April 6, 1948. W. O. LUM 2,439,257

FUEL ATOMIZING NOZZLE

Filed March 15, 1944

Fig. 1.

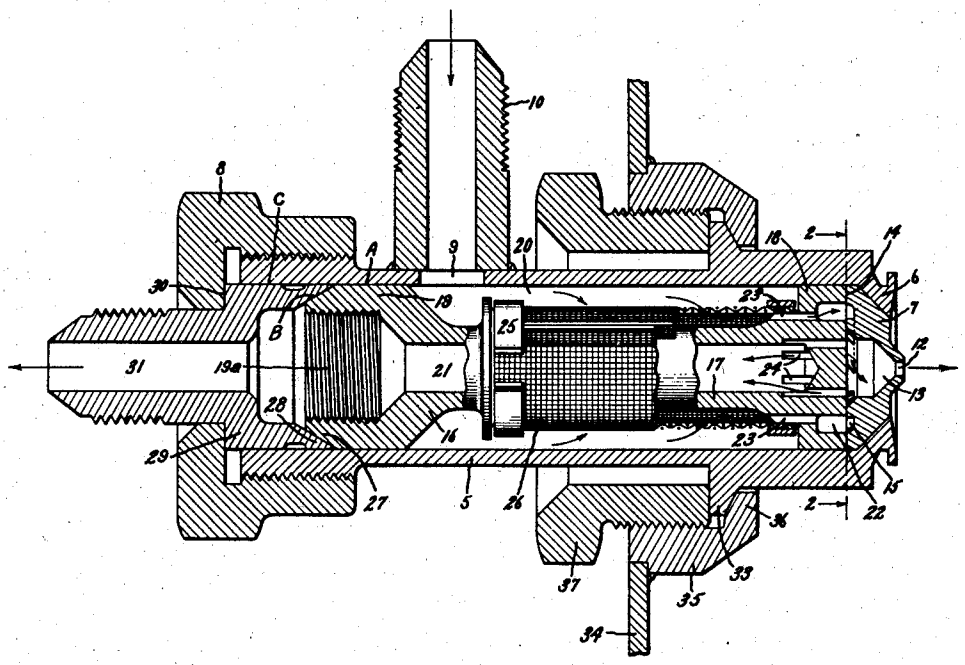


Fig. 2.

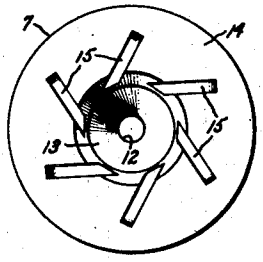
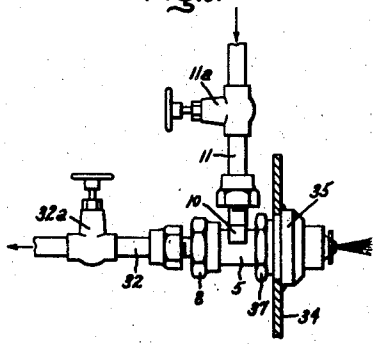


Fig. 3.



Inventor:
Walter O. Lum,
by Harry E. Dunborg
His Attorney.

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FUEL ATOMIZING NOZZLE

Walter O. Lum, Schenectady, N. Y., assignor to General Electric Company, a corporation of New York

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2 Claims. (Cl. 285—96.3)

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The present invention relates to fuel atomizing nozzles such as one used for supplying fuel to combustion chambers.

The object of my invention is to provide a fuel atomizing nozzle of improved construction and for a consideration of what I believe to be novel and my invention, attention is directed to the following specification and to the claims appended thereto.

In the drawing, Fig. 1 is a longitudinal sectional view of a fuel nozzle embodying my invention; Fig. 2 is a detail face view of an atomizing head looking in the direction indicated by section line 2—2, Fig. 1, and Fig. 3 shows the fuel atomizing nozzle connected into a piping system.

