OIL BURNER NOZZLE SWIRLER ASSEMBLY

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FIG. 1

FIG. 2

FIG. 3

FIG. 4

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This invention relates generally to oil burners of the gun type, and particularly to an improved swirler for the combustion air of such burners.

One of the principal objects of the invention is to provide an air swirler structure for use with a gun type oil burner so as to give improved combustion to the oil-air burning mixture.

Another object is to provide an improved swirler structure which will supply combustion air in sufficient quantity at the burner nozzle to give initial combustion thereat, and additional air at points spaced from the burner nozzle to complete the combustion.

Still another object is to provide a swirler structure which will supply a quantity of air at the burner nozzle for flame propagation immediately adjacent to the nozzle, and for completion of the combustion at points spaced closely to the nozzle.

Yet another object is to provide a swirler structure which will supply a sufficient quantity of air to give good preliminary burning at the nozzle, so that there is no "dancing" of the flame toward and away from the nozzle, and to the end that there is no pulsation of the flame longitudinally of the axis of the burner gun.

Another object is to provide a swirler structure characterized by swivel blades each of which has an outer portion of rather large pitch for causing the combustion air to cut across the marginal portions of the flame pattern to give an air envelope completing the combustion of the oil-air burning mixture, and an inner smaller portion of lesser pitch to divert a portion of the combustion air directly to the burner nozzle to initiate the burning of an oil-air mixture thereat and cause the flame to propagate within the air envelope provided by the outer portions of large pitch.

A still further object is to provide a swirler structure constructed according to the foregoing object in which a shorter flame path will result in a more compact and stable flame, the holding back of the flame path, and the ready accommodation to any gun type oil burner.

Another and final object is to provide a swirler assembly characterized by a central core placed in close proximity to the burner nozzle but spaced therefrom, and adapted by the air moving therepast to pick up droplets of oil from the burner nozzle tip and divert them into an air blast from the swivel blades, the central core supporting the swivel blades having outer portions of large pitch for causing the combustion air to cut across the marginal portions of the flame pattern to give an air envelope completing the combustion of the oil-air burning mixture, and inner smaller portions of small pitch to divert a portion of the combustion air directly to the burner nozzle to initiate with the air moving through the central core and past the nozzle tip the burning of the oil-air mixture at the burner nozzle tip, and to cause the flame to propagate within the air envelope provided by the blade portions of large pitch.

Other objects and important features of the invention will be apparent from a study of the specification following taken with the drawing which together describe and illustrate a preferred embodiment of the invention, and what is now considered to be the best mode of practicing the principles thereof. Other embodiments may be suggested to those having the benefit of the teachings herein, and such other embodiments are intended to be reserved especially as they fall within the scope and purview of the subjoined claims.

In the drawing:

FIG. 1 is a longitudinal sectional view through an oil burner tube showing the improved oil burner nozzle swirler assembly according to the present invention mounted therein;

FIG. 2 is a rear elevational view of the oil burner nozzle swirler assembly;

FIG. 3 is a side elevation view thereof; and

FIG. 4 is a longitudinal sectional view taken through the improved swirler and the discharge nozzle upon which it is mounted.

Referring now to the drawing, the improved oil burner nozzle swirler assembly is referred to generally by the reference numeral 10 and is shown in situ in respect to a burner tube 11, the forward end of which extends for a short distance, approximately 1/4", through an opening 15 in and beyond a wall 12 defining a combustion space 13 of a heater, not shown. A flange 14 encircling the tube 11 properly limits the position of burner tube 11 within combustion space 13.

The burner tube 11 has supported therewithin a supply pipe 17 connected at its rear end to a pipe 18 by an elbow 19 and a coupling 19 thereon. Fuel oil is supplied by a pipe 17 to a burner nozzle indicated generally by reference numeral 20. It comprises a hollow body member 21 which is externally threaded at 22 for coupling to the supply pipe 17 at a coupling 23, there being a nut 25 formed on body member 21 for such attachment.

The hollow body member 21 of burner nozzle 20, see FIG. 4, has a forward tip 24 formed with an axial discharge passage 26. An inner core 27 is provided within hollow body member 21 at the discharge passage 26, and is held in place by a hollow set screw 28 threaded at 29 to the body member 21. Core 27 and set screw 28 have aligned axial passages 31 so that oil fed by supply pipe 17 enters these passages and is discharged radially from core 27 by passages 32 into a pressure space 33 surrounding core 27. Core 27 has a spherical face 34 in seating relationship with the inner face of tip 24. The oil can reach discharge passage 36 only by way of slots 36 formed on the spherical face 34. A sintered filter element 35 is threaded into the hollow body member 21 to filter out any impurities in the oil being fed to the tip 24.

