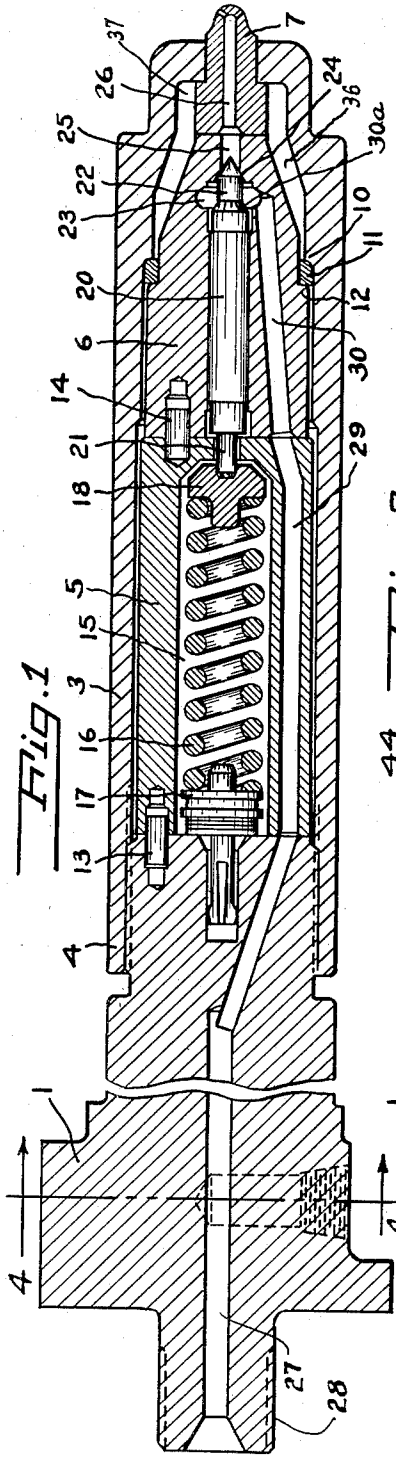
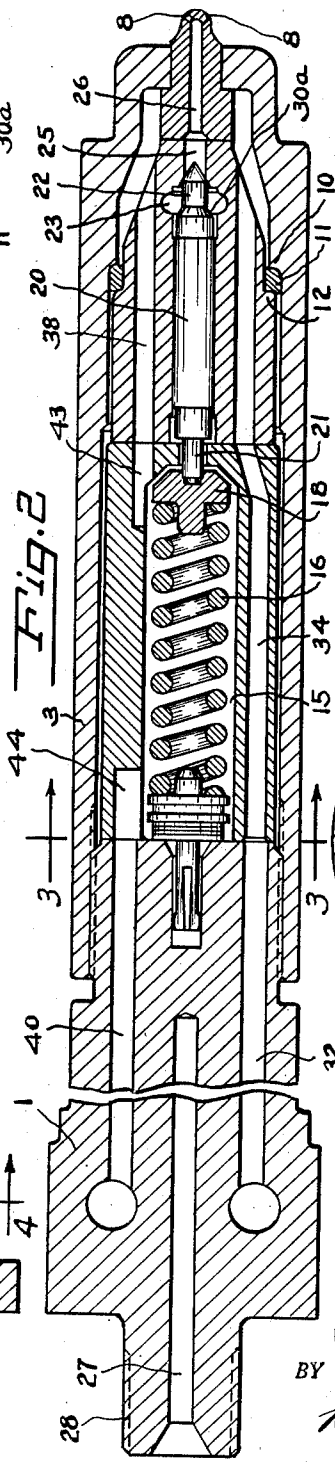
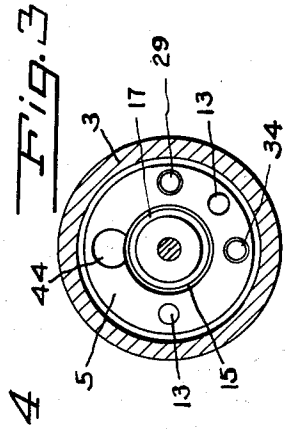
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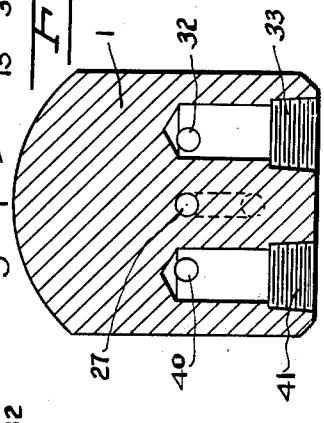
COOLED INJECTION NOZZLE

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COOLED INJECTION NOZZLE

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2 Claims. (Cl. 299—107.6)

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This invention relates to fuel injection apparatus for internal combustion engines and more particularly to nozzles for injecting liquid fuel into the combustion chambers of such engines.

