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(54) Tubular burner

(57) A burner which can be fed with a mixture of air and fuel, provided with a tubular body (1) with openings (4; 16, 17) for the outflow of said mixture of air and fuel and having a longitudinal axis (A), said tubular body (1) comprising burner body portions (2, 3; 7, 8, 9, 10) joined together along respective edges (5, 6; 12, 13, 14, 15) which are substantially parallel to said longitudinal axis (A), said portions (2, 3; 7, 8, 9, 10) being joined together by seaming of said edges (5, 6; 12, 13, 14, 15).

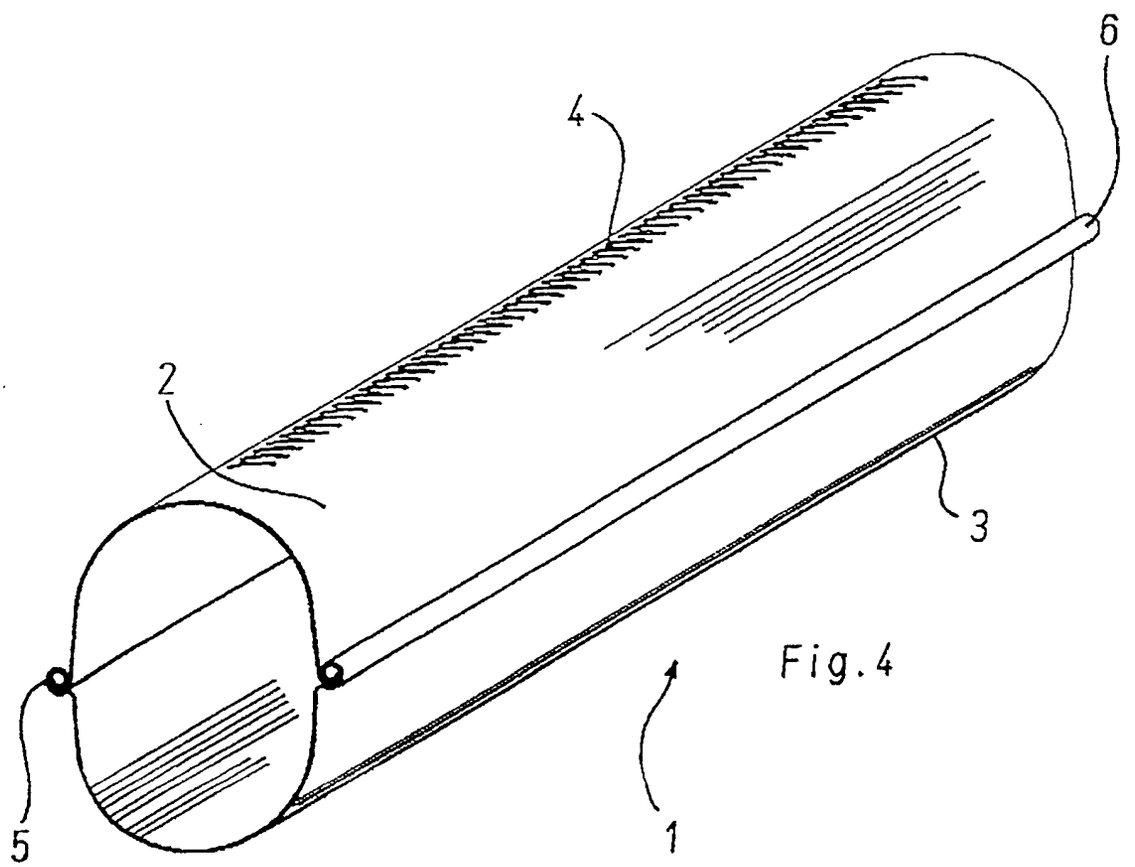

Fig.4

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Description

[0001] Tubular burners consist of a tubular shaped body into which a mixture of air and fuel, for example gaseous fuel, is introduced. The body is provided with openings through which said mixture is made to flow out and then burned.

[0002] The mixture of air and fuel can be introduced into a tubular burner in various ways.

