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(54) **GAS COMBUSTION OPTIMISING DEVICE FOR DOMESTIC AND INDUSTRIAL BOILERS**

(57) Gas combustion optimising device for domestic and industrial boilers which is interposed in the gas conduit of the boiler, as close as possible to the burner or consumption point. The optimising device (1-1') comprises a first tubular conduit (2) to be inserted into the gas conduit, having therein a narrowing for the passage of

gas, increasing the speed thereof, and incorporates in said narrowing a spiral body (5) with a smooth or engraved surface, which increases the gas turbulence. The speed and turbulence are increased in a controlled manner.

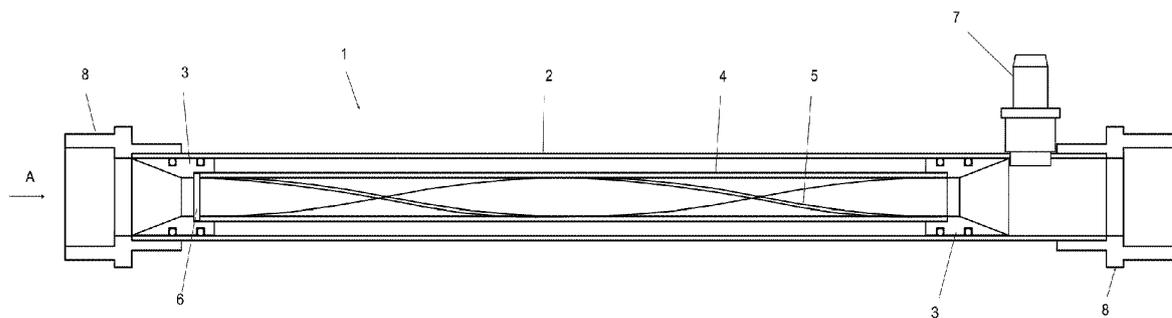


FIG. 1

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Description**OBJECT OF THE INVENTION**

[0001] The present invention relates to a gas combustion optimising device for domestic and industrial boilers whereby purification, filtration, and controlled turbulence generation are enabled in order to obtain a suitable gas-combustion air mixture, all this representing an improved combustion, reduced contamination, and cost saving.

[0002] The optimising device is inserted into the gas conduit and comprises a first tubular conduit which is the element that is inserted into the gas conduit and said first tubular conduit comprises interior narrowings, and a second tubular conduit with a smaller diameter than the first tubular conduit and which is connected to the narrowings. It also comprises a spiral body housed in the second tubular conduit, the surface of which may be smooth or have an engraving. As a result of the combination of the narrowings and the spiral body, the laminar gas flow acquires greater speed and turbulence. Both the speed and the turbulence are controlled such that the invention offers an improved gas combustion, and ultimately a 5% minimum savings in consumption that may exceed 15% depending on the model of the burner/boiler, and accordingly cost saving and reduced environmental contamination.

[0003] The optimising device is configured to be inserted into a gas conduit in the boiler in a position as close as possible to the burner or consumption point.

BACKGROUND OF THE INVENTION

[0004] Gas installations can be provided with a metallic and activated carbon filter with a variable load depending on the gas flow rate, for the purpose of eliminating impurities inherent to the gas, whereby the filters of which purify and filter the gas of any impurity contained therein.

[0005] Moreover, gas installations can also incorporate means for magnetising the gas. This causes an improvement at the mixing point of the combustion air of the burner.

[0006] Likewise, patent document US 5882514 describes an apparatus for magnetically treating a fluid, comprising a magnetic cartridge arranged within a shell to define a fluid passage between the inlet and the outlet of the shell and having components for subjecting the fluid to magnetic forces. The magnetic cartridge comprises an annular passage which can be defined by a spiral coil.

[0007] Document US 5149343 describes a method of filtering a gas stream wherein radon has been concentrated at sufficient levels to be a health threat, such that (a) the gas stream is introduced to a filter including activated carbon, (b) the filtered gas stream is passed through a coil to the customer's gas appliance wherein safe use of the energy associated with the stream occurs.

