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Hedges

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[54] **FUEL INJECTION NOZZLE ASSEMBLY**

[76] Inventor: **Harry O. Hedges**, P.O. Box 141, Marlton, N.J.

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[51] **Int. Cl.** **B05b 1/30**
[58] **Field of Search** ..... 239/533, 288.5, 453; 123/32 JV

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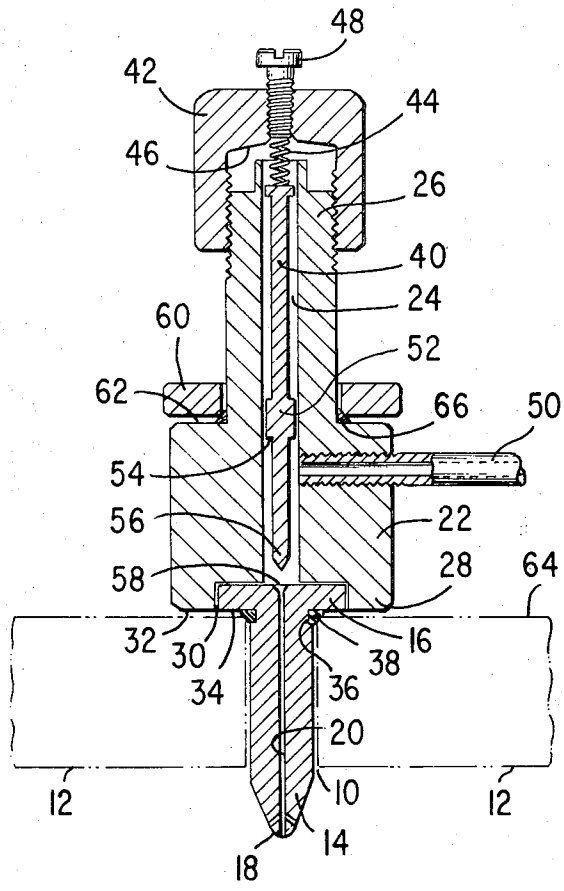
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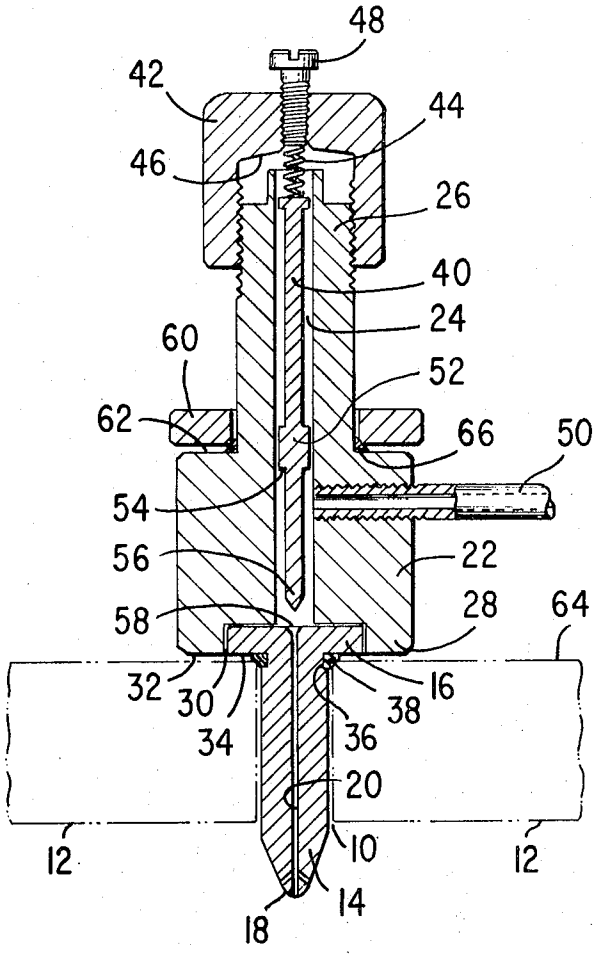
Primary Examiner—M. Henson Wood, Jr.
Assistant Examiner—Michael Y. Mar
Attorney, Agent, or Firm—Albert Sperry; Sperry and Zoda

[57] **ABSTRACT**

An improved fuel injection nozzle assembly is provided which may be easily removed from an engine block for replacement and maintenance purposes. A valve body may be provided having an axial passageway extending from a first axial end to a second axial end. A pintle may be axially, slideably disposed within the axial passageway and a coil spring may be disposed between a first axial end of the pintle and a fuel pressure adjustment nut, threadedly engaged over a first axial end of the valve body. An adjustment screw may be threadedly disposed axially through the adjustment nut for engagement with the spring, to make fine fuel pressure adjustments. A recess may be formed in a second axial end of the valve body to receive a correspondingly formed head of a spray nozzle and a clamping means may be provided for urging the body and nozzle toward an engine block bore hole. The valve body and nozzle are held in an operational posture solely in response to the action of the clamping member urging the two against the surfaces of the engine block, defining the bore hole.

