

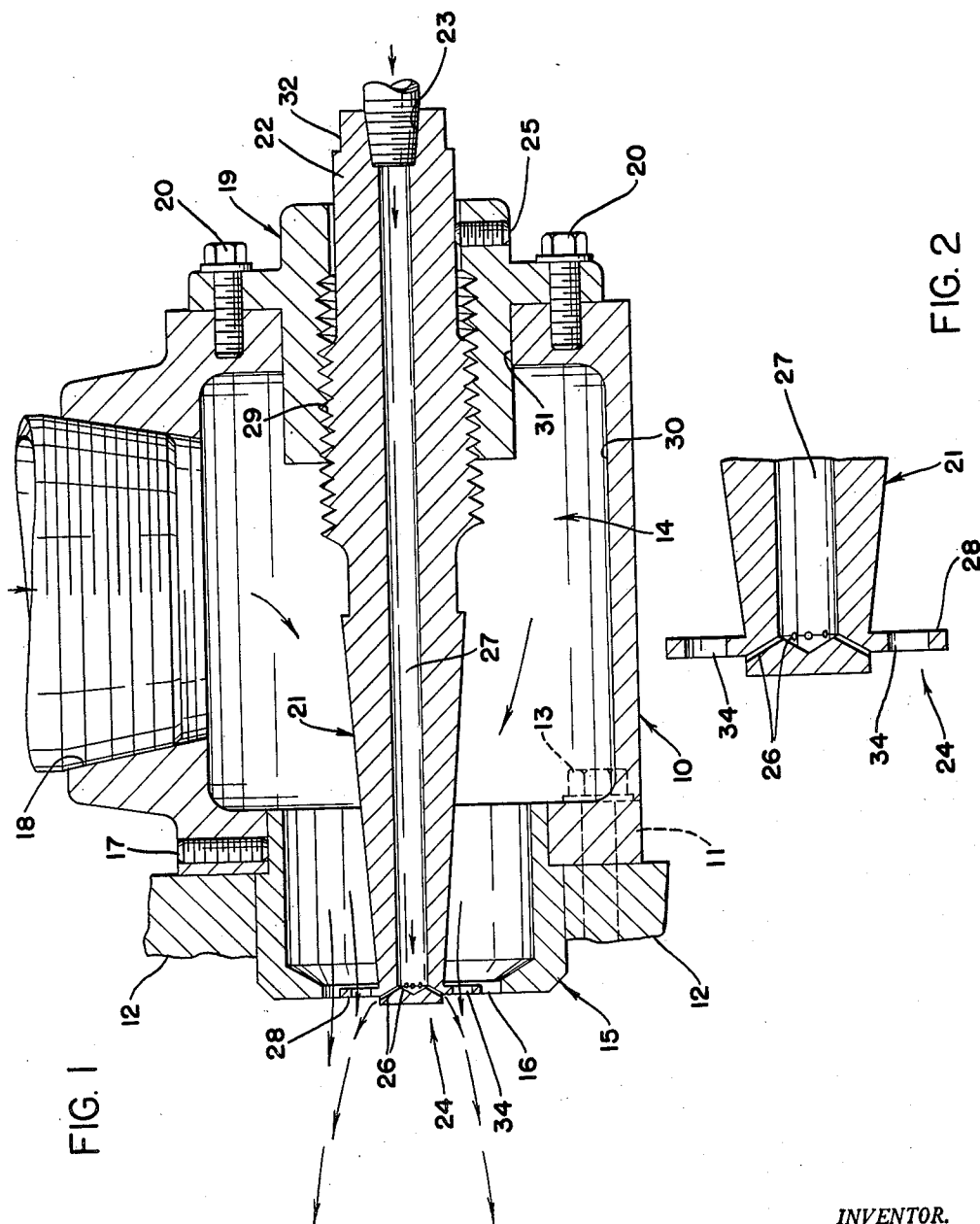
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LIQUID FUEL ATOMIZER