An object of the present invention is to provide a novel, fluid cooled injection nozzle wherein the reciprocating masses are substantially reduced thereby reducing the impact stresses on the valve seat and providing a quicker acting valve and which embodies means for cooling the nozzle by a fluid coolant thereby allowing the use of a wider range of types of fuel without carbonizing or the forming of craters on the nozzle tips.

Another object of the invention is to provide a fuel injection nozzle of the type set forth above wherein it is possible to place the valve actuating spring in a position nearer to the nozzle tip without danger of injury thereto caused by heating from the combustion chamber.

A further object of the invention is to provide a novel, fluid cooled injection nozzle of the type set forth wherein efficient and effective cooling of the valve means and valve actuating means is accomplished.

A still further object of the invention is to provide a novel, fluid cooled injection nozzle which utilizes the coolant as a means of removing the leak-off fuel and wherein the leak-off duct is combined with the coolant duct thereby reducing the number of ducts required as well as the number of plumbing connections to the nozzle holder with a resultant reduction in cost of manufacture and installation of the device.

Other objects and advantages of the invention will be apparent from the following description taken in connection with the accompanying drawings and it will be understood that changes may be made in the details of construction and arrangements of parts shown and described, as the preferred form has been given by way of illustration only.

Referring to the drawings:

Fig. 1 is a sectional view showing a fuel injection nozzle embodying the invention.

Fig. 2 is a sectional view showing a nozzle having a vertical fuel inlet.

Fig. 3 is a sectional view taken on line 3—3 of Fig. 2 looking in the direction of the arrows.

Fig. 4 is a sectional view taken on line 4—4 of Fig. 1 looking in the direction of the arrows.

The embodiment of the invention illustrated, comprises a nozzle holder body 1 having the threaded portion 2 to which is secured the nozzle holder 3 which has a corresponding threaded portion 4 adapted to engage the threaded portion 2

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on the nozzle holder body 1 to retain the parts in assembled relation.

Within the nozzle holder 3 is positioned the nozzle actuating spring supporting member 5 and the valve support 6. The nozzle tip 7 is positioned adjacent the valve support 6 and has a portion adapted to extend through the end wall of the nozzle holder 3 with said portions having the nozzle spray openings 8 and said member 7 also is provided with the flange 9 adapted to engage the inner surface of the nozzle holder 3 for locating the member 7 in proper position adjacent the end of said nozzle holder 3.

The nozzle holder 3 is provided with an internal shoulder 10 on which is positioned the gasket 11 on which is supported the member 6 by means of the peripheral shoulder 12.

Locating pins 13 and 14 are provided between the nozzle holder 1 and spring support 5 and the valve support 6 respectively for locating these members in desired aligned relation.

Within the spring support member 5 is the spring chamber 15 adapted to contain the coil spring 16 having its opposite ends supported by the spring seats 17 and 18. The valve support 6 has the central opening 19 in which is slidably positioned the valve 20 which has a reduced portion 21 extending into an opening in the spring seat 18 and having at its opposite end the valve portion 22 extending through the fuel supply groove 23 and adapted to engage the valve seat 24 to shut off the flow of fuel through the fuel duct 25 to the fuel groove 26 in the nozzle tip 7 from which the fuel flows through the openings 8 into the combustion chamber.

The nozzle holder body 1 has the duct 27 extending from a threaded portion 28 which is adapted to be connected to a high pressure fuel supply line and said duct 27 is in aligned relation with the duct 29 in the spring support 5 which, in turn, is in aligned relation with the duct 30 in the valve support 6 whereby fuel may be supplied from the high pressure line to the fuel supply groove 23.

When fuel is supplied through the ducts 27, 29 and 30 from the high pressure fuel line from the fuel injection pump to the fuel supply groove 23, the pressure of such fuel upon the surface 30a of the valve 20 raises said valve off of its seat 24 and allows fuel to be sprayed into the combustion chamber through the duct 26 and openings 8 in the nozzle tip 7 until the fuel injection pump spills, thereby relieving the pressure in the high pressure line whereby the force of the coil spring 16 is greater than the fuel supply pressure and

urges said valve 22 upon its seat 24 to shut off the supply of fuel. This cycle is repeated during each surge of high pressure fuel from the fuel injection pump. The leak-off duct 31 having the connection 31a is provided in the nozzle holder body 1 to allow the removal from the spring chamber 15 of all fuel leaking past the valve 20 into said chamber.

