United States Patent [19]

Wilhelm

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[54] **FLUID FUEL BURNER**

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[52] **U.S. Cl.** **431/211,** 431/190

[51] **Int. Cl.** **F23l 7/00**

[58] **Field of Search** 431/210, 211, 190, 162

[56] **References Cited**

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Attorney, Agent, or Firm—Lamont Johnston

[57] **ABSTRACT**

A fluid fuel burner has a hollow casing within which is a coaxial hollow core member closed at one end and a distributor forming a mixing chamber in the core member which comprises a multiplicity of concentrically arranged axial passages for mixing oil and air. Steam is produced by heating water flowing through a coil in the casing forward of the core member heated by the combustion of the oil with the air and is introduced into the same chamber as the oil and air; it is mixed in the mixing chamber and in passing through the distributor with the oil and air to increase the flame temperature and volume, reduce the ratio of fuel consumption to heat output and burn the great majority of the waste gases.

2 Claims, 3 Drawing Figures

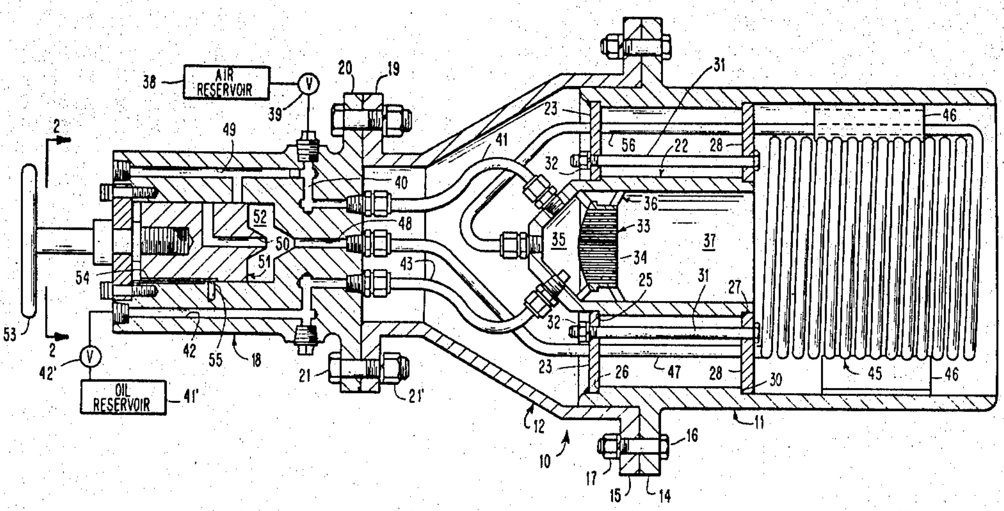


FIG. 1

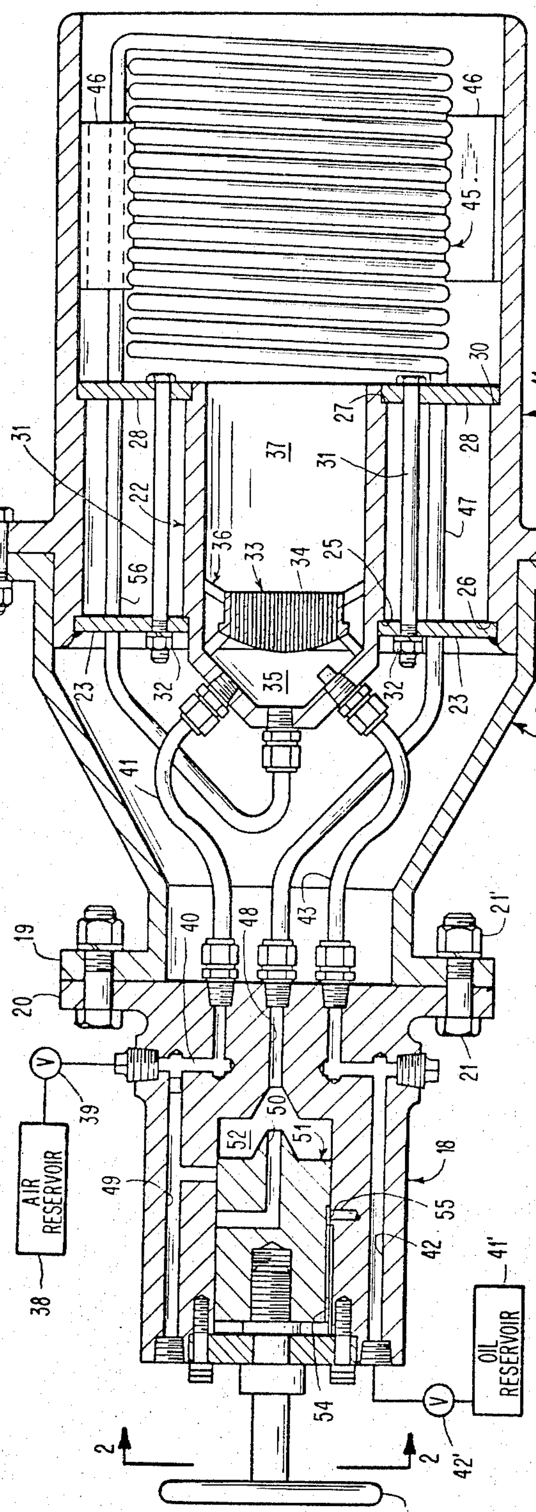


FIG. 3

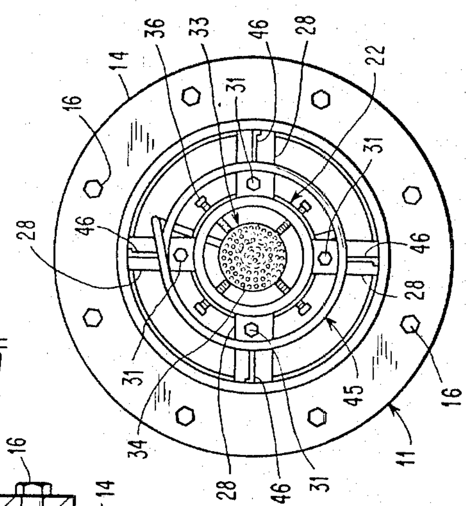
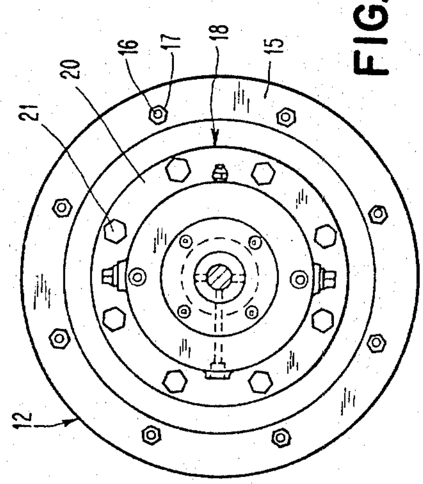


FIG. 2



FLUID FUEL BURNER

In U.S. Pat. No. 2,528,984 issued Nov. 7, 1950, to me, there is shown a fluid fuel burner in which air and a liquid fuel, namely oil, are introduced into a rotating drum. The rotating drum directs the oil and the air so as to produce a flame adjacent a heating coil and also receives water so that steam is introduced into the area of the heating coil to extend the flame.

The present invention is an improvement on my aforesaid patent in that the drum is completely eliminated. Thus, the expense for creating machined parts is eliminated so that the cost of the burner is reduced.

