United States Patent [19]

Tickell, Sr.

[11] **3,799,733**

[45] **Mar. 26, 1974**

[54] **OIL BURNER**

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[22] Filed: **June 27, 1972**

[21] Appl. No.: **266,724**

[52] **U.S. Cl.** **431/350**, 431/183, 431/265, 239/402

[51] **Int. Cl.** **F23d 13/24**

[58] **Field of Search** 431/183, 265, 350, 351; 239/402, 406

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[57] **ABSTRACT**

A liquid fuel oil burner of the type including an outer tubular housing including discharge and inlet ends and through which combustion air is blown under pressure with a tubular body disposed within the discharge end of the housing or tube and enclosing an axial discharge atomizing nozzle for liquid fuel and spaced ignition electrodes. The end of the tubular body corresponding to the discharge end of the housing is open and encloses the aforementioned nozzle and electrodes. Further, the discharge end of the housing includes a vaned turbulator ring of the tapering type for causing the air being discharged between the body and the housing to swirl about and toward the center axis of the housing. Disposed immediately outwardly of the discharge end of the housing is a secondary air turbulance developing plate in the form of an annular member whose inner peripheral marginal portion is registered with the annular spacing between the housing and body and includes further vanes inclined in the same direction as the vanes of the ring and are angularly displaced about the center axis of the housing so as to bridge across the angular spacing between adjacent vanes of the turbulator ring. Also, the nozzle and ignition electrodes are supported within the body for at least slight axial adjustment relative to the latter and the turbulator ring and the turbulator plate is also supported for axial displacement relative to the turbulator ring and body, independent of axial adjustment of the nozzle and the electrodes.

