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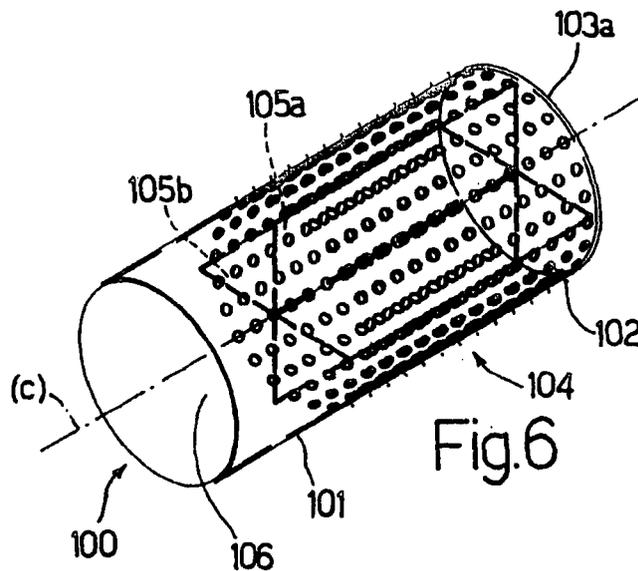
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(54) **Premix burner combustion head**

(57) A combustion head (100) for premix burners. The head (100) has a cylindrical body (101) having a number of holes or openings (102), through which the fuel gas/combustion air mixture flows from an inner space (106) of the cylindrical body (101) to a combustion

region (104) outside the cylindrical body (101). The combustion head (100) also has at least one partition (105a, 105b) for dividing the inner space (106) into a number of longitudinal sectors (106a, 106b, 106c, 106d).



Description

[0001] The present invention relates to a premix burner combustion head.

[0002] In combustion, so-called "premix" burners are used, which are characterized by premixing fuel gas and combustion air upstream from the combustion region.

[0003] The combustion head of this type of burner normally comprises a cylindrical tubular structure, in turn comprising a number of mixture outflow openings; and the fuel gas/combustion air mixture is ignited just outside the tubular structure.

[0004] As is known, premix burners permit extensive combustion power adjustment, and have a surface flame distribution enabling a reduction in the size of the combustion chamber.

[0005] Variations in operation, however, generate acoustic resonance phenomena between the head of the burner, which represents the source, and the combustion chamber.

[0006] Such resonance phenomena is thermal and geometric in nature. The chemical reaction speed of the mixture, in fact, is dependent on various factors, including surplus air, outflow speed from the openings in the tubular structure, mixture temperature, heat absorption of the environment, etc. In particular, outflow speed is not constant, but varies over time. All of which produces pressure waves which may enter into resonance with the combustion chamber structure and so be amplified.

[0007] The result is an extremely annoying noise to the user.

[0008] The current state of the art shown in Figures 1 and 2 provides for alterations upstream from the combustion region.

[0009] For example, in the Figure 1 prior art embodiment, a combustion head 10 comprises a perforated cylinder 11 inside which is inserted a concentric, smaller-diameter cylinder 12 connected integrally to cylinder 11 at one end 12a. The gas/air mixture flows into cylinder 12 in a direction, indicated by arrow F1, parallel to the longitudinal axis (a) of symmetry of cylinders 11 and 12.

[0010] After flowing along the whole length of inner cylinder 12, the gas/air mixture inverts direction and flows, in the direction indicated by arrow F2, into a region 13 defined between cylinders 11 and 12.

[0011] The gas/air mixture flows immediately out through the holes in cylinder 11, and is ignited in a region 14 outside cylinder 11. The end 11a of cylinder 11 is closed by a plate 15, possibly with holes (not shown).

[0012] The above features provide for reducing the acoustic emissions of combustion head 10.

[0013] A second embodiment, also forming part of the state of the art and shown in Figure 2, provides for a second type of combustion head 20.

[0014] Figure 2a shows an enlarged detail of Figure 2.

[0015] Combustion head 20 comprises a perforated outer cylinder 21 having a longitudinal axis (b) of symmetry.

[0016] Cylinder 21 houses a second perforated cylinder 22 coaxial with cylinder 21 with respect to axis (b), and both cylinders 21, 22 are closed at respective distal ends 21a, 22a by a plate 23.

[0017] On entering combustion head 20 in the direction shown by arrow F3, the gas/air mixture undergoes a change in direction, as shown by arrow F4, due to the presence of plate 23, flows out through the holes in cylinders 21, 22, and is ignited in the usual way in a region 24 outside cylinder 21.