4 Claims, 1 Drawing Figure




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FUEL INJECTION NOZZLE ASSEMBLY

BACKGROUND OF THE INVENTION

The present invention relates generally to fuel injection nozzles for internal combustion engines, and, more particularly; the invention relates to an improved fuel injection nozzle arrangement which is specifically designed to facilitate the removal and maintenance of a fuel injection system, within an operational internal combustion engine.

Over the years, industry has diligently endeavored to improve the design and operation of fuel injection apparatus for both spark and compression ignition engines. Today, fuel injection nozzles are compact and generally simple devices having a high degree of efficiency. One of the ever-present problems encountered by engineers in incorporating fuel injection devices within operational internal combustion engines, has been the seriously detrimental effects of high temperature cylinder gases which tend to freeze the components of fuel injection nozzles together, so as to hamper maintenance operations.

Engineers and mechanics have utilized seals and gaskets to prevent the cylinder gases from causing the above-mentioned freezing phenomenon. These seals may consist of a material such as copper, or the like, but, in spite of the presence of such sealing devices; cylinder gas seepage or breathing often occurs through the anular space surrounding the nozzle. These gases deposit a carbonaceous substance on the various parts comprising the nozzle assembly and this substance, in combination with the high temperatures, tends to cause an adherence between the various elements comprising the assembly. The carbonaceous deposits are not confined to the spray tip, alone, but form on whatever connecting means may be utilized to mount the nozzle within the cylinder head bore hole.

Since the removal of a fuel injection nozzle may occur quite frequently, as the removal might normally be associated with replacement of spark plugs in a spark ignition engine, it is important that the parts for mounting the nozzle within the cylinder head bore hole be easily separated and not become frozen together by such gas deposits.

Typically, existing fuel injection nozzle assemblies include the connection of nozzle and valve body elements by threaded fastening means, such as cap nuts, which threaded fastening elements are readily frozen.

Therefore, the freezing of fuel injection nozzle components, the difficulty of removing fuel injection nozzles and the resulting damage to nozzles during maintenance operation are problems which heretofore have not been solved. Indeed, the prior art indicates that this problem has not yet been fully recognized.

Accordingly, the inventor believes himself to be the first to fully recognize the problem and to devise a solution to the problem.

OBJECTS AND SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide an apparatus for preventing the freezing of fuel injection nozzle components when mounted within the head of an operational internal combustion engine.

It is another object of the present invention to provide an improved fuel injection nozzle for use within internal combustion engines.

It is still another object of the present invention to provide a fuel injection nozzle assembly which is uniquely uncomplicated.

It is yet another object of the present invention to provide a fuel injection nozzle assembly which is inexpensive to manufacture, to install and to maintain.

It is a major object of the present invention to provide a fuel injection nozzle assembly which presents a technical advance by solving many of the problems confronting industry today.

At least some of the above-cited objects are achieved by the provision of a fuel injection nozzle assembly for mounting within a bore hole of an engine block. A valve body is formed with a passageway extending from a first axial end to a second axial end thereof. A clamping member is provided and is operable to urge the valve member toward the engine block. A nozzle having a head portion at a first axial end and a spray tip at the second axial end, thereof, is slidingly disposed within the bore hole. A radial surface of the second axial end of the valve body is formed, with a recess communicating with the axial passageway of the valve body, for slideably receiving the head portion of the nozzle. The valve body and the nozzle are held in an operational posture solely in response to the urging of the clamping means.

BRIEF DESCRIPTION OF THE DRAWING

While the specification concludes with claims which particularly point out and distinctly claim the present invention, a preferred embodiment is set forth in the following detailed description, which may be best understood when read in connection with the accompanying drawing, in which:

FIG. **1** is a vertical sectional view of the preferred embodiment of the present invention, mounted within the bore hole of an engine block.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIG. **1**, a nozzle assembly according to present invention is mounted within the bore hole **10** of an engine block **12.**

A nozzle member **14** may be provided having an enlarged head portion **16** at a first axial end and a spray tip portion **18** at a second axial end, thereof.

An axially extending passageway **20** may be formed in the nozzle **14** to extend from the first axial end **16** to the second axial end **18** thereof.

The enlarged head portion **16** may generally comprise a flange like portion which may be of a circular radial cross section.

A valve body **22** may be provided having an axially extending passageway **24** extending from a first axial end **26** to a second axial end **28,** thereof. A recess **30** may be formed in a radial surface **32** of the axial end **28** of the valve body **22.**

The recess **30** is formed to slidingly receive the enlarged head portion **16** of the nozzle **14.** Accordingly, the precise radial cross sectional configuration of the enlarged portion **16** of the nozzle **14,** is not critical as long as it corresponds with the radial cross-sectional configuration of the nozzle receiving recess **30.**

The depth of the recess **30** and the thickness of the enlarged head portion **16** of the nozzle **14,** are preferably co-extensive so that the radially extending surface **32** of the valve body is closely aligned with the radially

extending surface **34** of the enlarged head portion **16** of the nozzle **14.**

The nozzle **14** may be formed with an anular groove **36** for generally receiving an O-ring seal **38.**

It is important to note that the nozzle is slidingly engaged within the bore hole **10** and that the enlarged head portion **16** is slidingly received within the recess **30** of the valve members **22.** Accordingly, no fastening means, such as cap nuts, are presented adjacent the bore hole **10** so as to be susceptible of accumulating carbonaecous deposits or of being frozen because of uneven expansion during heating.

