June 16, 1942. W. VOIT 2,286,658

COOLED INJECTION NOZZLE

Filed Jan. 18, 1940

Fig. 1

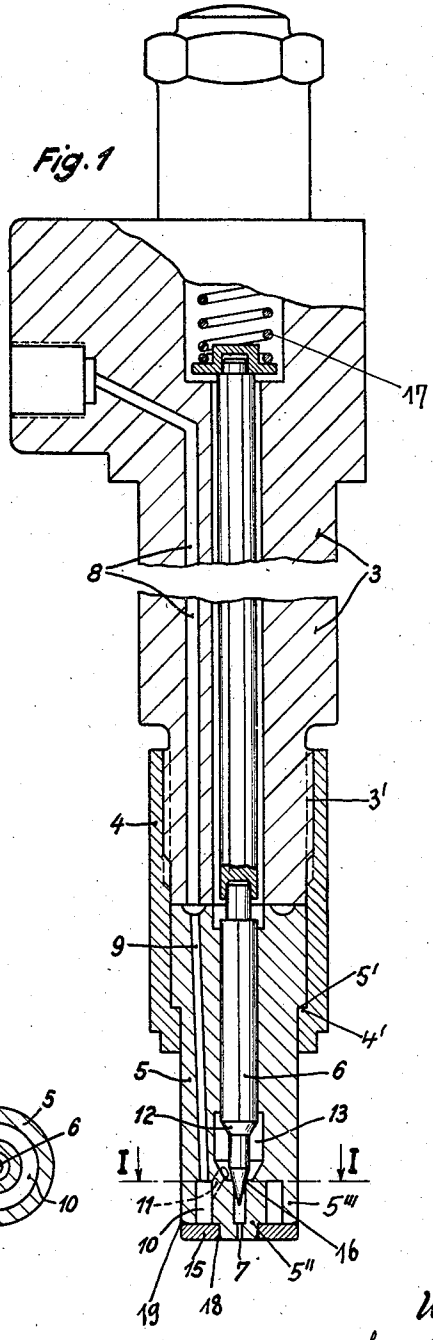
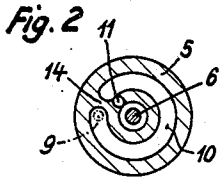


Fig. 2



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COOLED INJECTION NOZZLE

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5 Claims. (Cl. 299—107.1)

The present invention relates to cooled, fluid-controlled injection nozzles for internal combustion engines, of the type in which the nozzle body comprises a cooling chamber surrounding the seat for the nozzle needle and the nozzle jet and through which the fuel passes before injection thereof.

This arrangement offers an advantage over injection nozzles in which the cooling liquid passes through chambers separate from the chambers through which the fuel to be injected passes because no additional feed and discharge pipes are required which would occupy much space. Moreover, in the known nozzles of this type the cooling chamber has been arranged in the nozzle plate in the form of a helical channel which is very difficult to be made.

It is an object of the present invention to provide an injection valve of the kind referred to, which is easy to make and very efficient in operation.

With this and further objects in view, as may become apparent from the within disclosures, the invention consists not only in the structures herein pointed out and illustrated by the drawing, but includes further structures coming within the scope of what hereinafter may be claimed.

The character of the invention, however, may be best understood by reference to certain of its structural forms, as illustrated by the accompanying drawing in which:

Fig. 1 is a longitudinal section,

Fig. 2 a cross section on line I—I of Fig. 1.

Similar reference numerals denote similar parts in the different views.

Referring now to the drawing in detail, it will be seen that a nozzle body 5 is tightly held against a nozzle holder 3 by means of a tubular cap nut 4 which is screwed over a threaded portion 3' of the holder 3 and engages a shoulder 5' on the body 5, by means of an inward collar 4'. Guided in a central bore of the body 5 is a nozzle needle 6 the conical forward end of which cooperates with a valve seat 16 at the forward end of an annular control chamber 13 for opening and closing the injection channel or jet 7 in the body 5.

The fuel is fed through a bore 8 in the nozzle holder 3 and a bore 9 in the nozzle body 5 into a cooling chamber formed by an annular recess 10 cut into the forward end face of the nozzle body 5 and a cover 15. From the cooling chamber the fuel flows through an inclined bore 11 in the body 5 into the above mentioned control chamber 13 and acts upon the conical surface 12 of the nozzle needle 6, for lifting the needle against the action of the spring 17 and permitting injection of the fuel into the cylinder of the engine (not shown), through the injection channel 7.

The inner portion 5'' and the outer portion 5''' at the front end of the body 5 defining together the annular chamber 10 are connected by a narrow bar portion 14 left in the cutting operation, whereby the fuel is prevented from taking the short direct way from bore 9 to bore 11 and is compelled to flow through the annular cooling chamber 10. The disc 15 is tightly connected to the portion 5'', extending through its central bore, and to the portion 5''' of the body 5, soldered or welded seams 18 and 19, respectively. By way of alternative, screw joints (not shown), may be provided for this purpose which are well known in the art and need not be illustrated.

It will thus be understood that my novel injection valve comprises a groove or recess 10 on the forward end face of the nozzle body 5 which recess surrounds the seat 16 for the nozzle needle 6 and the wall of the nozzle jet 7 and communicates on the one hand with the feeding channel 9 for the fuel and, on the other hand, through a bore 11, with the control chamber 13 for the nozzle needle, while the open side of the recess is closed by a cover which advantageously is tightly soldered or welded to the nozzle body.

