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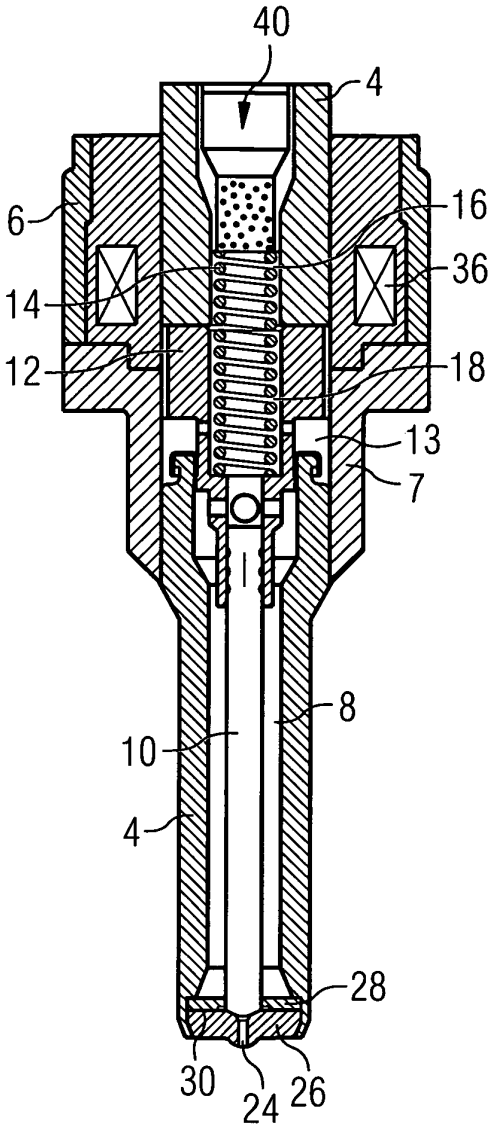
(54) Injector

(57) An Injector comprises an injector body, a needle (10), an actor (36,12), a spring (14), and a cup-shaped calibration pin (40). The injector body has a recess. The needle (10) is arranged in the recess of the injector body and prevents a fluid flow through an injection nozzle (24) of the injector body in a closed position of the needle (10) and otherwise enables the fluid flow through the injection nozzle (24). The actor (36,12) is coupled to the needle (10). The spring (14) is arranged in the recess of the injector body and is coupled to at least a part of the actor (36,12). The cup-shaped calibration pin (40) is made of one piece and comprises a tube-shaped portion (44) and a perforated bottom portion (42).

FIG 1



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Description

[0001] The invention relates to an injector. The injector comprises an injector body which has a recess and a needle which is arranged in the recess of the injector body. The needle prevents a fluid flow through an injection nozzle of the injector body in a closed position of the needle and otherwise the needle enables the fluid flow through the injection nozzle. The injector further comprises an actor which is coupled to the needle and a spring which is arranged in the recess of the injector body and which is coupled to at least a part of the actor.

[0002] EP 1 296 057 A1 discloses an integrated fuel filter and calibration tube for a fuel injector. The integrated fuel filter and calibration tube for the fuel injector is preferably made from a filtration element. The filtration element comprises filtration media insert molded into a thermoplastic frame member. Further, the integrated fuel filter and calibration tube is made from a metal calibration tube wretchedly attached to the filtration element. The calibration tube is sized so as to fit inside of a fuel injector flow channel.

[0003] The object of the invention is to create an injector which enables a precise dosing of fluid in an easy way.

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

[0005] The invention is distinguished by an injector. The injector comprises an injector body, a needle, an actor, a spring, and a cup-shaped calibration pin. The injector body has a recess. The needle is arranged in the recess of the injector body. The needle prevents a fluid flow through an injection nozzle of the injector body in a closed position of the needle and otherwise enables the fluid flow through the injection nozzle. The actor is coupled to the needle. The spring is arranged in the recess of the injector body and is coupled to at least a part of the actor. The cup-shaped calibration pin is made of one piece and comprises a tube-shaped portion and a perforated bottom portion. The cup-shaped calibration pin is coupled to the spring and is fixed into the recess of the injector body in such a way that the spring is preloaded by the cup-shaped calibration pin in a given way.

