United States Patent

[11] 3,542,500

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[54] **GAS NOZZLE FOR MULTI-FUEL BURNER ARRANGEMENTS**
8 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** **431/181,** 431/183, 431/278; 239/561, 239/567
[51] **Int. Cl.** **F23c 5/08**
[50] **Field of Search** 431/159, 161, 166, 181, 182, 183, 187, 188, 189; 239/561, 559, 567; 431/278

[56] **References Cited**
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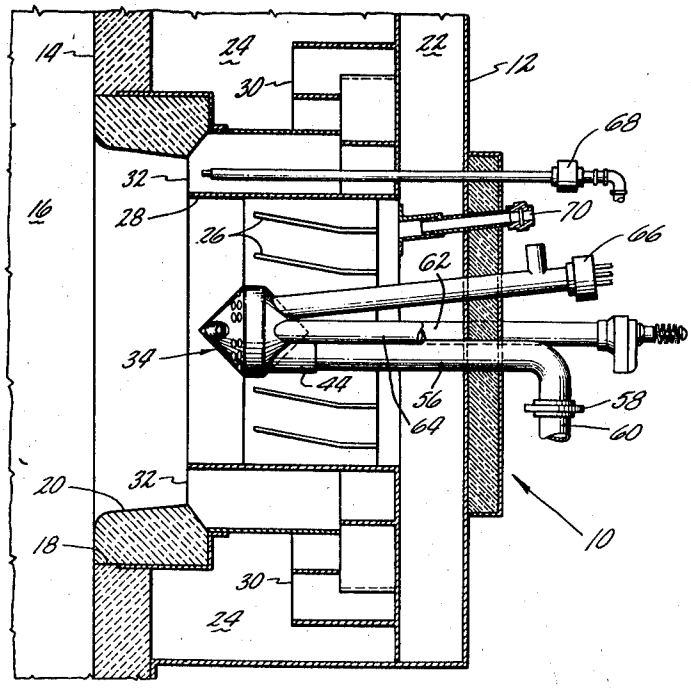
ABSTRACT: A multi-fuel burner arrangement having a hollow aerodynamically shaped gas nozzle with an opening in the rear face thereof for the admission of a gaseous fuel to the interior of the nozzle and particularly placed ports in the front face thereof for uniform gas distribution within the burner. The nozzle has a plurality of integral passages extending therethrough for the purpose of positioning supplemental burner structure relative to the nozzle, the additional structure including plural oil guns for selective continuous oil firing and an ignitor.



