

METHOD OF IGNITING A COAL-DUST ANNULAR
BURNER FLAME

The invention relates to a method of igniting an air/coal-dust mixture in a coal-dust annular burner which in operation has a flame with an internal return flow region, wherein the ignition energy is introduced centrally into the internal return flow region of the coal-dust annular burner flame.

In order to ignite a burner, ignition energy is generally supplied to the combustible mixture of fuel and air. In coal-dust annular burners, the preparation and supply of the ignition energy is effected by so-called igniting burners which are operated with oil or gas. In this case, the oil or the gas is ignited by means of an electrical ignition spark. The use of oil or gas as an ignition energy carrier is effected in view of its readiness to ignite and combustion stability, which is particularly necessary with cold combustion-chamber influences.

For reasons of cost and of the available reserves it is becoming ever more desirable to use coal or another solid fuel as ignition fuel instead of natural gas or petroleum as an ignition energy carrier, particularly with coal-dust firing.

It is therefore the object of the present invention to use a solid fuel as an ignition energy carrier in coal-dust annular burners, that is to say burners of a special construction.

According to the present invention there is provided a method of igniting an air/coal-dust mixture in a coal-dust annular burner which in operation has a flame with an internal return-flow region, in which the ignition energy is introduced centrally into the internal return-flow region of the coal-dust annular burner flame, characterised in that the ignition energy for the annular burner flame is applied by a dust igniting flame obtained by combustion of a fuel dust.

Preferably, the dust-laden air - dust weight ratio for the dust igniting flame is lower (0.5 to 1.0) than that of the main burner flame (1.5 to 2.0).

In order to increase the dwell time of the individual dust particles in the ignition region, it is further proposed that the axial combustion air component for the dust igniting flame should be smaller than that of the main burner flame.

In order to balance the smaller axial combustion air component for the dust igniting flame with respect to the resulting one aimed at, the tangential combustion air component for the dust igniting flame should be greater than that of the main burner flame.

In the method according to the invention, the dust igniting flame is preferably operated with a lower air number ($\lambda = 0.8$ to 1.1) than the main burner flame ($\lambda = 1.1$ to 1.3).

The igniter of the igniting burner can be operated gas-electrically, oil-electrically or purely electrically.

Preferably the igniting burner flame is supplied with combustion air through the core air passage of the main burner.

In addition, in order to reduce the expense to a minimum, it is proposed that the igniting burner flame should be operated with the main fuel. In special cases, when this is necessary for the reliable ignition or the ignition stability, however, a fuel dust differing from the main fuel in grain size and/or consistency may be used.

Although a dust flame displays a more sluggish behaviour with regard to its readiness to ignite than the gas or oil flames hitherto used, allowance can be made for this circumstance by influencing the igniting burner construction.

It has been found that the relative unreadiness of a dust igniting flame to ignite and the associated ignition difficulties can be counteracted if the construction principle of the main burner is used as a basis for the igniting burner. Thus according to the method of the invention, the burner is extended in the burner principle to dust-dust flames in the annular burner.

A coal-dust annular burner of known construction with an igniting burner disposed in the burner axis and using the principle of the method according to the invention is illustrated in the Figure and described below.

The annular burner operated with coal dust consists of a central core air tube 1 which is used to receive the dust igniting burner. The dust igniting burner consists of an igniting dust tube 3 which is disposed concentrically round an igniter tube 2 and which in turn is surrounded by a jacket air tube 4 with an axially displaceable ring of swirl vanes 5 disposed at its air inlet, the tube 4 having an outlet 6 widening out in a taper. Regardless of the constructive similarity of the igniting burner to the main burner, there are however necessary differences in construction and operation.

which are specific to the method.

The constructional differences consist in the formation of the tapered igniting burner outlet 6, the cone angle of which is generally greater than the cone angle of the main burner outlet 7. Furthermore, the ratio of the axial length of the outlet cone to the diameter of the jacket air tube is greater (0.75 to 1.5) than that of the main burner (0.4). Furthermore, the core air tube is absent in the igniting burner with a view to producing a rich mixture of dust and air which is therefore readier to ignite. A further constructional difference lies in the fact that the igniting dust flame, after emerging from the burner cone 6, in contrast to the main burner flame through the main burner cone 7, is protected from an excessive heat loss which has a favourable effect on the readiness to ignite and the ignition stability.

