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(54) **Pressure regulator for regulating the pressure inside the fuel supply manifold of an internal combustion engine fuel supply device.**

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EP-A- 0 233 697
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Description

The present invention relates to a pressure regulator for regulating the fuel pressure inside a supply manifold forming part of an internal combustion engine fule supply device, of the type indicated in the preamble of claim 1. Known regulators of the aforementioned type (see e.g. EP-A- 0 233 697) substantially comprise a cup-shaped body having a side and bottom wall, and defining a fuel chamber communicating with a fuel inlet and outlet hole. The outlet hole is controlled by a plunger connected to a deformable diaphragm forming a wall of the fuel chamber and which is subjected to the action of a spring designed to normally maintain the plunger against a corresponding seat and so close the outlet hole. The fuel inlet hole is usually formed inside or communicates with a fitting secured to the side wall of the body, or inside the bottom wall of the body. The outlet hole is usually formed inside or communicates with a fitting projecting from the bottom wall or the lateral surface of the body and usually forming part of a coupling in which a seat is also formed for the plunger.

Known pressure regulators of the type briefly described above present numerous drawbacks.

First of all, for connecting the regulator to the fuel supply circuit of the supply device, certain parts of the device must be specially designed, or provision made for appropriate pipe sections and fittings. If, in fact, the fuel inlet hole on the pressure regulator is formed inside or communicates with a fitting projecting from the side wall of the regulator body, provision must be made for a duct to connect the fitting in fluid tight manner to a corresponding fitting on the fuel manifold. If, on the other hand, the fuel inlet hole is formed in the bottom wall of the regulator body, and the outlet hole is formed inside or communicates with a fitting projecting from the same wall, the fuel manifold must be designed so as to present two separate internal ducts, one for supply and the other for drainage. Moreover, regulators of the aforementioned type fail to provide for accurate pressure regulation, mainly on account of the flow resistance encountered by the fuel through the various holes and ducts formed inside the regulator.

What is more, in some cases, the regulator presents a fairly complex structure.

The aim of the present invention is to provide a pressure regulator of the aforementioned type, designed to overcome the above drawbacks typically associated with known regulators.

With this aim in view, according to the present invention, there is provided a pressure regulator for regulating the fuel pressure inside a fuel supply manifold forming part of an internal combustion engine fuel supply device, as defined in claim 1.

One embodiment of the pressure regulator according to the present invention will be described by way of example with reference to the accompanying drawings, in which:

Fig.1 shows a longitudinal section of the regulator according to the present invention, connected to the fuel manifold forming part of the supply device;

Fig.2 shows a partially-sectioned side view of the Fig.1 regulator mounted on a different type of fuel manifold.

The pressure regulator according to the present invention substantially comprises a cup-shaped body 1 having a side wall 2 and a bottom wall 3 defining a fuel chamber 4 communicating with a fuel inlet hole 5 and a fuel outlet hole 6. Said outlet hole 6 is controlled by a plunger 7 connected to a deformable diaphragm 8 forming one wall of chamber 4 and subjected to the action of a spring 9 designed to normallu maintain plunger 7 against a corresponding seat 10 and so close outlet hole 6.

Inlet hole 5 communicates with an inlet fitting 12 projecting from bottom wall 3 and connectable in fluidtight manner inside a seat 13 on a manifold 14 forming part of the supply device. Outlet hole 6 communicates with an outlet fitting 15 projecting from the lateral surface 16 of body 1 and having its axis substantially perpendicular to the longitudinal axis of body 1.

Outlet hole 6 comprises a first hole portion 6a having its axis parallel to said longitudinal axis, and a second portion 6b perpendicular to said first portion 6a and formed inside outlet fitting 15.

Said first portion 6a houses a coupling 17, one end of which presents seat 10 for plunger 7.

Inlet hole 5 comprises at least a first portion 5a formed inside inlet fitting 12, and a second portion 5b formed inside bottom wall 3.

Inlet fitting 12 presents an annular groove 18 housing a seal 19 for sealing seat 13 on manifold 14, as shown clearly in Fig.1.

Body 1 is formed, e.g. die-cast, in one piece with inlet and outlet fittings 12 and 15, or may be formed from a drawn sheet metal element, in which case, fitting 15 may be welded in a radial hole on the body, and coupling 17 secured to the inside end.