DESCRIPTION OF THE INVENTION

[0008] The present specification describes a gas combustion optimising device for domestic and industrial boilers which is housed in the boiler gas installation, as close as possible to the burner or consumption point. The optimising device comprises a first tubular conduit to be inserted into the gas conduit, having therein narrowings and a second tubular conduit which has a smaller diameter than the first tubular conduit and incorporates therein a spiral body the surface of which may be smooth or have an engraving. When the spiral body comprises an engraving, turbulence is increased since the surface is rough. The combination of the narrowings and spiral body turns the laminar gas flow into a flow with a higher speed, due to the reduced diameter, and turbulent, due to the effect of the spiral body. Both actions are controlled, with which it facilitates the mixing with the combustion oxygen inside the burner.

[0009] Thus, in a practical embodiment of the invention, the optimising device comprises:

- a first tubular conduit having a diameter identical or similar to that of the gas conduit;
- a pair of tubular adaptors assembled inside the first conduit with at least one O-ring seal in each of them with the first tubular conduit;
- a second tubular conduit which is arranged between the pair of tubular adaptors and has a smaller diameter than the first tubular conduit with at least one O-ring seal with respect to the first tubular conduit, wherein said second tubular conduit has a length that is determined by the boiler output;
- a spiral body housed inside the second tubular conduit and extending along the entire length thereof;
- at least one stainless steel filter with a grid of at least 16 mesh per 10 mm (complying with the UNE 60402 standard), and;
- at least one small-calibre pressure tap for measuring the head loss of the device.

[0010] The optimising device is intercalated in the gas conduit by means of threading or clamping, complying with the UNE 60670:2014 material standard, and the accessories will preferably be attached to the optimiser by means of press-fitting or welding system. By using press-fitting (working pressure up to 5 bar according to the UNE 60670 standard), the risk of there being possible accidents in rooms where gas is present is prevented.

[0011] The second tubular conduit which is part of the device has a length that is determined by the boiler output (in kW), head loss, and gas speed.

[0012] The gas optimising device, in the application thereof for domestic boilers, has a small-calibre pressure tap downstream from the second tubular conduit.

[0013] The gas optimising device, in the application

thereof for industrial boilers, has a first small-calibre pressure tap downstream from the second tubular conduit and a second small-calibre pressure tap upstream from the second tubular conduit.

[0014] Likewise, the gas optimising device, in the application for industrial boilers, has a 0.5" (1.27 cm) tap for connecting a mass flowmeter, so as to be able to check the gas consumption of each boiler individually, before the inlet of the second tubular conduit. This tap is optional.

[0015] To complement the description that will be made below and for the purpose of helping to better understand the features of the invention, a set of drawings is attached to the present specification, with the more characteristic details of the invention being depicted in the non-limiting illustrative figures thereof.

BRIEF DESCRIPTION OF THE FIGURES

[0016]

Figure 1 shows a longitudinal cross-sectional view of the optimising device according to the application thereof in domestic boilers, showing a connection by threading on each end of the device.

Figure 2 shows a view of the different components comprised in the optimising device of the preceding figure independently, having shown a possible connection by threading or by nipples for a rubber tube. Figure 3 shows a cross-sectional view of the optimising device, in the application thereof for domestic boilers, according to a practical embodiment variant, wherein it has connections consisting of a nipple standardised for an LPG rubber tube.

Figure 4 shows a longitudinal cross-sectional view of the optimising device according to the application thereof in industrial boilers, wherein it shows two possible types of connection, by clamping or threading, at each end of the device.

Figure 5 shows an exploded view of the different components forming the optimising device of the preceding figure independently.

DESCRIPTION OF A PREFERRED EMBODIMENT

[0017] In view of the mentioned figures and according to the numbering used, it can be seen that the gas optimising device 1-1' for domestic and industrial boilers comprises a first tubular conduit 2 configured to be arranged in the gas conduit, close to the burner or consumption point. This first tubular conduit 2 has narrowings between which a second tubular conduit 4 is arranged, inside of which a spiral body 5 having a smooth surface or a surface with an engraving is housed. With the conduit narrowing-spiral body combination, the laminar gas flow becomes a flow with a higher speed (due to the narrowing) and turbulent (due to the spiral body), both actions (the increased speed and increased turbu-

lence) being under control.