The present invention obtains the desired mixing of the fluid fuel, air and steam without the use of a drum by employing a stationary distributor which forms with a core member a mixing chamber and through which the fluid fuel, air and steam flow. This produces a quicker and more thorough mixture than was previously available with the rotating drum of my aforesaid patent.

Additionally, the present invention does not require separate mixing of the liquid fuel and air prior to introducing the steam thereinto as was required in my aforesaid patent. Instead, the steam may be directly introduced into the same mixing chamber in which the fluid fuel and the air are mixed.

The supply of steam is controlled by a manual valve. Thus, no water is allowed to flow to the heating coil until it has become sufficiently heated to have a lurid glow. This insures that the water will be changed to steam when the water is supplied to the heating coil.

Accordingly, the original flame of air and oil, which is often the fluid fuel, is supplemented by steam. The steam is superheated from 212° F. by passing through about 13 turns of steel coil, approximately 21 feet, heated to 1,200° F., to at least 525° F. The usual volume of saturated steam at 212° F. is 17,000 times the volume of the original water. By being superheated, the volume of the steam is expanded about 40 percent more than saturated steam, so that it has a volume about 23,000 times that of the original water. The steam being injected into the flame of oil and air is broken down into hydrogen and oxygen which combine with the hydrocarbons in the oil and increase the temperature of the flame to about 1,350° F. and its volume 250 per cent or greater so that the flame will extend much further than was available with the structure of my aforesaid patent or of any other burner known to me.

Furthermore, the greater flame volume causes combustion of a greater percentage of the fuel gases which have previously been wasted as flue gases and/or smoke. Thus, a more efficient burner is produced by the present invention.

An object of this invention is to provide an improved fluid fuel burner having no moving parts other than valves.