Patented Nov. 24, 1970 3,542,500

FIG_1

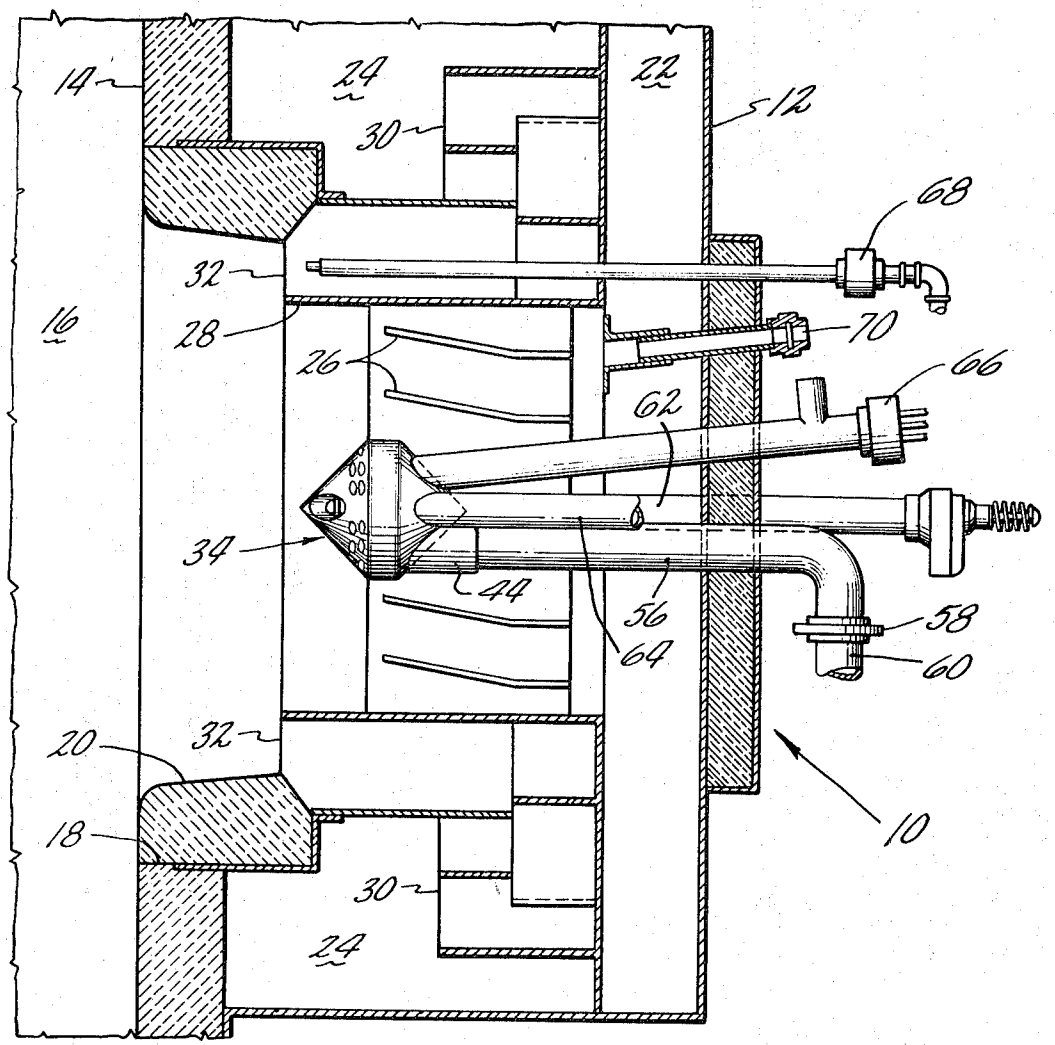


FIG_4

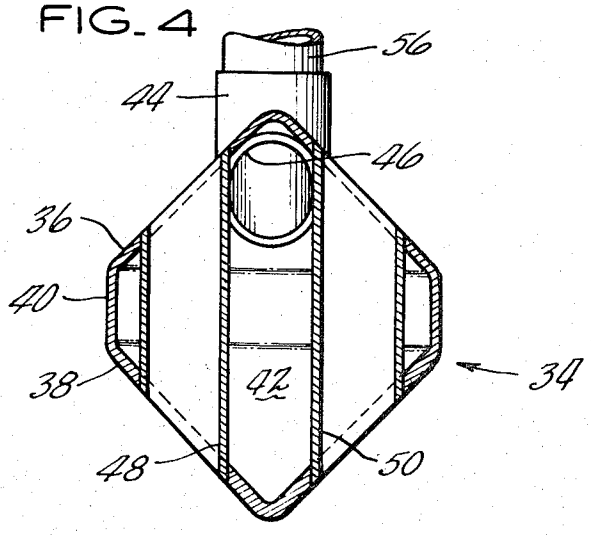