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2 Sheets-Sheet 1



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FIG. 3

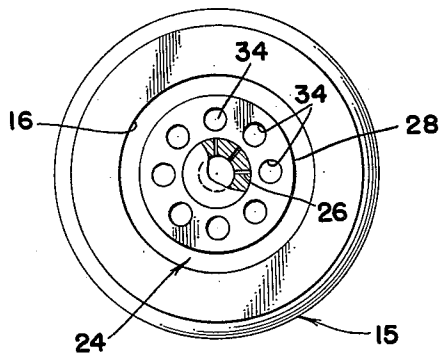


FIG. 4

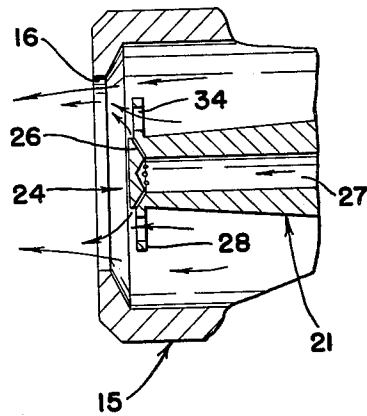


FIG. 5

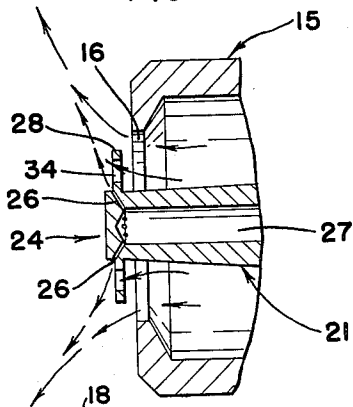


FIG. 6

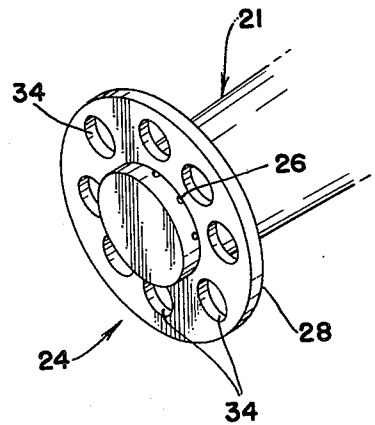
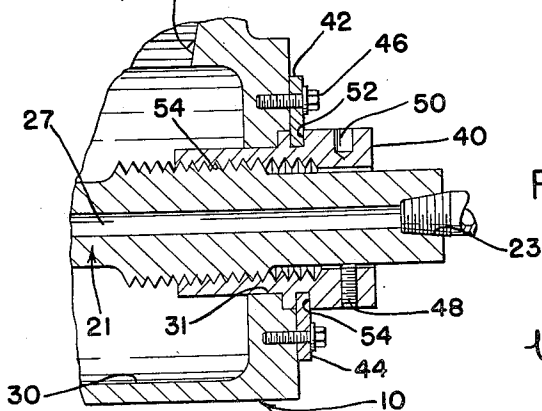


FIG. 7



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LIQUID FUEL ATOMIZER

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4 Claims. (Cl. 239-417)

This invention relates generally to devices for atomizing liquid fuel, and more particularly, to atomizing means for providing a finely divided, highly combustible mixture of liquid fuel and air.

Many of the liquid fuel atomizers, heretofore known, have provided means for atomizing liquid fuels, such as oil and other hydrocarbon liquids, into finely divided particles, and mixing the particles with air so as to produce a combustible mixture. Certain of these atomizers require that the fuel be injected into the air stream in very small jets under high pressure, the general organization of these atomizers being such that the tiny jet openings eventually become clogged with impurities normally expected to be found in hydrocarbon fuels.

