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(12) # EUROPEAN PATENT SPECIFICATION

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Description

This invention relates to a delivery valve for use in a fuel system for a compression ignition engine, the valve being located in or adjacent the outlet of a fuel injection pump and connected to an associated fuel injection nozzle of the engine by means of a pipe, the delivery valve comprising a valve body, a bore defined in the body, a seating defined at one end of the bore, a cylindrical valve member slidable in the bore, said valve member having an integral head at one end thereof, said head being shaped for cooperation with the seating, a circumferential groove formed in the outer periphery surface of the valve member adjacent said head, a by pass port connecting said groove with the other end of the bore by way of a flow passage in the valve member, an opening formed in the valve member at a position spaced from said groove.

The usual form of delivery valve comprises a valve member having a head shaped for cooperation with a seating defined at one end of a bore defined in a valve body. The head is integrally formed with a fluted portion which is slidably mounted in the bore. The end of the bore remote from the seating is connected to the fuel pump and a spring is provided which acts upon the valve member to bias the head into engagement with the seating. Located between the head and the fluted portion is a so called unloading collar which cooperates with the wall of the bore during closure of the valve member to control the volume of fuel which is returned to the fuel pump from the nozzle and pipe before the head contacts the seating. During delivery of fuel by the fuel pump the unloading collar emerges from the bore to permit fuel flow and during closure of the valve the unloading collar re-enters the bore. Even though the fluted portion of the valve member remains in the bore to guide the movement of the valve member, the cylindrical surface of the unloading collar can be damaged. If the fluted portion of the valve member is extended to improve its ability to guide the movement of the valve member, the bore must also be extended and of course the valve body. Moreover, extending the length of the fluted portion adds to the weight and inertia of the valve member and it is likely that a stronger spring will be necessary to provide the valve with an adequate performance. In addition, in order to allow limited by pass flow it is the practice to provide a flat on the unloading collar and it is not easy to form the flat to the required degree of accuracy.

GB-A-732695 shows a delivery valve of the aforesaid kind in which the flow passage is defined by a drilling formed in the valve member. The valve member has the openings in the form of ports which communicate with the drilling or the ports may be in communication with a further circumferential groove in the periphery of the valve member.

The object of the present invention is to provide a delivery valve in a simple and convenient form.

According to the invention a delivery valve of the kind specified is characterised in that the valve member is of tubular form and by a flat formed on the surface of the valve member, the flat communicating with said opening and extending towards but being spaced from said circumferential groove, the flat being positioned so that it is covered by the wall of the bore before the head moves into engagement with the seating.

An example of a valve in accordance with the invention will now be described with reference to the accompanying drawings in which:-

Figure 1 shows the valve in the closed position and it also shows the associated fuel injection pump and injection nozzle,

Figures 2 and 3 show the valve in the partially open and fully open positions and

Figure 4 is a view to an enlarged scale of the valve member.

Referring to Figure 1 of the drawings the delivery valve is generally indicated at 10 and it includes a valve body 11 which defines a bore 12 at one end of which is formed a frusto conical seating 13. The other end of the bore is connected to the outlet of a fuel injection pump diagrammatically illustrated at 14 and fuel flowing from the aforesaid one end of the bore is conveyed by means of a pipe 15 to a fuel injection nozzle 16 of the associated engine. Slidable within the bore 12 is a valve member 17.

With reference to Figure 4 the valve member 17 is of tubular form having a cylindrical portion 18 and an integral head 19 which closes the centre passage 20. The head 19 has a flange 21 the underside of which is shaped as at 22, to cooperate with the seating 13. Adjacent the flange the cylindrical portion 18 is provided with a peripheral groove 23 and extending from the base of the groove 23 into the centre passage 20 is a by- pass port 24. Also formed in the wall of the cylindrical portion are in the particular example, four equiangularly spaced openings 25. Connected to one of the openings 25 is a flat 26 which is shown in dotted outline in Figure 4. The flat is formed on the external surface of the cylindrical portion of the valve member and it extends towards but is spaced from the groove 23. The head 19 is formed with a recess 27 which reduces the mass of the valve member and the head is engaged by one end of a coiled compression spring 28 which acts to urge the delivery valve member to the closed position as shown in Figure 1.