[0003] In the so-called naturally aerated burners, the body of the burner is provided internally with a Venturi tube into which the fuel is introduced under pressure by way of an injector nozzle, resulting in the intake of air from outside due to the so-called Venturi effect and formation of the mixture of air and gaseous fuel.

[0004] In the so-called pre-mixed burners, said mixture is introduced into the body of the burner by means of a fan or a compressor. In the so-called mixed or fan-assisted burners, a mixture of air and fuel is introduced into the burner, by way of a fan or a compressor, under pressure or by suction, supercharging a Venturi tube housed in the body of the burner.

[0005] The body of the tubular burners can be obtained from a piece of metal sheet folded into the shape of a tube, of which the edges parallel to the axis of the tube are joined together by for example welding or seaming. In burners produced in this fashion, the entire body of the burner must be made of metal resistant to the high temperatures created by combustion of the mixture of air and gaseous fuel, even though only the portion of the burner body having the openings for outflow of the mixture of air and fuel is subjected to said high temperatures. Furthermore, the thermal expansions to which the body of the burner is subjected during operation differ from zone to zone due to the different temperatures reached by the various zones of the burner body due to the distribution of the openings for outflow of the mixture of fuel and air to be burned. This distribution is not generally uniform, since there are zones of the body of the burner entirely without openings and zones with various densities of said openings. The different thermal expansions to which the various zones of the body of the burner are subjected give rise to mechanical stresses which reduce the lifetime of the burner.

[0006] Another known technique is to produce the body of a tubular burner with two shells of folded metal sheet, each of semi-tubular shape, joining together said two shells by welding, in such a way as to form a tubular body, along their edges parallel to the axis of said tubular body.

[0007] With this form of construction, it is possible to use different materials for the two shells constituting the body of the burner: for example, a material with high temperature resistance for a first shell in which for example the openings for the outflow of the air and fuel mixture are made and a less high quality and hence less expensive material for the other shell, for example without said openings, which is subjected to much lower temperatures than the first shell.

[0008] However, the joining of the two shells by welding creates some problems since the different thermal expansions of the two shells, due to the different temperatures to which they are subjected, give rise to deformations in the body of the burner during operation, with consequent mechanical stresses which limit the lifetime of the burner. Furthermore, the joining of the two shells by welding requires a continuous type procedure, in other words it is not possible to produce single or a limited number of burners at low cost. Finally, welding technology requires costly expedients to prevent the occurrence of detrimental effects, such as local strain hardening of the welded parts or welding defects.

[0009] The purpose of the present invention is to eliminate the aforesaid problems.

[0010] The present invention envisages a burner which can be fed with a mixture of air and fuel provided with a tubular body, with openings for the outflow of said mixture of air and fuel and having a longitudinal axis, said tubular body comprising at least a first body portion and at least a second body portion, said first portion and said second portion being joined together along respective edges parallel to said longitudinal axis, characterised by the fact that said first portion and said second portion are joined together by seaming of said edges.

[0011] The present invention permits simple and cheap production of a tubular burner consisting of portions made of different materials, for example a material with high temperature resistance for the portions subjected to higher temperatures and a less temperature resistant, and hence less costly, material for the portions subjected to lower temperatures, with a considerable reduction in costs. Furthermore the burner body portions can be joined by seaming in such a way as to permit reciprocal sliding movement of each portion relative to adjacent portions in a direction parallel to the axis of the burner in order to compensate for the different thermal expansions to which said portions are subjected, thereby avoiding deformations of the burner body and consequent mechanical stresses and significantly improving the lifetime of the burner.

