

[54] **DIFFUSER**
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sor, Conn.
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[58] **Field of Search**.....239/419.5, 422, 405, 402.5,
239/498, 425.5

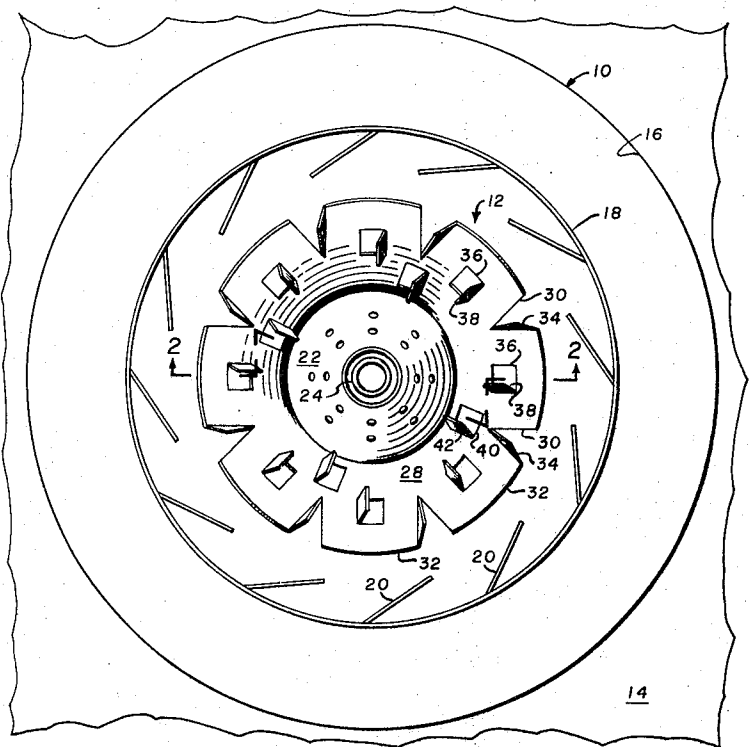
[57] **ABSTRACT**

An improved diffuser for liquid fuel fired burners wherein the diffuser has a frusto-conical surface located in the combustion-supporting air path with widely spaced slots formed in the frusto-conical surface to divide the surface into several distinct frustums to direct combustion-supporting air into the fuel spray as independent streams for the complete mixing thereof. The tabs from which the slots are formed are bent forward at substantially an 80° angle with respect to the frusto-conical surface to direct the air streams into the fuel spray in a tangential manner.

