

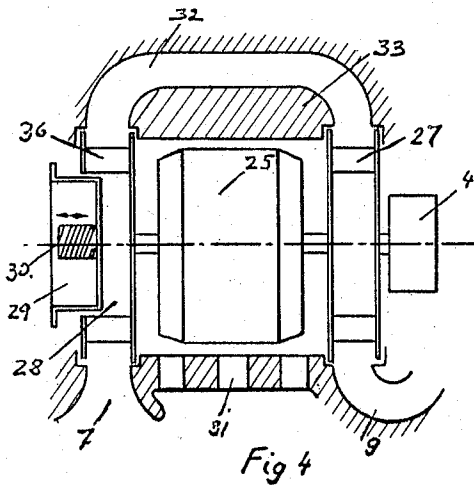
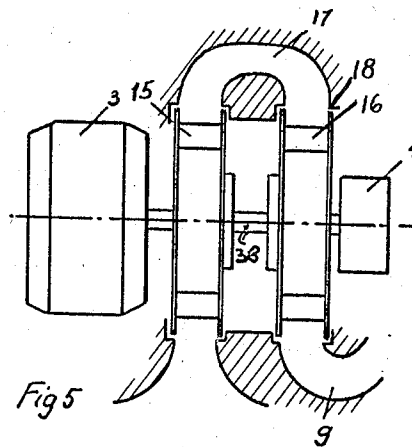
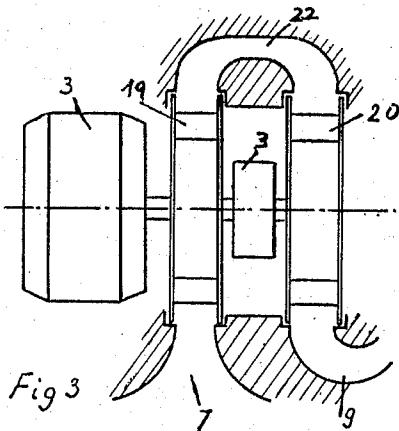
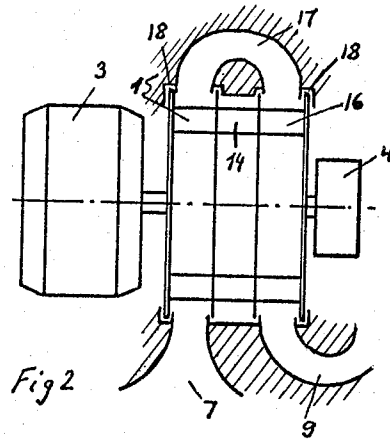
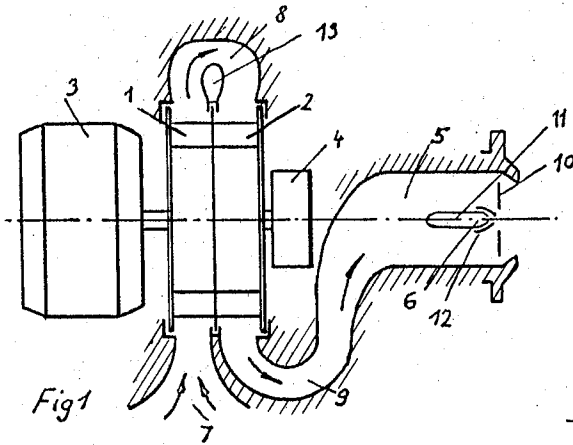
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3,306,336

PRESSURIZED FLUID FUEL BURNER

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PRESSURIZED FLUID FUEL BURNER**Kurt Zenkner, Quellenstrasse 22, Grunwettersbach-Karlsruhe, Germany**

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6 Claims. (Cl. 158—76)

This invention relates to a fuel burner apparatus. In particular, this invention is directed to an oil or gas burner wherein the oil is sprayed or the gas is blown at high pressure through a nozzle into a mixing chamber through which air flows, is atomized or diffused during this operation, and intimately mixes with the air in the mixing chamber, and is ignited at the end of the mixing chamber.

It is one object of this invention to provide a quiet, compact blower assembly for a fuel burner which will provide the necessary air pressure to insure adequate gas flow through the heat exchange surfaces of a combustion chamber.

