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(54) Gas dosing device.

(57) The invention relates to a gas dosing device comprising a flow duct which is connected to a flow generating device such as a fan and has an inlet end for a main gas flow and an outlet end. The flow duct is divergent in the through-flow direction and a main gas valve element extending transversely of the duct is accommodated therein guided for movement co-axially of the duct. The main gas valve element is loaded in the direction counter to the through-flow direction and is connected to a mixing gas dosing unit which is connected to a mixing gas feed pipe and can deliver an amount of mixing gas related to the position of the main gas valve element in the duct. The invention further relates to a heating device (1) comprising means defining a flow duct (2) which is connected to a fan (6) and has successively in a through-flow direction at least a gas dosing device (3) as described above, a burner (4) and a heat exchanger (5) through which a heat transfer medium can flow. The inlet end of the gas dosing device is connected to the atmosphere and the mixing gas feed pipe is connected to a source of flammable gas.

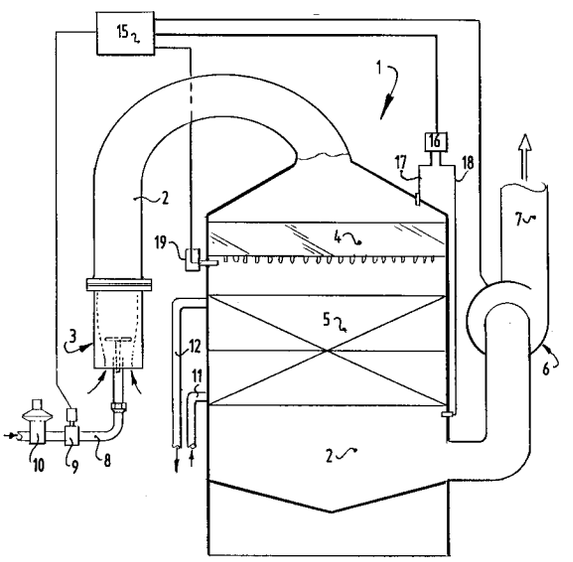

FIG.1

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The invention relates to a gas dosing device comprising a flow duct which is connected to a flow generating device such as a fan and has an inlet end for a main gas flow and a mixing gas dosing unit for supplying a mixing gas in doses to the main gas.

Such a gas dosing device is generally known and is for instance used for adding flammable gas such as natural gas to air for combustion in the burner of a heating device. The mixing gas dosing unit is herein formed for instance by a gas sprayer connected to a gas feed pipe in which the flammable gas is supplied under a determined pressure. In this way an accurate mixing ratio of the main gas and the mixing gas can be adjusted.

In particular applications, however, it is desired to obtain a variable quantity of the gas mixture. It is already known in the case of heating devices to use a burner which can operate at a lower or higher capacity according to the conditions. Complicated control systems are required to obtain an accurately determined gas/air mix at both low capacity and full load. The costs involved form in many cases an obstacle to the use of such a variable gas dosing device.

The invention now has for its object to provide a gas dosing device of the type specified in the preamble with which in simple and economic manner a gas mixture can be obtained with a precisely constant mixing ratio at considerably varying flow rates.

This objective is achieved with the gas dosing device as specified in claim 1. The main gas valve element will assume a position in the diverging flow duct which depends on the quantity of gas which flows through the flow duct as a result of the action of the flow generating device. As more gas flows through the duct, the main gas valve element will position itself in a wider portion of the flow duct. The position of the main gas valve element is thus a measure of the quantity of gas that has flown through and the mixing gas dosing unit accordingly delivers a quantity of mixing gas adapted to the through-flowing quantity of gas. An optimum mix ratio is thus obtained within very wide limits of the through-flowing quantity of main gas.

A very simple device is obtained with the characteristic of claim 2. In the case of a greater quantity of through-flowing main gas the main gas valve element assumes a position in a wider portion of the main gas duct, wherein the mixing gas valve element is thus positioned simultaneously in a wider portion of the mixing gas duct, whereby a proportionally larger amount of mixing gas can flow in.

The step of claim 3 achieves that no transmissions, seals and the like requiring frequent maintenance are necessary.

A very favourable further development is characterized in claim 4. The integrally connected mixing gas valve and main gas valve elements are hereby not obstructed in their movement by friction. There is therefore no risk of an incorrect mix ratio occurring due to jamming of the valve elements.

A further simplification with an accompanying increase in reliability is achieved with the step of claim 5. The mixing gas valve/main gas valve element can hereby float freely. This element forms the only moving part of the gas dosing device.

