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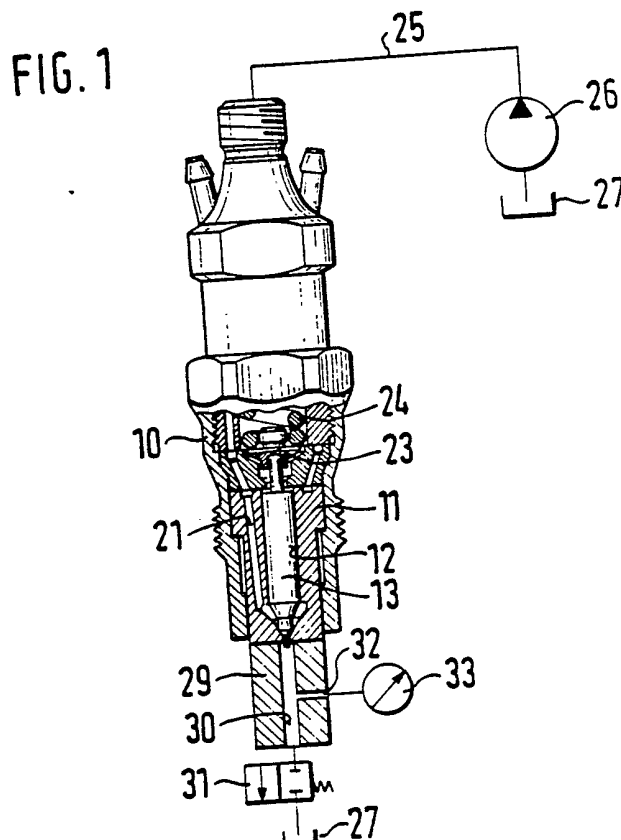
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UK CL (Edition K) **F1B**  
INT CL<sup>5</sup> **F02M 65/00**

(54) **Injection nozzle testing**

(57) Connected to the nozzle body is a chamber 30 which can be sealed by a valve 31. During a measuring process, pressure is reduced, after a preceding build-up by injection into the chamber 30, via the needle play until the nozzle needle (13) has come to bear on the valve seat. The pressure then prevailing in the chamber 30 is the nozzle closing pressure.