It is another object of this invention to provide an inexpensive, efficient fuel burner assembly.

It is still another object of this invention to provide a compact blower assembly for oil and gas burners which produces greater air pressures at greater air flows than axial blowers or radial blowers operating at the same rotor speeds.

In the drawings:

FIGURE 1 shows a sectional view of an oil burner including an electric motor, two transverse blowers, an oil pump, and a mixing chamber in axial alignment.

FIGURE 2 shows a sectional view of the oil burner of this invention with two transverse blower portions separated by a central chamber.

FIGURE 3 shows a sectional view of the oil burner of this invention with the oil pump being axially disposed between two transverse blowers.

FIGURE 4 shows a sectional view of the oil burner of this invention with a transverse blower having a central recess and an adjustable cylinder positioned therein.

FIGURE 5 shows a sectional view of an oil burner of this invention wherein the two transverse blowers are mountingly supported to a connecting shaft disposed therebetween.

In oil burners, the position of the flame and the stability thereof depend exclusively upon the flow of the air for combustion. The flow energy of the combustion air is derived from blowers which usually constitute a single unitary assembly with the oil pump motor, the control system, and the burner proper.

In the burner, the flame is located in either a straight or a curved combustion chamber which is surrounded by heat exchangers. The heat generated by the flame may be used to heat air or water. The more compact arrangements of the heat exchange surfaces allow smaller furnace structures, but the more compact arrangements also provide flow paths for the hot gases which are twisted and circuitous. Hence the pressure and flow rate of the combustion gases decreases rapidly in the combustion chamber.

Previously, these problems were overcome by increasing the circumferential speed of the conventional blowers. This required that the diameters of the blowers be increased if the speed of the motors were to remain unchanged. This also increased the noise intensity of the blower. The provision of axially aligned radial blowers in several stages was less frequently employed. This arrangement has the disadvantage that each rotor has to be connected to a drive wheel which is expensive and inefficient.

These disadvantages are effectively eliminated, in accordance with the present invention, by the use of a trans-

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verse air blower to provide the requisite flow pressure to the combustion air. A transverse air blower is adapted to produce more pressure, relative to the rotational or circumferential speed of the rotor, than an axial blower or a radial blower.

Furthermore, according to the present invention, the transverse air blower assembly increases the air pressure and flow velocity through at least two blower stages. This may be effected either with separate blowers or with a rotor which is subdivided into several chambers by intermediate disks or dividers extending radially from the rotor axis.

FIGURE 1 shows one embodiment of the present invention with an oil burner including two transverse air blower stages in which the motor, the blowers, the oil pump, and the mixing chamber with the oil injector are axially aligned. A central disk or partition extending radially from the rotor axis separates the two rotor stages. However, all of the other angular relationships between the axis of the burner proper and the axis of the blower subcombination may be employed as well. For example in extreme instances, the axis of the burner and the axis of the blower can be positioned at right angles with respect to each other.

Analogously, the same blower arrangement may also be used in gas burners according to the present invention. In this variation of the invention, the oil supply is replaced by a gas supply means, and the oil pump is omitted.

In the embodiment shown in FIGURE 1, the air enters through an inlet terminal orifice 7 and is directed through the first stage 1 of the transverse air blower rotor. The deflecting channel 8 guides the air being discharged from the outlet of the first stage 1 into the inlet of the second stage 2. The deflecting channel 9 is a terminal outlet orifice and directs the air being discharged from the outlet of the second stage 2 into the blast tube 5. If there is a third stage, a second deflecting channel 8 is put in place of part 9. The flame barrier 10, the oil supply means 11, and the ignition electrodes 12 are contained in the blast tube 5. Within the air-deflecting channel 8, the inner radial portion 13 nearest to the rotor axis is expanded in a bulge-like manner toward the opposite wall of the deflecting channel. The blower rotor may be mounted on either the motor shaft or the pump shaft.

Since the distance from chamber to chamber is very small, the deflecting channel in the apparatus of this invention has an inner radius projecting toward the opposite wall of the channel in a bulge-like manner. This provides a larger radius of curvature, smaller centrifugal forces, and decreases danger that the flow of air would create a low pressure zone with the resulting eddies along the inner wall. It is also possible to introduce a blind chamber or spacing chamber between two stages about which the air must then be deflected. This permits the use of a deflecting channel with a larger inner radius.