3 Claims, 5 Drawing Figures

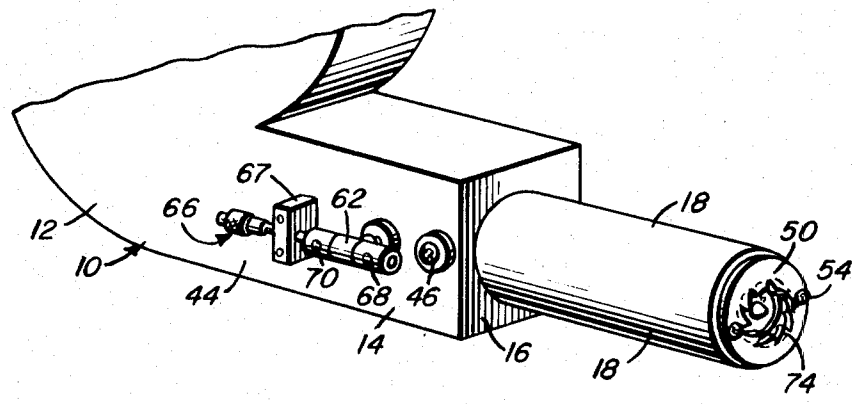


Fig. 1

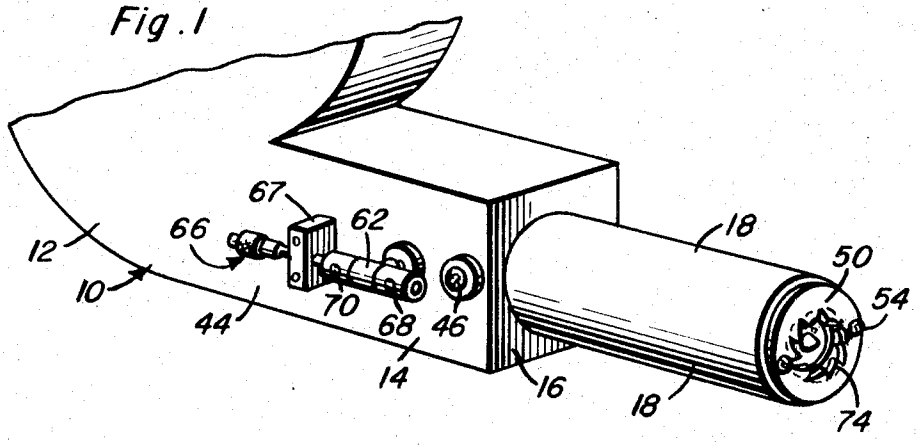


Fig. 2

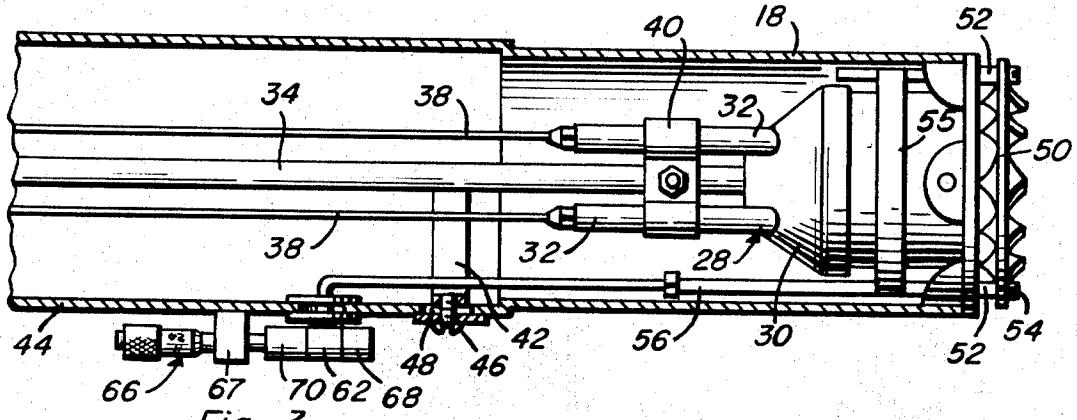


Fig. 3

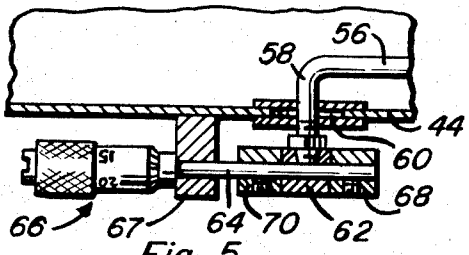


Fig. 4

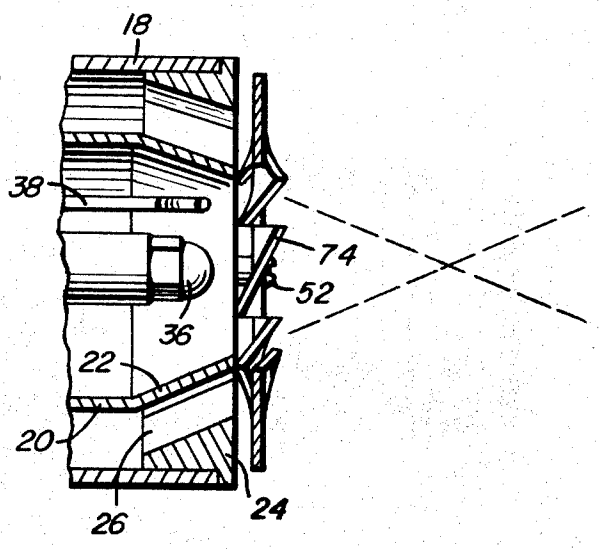
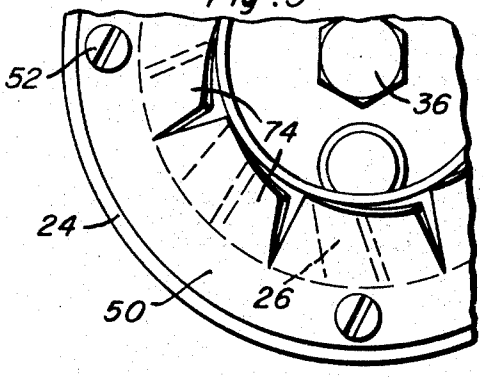


Fig. 5



OIL BURNER

The burner of the instant invention has been specifically designed to provide a burner structure that will develop maximum heat obtainable from a given amount of liquid fuel. The invention is best adapted to oil burners having a firing rate of .6 to 1.20 gallons per hour, but is not limited to this range. It is intended for oil burners of the pressure atomizing type, wherein air is supplied by a blower through a tubular draft tube or housing fitted centrally with a fuel line terminating in an atomizing nozzle and an electric igniter mounted adjacent the atomizing nozzle.

Conventional pressure atomizing burners of this general construction are also known as "gun burners" to the trade.

Over the years, many different types of burners have been designed to accomplish a desirable mixture of air and oil or other liquid fuel so as to obtain the most efficient flame at an acceptable noise level. To secure the best results, it is proposed that a precise control of the static pressure within the draft tube or housing is of great importance and that the shape of the resulting flame, if variable, can be tailored to fit the combustion chamber.

It is the main object of this invention to provide a burner which will be capable of obtaining precise control of the static pressure within the draft tube or housing and which will also include adjustment structure whereby the shape of the flame developed can be tailored to fit the combustion chamber in which the burner outlet is disposed.