Referring to the drawing, 5 indicates an outer casing or barrel of the nozzle assembly. At its discharge end the outer casing is provided with an inwardly extending flange 6, the inner surface of which tapers outwardly to form a conical seat for the end of a spray nozzle tip 7. The other end of the longitudinal bore in casing 5 is open and at such end the casing is threaded on its outer surface to receive a clamping or coupling member 8. Casing 5, at a point intermediate between its ends, is provided with a fuel admission opening 9 to which is attached by welding or other suitable means a side connection nipple 10 threaded on its exterior, adapting it to have connected to it a pipe 11, as shown in Fig. 3. In pipe 11 is a suitable regulating valve 11a.

Spray tip 7 has a discharge opening 12, and a vortex whirl space 13. Its inner end is a flat surface 14 provided with tangentially extending grooves 15.

Inside outer casing 5 is an inner casing or cylindrical member 16 comprising a central tube portion 17 of less diameter than casing 5, having a head 18 at its discharge end and a head 19 at its other end, the two heads engaging the inner surface of the bore in casing 5. Thus there is provided an annular fuel admission chamber 20 with which opening 9 connects and a central axially extending fuel passage or bore 21. Head 18 has a flat end surface which fits against the inner flat surface of spray tip 7 to hold it in place. In the flat surface of head 18 is an annular groove 22 which connects with tangential grooves 15 and which is connected by axially extending holes 23 to annular fuel admission chamber 20. Also in tip 18 are a number of spaced passages 24 which connect whirl chamber 13 with bore 21. Surrounding tube portion 17 and fastened thereto by clips 25 is a suitable screen 26 which serves as a strainer for separating dirt from the fuel.

Head 19 terminates short of the end of casing 5 and is provided with a conical end surface 27 over which fits a flared conical end 28 on a cylindrical sealing member 29. Member 29 is of a diameter to fit closely in casing 5 and is provided with a shoulder 30 against which the flange of clamping member 8 engages. Member 29 has an axial discharge passage 31 and its outer end is threaded to adapt it to have connected to it a discharge pipe 32 in which is a regulating valve 32a. The inside of head 19 is threaded as shown at 19a to receive a threaded tool for removing the inner casing. The threads may be of a size to have screwed into them the threads on the outer end of member 29 so that if desired member 29 may be used as a tool for removing the inner casing.

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Adjacent to the discharge end of outer casing 5 and formed integral with it is a flange 33 for use in fastening the nozzle to the wall of a combustion chamber. In Fig. 1, 34 indicates a wall of a combustion chamber provided with an opening in which is fixed by a weld or other suitable means, a nipple 35 having an inturned flange 36 at its free end with which flange 33 may engage, the discharge end of the nozzle projecting through the nipple into the combustion chamber. Nipple 35 is threaded on its interior to receive a coupling member 37 for clamping flange 33 against flange 36.

In operation, fuel oil, regulated by valve 11a, is supplied under suitable pressure to annular chamber 20 from whence it flows through holes 23, annular groove 22, and tangential grooves 15 to whirl chamber 13. The fuel oil pressure may be of the order of 400 pounds per square inch, for example. From chamber 13, a part of the fuel oil is sprayed through opening 12 into the combustion space and the remainder is discharged through holes 24 to chamber 21 from whence it flows out through return line 32. Valve 32a in line 32 is adjusted to regulate the amount of fuel discharged from discharge chamber 21 to the return line and hence the amount of fuel supplied to the combustion space. Thus the load on the combustion chamber can be adjusted by adjusting valves 32a and 11a.

In a fuel nozzle of this type, it is important that leakage be prevented between the respective chambers, and also from the fluid passages inside the nozzle assembly to the exterior thereof.

One important feature of my construction is the sealing arrangement whereby a single part, the member 29, serves as a fitting for the pipe line connection and a means of providing a pressure seal. The arrangement is such that the angle on the outside of the tapered end of head 27 is a few degrees greater than the angle of the inner

tapered surface on the inner end of member 29. As a result, when member 29 is forced firmly into position by screwing up the clamping member 8, the annular inner end of member 29 is forced outwardly and wedged tightly between the tapered surface of head 18 and the inner surface of the bore in outer casing 5. This serves effectively to seal the seam or leakage path A between the contact surfaces of head 29 and the adjacent casing 5, and the leakage path B between the conical surfaces. Also, the construction is sealed against leakage along path C between the outside surface of member 29 and the inner surface of the bore in casing 5. Thus it will be seen that the arrangement provides a "three-way seal" between the separate fluid passages 20 and 21, and between each of said passages and the exterior of the nozzle assembly. The member 29 serves also to hold in position the inner cylinder or barrel 16 and to clamp it firmly against the spray tip 7.