[0018] The fact that the spiral body 5 has an engraving on the surface thereof causes a further increase in turbulence and thereby an improvement in combustion.

[0019] Therefore, in a practical embodiment of the invention, the optimising device for domestic boilers 1 comprises a first tubular conduit 2 having a diameter identical or similar to the diameter of the gas conduit; a pair of tubular adaptors 3 with a frustoconical inner surface (the narrowings) assembled inside the first tubular conduit 2 with at least one O-ring seal with respect to the first tubular conduit 2. It also comprises a second tubular conduit 4 which is arranged between the pair of tubular adaptors 3 with a frustoconical inner surface, and has a smaller diameter than the first tubular conduit 2, with a length that is determined by the output in kW, head loss, and gas speed.

[0020] Likewise, the optimising device for domestic boilers 1 comprises at least one O-ring seal between the second tubular conduit 4 and the corresponding tubular adaptor 3.

[0021] Furthermore, the second tubular conduit 4 incorporates therein a spiral body 5 with a smooth surface or a surface with an engraving. The second tubular conduit 4 and the spiral body 5 have the same length. The device also comprises at least one stainless steel filter 6 upstream from the second tubular conduit 4, with a grid with at least 16 mesh per 10 mm, according to the UNE 60402 standard.

[0022] The gas optimising device for domestic boilers 1 incorporates a first small-calibre pressure tap 7 downstream from the second tubular conduit 4, considering the direction of gas circulation, as shown by arrow "A" in the figures.

[0023] The optimising device for domestic boilers 1 is intercalated in the gas conduit, fastened by means of threading, preventing welding of any type. In figure 1 it can be seen a practical embodiment wherein the device is fastened by threading attachment means 8.

[0024] As seen in figure 3, the gas optimising device for domestic boilers 1 can have LPG tube nipple (9) connections .

[0025] Moreover, the optimising device for industrial boilers 1' incorporates, upstream from the second tubular conduit 4, at least one stainless steel filter 6 with a grid with at least 16 mesh per 10 mm, according to the UNE 60402 standard, and it also has a first small-calibre pressure tap 7 downstream from the second tubular conduit 4 and a second small-calibre pressure tap 10 upstream from the second tubular conduit.

[0026] Likewise, the gas optimising device for industrial boilers 1' has, upstream from the second tubular conduit 4, a 0.5" (1.27 cm) tap 11 for connecting a mass flowmeter in order to check the consumption of each appliance individually. The tap is provided with a plug 12. This is an option to individualise the consumptions of the boilers.

[0027] Figures 4 and 5 of the designs show how the

gas optimising device for industrial boilers 1' can be fastened to the gas conduit by threading means 8 or by clamping means 13.

[0028] In short, the optimising device for domestic boilers 1 or industrial boilers 1' is intercalated in the gas conduit by threading or clamping, avoiding *in situ* welding of any type with the risk that it would entail.

[0029] The spiral body 5 may have a smooth surface, as depicted in figures 1 to 3, or a surface provided with an engraving, as depicted in figures 4 and 5. Said surface with engraving is assembled in the factory by welding, preventing the need to perform welding close to the installation site with the risk that it would entail.

[0030] The presence of an engraving 14 on all or a portion of the surface of the spiral body 5 causes a further increase in gas turbulence.

[0031] In short, using the optimising device object of the invention enables gas saving measured between 5% and 15%, and thereby the subsequent cost saving and environmental protection.

