CONTROL ARRANGEMENT FOR A HOT GAS GENERATOR

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1 Claim

ABSTRACT OF THE DISCLOSURE

A hot gas generator comprising a combustion chamber, a turbine having a rotor driven by heated gases leaving the combustion chamber and in combination a first compressor supplying air to the combustion chamber and a second compressor supplying dilution air to the combustion chamber, and means for controlling the relative pressures of the air/fuel mixture and dilution air can be controlled.

This invention relates to hot gas generators of the kind comprising, a combustion chamber, a turbine which is driven by heated gases leaving the combustion chamber, and means for supplying dilution air and fuel to the combustion chamber.

The object of the invention is to provide such a generator in a simple and convenient form.

According to the invention, in a generator of the kind specified, said means comprises first and second compressors driven by said turbine, the first compressor serving to supply an air/fuel mixture to a burner disposed in the combustion chamber, the second compressor serving to supply dilution air to the combustion chamber, and means for controlling the quantity of air supplied by the second compressor.

In the accompanying drawings:

FIG. 1 is a sectional side elevation of one example of a hot gas generator to which the invention may be applied and

FIG. 2 is a diagrammatic representation of the generator of FIG. 1 modified in accordance with the invention.

Referring to the drawings there is provided a body part 10 in which is mounted a rotary shaft 11. At one end of the shaft is mounted a radial flow turbogenerator 12 which is accommodated within a turbine casing 13 having a tangential inlet 14 and an axially extending outlet 15. The turbine casing is secured to the body part 10. At the other end of the shaft is mounted a pair of radial flow compressors 16 and 17 disposed in compressor casings 18 and 19 respectively. The compressor defined by the rotor 16 and casing 18 is hereinafter called the first compressor whilst the compressor defined by the rotor 17 and the casing 19 is hereinafter called the second compressor. The casings 18 and 19 have tangential outlets 20 and 21 respectively and inlets 22 and 23.

Also provided is a combustion chamber indicated at 24 and this includes an outer casing 25 which is of generally cylindrical form and has a throat portion 26. The downstream end of the combustion chamber is secured to the inlet 14 of the turbine and upstream of the throat portion 26 is an annular chamber 27 which serves to support the downstream end of a flame tube 28. The upstream end of the flame tube is supported by a burner assembly 29 secured to the upstream end of the outer casing. Surrounding the flame tube is an annular space to which dilution air is fed by the second compressor through a pipe 29. Formed in the flame tube are holes 30 through which the dilution air flows into the flame tube. Furthermore, the burner assembly 29 is in communication with the outlet 20 of the first compressor by way of a pipe 31. Also mounted on the casing 25 is an ignition plug 32 which extends into the flame tube downstream of the burner assembly 29 so as to ignite the air/fuel mixture entering the combustion chamber.

In order to entrain fuel with the air entering the first compressor a carburetor indicated at 33 in FIG. 2 is provided. The carburetor is supplied with fuel from a source 34 and when liquid fuel is employed a conventional fuel carburetor having a venturi may be provided in order to draw the fuel into the air stream. Where a gaseous fuel is used such for instance as town gas, natural gas or vapourised petroleum gas, the gas will be supplied under a slight pressure to the nozzle of the carburetor so that the latter is little more than a mixing device for the air and gas.

In operation the heated gases leaving the combustion chamber drive the turbine rotor prior to being discharged through ducting or the like. The turbine rotor in turn drives the compressor rotors which supply the air/fuel mixture and the dilution air to the combustion chamber.

The dilution air acts to reduce the temperature of the gases entering the turbine so that the safe working temperature thereof is not exceeded.

It will be noted from the drawings that the compressor rotors 16 and 17 are of differing diameters and widths. The rotor 16 of the first compressor is larger in diameter but has a smaller axial width than that of the rotor 17 so that the output pressure of the first compressor is slightly larger than that of the second compressor. The reduced axial width however means that the volume of air/fuel mixture delivered is less. By supplying the air/fuel mixture at slightly higher pressure, penetration of the air/fuel mixture into the combustion chamber is ensured and once the combustion process has started the apparatus is self sustaining as long as fuel is supplied.

It is essential to ensure that at all conditions of operation the air/fuel mixture should be supplied to the burner at a slightly higher pressure than that pertaining within the combustion chamber.

It is possible to design the compressors such that the temperature of the exhaust gases leaving the combustion chamber does not exceed that which is acceptable by the turbine under all conditions of operation of the generator. However, such a task is not easy particularly in view of the fact that the first compressor should provide a higher output pressure than the second compressor. In order to overcome this difficulty the second compressor is provided with a throttle 35 whereby the quantity of dilution air admitted to the combustion chamber can be altered to suit varying conditions of operation of the generator.

The throttle 35 can be made to be responsive to the pressure developed by the second compressor and for this purpose a pressure sensitive device 36 such for instance as a spring loaded diaphragm or bellows is used to control the setting of the throttle 35.

Having thus described my invention what I claim as new and desirable to secure by Letters Patent is:

1. A control arrangement for a hot gas generator comprising a combustion chamber, a burner disposed in said chamber, a turbine driven by heated gases leaving said combustion chamber, a first compressor driven by said turbine and arranged to deliver an air/fuel mixture to said burner, a second compressor driven by said turbine for supplying dilution air to said combustion chamber, a throttle for controlling the air flow through
said second compressor, and pressure sensitive means responsive to the outlet pressure of the first compressor for controlling said throttle.

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U.S. Cl. X.R.