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[54] **GAS BURNER ASSEMBLY**
7 Claims, 1 Drawing Fig.

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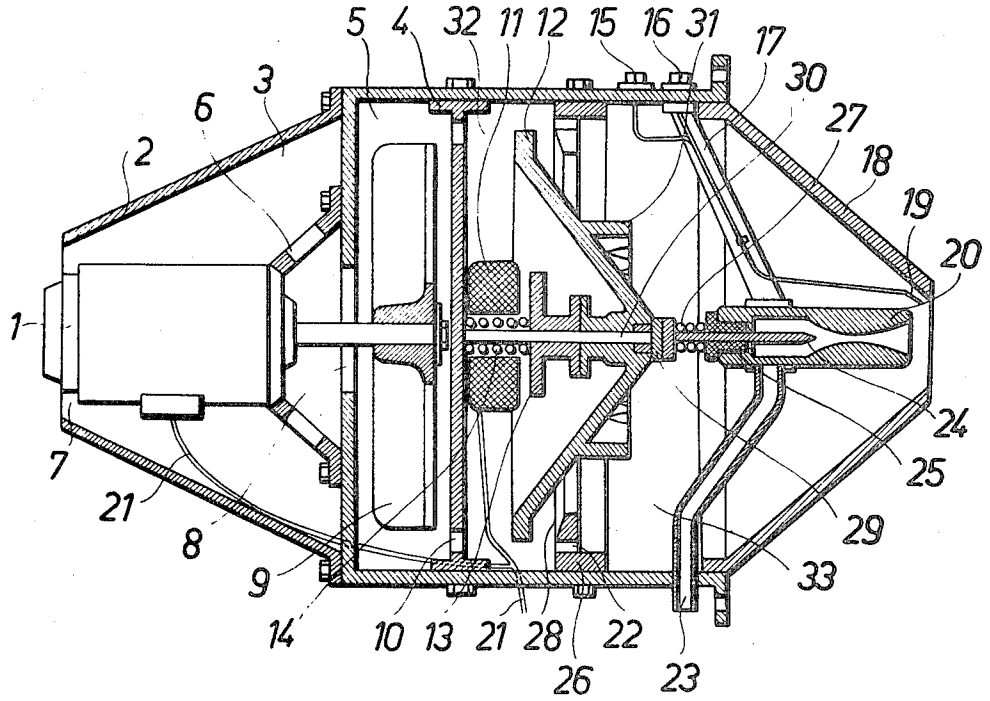
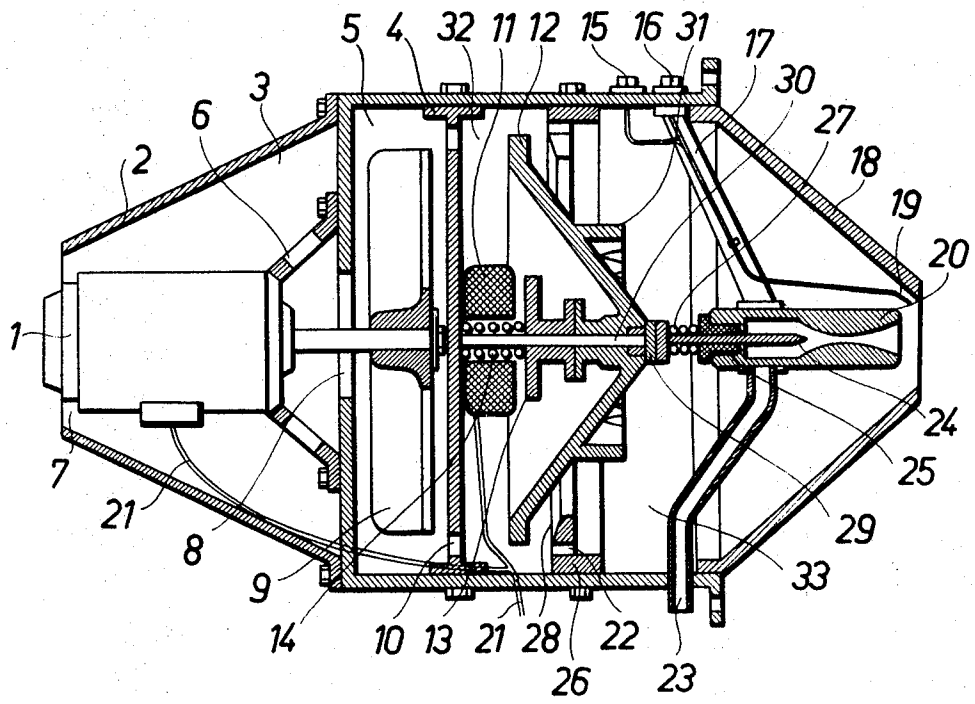
ABSTRACT: Fuel burner assembly for the combustion of gaseous fuels with a heating value over 3,000 Kcal./Nm.^{3} in which one and the same member is provided for controlling output, keeping the flame length constant and controlling the air-gas proportion. The said member is an axially displaceable mixing member actuated by a solenoid with a soft iron yoke mounted on the mixing member. The needle of the valve for the gas is also mounted on the mixing member having means for engaging it in an axial direction. The casing of the burner is divided into at least two chambers, by a dividing ring, said chambers being connected by passages. Both the mixing member and the dividing ring have a closing surface serving to close the aperture arranged in said dividing ring.