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FIG. 3

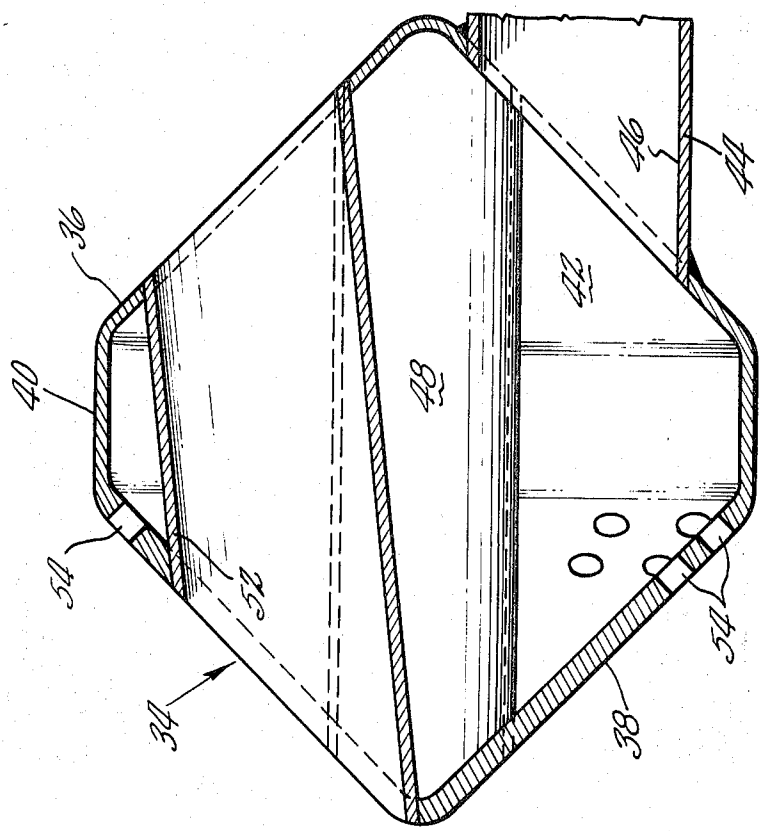
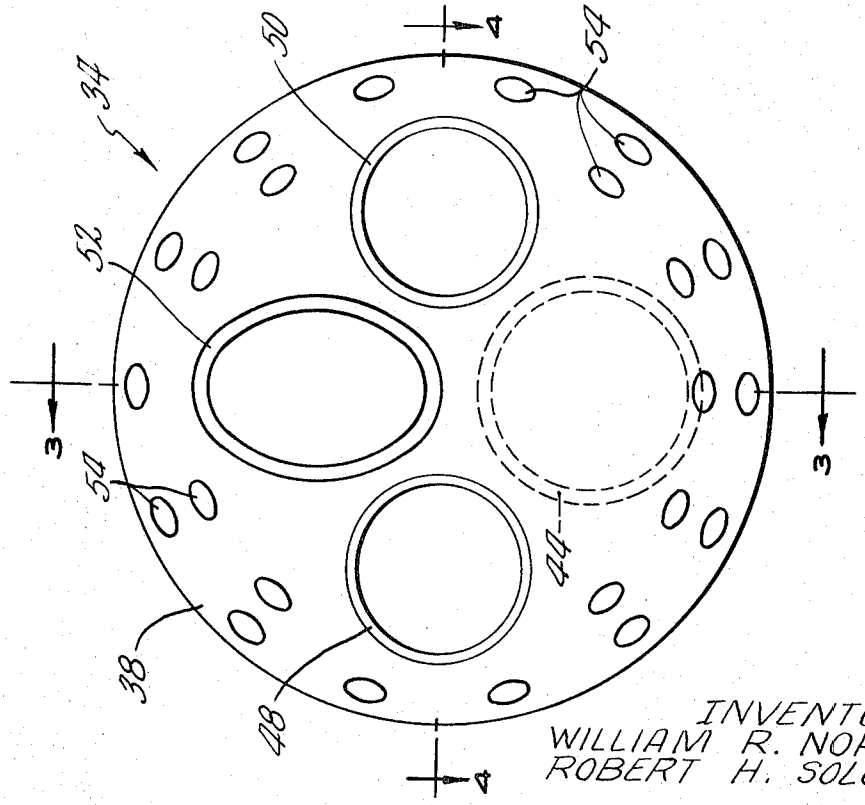


