(19) DANMARK

(10) **DK/EP 2368024 T3**

Patent- og Varemærkestyrelsen

(12) # Oversættelse af europæisk patentskrift

(51) Int.Cl.: ***F 01 N 3/20 (2006.01)*** ***F 01 N 3/36 (2006.01)***

(45) Oversættelsen bekendtgjort den: **2016-02-01**

(80) Dato for Den Europæiske Patentmyndigheds bekendtgørelse om meddelelse af patentet: **2015-11-11**

(86) Europæisk ansøgning nr.: **09799253.1**

(86) Europæisk indleveringsdag: **2009-12-12**

(87) Den europæiske ansøgnings publiceringsdag: **2011-09-28**

(86) International ansøgning nr.: **EP2009008912**

(87) Internationalt publikationsnr.: **WO2010069528**

(30) Prioritet: **2008-12-18 DE 102008063515**

(84) Designerede stater: **AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK SM TR**

(73) Patenthaver: **DEUTZ Aktiengesellschaft, Ottostrasse 1, 51149 Köln, Tyskland**

(72) Opfinder: **SCHLÜTER, Dirk, Linnenkamp 16, 49196 Bad Lear, Tyskland**
BROLL, Peter, Hackberg 16, 51429 Bergisch-Gladbach, Tyskland
MIEBACH, Rolf, Königstraße 36, 50321 Brühl, Tyskland
SCHRAML, Stephan, Berghausener Straße 123B, 53639 Königswinter, Tyskland

(74) Fuldmægtig i Danmark: **RWS Group, Europa House, Chiltern Park, Chiltern Hill, Chalfont St Peter, Bucks SL9 9FG, Storbritannien**

(54) Benævnelse: **FORDAMPER**

(56) Fremdragne publikationer:

WO-A1-2006/066043
DE-A1- 4 441 261
DE-A1-102004 048 335
DE-A1-102005 039 630
US-B1- 7 032 376

Description

The invention relates to an evaporator device, in interaction with an exhaust pipe which conducts a process exhaust gas, into which exhaust pipe an exhaust-gas line of the evaporator device issues, said evaporator device having a burner with a supply apparatus for fuel and air and having a combustion chamber and having the exhaust-gas line, and wherein an exhaust-gas aftertreatment device is inserted into the exhaust pipe downstream of the point of issue of the exhaust-gas line, and a method for operating such an evaporator device.

Such an evaporator device is known from DE 10 2004 048 336 A1. The evaporator described in this document is inserted into the exhaust-gas system of an internal combustion engine, by means of which the internal combustion engine exhaust gas is conducted away and undesirable emissions are reduced. To this end, a fuel supply device, an oxidation catalyst and a particle filter are arranged in the exhaust-gas system. In order to be able to improve the introduction of the fuel into the exhaust gas, a recirculation unit which acts as an evaporator is also provided which is connected to the exhaust-gas tract and to which the fuel supply device is connected so that the introduction of fuel into the exhaust gas is carried out via or through the recirculation device. In addition to fuel, air can also be supplied to the recirculation device and the resultant mixture can be ignited and burned in the recirculation device which operates as a burner. In particular, the quantity of fuel can be adjusted to regulate the burner output. The burner output must be calculated in interaction with the oxidation catalyst so that a regeneration of the particle filter can be carried out in all possible operating states.

Moreover, evaporators for an exhaust-gas system of an internal combustion engine are known which take energy for heating and evaporation directly from the process exhaust gas. Such evaporators are not fully functional in the case of low process exhaust gas temperatures.

Finally, evaporators for an exhaust-gas system of an internal combustion engine are known which take energy for heating and evaporation from electric heating devices. In many applications, it is difficult or impossible or undesirable on the grounds of efficiency to provide the required amount of electric energy.

US 7,032,376 B1 discloses a burner for an exhaust-gas aftertreatment system at an internal combustion engine with an injection device which makes available atomized fuel.

