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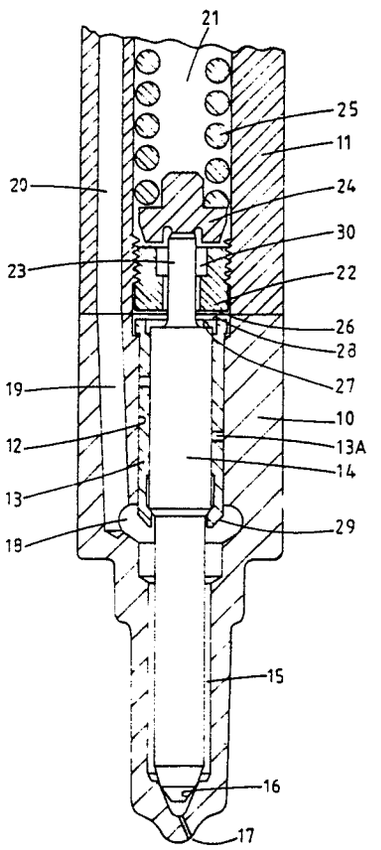
(54) Fuel injection nozzle.

(57) A fuel injection nozzle includes a nozzle body (10) which is mounted on a nozzle holder (11). The nozzle body incorporates an inwardly opening fuel pressure actuated valve member (14) movable against the action of a spring (25) located in a chamber (21) in the holder. In order to limit the movement of the valve member there is adjustably mounted in the end of the chamber adjacent the nozzle body, an annular bush (22) which defines a stop face (26) for engagement by a step (27) on the valve member.



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"FUEL INJECTION NOZZLE"

This invention relates to a fuel injection nozzle for supplying fuel to an internal combustion engine, the nozzle being of the so-called inwardly opening type and comprising a nozzle body, a spring loaded valve member movable axially in a bore, the valve member defining a surface against which fuel under pressure can act to lift the valve member away from a seating to allow fuel flow through an outlet, a nozzle holder to which the nozzle body can be secured, the nozzle holder defining a chamber in which is located the spring which loads the valve member and the valve member defining a reduced extension upon which is mounted an abutment for one end of said spring.

With such nozzles it is customary to provide a stop to limit the extent of movement of the valve member away from the seating and it is known to provide an apertured distance piece which is interposed between the nozzle body and the nozzle holder and which is engaged by the step formed on the valve member between the extension and the main portion thereof. The extent of movement of the valve member away from the seating is therefore determined during manufacture of the components of the nozzle and it has been necessary to ensure that the various components are machined to close tolerances although final adjustment can be achieved by grinding the valve member or the end surface of the nozzle body. The cost of manufacturing the various components because of the close tolerances is high and considerable time can be spent in final adjustment of the allowed movement of the valve member.

The object of the invention is to provide a nozzle of the kind specified in a simple and convenient form.

According to the invention a fuel injection nozzle of the kind specified comprises an adjustable apertured bush which is mounted in the end portion of said chamber adjacent the nozzle body, said bush defining a stop surface for engagement by a step defined between the extension and the main portion of the valve member, said extension extending through the aperture in said bush.

An example of a fuel injection nozzle in accordance with the invention will now be described with reference to the accompanying sectional drawing.

Referring to the drawing the nozzle comprises a nozzle body 10 of stepped cylindrical form and which is secured by means of a conventional cap nut not shown, to one end of a nozzle holder 11 of cylindrical form.

Formed in the nozzle body in a stepped bore 12. In the wider portion of the bore there is mounted a sleeve 13 and slidable within the sleeve is the wider portion of a valve member 14 the narrower portion of which extends with clearance within the narrower portion of the bore to define an annular clearance 15. The narrower end of the valve member is shaped to co-operate with a seating 16 and from this end of the bore extends an outlet orifice 17. Intermediate the ends of the bore there is defined an enlargement 18 which by way of a passage 19 in the nozzle body and a corresponding passage 20 in the holder, communicates with a fuel inlet (not shown) which in use is connected to a fuel injection pump. The sleeve 13 is provided with a plurality of openings 13A extending between the inner and outer surfaces thereof.

