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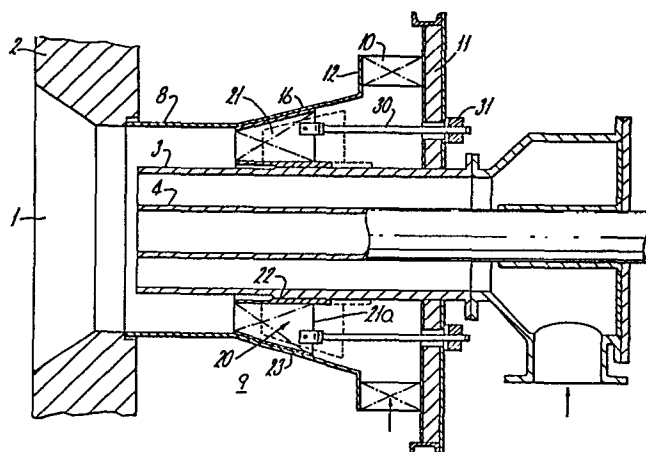
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54 Improvements in or relating to axial swirl generators.

57 The invention provides a burner that may be mounted at the wall (2) of a furnace. A mixture of pulverised fuel and primary air is discharged through a duct (4) and secondary air is discharged through a duct (8). The duct (8) includes a portion (16) that is convergent in the direction of flow. The convergent portion (16) houses a unit in the form of two concentric rings (22) and (23) between which are connected swirl inducing vanes (21). The unit can be moved between a forward position in which secondary air can pass only between the vanes and a retracted position in which part of the secondary air can flow between the vanes and part can flow as an envelope around the unit.



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"Improvements in or relating to Axial Swirl Generators"

DESCRIPTION

In the combustion of pulverized fuel, good mixing of the fuel and the combustion air is conducive of good combustion. In a known burner, a mixture of pulverised fuel and primary air is discharged through one tube
5 that lies co-axially of another, and secondary air is discharged along the annular space between the tubes. The present invention arose from a consideration of the ways in which swirl might be induced in the secondary air.

10 According to the present invention there is provided an annular gas flow path having a portion of which the outer boundary has a cross-section that tapers in the general direction of flow along the path and of which the inner boundary is cylindrical, there being a ring of
15 swirl inducing vanes lying within the portion and reciprocable as a unit in the general direction of flow between a position in which gas can pass the vanes only by flowing between the vanes and a position in which some of the air can flow between the vanes and some of the
20 air can flow past, outside, the vanes.

When the vanes are withdrawn from the first of these positions, there will be an envelope of gas tending to retain the gas that has been set swirling by the vanes from diverging outwardly.

25 By way of example, an embodiment of the invention will now be described with reference to the accompanying drawings in which:

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Figure 1 is a longitudinal section through a burner appropriate to the combustion of pulverised fuel in a furnace;

Figure 2 is a section on the line II - II of Figure 1;

5 Figure 3 is a section on line III - III of Figure 2;
and

Figure 4 is a section on the line IV - IV of Figure 2.

Figure 1 illustrates a burner mounted at an opening 1
10 in furnace wall 2. Coaxial with the opening 1 is duct 3 through which pulverised fuel entrained in primary air can be discharged into the furnace. Concentric with the duct 3 is a core tube 4 that houses a light-up burner (not shown).

15 Sealed at its leading end around the opening 1 is a duct 8 for secondary air. Secondary air passes to the duct 8 from the wind box 9 through six plane, equispaced and radially extending blades 10 that extend between a rear wall 11 and a flange 12. The flange 12 extends
20 radially outwardly from the wider end of a conically tapering portion 16 that is connected at its narrower end to the duct 8.

The forward end of the duct 2, tube 4 and duct 8 lie at the level of the outer surface of the wall 2.

