

Dec. 22, 1942.

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2,305,801

NOZZLE ASSEMBLY FOR DIESEL MOTORS

Filed Aug. 21, 1940

Fig. 1.

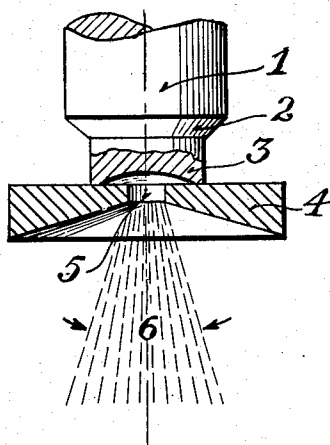
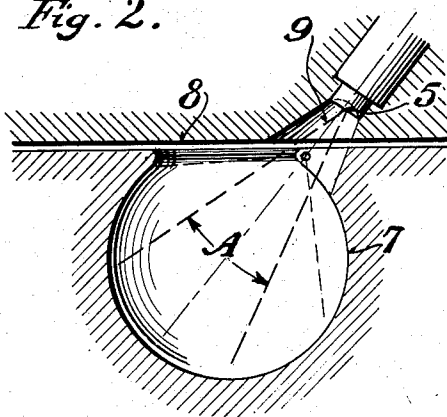


Fig. 2.



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UNITED STATES PATENT OFFICE

2,305,801

NOZZLE ASSEMBLY FOR DIESEL MOTORS

Paul Wiebicke, Nuremberg, Germany; vested in
the Alien Property CustodianApplication August 21, 1940, Serial No. 353,554
In Italy September 4, 1939

1 Claim. (Cl. 299—107.6)

This invention relates to high-speed engines of the Diesel type, and particularly to a novel fuel injector nozzle.

Most fuel nozzles hitherto designed produce a relatively large jet angle, and, moreover, the fuel is atomized in the form of a hollow cone, so that little or no substantial quantity of fuel is present within the core.

Accordingly, the present invention provides a construction for overcoming this objection and which produces a novel and improved nozzle adapted to operate with a high degree of perfection, because the nozzle is so designed that the fuel is uniformly distributed over the entire cross-sectional area of the cone, the spraying angle (cone angle), measured in the open air, amounting to from 20 to 30°. In other words, a nozzle according to the present invention injects the fuel into the cylinder in a substantially solid cone, having a small included angle. This action is advantageously obtained by means of a nozzle, in which the fuel, before leaving the nozzle discharge aperture, is compelled to stream through an annular gap provided between the end of the needle valve situated directly in front of said aperture, said needle valve having a flat peripheral seat disposed vertically with respect to the nozzle axis and surrounding a medial concavity in the end of the needle valve. When the fuel is forced through the annular space between the periphery of the end of the needle valve and a portion of the disk surrounding the aperture, it is thoroughly atomized before it passes through the aperture, so that the latter then serves the purpose of bounding and shaping the spraying cone which produces the relatively small spraying angle referred to. The apex of the conical spray at the nozzle aperture is very dense and expands to a larger cone angle into the combustion chamber of the piston with the result, that the latter is filled with atomized fuel. Preferably, the apex of the cone is located inwardly of the cylinder head so that the base of the cone is projected into the spherical combustion chamber in the head of the piston.

The invention is illustrated diagrammatically and by way of example on the accompanying drawing on which Figure 1 is partly a side-view of, and partly an axial section through members of a fuel nozzle designed according to this invention, and Figure 2 shows in section the end portion of the piston with the spherical combustion space therein and, likewise in section, the adjacent portion of the cylinder cover with the neighbouring end of the fuel nozzle therein, this latter being drawn to a greatly reduced scale relatively to Fig. 1.

On the drawing, 1 (Fig. 1) denotes the nozzle

needle which is lifted in known manner at the instant when the fuel is injected, the needle being lifted by the fuel pressure acting upon the shoulder 2. The annular seat 3 of the needle is flat and contacts with the flat or plane upper surface of the nozzle plate 4, in the centre of which is the spraying aperture 5. When the fuel streams from all sides through the annular gap below the lifted seat to the aperture 5 the fuel will be atomized for the first time already within said gap, for the second time just over said aperture where the numerous streams impinge upon one another, and for the third time when the assembled streams discharged from the said aperture change their direction on all sides by angles of approximately 90°, the fuel forming now a cone having an angle of about from 20 to 30° whereby the entire sectional area is uniformly filled with the very finely distributed fuel.

In order to make matters still more clear I refer now also to Fig. 2 in which 7 denotes the spherical combustion space provided in the upper portion or end of the piston which is shown in its upper dead-centre position. The spraying aperture 5 of the nozzle is located a short distance inwardly from the inner face of the head of the cylinder and likewise inwardly from the spherical wall 7 so that the nozzle seat is somewhat withdrawn into the cylinder wall 8, whereby a space 9 resembling a truncated cone is formed. This space is, however, so small that it cannot exert any unfavourable influence upon the combustion procedure.

A in Fig. 2 denotes the fuel cone, the angle of which amounts to about from 20 to 30° when the spraying is carried out in the open air, as has already been mentioned. Within the space 7, however, the atomized fuel fills up said space completely and uniformly, as intended and, in fact, attained.

I claim

A nozzle assembly for high-speed Diesel motors, including a disk having a single central aperture of uniform diameter throughout, a needle having its end wall formed with a flat peripheral portion and a central concavity, said flat peripheral portion normally having a flush fluid-tight contact with the face of the disk surrounding the aperture therein, said needle upon actuation by pressure of fuel away from the disk compelling fuel to pass from the space surrounding the needle tip into the said concavity to effect atomization of fuel therein preliminary to forcing the atomized fuel through the aperture in the disk in the form of a uniform concentrated spray jet approximating a 20° to 30° cone whose apex lies inwardly of the mouth of the said aperture.

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