In operation, and assuming that the delivery valve is closed as shown in Figure 1, when fuel is delivered by the fuel injection pump the fuel under pressure will act on the valve member to move the valve member against the action of the spring 28. Figure 2 shows partial lift of the valve member and it will be seen that the flange 21 of the valve member has been

lifted from the seating so that a limited flow of fuel can take place through the port 24 to the pipe 15. With continued movement of the valve member the flat 26 will be exposed beyond the end of the bore 12 and normal fuel flow can take place to the associated engine by way of the pipe line 15 and the injection nozzle 16. Figure 3 shows the fully open position of the valve member and it will be observed that the flat 26 is exposed beyond the end of the bore 12. The valve member may move against the action of the spring by an amount sufficient to slightly expose portions of the openings 25 beyond the end of the bore but even if this is not the case, the openings would still be provided in order to minimise the weight of the valve member. When the flow of fuel from the injection pump ceases, the valve member will be returned by the action of the spring 28 and the fuel pressure in the pipe 15. As soon as the flat 26 during the return motion of the valve member is covered by the wall of the bore, the additional movement of the valve member until the flange engages the seating, is termed the unloading movement of the valve member during which a predetermined volume of fuel is returned towards the injection pump from the pipe. The actual volume of fuel will of course depend upon the displacement of the valve member after the flat has been covered and adjustment can be effected by altering the axial length of the flat 26.

During the movement of the valve member only a small portion of the cylindrical surface of the valve member moves beyond the end of the bore but in any case, the aforesaid cylindrical surface is continuous with the remaining cylindrical surface of the valve member and therefore adequate guiding of the movement of the valve member is obtained and the risk of damage such as occurs with the conventional form of delivery valve, is minimised. The size of the by-pass port 24 is more readily controlled since it is only necessary to select the appropriate size of drill to form the port. Furthermore, the flat 26 can be formed at any desired position to determine the volume of fuel unloaded by the valve during its closing movement, from the pipe 15.

The openings 25 may form a flow path for fuel and also act in the same manner as the flutes of a conventional delivery valve, to minimise possible blockage of the valve by dirt in the fuel.

Claims

1. A delivery valve for use in a fuel system of a compression ignition engine the valve (10) being located in or adjacent to the outlet of a fuel injector pump (14) and connected to a fuel injection nozzle (16) by way of a pipe (15) the valve comprising a valve body (11), a bore (12) defined in the body and a seating (13) defined at one end of the bore, a cylindrical valve member (17) slidable in the bore (12) the valve member having a cylindrical portion (18) having a head (19) at one end which is shaped for engagement with the seating (13) and being biased by a spring (28) into engagement with the seating, a circumferential groove (23) defined in the peripheral surface of the valve member adjacent the head, a by pass port (24) connecting the groove (23) with the other end of the bore by way of a flow passage (20) formed in the valve member, and a plurality of openings (25) formed in the valve member at a position removed from said groove (23) said openings communicating with said flow passage characterised in that said valve member is of tubular form and in that a flat (26) is formed on the surface of the valve member, said flat communicating with one of said openings (25) and extending towards but being spaced from said circumferential groove (23), the flat (26) being positioned so that it is covered by the wall of the bore (12) before the head (19) moves into engagement with the seating (13).

2. A valve according to Claim 1 characterised in that said head (19) is provided with a flange (21) which serves as an abutment for the spring (28) and also is shaped for co-operation with the seating (13).