Claims

1. A gas combustion optimising device for domestic and industrial boilers, configured to be interposed in a gas conduit, in a position close to the burner or consumption point of the boiler, **characterised in that** the optimising device (1-1') comprises a first tubular conduit (2) configured to be inserted into a gas conduit, and said first tubular conduit (2) comprises therein a narrowing wherein a spiral body (5) is arranged.
2. The gas combustion optimising device for domestic and industrial boilers according to claim 1, **characterised in that** the optimising device (1-1') comprises:
 - a pair of tubular adaptors (3) with a frustoconical inner surface, arranged inside the first tubular conduit (2) and having at least one O-ring seal which is in contact with the inside of the first tubular conduit (2);
 - a second tubular conduit (4) extending between the pair of tubular adaptors (3) and having a smaller diameter than the first tubular conduit (2), and having at least one O-ring seal between said second tubular conduit (4) and each tubular adaptor (3), and said second tubular conduit (4) having a length determined by the boiler output, head loss, and gas speed;
 - the spiral body (5) is housed inside the second tubular conduit (4) and extends along the entire length thereof;
 - at least one stainless steel filter (6) with a grid of at least 16 mesh per 10 mm, and;
 - at least one small-calibre pressure tap (7).
3. The gas combustion optimising device for domestic and industrial boilers according to claim 1, **characterised in that** it has a first small-calibre pressure tap (7) which is arranged downstream from the second tubular conduit (4).
4. The gas combustion optimising device for domestic and industrial boilers according to claim 1, **characterised in that** it has a second small-calibre pressure tap (10) arranged upstream from the second tubular conduit (4) and a first small-calibre pressure tap (7) arranged downstream from the second tubular conduit (4).
5. The gas combustion optimising device for domestic and industrial boilers according to claim 1, **characterised in that** the spiral body (5) has an engraving (14) on the surface thereof.
6. The gas combustion optimising device for domestic and industrial boilers according to claim 1, **characterised in that** it has a 0.5" tap (11) for connecting a flowmeter upstream from the second tubular conduit (4).