DE 44 41 261 A1 shows a device for aftertreatment of exhaust gases of a self-igniting internal combustion engine, in the exhaust-gas collection system of which a reduction catalyst for the reduction of NOx components, of the exhaust gas of the internal combustion engine is arranged and wherein the device for exhaust gas aftertreatment has a metering device.

The object on which the invention is based is to indicate an evaporator device or a method for operating such an evaporator device which is expanded or improved in terms of the function.

This object is achieved in that an introduction apparatus for a liquid for evaporation is inserted into the exhaust-gas line of a burner. The corresponding method is characterized in that the burner provides a base amount of thermal power, the lower limit of which is predefined by the provision of an adequate amount of energy for the evaporation of an amount of liquid for evaporation which is introduced into the exhaust-gas line.

The configuration according to the invention is characterized in that the evaporator device can be used for any desired liquid to be evaporated. A non-combustible liquid, for example, an aqueous urea solution, can thus also be evaporated. In the event that the liquid is a fuel, this is preferably the same fuel, for example, diesel fuel which is also injected with the supply apparatus of the burner. In principle, it is, however, possible to also use a gaseous fuel, for example, natural gas for operation of the burner. The separate introduction of the additional fuel via the introduction apparatus has the advantage that, in contrast to the prior art, a quantity of fuel required, for example, for a process no longer has to be supplied in its entirety through the supply apparatus of the burner, rather a partial quantity of the fuel required overall is supplied as a "secondary fuel quantity" downstream of the burner. This secondary fuel quantity is then ultimately prepared and/or burned in a fully controlled manner. The corresponding possible method variants are explained below in connection with the dependent method claims.

In a further development of the invention, a mouth of the introduction apparatus in the exhaust-gas line has an atomizer nozzle, in particular a pressure atomizer nozzle or an air flow atomizer nozzle. The liquid for evaporation is solely atomized by the pressure of the liquid for evaporation with the pressure atomizer nozzle. Alternatively, the introduction apparatus can, however, also be configured as an air flow atomizer nozzle. Here, the air flow atomizer nozzle is operated so that the liquid for evaporation is introduced with a small quantity of air into the exhaust-gas line. If the liquid for evaporation is fuel, during normal operation, for example, 20 l air/min. and 2 cm^3/min. fuel are conveyed to an air flow atomizer nozzle to provide an ignitable fuel/air mixture, while up to 100 cm^3/min. fuel is conveyed with the air flow atomizer nozzle operated according to the invention. Such a rich fuel/air mixture is primarily not ignitable.

In a further configuration, a venturi device is arranged in the exhaust-gas line in the region of a mouth of the introduction apparatus. This brings about a rapid mixing of the converging component flows of exhaust gas and liquid for evaporation.

In a further configuration of the invention, the burner with the combustion chamber, the exhaust-gas line and the introduction apparatus are integrated into a housing, and the housing is adapted to the exhaust pipe. A structural unit is thus provided which can be attached to various exhaust pipes. The housing can ideally be configured such that, in the case of use in an internal combustion engine, it can be attached to the exhaust-gas system preferably close to the internal combustion engine, for example, directly behind the exhaust-gas collection line or an exhaust-gas turbocharger of the internal combustion engine.

In a further configuration, the exhaust-gas line projects by way of at least one outlet into the exhaust pipe. As a result, a good mixing of the coinciding gas flows is ensured. To this end, the exhaust-gas line is preferably inserted concentrically into the exhaust pipe such that the outlet from the exhaust-gas line is arranged in the flow direction of the process exhaust-gas flow, i.e., for example, of the internal combustion engine exhaust-gas flow. As a result, an increase in the speed of flow of the process exhaust gas is achieved which ensures a rapid mixing through of the gas mixture of burner exhaust gas and vapour (evaporated liquid for evaporation) with the process exhaust gas. As a result, an ignition of the gas mixture can also be prevented if the process exhaust gas contains oxygen. In order to further suppress the occurrence of chemical reactions in the region of the introduction, corresponding aids which assist this can be provided. Such possible aids include, for example, a disc or a cone which are arranged in front of the outlet of the exhaust-gas line, wherein the cone tip is aligned towards the outlet of the exhaust-gas line. It is also provided, in addition or alternatively to the further increase in the speed of flow in the region of the outlet, to provide a narrowing of the flow in the exhaust pipe, for example, in the form of a venturi device or venturi nozzle. In other words, a possible reaction of the burner exhaust gas treated with liquid for evaporation with the process exhaust gas should be quenched.