Patentansprüche

1. Zuführventil zur Verwendung in einem Kraftstoffsystem eines Motors mit Kompressionszündung, wobei das Ventil (10) im Auslaß einer Kraftstoffeinspritzpumpe (14) oder angrenzend an denselben angeordnet und über ein Rohr (15) mit einer Kraftstoffeinspritzdüse (16) verbunden ist und wobei das Ventil umfaßt:
einen Ventilkörper (11), eine in dem Körper definierte Bohrung (12) und einen an einem Ende der Bohrung definierten Sitz (13), ein zylindrisches Ventilelement (17), welches in der Bohrung (12) gleitverschieblich ist, wobei das Ventilelement einen zylindrischen Teil (18) mit einem an dessen einem Ende vorgesehenen Kopf (19) aufweist, welcher zum Eingreifen in den Sitz (13) ausgebildet ist und mittels einer Feder (28) in Eingriff mit dem Sitz vorgespannt ist,
eine Ringnut (23), die in der Umfangsfläche des Ventilelements angrenzend an den Kopf vorgesehen ist, eine Bypass-Öffnung (24), welche die Nut (23) mit dem anderen Ende der Bohrung über einen Durchflußkanal (20) verbindet, der in dem Ventilelement ausgebildet ist, und mehrere Öffnungen (25), die in dem Ventilelement in einer von der Nut (23) entfernten Position ausgebildet

sind, wobei diese Öffnungen mit dem Durchflußkanal kommunizieren,
dadurch gekennzeichnet, daß das Ventilelement rohrförmig ausgebildet ist und daß an der Oberfläche des Ventilelements eine Fläche (26) ausgebildet ist, wobei diese Fläche mit einer der Öffnungen (25) kommuniziert und sich in Richtung auf die Ringnut (23) erstreckt, jedoch im Abstand von dieser angeordnet ist, und wobei die Fläche (26) so angeordnet ist, daß sie von der Wand der Bohrung (12) bedeckt wird, ehe der Kopf (19) sich in Eingriff mit dem Sitz (13) bewegt.

2. Ventil nach Anspruch 1, dadurch gekennzeichnet, daß der Kopf (19) mit einem Flansch (21) versehen ist, der als Abstützung für die Feder (28) dient und außerdem zum Zusammenwirken mit dem Sitz (13) geformt ist.

Revendications

1. Soupape d'alimentation destinée à être utilisée dans un système d'approvisionnement en carburant d'un moteur à allumage par compression, la soupape (10) étant située dans ou en position adjacente à la sortie d'une pompe d'injecteur de carburant (14) et étant reliée à un injecteur de carburant (16) au moyen d'un conduit (15), la soupape comprenant un corps de soupape (11), un alésage (12) défini dans le corps et un logement (13) défini à une extrémité de l'alésage, un élément cylindrique (17) faisant office de soupape apte à coulisser dans l'alésage (12), l'élément faisant office de soupape possédant une portion cylindrique (18) munie d'une tête (19) à une extrémité, qui est façonnée pour venir se mettre en contact avec le logement (13) et qui est mise en état de précontrainte à l'intervention d'un ressort (28) en contact avec le logement, une rainure circonférentielle (23) définie dans la surface périphérique de l'élément faisant office de soupape adjacente à la tête, un orifice de déviation (24) reliant la rainure (23) à l'autre extrémité de l'alésage au moyen d'un passage d'écoulement (20) pratiqué dans l'élément faisant office de soupape, et plusieurs ouvertures (25) pratiquées dans l'élément faisant office de soupape à une position éloignée de ladite rainure (23), lesdites ouvertures communiquant avec ledit passage d'écoulement, caractérisée en ce que ledit élément faisant office de soupape est de forme tubulaire et en ce qu'un méplat (26) est formé à la surface de l'élément faisant office de soupape, ledit méplat communiquant avec une desdites ouvertures (25) et s'étendant en direction de ladite rainure circonférentielle (23) tout en étant écarté de cette dernière, le méplat (26) étant positionné de telle sorte qu'il est recouvert par la paroi de l'alésage (12) avant que la tête (19) ne se déplace pour venir se mettre en contact avec le logement (13).

2. Soupape selon la revendication 1, caractérisée en ce que ladite tête (19) est munie d'une bride (21) qui sert de butée pour le ressort (28) et qui est également façonnée pour coopérer avec le logement (13).

