

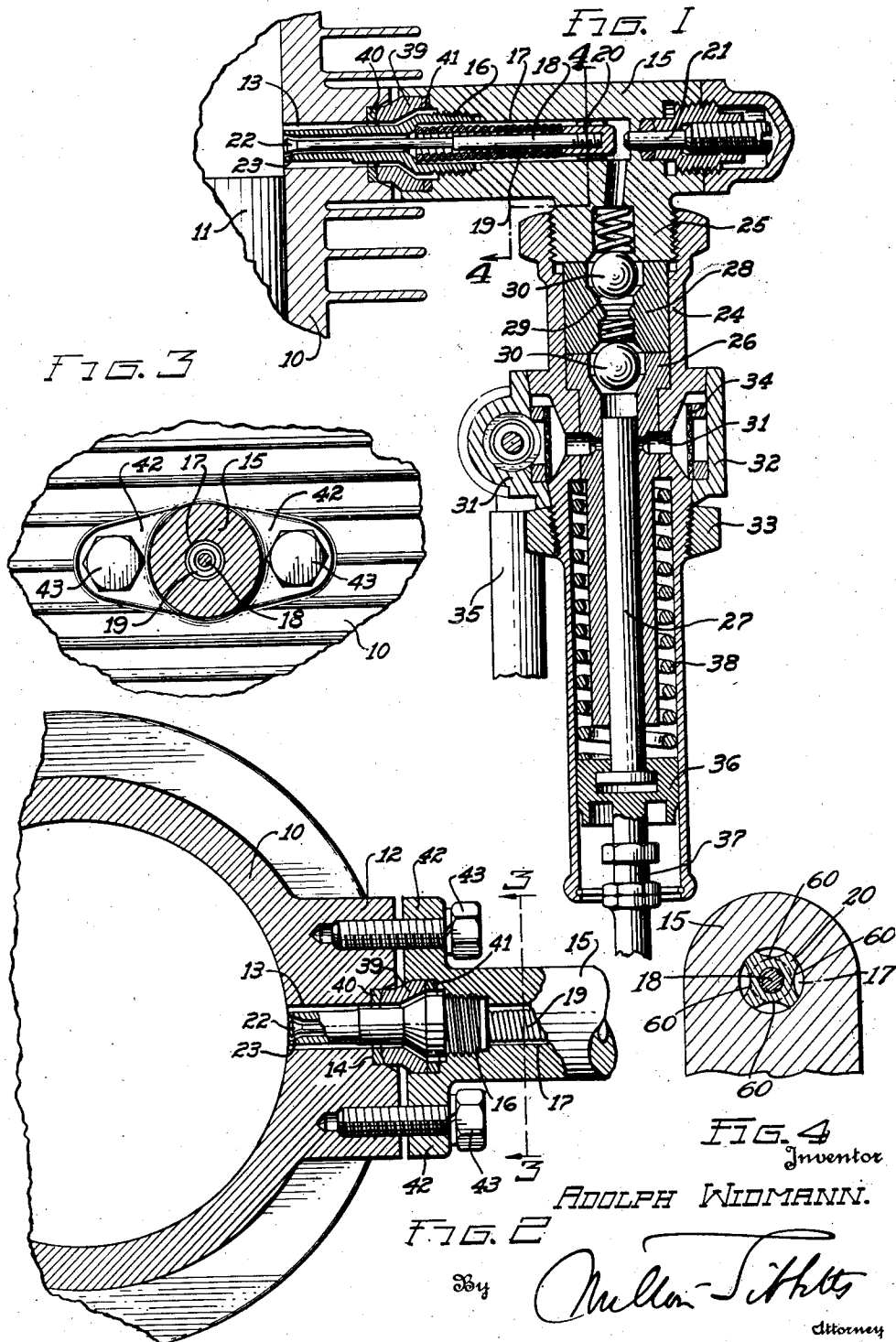
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INTERNAL COMBUSTION ENGINE

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INTERNAL COMBUSTION ENGINE

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4 Claims. (Cl. 299—107.1)

This invention relates to internal combustion engines and more particularly to engines of the fuel injection type.

One form of injection device which is now in commercial use includes a nozzle having a casing, bolted to an engine cylinder, which has associated therewith a detachable threaded extension projecting through the cylinder wall, a chamber extending through a portion of the casing and entirely through the extension and a spring controlled valve element having a head which is adjusted to control the fuel charges passing through the outlet orifice at the end of the chamber. It is essential that the valve adjustment is accurate because a minute variance causes a major change in both the fuel charge volume and its atomization, and it is customary to adjust the valve and the spring prior to the attachment of the nozzle casing to the cylinder. With the type of nozzle above referred to it is customary to employ sealing gaskets, and I have found that the variable compression of the gaskets, through the clamping of the nozzle extension thereagainst, will change the relation of the nozzle with the orifice when finally assembled with the cylinder.

