The following examples are given for illustrative purposes only and they do not limit the scope of the present invention.

EXAMPLES

Air excess

The air excess as % by volume is defined by the following formula:

$[(W_{combustion\ air}/W_{stoichiometric\ air}) -1)]x100$ wherein $W_{combustion\ air}$ is the air flow rate actually used and $W_{stoichiometric\ air}$ is the air flow rate required for the stoichiometric balance of the combustion reaction.

EXAMPLE 1

A combustion process is carried out in a burner according to the present invention as represented in Fig. 1a and connected to an industrial refractory boiler. The burner is used at 100% of its thermal power (100% load). The fed fuel is natural gas (% by volume about 95% methane, 2.5% ethane, 0.2% propane, 0.06% butane, 0.02% of a mixture of pentane + $C_{10}H_{22}$, 1.6% nitrogen, 0.7% CO_2, H_2O traces and H_2S). The comburent is atmospheric air at room temperature.

The air feeding pressure is of 12,000 Pa. The gaseous fuel is fed through the injection system 8, downstream of the injector 1. The fuel feeding pressure is 250,000 Pa.

The air excess is 1.5%. The oxygen contained in flue gases is 0.3% by volume, calculated on the dry gas. The temperature of the flue gases outletting the boiler is 1320°C.

The ratio by volume recycled flue gases/comburent is 45%.

The stack emissions of CO are ≤20 ppmv and NO_x ≤15 ppmv.

EXAMPLE 2

Example 1 is repeated but the injection of the natural gas is carried out through the injection system 5, upstream of the injection section 1.

The stack emissions of CO are ≤10 ppmv and NO_x ≤10 ppmv.

EXAMPLE 3 COMPARATIVE

A prior art conventional flame combustion burner is used (see Fig. 4). The burner is used at 100% of its thermal power. The fuel and the comburent used are the same as in example 1.

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The stack emissions of CO are ≤10 ppmv and NO_x ≤10 ppmv.

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A prior art conventional flame combustion burner is used (see Fig. 4). The burner is used at 100% of its thermal power. The fuel and the comburent used are the same as in example 1.