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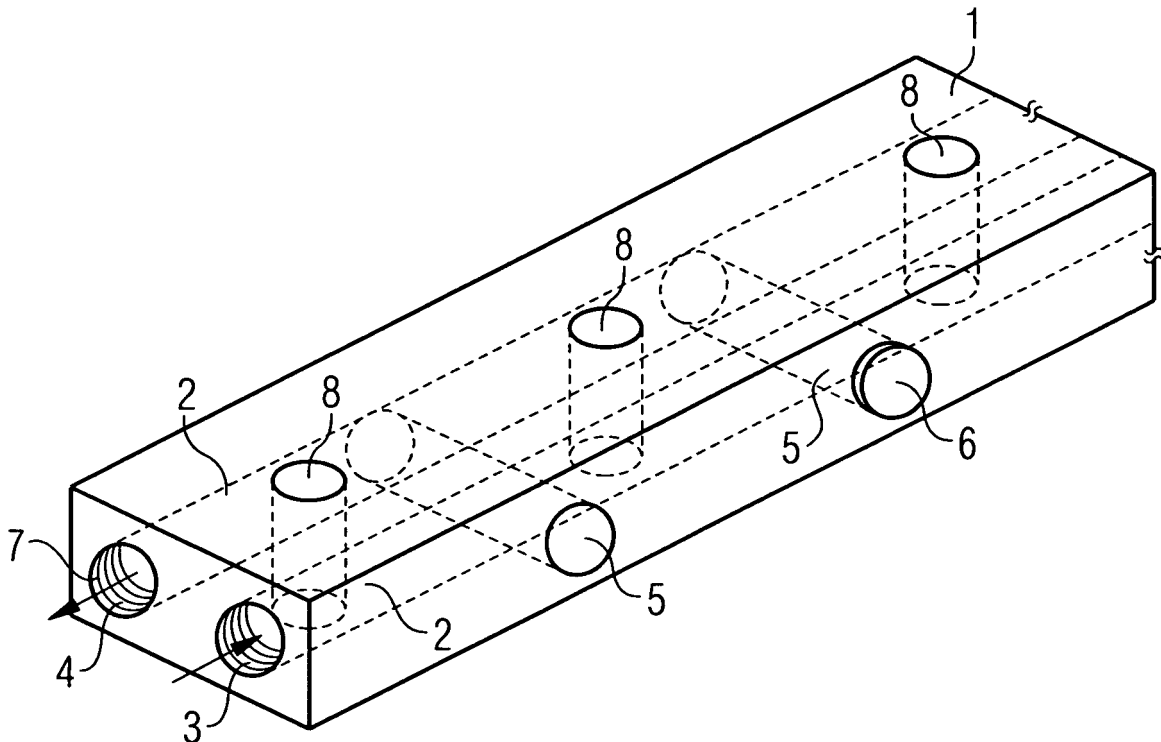
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(54) **High-pressure fuel storage unit**

(57) The invention relates to a high-pressure fuel storage unit for a fuel injection system of an internal combustion engine and with a lengthwise base unit (1) in which at least one continuous hollow space (2) embodied in the longitudinal direction of the base unit (1) is made. The high-pressure fuel storage unit has at least one fuel inlet (3) and at least one fuel outlet (4). The lengthwise

base unit is embodied as a rectangular profile and is made by means of an extrusion process with the hollow space in the lengthwise base unit (1) being embodied at the same time. Such a high-pressure fuel storage unit can be manufactured particularly easily and cost-effectively and can be easily adapted to the different requirements, particularly with respect to the storage volume.



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Description

[0001] The invention relates to a high-pressure fuel storage unit for a fuel injection system with an internal combustion engine and with a lengthwise base unit into which at least one continuous hollow space is embodied in the longitudinal direction of the base unit, with at least one fuel inlet and at least one fuel outlet.

[0002] From DE 102 56 703 B3 a high-pressure storage fuel unit with a tubular base unit and with at least one connection for the fuel supply, at least one connection for the drawing off of fuel and at least one fastening element is known. The tubular base unit is embodied with the connections and the fastening element in one piece. The hollow profile of the tubular base unit is made by means of profile extrusion. A disadvantage of such a structure is the fact that the manufacturing cost of the matrix that is needed for the extrusion is very high. In addition, the position of the terminal strip and the fastening strip has already been determined by the extrusion process and cannot be changed afterwards. This results in a rigid embodiment of the high-pressure fuel storage unit. The position for later attachment of the fuel storage unit connections must be planned in right at the start when the matrices are produced. Therefore, an adaptation to different engine variants is only possible with great effort and at increased costs.