Although some of the heretofore known atomizers have produced a fair degree of atomization of the liquid fuel, as far as I am aware, no atomizing devices other than those disclosed in my United States Patent Number 2,532,851, and in my co-pending United States patent application Number 25,271, filed April 28, 1960, now forfeited, have been capable of producing an atomized liquid fuel and air mixture which when burned produces substantially complete combustion. Furthermore, I have found that the present invention provides improved atomization of liquid fuel and air than is obtainable with either of my earlier atomizers.

It is, therefore, a principal object of the present invention to provide a novel and improved liquid fuel atomizer which is adapted to provide a liquid fuel air mixture producing more complete combustion than has been hitherto attainable.

It is another object of my invention to provide a novel and improved liquid fuel atomizer which has superior resistance to clogging by solid matter residues in fuel oils, and which maintains a more even flow of fuel oil on low turndown, as well as better atomization at high ranges of operation.

It is another object of my invention to provide a liquid fuel atomizer in which the liquid fuel is discharged from the end of a nozzle having an improved diffusing member.

A still further object of the invention is to provide a liquid fuel atomizer having a novel fuel diffuser tip assembly which may be adjusted to obtain both narrow and wide cones of air and fuel mixtures.

Other objects and advantages will be evident from the following description of a preferred form of the invention. The features of this invention which are believed to be novel are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and use, together with further objects and advantages which will become obvious to those skilled in the art, may best be understood by reference to the following description taken in conjunction with the accompanying drawings in which:

FIG. 1 is a longitudinal section view of the improved fuel atomizer showing the fuel discharge tip at its zero or normal position;

FIG. 2 is an enlarged fragmentary view of the fuel discharge tip;

FIG. 3 is an enlarged end elevation of the fuel discharge tip;

FIG. 4 is a fragmentary longitudinal section view of the improved fuel atomizer showing the fuel discharge tip retracted within the nozzle;

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FIG. 5 is a fragmentary longitudinal section view of the improved fuel atomizer showing the fuel discharge tip forward of the nozzle; and

FIG. 6 is a perspective view of the novel diffuser tip assembly illustrated in the preceding five figures.

The FIGURE 7 is a fragmentary sectional view of a portion of the improved fuel atomizer, illustrating another means for adjustably mounting the fuel discharge tip.

The liquid fuel atomizer embodying the present invention is adapted to be used in conjunction with a burner or other means for producing substantially complete combustion of fuel and air mixtures discharged from the atomizer. The atomizer includes in its general organization a housing 10, having an interior wall surface 30 which forms a longitudinal air chamber or passage 14 coaxial with the housing. The housing is adapted to be secured to the burner wall 12 by means of lugs 11 and screws 13. Attached to the front end of the housing 10 (the left hand portion of FIG. 1) is secured an orifice or nozzle member 15 having a tapered or converging bore 16 communicating with the chamber 14. Orifice 15 is removably secured to the housing 10 by means of set screws shown at 17. Depending on the particular use to which the atomizer may be adapted, orifices of different sizes may be secured in housing 10. At one side of the housing 10, an air inlet opening 18 is provided in the housing wall, preferably at right angles to the longitudinal axis of the housing. The inlet opening is preferably threaded, as shown, so as to receive the threaded end of a suitable air inlet which may be engaged therein for supplying air under pressure to chamber 14. The air pressure used may vary from an ounce or so to several pounds, depending on the viscosity of the fuel oil being used. The lower the viscosity of the fuel oil, the lower the air pressure required for atomization.

An opening 31 is formed in the housing 10 opposite the orifice opening 16, and coaxial with said orifice opening 16 and the chamber 14. Secured within the opening 31 is abushing 19 attached to housing 10 by means of suitable screws 20. Bushing 19 is threaded as at 29 to receive the fuel tube 21. Preferably, the fuel tube 21 projects forwardly from bushing 19 and is coaxial with the orifice opening 16 and chamber 14. The fuel tube 21 is also threadably received in bushing 19 and projects rearwardly from the housing 10 and bushing 19, as shown at 22. A threaded fuel inlet 23 is provided at the rear of the fuel tube.