An object of this invention is to provide a nozzle construction for engine fuel injection devices which can be attached to engine cylinders in a manner to maintain the valve adjustment in its desired position of regulation.

Another object of the invention resides in the manner of attaching a fuel injection device to a cylinder so that the valve adjustment will not be disturbed.

A further object of the invention is to provide a novel and improved form of injection device which can be attached to an engine cylinder without disturbing the relation of the valve with the orifice which it controls.

Other objects of the invention will appear from the following description taken in connection with the drawing, which forms a part of this specification, and in which:

Fig. 1 is a vertical sectional view of a fuel injection device associated with a fragment of a cylinder;

Fig. 2 is a fragmentary horizontal sectional view taken through the cylinder and the nozzle portion of the injection device;

Fig. 3 is a sectional view taken on line 3—3 of Fig. 2.

Fig. 4 is a sectional view taken on line 4—4 of Fig. 1.

Referring now to the drawing by characters

of reference, 10 designates a cylinder of a Diesel type of engine in which piston 11 is arranged to reciprocate. Suitable valve means (not shown) is provided for the introduction of air charges into the cylinder and for the discharge of exhaust therefrom. The cylinder is formed with a boss 12 with which the nozzle portion of an injection device is adapted to be associated and a passage 13 extends through the wall of the cylinder and the boss and is enlarged at its outer end 14 for a purpose which will be later described. The passage is arranged adjacent the head of the cylinder and fuel charges are projected therefrom during the compression of air in the cylinder by the piston 11.

An injection device is associated with the cylinder and comprises generally a nozzle portion and pump portion which are secured together and assembled as an integral unit with the cylinder. The nozzle section of the injection device includes the main casing 15 and an extension casing 16 which is screwed into the end of the main casing and arranged to extend through the passage 13 in the cylinder wall and boss. An axially extending chamber 17 is formed in the two nozzle casings and is adapted to receive the valve 18 and a coil spring 19 which is seated against a shouldered portion of the casing extension and nut 20 screwed upon the end of the valve stem. The nut 20 is slidably mounted in the casing and supports and centers the valve in the chamber 17. In the peripheral wall of the nut is formed grooves 21 which extend longitudinally of the chamber 17 to form passages through which the fuel oil can flow. An adjustable stop member 22 is screwed into the nozzle casing and limits the movement of the valve outwardly away from the cylinder so that it will not strike the nozzle casing. The valve is formed with a head 23 which controls the passage of oil charges through the tapered outlet end 24 of the nozzle chamber, it being understood that oil is free to move lengthwise of the chamber.

The pump section of the injection device includes a casing 25 which is screwed upon the depending neck 26 of the nozzle casing, and carried within the pump casing is a barrel 27 in which the plunger 28 is adapted to reciprocate. A spacing member 29 is arranged intermediate the flanged end of the barrel and the neck to secure the barrel axially within the pump casing. Passage 30 establishes communication between the barrel and the nozzle chamber and extends through the spacer 28 and the nozzle neck 25, and a pair of spring-pressed one-way

ball valves 30 are arranged in such passage to prevent return flow of oil into the barrel from the nozzle. The barrel and casing are formed with a plurality of aligned ports 31 which are enclosed by a housing 32 which is wedged in leak-proof relation upon the pump casing by the nut 33, and a suitable screen 34 encircles the interior of such housing. At one side of the housing there is attached a conduit 35 through which fuel oil is fed under a low pressure, and when the plunger 27 is in a position uncovering the ports 31 fuel oil will be forced into and fill the space in the barrel above the plunger.

A plunger guide 36 is slidably mounted in the lower end of the casing and a tappet member 37 is arranged to engage the plunger carrying guide for causing plunger strokes in a direction forcing oil charges through the nozzle. A coil spring 38 is arranged within the pump casing and engages the plunger guide to normally move the plunger into a position uncovering the ports 31. Suitable engine driven mechanism of a conventional type can be employed for actuating the tappet 37.

As before explained, when the plunger 27 is in a position uncovering the ports 31, the space in the barrel thereabove will be filled with fuel oil from the conduit 35. As the plunger moves toward the nozzle portion of the device fuel oil will be displaced from the barrel into the housing 32 through the ports 31 until such time as the plunger covers the ports 31, whereupon further movement of the plunger toward the nozzle will develop pressure behind the oil column thereabove and will displace a portion thereof through the nozzle into the cylinder, it being understood that the pressure developed will move the valve inwardly of the cylinder so that flow therepast can take place, and as shown in the drawing the device is illustrated in its fuel injecting position. The extent of the movement of the plunger 27 after closing the ports 31 will control the volume of the oil charges displaced into the cylinder from the nozzle.

