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(54) **Feed assembly for feeding an air/gas mixture**

(57) A feed assembly (1) of an air/gas mixture to a burner (5) of a gas boiler defines a feed path (P) of the air/gas mixture and has a mixing and modulating device (5) of the air/gas mixture defining a mixing region, and a suction conduit (8) connected to the mixing and modu-

lating device (5); and a plurality of openings (20) communicating with the outside, and located downstream of the mixing area and near the junction between the mixing and modulating device (5) and the suction conduit (8).

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Description

[0001] The present invention relates to a feed assembly for feeding an air/gas mixture.

[0002] In particular, this invention relates to a feed assembly for feeding an air/gas mixture to a burner of a gas boiler.

[0003] The air/gas feed assemblies are widely used in the field of gas-fired boilers for domestic use and, in particular in the field of gas-fired boilers of the condensing type. A particularly common type of feed assembly for feeding an air/gas mixture defines a feed path for feeding an air/gas mixture and comprises an air/gas mixture mixing and modulating device defining a mixing region; and a suction conduit connected to the mixing and modulating device. Generally, the mixing device is defined by a venturi tube which is axially connected to an air feeding conduit and in which, at the level of the minimum flow cross section, a flow of gas is injected. The gas flow rate is regulated by a modulation valve, while the suction conduit is generally defined by the suction conduit of a fan whose speed can be modulated to vary the flow rate of the air/gas mixture. The feed assemblies for feeding an air/gas mixture of the type identified above have proven able to provide an adequate flow modulation and to vary the composition ratio of air/gas mixture within a given range.

[0004] The research to provide more efficient and less polluting gas boilers has resulted in the development of modulating and mixing devices which allow reduction of pollutants for any level of modulation. For example, the documents EP 559, 280; U.S. 6,604,938; DE 101 19 598; and WO2009/133451 disclose a type of modulating and mixing device, in which at least one valve is disposed in the venturi conduit so as to partially close the flow of the air/gas mixture and create air/gas mixtures greater than the ratio of 5 to 1 and constant as a function of the mixture flow rate required by the burner.

[0005] These technical solutions represent an objective improvement in the reduction of pollutants over previous solutions, however, it was found that the introduction of these new modulating and mixing devices occasionally causes vibrations, which are undesirable and annoying since they may create technical problems and give the impression of being a low quality product.

[0006] One purpose of the present invention is to provide a feed assembly that is free from the drawbacks of the prior art feed assemblies.

[0007] According to the present invention a feed assembly for feeding an air/gas mixture to a burner of a gas boiler is achieved; the feed assembly defining a feed path of the gas and air mixture comprising a device for mixing and modulating of the air/gas mixture defining a mixing region; and a suction conduit connected to the mixing and modulating device; the feed assembly being provided with at least an opening communicating with the outside, and arranged downstream of the mixing region.

[0008] Thanks to the present invention the feed as-

sembly for feeding an air/gas mixture is free from vibrations to any degree of modulation of the flow and for any air/gas ratio.

[0009] It was also found that it is preferable that the opening extends in the proximity of the junction between the mixing and modulating device and the suction conduit.

[0010] It was found that it is preferable to create a plurality of openings which extend around the feed path.

[0011] According to a preferred embodiment of the present invention the mixing and modulating device comprises a conduit provided with a first flange; and the suction conduit comprises a second flange; the first and second flanges being jointed to each other so as to form the plurality of openings between the first and second flange.

[0012] This solution is particularly easy to accomplish because it is sufficient to create a gap between the first and second flange during assembly of the same. According to a preferred embodiment of the present invention the first and second flanges have respective faces facing each other; the first and/or second flange having a number of projections along the first and/or second face, so as to define, when the first and second flange are tightened to each other, a number of openings, each extending between the first and second face and two projections.

[0013] Alternatively, according to a further preferred embodiment of the invention, the first and second flanges have, respectively, a first and second flat face facing each other; and a number of plates interposed between the first and second flange to define, when the plates are gripped between the first and second flange, a number of openings, each extending between the first and second flat face and two plates.

