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REGULATING DEVICE, SPECIALLY FOR FUEL INJECTION PUMPS OF INTERNAL COMBUSTION ENGINES

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Fig. 1.

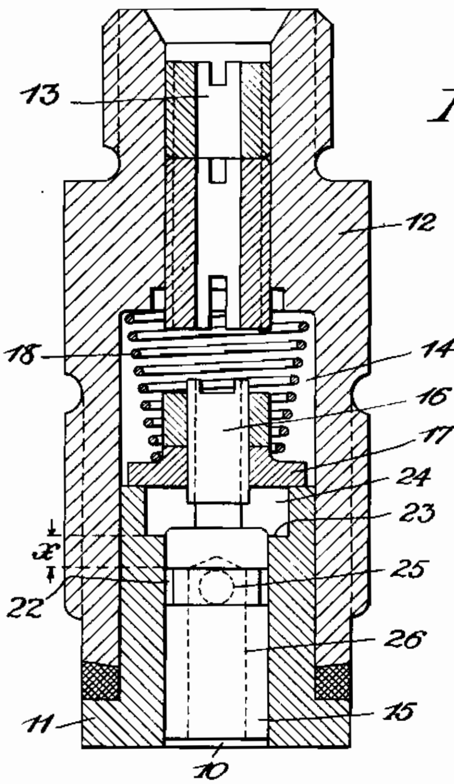


Fig. 2.

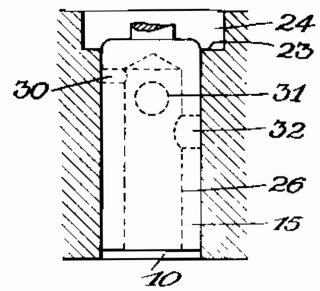


Fig. 3.

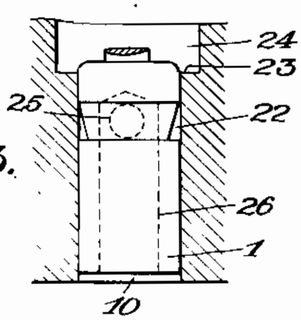
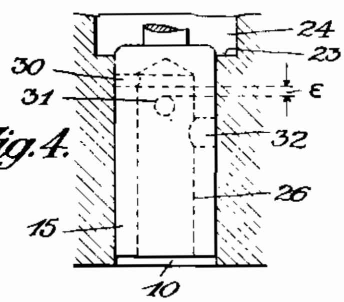


Fig. 4.



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ALIEN PROPERTY CUSTODIAN

REGULATING DEVICE, SPECIALLY FOR FUEL INJECTION PUMPS OF INTERNAL COMBUSTION ENGINES

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The invention relates to a regulating device, specially for the improved regulation of the injection of fuel which is being conveyed by means of injection pumps to the combustion chamber of internal combustion engines, and to a construction of a suitable regulating member for this purpose, specially a regulating slide valve. The object of the invention is above all, in adaption to the ignition delay, to prevent a too sudden injection of the fuel into the combustion space of the engine, and in connection therewith a too sudden inflammation of the fuel. Specially for this purpose the cross section of the fuel passage shall be opened irregularly and that, first a little and later more.

It is well known that at given cylinder contents of the engine, the fuel quantity injected during the time corresponding to the ignition delay should not surpass a certain value in order to guarantee a shock-free course of the combustion, and therewith a sufficient quietness in running. Up to the present time the regulating devices allow under circumstances that too much fuel passes in the time unit, at the beginning of the injection, so that also in the running of the engine a certain non-uniformity is to be noted.

By means of the invention this disadvantage may be removed by the fact that in a primary section of the opening period, corresponding to the ignition delay, only a comparatively small quantity of fuel is let through to the injection piping or to the injection nozzle, for instance by means of providing instead of a cylindrical, a conical shaped regulating groove in ring form, in the regulating slide valve, forming the connection between the pumping space and the injection pipe, and a correspondingly slow increase of the passing fuel quantity ensuing in conformity to the steepness of the cone.