Another feature of the construction is the use of a union type of attachment for fastening the spray nozzle to the combustion chamber so that the side connection 10 may be left in any convenient position without reference to the threaded portion of the nozzle holding means. This result is accomplished by providing an annular flange 33 on the outer casing 5 which is clamped against an annular flange 36 which forms a part of the combustion chamber, the two flanges being clamped together by the coupling member 37.

It will be seen that my improved spray nozzle comprises few parts, is simple in construction, easy to assemble and disassemble, and capable of being manufactured at low cost. At the same time a structure is provided in which leakage past the respective seams between the parts is effectively prevented by a single sealing and clamping member.

In accordance with the provisions of the patent statutes, I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof, but I desire to have it understood that the apparatus shown is only illustrative and that the invention may be carried out by other means.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In a casing arrangement for a device of the type described, the combination of an outer casing member with a cylindrical bore opening through one end thereof and having a portion defining a surface projecting inwardly into the bore at a location remote from said end, an inner cylindrical casing member disposed within the bore and spaced therefrom to define therewith a first fluid flow passage, fluid conduit means connected to said passage, the inner casing member having associated therewith an end member engaging said inwardly projecting surface, a longitudinal bore opening through the end of the inner casing member adjacent the open end of said first bore and forming part of a second fluid flow path, and a portion adjacent said open bore end with a cylindrical outer surface slidably engaging the inner surface of the first-mentioned bore, said portion having also a conical end surface with its smallest portion nearer the end of the inner casing member, said conical portion being within the bore and axially spaced from the open end of said first bore, a cylindrical sealing member disposed within the open end of the first bore and having an outer surface slidably engaging the inner surface of the bore and an annular end portion with a conical end surface adapted to surround and sealingly engage the conical end surface of the inner casing member, and clamping means associated with the outer casing for forcing the sealing cylinder member axially against the end of the inner casing member, whereby said conical surfaces are forced into tight sealing engagement to prevent fluid leakage between said first and second flow paths and the annular end portion of the sealing cylinder is caused to expand into tight sealing engagement with the inner surface of the first bore to prevent fluid leakage from both fluid paths to the exterior of the outer casing.

2. In a casing arrangement for a device of the type described, the combination of an outer casing with a cylindrical bore therethrough and having an end portion forming a circumferential inwardly-extending surface, an end member within the bore and having an annular surface in sealing engagement with said circumferential surface, an inner casing member disposed within the bore, the inner casing member also having a longitudinal bore therethrough and having a first end portion in engagement with said end member for forcing it into sealing engagement with said outer casing end portion, the other end of the inner casing member having a cylindrical head slidably engaging the inner surface of the outer casing bore, said head having a conical surface formed on that end of the head remote from said end member, the smaller portion of the conical surface being nearer the extreme end of the head and the inner casing member having a portion spaced from the outer casing bore to define therewith an annular chamber, walls defining a fluid conduit communicating with said chamber, and sealing means for preventing leakage between said chamber and the longitudinal bore of the inner casing member and from said chamber and bore to the exterior of the outer casing, the sealing means including a sealing cylinder with an annular end portion defining a conical surface surrounding and sealingly engaging the conical surface of the cylindrical head of the inner casing member, and clamping means associated with the casing for forcing the sealing cylinder axially against the head whereby the inner casing member is biased against said end member, the end member is in turn biased against said circumferential end surface of the outer casing and the annular end portion of the sealing cylinder is wedged into sealing engagement with both the conical surface of said head and the inner surface of the outer casing bore.

WALTER O. LUM.

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