The pressure regulator according to the present invention also comprises a cover 22, the edge of which is turned about a corresponding edge 21 of body 1, as shown clearly in Fig.1. In addition to locking the edge of deformable diaphragm 8, cover 22 also acts a support for one end of spring 9, the other end of which conveniently rests, in known manner, on a ring 23 connected to a disc 24 in turn resting on plunger 7.

The pressure regulator described above is designed to maintain the fuel pressure inside manifold 14 substantially constant: the fuel in manifold 14 communicates with chamber 4 on the regulator via hole 5; when the pressure inside chamber 4 exceeds a predetermined value, the force exerted on deform-

able diaphragm 8 overcomes the elastic reaction of spring 9, thus detaching plunger 7 from seat 10, enabling communication between chamber 4 and outlet hole 6, and draining off sufficient fuel for restoring the pressure inside chamber 4 to the required value.

The pressure regulator described above may be fitted to a highly straightforward manifold 14 substantially comprising a single central duct with a substantially cup-shaped end housing 25. To fit the regulator inside housing 25, provision need simply be made for a slot 26 in the side wall of the housing, as shown clearly in Fig. 1.

In the case of a manifold 14 designed as shown in Fig.2 and featuring a regulator housing 27 arranged radially in relation to the longitudinal axis of the manifold (as opposed to axially as in Fig.1), the regulator is connectable to the manifold in exactly the same way as already described.

The regulator according to the present invention provides for accurately regulating the pressure inside manifold 14 by virtue of the rapid response afforded by the pressure inside the manifold being transmitted with practically no load loss to chamber 4 on the regulator. This is due to the design, arrangement and size of fuel inlet holes 5, which, in addition to being arranged substantially axially, may present a large diameter occupying substantially the entire section of inlet fitting 12 and most of the section of bottom wall 3 of body 1.

The design of the regulator is extremely straightforward, by virtue of consisting of a small number of easy-to-make components. Body 1, in particular, may be formed in one piece using any appropriate technique enabling low-cost production.

Claims

1. A pressure regulator for regulating the fuel pressure inside a fuel supply manifold (14) forming part of an internal combustion engine fuel supply device, said device comprising a cup-shaped body (1) consisting substantially of a side wall (2) and a bottom wall (3) and defining a fuel chamber (4) communicating with a fuel inlet hole (5) and with a fuel outlet hole (6) controlled by a plunger (7) connected to a deformable diaphragm (8) forming a wall of said chamber (4) and subjected to the action of a spring (9) designed to normally maintain said plunger (7) against a corresponding seat (10) and so close said outlet hole (6); said fuel inlet hole (5) communicating with an inlet fitting (12) projecting from said bottom wall (3) of said body (1) and connectable in fluidtight manner inside a seat (13) on said manifold (14), said fuel outlet hole (6) communicating with an outlet fitting (15) projecting from the lateral surface (16) of said body (1),

characterized in that said inlet fitting (12) is formed by a sleeve element integral with said cup-shaped body (1) and projecting beyond said bottom wall (3) thereof and said outlet fitting (15) is formed by an integral projection of said wide wall (2) extending outwardly form said lateral surface (16) and having its axis perpendicular to the longitudinal axis of said body (1), and in that said side wall (2) defines an annular collar (21) projecting radially outwardly from its edge and being engaged by a turned edge of a cover (22) locking the outer edge of said diaphragm (8) between its turned edge and said collar (21).

2. A pressure regulator according to claim 1, characterized by a coupling (17) defining said seat (10) for said plunger (7) being fitted in a first longitudinal portion (6a) of said outlet hole (6).

3. A pressure regulator according to claim 1 or 2, characterized in that said sleeve element (12) presents an annular groove (18) accommodating a seal (19) to seal said seat (13) on said manifold (14).