[0018] The features provided in the two state-of-the-art embodiments in Figures 1 and 2 preheat the gas/air mixture prior to combustion, and change the characteristic frequency of the system, both of which have a positive effect on the acoustic resonance phenomenon.

[0019] On the other hand, lengthening the path of the gas/air mixture and reducing the flow section increase load losses. Moreover, in certain environments and with certain geometrical dimensions, acoustic resonance phenomena may still be manifested.

[0020] It is therefore a main object of the present invention to achieve positive effects on resonance in numerous situations, and to minimize load losses.

[0021] According to the present invention, there is provided a premix burner combustion head as claimed in Claim 1.

[0022] Two non-limiting embodiments of the present invention will be described by way of example with reference to the other accompanying drawings, in which:

30 Figure 3 shows a side view of a first embodiment of a combustion head in accordance with the present invention;

35 Figure 4 shows a front view of the Figure 3 combustion head;

Figure 5 shows a longitudinal section along line A-A of the Figure 3 combustion head;

Figure 6 shows an isometric view of the combustion head in Figures 3, 4 and 5;

40 Figures 7 to 10 show a second embodiment of a combustion head in accordance with the present invention.

[0023] Figures 3 to 6 show a combustion head 100 comprising a cylindrical body 101 having a number of holes 102 formed in at least one surface portion of cylindrical body 101.

[0024] More specifically, holes (or openings) 102 are formed in the distal portion of cylindrical body 101 with respect to inflow of the gas/air mixture, which flows into cylindrical body 101 in the direction indicated by arrow F5.

[0025] Cylindrical body 101 is symmetrical with respect to a longitudinal axis (c).

[0026] The distal end 103 of combustion head 100 may be provided with a cover plate 103a, possibly also having a number of holes (not shown).

[0027] The gas/air mixture flows out through holes

102 in known manner, and, in a region 104 facing the outer surface of cylindrical body 101, is ignited by an ignition device not shown.

[0028] The flames (not shown in Figures 3 to 6) are therefore formed in region 104, as of the outer surface of cylindrical body 101.

[0029] To improve performance of head 100 in terms of acoustic resonance, this has surprisingly been found to be attenuated greatly by providing at least one longitudinal partition 105.

[0030] Figures 3 to 6 show a first embodiment employing two perpendicular partitions 105a, 105b, both extending through the longitudinal axis (c) of symmetry of cylindrical body 101.

[0031] Partitions 105 may be of various length and thickness, may be made of various materials, and may be variously positioned inside cylindrical body 101.

[0032] In the first embodiment shown in Figures 3 to 6, partitions 105 divide the inner space 106 defined by cylindrical body 101 into a number of, in this case, equal longitudinal sectors 106a, 106b, 106c, 106d.

[0033] In other embodiments not shown, the sectors into which inner space 106 is divided may differ in size.

[0034] Partitions with a curved cross section (not shown), as opposed to flat partitions, may be used to advantage.

[0035] Tests have shown that dividing inner space 106 into sectors produces chambers so sized as to absorb the resonance frequencies generated for the reasons explained above.

[0036] The above principles relative to a cylindrical body 101 also apply to an other than cylindrical, e.g. square- or rectangular-section body.

[0037] As opposed to extending through it, at least one partition may lie parallel to and a given distance from the central axis (c) of symmetry.

[0038] For example, in a second embodiment shown in Figures 7 to 10, two partitions 205a, 205b are positioned parallel to the central axis (c) of symmetry.

[0039] As a result, two peripheral sectors 206a, 206b and a central sector 206c are formed.