FIG. 2



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GAS NOZZLE FOR MULTI-FUEL BURNER ARRANGEMENTS

BACKGROUND OF THE INVENTION

In order to provide overall fuel economy, many heat generating systems in use today employ compact burner arrangements which fire fuels of different types directed into the furnace chamber through a throat formed in a wall of the chamber. These multi-fuel burner arrangements function by burning fuels such as gas and oil separately or in combination supplied by gas nozzles and oil guns located adjacent the burner throat. While ultimate fuel selection is dependent upon relative availability, the general arrangement calls for gas as the primary fuel with oil being used to supplement the gas burning if the gaseous burning should be below a desired operating level or fail altogether. In the burner arrangements of this type, it is desired that the oil guns be located closely adjacent the gas nozzles so that the generated flame originates at generally the same point in the combustion chamber regardless of which fuel (or combination thereof) is being fired. Since all oil guns require some periodic shut down for cleaning of the gun tips, it is also desired that the oil guns be easily removable from the burner arrangement without effecting the continuous uniform multi-fuel firing capability.

In utilizing different types of fuels having different heating values and characteristics, difficulties may be experienced due to the fact that the different fuels require differing flow patterns of combustion-supporting air for proper air fuel mixing in order to accomplish efficient burning. In fixing the location of the various nozzles and guns within the burners and maintaining their relative positioning, the means therefore may interfere with the desired flow pattern of combustion-supporting air necessary for maximum fuel economy. It has therefore been an object to standardize a multi-fuel burner arrangement to provide uninterrupted economical, efficient firing of both oil and gaseous fuels, while positioning the gas nozzle and oil gun organization for selective distribution of the fuels at the same point within the burners without disturbing the desired flow pattern of combustion-supporting air.

SUMMARY OF THE INVENTION

It is the purpose of this invention to provide a standardized multi-fuel burner arrangement having aerodynamic combustion-supporting air flow properties in order to accomplish uninterrupted economical, efficient burning of the plural types of fuel alone or in combination. The burner arrangement of this invention has a hollow, aerodynamically shaped nozzle housing, the housing having first and second oppositely directed interconnected conical faces. The nozzle housing has an inlet in one of the conical faces for admission of gas from the gas source and is positioned so that a series of ports in the oppositely directed conical face is adjacent the throat of the burner for uniform gas distribution therein. Additionally, integral passages extend through the housing and serve to position an ignitor and means for burning a second fuel such as oil. When oil guns for the firing of oil are used, plural guns are provided, each capable of full load operation so that the others may be removed without interrupting the oil firing capability.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevation, partly in section, of a multi-fuel burner arrangement including the gas nozzle according to this invention.

FIG. 2 is an enlarged front view of the gas nozzle of this invention.

FIG. 3 is a sectional view of the instant gas nozzle taken on line 3–3 of FIG. 2.

FIG. 4 is a sectional view of the instant gas nozzle taken on line 4–4 of FIG. 2 and shown on a somewhat reduced scale.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, FIG. 1 shows a heat generating system having a multi-fuel burner arrangement 10 incorporating the gas nozzle organization of our invention. It is, of course, understood that the heat generating system might contain a series of burners, and while only one burner arrangement is shown when a series is utilized, each of the burners would be of the same configuration as the one described herein. A windbox 12 is attached to a wall 14 of the heat generating furnace 16. The wall 14 has an opening in which is located the throat 20 of the burner arrangement 10 for communication of the burner with the interior of the furnace 16. The windbox 12 has a primary combustion-supporting air chamber 22 communicating with the internal burner area and a secondary combustion-supporting air chamber 24 concentric with the internal burner area. The chambers 22 and 24 serve, in slidably regulatable manner, to supply combustion-supporting air for the burner arrangement 10 by means of suitable control dampers (not shown). Primary slidable air spinning vanes 26 are located within a cylinder 28 directed centrally toward the burner throat 20 and forming a primary combustion chamber. Secondary combustion-supporting air spinning vanes 30 communicate between the secondary combustion-supporting air chamber 24 and the passage 32 concentric with primary burning chamber to admit secondary combustion-supporting air to the burner throat 20.