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FIG. 1

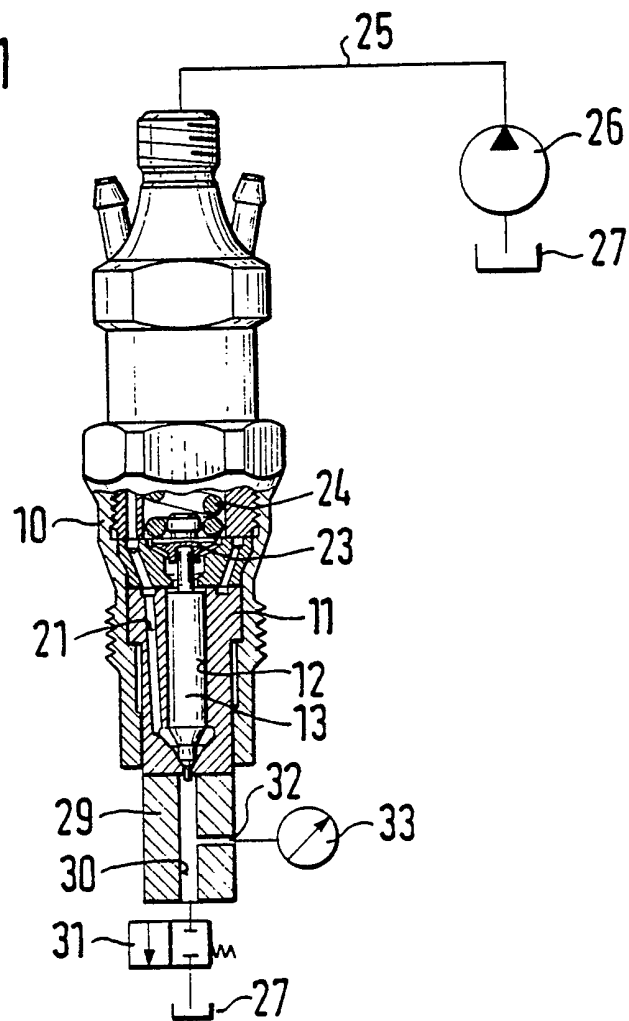


FIG. 3

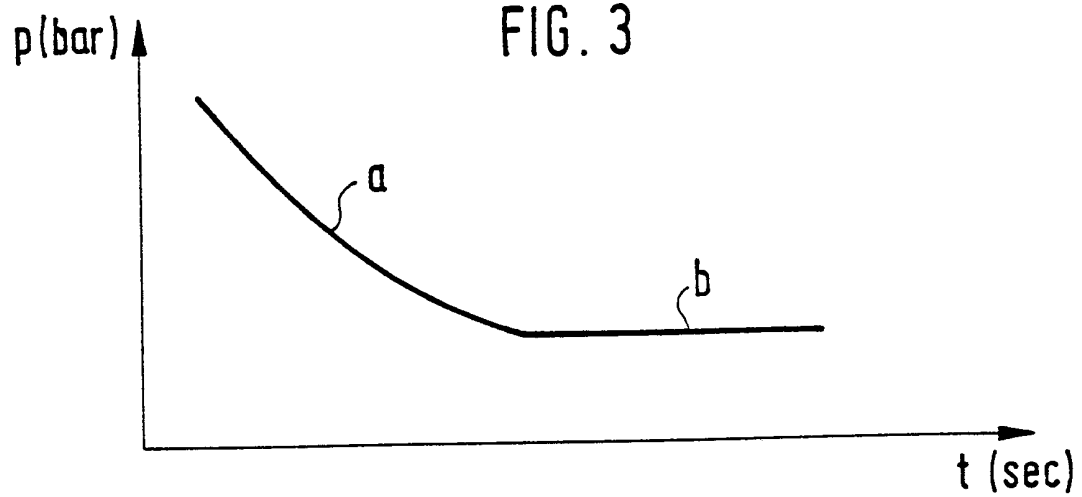
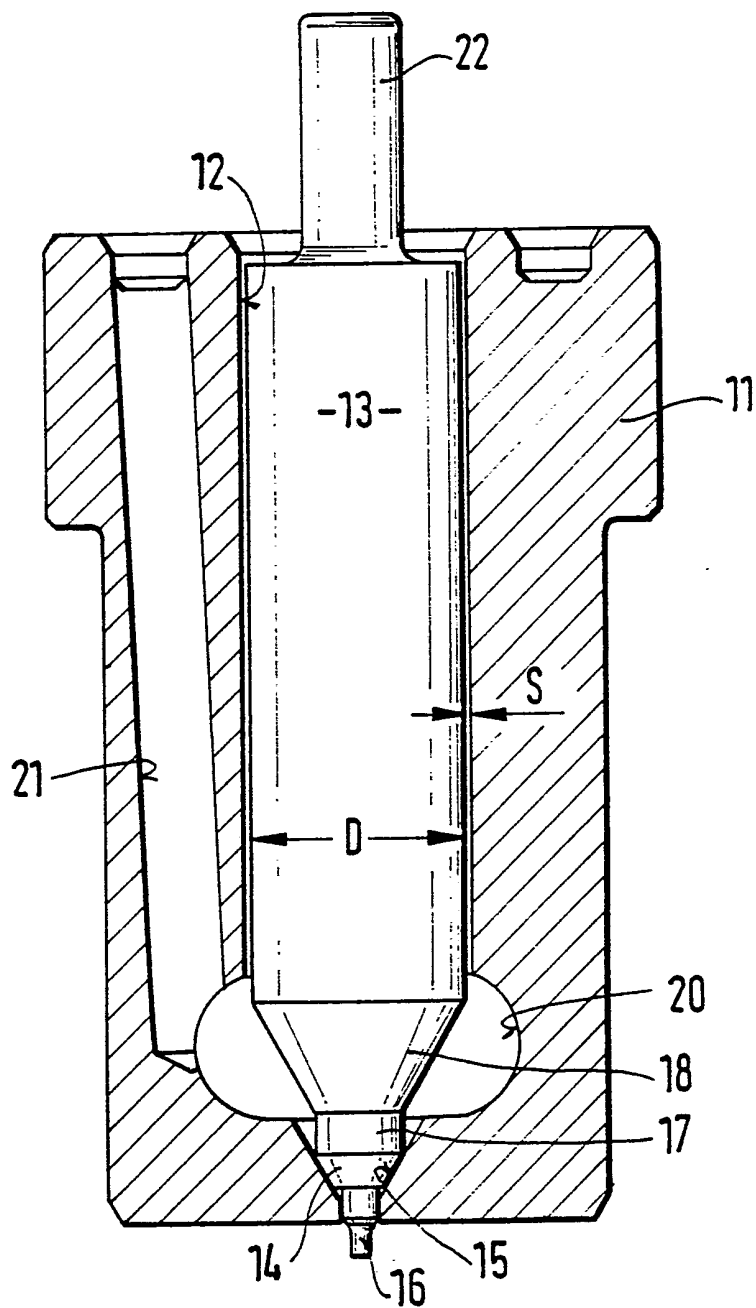


FIG. 2



### Measuring device

#### 5 Prior art

The invention proceeds from a measuring device for the closing pressure of a nozzle holder combination according to the preamble of the main claim.