[0003] Taking the state of the art as its starting point, it is the object of the invention to embody a high-pressure fuel storage unit which can be manufactured easily and in the case of which the connections as well as the fasteners can be adapted in a simple way and a very flexible manner to the different engine variants.

[0004] The object of the invention is achieved by the independent patent claim 1.

[0005] Advantageous embodiments of the invention which can be used individually or in combination with one another are characterized in the subclaims.

[0006] According to the invention, the high-pressure fuel storage unit for a fuel injection system of an internal combustion engine and with a lengthwise base unit into which at least one continuous hollow space is embodied in the longitudinal direction of the base unit, with at least one fuel inlet and at least one fuel outlet, is in itself characterized by the fact that the lengthwise base unit is embodied as a rectangular profile and is made by means of an extrusion process whereby the hollow space in the lengthwise base unit is embodied at the same time. The profile extrusion process offers the advantage that the length of the high-pressure fuel storage unit and as a result also the storage volume can be adapted in a simple way individually to the engine conditions. The hollow profile then leaves the profile extruder in the form of a long profile blank. Subsequently, a section can be cut off from the profile blank which already has the desired length of the subsequent high-pressure fuel storage unit. Because a hollow profile is already embodied at the same time as the extrusion process, the usually essential, expensive

and complicated deep-hole boring process is dispensed with in a particularly advantageous manner. Because of the rectangular profile of the lengthwise base unit, the connections can be made anywhere and at random on each one of the flat sides in the high-pressure fuel storage unit. The connecting holes, in this case, on the basis of the flat surfaces can be made much easier than those for a tubular high-pressure fuel unit. Because in the case of the rectangular profile, unlike the pipe there are only flat contact surfaces, an off-center bore must be excluded to a large extent.

[0007] A particularly advantageous development of the invention with at least two hollow spaces embodied in the longitudinal direction of the base unit takes care of the fact that the hollow spaces are at least interconnected hydraulically by at least one connecting opening. The smaller hollow spaces arranged side by side in the base unit are able to maintain a higher pressure load in the case of an altogether constant hollow space volume than an individual hollow space with a larger diameter. Therefore, the connection between the individual hollow spaces takes care of the fact that the pressure in all the hollow spaces is the same and that pressure differences which would influence the injection behaviour cannot occur in any way. Depending on the engine variant and the required hollow space volume, it is possible that individual hollow spaces are not used. In this case, no connecting opening between the vacant hollow space and the remaining hollow space is embodied. Because of this, the high-pressure volume can be adapted to the individual engine variants in a simple way.

[0008] A further advantageous embodiment of the invention provides for the longitudinal axes of the individual connecting openings to run at right angles to the longitudinal axes of the hollow spaces. The rectangular cross-section profile of the high-pressure fuel storage unit means that the perpendicular or right-angled arrangement of the connecting openings is very easy to produce.

[0009] A further advantageous embodiment of the invention provides for the connecting opening to be embodied as a through-hole. Such a through-hole can be made particularly easily in the base unit.

[0010] It is particular preferred for the connecting openings and/or the hollow spaces to be sealed by plugs. By means of the sealing plugs, all the openings in the high-pressure fuel storage unit which are not used for other purposes, for example, to connect fuel inlet lines or fuel outlet lines can be sealed off in a simple and cost-effective way.

[0011] In a particularly advantageous embodiment of the invention, fastening means are embodied in the base unit via which additional components or sealing plugs can be connected to the hollow space. As the fastening means, an internal thread which is embodied in the hollow space is particularly suitable and mates with a corresponding external thread which is embodied on the additional component or the sealing plug. This allows the sealing plug or the additional components such as safety

valves, pressure sensors or connecting lines can be easily screwed into the base unit. The screw-in process makes possible a secure and leaktight connection of the components with the base unit. The internal threads can be made in the base unit in a simple way. In order to ensure a particularly secure seal, additional sealing elements such as sealing discs can be used.