[0012] Further advantages and characteristics of the present invention will become evident from the following description, provided purely as a non-limiting example, with reference to the attached drawings in which:

figure 1 is a cross-section of a burner according to the invention, of which the body consists of two semi-tubular portions joined together by seaming;

figure 2 is a cross-section of a tubular burner according to the invention, of which the body consists of four portions joined together by seaming;

figure 3 is an enlarged detail of the seamed join of two adjacent portions of the body of the burner shown in figures 1 or 2;

figure 4 is a perspective view of the burner of figure 1;

figure 5 is a side view of the burner of figure 1 showing, not to scale, the reciprocal sliding movement of the two semi-tubular portions of the burner body due to different thermal expansions during operation of the burner;

figure 6 is a top view of the burner of figure 2;

figure 7 is a view like the one shown in figure 6 showing, not to scale, the reciprocal sliding movement of two adjacent portions of the burner body due to different thermal expansions during operation of the burner.

[0013] Figure 1 shows a tubular burner according to the invention comprising a tubular body 1 with a longitudinal axis A, consisting of a first semi-tubular shaped body portion 2 and a second body portion 3, also of semi-tubular shape. On one of said semi-tubular portions, for example the first semi-tubular portion 2, there are made openings 4 for the outflow and subsequent combustion of a mixture of air and gaseous fuel which is introduced into the tubular body 1. The first semi-tubular portion 2 and the second semi-tubular portion 3 are joined together by seaming along their respective edges 5 and 6, which are substantially parallel to said longitudinal axis A. The seaming is carried out in such a way that the edges 5 and 6, in the seaming zone, constitute a seal preventing said mixture of air and gaseous fuel from escaping. Furthermore, the seaming may be carried out in such a way that the first semi-tubular portion 2 and the second semi-tubular portion 3 are able to slide relative to each other in a direction parallel to the axis A of the burner body 1. This makes it possible to compensate for the different thermal expansions to which the first semi-tubular portion 2 and the second semi-tubular portion 3 are subjected due to the different temperatures to which they are subjected during operation of the burner. The first semi-tubular portion 2, on which the openings 4 are made, is in fact subjected to much higher temperatures than the second semi-tubular portion 3 due to combustion of the mixture of air and gaseous fuel, which occurs in the proximity of the external surface zone of the semi-tubular portion 2 on which the openings 4 are made. Reciprocal sliding movement between the two semi-tubular portions 2 and 3 of the burner body 1 due to different thermal expansions of said portions is marked by S in figure 5.

[0014] By compensating for the different thermal expansions it is possible to avoid permanent deformations and mechanical stresses in the tubular body 1 of the burner during its operation, thereby significantly increasing the lifetime of the burner.

[0015] The two semi-tubular portions 2 and 3 may also be made of different materials, using a high quality material with high temperature resistance for the first semi-tubular portion 2, which is subjected to very high temperatures during operation of the burner, and a less high quality material, with lower temperature resistance, for the second semi-tubular portion 3, which is subjected to considerably lower temperatures. This permits a significant reduction in the production costs of the burner.

[0016] Figures 2, 6 and 7 show a second version of a burner according to the invention comprising a tubular body 1 consisting of four portions, respectively a first body portion 7, a second body portion 8, a third body portion 9 and a fourth body portion 10, all of which are arch-shaped.

[0017] Each of said body portions is joined to the adjacent portions by seaming along the respective longitudinal edges 12, 13, 14, 15, which are substantially parallel to the longitudinal axis A of the burner body 1.

[0018] On the first burner portion 7 there are made first openings 16 for the outflow and subsequent combustion of a mixture of air and fuel which is introduced into the tubular body 1. On the second burner portion 8 there are made second openings 17 for the outflow and subsequent combustion of said mixture of air and fuel. The distribution and/or total area of said second openings 16 is different from the distribution and/or total area of said second openings 17.

[0019] Analogously to the burner version shown in figures 1 and 4, the seamed joins are made in such a way that the longitudinal edges 12, 13, 14, 15 in the seaming zones constitute a seal preventing said mixture of air and fuel from escaping. Furthermore, the seamed joins can be made in such a way that each burner portion 7, 8, 9, 10 is able to slide relative to the adjacent burner portions, in a direction parallel to the A axis of the burner body 1. The seamed joins of the burner portions make it possible to compensate for the different thermal expansions that said portions undergo due to the different temperatures to which they are subjected during operation of the burner. Said different temperatures depend on whether or not openings 16, 17 for the outflow of said mixture of gaseous fuel and air are present, and on the number, distribution and total area of said openings on burner portions 7, 8, 9, 10. By compensating for the different thermal expansions, it is possible to avoid permanent deformations and mechanical stresses in the tubular body 1 of the burner during its operation, thereby significantly increasing the lifetime of the burner. Reciprocal sliding movement between the two adjacent portions 7 and 8 of the burner body 1 due to the different thermal expansions of said portions is marked by S in figure 7.

