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AIR DIFFUSER FOR OIL BURNER

Original Filed Aug. 28, 1962

FIG. 2

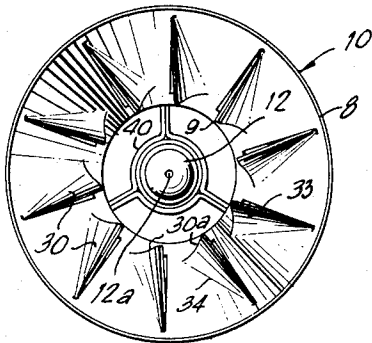


FIG. 3

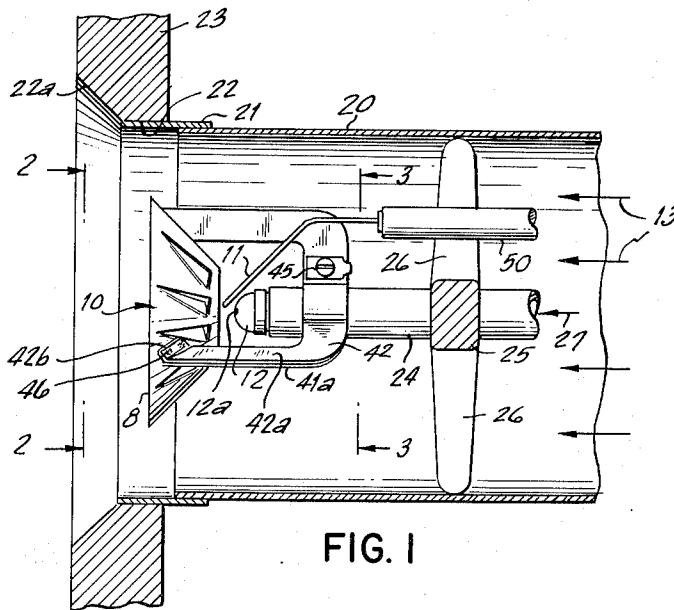
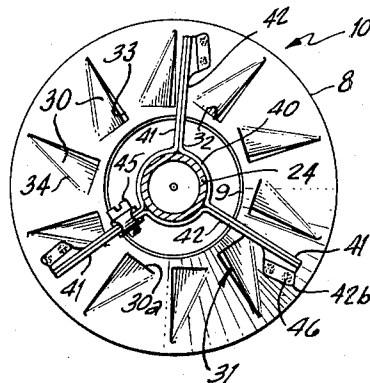


FIG. 1

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AIR DIFFUSER FOR OIL BURNER

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Continuation of application Ser. No. 219,883, Aug. 28, 1962. This application Jan. 22, 1965, Ser. No. 427,283

2 Claims. (Cl. 158—76)

This is a continuation of application Serial No. 219,883, filed August 28, 1962, now abandoned.

This invention relates to an improved burner head for oil burners, and in particular relates to an improved burner head which retains the flame resulting from combustion of the fuel.

The invention generally relates to the type of burner wherein oil under pressure is passed through a nozzle to atomize it, with a stream of air being forced against the resulting oil droplets so as to mix the oil droplets intimately with the air, suitable means being employed to initiate a combustion reaction.

An important object of the invention is to provide a burner head having means for intermixing the air and oil droplets in such a way that the combustion reaction will be maintained in the burner head without the flame being "blown out" of the burner head. An important advantage of the invention is that once ignition has taken place, the ignition means can be made inactive since the reaction is self sustaining in the burner head.

In accordance with a preferred embodiment of the invention, the burner head comprises a longitudinal casing adapted to have air blown evenly therethrough from rear to front, as well as an axially extending pipe in the casing having a front atomizing nozzle and adapted to have oil forced through the pipe and out of the nozzle under pressure. The burner head further comprises an air distributor, together with means mounting the air distributor within the casing forwardly of the nozzle and adjacent the front of the casing. The air distributor is frusto-conical with its axis aligned with the axis of the pipe. The rear end of the air distributor is of smaller diameter than the front end and is proximate to and of greater diameter than the pipe. As a result, there is a longitudinal flow of air and oil droplets through the rear end of the air distributor. The front end of the air distributor is of smaller diameter than the casing to permit convenient discharge of excess air around the outside of the air distributor.

In accordance with the invention, the air distributor has vanes struck inwardly therefrom, all such vanes being struck inwardly in the same sense. These vanes define slots in the air distributor of dimensions corresponding to those of the vanes. The vanes are laterally aligned and equally spaced circumferentially.

Each slot is conveniently in the form of a right triangle with the short side proximate to and parallel to the rear edge of the air distributor, a long side perpendicular to the short side and extending longitudinally to near the front edge of the air distributor, and a hypotenuse edge between the vane and the air distributor.