In a further development of the invention, a gas-conducting apparatus which conducts process exhaust gas opens into the exhaust-gas line. As a result, process exhaust gas is supplied to the burner exhaust gas and the liquid for evaporation. As a result, the burner exhaust gas (in the case of a supply in the flow direction in front of the mouth of the introduction apparatus) is cooled in a controlled manner, and indeed in the form that enough power is still provided to evaporate the liquid for evaporation, but its ignition (if the liquid for evaporation is fuel) is prevented. The supply can, however, also be carried out in the region of the mouth or in the flow direction behind the mouth. By suitable selection of the described aids, the chemical reactions of the liquid for evaporation with the burner exhaust gas and/or the process exhaust gas can be supported or prevented as necessary. In particular by influencing the temperature in the region of the introduction apparatus, it is possible, by means of reactions of the liquid for evaporation with the burner exhaust gas, to specifically generate substances which assist desired reactions in the downstream catalysts.

In a further configuration, the exhaust-gas aftertreatment device has a catalyst which selectively catalytically reduces nitrogen oxides and/or a NO_x storage catalyst and/or an oxidation catalyst and/or at least one particle filter. Each of the catalysts or the catalyst particle filter systems can be operated with the evaporator device according to the invention alone or in any desired combination, as is explained in detail below in the context of the operating methods. It is also provided in the framework of the invention that the oxidation catalyst is a multi-purpose catalyst which, in particular, comprises vanadium and which is also suitable for catalytically assisting the selective reduction of nitrogen oxides.

The structural configurations described above are expediently used to implement the further configuration described below of the operating method according to the invention. The burner is thus operated in a Lambda range from 0.75 to 1.75, preferably of 1. The burner is furthermore configured such that it can be operated in a power range up to 20 kW, preferably up to 15 kW and very preferably up to 5 kW. One aim of the invention is to operate the burner with as little power as possible because in particular the required air conveying device can then be configured relatively easily for the supply of (combustion) air.

Moreover, as a result of the method according to the invention in a general form, liquid for evaporation (possibly with direct addition of a partial quantity of process exhaust gas) is evaporated by the burner exhaust gas and conducted together with the burner exhaust gas and the total quantity of the process exhaust gas into the exhaust-gas aftertreatment device in order to bring about the reactions intended there. In the case of a use in conjunction with internal combustion engines which are operated with diesel fuel, NH_3 generated from evaporated urea solution brings about a chemical reaction in an SCR catalyst in which nitrogen oxides and NH_3 are converted into nitrogen and water vapour. In the event that in turn in the case of a use in the context of internal combustion engines which are operated with diesel fuel the liquid for evaporation is fuel, this is supplied together with the burner exhaust gas and the process exhaust gas via the exhaust pipe to an oxidation catalyst and a downstream particle filter and oxidized in the oxidation catalyst and/or in a catalytically coated particle filter. One particular advantage of this configuration is that the oxidation reaction is therefore firstly carried out in the oxidation catalyst and as a result it is only here that the temperatures required for regeneration of the particle filter are generated. Were, as occurs in the case of the system described in relation to the prior art, the injected fuel already to be ignited at the location of the introduction into the exhaust-gas line, this would be associated with a higher thermal loading of the entire exhaust-gas system and considerable heat losses would have to be balanced out by larger fuel quantities. For example, a temperature of up to 650°C which is required to regenerate particle filters is generated in the oxidation catalyst by the oxidation of the evaporated fuel.

