

METHOD FOR THE DRY CLEANING OF REACTION PRODUCTS
FROM A FLAME COMBUSTION

This invention relates to a method of cleaning reaction products which result from flame combustion of fuels containing impurities such as sulphur, chlorine and fluorine compounds, by the addition of additives binding the impurities, in the combustion chamber.

Methods are known whereby a dry cleaning of reaction products from the combustion of fuels containing impurities such as sulphur, chlorine and fluorine, can be carried out. In this case, the additives binding the impurities are introduced into the combustion chamber in various ways.

In a first known method, the procedure is such that the additives are injected into the combustion chamber, above the flame region, by means of jets of air. The disadvantage of this known method consists in that the method of introducing the additives into the combustion chamber does not ensure the binding of the impurities by the additives because the relatively small mixing energy of the jets of air is not sufficient to achieve a satisfactory degree of mixing of the reaction partners. In addition, the mixing of the reaction partners is effected mainly in temperature regions which do not ensure the optimum reaction conditions. Furthermore, the available dwell time is insufficient for the conclusion of the reaction because the injection of the additives is generally effected in regions where the reaction is slow.

In a second known method, the procedure is such that the additives are admixed with the fuel immediately before the fuel is introduced into the burner. What is unfavourable about this method

is that the additives are subjected to the whole temperature spectrum of the flame and have to travel through temperature ranges which lead to an inactivation of the additive. This applies, in particular, to fuels with a high calorific value which necessarily lead to flames with high temperatures.

It is therefore the object of the present invention to develop a method of cleaning reaction products from flame combustion of fuels containing impurities, in which, on addition of additives binding the impurities, these are brought together with the reaction products from the combustion at a place and in a form in the combustion chamber so that the prerequisites necessary for the binding are reached with regard to temperature and degree of mixing.

In order to solve this problem, it is proposed, according to the invention, that the additives should be added to the burner flame by means of a gaseous and/or liquid stream of carrier agent forming a veil surrounding the burner flame.

Various substances may be used as carrier agent. According to a first form of embodiment of the method according to the invention, a component stream of the combustion air may be used as a stream of carrier agent.

There is also the possibility, according to the invention, of using a mixture of combustion air and flue gas as a stream of carrier agent.

Another possibility is to use pure flue gas as a stream of carrier agent.

Water in which the additive is suspended may also be used as a stream of carrier agent according to the method.

In the method of the invention, the additives capable of reaction with impurities in the fuel may be metallic oxides or hydroxides such as those of the metals sodium, potassium, aluminium, barium, cadmium, calcium, copper, iron, lead, magnesium, manganese or zinc. The additives may however be substances in the form of dust such as calcium carbonate, magnesium carbonate or dolomite.

As a result of the fact that the place and the form of the addition of the additives is clearly predetermined in the region of the flame using a gaseous or liquid stream of carrier agent, the effect is achieved that the reaction of the additives with the impurities from the combustion gases is effected where the optimum reaction conditions for the method are present.

Apart from determining the position and the form for the addition of the additives, the selection of the carrier agent for the course of the reaction can be influenced in the direction of further optimization. This applies, for example, when fuels with high flame temperatures might have a negative influence on the activity of the additive. Furthermore, the mixing operation of the reaction partners can be controlled with regard to an optimization of the reaction by the selection of the pulse stream of the carrier agent for the additive.

The use of the method according to the invention is described below by way of example with reference to a coal-dust burner.

With the burner consisting of core air tube 2, fuel and coal dust carrier-air part 1 and jacket air part 3, a primary combustion zone 6 is produced, the air number of which is between 0.8 and 1.1 times the stoichiometry.

The burner is so constructed that by specific means (swirl of the jacket air, burner mouth widened out in a taper, closed core air) in the interior of the flame a zone of intensive return flow 5 from a region of already advanced combustion is produced. As a result, the mixture of fuel and air is quickly heated and ignited. The heating and ignition can be influenced by adjusting the amount of core air.

The remaining combustion air is blown in through some nozzles at the periphery, as a component stream of air 4 with additives which are intended to bind the gaseous substances formed during the combustion, so that a veil of component air stream and additive forms round the flame, through which the secondary flame or post-reaction zone 7 develops outside the primary flame, and is supplied with oxygen and additives which bind harmful substances through the component stream of air. The component stream of air 4 is disposed for this purpose in a pitch circle which corresponds to double the diameter of the jacket air tube or more. By this means, assurance is provided that the component stream of air 4, with the additives, reaches the actual flame downstream of the burner mouth only after a distance of about 1 to 2 diameters of the jacket air tube outside the temperature ranges which weaken the activity of the additives. The addition of the additives

to the component stream of air 4 is effected through a conduit 8, in the region of the regulating member for the amount of component air, because there a satisfactory mixing is ensured because of the flow turbulence which forms.

At the sections of the peripheral area of the flame which are not adjacent to the component air flow 9, flue gases are drawn in from the combustion chamber by pulse exchange. By this means, the flame temperature is lowered which contributes to a favourable influencing of the course of the reaction between additive and gaseous harmful substances.



CLAIMS:

1. A method of binding sulphur, chlorine and/or fluorine compounds which are formed as reaction products during the combustion of fuels containing such impurities via burners in a combustion chamber, by the addition of additives by means of a stream of carrier agent in the region of the burner flame, characterised in that the additives are added by means of a gaseous and/or liquid stream of carrier agent forming a veil surrounding the burner flame.
2. A method as claimed in claim 1, characterised in that the stream of carrier agent is a component stream of the combustion air.
3. A method as claimed in claim 1, characterised in that the stream of carrier agent is a mixture of combustion air and flue gas.
4. A method as claimed in claim 1, characterised in that the stream of carrier agent consists of pure flue gas.
5. A method as claimed in claim 1, characterised in that the stream of carrier agent is water in which the additive is suspended.
6. A method as claimed in one of the claims 1 to 5, characterised in that metallic oxides or hydroxides such as those of the metals sodium, potassium, aluminium, barium, cadmium, calcium, copper, iron, lead, magnesium, manganese and zinc for example are used as additives.
7. A method as claimed in one of the claims 1 to 5, characterised in that calcium carbonate, magnesium carbonate or dolomite in dust form are used as additives.



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8. A method of binding sulphur, chlorine and fluorine compounds which are formed as reaction products during the combustion of fuels containing such impurities via burners in a combustion chamber, substantially as hereinbefore described with reference to the accompanying drawing.

The text of the specification has been reproduced by photocopying the applicants original typescript. It may contain a few amendments which are difficult to read. The original typescript containing these amendments may be inspected on the premises of the Patent Office