A constructional feature specific to the method is also to be seen in the fact that the combustion air stream for the igniting dust flame is supplied to the igniting burner through the core air passage of the main burner and can be regulated through a separate regulating member independently of the jacket air stream of the main burner.

The operational differences of the ignition burner in comparison with the main burner consist in that the dust-laden air - dust weight ratio to encourage the readiness to ignite is selected considerably lower (0.5 to 1.0) than in the main burner (1.5 to 2.0). Furthermore, the dust igniting flame is operated with a lower air number ($\lambda = 0.8$ to 1.1) than the main burner flame ($\lambda = 1.1$ to 1.3), with the

object of keeping the dust air mixture for the igniting flame in a rich range which therefore ignites more readily. Furthermore, the combustion air of the main burner has different air velocity components, and the axial air velocity component is less than that of the main burner as a result of which the dwell time of the particles of fuel dust in the ignition region is increased and so the ignition stability is improved. The tangential air velocity component, on the other hand, which can be adjusted through the ring of swirl vanes 5, is greater than that of the main burner so as to ensure that the resulting combustion-air velocity vector which predominantly influences the turbulence or the mixing operation is always kept within the optimum range.

In addition, the mode of operation of the igniting burner can differ from the main burner in special cases in that it is operated with a fuel dust differing from the main fuel in grain size and/or consistency, if this is necessary for reliable ignition and the ignition stability.

The main burner consists, for its part, not only of a core air tube 1 with an adjustable supply of air 8, but also of a dust-laden air tube 9 which is disposed coaxially and which is connected by a dust distributor chamber 10 to the dust conduit 11. Disposed coaxially round the dust-laden air tube 9 is a jacket air tube 12 which is connected through flaps 13 to the main air passage 14.

A ring of swirl vanes 15, through which the jacket air flows axially, can be displaced axially through a plurality of spindles 16 and the hand wheel 17. The jacket air passage 18 is connected to the combustion chamber through the main burner outlet 7 which widens out in a taper. The ring of swirl vanes 15 and the conical burner outlet 7 ensure the formation of a return flow zone encouraging the ignition of the main burner in known manner. The main burner outlet 7 is made of ceramic composition for example; it is installed in a tube basket 19 which is formed from the tubes of the wall tubing of the combustion chamber.



CLAIMS:

1. A method of igniting an air/coal-dust mixture in a coal-dust annular burner which in operation has a flame with an internal return-flow region, in which the ignition energy is introduced centrally into the internal return-flow region of the coal-dust annular burner flame, characterised in that the ignition energy for the annular burner flame is applied by a dust igniting flame obtained by combustion of a fuel dust.
2. A method as claimed in claim 1, characterised in that the dust-laden air - dust weight ratio for the dust igniting flame is lower (0.5 to 1.0) than that of the main burner flame (1.5 to 2.0).
3. A method as claimed in claims 1 or 2, characterised in that the axial combustion air component for the dust igniting flame is smaller than that of the main burner flame.
4. A method as claimed in any of claims 1 to 3, characterised in that the tangential combustion air component for the dust igniting flame is greater than that of the main burner flame.
5. A method as claimed in any of claims 1 to 4, characterised in that the dust igniting flame is operated with a lower air number ($\lambda = 0.8$ to 1.1) than the main burner flame ($\lambda = 1.1$ to 1.3).
6. A method as claimed in any of claims 1 to 5, characterised in that the igniter of the igniting burner is operated gas-electrically, oil-electrically or purely electrically.



7. A method as claimed in any of claims 1 to 6, characterised in that the combustion air is supplied to the igniting burner flame through the core air passage of the main burner.
8. A method as claimed in any of claims 1 to 7, characterised in that the igniting burner flame is operated with the main fuel.
9. A method of igniting an air/coal-dust mixture in a coal-dust annular burner which in operation has a flame with an internal return-flow region, substantially as hereinbefore described with reference to the accompanying drawing.

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