[0012] Preferred according to the invention, at least one connection for fastening the high-pressure fuel storage unit to another component of the internal combustion engine is embodied in the base unit. This allows the high-pressure storage unit, for example, to be fastened to the engine block in a simple manner. The fastener can be embodied particularly advantageously in the form of a through-hole. In this case, neither additional fastening elements nor fixing strips need to be provided on the high-pressure storage unit. This produces a particularly simple structure of the high-pressure fuel storage unit.

[0013] The rectangular high-pressure fuel storage unit embodied by an extrusion process is, on the one hand, particularly easy to manufacture, and makes possible because of its flat contact surfaces, on the other hand, a particularly easy embodiment of the connections. In addition, the high-pressure fuel storage unit can be adapted very easily in the different engine variants and is very cost-effective to manufacture.

[0014] Embodiments of the invention are explained below on the basis of the accompanying drawing. The figure is a three-dimensional view of the high-pressure fuel storage unit. The high-pressure fuel storage unit, in essence, consists of a lengthwise base unit 1 which is embodied as a rectangular profile. Two continuous hollow spaces 2 are embodied in the lengthwise base unit 1. The hollow spaces 2 are interconnected hydraulically by means of two connecting openings 5. This means that the pressure between the two hollow spaces 2 is always equalized, resulting in the fact that there can be no pressure differences between the individual hollow spaces 2 which could influence the injection behaviour of the injectors. The connecting openings 5 are embodied as through-holes. The longitudinal axis of the connecting openings 5, in essence, runs at right angles to the longitudinal axes of the two hollow spaces 2. There are particular manufacturing reasons for this because the connecting openings 5 in this way can be made perpendicular to one of the flat side surfaces in the lengthwise base unit 2. The sealing plugs 6 seal off the connecting openings 5 (only one of the two sealing plugs is shown on the drawing). The hollow space 2 embodied as a through-hole has already also been embodied during the extrusion process of the lengthwise base unit. Therefore, the drilling of the hollow spaces required in the case of the conventional high-pressure fuel storage units is not needed. The extrusion process results in a high surface quality so that a post-processing of the hollow spaces 2 is not necessary.

Fastening means 7 are embodied in base unit 1 via which individual components such as sealing plugs 6, pressure

sensors, pressure valves or connecting lines can be attached for the inlet or the outlet. As fastening means 7, internal threads which are embodied in the specific end vicinity of the hollow spaces and mate with the corresponding external threads on the individual components are particularly suitable.

[0015] In order to fasten the high-pressure fuel storage unit to another component of the internal combustion engine, for example the engine block, the base unit 1 has connections 8, preferably simple through-holes. The through-holes serve to accommodate the fastening screws by means of which the high-pressure fuel storage unit can be fastened. The through-holes make possible a particularly simple fastening of the high-pressure fuel storage unit. Therefore, the conventional terminal lugs which are complicated to manufacture can be dispensed with completely. This greatly reduces the manufacturing costs of the high-pressure fuel storage unit.

[0016] Therefore, the high-pressure fuel storage unit is, in particular, distinguished by means of its simple embodiment. The lengthwise base unit embodied as a rectangular profile is manufactured together with the hollow spaces in an extrusion process. Subsequently, connecting openings which are possible between several hollow spaces as well as the fasteners for fastening the high-pressure fuel storage unit to the internal combustion engine must still be embodied. Therefore, such a high-pressure fuel storage unit can be manufactured particularly easily and very cost-effectively.

[0017] The high-pressure fuel storage unit illustrated naturally shows only one possible embodiment. The high-pressure fuel storage unit can also self-evidently be embodied with only one hollow space. Naturally, the connecting openings can be dispensed with in this case resulting in an even simpler structure of the high-pressure fuel storage unit. In addition, embodiments with more than two hollow spaces are, however, also feasible. This allows the volume to be adapted as required to the corresponding engine variant in a simple manner.