FIGURE 2 shows a variation of the apparatus of this invention differing from that shown in FIGURE 1 in that a center chamber 14 is provided which spaces apart the end chambers 15 and 16. The air is directed between these stages by deflecting channel 17. When using a rotor with intermediate chambers, the disks on the ends of the blower chambers as well as the intermediate blower disks may protrude beyond the blower chambers with the outer edges beyond the periphery of the blower blades. This protruding portion can project or be received into an annular groove in the housing, which combination provides a labyrinth packing 18. The air blown from the outlet of one blower chamber is guided by deflecting channel 17 to the inlet of the next chamber.

FIGURE 3 illustrates an embodiment in which the individual blower stages 19 and 20 are disposed separate from each other and wherein the oil pump 21 is positioned

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between the stages. The individual blower rotors can be mounted on the rotor shaft of the oil pump 21. Air from the outlet of stage 1 is directed to the inlet of stage 2 by means of deflecting channel 22. When employing blower stages which are separate from each other, the deflection of the air from one stage to the next one becomes easier when the distance between the two stages is increased. In order to retain a compact structure, the oil pump can be disposed between the two stages in accordance with this invention.

FIGURE 4 shows another two-stage embodiment of this invention in which the motor 25 is disposed between stage 26 and stage 27. Stage 26 is provided with a central axial space or recess 28 for receipt of a control cylinder 29. The cylinder may be laterally inserted into the recess 28 by means of adjusting element 30. This arrangement makes possible a linear regulation of the flow rate of the air through the stage. Air from the outlet of stage 26 is directed around area 33 by the deflecting channel 32 to the inlet of stage 27. The housing enclosing the motor 25 is provided with passageways 31 which permit air circulation for cooling the motor. By this arrangement, the space between the rotors is occupied by the motor rather than the oil pump as shown in FIGURE 3.

FIGURE 5 shows an arrangement of this invention wherein the separate blower stages 35 and 36 are spaced apart and separated by a coupling shaft 37. The coupling shaft can be rigidly attached to the blower rotors and can serve to support the rotors as a mounting.

Obviously many modifications and variations of the invention as hereinabove set forth can be made without departing from the essence and scope thereof, and only such limitations should be applied as are indicated in the appended claims.

The invention claimed is:

1. An oil, gas, or other fluid fuel burner with air admixing blower means, comprising a motor having a rotating drive shaft; a transverse-flow blower with air inlet and outlet terminal orifices; a blast tube connected to the outlet terminal orifice; a fuel nozzle within the open end of the blast tube; the blower having at least two blower stages; each of said at least two stages including a rotor in axial alignment with and drivingly connected to said drive shaft; the first of the rotors having a peripheral

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air outlet orifice, the successive rotor having a peripheral air inlet orifice adjoining the outlet orifice of the previous rotor; one air deflecting housing of the air outlet and inlet orifices attached from the outside for every pair of rotors; a segment of a ring structure of a bulbous cross section of an aerodynamic shape of a large radius of curvature in the flow of air between every pair of rotors to avoid air turbulence, said ring structure interposed between the air outlet of one rotor and the air inlet of the successive rotor within said housing; said blast tube axially aligned with respect to said drive shaft; said fuel nozzle coaxial with said blast tube; said blast tube having a large radius of curvature between said outlet terminal orifice and said fuel nozzle to avoid turbulence.

2. A burner as in claim 1, each two rotors spaced from each other in their axial alignment to enlarge the bulbous cross section of said ring and to increase the radius of curvature of the air flow.

3. A burner as in claim 2, said motor mounted in the space between two spaced rotors, one rotor mounted on each side thereof.

4. A burner as in claim 2, further comprising an oil pump positioned in the space between two spaced rotors, the fuel pump in axial alignment with said motor, the motor shaft drivingly connected with said fuel pump.

5. A burner as in claim 2, further comprising spacing structures positioned between pairs of spaced rotors.

6. A burner as in claim 1, at least one blower stage having a central axial space; a control cylinder mounted therein slidably coaxially with the motor shaft and means for adjusting the distance of sliding thereof.

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45 JAMES W. WESTHAVER, *Primary Examiner*.