7 Claims, 2 Drawing Figures

[56] **References Cited**

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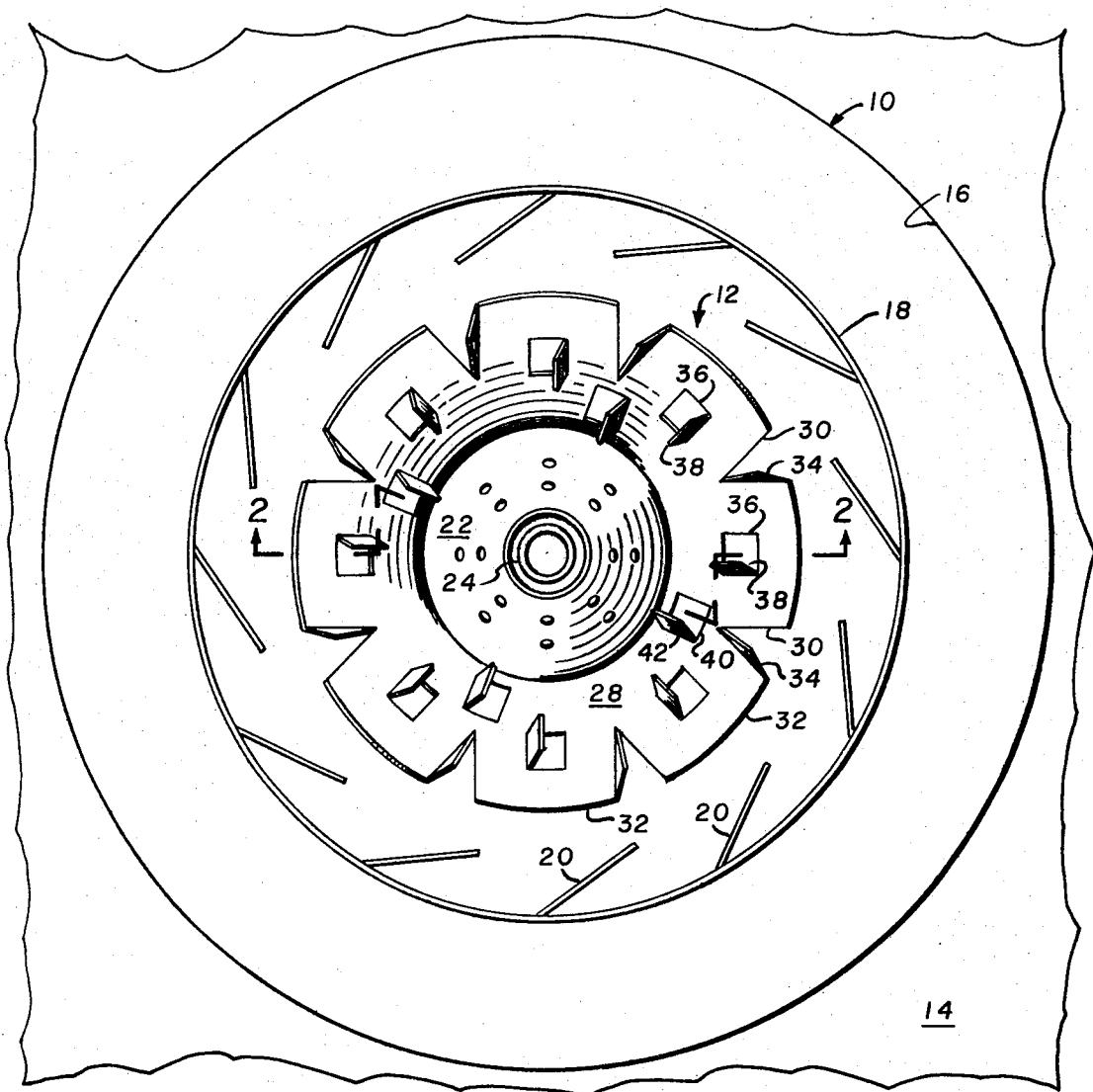


FIG. 1

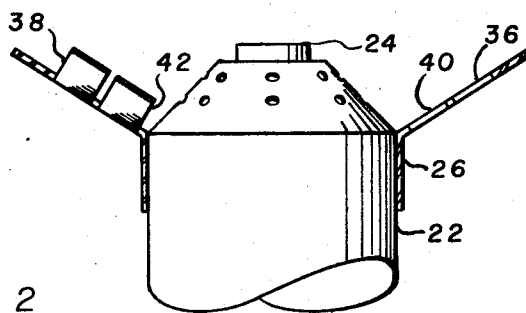


FIG. 2

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DIFFUSER

BACKGROUND OF THE INVENTION

Fluid fuel fired burners of high capacity require proper mixing of combustion-supporting air and the liquid fuel in order to promote efficient burning. This proper mixing of fuel and combustion-supporting air must be accomplished over the full burner operating range for maximum burner efficiency. Apparatus to accomplish a more complete mixing of fuel and air are continually being sought due to increasing desire of burner users to go to greater turn-down ratios (wider range of fuel pressures).

Liquid fuel burners commonly have a nozzle generating a conical shaped spray of atomized fuel discharging through a burner port into a swirling stream of air. To improve the mixing action to facilitate rapid and complete combustion, diffusers have been provided in the air stream to direct a portion of the air into the fuel spray and to promote the swirling action thereof. The diffusers have generally been of conical configuration having narrow, slotted, radial deflecting vanes (such as shown in U.S. Pat. Nos. 1,434,406 and 2,669,296). With a multiplicity of uniform closely spaced openings of the diffuser, however, the combustion-supporting air will tend to reform into a homogeneous mass as it strikes the fuel spray so that efficient mixing over a wide burner operating range is not possible.

SUMMARY OF THE INVENTION

It is the object of this invention to provide a novel diffuser which directs the combustion-supporting air so as to cause it to intersect atomized liquid fuel spray as independent streams to accomplish a more complete mixing thereof over a wider burner operating range. The diffuser has widely spaced slots formed in a frusto-conical surface positioned in the path of the combustion-supporting air. The slots are positioned to divide the frusto-conical surface into several distinct frustums. Slots of the outermost frustum V-shaped, while the slots of the inner frustums are substantially square. The tabs from which the slots are formed are bent forward at substantially an 80° angle relative to the frusto-conical surface so as to direct the air from the frustums tangentially into the fuel spray as independent streams.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front elevation of the diffuser according to this invention in relation to a typical burner arrangement.