In a further configuration of the invention, different evaporation liquids, in particular fuel and aqueous urea solution, can be introduced into the exhaust-gas line by way of one or more introduction apparatuses. In the case of only one introduction apparatus, the supply of the liquid for evaporation is carried out in an alternately controlled manner by means of a corresponding switching device, while in the case of two introduction apparatuses being present, the switching device is not required. An alternating supply of liquid for evaporation is normally also carried out in this case. This alternating supply can, for example, advantageously be used if the oxidation catalyst is a multi-purpose catalyst which, in particular, comprises vanadium and which is also suitable for assisting the selective catalytic reduction of NO_x. In this case, the oxidation catalyst is used alternately for different functions. Naturally, however, it is also possible to provide an oxidation catalyst and, separately from this, a catalyst which brings about a selective catalytic reduction of NO_x.

In a further configuration of the method, a partial quantity of the fuel quantity, which is introduced as a liquid for evaporation and evaporated, is oxidized, with a release of heat, within the exhaust-gas line and/or within the location at which the merging with the process exhaust gas takes place. As a result, in the case of burner power set to the minimum, the total thermal power can be increased to such an extent that reliable start-up of a catalyst takes place. In order to start its activity, i.e. to start a catalytic reaction of the introduced evaporated fuel, for example, an oxidation catalyst must reach a predefined minimum temperature, for example, 300°C. This temperature is achieved by the summation of the burner power and the power which is generated by the burnt partial quantity.

In a further configuration, the oxidized partial quantity of the evaporated fuel quantity is kept at least approximately constant regardless of the total evaporated fuel quantity. It is furthermore provided here, after an exceedance of a threshold quantity of the partially converted fuel quantity, to terminate the partial conversion and evaporate the entire fuel quantity. These different effects are achieved by strict control of the combustion air ratio in the burner and/or strict control of the quantity of the atomization air supplied in the case of use of an air flow atomizer nozzle for the air flow atomizer nozzle. Further influence variables include the location of the installation of the mouth of the introduction apparatus and the supply of a partial quantity of process exhaust gas (for cooling the burner exhaust gas and as a result the fluid for evaporation), also taking into account the supply location.

Further advantageous configurations of the invention can be inferred from the description of the drawing in which exemplary embodiments of the invention represented in the Figs. is described in greater detail. In the drawing:

Fig. 1 shows a first embodiment of the evaporator device which interacts with an exhaust pipe,

Fig. 2 shows a second embodiment of the evaporator device which interacts with an exhaust pipe and

Fig. 3 shows a third embodiment of the evaporator device which interacts with an exhaust pipe.

In all the embodiments, the evaporator device has a housing 1 in which a burner 2, a combustion chamber 3, an exhaust-gas line 4 and an introduction apparatus 5 for a liquid for evaporation are integrated. In all the embodiments, housing 1 is also connected to an exhaust pipe 6 so that exhaust-gas line 4 is introduced with an outlet 7 concentrically into exhaust pipe 6 and outlet 7 in arranged in the flow direction of the process exhaust gas which flows through exhaust pipe 6.

Burner 2 has a supply apparatus 8a for a gaseous or liquid fuel and a supply apparatus 8b for air. The fuel and the air are mixed with one another in a suitable manner and introduced, for example, by means of an air flow atomizer nozzle 9 into combustion chamber 3 and the mixture is burned in combustion chamber 3. To this end, the mixture is ignited in burner 2 and/or combustion chamber 3 in a suitable manner. In order to minimize heat loss, combustion chamber 3 is inserted into housing 1 in as insulated a manner as possible. Combustion chamber 3 has an outlet opening 10 through which the burner exhaust gas enters into exhaust-gas line 4 and flows along exhaust-gas line 4 up to outlet 7 in order to mix there with the process exhaust gas which flows in exhaust pipe 6 and is internal combustion exhaust gas in the exemplary embodiment. The mixture of fuel and air is adjusted so that, in the region of outlet opening 10 from combustion chamber 3, the oxidation reactions are largely concluded and as a result a heated exhaust-gas flow flows into exhaust-gas line 4. Introduction apparatus 5 issues with a mouth 11 into exhaust-gas line 4 preferably concentrically to exhaust-gas line 4. There is arranged at the location of mouth 11 an atomizer nozzle with which the liquid for evaporation supplied via introduction apparatus 5 is finely atomized. As a result, the liquid for evaporation introduced in this manner is heated and evaporated. A venturi device 12a is inserted into exhaust-gas line 4 in the region of mouth 11. Venturi device 12a brings about an additional mixing of the liquid for evaporation with the exhaust gas. There is arranged in the region of outlet 7 a quenching device 13 which is formed in the exemplary embodiment as a baffle plate and brings about a mixing through of exhaust gas flowing out of outlet 7 and mixed with the evaporated liquid for evaporation with the process exhaust gas. Quenching device 13 can simultaneously be used to avoid an ignition of the overall mixture arising here. A venturi device 12b is fitted in exhaust pipe 6 for an increase in the speed of flow of the process gas flow in the region of outlet 7 or quenching device 13.