In the nozzle holder there is formed a chamber 21 in the end of portion of which adjacent the nozzle body there is located an apertured bush 22. The bush is in screw thread engagement with the wall of the chamber and extending through the aperture is an extension 23 integrally formed with the valve member. The extension engages with a spring abutment 24 against which is located one end of a coiled compression spring 25.

The bush 22 defines a stop surface 26 for engagement by a step 27 formed between the main portion of the valve member and the extension, and with a surface 28 defined at the end of the sleeve.

The sleeve 13 at its end within the enlargement, defines an inwardly extending portion 29 engageable with the step defined on the valve member and in operation, when fuel under pressure is supplied to the enlargement 18, the fuel pressure acting on the sleeve and also the valve member, generates a force which opposes the action of the spring 25 and when the force is sufficient, the valve member will lift to permit fuel flow along the annular space 15 to the outlet 17. The initial movement of the valve member taken place under the combined action of the fuel pressure acting on the sleeve and also the valve member. It will be noted however that the allowed movement of the sleeve before its end surface 28 engages the surface 26, is less than that of the valve member. When the sleeve engages the stop surface 26 of the bush, the movement of the valve member will be halted until the pressure in the enlargement has increased sufficiently for the fuel force acting on the valve member to effect further movement of the valve member against the action of the spring. The movement of the valve member is limited by the engagement of the step 27 with the stop face 26 and in this manner two stage lifting of the valve member is obtained.

It is necessary to carefully adjust the allowed

movement of the valve member and this is effected by adjustment of the bush 22 within the holder. This adjustment is effected before assembly of the abutment 24 and the spring and it is conveniently effected by providing a hexagonal or like recess 30 in the bush so that a tool can be inserted from the end of the chamber remote from the bush. The adjustment of the lift of the valve member can therefore be effected after the nozzle holder and the nozzle body have been secured together with the aforesaid cap nut. After adjustment of the lift of the valve member, the assembly of the remaining components of the nozzle can take place.

It will be understood that the apertured bush 22 can be used in conventional fuel injection nozzles in which the valve member is slidable directly within the bore.