25 To induce swirl into the secondary air, a unit 20, comprising a set of similar and equispaced vanes 21, is disposed within the tapering portion 16. The unit comprises an inner ring 22 of constant cross-section that can reciprocate along the duct 3 and an outer ring 23 so

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shaped that at the most forward position to which the unit can move (in which position it is shown in Figure 1), the outer ring 23 mates with the tapering position 16. Both rings 22 and 23 extend from end to
5 end of the vanes; ring 22 extends a little rearwardly of them.

The vanes 21 are each connected at their edges to both rings 22 and 23. The wider end 21a of each vane extends radially; downstream of that end the vanes curve
10 to induce swirl in the air passing between them. At the outlet from the unit 20, the edges of the vanes 21 are inclined to the radius at an angle in the order of 45° . As a result of the shaping of the vanes, the overlap (see x of in Figure 4) between them at the radially
15 outer part of the unit is less than the overlap (see y of Figure 3) between them at the radially inner part of the unit.

Connected to the rear end of every fourth vane 21 is a rod 30 that extends rearwardly from the vane 30,
20 parallel to the axis, and through the rear wall 11. The end of each rod 30 that projects beyond the rear wall 11 is threaded and carries a screw member 31. By turning the screw members 31 on the rods 30, the unit 20 can be moved back from the position in which it is shown in
25 Figure 1 to position indicated in broken lines in Figure 1. When the unit is in its most forward position, all the secondary air must pass between the vanes 21 and so be caused to swirl. It will also be accelerated. When the unit has been retracted, only some of the secondary

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air passes between the vanes; the rest passes as an envelope past the outer edges of the vanes. This will reduce the total swirl imparted and also be effective to constrain the swirling air towards the axis about
5 which it swirls. It will thus more effectively be contained to engage with the primary air and fuel discharging from the duct 3 and so be more effective in dispersing the jet of primary air and fuel so that combustion in the primary zone of the burner flame is
10 improved.

In a modification, it is envisaged that reciprocal movement of the unit 20 could be effected by means remote from the burner. It is also envisaged that a conical baffle should be located around the tube 4
15 at its junction with the rear wall 11 to steer the air from its radially inward flow past the blades 10 to its axial flow between the vanes 21. The effect of the baffle will be to inhibit turbulence and the losses resulting from it.

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1. An annular gas flow path having a portion of which the outer boundary has a cross-section that tapers in the general direction of flow along the path and of which the inner boundary is cylindrical, there being a ring of swirl inducing vanes lying within the portion and reciprocable as a unit in the general direction of flow between a position in which gas can pass the vanes only by flowing between the vanes and a position in which some of the air can flow past, outside, the vanes.
2. An annular gas flow path as claimed in claim 1 in which the radially inner edges of the vanes are connected to a ring that is slidable along the inner boundary and extends from end to end of the vanes.
3. An annular gas flow path as claimed in either of claims 1 and 2 in which the radially outer edges of the vanes are connected to a ring that extends from end to end of the vanes and that mates with the outer boundary when the vanes are in that position specified first in claim 1.
4. An annular gas flow path is claimed in any of the preceding claims in which the wider end of the vanes each extend radially, and each vane then curves towards its narrower end in a sense that causes the gas leaving the vanes to swirl.

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5. An annular gas flow path as claimed in any of the preceding claims in which the portion is included in a secondary air duct disposed to discharge air into a furnace, the secondary air housing having a rear wall
- 5 that extends transversely to the axis of the inner boundary through the rear wall to means by which the separation between the vanes and the rear wall can be varied.
6. An annular gas flow path as claimed in any of the
- 10 preceding claims in which the inner boundary is included in the outer wall of a duct that is connected to a source of pulverised fuel and the outlet from which lies forwardly of the narrower end of the tapering portion.

