

The invention relates to a nozzle for feeding secondary air into a furnace comprising a mechanical grate through which primary air can be introduced and a combustion chamber arranged above it and delimited by boundary walls into which secondary air can be injected by means of nozzles arranged at least in the front and rear boundary walls, the nozzle having an inner casing and an outer casing held concentrically thereto and the inner casing being connected to a flange which has a larger diameter than the outer casing and serves to deflect the air flowing between the inner and outer casings perpendicularly to the air emerging from the inner casing.

In furnaces in which secondary air is fed into the combustion chamber by means of nozzles, the nozzles preferably being arranged on the front and rear walls, fuel particles are very often baked on in the region of one boundary wall situated below an opposing secondary air nozzle by which they are thrown against the opposing wall where they adhere as these fuel particles are still in an incandescent and free-flowing state. These adhering particles can only be removed with great difficulty and the entire furnace has to be shut down, this involving a long stoppage. In furnaces with a reciprocating grate, the particles adhere to the rear boundary wall as its lower wall region is subjected to the jet action of the secondary air nozzle of the front boundary wall as a result of the construction of the furnace chamber.

A nozzle of the type described at the outset for eliminating the aforementioned problems is known from US-A-2 956 527.

In the known nozzle, the outer casing is provided with a ring with star-shaped webs for holding the inner casing, the front

edges of which as viewed in the flow direction are flush with the front edge of the inner casing. This not only necessitates additional constructional complexity, but the radially arranged webs also have an adverse effect on the air flow into the outer annular channel and thus make precise calculation of the quantities of air flowing into the two air channels more difficult. The annular channel on the outer circumference of the inner casing has a substantially constant thickness over its entire length and is deflected in a gentle curve by means of the flange connected to the inner casing in a direction perpendicular to the flow direction of the air emerging from the inner casing. This results in a substantially laminar flow along the wall of the combustion chamber which can only prevent the adhesion of particles if an extremely large quantity of air is used. Although in the known nozzle the internal end of the inner casing tapers, it is essentially blunt, this having a disadvantageous effect on the precisely calculated division of the quantities of air into the inner core jet and the outer annular jet.

The aim of the invention is to provide a nozzle for feeding secondary air into a furnace with the aid of which the adhesion of particles to the wall of the combustion chamber in the region of the nozzle is effectively prevented, thereby ensuring the precisely calculated division of the air streams into a central core jet and an outer annular jet.

This problem is solved according to the invention departing from the nozzle described at the outset in that the outer casing tapers over its entire length in the flow direction of the air, that the inner casing traverses the flange designed as an impact plate and the opposite end of the inner casing

located in the interior of the outer casing is designed as a cutting edge with an internal diameter increasing towards the outside and a constant external diameter, and that the outer casing is secured at its end face to the flange and at least one circumferential region is designed as an end slot-type nozzle between the outer casing and the flange.

The tapering of the outer casing sharply accelerates the flow between the two casings in the direction of the outlet end and the fact that the outer casing is secured at its end face to the flange leaving outlet slots means that the flange acts as an impact plate, resulting in strong turbulence in the emergent outer jet, thereby effectively preventing the adhesion of particles to the wall of the combustion chamber, even in the case of smaller quantities of air. As the internal end of the inner casing is designed as a cutting edge with an internal diameter increasing towards the outside, precise turbulence-free division into a central core jet and an outer annular jet is achieved, this being very important for calculating the emergent quantities of air. This turbulence-free inner core jet is not adversely affected by the flange either as the inner casing traverses this flange, i.e. projects beyond it, so that the core jet cannot be adversely affected by the flange.

In most applications, in the case of a plurality of slot-type nozzles, it is sufficient for these to be situated opposite one another, and in the case of only two slot-type nozzles, for them to be arranged in the upper and lower circumferential regions of the outer casing.

In order to obtain reliable division of the secondary air within the nozzle in such a manner that some of it emerges into

the combustion chamber perpendicularly to the boundary wall and the remainder of the secondary air extends parallel to the boundary wall, in a further embodiment of the invention, the inner casing is shorter than the outer casing and has a length which is between three times and six times its diameter.

The invention will now be described in more detail with reference to one embodiment illustrated in the accompanying drawings, in which:

Fig. 1 is a partial longitudinal section through the combustion chamber of a furnace;

Fig. 2 is a longitudinal section through a first embodiment of a secondary air nozzle;

Fig. 3 is a section along the line III-III of Fig. 2;

Fig. 4 is a longitudinal section through a second embodiment of a secondary air nozzle, and

Fig. 5 is a section along the line V-V of Fig. 4.