#### Advantages of the invention

10 The measuring device for the closing pressure of a nozzle holder combination having the characterising features of the main claim has the advantage that it permits an exact result of the closing pressure relatively rapidly and in a simple way. Further advantageous  
15 embodiments of the invention follow from the subclaims.

#### Drawing

An exemplary embodiment of the invention is reproduced in the following description and drawing. The latter shows in Figure 1 a nozzle holder combination,  
20 partly cut away, in Figure 2 an enlarged representation of a part of the nozzle holder combination, and in Figure 3 a diagram.

#### Description of the exemplary embodiment

25 Represented by 10 in Figure 1 is the nozzle clamping nut of a nozzle holder combination which accommodates injection nozzle body 11 in whose central

longitudinal bore 12 a nozzle needle 13 is guided with a specific play  $s$ . This play is only a few  $\mu$  large. These parts are represented enlarged in Figure 2. The nozzle needle 13 has a conical closing part 14, which is able to rest on just such a valve seat 15 in the nozzle body 11, a pin 16 following the closing part 14, a preceding cylindrical part 17 and a once again preceding conical part 18 which merges into the main body of the nozzle needle 13. Formed around the last-mentioned parts in the longitudinal bore 12 is a chamber 20, which is connected to a slightly obliquely extending bore 21, which is formed in the nozzle body 11, extends as far as the upper end face of the nozzle body 11 and continues in the nozzle holder combination. At its upper end, the nozzle needle has a pin 22 on which is supported a spring plate 23 on which a compression spring 24 acts in the closing direction on the nozzle needle.

Extending from the upper opening (not represented) of the nozzle holder combination is a line 25 to a pump 26 which sucks in pressure medium, in particular diesel fuel, from a vessel 27 and conveys it at high pressure into the nozzle holder combination.

Adapted on the nozzle body 11 is a cylindrical body 29 in which there is formed a continuous longitudinal bore 30 which extends with the same axis as the longitudinal bore 12 in the nozzle body 11. Situated at the end of the longitudinal bore 30 is a shutoff valve 31 by means of which the bore can be closed or via which there is a flow from the nozzle to the vessel 27, so that the longitudinal bore 30 forms a defined chamber. Extending from the latter to the exterior of the body 29 is a transverse bore 32; a pressure measuring instrument 33 is connected thereto.

Measurement of the closing pressure proceeds as follows: after a purging process (removal of any air present), the longitudinal bore 30 - that is to say the defined chamber - is closed pressure-tight by the shutoff valve 31. If, now, pressure medium is additionally conveyed through the nozzle holder combination, there

builds up in the longitudinal bore 30 a pressure which is precisely as high after a short time as the pressure in the nozzle holder combination. Due to the pressure on the surface of pressure application  $A_N$  ( $A_N = (\phi \text{ of the nozzle needle})^2 \times \pi : 4$ ), the nozzle needle remains completely open against the force of the spring 24. After termination of conveyance, the pressure can be reduced only via the very narrow gap  $s$  between the nozzle needle and longitudinal bore 12 (needle play). This produces a slow pressure drop in the system, to which reference is made in Figure 3. There, the time  $t$  is plotted in seconds on the abscissa, and the pressure  $p$  in bar on the ordinate. When the effective pressure or the force resulting therefrom on the needle becomes smaller than the pressure acting through the preloading force of the compression spring, the nozzle needle closes, i.e. the closing part 14 comes to bear on the valve seat 15. As a result, the longitudinal bore 30 (defined chamber) after the nozzle is tightly closed. The pressure drop resulting from the switching flow is denoted by  $a$  in the diagram, and the horizontal branch  $b$  of the curve is the closing pressure in the case of a closed nozzle needle. The remaining pressure in the bore 30 corresponds to the closing pressure. It may be seen that the latter is to be measured very simply and using a suitable pressure measuring system 33.

The measuring device according to the invention has the advantage that a reduction of the outlet-to-outlet dispersion can be achieved through the coordination of the closing pressures instead of the opening pressures in the case of specific hydraulic conditions at the injection pump.

## Claims

- 5        1.        Measuring device for the closing pressure of a  
nozzle holder combination, whose nozzle needle (13),  
loaded by a compression spring (24), is guided with  
slight play (s) in a longitudinal bore (12) of a nozzle  
body (11) and bears with a closing surface (14) against  
10       a valve seat (15) joined to which there is a connection  
(30) to a vessel, characterised in that the connection  
(30) is formed as a defined chamber which can be closed  
by a shutoff valve (31).
- 15       2.        Device according to Claim 1, characterised in  
that the defined chamber is formed as a longitudinal bore  
(30), extending to the nozzle needle, in a component (29)  
connected to the nozzle holder combination.
- 20       3.        Device according to Claims 1 and 2, characterised  
in that a pressure measuring device (33) is connected to  
the defined chamber.
4.       A measuring device substantially as herein  
described with reference to the accompanying drawings.