Claims

1. High-pressure fuel storage unit for a fuel injection system of an internal combustion engine and with a lengthwise base unit (1) in which at least one continuous hollow space (2) embodied in the longitudinal direction of the base unit (1) is made, with at least one fuel inlet (3) and at least one fuel outlet (4),
characterized in that
the lengthwise base unit (1) is embodied as a rectangular profile and is made by means of an extrusion process, with the hollow space (2) being embodied in the lengthwise base unit (1) at the same time.
2. High-pressure fuel storage unit according to Claim 1, with at least two hollow spaces (2) embodied in the longitudinal direction of the base unit (1),

characterized in that

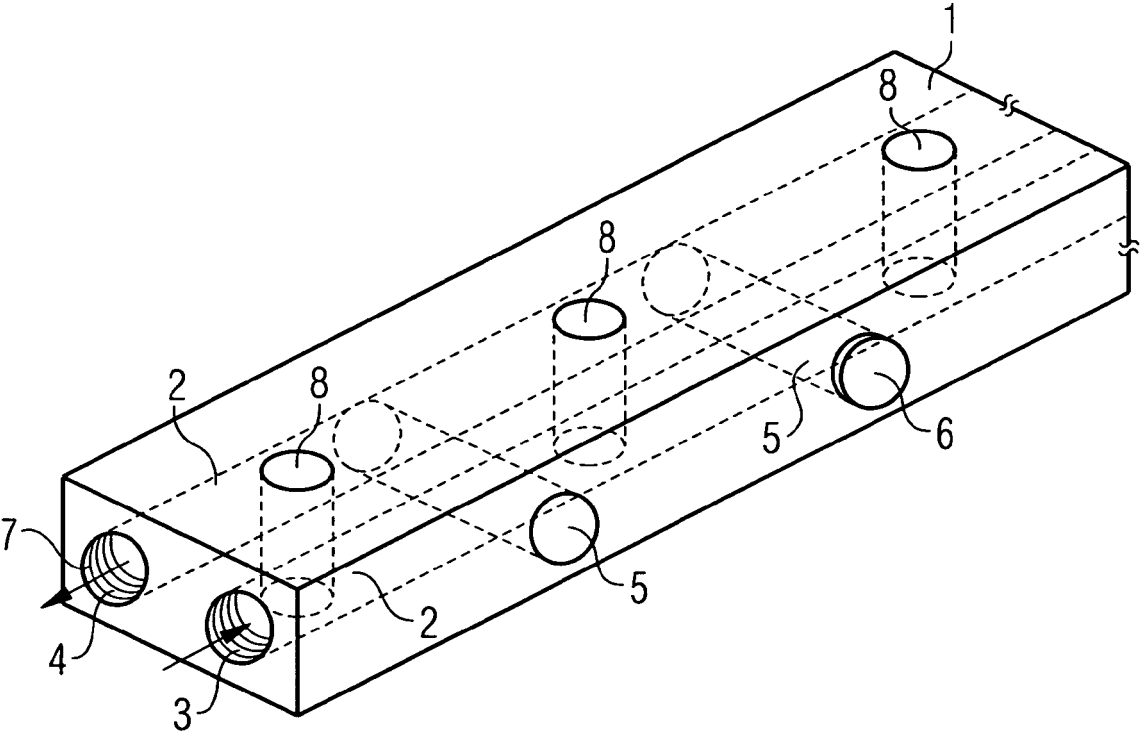
the hollow spaces (2) are at least interconnected hydraulically by at least one connecting opening (5).

3. High-pressure fuel storage unit according to Claim 2, 5
characterized in that
the longitudinal axis of the connecting opening (5) runs at right angles to the longitudinal axes of the hollow spaces (2). 10
4. High-pressure fuel storage unit according to Claim 2 or 3,
characterized in that
the connecting opening (5) is embodied as a through-hole. 15
5. High-pressure fuel storage unit according to one of the preceding claims,
characterized in that
the sealing plugs (6) seal off the connecting opening (5) and/or the hollow spaces (2). 20
6. High-pressure fuel storage unit according to one of the preceding claims,
characterized in that 25
fastening means (7) are embodied in the base unit (1) via which the additional components or the sealing plugs (6) can be connected to the hollow space (2). 30
7. High-pressure fuel storage unit according to one of the preceding claims,
characterized in that
at least one connection (8) for fastening the high-pressure fuel storage unit to another component of the internal combustion engine is embodied in the base unit (1). 35
8. High-pressure fuel storage unit according to claim 7,
characterized in that 40
the connection (8) is embodied as a through-hole.

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EUROPEAN SEARCH REPORT

Application Number
EP 05 00 4693

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 10 May 2005	Examiner Torle, E
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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 05 00 4693

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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