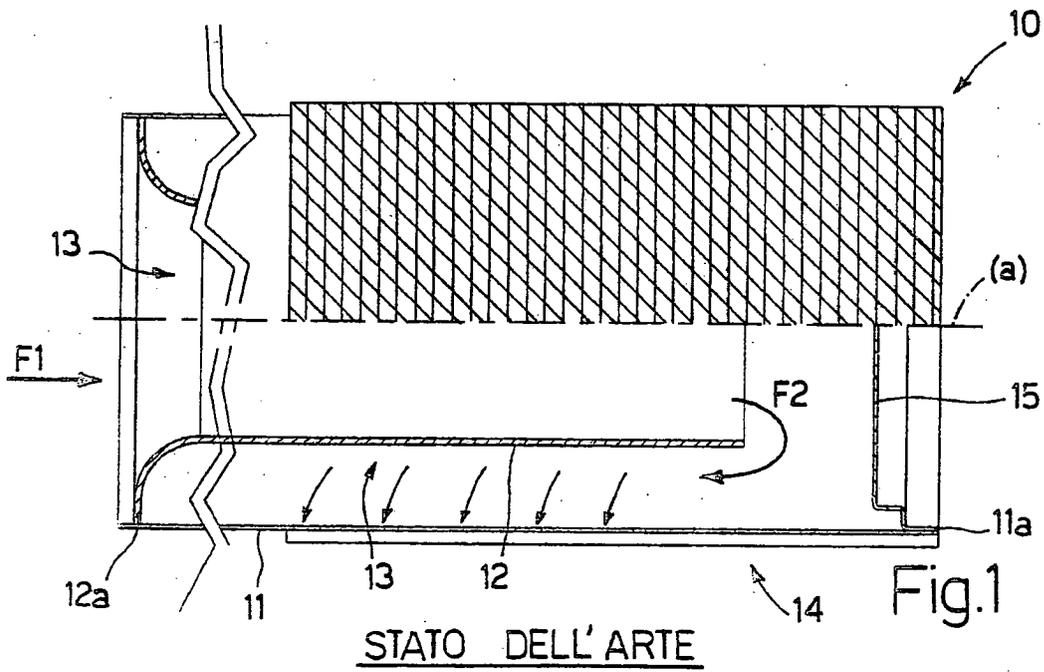
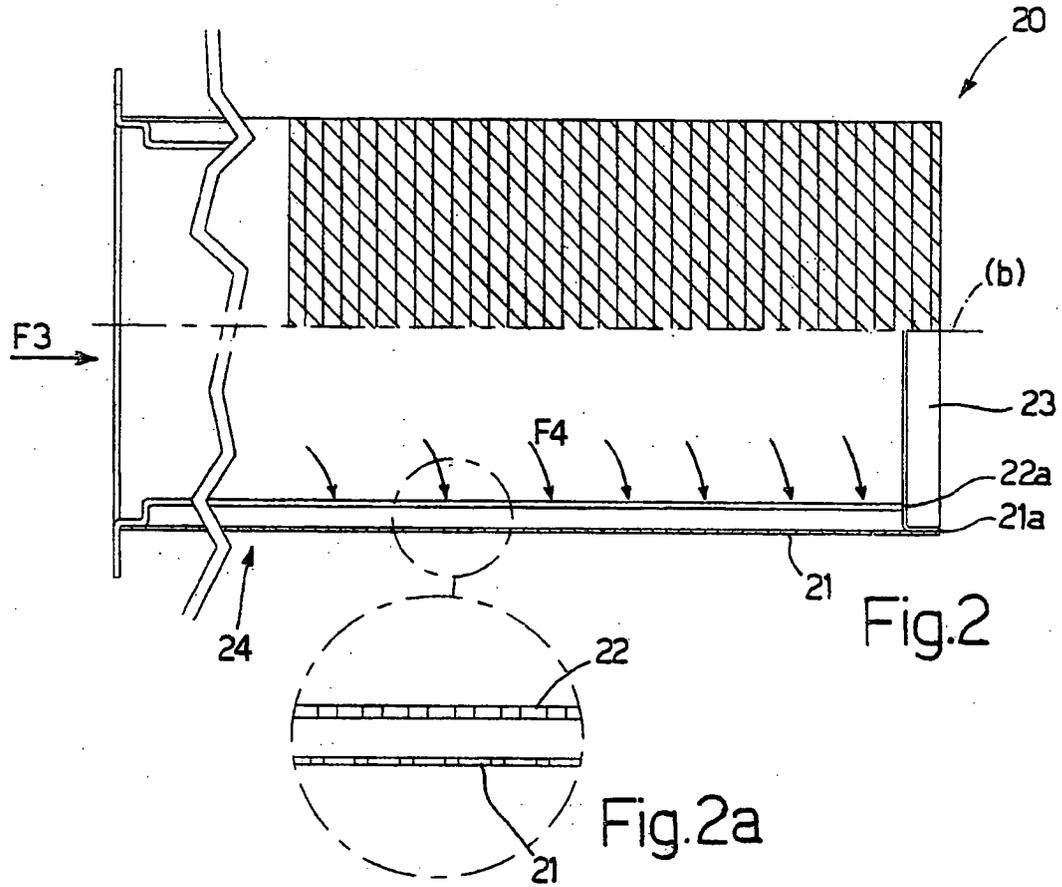
[0040] In the second embodiment shown in Figures 7 to 10, any parts identical with those shown in the first embodiment in Figures 3 to 6 are indicated using the same reference numbers.