[0014] Additional features and advantages of the present invention will appear clear from the following description of nonlimiting examples of embodiments, with reference to the figures of the annexed drawings, wherein:

- Figure 1 is a sectional view, with parts removed for clarity and with parts shown in a schematic way, of a feed assembly for feeding an air/gas mixture object of the present invention;
- Figure 2 is a sectional view, on an enlarged scale and with parts removed for clarity, of a detail of Figure 1;
- Figure 3 is a sectional view, on an enlarged scale and with parts removed for clarity, of an alternative embodiment of the detail of Figure 2; and
- Figure 4 is a perspective view of a detail of Figure 3.

[0015] With reference to Figure 1, with the reference number 1 is indicated as a whole a feed assembly for feeding an air/gas mixture to a burner of a gas boiler. The feed assembly 1 is connected to an air feed conduit 2, to a gas feed conduit 3; and to a burner 4 and comprises essentially a mixing and modulating device 5; and a fan

6. The air feed conduit 2 and the gas feed conduit 3 are connected to the mixing and modulating device 5, which in turn is fixed to the fan 6, which is connected to the burner 4. The gas feed conduit 3 presents a modulating valve 7 connected to a control unit (of a known type and not illustrated in the attached figures) for the control of the burner 4 and of the fan 6.

[0016] The fan 6 comprises a suction conduit 8, which is jointed to the mixing and modulating device 5 and ends with a flange 9. In the case illustrated, the fan 6 is a centrifugal fan of the type commonly used in gas-fired boilers, but for the purposes of the present invention may be of different types. The mixing and modulating device 5 has a tubular shape, extending along an axis A and comprises a flange 10 configured to establish a connection with the flange 9; an attaching element 11 to establish a connection with the air feed conduit 2; and an attaching element 12 to establish a connection with the gas feed conduit 3. In this case, the mixing and modulating device 5 comprises an outer tube 13, and an inner tube 14, coaxial, coupled to each other, and shaped to form between them an annular chamber 15, which is in communication with the gas feed conduit 3, and with the compartment of the inner tube 14 by way of two nozzles 16 facing and opposite to each other. The inner tube 14 is shaped so as to give to the inner compartment the typical configuration of the venturi tube and has a separator septum 17 which divides in half the flow section. In addition, the mixing and modulating device 5 comprises two bulkheads 18 and 19, arranged in series, hinged to the separator septum 17, and movable between a closed position in which they block half of the flow section and an open position, not shown. The bulkheads 18 and 19 occupy the closed position under the action of their own weight and are arranged in the fully or partially open position as a function of the suction generated by the fan 6.

[0017] The feeding device 1 comprises at least one opening 20 arranged near the junction between the mixing and modulating device 5 and the suction conduit 8. The opening 20 is arranged downstream of the mixing region, i.e. of the nozzles 16 and the bulkheads 18 and 19.

[0018] The tests performed by the applicant showed that the creation of an opening 20 near to the area shown eliminates vibration in all operating conditions. In particular, the tests have given satisfactory results especially when the opening 20 extends in proximity of the junction between the mixing and modulating device 5 and the suction conduit 8. In addition, the tests have given very positive feedback when the opening 20 extends as much as possible around the feed path P of the air/gas mixture. Therefore, the preferred embodiment of the invention comprises a plurality of openings 20 extending around the feed path P of the air/gas mixture.

[0019] With reference to Figure 2, the flange 9 and the flange 10 are jointed to each other so as to achieve a plurality of openings 20 between the flanges 9 and 10. In particular, the flanges 9 and 10 have respective faces 21 and 22 facing each other, and tightened together by

fasteners 23, in this case screws, each of which is engaged in a hole 24 and in a hole 25 respectively of the flange 9 and of the flange 10. In the case illustrated, the flange 10 has a plurality of projections 26 along the face 22 so as to define, when the flanges 9 and 10 are fastened against each other, a series of openings 20, each of which extends between the first and second faces 21 and 22 and the two projections 26. The openings 20 are in fact the annular gaps that have an axial dimension equal to the height of the two projections 26. Said axial dimension of the opening is of the order of tenths of a millimeter. In the specific case of a feed assembly with a fan with a maximum capacity of 70 kg/h, the axial dimension of the openings is about two tenths of a millimeter.

[0020] According to a variant not shown. The face 22 of flange 10 is flat, while the projections 26 project from the face 21 of the flange 9.

