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FUEL INJECTION TYPE INTERNAL COMBUSTION ENGINE HAVING A WHIRL CHAMBER

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Fig. 1

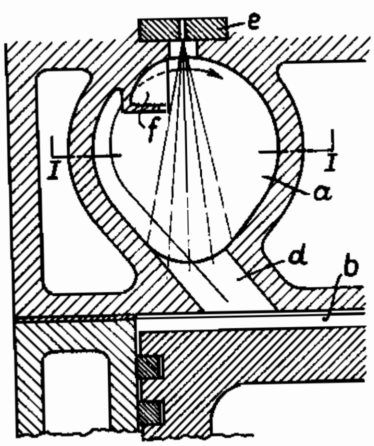


Fig. 3

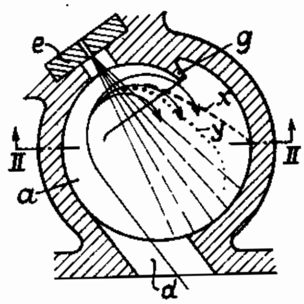


Fig. 4

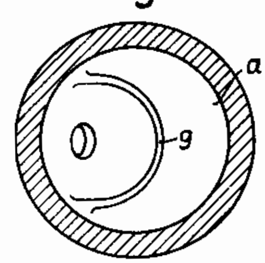


Fig. 2

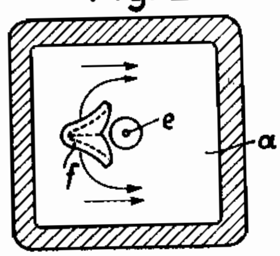


Fig. 5

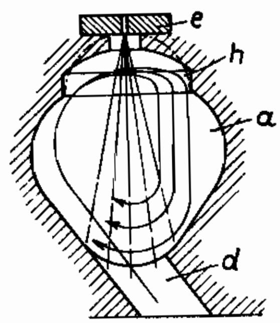
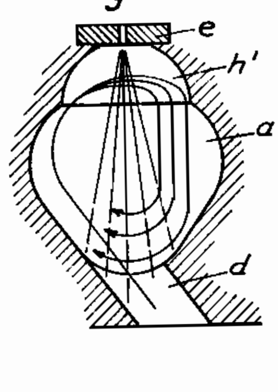


Fig. 6



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ALIEN PROPERTY CUSTODIAN

FUEL INJECTION TYPE INTERNAL COMBUSTION ENGINE HAVING A WHIRL CHAMBER

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The invention relates to fuel injection type internal combustion engines in which air is compressed in the cylinder and the fuel ignited spontaneously. More particularly, it relates to an engine of this type, wherein the air is forced from the piston chamber into a separate whirl chamber, through a connecting duct, which opens into the whirl chamber tangentially, the fuel being injected into the whirl chamber.

In machines of this kind the air current circulating in the whirl chamber crosses the fuel jet also in the vicinity of the injection nozzle, where the fuel jet has just been released and still consists of relatively large drops of fuel. The air current deflects a part of these drops away from the direction of the fuel jet and drives them against the wall of the whirl chamber, where they remain hanging and become coked, so that they are prevented from yielding their energy.

This disadvantage is avoided, in accordance with the invention, by deflecting the air current circulating in the whirl chamber, either by a shield arranged, with reference to the direction of the air current, in front of that part of the fuel jet next to the injection nozzle; or by a shield arranged, with reference to the direction of the air current, behind the said part of the fuel jet, by which shield the fuel is deflected from the part of the wall of the whirl chamber which is in danger of being sprayed.

In the drawing, several embodiments of the invention are represented.

Fig. 1 is a vertical section through the upper portion of a cylinder showing a cylindrical whirl chamber with means for shielding the fuel jet;

Fig. 2 is a section on the line II—II of Fig. 1;

Fig. 3 is a vertical section of a spherical whirl chamber showing means for deflecting the air current from the wall of the whirl chamber;

Fig. 4 is a horizontal section on the line IV—IV of Fig. 3;

Fig. 5 is a vertical section of a pear-shaped whirl chamber showing means for deflecting the air current from the wall of the whirl chamber;

Fig. 6 is a vertical section of a pear-shaped whirl chamber similar to Fig. 5, but with a slight modification in the shape of the deflecting means.

In Figs. 1 and 2 is shown a cylindrical whirl chamber *a*, connected with a piston chamber *b* by a duct *d*, opening tangentially into the whirl chamber, so that the air compressed into the whirl chamber from the piston chamber circulates in the direction of the arrow. The fuel is injected into the whirl chamber through an injection nozzle *e*. A shield *f* stands, with reference to the direction of circulation of the air, in front of that part of the fuel jet nearest the injection nozzle. The shield deflects the air current around the fuel jet, in the vicinity of the nozzle. The air current therefore does not come in contact with that part of the fuel jet which has just been released and which still contains relatively coarse drops of fuel; consequently the coarse drops cannot be deflected from the direction determined by the injection. Only in the opposite end of the whirl chamber, where the fuel jet has been reduced to the finest fog, is it engaged by the air current and thereby distributed through the whole inner space of the whirl chamber.

In the embodiment shown in Figs. 3 and 4, a spherical whirl chamber *a'* has a communication duct *d'*. In place of a deflecting shield located in front of that part of the fuel jet nearest the injection nozzle, a deflecting shield *g* is provided behind the fuel jet, which deflects the air current after it has crossed the fuel jet and turns it sharply in the direction of the axis of the fuel jet and thereby at the same time away from the wall of the whirl chamber. Consequently the path of flight of the drops picked up by the air current is not directed along the path indicated by the dash line *x*, against the wall of the whirl chamber, but along the flat curve indicated by the dotted line *y*, approximately parallel to the direction of the jet and thence back into the cone of the fuel jet. Along the long path *y* the fuel drops have ample time to atomize into the finest fog.

In place of deflecting shield *g* the wall of the whirl chamber may have an abrupt change of direction, by which the deflection of the air current away from that part of the whirl chamber in danger of being sprayed is achieved. In Fig. 5 the whirl chamber a^2 passes over abruptly into a cylindrical chamber *h*, at the end where the injection nozzle is located, the cylindrical chamber being coaxial with the cone of the fuel jet. The wall of the cylindrical chamber, which is parallel to the axis of the fuel jet, deflects the air current in a direction parallel to the axis of the fuel jet and at the same time away from the wall of the whirl chamber.

In place of the cylindrical chamber *h* shown in Fig. 5, there can be used a hemispherical chamber, as shown in Fig. 6. The embodiment shown in this figure is otherwise the same as that of Fig. 5.

The invention is not limited to whirl chambers which, at the end of the compression stroke, have taken up approximately all of the combustion air, but it can also be used in a pre-ignition chamber of whirl chamber shape.

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