A pintle **40** may be operationally and slideably disposed within the axial passageway **24** of the valve body **22.** An adjustment nut **42** may be threadedly mounted over the first axial end of the valve body **22** and may be operable to compress a helical spring **44,** or the like, between the first axial end of the pintle **40** and an inner surface **46** of the adjustment nut **42.** Additionally, a fine adjustment screw **48** may be provided to make precise adjustments in the spring pressure applied to the pintle **40.**

A fuel inlet conduit **50** may be provided for supplying fuel to the passageway **24** of the valve body at a point beneath an enlarged portion **52** of the pintle.

Operationally, fuel is introduced under pressure through the fuel inlet **50** and acts on the lower radial surface **54** of the enlarged portion **52** of the pintle **40** to move the pintle upwardly against the spring bias of the compressed spring **44.** This operation, in turn, removes the tip **56** of the pintle **40** away from a valve seat portion **58,** defining the first axial end of the passageway **20,** extending through the nozzle **14.** At this point, fuel is sprayed through the spray tip **18.**

A clamping member **60** may be fit over the first axial end of the valve body **22** to bear against radially extending surfaces **62** thereof.

In order to operationally mount the overall arrangement accord-ing to present invention, the nozzle **14** is slidingly disposed within the bore hole **10.** The O-ring seal **38** may be disposed about the nozzle and generally disposed within the anular groove **36,** before inserting the nozzle.

The valve body **22** is then fit over the nozzle with the enlarged head **16** of the nozzle slidingly engaged within the correspondingly sized and configured recess **30.** The clamping member **60** is then tightened down onto the engine block by means of machine screws, or the like, so that the clamping member **60** urges downwardly on the surfaces **62** to secure the body **22** and the enlarged head portion **16** of the nozzle between the clamping member **60** and the upper surface **64** of the engine block **12.** A cushioning element or gasket **66** may be disposed between the clamping element **60** and the radial surface **62** of the valve body **22.**

It can thus be seen that a fuel injection nozzle assembly has been herein provided which may be easily removed from an operational posture, within an engine block, by merely removing the nozzle clamp **60.** Upon removing the clamp **60,** the valve body **22** may be merely lifted upwardly from the nozzle **14** and then the nozzle may be slidingly disengaged from within the bore hole **10.**

In this manner, when the valve body **22** is lifted off from the nozzle **14,** the adjustment nut **42** may be removed from the first axial end of the body so that the pintle may be removed from either axial end of the valve body **22.**

Since there is no actual connection between the valve body and the nozzle, there is little tendency for the nozzle and the valve body to freeze together as currently happens when nozzles are attached to valve bodies by means of cap nuts, and the like.

Therefore, the inventor has provided a technical advance by way of an improved fuel nozzle assembly for use in an internal combustion engine which assembly prevents the freezing of the components of the nozzle assembly. The nozzle assembly according to present invention is uniquely non-complicated so as to be remarkably inexpensive to manufacture, to install and to maintain.

Therefore, the present invention solves at least some of the problems confronting the industry today.

SCOPE OF THE INVENTION

While what has been described herein is a preferred embodiment of the present invention, it is of course to be understood that various modifications and changes may be made therein without departing from the invention.

Accordingly, it is intended to cover in the following claims all such modifications and changes as may fall within the true spirit and scope of the present invention.

What I claim is:

1. A fuel injection nozzle assembly, mountable within a bore hole of an engine block, comprising:

a valve body;

a clamping member, operable to urge the valve body toward the engine block; a nozzle seperable from said valve body and having a head portion at a first axial end and a spray tip at the other axial end, being slideably disposable within the bore hole;

said valve body being formed with a passageway extending, generally, from a first axial end to a second axial end thereof;

a radial surface of said second axial end of said valve body being formed with a recess communicating with said axial passageway of said nozzle and being operable to slideably receive said head portion of said nozzle; and said valve body and said nozzle being held in a properly aligned, operational posture solely in response to the urging of said valve body toward said engine block by said clamping means.

2. Apparatus according to claim No. **1,** wherein:

said first axial end of said body is provided with a removeable cap member, covering the first axial end of said passageway extending through said valve body;

a pintle member is slidingly disposed within said axial passageway of said valve body; and

said pintel is slideably, removeable from either axial end of said valve body upon lifting said valve body from said nozzle and upon removing said cap from said first axial end of said valve body.

3. Apparatus according to claim No. **1,** wherein an annular groove is formed about said nozzle immediately adjacent said head portion, thereof; and

an O-ring seal is operationally disposed about said nozzle and is generally received within said anular groove.

4. Apparatus according to claim No. **1,** wherein:

said head portion is radially enlarged with respect to the remaining portion of said nozzle;

said radial cross-sectional configurations of said enlarged head and of said recess are substantially identical; and the axial thickness of said enlarged head is substantially co-extensive with the axial depth of said recess.

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