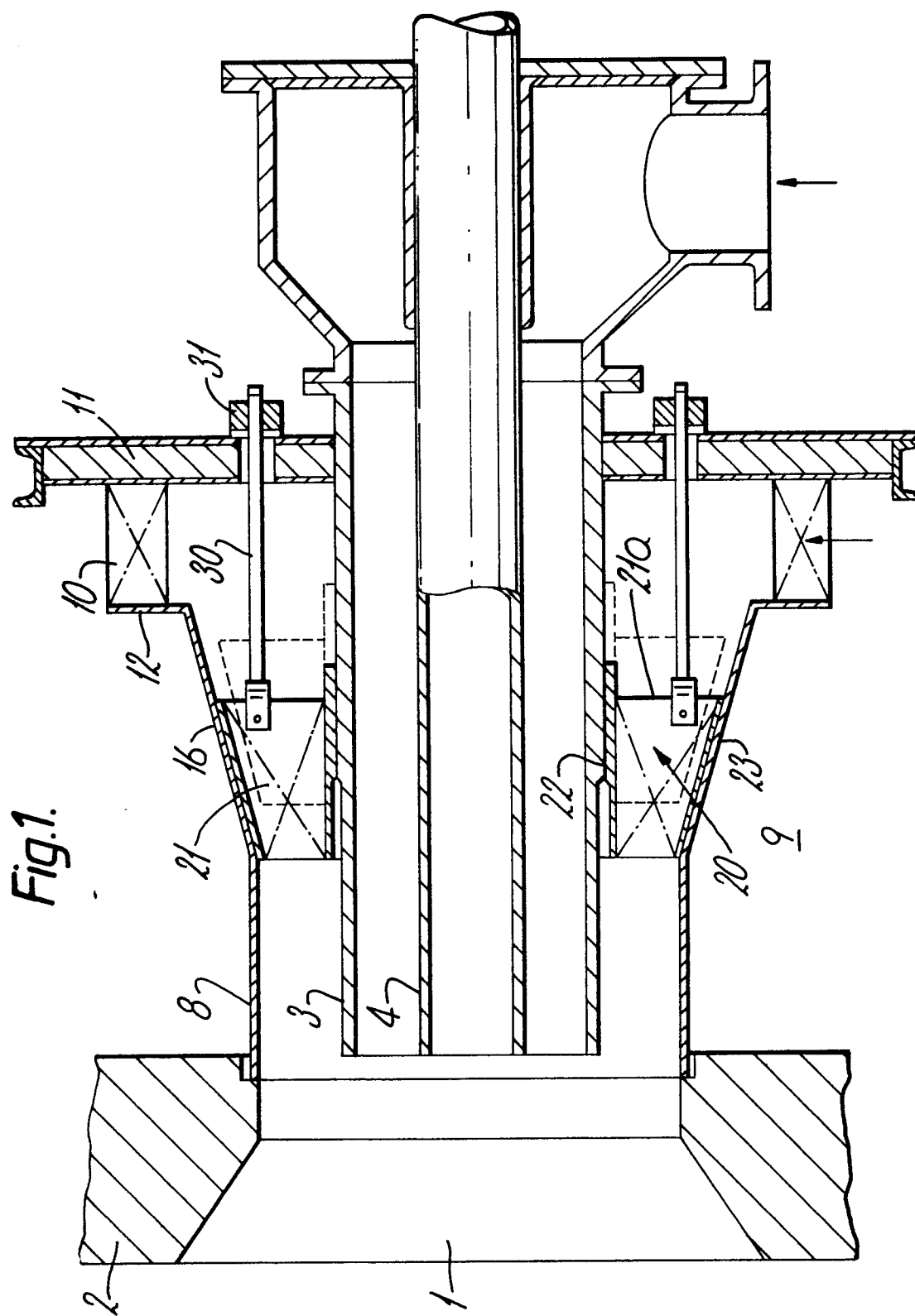


Fig. 2.