[0020] Furthermore, it is possible to make burner body portions 7, 8, 9, 10 from different materials according to their respective operating temperatures, thereby significantly reducing production costs of the burner.

[0021] If the burner is provided at both ends with a flange 18 for mounting the burner inside a heating appliance, at least one flange 18 is made in such a way as to permit reciprocal axial sliding movement of burner body portions 2, 3; 7, 8, 9, 10. For example the burner portions intended for operation at the highest operating temperatures are fixed with a clearance to said at least one flange 18, with labyrinth seals (not shown) to prevent the mixture of gaseous fuel and air from escaping

from said clearances.

[0022] In the practical implementation, the materials, dimensions and construction details may be different from but equivalent to those illustrated without departing from the scope of the present invention.

Claims

1. A burner which can be fed with a mixture of air and fuel, provided with a tubular body (1) with openings (4; 16, 17) for the outflow of said mixture of air and fuel and having a longitudinal axis (A), said tubular body (1) comprising burner body portions (2, 3; 7, 8, 9, 10) joined together along respective edges (5, 6; 12, 13, 14, 15) substantially parallel to said longitudinal axis (A), characterised by the fact that said portions (2, 3; 7, 8, 9, 10) are joined together by seaming of said edges (5, 6; 12, 13, 14, 15).

2. A burner as defined in claim 1, characterised by the fact that said seaming is carried out in such a way as to permit a sliding movement (S) of each of said portions (2, 3; 7, 8, 9, 10) relative to an adjacent portion, in a direction substantially parallel to said longitudinal axis (A).

3. A burner as defined in claims 1 or 2, characterised by the fact that said seaming is carried out in such a way as to constitute a seal preventing said mixture of air and fuel from escaping from inside the body (1) of the burner.

4. A burner as defined in any of the previous claims, characterised by the fact that at least one of said burner body portions (2, 3; 7, 8, 9, 10) is made of a different material from the other burner body portions.

5. A burner as defined in any of the previous claims, characterised by the fact that said openings (16, 17) are made on at least a first portion (7) and a second portion (8) of said burner body portions (2, 3; 7, 8, 9, 10).

6. A burner as defined in claim 5, characterised by the fact that the distribution of the openings (16) on said first portion (7) is different from the distribution of the openings (17) on said second portion.

7. A burner as defined in claims 5 or 6, characterised by the fact that the total area of the openings (16) on said first portion (7) is different from the total area of the openings (17) on said second portion (8).

8. A burner as defined in one of the previous claims, characterised by the fact that said tubular body (1) is provided at both ends with flanges (18), at least one of said flanges (18) being joined to said burner body portions (2, 3; 7, 8, 9, 10) in such a way as to permit a sliding movement (S) of each of said portions (2, 3; 7, 8, 9, 10) relative to an adjacent portion, in a direction substantially parallel to said longitudinal axis (A).

9. A burner as defined in claim 8, characterised by the fact that said at least one flange (18) is joined rigidly to burner body portions (2, 3; 7, 8, 9, 10) subjected to lower operating temperatures and is joined with a clearance to burner body portions (2, 3; 7, 8, 9, 10) subjected to higher operating temperatures.

10. A burner as defined in claim 9, characterised by the fact that between said at least one flange (18) and said burner body portions (2, 3; 7, 8, 9, 10) subjected to higher operating temperatures there is envisaged a sealing means to prevent said mixture of air and gaseous fuel from escaping.