The overall mixture formed in the manner described is then supplied to an exhaust-gas aftertreatment device which has a catalyst which selectively catalytically reduces nitrogen oxides and/or NO_x storage catalyst and/or an oxidation catalyst and a particle filter.

The embodiment according to Fig. 2 differs from the embodiment according to Fig. 1 in that a gas-conducting apparatus 14 in the form of bores arranged on the circumference of exhaust-gas line 4 and issuing, for example, in the centre of venturi device 12a is additionally arranged here in the region of venturi device 12a. A partial quantity of process exhaust gas is introduced through said gas-conducting apparatus 14 into exhaust-gas line 4. Moreover, in this embodiment, no venturi device 12b is fitted in the region of mouth 11.

The embodiment according to Fig. 3 differs from the embodiment according to Fig. 2 in that gas-conducting apparatus 14 is incorporated here into exhaust-gas line 4 in the region downstream of venturi device 12a.

Reference numbers

1	Housing
2	Burner
3	Combustion chamber
4	Exhaust-gas line
5	Introduction apparatus
6	Exhaust pipe
7	Outlet
8a, 8b	Supply apparatus
9	Air flow atomizer nozzle
10	Outlet opening
11	Mouth
12a, 12b	Venturi device
13	Quenching device
14	Gas-conducting apparatus

Patentkrav

1. Fordamperindretning, der samvirker med et røggasrør (6), der fører en procesrøggas, i hvilket røggasrør der udmunder en røggasledning (4) for fordamperindretningen, som har en brænder med en forsyningsanordning for brændstof og luft samt et forbrændingskammer og røggasledningen (4), og hvor der i røggasrøret (6) nedstrøms for indmundingen af fordamperindretningens røggasledning (4) er indsat en røggasefterbehandlingsindretning,
kendetegnet ved, at der i fordamperindretningens røggasledning (4) er indsat en indbringningsanordning (5) for en fordampningsvæske.

2. Fordamperindretning ifølge krav 1,
kendetegnet ved, at brændstoffet er et gasformigt eller flydende brændstof.

3. Fordamperindretning ifølge krav 1 eller 2,
kendetegnet ved, at fordampningsvæsken er en vandig urinstofopløsning, et flydende brændstof eller en anden væske.

4. Fordamperindretning ifølge et af de foregående krav,
kendetegnet ved, at især indbringningsanordningens (5) udmunding (11) i røggasledningen (4) har en forstøverdyse, især en trykforstøverdyse eller en luftforstøverdyse.

5. Fordamperindretning ifølge et af de foregående krav,
kendetegnet ved, at der i røggasledningen (4) i området ved en udmunding (11) af indbringningsanordningen (5) er anbragt en venturiindretning (12a, 12b).

6. Fordamperindretning ifølge et af de foregående krav,
kendetegnet ved, at brænderen (2), røggasledningen (4) og indbringningsanordningen (5) er integreret i et hus (1), og huset (1) er adapteret til røggasrøret (6).

7. Fordamperindretning ifølge et af de foregående krav,

kendetegnet ved, at røggasledningen (4) rager ind i røggasrøret (6) med et udløb (7).