[0041] In a further embodiment not shown, a third partition (not shown) is interposed between partitions 205a, 205b of the second embodiment in Figures 7 to 10, extends through axis (c), and is perpendicular to partitions 205a, 205b, thus forming four sectors (not shown).

[0042] Partitions 105a, 105b and partitions 205a, 205b may be the same length as or shorter than cylindrical body 101, but advantageously extend along the whole length of the portion in which holes 102 are formed.

Claims

1. A combustion head (100) for premix burners, the combustion head (100) comprising a main body (101) having a number of holes or openings (102), through which the fuel gas/combustion air mixture flows from an inner space (106) of said main body (101) to a combustion region (104) outside said main body (101); and the combustion head (100) being **characterized by** comprising internally at least one partition (105a, 105b) for dividing said inner space (106) into a number of longitudinal sectors (106a, 106b, 106c, 106d).
2. A combustion head (100) as claimed in Claim 1, wherein said main body (101) has a longitudinal axis (c) of substantial symmetry.
3. A combustion head (100) as claimed in Claim 2, wherein said main body (101) is a cylindrical body.
4. A combustion head (100) as claimed in either of Claims 2 and 3, wherein said longitudinal axis (c) of substantial symmetry lies in said at least one partition (105a, 105b).
5. A combustion head (100) as claimed in Claim 1, wherein only a portion of said main body (101) has a number of holes (102), and wherein said at least one partition (105a, 105b) extends longitudinally along the whole length of the portion having said number of holes (102).
6. A combustion head (100) as claimed in any one of the foregoing Claims, wherein said at least one partition (105a, 105b) is substantially flat.
7. A combustion head (100) as claimed in any one of Claims 1 to 5, wherein said at least one partition has a substantially curved cross section.
8. A combustion head (100) as claimed in any one of Claims 2-3 and 5-7, wherein said at least one partition (205a, 205b), as opposed to extending through the central axis of symmetry (c) of said main body (101), lies parallel to and a given distance from it.
9. A burner, **characterized by** comprising at least one combustion head (100) as claimed in any one of Claims 1 to 8.