The invention likewise relates to and provides a heating device comprising means which define a flow duct which is connected to a fan and has successively in flow direction at least one gas dosing device according to any of the claims 1 to 5, a burner and a heat exchanger through which a heat transfer medium can flow, wherein the inlet end of the gas dosing device is connected to the atmosphere and the mixing gas feed pipe is connected to a source of flammable gas. This heating device can operate at a lower or higher capacity according to the conditions, wherein a high efficiency is achieved at all settings. At the same time this heating device is economic of manufacture.

The invention is further elucidated in the following description with reference to the use of a gas dosing device according to the invention in a heating device.

Fig. 1 shows schematically a heating device according to the invention.

Fig. 2 shows in cross-sectional perspective view on a larger scale the gas dosing device of the heating device according to the invention.

The device 1 shown in fig. 1 is a so-called high-yield boiler in which a flow duct 2 is defined in which a gas transport can be effected by a fan 6 accommodated therein. Situated successively in the flow duct 2 in the flow direction are a gas dosing device 3, a burner 4, which in this embodiment is of the fully pre-mixed type, a heat exchanger 5 and the above mentioned fan 6. The latter discharges the supplied combustion gas to the flue uptake 7. It is noted that in another embodiment the fan 6 may also be accommodated in the flow duct in advance of the burner 4. The fan is not then exposed to higher temperatures and condensate.

Heat exchanger 5 is connected to a heating water feed pipe 11 and a heating water discharge pipe 12 which are connected in known manner to radiators and convectors in order to deliver the heat supplied to the heating water in heat exchanger 5 to the desired locations.

In the gas dosing device 3 the air drawn in by the action of the fan 6 is mixed with gas from a gas feed pipe 8 in a predetermined desired mix ratio,

wherein an optimum combustion takes place.

Accommodated in the gas feed pipe 8 is an electrical gas valve 9 which can open and close the gas feed. Likewise accommodated in the gas feed pipe 8 is a reducing valve 10 which holds the gas pressure in gas feed pipe 8 at a constant value.

The whole device 1 is controlled by a control device 15, here shown schematically, of which only a few connecting lines are shown. Control device 15 is connected to a flow sensor 16, an ignition 19, the above mentioned electrical gas valve 9 and the fan 6. Flow sensor 16 can be a pressure difference sensor which responds to a pressure difference between the lines 17 and 18. These lines 17 and 18 are connected to the flow duct 2 on different sides of the burner and heat exchanger assembly. As soon as the fan 6 is switched on by control device 15 a flow begins in duct 2. As a result of this flow a pressure difference will occur over burner 4 and heat exchanger 5 and therefore a pressure difference between lines 17 and 18. This pressure difference is detected by sensor 16 and this sensor generates a relevant output signal to control device 15. The latter will then actuate the gas valve 9 and the ignition 19 so that gas is added to the air flow and the air/gas mixture is ignited on the surface of burner 19. The hot combustion gases flow through the heat exchanger 5 and the heat is transferred in known manner to the heating water therein. The cooled combustion gases are carried by fan 6 to the flue uptake 7.

If detectors (not shown) indicate to the control device 15 that for instance only a small quantity of heat must be generated, control device 15 will cause the fan 6 to operate at a low speed. When conversely much heat is required, the fan 6 will be switched to high speed. In these extreme situations and the situations therebetween a constant mix ratio of the air and the gas must always be obtained in the air mixer 3.

As can be seen in fig. 2, which shows a preferred embodiment of the gas dosing device according to the invention, this objective is achieved in extremely simple, effective and reliable manner.

Gas dosing device 3 comprises a housing 24 in which is formed a diverging duct 25. This diverging duct 25 connects at its broad end to, and forms part of, flow duct 2. At the narrow end duct 25 connects onto an air feed opening 26 freely connected to the atmosphere. Accommodated in the diverging duct 25 is an air valve element 27 extending transversely of the duct. This air valve element 27 is movable coaxially of duct 25, that is, vertically as seen in fig. 2. Connected to air valve element 27 is a rod-like gas valve element 28 which protrudes into a likewise diverging duct 30 in a gas regulator housing 29 fixedly connected to the housing 24 of the gas dosing device. The gas feed pipe 8 is connected to the narrow end of diverging duct 30.

The gas dosing device 3 shown in fig. 2 operates as follows.

Owing to the vertical disposition of the gas dosing device as shown in fig. 2 the integrally connected air valve element and gas valve element 28 are urged downward, that is, in the direction to the narrow ends of the respective diverging ducts 25 and 30. When no flow occurs through duct 25 the valve elements lie in their lowest position as designated with dashed lines, wherein both the air duct 25 and the gas duct 30 are closed.