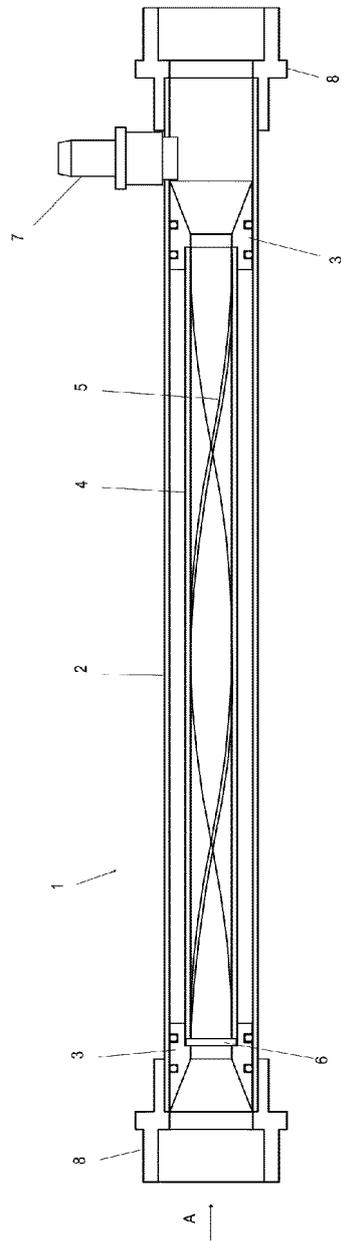


FIG. 1

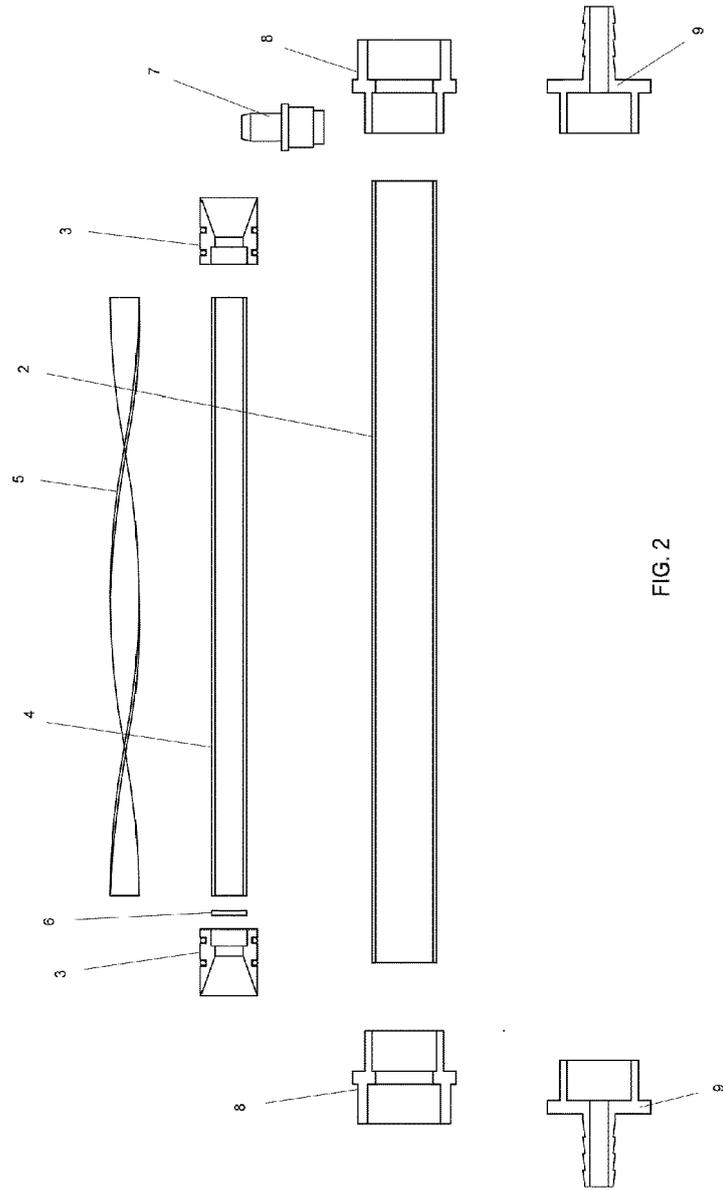


FIG. 2

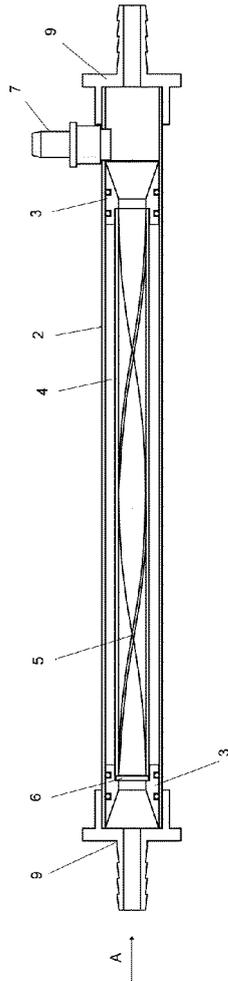


FIG. 3

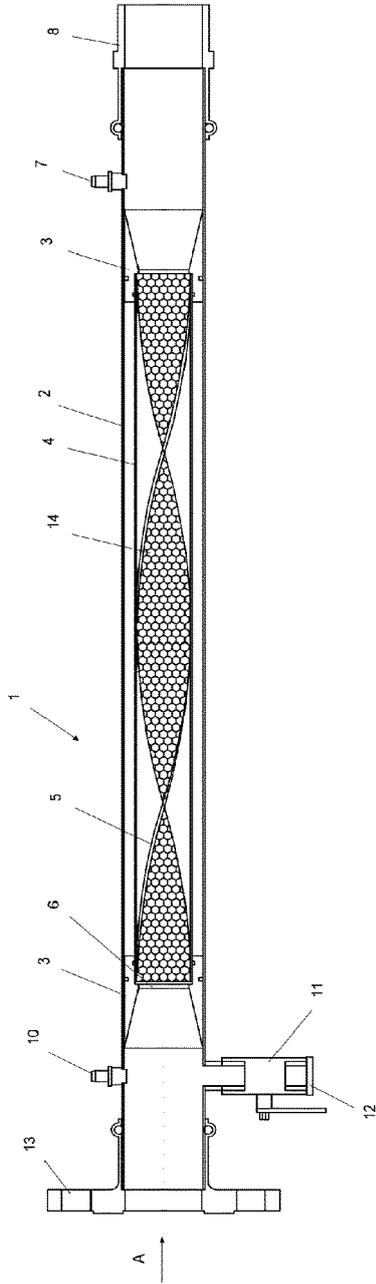