My improved fuel diffuser member of this invention is illustrated generally at 24, and is formed at the front end of the fuel discharge tube 21. Diffuser member 24 may be adjusted longitudinally with respect to the orifice opening 16 by shifting the fuel tube 21 along the longitudinal axis of the housing 10, so that the spread of the air and fuel mixture being discharged from the nozzle may be varied from a relatively wide cone resulting from the position of the diffuser member shown in FIGURE 1, to a substantially wider cone as shown in FIGURE 5. A relatively narrow cone may be obtained by adjusting the fuel tube and diffuser in the manner shown in FIGURE 4. The general shape of the cone obtainable by adjustment of the fuel tube and diffuser is illustrated by the arrows associated with FIGURES 1, 4 and 5. The position of the diffuser assembly 24 may be adjusted relative to the orifice opening 16, by loosening set screw 25, (FIG. 1), and rotating the fuel tube 21 within the threaded bushing 29 to the desired position. This adjustment may be made by means of a suitable tool engaging the tool pads 32. The fuel tube may then be secured in the desired position by readjusting set screw 25.

Another means for adjustably mounting the fuel tube 21 is illustrated in FIGURE 7. The embodiment of FIGURE 7 is similar to the embodiment of FIGURE 1 with the exception of the structure for mounting the fuel discharge tube. In this embodiment, a sleeve 40 is utilized, in place of the bushing 19, into which the fuel discharge tube 21 is threaded. The outer surface of sleeve 40 is not threaded, but is provided with a smooth surface which fits snugly within opening 31. Sleeve 40 is secured to housing 10 by means of a split ring, shown at 42, 44, which is adapted to fit within groove 52, 54 formed in each portion 42, 44 of the split ring. Suitable screws 46, threadably received in housing 10, may be used to secure the split ring and the sleeve 40 to the housing 10. A set screw 48, similar to set screw 25 of FIGURE 1, is utilized to firmly hold the threaded fuel discharge tip within the threaded inner surface 54 of sleeve 40.

The position of the diffuser assembly 24 may be adjusted relative to the orifice opening 16 in the embodiment of FIGURE 7 in the following manner. Set screw 48 is loosened and a suitable tool is placed in hole 50 formed in sleeve 40. By rotating sleeve 40, fuel discharge tip 21 may be adjusted relative to the orifice opening 16. The adjustment occurs because the sleeve 40 does not move, longitudinally, as it is rotated, but is effective to move the fuel discharge tip which is threaded within the sleeve. By providing fuel inlet 23 with a flexible connection, the embodiment of FIGURE 7 permits adjustment of the fuel discharge tip without disconnecting the fuel inlet. This is not the case, however, if the fuel tube itself were rotated, as, for example, in accordance with the embodiment of FIGURE 1.

The diffuser assembly 24 is secured to or made integral with one end of fuel tube 21. The assembly comprises a circular plate 28 having a plurality of holes 34 spaced near the circumference of the plate 28. Circumferentially spaced passageways 26 have openings located in front of plate 28 and are spaced near the junction of plate 28 with the outer surface of fuel tube 21. The passageways 26 extend radially inwardly from the surface of the fuel tube into the bore 27, in the manner illustrated at FIGURES 1-3. Holes 34 are provided for the purpose of permitting the fuel oil passing outwardly from bore 27 through channels 26 to be contacted on all sides by an air stream flowing through the nozzle chamber and past the diffuser tip. This causes the fuel jets from channels 26 to be highly agitated and atomized by the air stream producing very finely divided particles of fuel mixed with the particles of air to form a mixture which is substantially entirely combustible, and leaving no liquid fuel to drip from the channels 26.

Because of the extreme agitation and atomization of the fuel discharging through the diffuser, the fuel may be fed by gravity flow means from a reservoir through the fuel tube 21, and need not be injected under high pressure as is required by other prior art devices. The size of the passageways along with the agitation at the mouths of the passageways 26 substantially prevents deposits of carbon and impurities from the fuel from collecting and clogging the passageways.