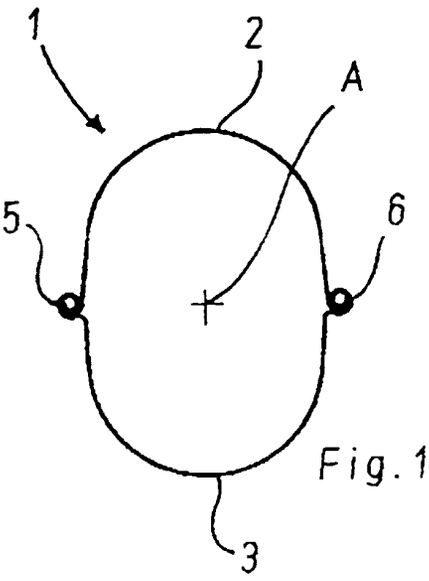

Fig.1

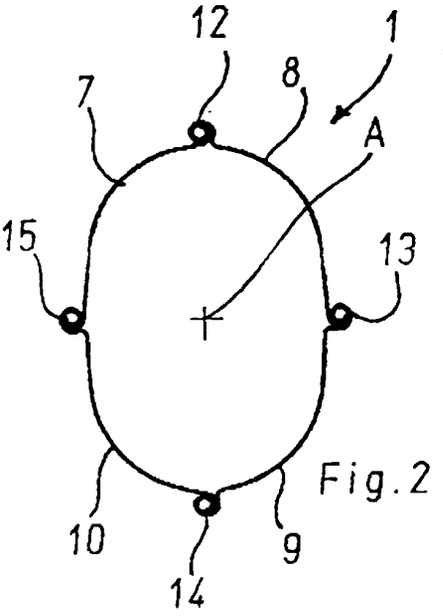

Fig.2

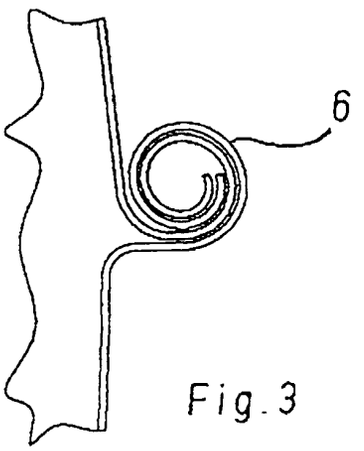

Fig.3

Fig.4

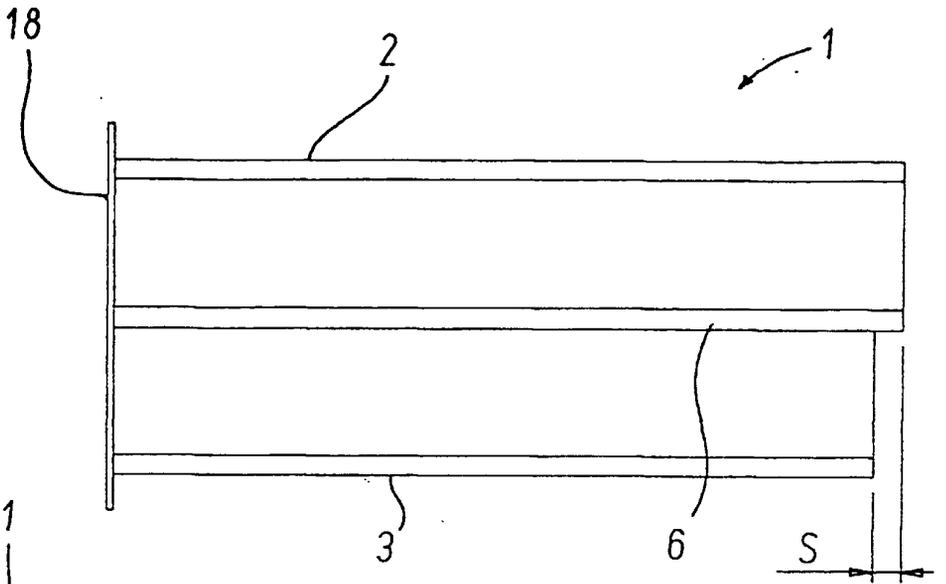

Fig.5

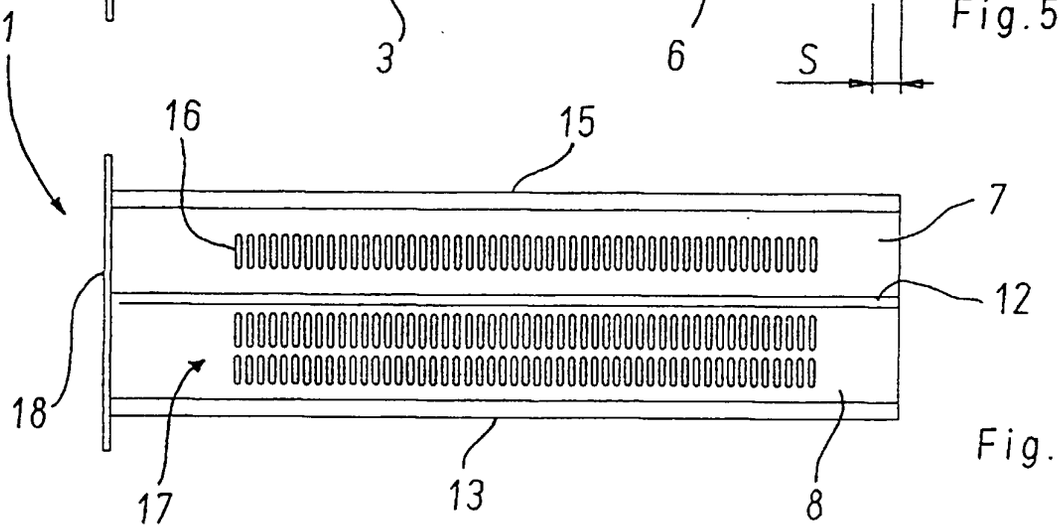

Fig.6

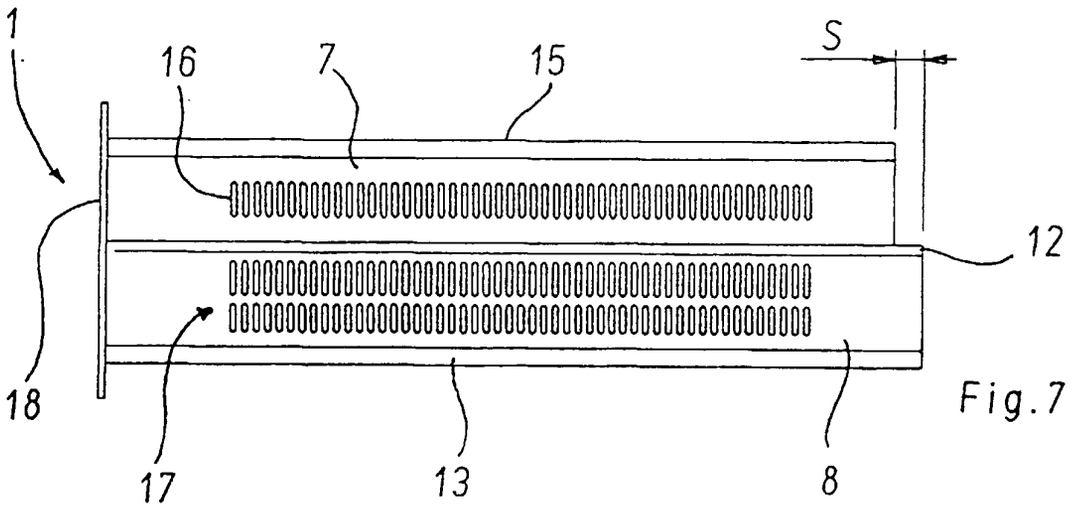

Fig.7

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EUROPEAN SEARCH REPORT

Application Number
EP 99 10 5600

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	7 September 1999	Phoa, Y

CATEGORY OF CITED DOCUMENTS

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