A further possibility for the realisation of the invention consists for instance in the fact that the regulating slide valve is provided with regulating bores coming into action one after the other, and that preferably in such manner, that between a smallest regulating bore coming first into action, and a following larger regulating bore, such a distance is provided that in the opening motion of the regulating slide valve the larger regulating bore will only be given free after a certain stroke, when the opening action of the smaller regulating bore is already finished. Eventually several regulating bores may be provided, being displaced with respect to each other, and being graduated in their cross sections.

In the drawing the object of the invention is shown in several types given by way of example.

Fig. 1 shows the upper part of a fuel injection pump with a well known type of a regulating slide valve which is to be improved.

Fig. 2 shows a regulating slide valve with radial transverse channels, being displaced with respect to each other.

Fig. 3 shows a regulating slide valve with conically shaped ring groove, and

Fig. 4 shows a regulating slide valve with radial transverse channels, an axial distance being provided between the topmost and the next following passage channel.

In Fig. 1, 11 indicates the upper part of an injection pump casing, being set onto the (not shown) pump casing proper, and being secured to it. The pumping space extending into the upper casing part, is formed by a bore 10 containing simultaneously the regulating slide valve 15. The latter is provided with an extension 16 onto which the valve 17 is adjustably screwed. It is located in a compression space consisting of the part spaces 24 and 14, being formed by means of the casing part 11 and by the casing part 12 which is set onto it and secured to it, and to which the injection pressure pipe 13 is connected, leading to the injection nozzle. A spring 18 presses the valve 17 onto its seat, and the regulating slide valve into its lower position.

The regulating slide valve 15 is provided with a center bore 26 and a ring shaped groove 22, being shaped cylindrically in the type shown in Fig. 1, and being connected by means of a transverse bore 25 with the center bore 26. The upper edge of the ring groove 22 having a distance x from the regulating edge 23 in the casing 11, as drawn here in the lower position of the slide valve.

The manner of operation of this known arrangement is the following:

The fuel sucked into the pump pressure space 10, by means of the pumping piston, in a well known manner, presses in the pressure stroke of the piston the slide valve 15, and with it the valve 17 upwards, and comes thereby through the center bore 26 of the pressure slide 15, and through the transverse bore 25, into the ring shaped groove 22, and from there (after lifting the pressure- or regulating slide valve 15 and the valve 17 by means of the fuel, being put under pressure by the pumping piston, by the amount x, and therewith after shifting the regulating edge 23 by the upper edge of the ring shaped groove 22) through the pressure space 24 and 14 into the injection pipe 13, leading to the injection

nozzle. With this type with cylindrical ring shaped groove 22 the cross section of the passage is opened comparatively quick, causing a sudden combustion and a sudden pressure increase in the combustion space of the engine.

According to Fig. 2 the conveyance of the fuel ensues into the pressure pipe from the pressure space 10 over the longitudinal bore 20 and the transverse passage channels 30, 31, 32 to the pressure space 24, the channels 30, 31, 32 being arranged in any desired radial direction in steps, but without axial distance from each other. As in the beginning only the comparatively narrow bore 30 will be opened, in opposition to the well known arrangement according to Fig. 1, first a comparatively throttled passage of the fuel will be guaranteed, so that the danger of a too strong and too sudden increase of pressure in the combustion space is lessened.

Still more favorable results may be obtained by the type of the regulating slide valve according to the Figs. 3 and 4.

With the type according to Fig. 3 the ring shaped groove 22 is, in opposition to the purely cylindrical form shown in Fig. 1, of conical shape, the basis of the cone being situated towards the regulating edge 23. The steeper the cone, the slower the increase of the passing fuel in the time unit.

With the type shown in Fig. 4 the topmost transverse bore 30 with an axial distance E from the next lower and larger bore 31 is arranged, differing from the one according to Fig. 2, in such a manner that first, only the smallest transverse bore will be given free, with the consequence that within a time unit corresponding to the ignition delay, only a quantity of fuel excluding a too sudden pressure increase may pass through. Only with further lifting of the regulating slide valve 15 also the second and larger transverse bore 31, and immediately subsequent the third and largest transverse bore 32 is laid free.

Besides the advantage of more favorable combustion, furthermore in consequence of the more rational conveyance of the fuel, a considerable saving of fuel will be reached.

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