Another object is to provide a fluid fuel burner which, by breaking down steam into its elements of hydrogen and oxygen and combining them with the hydrocarbons in a fuel, makes use of less air and thus less nitrogen, which lowers flame temperature, producing a hotter flame and a higher volume of flame for the same fuel consumption.

A further object of this invention is to provide a relatively inexpensive fluid fuel burner.

Other objects of this invention will be readily perceived from the following description, claims, and drawing.

This invention relates to a fluid fuel burner including a hollow casing having a hollow core member supported therein. The hollow core member has air introduced therein by suitable means and a fluid fuel introduced therein by suitable means. Distributor means is disposed within the hollow core member forwardly of the introduction of the air and fluid fuel to form in the hollow core member a mixing chamber and to cause mixing of the air, fluid fuel and steam both in the chamber and in passing through the distributor. A coil is supported within the hollow casing forwardly of the hollow core member to heat a fluid supplied thereto. One end of the coil is connected by first means to a supply of fluid to be heated and the other end of the coil is connected by second means to the mixing chamber in the hollow core member to supply the heated fluid to it. The flow of fluid to the coil through the first connecting means is controlled by a valve. The distributor means causes mixing of the heated fluid with the air and fluid fuel in the mixing chamber and in passing through the distributor when the valve allows flow of fluid to the coil.

The attached drawing illustrates a preferred embodiment of the invention, in which:

FIG. 1 is a longitudinal sectional view of one embodiment of a fluid fuel burner made according to the present invention;

FIG. 2 is an end elevational view, partly in section, taken along line 2—2 of FIG. 1; and

FIG. 3 is an end elevational view of the right end of the structure of FIG. 1 and showing the distributor.

Referring to the drawing and particularly FIG. 1, there is shown a fluid fuel burner **10** including a first hollow cylindrical casing **11** to which is secured an intermediate hollow member **12**. The hollow cylindrical casing **11** has an annular flange **14**, which abuts against an annular flange **15** on the hollow member **12**. Bolts **16** extend through aligned openings in the flanges **14** and **15** and cooperate with nuts **17** to secure the hollow casing **11** to the hollow member **12**.

The burner **10** also includes a rear member **18**, which is secured to the intermediate hollow member **12**. The hollow member **12** has an annular flange **19** at its rear end for abutting engagement with an annular flange **20** on the rear member **18**. Bolts **21** extend through aligned passages in the flanges **19** and **20** and cooperate with nuts **21'** to secure the rear member **18** to the hollow member **12**.

The casing **11** has a hollow core member **22** supported therein in spaced relation to the inner wall of the casing. The core member **22** is supported by four equally angularly spaced plates **23** (two shown in FIG. 1), which are welded to the inner wall of the casing and bear against an annular shoulder **25** on the outer surface of the core member. The plates **23** are welded in a position in which they also contact an annular shoulder **26** on the inner wall of the casing.

The forward portion of the core member has an annular shoulder **27** against which four equally angularly spaced plates **28** bear. The plates **28**, which have the same configuration as the plates **23**, abut against an outer annular shoulder **30** on the casing. The plates **28** are urged against the shoulders **27** and **30** by elongated bolts **31** extending through the plates **28** and **23**. Nuts

32 cooperate with the bolts 31 to secure each of the plates 23 to the aligned plate 28.

A distributor 33 is a member supported within the core member 22 so as to form in it with a bifurcated support 36, such as screws, a mixing chamber 35 to cause mixing of air, fluid fuel, and steam introduced into the interior of the core member in the chamber. The distributor has a multiplicity of axial passages 34 concentrically arranged therein to provide communication from the mixing chamber. A chamber 37 is formed forwardly of the distributor in the core member.

Air is introduced under pressure into the mixing chamber 35 from a suitable source, such as a reservoir 38. The pressurized air flows from the reservoir through a valve 39 into a passage 40 in the rear member 18. A conduit 41, preferably formed of stainless steel, connects the passage 40 with the chamber 35 in the core member by extending through the interior of the intermediate hollow member 12 to allow air to flow into the mixing chamber 35.

The fluid fuel, which may be oil, fuel gas or powdered coal, is supplied from a reservoir 41′ under pressure to a passage 42 in the rear member 18. A valve 42′ controls the flow of fluid fuel to the passage 42.

A conduit 43, preferably formed of stainless steel, connects the passage 42 with the chamber 35 to allow the fluid fuel to flow into the chamber 35. Where the fluid fuel is oil, it is discharged from the conduit 42 through an atomizer.

