June 26, 1945. A. F. SANDERS 2,379,190

FUEL-INJECTION ENGINE

Filed March 10, 1943

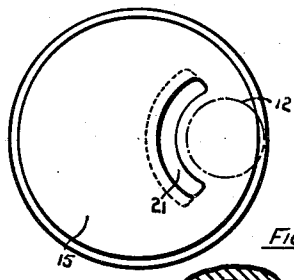


Fig. 5

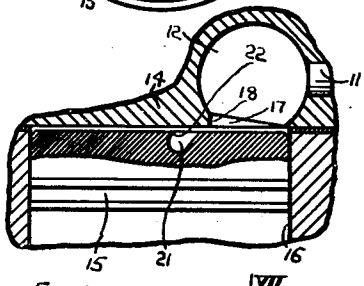


Fig. 4

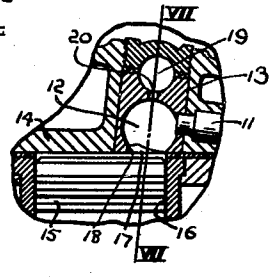


Fig. 6

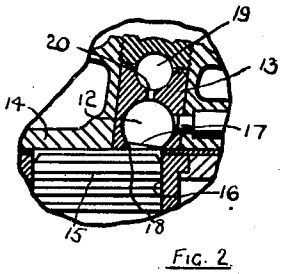


Fig. 2

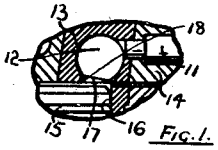


Fig. 1

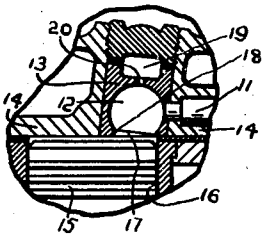


Fig. 3

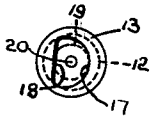


Fig. 7

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FUEL-INJECTION ENGINE

Arthur Freeman Sanders, Leeds, England

Application March 10, 1943, Serial No. 478,707
In Great Britain March 13, 1942

2 Claims. (Cl. 123—32)

This invention relates to fuel-injecting engines of the kind in which fuel is injected into a compact cavity (preferably one which is of part-spherical shape, being greater than hemispherical) disposed in the cylinder head towards one side of the cylinder bore and communicating directly with the bore through a sharp-edged opening.

It is found that, particularly in the case of an engine which is heavily supercharged, i. e., working with a very high B. M. E. P., there is a tendency for burning of the metal round the said opening to occur, and my main object is to prevent this from happening in a very simple manner.

According to the invention the said opening is substantially wedge-shaped in section, leaving the greatest mass of metal at the side of the said opening nearest the cylinder axis, whilst at the opposite side of the opening the adjacent edge of the injection cavity joins the face of the cylinder head.

Various forms of combustion chamber according to the invention are shown on the accompanying sheet of diagrammatic drawings, in which Figures 1 to 4 are fragmentary sectional elevational views of different arrangements, Figure 5 being a plan view of the piston of Figure 4, whilst Figure 6 is a fragmentary sectional elevation of another arrangement, Figure 7 being an underside plan of the plug of Figure 6 looking along the line VII—VII thereof. Like reference characters are applied as far as possible to the same elements throughout the various figures.

The construction shown in Figure 1 is one in which fuel is injected through an injector 11 into an injection cavity 12 of almost full-spherical shape, the cavity being formed in a plug 13 mounted in the cylinder head 14. The piston 15 working in the cylinder bore 16 has a minimum of mechanical clearance from the cylinder head at the top-dead-centre position shown. The cavity 12 communicates with the cylinder bore through the wedge-shaped opening 17, the cavity as a whole being placed to one side of the centre line of the plug, i. e., being machined on a centre line which is offset from the centre line of the plug. This leaves a greater mass of metal at the edge 18 than elsewhere round the opening 17 and in this way the conduction of heat from this edge, which is nearer the cylinder axis than any other part of the opening, is increased, whereby burning of this edge, due to contact with the flaming gases passing out of the cavity 12, is prevented.

In the modification of Figure 2 the cavity 12 is placed centrally with respect to the plug 13, but the latter is tilted slightly (as is also the plug 13 of Figure 1) and the cavity communicates with the cylinder bore through a similar wedge-shaped opening 17 having more metal at the edge 18 nearest the cylinder axis than elsewhere. In this modification there is also a reception cavity 19, in the upper part of the plug 13, which communicates with the injection cavity by a narrow, sharp-edged opening 20.

The construction of Figure 3 differs from that of Figure 2 mainly in that the reception cavity 19 and the communicating opening 20 are differently shaped, as shown.

In the construction of Figure 4, where there is but a single cavity, namely, an injection cavity 12, in the cylinder head, this cavity communicating with the cylinder bore by a wedge-shaped opening 17 as before, there is a reception cavity 21 formed in the piston crown. This reception cavity is spaced laterally at the top-dead-centre position of the piston from the adjacent edge 18 of the opening 17. It may be of arcuate shape, as actually shown by Figure 5, or it may be straight, or of circular or other shape. For preference it is between 0.3 and 0.5 of the total clearance volume. On the side remote from the injection cavity 12 it is formed with an overhanging lip 22 whereby to interfere as little as possible with the "squished" air being delivered across the piston face into the injection cavity 12 during the in-stroke. On the out-stroke, however, the lip 22 catches the flaming gases being delivered from the injection cavity and causes intense turbulence to take place in the reception cavity 21.

The construction of Figures 6 and 7 is substantially the same as that of Figure 2, except that the opening 17 in this case is D-shaped in axial view, as shown most clearly in Figure 7. The opening is still substantially wedge-shaped in section, it will be observed.

What I claim as my invention and desire to secure by Letters Patent of the United States is:

1. A fuel-injection engine having a cylinder, a cylinder head, and a fuel injector adapted to inject fuel into a compact cavity in the cylinder head, said cavity being disposed towards one side of the cylinder bore and directly communicating therewith through a sharp-edged opening, said opening being substantially wedge-shaped in section leaving the greatest mass of metal at the side of the said opening which is nearest the cylinder axis whilst at the opposite side of the opening

the said cavity joins the face of the cylinder head.

2. A fuel-injection engine having a cylinder, a cylinder head having a compact cavity therein, a fuel injector adapted to inject fuel into said cavity, the latter being disposed towards one side of the cylinder bore and directly communicating therewith through a sharp-edged opening, said opening being substantially wedge-shaped in section leaving the greatest mass of metal at the side of the said opening which is nearest the cylinder axis whilst at the opposite side of the opening the said cavity joins the face of the cylinder head, and a piston adapted to reciprocate in the cylinder, said piston having a cavity, in its face adjacent the cylinder head, which is spaced laterally from said opening, said second-mentioned cavity having an overhanging lip on the side remote from said first-mentioned cavity so as to reduce interference with the final air flow into the cavity first mentioned.

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