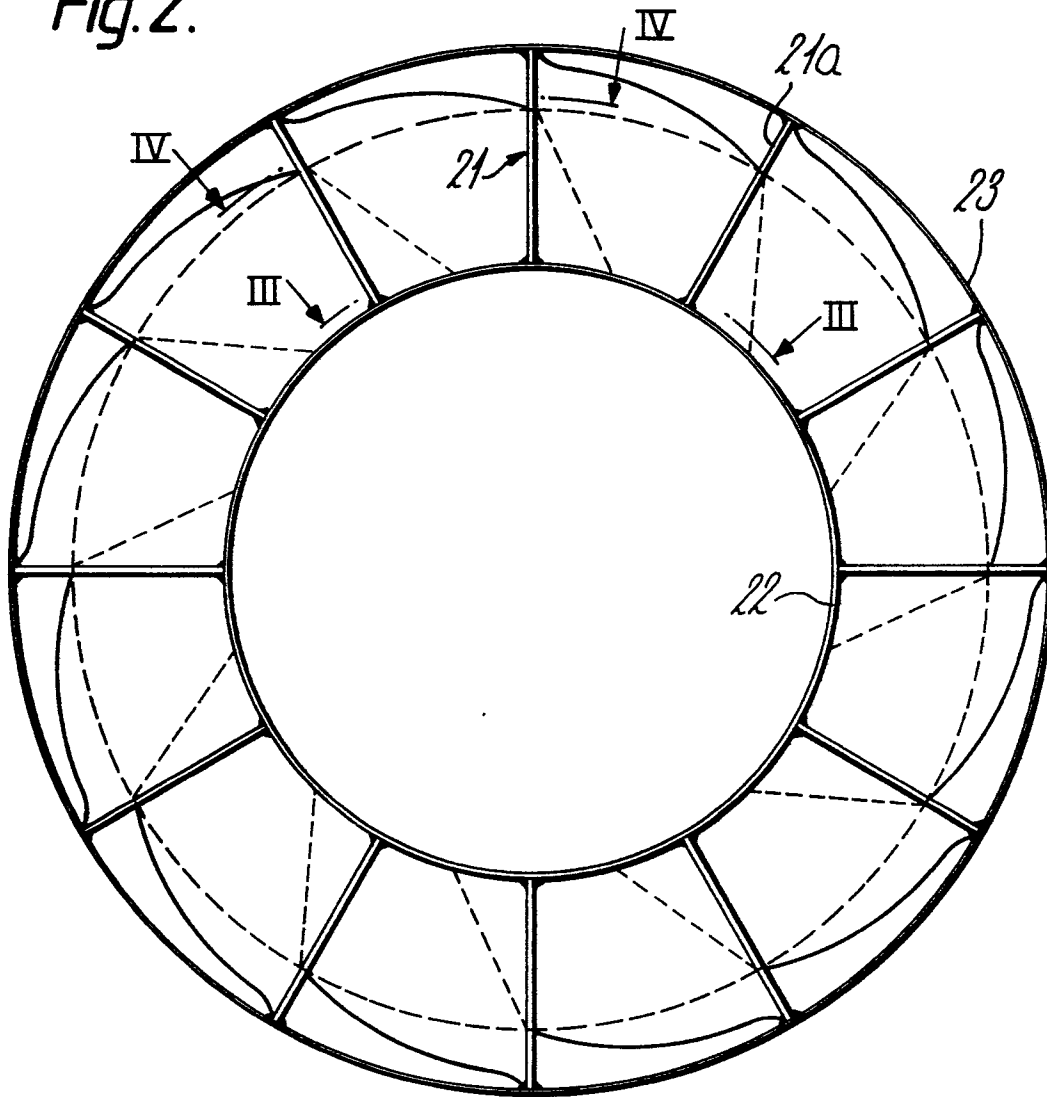


Fig. 3.

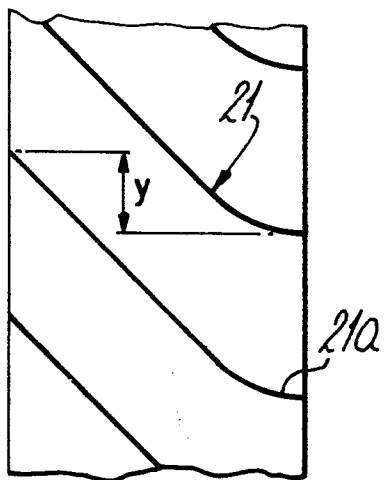


Fig. 4.