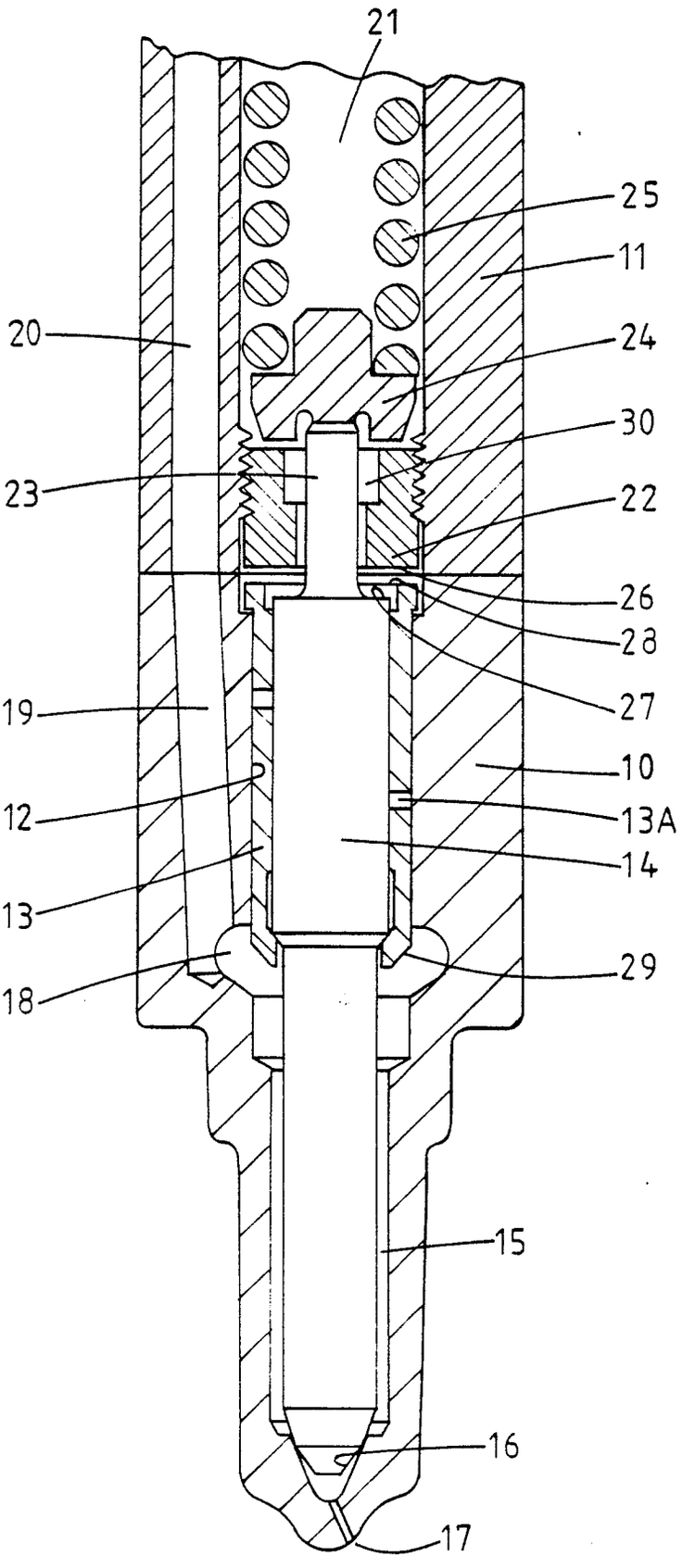
The bush 22 can be fixed once adjustment has been effected in a number of ways. For example, the threads may be of a special form to provide the desired interference, locking compounds may be used, locking screws, plastics or adhesive patches can be incorporated into one of the components or deformation of the threads may be effected using a suitable punch.

Claims

1. A fuel injection nozzle for supplying fuel to an internal combustion engine comprising a nozzle body (10), an inwardly opening valve member (14) slidable axially in a bore, a surface defined on the valve member against which fuel under pressure can act to lift the valve member from a seating (16) to allow fuel flow through an outlet (17), a nozzle holder (11) to which the nozzle body is secured, the nozzle holder defining a chamber (21) in which is located a spring (25) which loads the valve member, the valve member defining a reduced extension (23) which extends into said chamber, an abutment (24) for said spring mounted on said extension (23), characterised by an adjustable apertured bush (22) mounted on said holder in the end portion of said chamber adjacent the nozzle body, said bush defining a stop surface (26) for engagement by a step (27) defined between the exterior and the main portion of the valve member, said extension extending through the aperture in said bush.

2. A nozzle according to Claim 1 in which said bore is formed in a sleeve (13) and the sleeve is axially slidable in the body under the action of the fuel under pressure and said sleeve and said valve member are formed with interengageable means whereby the force exerted on the sleeve by the fuel under pressure will initially assist the movement of the valve member away from the seating characterised in that said apertured bush (22) also serves to limit the movement of the sleeve.

3. A nozzle according to claim 1 or Claim 2 characterised in that the bush is provided with a hexagonal or like recess (30) for engagement by a tool inserted from the end of the chamber (21) remote from the nozzle body (10).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EUROPEAN SEARCH REPORT

Application Number

EP 88 30 0598

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	GB-A- 671 940 (HARTRIDGE) * Page 2, lines 9-83; figures 1-6 *	1	F 02 M 61/16 F 02 M 45/08
Y		2,3	
Y	FR-A-2 333 973 (BOSCH) * Page 4, lines 5-13; figure 4 *	2	
Y	GB-A-1 303 527 (BARKAS-WERKE) * Page 3, lines 60-65; figure 2 *	3	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

F 02 M

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	09-05-1988	HAKHVERDI M.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
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