Fig. 1 illustrates in diagrammatic form a detail from a furnace comprising a grate 1 and a feed table 2 with feed pistons 3 which push the fuel fed by means of a feed hopper 4 on to the grate. The upwardly extending combustion chamber 5 is formed above the grate in its first part and is delimited by a front boundary wall 6, a rear boundary wall 7 and side walls 8. Primary combustion air is fed from below through the grate to the fuel situated on the grate 1. As still unburnt particles are also carried along with the ascending gases, secondary air

nozzles 10 and 11 are preferably provided in the region of the front boundary wall 6 and in the region of the rear boundary wall 7, these injecting additional combustion air into the combustion chamber in order to subject the unburnt particles ascending into the combustion chamber to further combustion.

As it has been found in the past that the unburnt particles present in the ascending gases are thrown against the rear boundary wall 7 by means of the nozzles 10 provided in the region of the front boundary wall, where they adhere, the secondary air nozzles 11 of the rear boundary wall are designed in such a manner that these deposits are prevented by means of a special air supply.

To this end, the secondary air nozzle as shown in Figures 2 and 3 is composed of an outer casing 12 and an inner casing 13 which traverses a flange 14 and is rigidly connected to the latter, e.g. by welding. The outer casing 12 is connected at its end face to the flange 14, by the interposition of two arcuate spacers 16 and 17 which are rigidly connected, on the one hand, to the flange 14 and, on the other hand, to the end face of the outer casing 12, leaving slot-shaped nozzles 15 between the two spacers between the end face of the outer casing 12 and the flange 14 from which air can emerge, said air being supplied by means of a supply line which is not shown and can be connected to the end 19 of the outer casing 12. This air is divided into two parts by the inner casing 13 provided at its end located in the interior of the outer casing 12 with a cutting edge 20, some of the secondary air flowing within the inner casing 13 and emerging from the free end 21 into the combustion chamber perpendicularly to the boundary wall 7, while the remainder of the air flows between the outer face of

the inner casing 13 and the inner face of the outer casing 12 to the slot-shaped nozzles 15 between the end face of the outer casing 12 and the flange 14, where it flows out of the secondary air nozzle designated in general by the reference numeral 11 substantially parallel to the rear boundary wall 7 and expands like a film parallel to the boundary wall. This air emerging substantially parallel to the boundary wall 7 between the end face of the outer casing 12 and the flange 14 which projects considerably beyond the external diameter of the outer casing at this point prevents combustible particles from adhering to the boundary wall 7 of the combustion chamber.

The secondary air nozzle according to Figures 4 and 5 corresponds essentially to that according to Figures 2 and 3, and corresponding components have therefore been given the same reference numerals. The only difference consists in that four spacers 16, 16a, 17 and 17a are provided between the flange 14 and the outer casing 12, resulting in four opposing nozzles 15.

CLAIMS

1. Nozzle for feeding secondary air into a furnace comprising a mechanical grate (1) through which primary air can be introduced and a combustion chamber arranged above it and delimited by boundary walls into which secondary air can be injected by means of nozzles (10, 11) arranged at least in the front and rear boundary walls (6, 7), the nozzle (10) having an inner casing (13) and an outer casing (12) held concentrically thereto by means of a flange and the inner casing (13) being connected to the flange (14) which has a larger diameter than the outer casing (12) and serves to deflect the air flowing between the inner and outer casings perpendicularly to the air emerging from the inner casing (13), the outer casing (12) tapering over its entire length in the flow direction of the air, the inner casing (13) traversing the flange (14) designed as an impact plate and the opposite end of the inner casing located in the interior of the outer casing being designed as a cutting edge (20) with an internal diameter increasing towards the outside and a constant external diameter, and the outer casing (12) being secured at its end face to the flange (14) and at least one circumferential region being designed as an end slot-type nozzle (15) between the outer casing (12) and the flange (14).
2. Nozzle according to claim 1, characterised in that, in the case of a plurality of slot-type nozzles (15), they are situated opposite one another, and, in the case of only two slot-type nozzles, they are arranged in the upper and lower circumferential regions of the outer casing (12).



3. Nozzle according to claim 1 or claim 2, characterised in that the inner casing (13) is shorter than the outer casing (12) and has a length which is between 3 times and 6 times its diameter.



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