[0006] To use the cup-shaped calibration pin for preloading the spring in order to have a proper calibration of the injector and to use the cup-shaped calibration pin for filtering the fluid which flows through the injector contributes to a low cost production of the injector. In particular, the perforated bottom portion of the cup-shaped calibration pin enables to omit an internal filter which is arranged in the cup-shaped calibration pin. This enables to design the cup-shaped calibration pin more space saving, especially, this enables to design the cup-shaped calibration pin shorter respectively its axial length than it would be possible with the internal filter while having a comparable filtering of the fluid. The shorter axial length of the injector contributes to a more precise dosing of fluid by the injector. Further, the use of the cup-shaped calibration pin for filtering the fluid may enable to have a bigger filtering area than with the internal filter.

[0007] In an advantageous embodiment of the injector the cup-shaped calibration pin is, fixed into the recess of the injector body by a press-fit. This contributes to a proper calibration of the injector.

[0008] In a further advantageous embodiment of the injector the tube-shaped bottom portion comprises a first axial section which joins to the bottom portion. Further, the tube-shaped portion comprises a second axial section which has a larger diameter than the first axial section. The second axial section is coupled to a wall of the recess of the injector body. This enables to fix the cup-shaped calibration pin with its second axial section into the injector by a press-fit while using the first axial section as a filter.

[0009] In a further advantageous embodiment of the injector the tube-shaped portion of the cup-shaped calibration pin has a perforated area. This increases a filtering area and so this contributes to a proper fluid flow through the cup-shaped calibration pin while having the proper filtering of the fluid.

[0010] In a further advantageous embodiment of the invention the perforated area of the tube-shaped portion of the cup-shaped calibration pin extends over the whole first axial section. This contributes to a proper fluid flow through the cup-shaped calibration pin while having a proper filtering of the fluid in an easy way.

[0011] In a further advantageous embodiment of the invention perforations of the perforated bottom portion and/or, respectively, perforations of the perforated area of the tube-shaped portion of the cup-shaped calibration pin have a diameter in a dimension of some micrometers. This contributes in an easy way to a proper fluid flow through the perforations while having a proper filtering of the fluid.

[0012] In a further advantageous embodiment of the injector the perforated bottom portion and the perforated area of the cup-shaped calibration pin have an area of 60 to 120 mm^2. This contributes to a proper fluid flow through the cup-shaped calibration pin while having a proper filtering of the fluid in an easy way.

[0013] The invention is explained in the following with the aid of schematic drawings.

[0014] These are as follows:

Figure 1 an injector,

Figure 2 a cup-shaped calibration pin for the injector.

[0015] Elements with the same design and function that appear in the different illustrations are identified by the same reference characters.

[0016] An injector (figure 1) has an injector body with a recess of the injector body. The injector body comprises an inlet tube 4, a coil housing 5, an injector housing 6, a valve body 4, a valve body shell 7, and a needle body. The recess of the valve body comprises a recess 8 of

the valve body 4 which takes in a part of the needle body movable in axial direction. The injector is suitable for dosing a fluid. Preferably, the injector is suited for dosing fuel into a combustion chamber of an internal combustion engine.

[0017] The needle body may comprise a needle 10, a needle body recess and an armature 12. The needle body recess comprises a recess 18 of the armature 12. The armature 12 is fixed to the needle 10. The recess 8 of the valve body 4 takes in the needle 10 and preferably part of the armature 12. Alternatively the needle body may be made of one piece or the needle body may comprise further parts of the needle body.

[0018] A recess 16 of the inlet tube 2 is provided which further extends to the recess 18 of the armature 12. A spring 14 is arranged in the recess 16 of the inlet tube 2 and/or the recess 18 of the armature 12. The spring 14 is mechanically coupled to the needle 10.

[0019] In a closed position of the needle 10 it rests on a seat 26 and prevents in this way a fluid flow through at least one injection nozzle 24. The injection nozzle 24 may, for example, be an injection hole. The injection nozzle 24 may also be of some other type suitable for dosing fluid. The seat 26 may be made of one piece with the valve body 4 or may also be a separate part from the valve body 4. Additionally, a lower guide 28 for guiding the needle 10 may be provided. Additionally, a swirl disk 30 may be provided.

[0020] The injector is provided with a drive which is preferably an electromagnetic drive. The electromagnetic drive may comprise a coil 36, which is preferably extrusion-coated, and the armature 12. Preferably, the armature 12 comprises a larger diameter then the needle 10. The larger diameter enables a proper electromagnetic flow through the armature 12 which contributes to a proper controllability of the movement of the needle body.