The vanes are inclined at an acute angle from the frusto-conical air distributor so as partially to overlie the slots and so that the longitudinal stream of air through the slots and striking the vanes is deflected to form a circumferential stream of air adjacent the inner surface of the air distributor, which decreases forwardly longitudinally in intensity. As a result of this configuration, there is a dead air space between the central longitudinal stream of air through the air distributor rear opening and the circumferential air stream. The result is that oil droplets in the central longitudinal air stream are drawn radially outwardly by the partial vacuum of the dead air space. Means are provided for igniting the oil air mixture in the

distributor head. Since the oil droplets tend to be drawn radially outwardly from the main central stream, the flame tends to spread radially over the entire air distributor and is not readily blown out forwardly from the distributor. Even if there is an excess of air, thereby increasing the intensity of the central longitudinal stream, the intensity of the circumferential air stream is correspondingly increased, with the result that there is a greater tendency for the oil droplets to be drawn radially outwardly.

It has been found that the above-described arrangement results in an effectively operating burner head under a wide variety of conditions, without flame blow-out, and makes it possible to inactivate the ignition means once ignition has been accomplished.

Other objects and advantages of the invention will become apparent from the following description, in conjunction with the annexed drawing, in which a preferred embodiment of the invention is disclosed.

In the drawings,

FIG. 1 is a vertical longitudinal section of the apparatus in accordance with the invention.

FIG. 2 is a front elevational view of the air distributor, taken on line 2—2 of FIG. 1.

FIG. 3 is a section on line 3—3 of FIG. 1, with the casing being omitted.

Upon reference to the drawing in detail, it will be noted that it shows a longitudinally extending cylindrical casing 20. The front of casing 20 is wedged into a forwardly slightly tapered high temperature-resistant support ring 21 which in turn extends into the rear cylindrical bore 22 of a vertical member 23 which is part of the furnace. Ring 21 may be considered as part of the casing. The front portion 22a of bore 22 is optionally outwardly flared.

The rear of casing 20 may be connected to any suitable part of an oil burner, such as the oil supply unit and the air supply unit thereof. These elements are conventional, and accordingly are not shown, the rear portion of casing 20 being broken away. The arrows 13 indicate the longitudinal rear to front direction of air which may be blown evenly through casing 20, by means of any suitable blower (not shown).

Pipe 24 extends axially in casing 20, the rear portion of pipe 24 being broken away. Said pipe 24 is supported by any suitable way, such as the collar 25 on pipe 24 and the spider arms 26 extending radially from collar 24 and engaging the wall of casing 20. A front atomizing nozzle 12 of conventional design is fitted on the front of pipe 24 and has a front central discharge orifice 12a. Oil is forced from rear to front, under pressure, through pipe 24, in the direction of arrow 27, by any suitable means (not shown). The oil is ejected through orifice 12a in the form of droplets, in any conventional manner.

Air distributor 10 is located in front of nozzle 12. Said air distributor 10 is frusto-conical with its axis aligned with the axis of pipe 24. The rear circular end opening 9 of air distributor 10 is of smaller diameter than the front circular and edge opening 8 thereof and is proximate to and of greater diameter than pipe 24. The front edge opening 8 is of smaller diameter than casing 20 and is located rearwardly of the front end of ring 21. A central longitudinal stream of air and oil droplets can pass through rear opening 9 and hence through distributor 10 and out of front opening 8. Radially outwardly of the central stream of air, a further stream of air strikes the outer face of the peripheral wall of air distributor 10 and is there deflected by vanes to be described below. Excess air can pass out of casing 20 around the outside of air distributor 10.

In order to mount air distributor 10, three strips of metal are bent so as to define central segments 40 which

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together define a central ring around pipe 24, and radial segments 41 and 42. The adjacent segments 41 and 42 connecting with successive segments 40 abut each other to define a radial arm, there being three such radial arms, 41, 42. The arm segments 41 and 42 may be secured together by any suitable means (not shown). Some freedom of play is left between one pair of adjacent arm segments 41 and 42 so as to permit the ring segments 40 forming the ring to be closely fit sectionally around pipe 24, with the free segments 41 and 42 being held together by screw 45 so as to tighten the assembly. The outer ends of the segments 41 and 42 are bent forwardly at 41a and 42a respectively to extend to the outer surface of air distributor 10 adjacent the front edge 8 thereof. Each of the segments 42a is bent at 42b to conform to the surface of air distributor 10 and is secured thereto by spot welding 46. It will be apparent that any other suitable mounting means for air distributor 10 may be provided, but it is advantageous to mount air distributor 10 upon pipe 24 since in that instance the nozzle 12 will always be properly centered upon air distributor 10.