I declare that what I claim is:

1. A fuel injection nozzle for internal combustion engines comprising, a nozzle holder provided with a fuel inlet channel and having a flat inner end, a nozzle body provided with a fuel channel and having a flat end adapted to contact in fluid-tight relation the flat end of said holder, with said fuel channels in register, means including a screw sleeve through which said nozzle body extends and which engages a shoulder intermediate the ends of said nozzle body to secure said nozzle body tightly on said holder with a free end of said body extending unobstructed for some distance from said sleeve, a nozzle needle in said body, said body being formed to provide integral therewith an exit nozzle jet opening directly into the free end of said body and a seat for said needle, the face of the free end of said body being provided with a recess surrounding said seat and said jet and opening into said face, and a cover member tightly secured to the free end of said body and closing the open side of said recess to define a cooling chamber, said fuel channel in said nozzle body being connected to said cooling chamber and said cooling chamber being connected to said nozzle jet

whereby fuel is delivered first to said cooling chamber and then to said nozzle jet.

2. A fuel injection nozzle for internal combustion engines comprising, a nozzle holder provided with a fuel inlet channel and having a flat inner end, a nozzle body provided with a fuel channel and having a flat end adapted to contact in fluid-tight relation the flat end of said holder, with said fuel channels in register, means including a screw sleeve through which said nozzle body extends and which engages a shoulder intermediate the ends of said nozzle body to secure said nozzle body tightly on said holder with a free end of said body extending unobstructed for some distance from said sleeve, a nozzle needle in said body, said body being formed to provide integral therewith an exit nozzle jet opening directly into the free end of said body and a seat for said needle, the face of the free end of said body being provided with a recess surrounding said seat and said jet and opening into said face, and a cover member tightly secured to the free end of said body by soldering or welding and closing the open side of said recess to define a cooling chamber which communicates with said fuel channel and with said nozzle jet and valve seat by means of a bore and a control chamber provided in said nozzle body between said bore and said exit nozzle jet whereby fuel is delivered first to said cooling chamber and then to said nozzle jet.

3. A fuel injection nozzle for internal combustion engines comprising, a nozzle holder provided with a fuel inlet channel and having a flat inner end, a nozzle body provided with a fuel channel and having a flat end adapted to contact in fluid-tight relation the flat end of said holder, with said fuel channels in register, means including a screw sleeve through which said nozzle body extends and which engages a shoulder intermediate the ends of said nozzle body to secure said nozzle body tightly on said holder with a free end of said body extending unobstructed for some distance from said sleeve, a nozzle needle in said body, said body being formed to provide integral therewith an exit nozzle jet opening directly into the free end of said body and a seat for said needle, the face of the free end of said body being provided with a recess surrounding said seat and said jet and opening into said face, and a flat cover plate, provided with a central opening, tightly secured to the free end of said body by soldering or welding, with the nozzle jet extending through said central opening, said cover plate closing the open side of said recess to define a cooling chamber in the free end of said nozzle body, said fuel channel in said nozzle body being connected to said cooling chamber and said cooling chamber being connected to said nozzle jet whereby fuel is delivered first to said cooling chamber and then to said nozzle jet.

4. A fuel injection nozzle for internal combustion engines comprising, a nozzle holder provided with a fuel inlet channel and having a flat inner end, a nozzle body provided with a fuel channel and having a flat end adapted to contact in fluid-tight relation the flat end of said holder, with said fuel channels in register, means including a screw sleeve through which said nozzle body extends and which engages a shoulder intermediate the ends of said nozzle body to secure said nozzle body tightly on said holder with a free end of said body extending unobstructed for some distance from said sleeve, a nozzle needle in said body, said body being formed to provide integral therewith an exit nozzle jet opening directly into the free end of said body and a seat for said needle, the face of the free end of said body being provided with an annular recess surrounding said seat and said jet and opening into said face, and a cover member tightly secured to the free end of said body and closing the open side of said recess to define a cooling chamber which communicates with said fuel channel and with said nozzle jet and valve seat by means of a bore and a control chamber provided in said nozzle body between said bore and said exit nozzle jet whereby fuel is delivered first to said cooling chamber and then to said nozzle jet, the outlet of said fuel channel and the inlet of said bore to said cooling chamber being separated by a bar portion provided across the annular recess in said nozzle body.

5. A fuel injection nozzle for internal combustion engines comprising, a nozzle holder provided with a fuel inlet channel and having a flat inner end, a nozzle body provided with a fuel channel and having a flat end adapted to contact in fluid-tight relation the flat end of said holder, with said fuel channels in register, means including a screw sleeve through which said nozzle body extends and which engages a shoulder intermediate the ends of said nozzle body to secure said nozzle body tightly on said holder with a free end of said body extending unobstructed for some distance from said sleeve, a nozzle needle in said body, said body being formed to provide integral therewith an exit nozzle jet opening directly into the free end of said body and a seat for said needle, the free end of said body being provided with an annular flat face and said face being provided with a recess surrounding said seat and said jet and opening into said face, and a flat cover plate, provided with a central opening, tightly secured to the free end of said body by soldering or welding, with the exit nozzle jet extending through said central opening, said cover plate substantially covering the entire surface of said annular flat face and closing the open side of said recess to define a cooling chamber in the free end of said nozzle body with the periphery of said cover plate corresponding substantially to the periphery of the unobstructed free end of said nozzle body, said fuel channel in said nozzle body being connected to said cooling chamber and said cooling chamber being connected to said nozzle jet whereby fuel is delivered first to said cooling chamber and then to said nozzle jet.

WILLY VOIT.