Centrally located within the burner arrangement 10 and adjacent the entrance to the burner throat 20 is the nozzle organization of this invention. As more particularly shown in FIGS. 2, 3, and 4, the gas nozzle 34 is comprised of a first generally conically shaped face 36 and a second oppositely directed generally conically shaped face 38 having the base portions thereof joined by the flat cylindrical section 40. This arrangement forms an aerodynamically shaped housing for the nozzle 34 having a hollow interior 42. A connecting fitting 44 integral with the face 36 has an internal passage 46 communicating with the hollow interior 42 of the nozzle 34. The connecting fitting 44 of the nozzle 34 is sealingly, slidably mounted on a conduit 56 which, through the flange coupling 58, is connected to a gas supply line 60. The slidable connection between the connecting fitting 44 of the nozzle 34 and the conduit 56, while being of a sealing nature, permits the nozzle organization to be adjustably positioned relative to the burner throat 20 after assembly of the general burner arrangement 10 to provide maximum fuel firing efficiency.

Extending from the first face 36 to the second face 38 are integral cylindrical passages 48, 50 and 52; additionally the face 38 has a circumferential series of ports 54 communicating with the interior 42 and directed toward the burner throat 20. The integral passages 48 and 50 serve to position the second fuel supply means, such as oil guns 62 and 64, relative to the nozzle 34 closely adjacent the area in which the gas burning will be effected. The oil guns 62 and 64 are each capable of full demand load oil firing for fully independent operation as to be explained hereinbelow. The nozzle 34 additionally accommodates an ignitor 66 within the integral passage 52. The burner arrangement 10 may optionally include a flame scanner 68 of a well-known construction and an observation port 70 for observing the condition of the flame generated by the burning within the furnace 16.

The operation of the multi-fuel burner arrangement 10 including the nozzle organization of this invention is as follows. Combustion-supporting air is adjustably supplied through the primary and secondary combustion-supporting air chambers (22, 24) in a particular desired flow pattern by regulating suitable dampers (not shown) in a well-known manner.

The primary combustion-supporting air is spun by the primary spinning vanes 26 as it flows past the aerodynamically shaped gas nozzle 34 while the secondary combustion-supporting air is spun by the secondary spinning vanes 30 as it flows into the concentric passage 32 to the burner throat 20. The regulation of the spinning combustion-supporting air flow

is for the purpose of giving a desired air flow pattern necessary for maximum fuel economy. Gas from a suitable source flows through the gas line **60** and conduit **56** to the hollow interior **42** of the nozzle **34**. The gas supply to the interior **42** of the nozzle **34** is then distributed uniformly into the burner throat **20** through the ports **54** circumferentially spaced around the face **38** to provide a 360° gas firing circle therein. The precise selection of the location of the ports **54** in the face **38** is based upon specific desired output characteristics for a burner when taking into account the particular operating parameters such as the pressure of the gas supplied and the availability of combustion-supporting air for that burner.

The combustion-supporting air flow through the cylinder **28** will not be adversely affected by the nozzle organization due to the aerodynamic shape of the hollow nozzle housing **34** which, in fact, enhances the required fuel-and-air mixing for efficient fuel burning. The construction of the nozzle **34** additionally permits the spacing of plural oil guns **62** and **64** closely adjacent the area where the gas burning is effected. While plural oil guns are shown, each oil gun is capable of supplying full demand load oil firing so that only one gun is operative at a time. The flame generated by the operative oil gun will thus originate at the same general point in the combustion chamber as the gas flame for uniform simultaneous firing of the gas and oil or the efficient firing individually of either fuel. The location of the integral passages **48** and **50** for positioning the oil guns **62** and **64**, permits one gun to be placed on standby or removed for tip cleaning without necessitating burner arrangement shut down or affecting continuous uniform multi-fuel firing. By the particular inclusion of the ignitor **66** with the nozzle **34**, the combustion-supporting air flow pattern remains undisturbed while permitting efficient and accurate ignition of the fuel within the burner arrangement **10**.