Patentansprüche

1. Ein Druckregler zum Regeln des Treibstoffdrucks im Inneren eines Treibstoffzufuhrverteiler (14), der einen Teil einer Kraftstoffzufuhrvorrichtung einer Verbrennungskraftmaschine bildet, wobei diese Vorrichtung einen becherförmigen Körper (1) enthält, der im wesentlichen aus einer Seitenwand (2) und einer Bodenwand (3) besteht, die eine Treibstoffkammer (4) definieren, die in Verbindung steht mit einem Treibstoffeinraßloch (5) und einem Treibstoffauslaßloch (6), welches von einem Kolben (7) gesteuert wird, der mit einer deformierbaren Membran (8) verbunden ist, die eine Wand der Kammer (4) bildet und der Kraft einer Feder (9) unterworfen ist, die so ausgelegt ist, daß sie normalerweise den Kolben (7) gegen den zugehörigen Sitz (10) drückt und so das Auslaßloch (6) schließt; wobei das Treibstoffeinlaßloch (5) in Verbindung mit einem Einlaßanschluß (12) steht, der von der Bodenwand (3) des Körpers (1) hervorsteht und in flüssigkeitsdichter Weise in einem Sitz (13) des Verteilers (14) anschließbar ist, und das Treibstoffauslaßloch (6) mit einem Auslaßanschluß (15) in Verbindung steht, welcher von der Seitenfläche (16) des Körpers (1) hervorsteht,
dadurch gekennzeichnet, daß der Einlaßanschluß (12) durch ein einstückig mit dem becherförmigen Körper (1) ausgebildetes Muffenelement gebildet ist und über die Bodenwand (3) hervorsteht, und der Auslaßanschluß (15) durch

einen angeformten Vorsprung dieser Seitenwand (2) gebildet wird, der sich von der Seitenfläche (16) nach außen erstreckt und dessen Achse senkrecht auf der Längsachse des Körpers (1) steht, und daß die Seitenwand (2) einen ringförmigen Bund (21) bildet, der radial von ihrem Rand nach außen hervorsteht und von einem umgebogenen Rand eines Deckels (22) umfaßt wird, so daß der Außenrand der Membran (8) zwischen dem umgebogenen Rand und dem Bund (21) befestigt ist.

2. Druckregler nach Anspruch 1, gekennzeichnet durch eine Kupplung (17), die den Sitz (10) für den Kolben (7) bildet und in einen ersten Längsabschnitt (6a) des Auslaßlochs (6) eingepaßt ist.

3. Druckregler nach einem der Ansprüche 1 oder 2, dadurch gekennzeichnet, daß das Muffenelement (12) eine ringförmige Nut (18) aufweist, die eine Dichtung (19) aufnimmt, um den Sitz (13) am Verteiler (14) abzudichten.

Revendications

1. Régulateur de pression pour régler la pression de carburant à l'intérieur d'un collecteur d'alimentation en carburant (14) faisant partie d'un dispositif d'alimentation en carburant de moteur à combustion interne, ledit dispositif comprenant un corps en forme de coupelle (1) consistant essentiellement en une paroi latérale (2) et une paroi inférieure (3) et définissant une chambre à carburant (4) communiquant avec un trou d'admission de carburant (5) et avec un trou d'évacuation de carburant (6), commandé par un piston (7) relié à un diaphragme déformable (8) constituant une paroi de ladite chambre (4) et soumis à l'action d'un ressort (9) conçu pour maintenir normalement ledit piston (7) contre un siège (10) correspondant et ainsi fermer ledit trou à d'évacuation (6), ledit trou d'admission de carburant (5) communiquant avec un raccord d'admission (12) faisant saillie de ladite paroi inférieure (3) dudit corps (1) et susceptible d'être relié, de manière étanche aux fluides, à l'intérieur d'un siège (10) situé sur ledit collecteur (14), ledit trou d'évacuation de carburant (6) communiquant avec un raccord d'évacuation (15) faisant saillie de la surface latérale (16) dudit corps (1),
caractérisé en ce que ledit raccord d'admission (12) est constitué d'un élément de douille réalisé d'un seul tenant avec ledit corps en forme de coupelle (1) et faisant saillie au-delà de sa dite paroi inférieure (3) et ledit raccord d'évacuation (15) est constitué d'une saillie monobloc de ladite paroi latérale (2), s'étendant vers l'extérieur de ladite surface latérale (16) et dont l'axe est perpendiculaire à l'axe longitudinal dudit corps (1) et en ce que ladite paroi latérale (2) définit un collier annulaire (21) faisant saillie radialement vers l'extérieur depuis son bord et étant en contact avec un bord retourné d'un couvercle (22) bloquant le bord extérieur dudit diaphragme (8) situé entre son bord retourné et ledit collier (21).