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GAS BURNER ASSEMBLY

The invention relates to a fuel burner assembly, particularly for burning gaseous fuels having a caloric value exceeding 3,000 Kcal./Nm.^{3}, in which the internal constructional design of the burner device permits to control and adjust the output and the air-gas proportion, with a practically identical flame length for the various outputs, as well as a perfect combustion of the fuel for all outputs. Accordingly, the invention permits to realize the required heating operation in the most advantageous manner, with a minimum of fuel input.

The automatic control of the air-gas proportion in conformity with requirements has not been satisfactorily solved in the known gas burner assemblies. In some cases valves or valve sets outside the burner unit have been provided, whereby the burner device has been rendered more expensive, voluminous and difficult to build in.

In the known burners the flow of gas and air is identical for small and large outputs. As a result, the flame is longer for large outputs and shorter for small outputs. This entails, especially in the case of high outputs, a longer flame than desirable, and a too small flame for low outputs. As a result, incomplete combustion of the gases, or combustion outside the furnace chamber are encountered, particularly in conjunction with high outputs in furnace chambers with temperatures below 800° C., whereas in the case of low heat or "simmer" flame deleterious local overheating occurs.

In conventional burners special means are provided for controlling output, air-gas proportion and flame length, which render the burner devices complicated and expensive.

It is the object of the invention to produce a burner assembly in which one and the same member is provided for controlling output, keeping the flame length constant and controlling the air-gas proportion, whereby the air-side resistance of the burner is diminished, flue gases are advantageously distributed over the furnace chamber, and high efficiency of combustion by means of simple and economical construction.

These aims are realized according to the invention by leading the combustion air over different paths across the control members, with the aid of a uniaxially disposed control arrangement actuated by a single solenoid, thus producing slower mixing for low outputs and quicker mixing for higher outputs. The same actuation directly controls or regulates, without the need for any additional member, the gas input, i.e. the output of the burner, ensures the constancy of the most desirable gas-air proportion and dispenses with expensive external control means, which may be difficult to coordinate.

Such operation of the burner has the following main advantages over the known solutions:

1. The adjustable flame length, practically independent from loading, ensures the most advantageous heat transfer in firing chambers, for example in the firing chambers of industrial furnaces.
2. The mixing disc actuated by the solenoid not only controls flame length but also serves to adjust the output and the gas-air proportion, whereby all these controlling measures are considerably simplified, thus reducing the cost of the equipment.
3. Even for satisfying the most complicated control requirements only one magnetic safety valve outside the burner, is provided, so as to permit considerable reduction of the size and weight of the equipment.

The invention relates to a gas burner assembly, particularly for the combustion of gaseous fuels of a caloric value over 3,000 Kcal./Nm.^{3}, which has a fan preferably driven by an electric motor, a fuel inlet, a gas valve, a gas nozzle, igniting and monitoring members, said burner assembly consisting of the following components, arranged uniaxially in a common casing which is conveniently composed of several parts; a driving motor, a fan, a solenoid, enclosing a compression spring, an axially displaceable mixing cone, a gas needle valve joining the cone, a compression spring disposed on said needle, and a stationary gas nozzle; the soft iron yoke of the solenoid is mounted on the mixing cone, both compression springs engage the mixing cone, directly or indirectly, and the internal space of the casing is divided into at least two chambers—a solenoid chamber and air chamber—said chambers being connected by passages.

The invention will be further described by way of example with reference to the accompanying drawing, representing one embodiment in longitudinal section.