As soon as the fan is now switched on at a determined speed an air flow will begin in air duct 2. In accordance with the strength of this flow the air valve element 27 will be drawn upward in the diverging duct 25 counter to the force of gravity acting upon the valve assembly. As the air valve 27 moves higher the gap between the edge of the air valve and the wall of duct 25 becomes larger, whereby the upward force decreases so that at a given speed of the air flow an equilibrium situation will be adjusted at a determined height of air valve element 27 in the conical duct 25. Due to the direct connection of the air valve element 27 to the gas valve element 28 a corresponding position of this gas valve element 28 in the gas duct 30 is adjusted, and consequently of the gap between the bottom end of the gas valve element 28 and the wall of the gas duct 30. The amount of gas flowing through the gap between the bottom end of gas valve element 28 and the wall of the diverging gas duct 30 is dependent on the width thereof, and consequently dependent on the vertical position of the gas valve element 28. By a suitable choice of the conicity of the gas duct 30 in combination with that of the air duct 25 it can thus be achieved that at each position of the air valve element 27 determined by the air flows in duct 25 a correct amount of gas is fed into the duct 25 to obtain the desired mix ratio. In this manner a precise mix ratio can be achieved at a very large variation range of the air speed. As can be seen clearly in fig. 2, the gas dosing device is of exceptionally simple construction, having only one moving element which, in the situation of use, can moreover assume a suitable position in free floating and thus unobstructed manner. The described gas dosing device can therefore be manufactured economically and will function reliably for a long period.

The dimensioning of the conicities of air duct 25 and gas duct 30 can be determined with tests and depends to a certain extent on the further embodying of the heating device. The control range of the gas dosing device must of course be adapted to the desired control range of the heating device.

A setting of the desired mix ratio can be obtained by adjusting the reducing valve 10.

The device shown in the figures relates to a preferred embodiment and the invention is not limited to this embodiment. It is not for instance necessary to dispose the gas dosing device vertically, as it can be placed horizontally or in another position, wherein however it may then perhaps be necessary to arrange a spring to urge the air valve with bias in the direction towards the narrow end of the diverging duct 25. A direct connection of the air valve element 27 to the gas valve element 28 is also a favourable step, although an indirect connection can also be used.

Although the gas dosing device according to the invention lends itself particularly well for use in a heating device, it is not limited thereto. The invention is applicable in all conditions wherein a mixing gas has to be added in a fixed ratio to a main gas, while the flow rate of the main gas flow varies greatly.

Claims

1. Gas dosing device comprising a flow duct which is connected to a flow generating device such as a fan and has an inlet end for a main gas flow and an outlet end, wherein the flow duct is divergent in the flow direction and a main gas valve element extending transversely of the duct is accommodated therein guided for movement coaxially of the duct and wherein the main gas valve element is loaded in the direction counter to the through-flow direction and is connected to a mixing gas dosing unit which is connected to a mixing gas feed pipe and can deliver an amount of mixing gas related to the position of the main gas valve element in the duct.

2. Device as claimed in claim 1, wherein the mixing gas dosing unit comprises a mixing gas duct diverging in a direction parallel to the through-flow direction and a mixing gas valve element fixedly connected to the main gas valve element and guided for coaxial movement therewith, wherein the mixing gas duct is connected at the end with the small diameter to a source of gas under constant pressure and is connected with the other end to the flow duct.

3. Device as claimed in claim 2, wherein the mixing gas duct is arranged coaxially of the flow duct and debouches directly therein.

4. Device as claimed in claim 3, wherein the mixing gas valve element is rod-like and the main gas valve element is a disc fixedly connected thereto, and the rod-like mixing gas valve element is guided for free movement in the mixing gas duct.

5. Device as claimed in any of the foregoing claims, wherein this is disposed such that the through-flow direction is oriented vertically upward so that the main gas valve element is loaded counter to the through-flow direction by the force of gravity.

6. Heating device comprising means defining a flow duct which is connected to a fan and has successively in a through-flow direction at least a gas dosing device as claimed in any of the foregoing claims, a burner and a heat exchanger through which a heat transfer medium can flow, wherein the inlet end of the gas dosing device is connected to the atmosphere and the mixing gas feed pipe is connected to a source of flammable gas.