[0021] If the coil 36 gets energized, an electromagnetic force acts on the needle body. The electromagnetic force acts against the mechanical force obtained from the spring 14. After a given time the coil 36 may be de-energized again. By appropriately energizing the coil 36, the needle body and, in particular, the needle 10 may be moved away from its closed position which results in a fluid flow through the injection nozzle 24.

[0022] A cup-shaped calibration pin 40 is arranged in the recess 16 of the inlet tube 4. At a first axial end of the cup-shaped calibration pin 40 facing towards the spring 14 the cup-shaped calibration pin 40 is coupled to the spring 14. The cup-shaped calibration pin 40 is arranged in such a way that the spring 14 is preloaded.

[0023] The cup-shaped calibration pin 40 comprises a perforated bottom portion 42 (figure 2) for having a cheap and space saving filter for filtering the fluid which enters the injector. The cup-shaped calibration pin 40 further comprises a tube-shaped portion 44. Preferably, the tube-shaped portion 44 comprises a first axial section 46 and a second axial section 48. Preferably, the second axial section 48 has an interference fit related to the recess 16 of the inlet tube 4. The interference fit easily enables to fix the cup-shaped calibration pin 40 into the recess 16 of the inlet tube 4. Preferably, the first axial section 46 has a smaller diameter than the second axial section 48. In combination with a perforated area at the first axial section 46 this enables a large filtering area. The perforated bottom portion 42 and the perforated area of the first axial section 46 have an area of preferably 60 to 120 mm^2. A free single perforation of the perforated bottom portion 42 and/or the perforated area of the first axial section 46 has a diameter in the dimension of some micrometers, for example 30 micrometers. The area of the perforated area and the perforated bottom portion 42 and the dimension of the perforations contribute to a proper fluid flow through the cup-shaped calibration pin 40 while having the proper filtering of the fluid.

[0024] Preferably, the cup-shaped calibration pin 40 is made of one piece. The perforations may be formed in the cup-shaped calibration pin 40 by laser drilling or by photo incision.

[0025] At the end of an assembling process for assembling the injector, the injector gets calibrated. For calibrating the injector the cup-shaped calibration pin is sticked into the recess 16 of the inlet tube 4 and the spring 14 gets preloaded by the cup-shaped calibration pin 40. While the cup-shaped calibration pin 40 is inserted into the recess 16 of the inlet tube 4 and while the preload on the spring 14 increases, the fluid is dosed by the injector. The dosed fluid is detected. While detecting the dosed fluid the cup-shaped calibration pin 40 is moved further into the recess 16 of the inlet tube 4 towards the spring 14 and so the preload on the spring 14 increases further. If the fluid is dosed by the injector in a given way, the movement of the cup-shaped calibration pin 40 towards the spring 14 is stopped and the cup-shaped calibration pin 40 is fixed in its position. So, the spring 14 is preloaded in a given way. This enables a precise dosing of fluid by the injector.

[0026] To use the cup-shaped calibration pin 40 for filtering fluid and for calibrating the injector enables to omit an internal filter. For example, such an internal filter is disclosed in the cited prior art. It is very space saving to omit the internal filter. Especially, the axial length of the cup-shaped calibration pin 40 can be designed shorter than it is possible, for example, in the cited prior art. The shorter cup-shaped calibration pin 40 enables to design the whole injector shorter, than it would be possible with the internal filter while having a comparable filtering of the fluid. The shorter the injector is the more stable is the injector. In particular, the shorter the injector is the bigger a force can be which acts in axial direction on the injector without destroying the injector or a part of the injector. Further, the longer the injector is the bigger is the effect of vibrations of the injector at a tip of the injector which comprises the injection nozzle 24. So, the shorter the injector is the more precise is the dosing of fluid by the injector.

Claims

1. Injector comprising

   - an injector body which has a recess,
   - a needle (10) which is arranged in the recess of the injector body and which prevents a fluid flow through an injection nozzle (24) of the injector body in a closed position of the needle (10) and which otherwise enables the fluid flow through the injection nozzle (24),
   - an actor (36, 12) which is coupled to the needle (10),
   - a spring (14) which is arranged in the recess of the injector body and which is coupled to at least a part of the actor (36, 12),
   - a cup-shaped calibration pin (40) which is made of one piece, which comprises a tube-shaped portion (44), which comprises a perforated bottom portion (42), which is coupled to the spring (14) and which is fixed into the recess of the injector body in such a way that the spring (14) is preloaded by the cup-shaped calibration pin in a given way.