Another object of this invention is to provide a burner in accordance with the immediately preceding object and which basic structural components may comprise substantial duplicates of existing "gun burners."

A still further object of this invention is to provide a burner in accordance with the preceding objects and constructed in a manner whereby any necessary or desirable adjustments in the axial positioning of the nozzle and electronic igniter within the blast tube as well as the axial adjustments to the secondary turbulator ring may be readily accomplished from the exterior of the blast tube at a point spaced axially therealong in an upstream direction from the discharge end of the blast tube.

A final object of this invention to be specifically enumerated herein is to provide an oil burner which will conform to conventional forms of manufacture, be of simple construction and dependable in operation, so as to provide a device that will be economically feasible, long lasting and relatively trouble free in operation.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIG. 1 is a fragmentary perspective view of a "gun burner" constructed in accordance with the present invention;

FIG. 2 is an enlarged fragmentary horizontal sectional view, taken substantially along a plane passing through the longitudinal center line of the blast tube of the burner;

FIG. 3 is an enlarged fragmentary horizontal sectional view, illustrating the micrometer adjustment feature of the secondary turbulator ring portion of the burner;

FIG. 4 is a fragmentary vertical sectional view, taken substantially upon a plane passing through the center of the discharge end portion of the burner; and

FIG. 5 is a fragmentary and elevational view of the discharge end of the burner.

Referring now more specifically to the drawings, the numeral **10** generally designates the "gun burner" of the instant invention. The burner **10** includes a blower housing **12** provided with a tangential hollow discharge duct portion **14** over whose outlet end an end wall **16** is secured. The end wall **16** includes a centrally disposed endwise outwardly projecting blast tube or housing **18** and a shield tube **20** is disposed within the outlet end of the housing **18.** The shield tube **20** includes a tapering discharge end **22** and an outer turbulator ring **24** having spiral vanes **26** which support the turbulator ring **24** from the tapering discharge end **22** of the shield tube **20.** The ring **24** is secured in the outer end of the blast tube or housing **18** in any convenient manner.

A burner head referred to in general by the reference numeral **28** includes a hollow conical body **30** whose major diameter end portion is telescoped over the inlet end of the shield tube **20.** Further, a pair of generally parallel tubular insulators **22** open into the conical body **30** on opposite sides thereof and at an elevation spaced above a horizontal plane extending along the center axis of the body **30.** A liquid fuel line **34** extends into the concial body **30** along its center axis and an atomizing nozzle **36** is carried by the discharge end of the fuel line **34** in the tapering discharge end **22** of the shield tube **20.** Electrodes **38** extend through the tubular insulators **32** and include angulated forward end portions projecting toward each other so as to terminate in close proximity to each other and at an elevation spaced slightly above the nozzle **36** within the tapering discharge end **22** of the shield tube **20.** The tubular insulators **32** are supported from a bracket **40** carried by the fuel line **34** and the entire burner head **28** is supported by means of a transversely extending support bracket **42** having one end secured to the fuel line **34** and the other end secured to a side wall portion **44** of the discharge duct portion **14** by means of a threaded fastener **46** threadedly engaged with the adjacent end of the support bracket **40** and passing through a slot **48** formed in the side wall portion **44.** Accordingly, the fastener **46** may be loosened and the entire burner head **28** may be shifted axially of the blast tube or housing **18** relative to the turbulator ring **24.**

A secondary turbulator plate **50** is provided and is in the form of an annular plate secured to a pair of diametrically opposite guides **52** by means of fasteners **54** and which are slidingly received through guide passages (not shown) formed through the turbulator ring **24.** The rear ends of the guides **52** are interconnected by means of a support ring **55** and a control rod **56** extending longitudinally through the blast tube or housing **18** is provided with its forward end secured to the ring **55** and its rearward end provided with a right angulated portion **58** slidingly received through a second longitudinal slot **60** formed in the side wall portion **44.** The right angulated end **58** is secured to a follower **62** rotatably journaled on the axially shiftable shaft portion **64** of a micrometer referred to in general by the reference

numeral **66** journaled from a mounting bracket **68** carried by the side wall portion **44.** The follower **62** is disposed between a pair of abutments **68** and **70** secured to the shaft or shank portion **64** for rotation therewith and accordingly it may be seen that the micrometer **66** may be manipulated to effect axial shifting of the control rod **56** and thus the secondary turbulator plate **50** supported therefrom. The turbulator plate, as hereinbefore set forth, is annular and its inner periphery includes generally radial slits defining spiral vanes or blades **74** spaced circumferentially about the inner periphery of the ring **55.** The blades **74** are slightly angularly displaced about the center axis of the blast tube or housing **18** in relation to the vanes **26** of the ring **24** and thus the vanes **74** bridge the circumferential spacing between adjacent vanes **26.** Of course, the vanes **74** are angled in the same direction as the vanes **26.**