While herein shown and described are preferred embodiments of the invention, it is contemplated that the invention is susceptible of embodiments in other forms, and is applicable to a variety of situations which will be readily suggested to those skilled in the art upon reading the foregoing specification. The construction, the operation and use, and a preferred embodiment thereof, and the advantageous new and useful results obtained thereby having been described, the new and useful constructions and reasonable mechanical equivalents thereof obvious to those skilled in the art, are set forth in the appended claims.

I claim:

1. In a liquid fuel atomizer device including a housing having an air inlet port and an orifice outlet port, each

communicating with the interior of said housing, a body member movably mounted in said housing having a fuel inlet, a fuel discharge tip communicating with said fuel inlet and located at said orifice outlet, the improvement comprising: said fuel discharge tip having circumferentially spaced discharge channels in the surface of said body member sloping radially inwardly from in front of diffuser plate means and in communication with said fuel inlet, said diffuser plate means comprising a thin coin like disk formed about the outer peripheral surface of said body means and having circumferentially spaced circular openings therein corresponding to each of said discharge channels with the axes of said openings parallel to the axis of said fuel discharge tip and at an acute angle to the respective discharge channels whereby fuel is drawn from the interior of said discharge tip along each of said channels for atomization with an air stream under pressure passing through said spaced openings in said diffuser plate.

2. The liquid fuel atomizer set forth in claim 1, wherein the discharge channels terminate at their outer ends at the base of the diffuser plate means.

3. In a liquid fuel atomizer device including a housing having an air inlet port and a tapered orifice outlet port, each communicating with the interior of said housing, a body member movably mounted in said housing having a fuel inlet, a fuel discharge tip communicating with said fuel inlet and located at said orifice outlet, the improvement comprising: said fuel discharge tip having circumferentially spaced, radially and inwardly sloping directed channels extending from the exterior surface of said fuel discharge tip to the interior of said body member, and diffuser plate means secured to said tip comprising a thin coin-like disc, having a plurality of circumferentially spaced circular openings therein each in radial alignment with a corresponding one of said channels formed in said discharge tip, with the axes of the openings extending parallel to the axis of said tip and at an acute angle with respect to the axis of its corresponding channel whereby fuel is drawn from the interior of said discharge tip through each of said channels for atomization with an air stream under pressure passing through said spaced openings in said diffuser plate, said diffuser plate means being of a size to provide a circumferentially-extending opening between the periphery of the orifice outlet port and the periphery of the diffuser plate means whereby air flowing through the circumferentially-extending opening may vary the spread of the air and fuel mixture discharged from the orifice upon movement of the body member within said housing.

4. In a liquid fuel atomizer device including a housing having an air inlet port and a tapered orifice outlet port each communicating with the interior of said housing, a body member mounted in said housing for movement along the axis of said orifice outlet, a fuel inlet port in the body member, and a fuel discharge tip on the body member communicating with said fuel inlet port and located at said orifice outlet; the improvement comprising a diffuser plate secured to said tip, said plate comprising a thin coin-like disc having a cross-sectional area which is smaller than the cross-sectional area of said orifice to provide a generally annular opening between the periphery of the plate and the periphery of the orifice, circumferentially spaced radial discharge channels in the discharge tip sloping inwardly for communication with said fuel inlet port and terminating at their outer ends at the front surface of the diffuser plate, and circumferentially spaced circular openings in the diffuser plate spaced radially outwardly from a corresponding discharge channel, with the axis of each of said openings at an acute angle with the axis of its corresponding radially spaced channel, and parallel to the axis of said tip, the arrangement being such that fuel may be drawn from the in-

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terior of said discharge tip along each of said channels for atomization with an air stream under pressure passing through an associated one of said openings in the diffuser plate, while the body member may be moved axially within the housing such that the angle of a stream of air flowing through said generally annular opening may be varied to vary the spread of the air and fuel mixture discharged from the orifice.

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