2. Régulateur de pression selon la revendication 1, caractérisé par un couplage (17) définissant ledit siège (10) pour ledit piston (7) installé dans une première partie longitudinale (6a) dudit trou d'évacuation (6).

3. Régulateur de pression selon la revendication 1 ou 2, caractérisé en ce que ledit élément de douille (12) présente une gorge annulaire (18) logeant un joint d'étanchéité (19) pour isoler hermétiquement ledit siège (13) situé sur ledit collecteur (14).

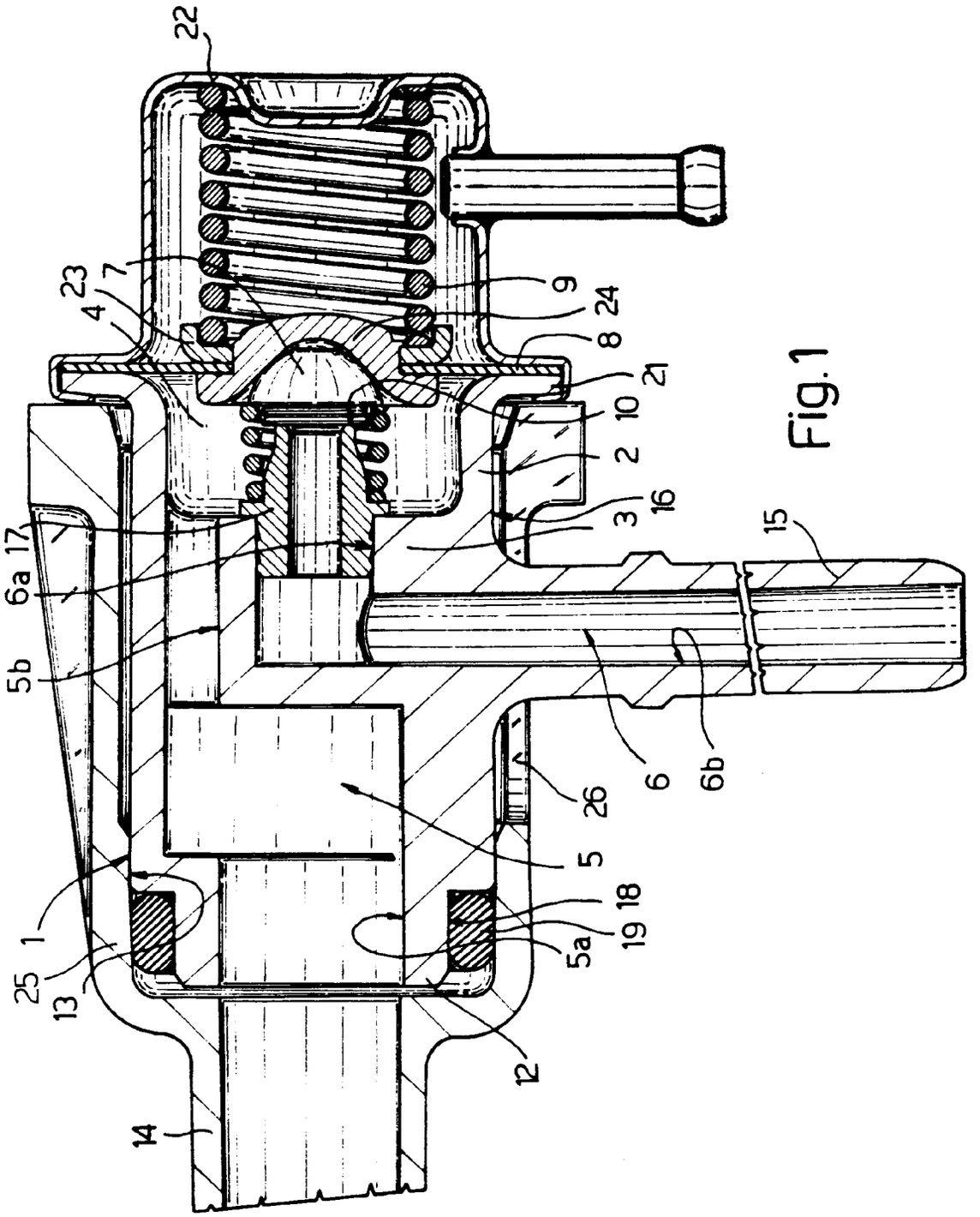


Fig.1

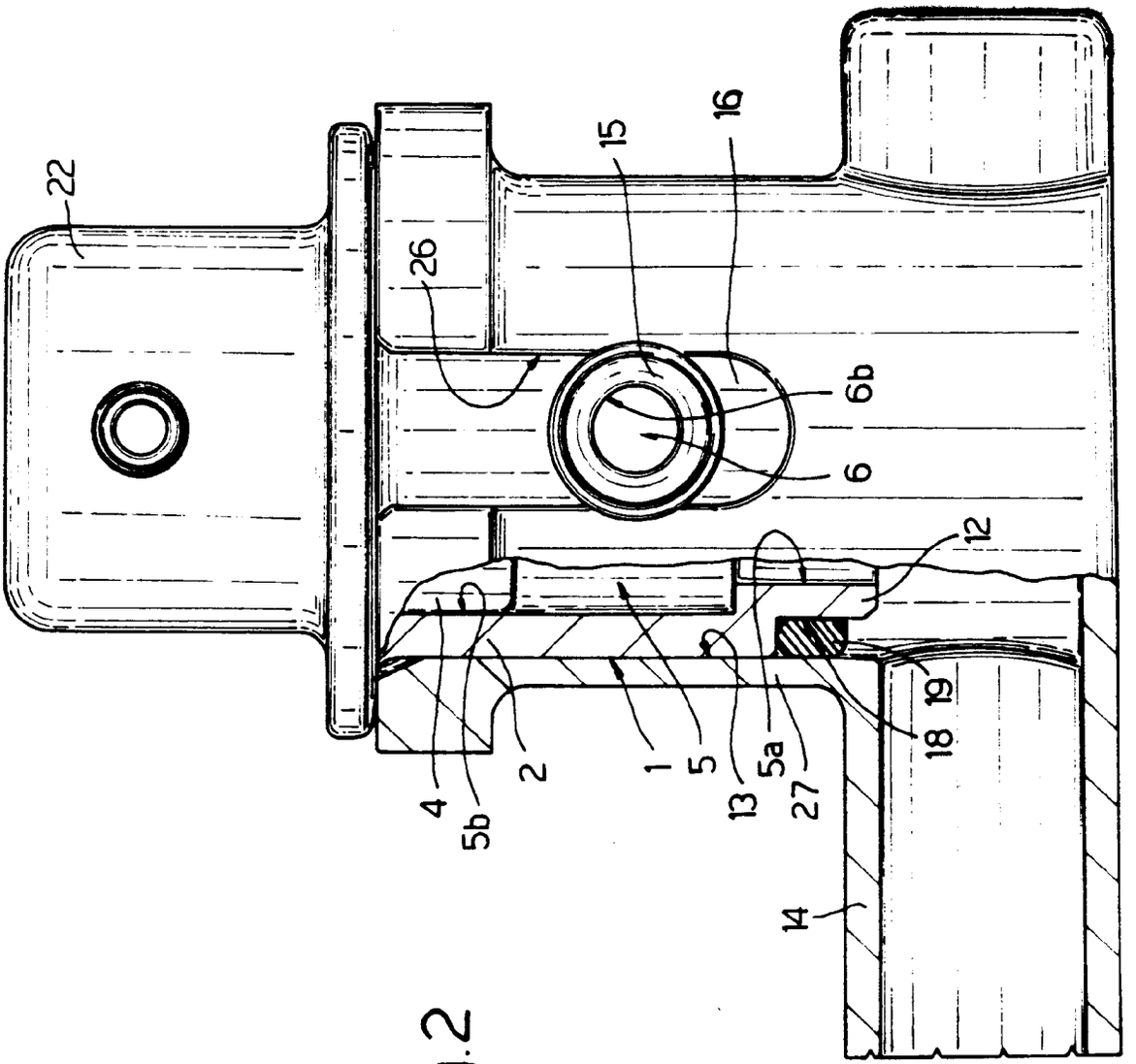


Fig.2