Fan 9 driven by an electric motor 1 disposed in the motor chamber 3 conveys the combustion air from a fan chamber 5 through passages 6, 7, 8 and 10 into a solenoid chamber 32 where a solenoid 11 is mounted on a partition 4. On said partition 4 a rod 30 is mounted axially, on which a controlling or mixing cone 12 is so arranged as to permit sliding of the cone on the effect of the opposed forces of compression spring 14 and a solenoid 11. When the solenoid 11 is switched on, the soft iron yoke 13 mounted on the mixing cone is displaced towards the solenoid and compresses spring 14. Thereupon a passage is opened along the circumference of the mixing cone 12 between said cone and a dividing ring 26 for the air to stream from the solenoid chamber 32 into an air chamber 33. When the solenoid 11 is switched off, the spring 14 pushes cone 12 forward, whereby opening 28 on the circumference of the disc 12 is closed, so that air can stream into the air chamber 33 only through the small-diameter passages 22.

In the switched-on condition of the solenoid 11 the compressed spring 27 draws the valve needle 24 backwards, so that the gas amount required for high heating output may freely stream through a gas nozzle 20. In the switched-off condition of the solenoid 11 the stronger spring 14 compresses spring 27, the valve needle 24 advances and reduces the gas in feed. A threaded control member 29, disposed on the front part of cone 12 serves for controlling the gas-air proportion by checking the advance of valve needle 24 dispensing the gas. A collar 31 arranged on cone 12 has a helically worked surface causing the combustion air to stream with turbulence, when high heating output is desired, whereby flame length is diminished. A baffle 18 of truncated conical shape is disposed on the front part of the burner for securing complete combustion for low heat or "simmer" heat.

Envelope 2 covering the rear part of the burner serves the purpose of covering and heat protection of electric motor 1 and electric lead-in 21, beside esthetical reasons. Igniting member 15 and flame monitor 16, mounted on a reinforcing rib 17 of the gas nozzle, ensure the complete automatization of the operation of the burner. Conduit 23 serves for supplying fuel, for example natural gas, to the nozzle 20. A sealing gasket 25 is provided for preventing gas to stream into the interior of the burner.

A "full-flame –reduced flame" method is adapted for controlling low or high heating output; when the solenoid 11 is switched on, high heating output is secured, when it is switched off, low or "simmer" heat is supplied.

The burner assembly according to the invention has the following main advantages:

It is simpler and easier to manufacture than the conventional devices. The casing can be made of metal tubes and sheets.

A single solenoid is necessary for regulating heat output (which may be controlled by the steam pressure of the furnace or by its temperature) as well as the gas-air proportion.

Owing to the special design of the axially displaceable mixing cone, it is suited for controlling not only heat output and gas-air proportion but also the turbulence and thus the length of flame. The inner resistance of the burner is small, owing to the greatly simplified control members, so that it is possible to reduce the size of the fan and the power input. There are no rotating components except the fan, and the sources of defects are very few, as a result of the simplicity of design.

Since the flame length outside the burner is constant, this permits uniform loading of the firing chamber and improved efficiency.

Any known type of igniting of monitoring devices may be used with the burner assembly according to the invention, with the aid of devices incorporated into said assembly. The burner is therefore highly adaptable to a wide range of requirements.

It will be understood that the invention is by no means confined to the described embodiment. If the components are replaced by other components of different design but similar operation, function and effect, the scope of the invention does not change.

What I claim is:

1. A gas burner for the combustion of gaseous fuels with a heating value over 3,000 Kcal./Nm.^{3}, comprising a casing, a solenoid in the casing, a stationary gas nozzle mounted on the casing and having a gas inlet, and a unitary assembly coaxial with and movable under the control of said solenoid, said unitary assembly comprising a valve member for controlling flow of air through the casing, a needle valve, and a core movable by said solenoid, said needle valve cooperating with said nozzle to regulate the flow of gas at the same time that said valve member regulates the flow of air.

2. A burner as claimed in claim 1, and screw-threaded means for adjusting said needle valve relative to said valve member thereby to adjust the flow rate of gas relative to the flow rate of air through said casing.

3. A burner as claimed in claim 1, said valve member extending radially outwardly from said assembly and cooperating at its outer periphery with means to restrict the air flow through said casing.

4. A burner as claimed in claim 1, and a fan in said casing coaxial with said assembly for moving air through said casing.

5. A burner as claimed in claim 4, and means dividing the casing into at least two chambers connected by passages, said fan being disposed in one said chamber and said solenoid and assembly being disposed in another said chamber.

6. A burner as claimed in claim 1, and a pair of coil compression springs acting on said assembly in opposite directions to resist movement of said assembly in either direction.

7. A burner as claimed in claim 1, and a helical turbulence-inducing collar on an outside conical surface of said valve member.