FIG. 4

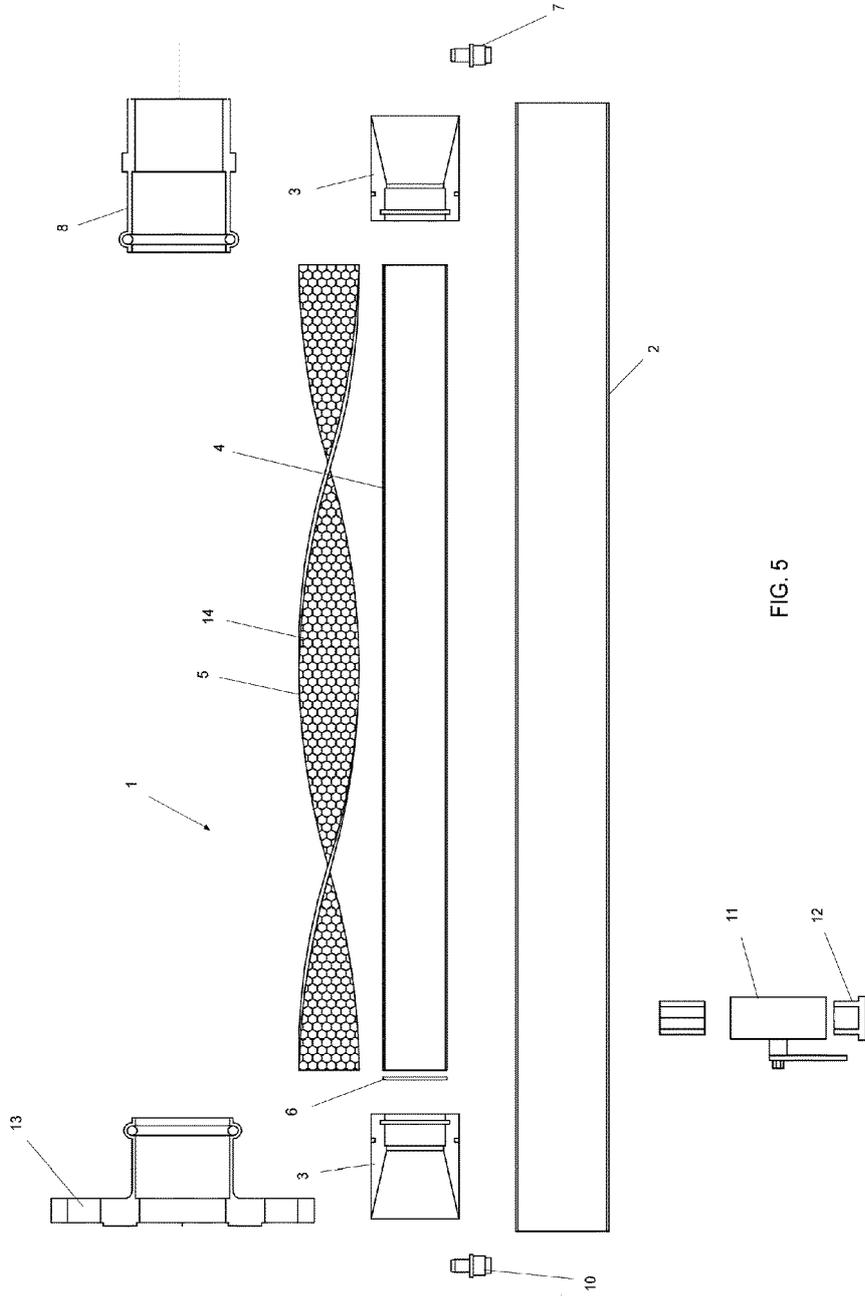


FIG. 5



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Application Number
EP 20 38 2977

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