[0021] With reference to Figure 3, the same reference numbers are used to define similar parts. In the case shown in Figure 3, the flanges 9 and 10 have respective flat faces 27 and 28, parallel and facing each other and the openings 20 are made by way of plates 29 interposed between the faces 27 and 28 of the flanges 9 and 10. When the plates 29 are fastened between the flanges 9 and 10 a plurality of openings 20 are defined, each of which extends between the flanges 9 and 10 and two plates 29.

[0022] Each plate 29 is U-shaped and has two wings 30 connected by a base 31 so as to be fit on the flange 10. In particular, the two wings 30 of each plate 29 have two respective holes 32 aligned with each other, which, in use, are aligned with holes 24 and 25 of the flanges 9 and 10 to allow the passage of the fasteners 23. In this way, through the use of fasteners 23 in the holes 32 the correct positioning of the plates 29 is ensured and their potential loosening is prevented.

[0023] In use and with reference to Figure 1, the fan 5 sucks air in from air feed conduit 2 through the modulating mixing device and feeds the air/gas mixture to the burner 4. The gas is injected from the two nozzles 16 within the modulating mixing device 5 where it mixes with the air. The gas flow rate is regulated by the gas modulating valve 7, while the flow rate of the air/gas mixture and the position of the bulkheads 18 and 19 is regulated by the operating speed of the fan 6. In this way, it is possible to tune the air/gas mixture in a fine and stable way. The pressure waves generated by the combined action of the fan 6, the bulkhead 18 and 19, and nozzles 16 are compensated and dampened by the openings 20 to the point of eliminating the vibrations induced in the entire feed assembly 1.

[0024] It is also clear that to the feed assembly for feeding an air/gas mixture can be applied changes, variations, improvements without going beyond the scope of the appended claims.

Claims

1. A feed assembly for feeding an air/gas mixture to a burner of a gas boiler; the feed assembly (1) defining an air/gas mixture feed path (P), and comprising an air/gas mixture mixing and modulating device (5) defining a mixing region; and an suction conduit (8) connected to the mixing and modulating device (5); the feed assembly (1) having at least one opening (20) communicating with the outside and located downstream from the mixing region. 5 10
2. A feed assembly as claimed in Claim 1, wherein the opening (20) extends close to where the mixing and modulating device (5) joins the suction conduit (8). 15
3. A feed assembly as claimed in Claim 2, and comprising a number of openings (20) extending about the feed path (P). 20
4. A feed assembly as claimed in Claim 3, wherein the mixing and modulating device (5) is tubular, and comprises a first flange (10); and the suction conduit (8) comprises a second flange (9); the first and second flange (10, 9) being joined to form the number of openings (20) between the first and second flange (10, 9). 25
5. A feed assembly as claimed in Claim 4, wherein the first and second flange (10, 9) have, respectively, a first and second face (22, 21) facing each other; the first and/or second flange having a number of projections (26) along the first and/or second face (22, 21), so as to define, when the first and second flange (10, 9) are tightened to each other, a number of openings (20), each extending between the first and second face (22, 21) and two projections (26). 30 35
6. A feed assembly as claimed in Claim 4, wherein the first and second flange (10, 9) have, respectively, a first and second flat face (28, 27) facing each other; and a number of plates (29) interposed between the first and second flange (10, 9) to define, when the plates (29) are gripped between the first and second flange (10, 9), a number of openings (20), each extending between the first and second flat face (28, 27) and two plates (29). 40 45
7. A feed assembly as claimed in Claim 6, wherein each plate (29) is U-shaped, and has two wings (30) connected by a base (31); each plate (29) being fitted to the first or second flange (10, 9). 50
8. A feed assembly as claimed in Claim 7, wherein the plate (29) has two aligned holes (32) formed in the two wings (30); the first and second flange (10, 9) have respective further holes (25 24) in which to insert fasteners (23); and each plate (29) being fitted

to the first or second flange (10, 9) so the holes (32) in the wings (30) are aligned with said further holes (25, 24).