A coil 45, preferably formed of stainless steel tubing, is supported in the casing 11 forwardly of the core member 22. Four equally angularly spaced L-shaped members 46 are welded to the inner surface of the casing 11 and to portions of the coil 45. One end of the coil 45 is connected by a conduit 47 to a passage 48 in the rear member 18.

Water, which is to be heated by flowing through the coil 45 when a flame is produced, is supplied to the passage 48 from a passage 49, which is connected to a suitable source of water (not shown) in the rear member 18 through a passage 50 in a valve member 51. The valve member 51 is slidably mounted in a chamber 52 in the rear member 18 and is controlled through turning a handle 53, which is attached to the valve member 51.

Rotation of the valve member 51 by turning of the handle 53 is prevented due to a longitudinal slot 54 in the valve member cooperating with a stud 55 in the rear member 18. Thus, only sliding movement of the valve member 51 can be accomplished, whereby the passage 50 can be aligned with the passage 49 and allow water to flow into the passage 48.

The other end of the coil 45 is connected by a conduit 56 with the mixing chamber 35. When the valve 51 is moved to allow flow of water through the coil 45, superheated steam will be produced and supplied to the chamber 35 for mixing with the air and oil in the chamber and in passing through the distributor 33. The oil, air and steam are initially mixed in the chamber 35 and are further mixed by flowing through the passages 34 in the distributor 33. This increases the volume of the flame so that the flame is elongated to heat a long industrial boiler, for example. The gunbarrel shape of the burner core member 22 also adds to the elongation of the flame.

Considering the operation of the present invention, the valve 51 is initially positioned as shown in FIG. 1. Air is admitted to the chamber 35 by opening the valve 39 and a fluid fuel, such as oil, gas or powdered coal, is admitted to the chamber by opening the valve 42′. The fuel and air initially mix in the chamber 35 and further mix while passing through the axial passages in the distributor 33 and in the chamber 37 within the core member. Combustion occurs in the chamber 37 due to a spark gap (not shown).

After combustion has been produced in the chamber 37 so that the coil 34 has a lurid glow, the valve 51 is moved to a position in which water can flow to the coil 45. This results in steam being supplied to the chamber 35 under considerable pressure and through the passages 34 in the distributor 33, whereby mixing occurs with the air and fuel to produce a homogeneous mass and increase the volume of the flame. The steam is broken down into its elements of hydrogen and oxygen, which combine with the hydrocarbons in the fuel to produce a flame of high temperature (B.T.U. output) and large volume. The result is that less air, with its temperature-lowering 78 percent nitrogen content, is used in the combustion.

The amount of steam produced is controlled by regulating the position of the valve member 51. That is, the passage 50 can be only partially aligned with the passage 49, whereby less water flows through the coil 45, so that less steam is produced. In this manner, the size of the flame is controlled.

An advantage of this invention is that the cost of the burner is reduced. Another advantage of this invention is that no mixing drum is required to produce mixing. A further advantage of this invention is that the temperature, elongation and size of the flame are significantly increased, for the same fuel consumption, due to the use of a gunbarrell-shaped core member, the supplying of superheated steam to the chamber under high pressure, to the breaking down of steam into its elements of hydrogen and oxygen which combine with the hydrocarbons of the fuel and to the use of less air with its 78 percent of flame temperature-lowering nitrogen.

For purposes of exemplification, a particular embodiment of the invention has been shown and described. However, it will be apparent that changes and modifications in the arrangement and construction of the parts thereof may be resorted to without departing from the spirit and scope of the invention.

What is claimed is:

1. A fluid fuel burner including a hollow casing, a hollow gunbarrel-shaped cylindrical core member open at its forward end and closed at its rearward end supported centrally within said hollow casing, means to introduce air into said core member, means to introduce a fluid fuel into said core member, a coil supported within said casing forwardly of said core member to heat a fluid supplied thereto, first means to connect one end of said coil to fluid to be heated, second means to connect the other end of said coil to said core member to supply the heated fluid thereto, valve means to selectively control the flow of fluid to said coil through said first connecting means and distributor means disposed within said core member forwardly of the introduction of air, fluid fuel and heated fluid, said distributor means forming a chamber in the rear portion of said hollow core member into which the air, fluid fuel and heated

fluid are introduced, thereby causing mixing of the heated fluid with the air and fluid fuel within the chamber and in passing through the distributor when said valve means allows flow of fluid to said coil, whereby the flame volume and temperature are maximized, the ratio of consumption of fluid fuel to the B.T.U. output of the burner is minimized and the great majority of the waste gases are burned.

2. The fluid fuel burner according to claim **1** in which said distributor means comprises a member having a multiplicity of concentric axial cylindrical passages extending therethrough.

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