FIG. 2 is a side elevation of the diffuser along the line 2—2 of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, FIG. 1 shown a typical burner arrangement 10 of the type in which the diffuser 12 of this invention may be utilized. A furnace wall 14 has an opening 16 in which the burner arrangement 10 is located. Concentric with the opening 16 is an air sleeve 18 which has swirl vanes 20 to impart rotation to the combustion-supporting air flowing therethrough. Centrally of the sleeve 18 is a gaseous fuel gun 22 through which liquid fuel gun 24 passes.

Liquid fuel gun 24 aspirates liquid fuel in a conical shaped spray into the throat of the burner arrangement 10. Mounted on the gaseous fuel gun 22 by means of a support means such as the sleeve 26 is a frusto-conical surface 28. The surface 28 has V-shaped slots 30 located equidistantly around the outer circumference thereof so as to divide the surface 28 into a peripheral frustum made up of a series of interconnected square fins 32 (in this instance, eight in number). The tab-like portion 34 from which the V-shaped slots 30 are formed are bent forwardly at an angle of substantially 80° with respect to the surface 28.

Located within the square fins 32 are square-shaped slot 36 having the tab-like portion 38 from which they are formed bent forwardly at an angle of substantially 80° with respect to the frusto-conical surface 28. The surface 28 also has a series of square slots 40 interspaced between the slots 36 and at a different radial distance thereon from that of the slots 36. The tab-like portions 42 from which each of the openings 40 is formed are also bent forward at an angle of substantially 80° with respect to the surface 28. The series of square-shaped slots 36 and the series of square-shaped slots 40 are located so as to effectively divide the frusto-conical surface 28 into distinct interior frustums, the frustum containing the slots 36 overlapping the frustum containing the V-shaped notches 30.

The square shape of the slots 36 and 40 and their spacing about the frusto-conical surface 28 of the diffuser 12 as well as the V-shaped slots 30 about the periphery thereof, and the distinct frustums effectively formed by the differing radial positioning of the slots, results in the combustion-supporting air being diffused into individual flow streams. The tab-like portions 38, 42 and 34, respectively direct these air streams tangentially into the aspirated fluid fuel flow from the liquid fuel gun 24 as independent flow streams from the distinct frustums. As a results, better intermixing of the liquid fuel and combustion-supporting air is accomplished to promote more efficient burner operation over a wider burner operating range.

While this preferred embodiment of the invention has been shown and described, it will be understood that it is merely illustrative and that changes may be made without departing from the scope of the invention as claimed.

What is claimed is:

1. An improved diffuser for liquid fuel fired burners having liquid fuel admission means emitting fuel therefrom located in a combustion-supporting air stream, said diffuser comprising: a support means; a frusto-conical surface on said support means; at least a series of widely spaced slots adjacent the outer periphery of said frusto-conical surface; at least a series of widely spaced slots adjacent the inner periphery of said frusto-conical surface; and tabs extending from said slots adjacent said outer and inner peripheries of said frusto-conical surface, said tabs being bent forwardly of said slots whereby said combustion-supporting air stream is divided into a plurality of independent, distinct air streams directed into said fuel emitted from said liquid fuel emission means.

2. The apparatus of claim 1 wherein said support means is mounted with respect to said liquid fuel admission means of said burner so as to accurately posi-

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tion said diffuser relative to said liquid fuel admission means in the combustion-supporting air stream.

3. The apparatus of claim 2 wherein said support means is a sleeve which is positioned so as to surround said liquid fuel admission means.

4. The apparatus of claim 3 wherein said slots adjacent to the outer periphery of said frusto-conical surface are of a V shape so as to divide said frusto-conical surface into a series of interconnected square fins.

5. The apparatus of claim 3 wherein said slots adjacent the inner periphery of said frusto-conical surface are of a substantially square shape.

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6. The apparatus of claim 3 wherein said slots adjacent the inner periphery of said frusto-conical surface are a substantially square shape, and said slots adjacent the outer periphery of said frusto-conical surface are of a V shape so as to form said frusto-conical surface into a series of interconnected square fins.

7. The apparatus of claim 6 wherein said tabs extending from said slots are bent forwardly of said frusto-conical surface at an angle of substantially 80° with respect thereto.

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