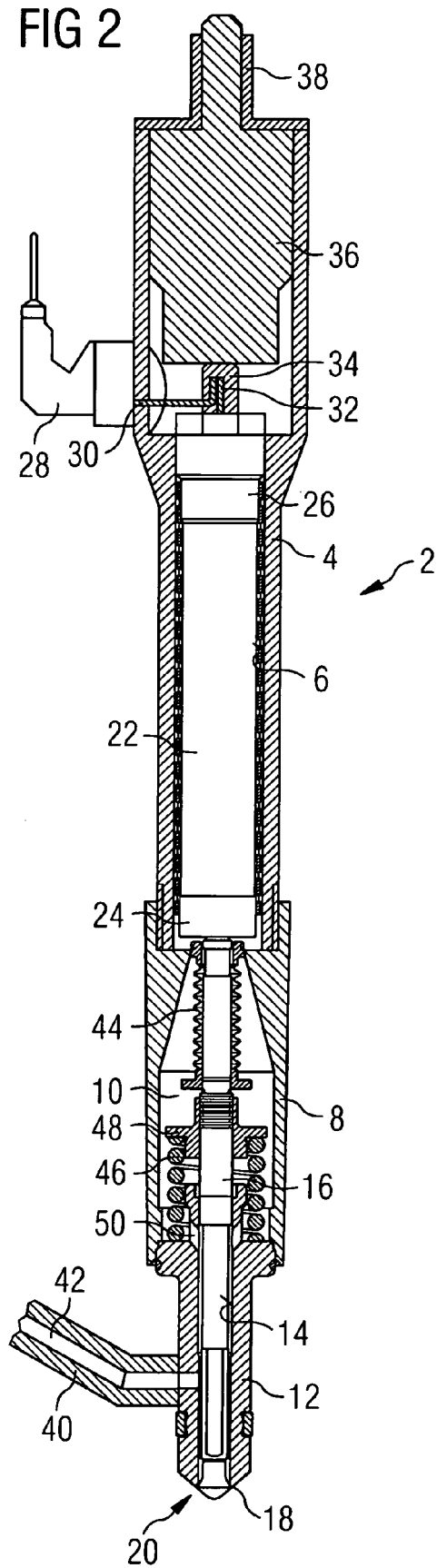


FIG 2





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Application Number  
EP 06 02 2852

| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                |                                  |                                         |
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| The Hague                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                | 9 March 2007                     | Hermens, Sjoerd                         |
| <p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone<br/> Y : particularly relevant if combined with another document of the same category<br/> A : technological background<br/> O : non-written disclosure<br/> P : intermediate document</p> <p>T : theory or principle underlying the invention<br/> E : earlier patent document, but published on, or after the filing date<br/> D : document cited in the application<br/> L : document cited for other reasons<br/> &amp; : member of the same patent family, corresponding document</p> |                                                                                                                |                                  |                                         |

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
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