In view of the foregoing, it is apparent that we have discovered a novel multi-fuel burner arrangement with a nozzle organization which does not interfere with desired combustion air flow patterns in order to accomplish uniform, efficient firing of different fuels independently or simultaneously. The aerodynamically shaped gas nozzle housing provides an efficient means for positioning supplemental burner structure such as plural oil guns and an ignitor with respect to the gas nozzle without adversely effecting the combustion-supporting air flow pattern. Moreover, the particular positioning of the plural oil guns permits the removal of one oil gun without affecting continuous uniform multi-fuel firing.

While these preferred embodiments of the invention have been shown and described, it will be understood that they are merely illustrative and that changes may be made without departing from the scope of the invention as claimed.

We claim:

1. A multi-fuel burner arrangement for a combustion furnace including: a burner throat communicating with the interior of the furnace through a wall thereof, a windbox fixed to said wall and associated with said burner throat for the supply of combustion-supporting air therethrough, an aerodynamically shaped hollow nozzle within said windbox and adjacent said burner throat, means communicating with the interior of said aerodynamically shaped hollow nozzle for the supply of combustion gas thereto, said aerodynamically shaped hollow nozzle having port means directed toward said burner throat for the uniform distribution of combustion gas thereinto, said aerodynamically shaped hollow nozzle further having a plurality of integral passages extending therethrough providing a mounting means for supplemental burner structure including means for firing a fuel other than gas.

2. The arrangement of claim **1** wherein said aerodynamically shaped hollow nozzle has a first face and an oppositely directed second face, said faces being of substantially conical configuration and having the base portions thereof joined so as to give said hollow nozzle its aforementioned aerodynamic shape.

3. The arrangement of claim **2** wherein said combustion gas supply means includes a conduit communicating with said first conical face, and wherein said port means includes a series of circumferentially spaced openings in said second conical face directed toward said burner throat.

4. The apparatus of claim **3** wherein said gas supply conduit communicating with said first conical face includes a fitting connected to said first conical face, a gas supply line, and a section of tubing connected at one end to said gas supply line and at the other end slidably engaging said fitting in a sealable arrangement whereby said aerodynamically shaped hollow nozzle can be moved on said tubing section relative to said burner throat.

5. In a multi-fuel burner arrangement for a combustion furnace the improvement comprising: an aerodynamic nozzle means for receiving and uniformly distributing a combustion gas to be burned, said aerodynamic nozzle means including a hollow housing having a first face and an oppositely directed second face, a conduit communicating with the interior of said housing through said first face for the supply of combustion gas therethrough, a series of circumferentially spaced ports in said second face for the uniform distribution of said combustion gas, and integral positioning means through said aerodynamic nozzle means for locating means for firing a fuel other than gas.

6. The apparatus of claim **5** wherein said oppositely directed first and second faces are of substantially conical configuration and have the base portions thereof joined so as to give said housing said aerodynamic shape.

7. The apparatus of claim **6** wherein said integral mounting means includes a plurality of passages extending within said housing from said first face to said second face.

8. The apparatus of claim **7** wherein said means for firing a fuel other than gas includes plural oil guns, each of said guns capable of sustaining full demand load oil firing to permit removal of the other without affecting continuous uniform multi-fuel firing.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,542,500 Dated 11-24-70

Inventor(s) William R. Norcross and Robert H. Solomon

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 2, line 18, of the patent, omit the word "slidably";

Column 2, line 20, of the patent, omit the word "slidable".

Signed and sealed this 28th day of December 1971.

(SEAL)
Attest:

EDWARD M.FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Acting Commissioner of Patent