In the past it has been customary to position the valve actuating spring 16 at a position remote from the valve 20 and to place a spindle or rod between said valve and said spring in order that the spring would not be injured by heat from the fuel combustion chamber, that is, the spring was usually placed as far as possible from the combustion chamber to avoid injury thereto from such heat. In the present invention this spindle has been eliminated and the spring has been placed adjacent the valve thus reducing considerably the reciprocating masses and also the impact stresses on the valve seat and providing a much quicker acting valve. This arrangement has been made practical by the use of the cooling arrangement whereby a fluid coolant, oil, is employed for cooling the spring, valve and nozzle which allows the positioning of the spring as previously described and also allows the use of a wider range of types of fuel oils such as heavier oils without carbonizing of the fuel in the nozzle or the forming of craters on the nozzle tips. The cooling arrangement comprises the inlet line 32 having the connection 33 adapted to be connected to the coolant supply line. The coolant line 32 in the nozzle holder body 1 is aligned with the line or duct 34 in the spring support 5 and with the line or duct 35 in the valve support 6 whereby liquid coolant may flow to the reservoir or area 36 surrounding the valve support 6 and the reservoir or area 37 surrounding the nozzle tip 7 and then be exhausted through the exhaust duct 38 in the valve support 6 and aligned duct 39 in the spring support 5 and the aligned duct 40 in the nozzle holder body 1 which has the connection 41 to which a coolant outlet line may be connected.

The invention shown is adapted solely for employing a fuel oil coolant and wherein the leak-off duct is combined with one of the coolant lines and the coolant is utilized as a means of removing the leak-off fuel. This arrangement reduces the number of ducts necessary and also the number of connections necessary to the nozzle holder body 1 and thus reduces the cost of the device as well as the installation costs, as it reduces the number of ducts necessary and one plumbing connection otherwise necessary for installation.

In this form of the invention the exhaust duct 38 is connected by a duct 43 in the spring support 5 to the spring supporting chamber 15 whereby the oil coolant in being exhausted from the nozzle tip will pass through the spring chamber 15 and through a second duct 44 in the spring support 5 to the exhaust duct 40 in the nozzle holder body and as such exhaust coolant oil passes through said spring chamber 15, it will remove or carry away with it any leak-off oil which passes the valve member 20 into the spring chamber 15.

From the foregoing it will be seen that I have provided simple, efficient and economical means for obtaining all of the objects and advantages of the invention.

Having described my invention, I claim:

1. In a device of the character described, a nozzle holder body, a nozzle holder aligned with and secured to said nozzle holder body, a valve supporting member and a spring supporting member in said nozzle body, a nozzle valve in said nozzle valve support and a spring for actuating said nozzle valve in said spring support, said valve actuating spring being located adjacent to said valve and connected therewith for actuating said valve, a fuel supply line extending through said nozzle body holder, spring support and nozzle valve support, said nozzle valve being adapted to control the flow of fuel through said fuel supply line and coolant inlet and exhaust lines extending through the body of said nozzle body holder, spring support and valve support, said coolant exhaust comprising two portions connected to said spring chamber adjacent opposite ends thereof, one allowing the passage of said coolant into said spring chamber and the other allowing the passage of said coolant from said spring chamber through the nozzle body holder to an exhaust line connected to said nozzle body holder.

2. In a device of the character described, a nozzle holder body, a nozzle holder aligned with and secured to said nozzle holder body, a valve supporting member and a spring supporting member in said nozzle body, a nozzle valve in said valve support and a spring for actuating said nozzle valve in said spring support, said valve actuating spring being located adjacent to said valve and connected therewith for actuating said valve, a fuel supply line extending through said nozzle body holder, spring support and valve support, said nozzle valve being adapted to control the flow of fuel through said fuel supply line and coolant inlet and exhaust lines extending through the body of said nozzle body holder, spring support and valve support, and a reservoir adjacent the end of said nozzle support and connected to said coolant inlet and exhaust lines, said coolant exhaust comprising two portions, one connecting said reservoir to said spring chamber for allowing the passage of said coolant into said spring chamber and the other extending from said spring chamber to an exhaust line for allowing the passage of said coolant from said spring chamber through the nozzle body holder to said exhaust line connected to said nozzle body holder.

HANS HOGEMAN.

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