8. Fordamperindretning ifølge krav 6 eller 7, kendetegnet ved, at røggasledningen (4) er indført koncentrisk i røggasrøret (6) sådan, at udløbet (7) fra røggasledningen (4) er anbragt i strømretningen af procesrøggassens strøm.

9. Fordamperindretning ifølge krav 7 eller 8, kendetegnet ved, at der i udløbets (7) område findes en quenchanordning (13) und/eller en venturiindretning (12a, 12b).

10. Fordamperindretning ifølge et af de foregående krav, kendetegnet ved, at en gasledeanordning (14), der fører procesrøggassen, udmunder i røggasledningen (4) fortrinsvis opstrøms for indbringningsanordningens (5) udmunding (11).

11. Fordamperindretning ifølge et af de foregående krav, kendetegnet ved, at røggasefterbehandlingsindretningen har en oxidationskatalysator og et partikelfilter.

12. Fordamperindretning ifølge et af de foregående krav, kendetegnet ved, at røggasefterbehandlingsindretningen har en katalysator, der selektivt katalytisk reducerer nitrogenoxider.

13. Fordamperindretning ifølge et af de foregående krav, kendetegnet ved, at røggasefterbehandlingsindretningen har en NO_x-lagringskatalysator.

14. Fremgangsmåde til drift af en fordamperindretning, der samvirker med et røggasrør, der fører en procesrøggas, i hvilket røggasrør der udmunder en røggasledning for fordamperindretningen, som har en brænder med en forsyningsindretning for brændstof og luft samt et forbrændingskammer og røggasledningen, og hvor der i røggasrøret nedstrøms for indmundingen af

fordamperindretningens røggasledning er indsat en røggasefterbehandlingsindretning,
kendetegnet ved, at brænderen (2) stiller en termisk grundydelse til rådighed, hvis nedre grænse er forudbestemt ved tilvejebringelsen af en tilstrækkelig energimængde til fordampningen af en mængde fordampningsvæske, der er indbragt i fordamperindretningens røggasledning (4) via en indbringningsanordning (5).

15. Fremgangsmåde ifølge krav 14,
kendetegnet ved, at der via en eller flere indbringningsanordninger indbringes forskellige fordampningsvæsker i røggasledningen (4).

16. Fremgangsmåde ifølge krav 14 eller 15,
kendetegnet ved, at brænderen (2) leverer en termisk ydelse, der yderligere opvarmer procesrøggassen til en forudbestemt temperatur.

17. Fremgangsmåde ifølge et af kravene 14 til 16,
kendetegnet ved, at brænderen (2) leverer en ydelse, der er tilstrækkelig til at fordampe en vandig urinstofopløsning, der er indbragt som fordampningsvæske, og opvarme en katalysator til sin driftstemperatur, hvilken katalysator findes som en del af røggasefterbehandlingsindretningen og selektivt katalytisk reducerer nitrogenoxider.

18. Fremgangsmåde ifølge krav 17,
kendetegnet ved, at genereringen af NH_3 af den indbragte urinstofopløsning understøttes af en katalysator, der er indbygget i røggasledningen (4).

19. Fremgangsmåde ifølge et af kravene 14 til 16,
kendetegnet ved, at brænderen (2) leverer en ydelse, der er tilstrækkelig til i det mindste at fordampe et flydende brændstof, der er indbragt som fordampningsvæske, og opvarme en NO_x-lagringskatalysator, der findes som en del af røggasefterbehandlingsindretningen.

20. Fremgangsmåde ifølge et af kravene 14 til 16, kendetegnet ved, at brænderen (2) leverer en ydelse, der er tilstrækkelig til i det mindste at fordampe et flydende brændstof, der er indbragt som fordampningsvæske, og opvarme en oxidationskatalysator, der findes som en del af røggasefterbehandlingsindretningen, til sin driftstemperatur, der er nødvendig til den katalytiske oxidation af brændstoffet.