FIG. 1

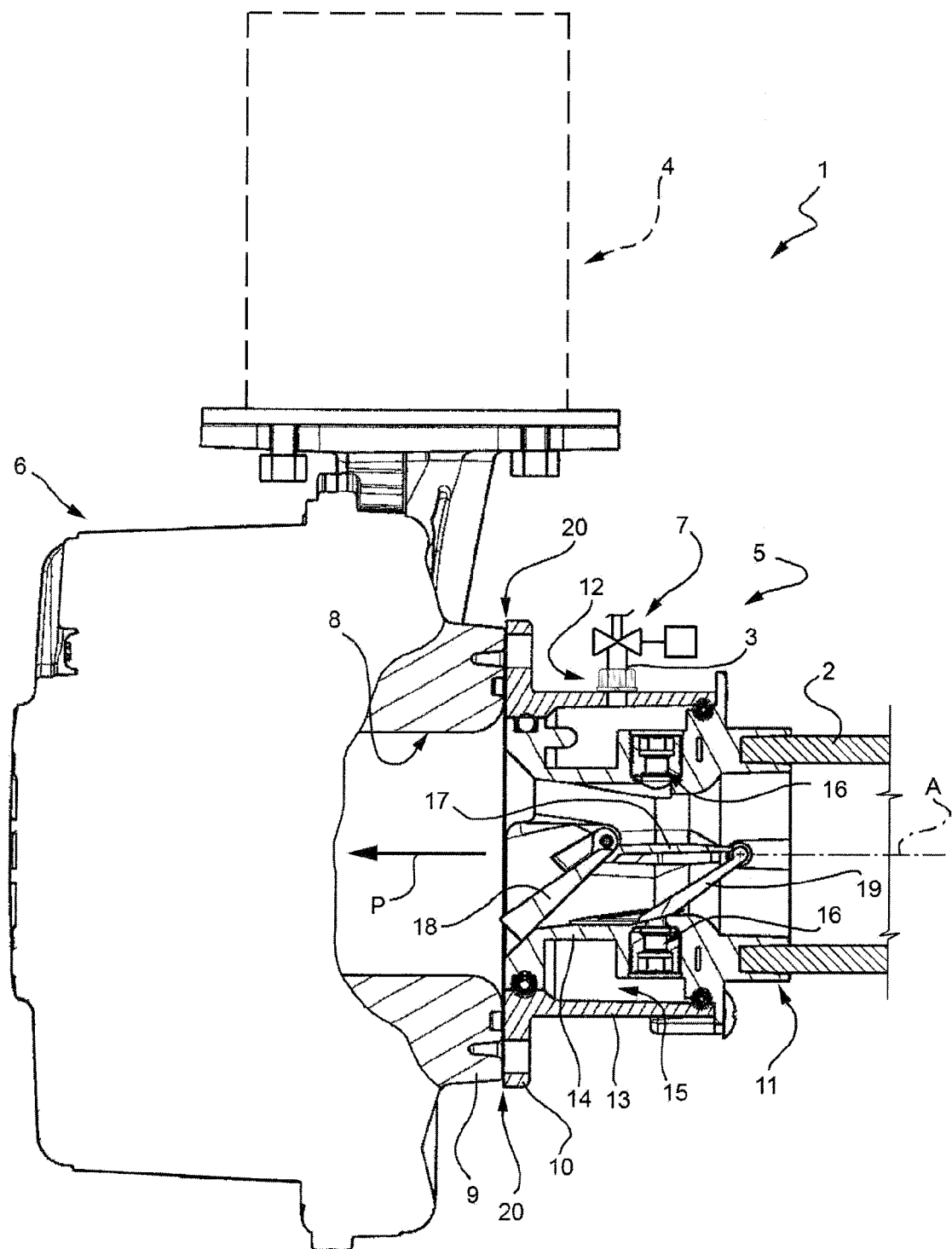


FIG. 2

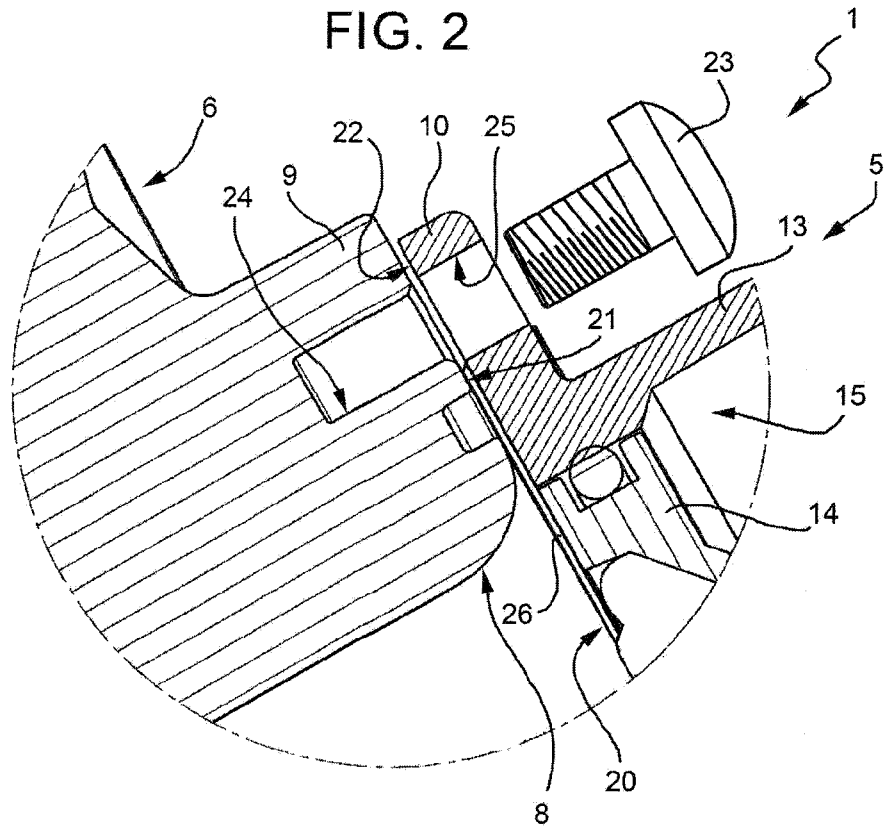


FIG. 3

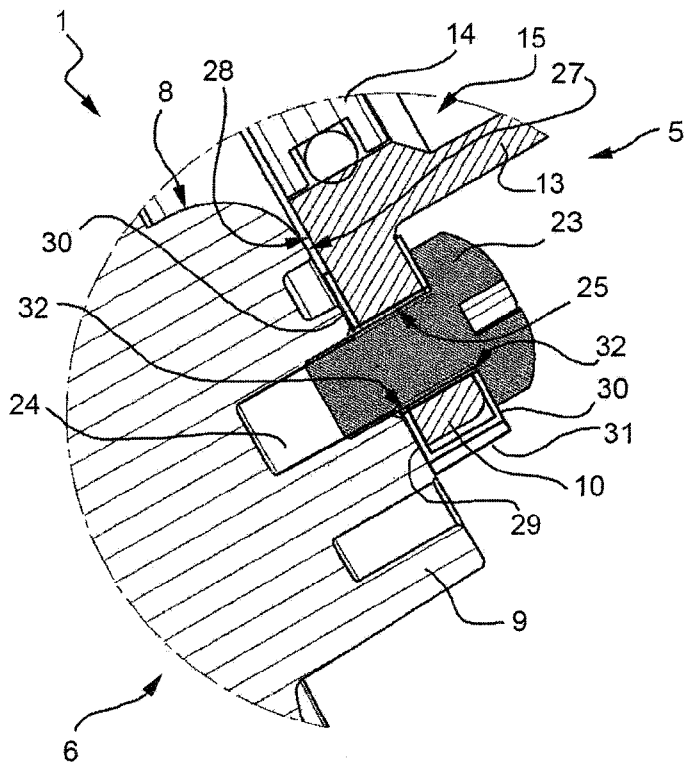
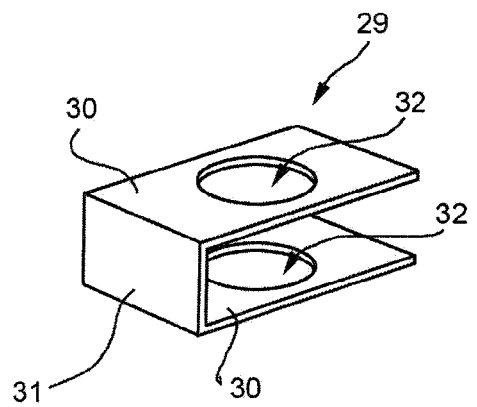


FIG. 4





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Application Number
EP 11 18 4234

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