In operation, initial basic adjustment of the burner head **28** is accomplished by means of the fastener **46** and slot **48.** Thereafter, the secondary turbulator plate **50** is axially shifted by means of the micrometer **66** to the position thereof wherein maximum combustion of a given amount of fuel is provided. By means of the axially adjustable secondary turbulator plate **50,** precise swirling of the combustion air into and about the conical spray discharge of liquid fuel from the nozzle **36** may be effected. In addition, according to the combustion chamber shape, size and the existing draft conditions of the blast tube or housing **18,** the shape of the flame resulting from combustion of the fuel being discharged from the nozzle **36** may be tailored to fit the combustion chamber. When the secondary turbulator plate **50** is correctly positioned relative to the discharge end of the housing **18** and the turbulator ring **24,** it is disposed in a position no greater than one-quarter of an inch outwardly of the end of the turbulator ring **24.** When the ultimate adjustment of the turbulator ring **50** has been accomplished, a portion of the burning fuel is swirled back through the fuel being discharged from the nozzle **36** resulting in substantially complete combustion of the liquid fuel discharged from the nozzle **36.** The turbulator rings **24** and **50** are each provided with eight vanes that cause the air being discharged from between the ring **24** and the tapering discharge end **22** of the shield tube **20** to be swirled about the discharge of liquid fuel in a clockwise direction. The center of the secondary turbulator ring **50** is open to allow the cone discharge of liquid fuel to pass through the ring **50.** When the turbulator ring **50** is in its closest proximity to the turbulator ring **24,** the greatest static pressure is applied to the vanes **74** of the plate or ring **50,** thus causing a larger quantity of the air being discharged from the blast tube or housing **18** to move along the center axis of the cone discharge of fuel from the nozzle **36** resulting in a long narrow flame. As the secondary turbulator plate or ring **50** is moved away from the turbulator ring **24,** the static pressure is relieved proportionately by air moving around the perimeter of the secondary turbulator plate **50** and the flame is retained closer to the nozzle **36.**

It has been found that burners utilizing the secondary turbulator plate **50** are capable of burning fuel oil with a 13 percent CO_2 flue gas content and with a very low soot deposit with the resultant flame being very stable during varying draft conditions. Further, operation of a burner equipped with the secondary turbulator plate or ring **50** is quiet.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur in those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly, all suitable modifications and equivalents may be resorted to, falling within the scope of the invention.

What is claimed as new is as follows:

1. In a fluid fuel burning apparatus, a tubular housing including inlet and outlet ends and adapted to convey combustion air to a combustion chamber with which the outlet end of said housing is communicated, hollow air flow deflecting body means within the outlet end portion of said housing and spaced radially inwardly from the side wall portions of said housing to define an annular air passage between the opposing inner and outer surface portions of said housing and body means, the end of said body means corresponding to the outlet end of said housing being open and having fluid fuel outlet nozzle means generally centered therein and opening outwardly through the open end of said body means, primary turbine vanes supported in and spaced circumferentially about the discharge end of said annular air passage, a flat annular turbulator plate supported from said housing and spaced slightly outwardly of the outlet end thereof, said plate including secondary turbine vanes spaced circumferentially about its inner periphery in registry with the discharge end of said air passage, whereby the combustion air being discharged from said annular air passage will be acted upon first by said primary turbine vanes while still in said air passage and thereafter by said turbulator plate secondary turbine vanes after having been discharged from said passage, means supporting said plate from said housing for limited adjustable shifting along the longitudinal axis of said housing and relative to said fuel outlet nozzle means and the outer peripheral portion of said plate being at least substantially free of air flow passages formed therethrough and extending radially outwardly of the radially outermost portions of the discharge end of said annular air passage, the radial innermost portions of said secondary vanes being spaced closer to the center axis of said annular air passage than the central circumferential zone of said annular air passage.

2. The combination of claim **1,** whereby said primary turbine blades are circumferentially spaced apart about said air passage, said secondary turbine vanes being equal in number to said primary vanes and being arranged so as to be generally axially aligned with the spacing between adjacent primary turbine vanes.

3. The combination of claim **1,** wherein the outlet end of said air passage is defined between inwardly tapering inner surface portions of said housing and inwardly tapering outer surface portions of said body.

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