As above stated, the casing extension 16 is screwed into one end of the main nozzle casing 15, and the manner of securing the nozzle to the cylinder is such that the adjusted relation of such casings is no way disturbed and therefore the regulation of the valve relative to the casing extension will not be effected through the attachment of the nozzle to the cylinder, and therefore the fuel charges delivered will be of the exact character desired when the nozzle was adjusted prior to its attachment to the cylinder.

In order to secure the nozzle to the cylinder so that there will be no change in the valve setting relative to the outlet orifice of the nozzle casing extension, I provide a spacer bearing sleeve 39 which telescopes the nozzle casing extension and is arranged to seat against a gasket 40 in the enlarged end 14 of the cylinder passage and also to extend interiorly of the end of the main nozzle casing so that it seats against a gasket 41 therein. The engaging faces of the bearing sleeve and the gasket 40 are formed spherical so that they will be in contact regardless of the angular disposition of the nozzle casing when fastened to the cylinder. The main nozzle casing is formed with oppositely extending flanges 42 through which extend bolts 43 which are screwed into the cylinder boss 12. Through means of the bolts 43 the flanges are drawn toward the boss so that the gaskets 40

and 41 are compressed by the sleeve 39 to form a leak-proof seal and a rigid support for the nozzle. It will be seen that the compression load exerted by the bolts is transferred to the flanges 42 and the sleeve and gaskets to the cylinder boss and, consequently, there will be no load transmitted to the nozzle extension through its threaded connection with the main nozzle casing. Consequently, the relation of the extension casing with the main nozzle casing is not disturbed during attachment of the device to the cylinder, and therefore the relation of the nozzle valve with the nozzle extension outlet orifice will retain the same adjustment as made prior to the association of the device with the cylinder. Heretofore the nozzle extension received the load and transmitted it to the boss so that there was a shifting of the extension relative to the main nozzle casing upon the attachment of the device to the cylinder, and such change in the relation also changed the valve setting so that the charges delivered thereby were not of the character desired.

It will be seen that the nozzle described and its attachment to the cylinder eliminates any change in the valve setting and, consequently, the device can be adjusted prior to its attachment with the assurance that the charges delivered are of the exact volume desired.

While I have herein described in some detail a specific embodiment of my invention, which I deem to be new and advantageous and may specifically claim, I do not desire it to be understood that my invention is limited to the exact details of the construction, as it will be apparent that changes may be made therein without departing from the spirit or scope of my invention.

What I claim is:

1. In an engine in which a fuel injection nozzle casing is clamped to a cylinder wall and has a valved extension projecting through a two diameter opening therein with clearance, sealing means comprising a gasket encircling the extension with clearance and seated in the larger portion of the opening in the wall, another gasket encircling the extension with clearance and seated against the casing, and a sleeve encircling the extension with clearance and engaging the gasket at its ends, said sleeve being of sufficient length to space the casing from the outer surface of the cylinder wall.

2. In an engine in which a fuel injection nozzle casing is clamped to a cylinder wall and has a valved extension projecting through a two diameter opening therein with clearance, sealing means comprising a gasket seated in the larger portion of the wall opening, said gasket having a concave outer end face, another gasket seated against the casing, and a sleeve intermediate the gaskets and having a convex end engaging the concave gasket face, said gaskets and said sleeve surrounding the nozzle extension with clearance.

3. In an engine in which a flanged fuel injection nozzle casing has a valved extension projecting into a two diameter opening in a cylinder wall with clearance, fastening and sealing means comprising a gasket encircling the extension with clearance and seated in the larger portion of the opening in the wall, another gasket encircling the extension with clearance and seated against the casing, a sleeve encircling the extension with clearance and engaging the gaskets at its end, said sleeve being of sufficient length to space the casing from the cylinder wall, and fastening means engaging the casing flanges and

the cylinder wall, said fastening means holding the gasket tightly seated and in sealed engagement with the sleeve irrespective of the angle of the extension in the wall opening.

4. In an engine in which a flanged fuel injection nozzle casing has a valved extension projecting into a two diameter opening in a cylinder wall with clearance, fastening and sealing means comprising a gasket encircling the extension with clearance and seated in the larger portion of the opening in the wall, another gasket encircling

the extension and seated within the nozzle casing, a sleeve intermediate the gaskets and encircling the extension with clearance, said sleeve being of sufficient length to space the casing from the outer cylinder wall, and fastening means engaging the casing flanges and the cylinder wall, said fastening means holding the gaskets and the sleeve together in compression irrespective of the angle at which the extension lies in the wall opening.

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