The burner nozzle 20 cooperates with ignition structure 39 secured by a clamp 38 to the supply pipe 17. An electrode 39 terminating in a tip 41 spaced a short distance from burner nozzle is made as part of the ignition structure 37.

The burner nozzle 20 is adapted to support the swirler 10 which has a support spider 42 having radial arms 44 extending from a central hub 46 having a flange 47 pressed fitted to the body member 21 again against the wall 22 thereon. The radial arms 44 have forward extending portions 43 welded at their forward ends to an air directing central frusto cone-shaped central supporting member 48 having a forward opening 49 in proximity to the tip 24.

The central supporting member 48 is of a larger assembly forming the swirler 10, and is preferably formed integrally with a plurality of fan-like blades 51 which may be considered generally radial extensions of the cone-shaped member 48. The entire assembly comprising fan-like blades 51 and frusto-cone-shaped member 48 may be formed from sheet metal by stamping and forming operations in which the blades 51 are defined by cutting radial slits 52 which at their inner ends have circumferentially extending slits 53 formed at a uniform distance from the center of frusto-cone member 48.

After the forming of slits 52 and 53 the metal of each blade 51 is bent to give an outer blade portion 54 of large
pitch for causing combustion air moving in burner tube 11 to cut across the marginal portions of a flame pattern resulting from the ignited and atomized fuel at the burner nozzle tip 20.

Each of blades 51 has small portions 56 at the inner free ends thereof with considerably smaller pitch than the outer blade portions 54 to divert a portion of the combustion air moving in the burner tube 11 directly to the oil discharge nozzle to initiate the burning of an oil-air burning mixture and the propagation thereof within the air envelope provided by the blade portions 54 of larger pitch.

The outer marginal portions of the blade portions 54 may be flattened as at 57, all to lie in a common plane to be welded or brazed to an annular connecting band 58 which preferably bears against a lip flange 59 formed at the front end of the burner tube 11.

The described fan blades of large pitch and the inner smaller portions thereof of smaller pitch have been found to give a flame pattern to the burning oil-air mixture of properties which are eminently desirable, as contrasted to the flame patterns obtained with structure of the prior art. It appears that the smaller portions of small pitch provides sufficient air at the nozzle tip greatly to implement the burning, so that the burning may be confined close thereto without the “dancing” of the flame toward and away from the burner tip. The larger blade portions of greater pitch appear to provide large volumes of air cutting across the marginal portions of the burning oil-air mixture to give an air envelope completing the combustion and without the “dancing” of the burning mixture therefrom.

With the elimination of the “dancing” effect it has been found that any noise of operation is greatly minimized which is always a greatly sought after advantage.

Having thus described this invention in such full, clear, concise and exact terms as to enable any persons skilled in the art to which it pertains to make and use the same, and having set forth the best mode contemplated of carrying out this invention, the subject matter regarded as being patentable is particularly pointed out and distinctly claimed in what is claimed, it being understood that equivalents or modifications of, or substitutions for, parts of the above specifically described embodiment may be made without departing from the scope of the invention as set forth in what is claimed.

We claim:

1. A swirler for use with an oil burner of the gun type wherein air flows forwardly in a burner tube to a combustion chamber and past a liquid atomization oil discharge nozzle, said swirler being adapted to be supported transversely in said burner tube adjacent said discharge nozzle and comprising a plurality of segmental symmetrically arranged fan-like blades each having an outer portion of large pitch for causing combustion air to cut across the marginal portions of a flame pattern resulting from ignited and atomized fuel to give an air envelope completing combustion of an oil-air burning mixture, and each having an inner smaller portion of lesser pitch to divert a portion of the combustion air directly to the oil discharge nozzle to initiate the burning of an oil-air mixture thereof and cause the oil-air burning mixture to propagate within the air envelope provided by the portions of large pitch.

2. The invention according to claim 1 wherein said fan-like blades are secured at their outer extremities to an annular rim having an outer diameter corresponding to the inner diameter of said burner tube.

3. The invention according to claim 1 wherein the means for supporting said central annular supporting member includes an inner ring lead by said burner nozzle and a plurality of radially spaced members secured to said inner ring at their inner ends and at their outer ends to said annular supporting member.

4. The invention according to claim 1 wherein said annular supporting member has an inner forward portion formed as a truncated cone in a position to intercept a portion of the air within said burner tube and direct same against said oil discharged nozzle.

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