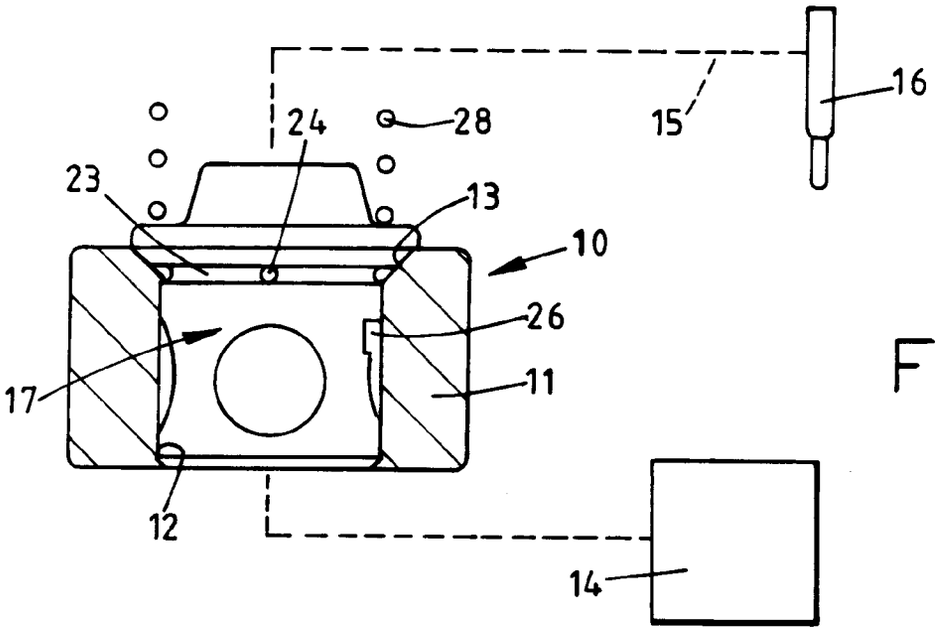

FIG.1.

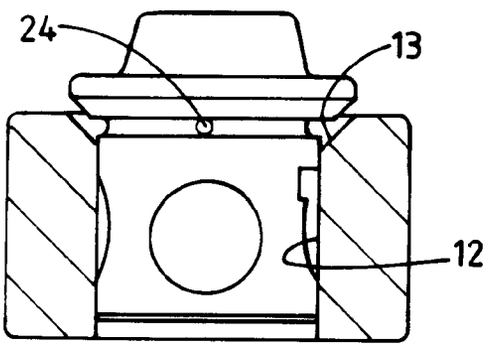

FIG.2.

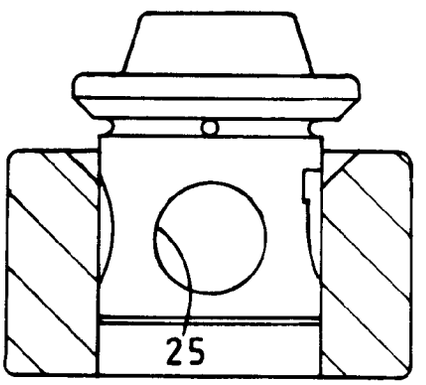

FIG.3.

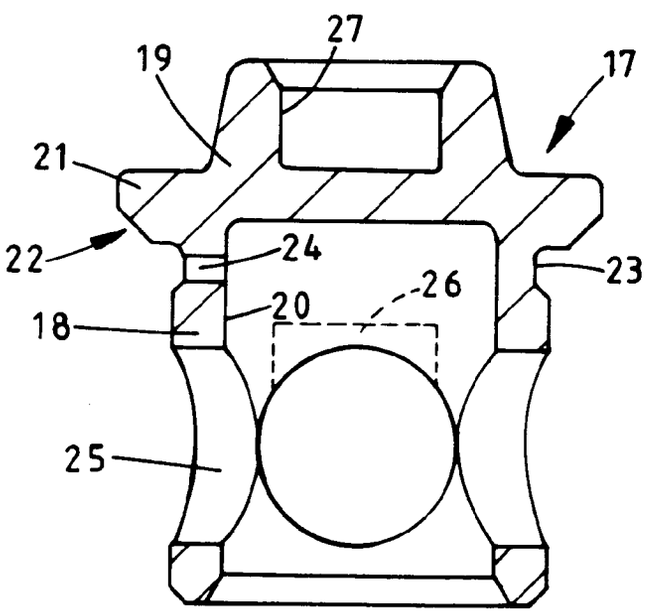

FIG.4.