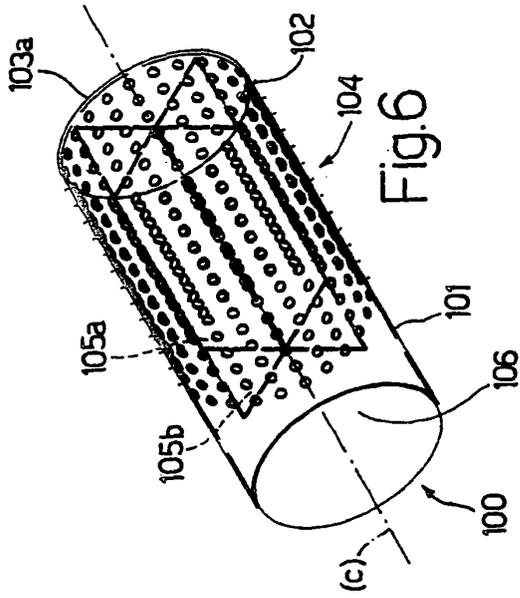


Fig.6

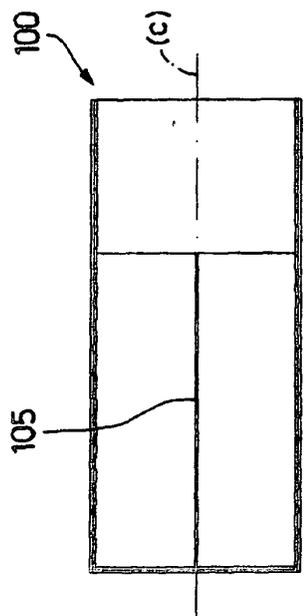


Fig.5 SEZ. A-A

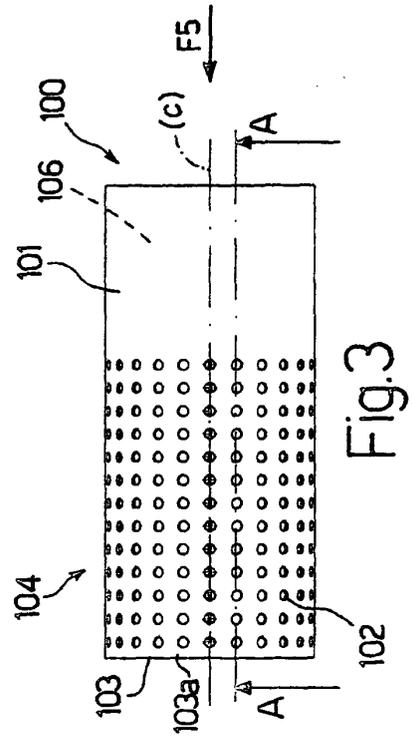


Fig.3

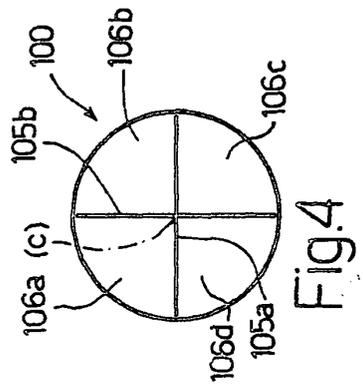


Fig.4

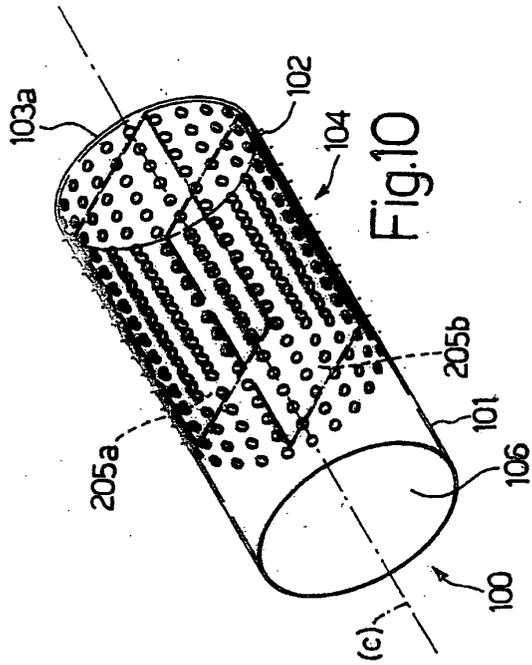


Fig.10

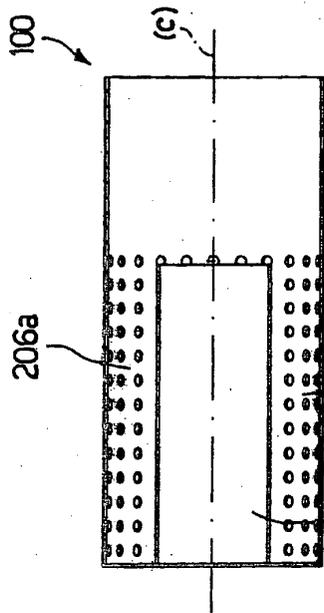


Fig.9 SEZ. A-A

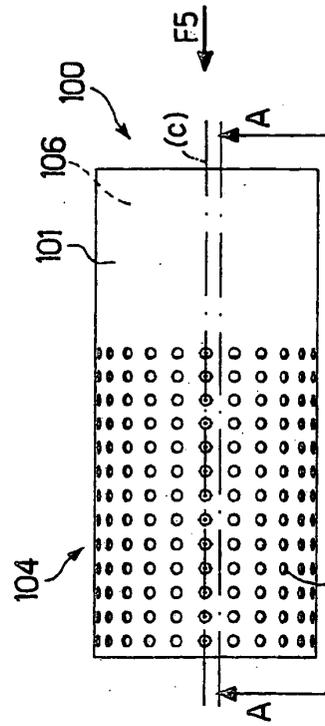


Fig.7

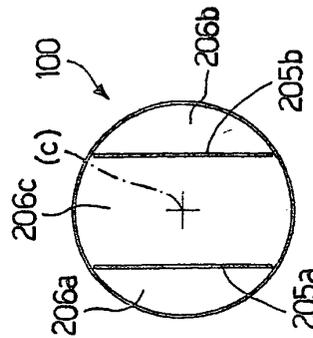


Fig.8



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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 27 April 2004	Examiner Theis, G
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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