7. Heating device as claimed in claim 6, further comprising a control device to which are connected an electrically operated gas valve accommodated in the mixing gas feed pipe, an ignition for the burner and a flow sensor for detecting flow in the flow duct, wherein the control device actuates the gas valve and the ignition in response to an output signal of the flow sensor.

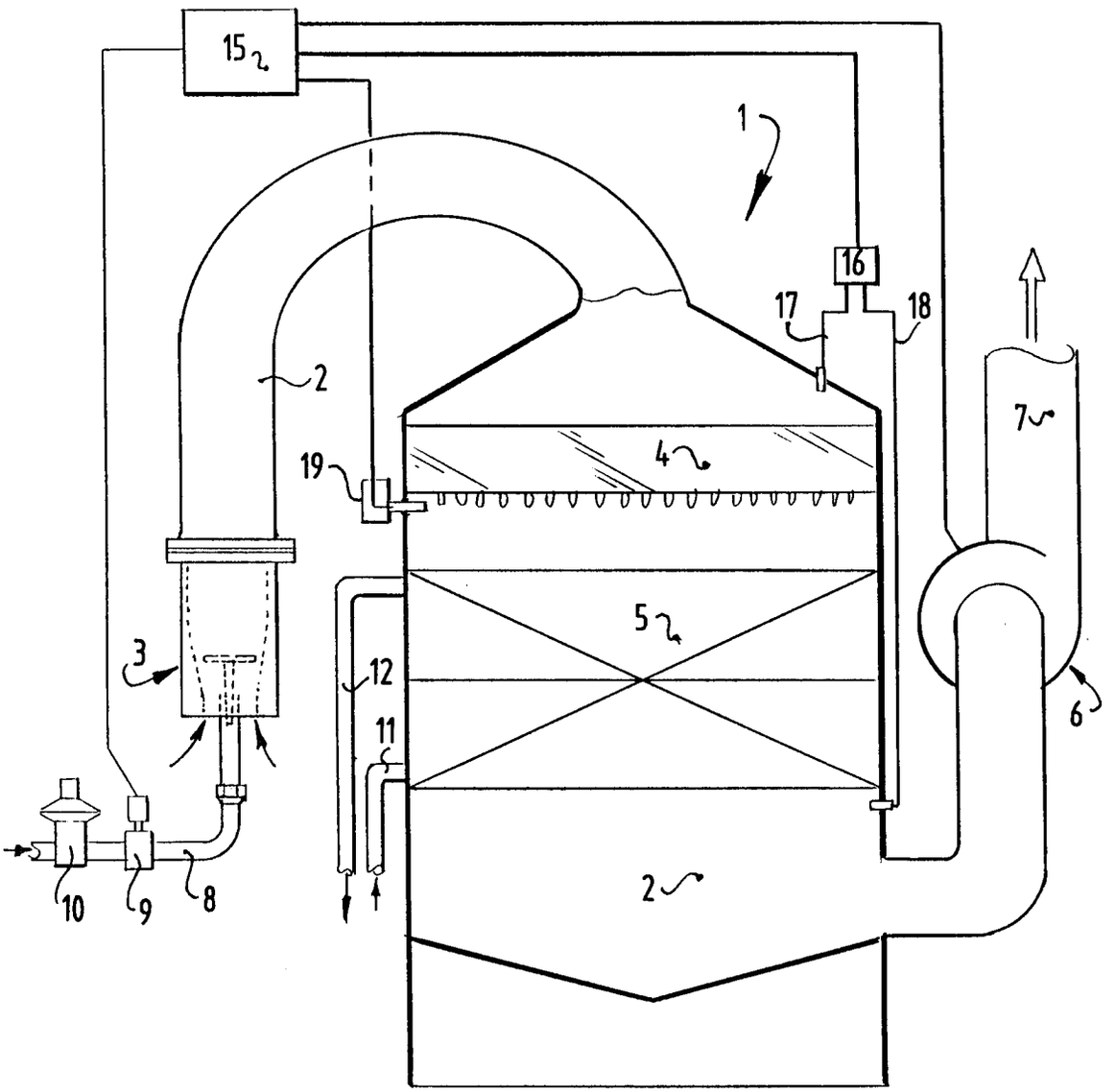

FIG.1

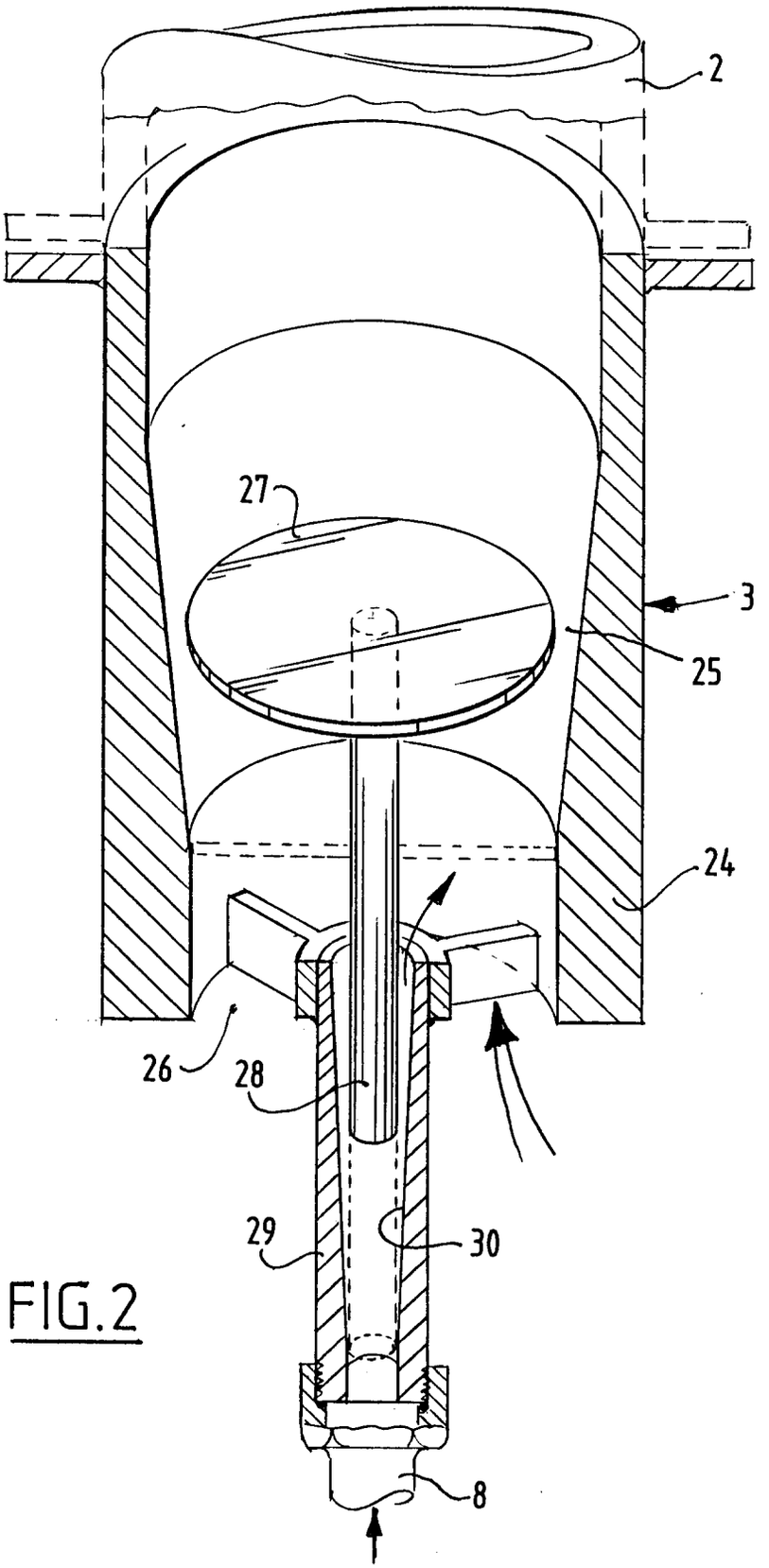

FIG.2

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 93 20 0557

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	EP-A-0 316 454 (EIKEN K.K.K.) * page 3, line 22 - page 4, line 6 * * page 9, line 10 - page 11, line 20 * * page 16, line 14 - page 18, line 17 * * abstract; figures 1,15,16,21 *	1-5	F23D14/60 F23D14/64 F23N1/02 F23N5/24
Y	---	6,7	
Y	PATENT ABSTRACTS OF JAPAN vol. 14, no. 49 (M-927)(3992) 29 January 1990 & JP-A-01 277 122 (MATSUSHITA) 7 November 1989 * abstract *	6,7	

A	DE-C-969 044 (SPALECK) * the whole document *	1	

A	DE-A-3 625 402 (KROMSCHRÖDER)		

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

F23D
F23N
F23M

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	07 MAY 1993	LEITNER J.

CATEGORY OF CITED DOCUMENTS

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E : earlier patent document, but published on, or after the filing date
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