2. Injector in accordance with claim 1 with the cup-shaped calibration pin (40) being fixed into the recess of the injector body by a press fit.

3. Injector in accordance with one of the preceding claims with the tube-shaped portion (44) comprising a first axial section (46) which adjoins to the bottom portion (42) and with the tube-shaped portion (44) comprising a second axial section (48) which has a larger diameter than the first axial section (48) and which is coupled to a wall of the recess of the injector body.

4. Injector in accordance with one of the preceding claims with the tube-shaped portion (44) of the cup-shaped calibration pin (40) having an perforated area.

5. Injector in accordance with claim 4 with the perforated area of the tube-shaped portion (44) of the cup-shaped calibration pin (40) extending over the whole first axial section (46).

6. Injector in accordance with one of the preceding claims or in accordance with claim 4 or 5 with perforations of the perforated bottom portion (42) and/or, respectively, the perforated area of the tube-shaped portion (44) of the cup-shaped calibration pin (40) having a diameter in a dimension of some micrometers.

7. Injector in accordance with one of the preceding claims with the perforated bottom portion (42) and the perforated area of the cup-shaped calibration pin (40) having an area of 60 to 120 mm^2.

FIG 1

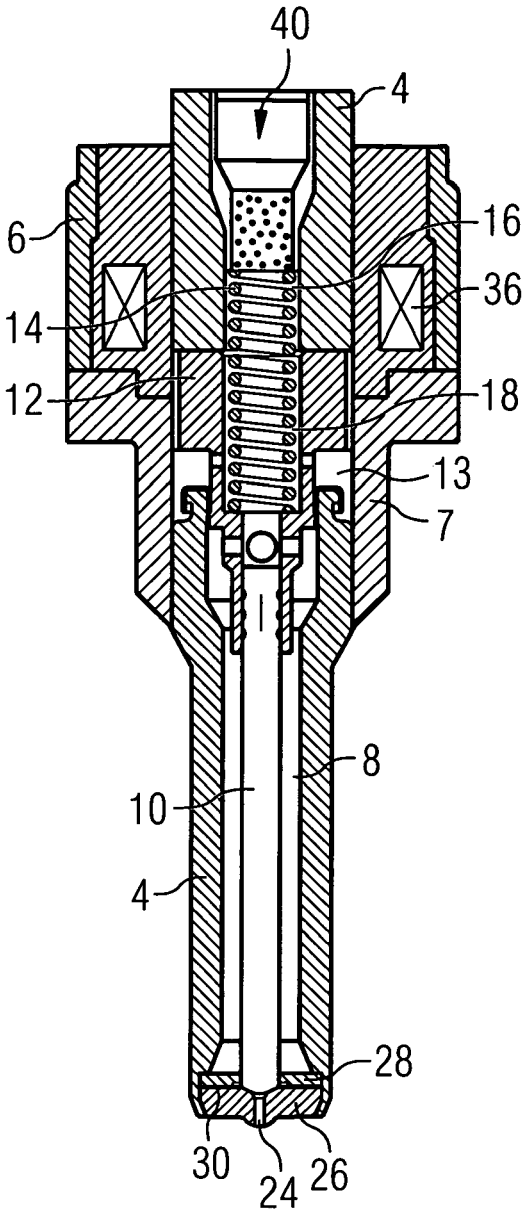
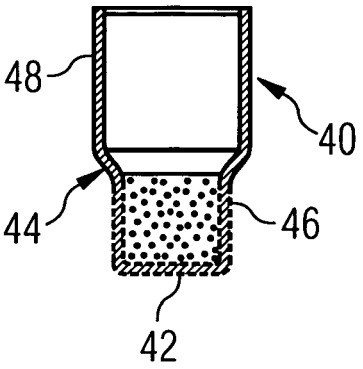


FIG 2



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EUROPEAN SEARCH REPORT

Application Number
EP 06 00 0410

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	US 5 340 032 A (STEGMAIER ET AL) 23 August 1994 (1994-08-23) * the whole document *	1	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	7 June 2006	Nobre, S

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EPO FORM 1503 03.82 (P04C01)

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REFERENCES CITED IN THE DESCRIPTION

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