Air distributor 10 has vanes 30 struck inwardly therefrom in the same sense and defining slots 31 in air distributor 10 of corresponding dimensions. Vanes 30 are laterally aligned and equally spaced circumferentially. Each slot 31 is optionally and preferably generally in the form of a right triangle with a short base or rear side edge 32 proximate and parallel to the rear edge of air distributor 10; and long side edge 33 perpendicular to the short side 32 and extending longitudinally to near the front end of air distributor 10; and a hypotenuse edge 34 on the diagonal, this being the connection edge between vane 30 and air distributor 10. The connection between edge 34 and edge 33 is defined as the tip of slot 31. The circumferential distance between the short rear edges of successive vanes corresponding to the slot sides 32 is less than the length of said rear vane edges 30a, for the number and configuration of vanes illustrated.

Vanes 30 are inclined at an acute angle to air distributor 10 so as partially to overlie slots 31. The result is that the longitudinal stream of air passing through the slots 31 strikes the vanes 30 and is deflected thereby to form a circumferential stream of air. This circumferential stream of air extends around the inner surface of air distributor 10 and extends in the direction of length thereof. The circumferential stream of air is greatest in intensity at the rear of vanes 30.

It will be apparent that there is a dead air space between the main central longitudinal stream of air and oil droplets through the end 9 and the circumferentially flowing stream of air adjacent the inner surface of air distributor 10. The result is to create a partial vacuum which tends to draw oil droplets radially outwardly from the main longitudinal stream. As a result, the flame front resulting from oil-air combustion within the air distributor 10 is confined within the distributor and is not blown out forwardly thereof.

Any suitable ignition means, preferably electrical in nature, is provided. The igniter device 50 is shown in the drawing as extending longitudinally, and may be fixed to one of the arms 26. The rear of the igniter device 50 is broken away. The usual igniter rod 11 extends out of the front of device 50 and is then inclined inwardly and forwardly to terminate at the front slightly forwardly of orifice 12a. Any suitable electric igniter may be provided to heat rod 11, so as to provide the increased temperature necessary to ignite the oil-air mixture in front of orifice 12. The combustion reaction is then carried almost instantly into air distributor 10, where it is maintained, as stated above in detail, by reason of the particular air flow pattern which is set up. Accordingly, once combustion is initiated, the ignition device 50 may be rendered inactive, by any suitable means, whether

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automatic or manual, such inactivation means being conventional and not shown.

It will be apparent that the device is effective over a wide range of operating conditions to maintain the combustion reaction within the confines of air distributor 10. By way of example, if the flow of air should be excessive, so as unduly to increase the velocity of the central longitudinal air stream through end 9, the circumferential air stream within distributor head 10 is correspondingly increased, thereby tending to increase the vacuum and to increase the tendency for oil droplets to be pulled radially from the main air stream.

In a representative working model, the diameter of cone opening 8 was three and three-quarter inches, with the diameter of casing 20 being six inches. The distance between the rear cone end 9 and the front of nozzle 12 was one-eighth to three-sixteenth inch. In such working model, there were ten vanes 30, this being the representative number shown in the drawing. The diameter of opening 9 was substantially one and one-half inches. The length of air distributor head 10 was approximately one and one-quarter inches. The drawing of head 10 is substantially to scale of said working model, and reference is made to the drawing to complete the disclosure of the size of the vanes and slots.

While I have disclosed a preferred embodiment of the invention, and have indicated various changes, omissions and additions which may be made therein, it will be apparent that various other changes, omissions and additions may be made in the invention without departing from the scope and spirit thereof.

What is claimed is:

1. Air distribution means for use in conjunction with a burner head of the type described including an axially extending pipe having a front atomizing nozzle, said air distribution means comprising an air distributor which is frustoconical with its rear end of smaller diameter than its front end, said air distributor having vanes struck inwardly in the same sense therefrom and defining slots in said air distributor of corresponding dimensions, and bracket means for mounting said air distributor on said pipe, said bracket means comprising a plurality of strips having central arcuate segments shaped and sized to form together in endwise adjacent relation a ring adapted to be mounted on said pipe, said strips further having substantially identical outwardly projecting flat arms at the ends of each of said central segments and disposed in radial planes, the arms projecting from adjacent segment ends in flush abutment with each other to form pairs of juxtaposed arms, each pair of juxtaposed arms having co-planar forwardly extending, flushly abutting extensions, means securing each pair of juxtaposed arms together, and means securing the front end of at least one arm of each pair of juxtaposed arms to said air distributor with said air distributor spaced from said ring whereby said air distributor can be located forwardly of said nozzle when said ring is mounted on said pipe.

2. Bracket means according to claim 1, wherein said means securing the juxtaposed arms together includes at least one screw connecting a pair of said juxtaposed arms, said central ring engaging said pipe frictionally.

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