21. Fremgangsmåde ifølge krav 20, kendetegnet ved, at opvarmningsprocessen understøttes af en katalysator, der er indbygget i røggasledningen (4).

22. Fremgangsmåde ifølge et af kravene 17, 18, 20 und 21, kendetegnet ved, at oxidationskatalysatoren er en universalkatalysator, der især indeholder vanadium, og som også er egnet til katalytisk at understøtte den selektive reduktion af NO_x.

23. Fremgangsmåde ifølge krav 19 eller 22, kendetegnet ved, at en delmængde af brændstofmængden oxideres under frigørelse af varme inde i røggasledningen og/eller inden for stedet for sammenføringen med procesrøggassen.

24. Fremgangsmåde ifølge et af kravene 19 til 23, kendetegnet ved, at den oxiderede delmængdes termiske ydelse holdes i det mindste tilnærmet konstant uafhængigt af den totale brændstofmængde.

25. Fremgangsmåde ifølge et af kravene 19 til 24, kendetegnet ved, at efter overskridelse af en grænsemængde fordampes den totale mængde brændstof.

26. Fremgangsmåde ifølge et af kravene 14 til 25, kendetegnet ved, at procesrøggassen ved hjælp af en gasledeanordning (14) indledes i røggasledningen (4) fortrinsvis opstrøms for indbringningsanordningen (5).

27. Fremgangsmåde ifølge et af kravene 14 til 26, kendetegnet ved, at ved påvirkning af gastemperaturen og gassammensætningen på stedet for den sekundære indsprøjtning fremmes ønskede kemiske reaktioner, for eksempel delvis oxidation, binding af radikaler, crackprocesser, termolyse, hydrolyse.

28. Fremgangsmåde ifølge krav 27, kendetegnet ved, at der til understøtning af den ønskede reaktion i røggasledningen indsættes en katalysator.

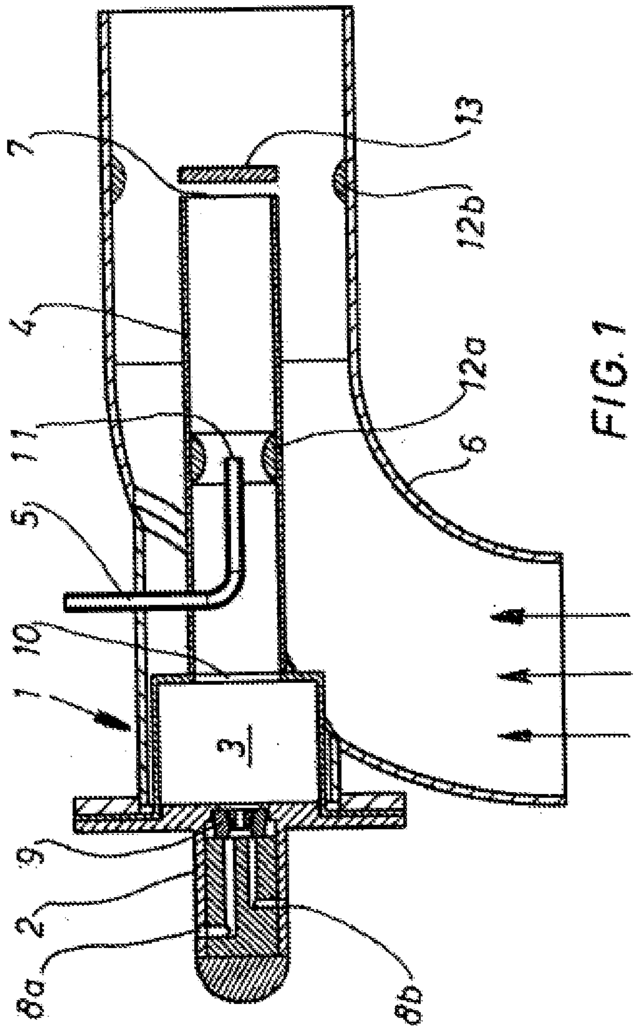

FIG. 1

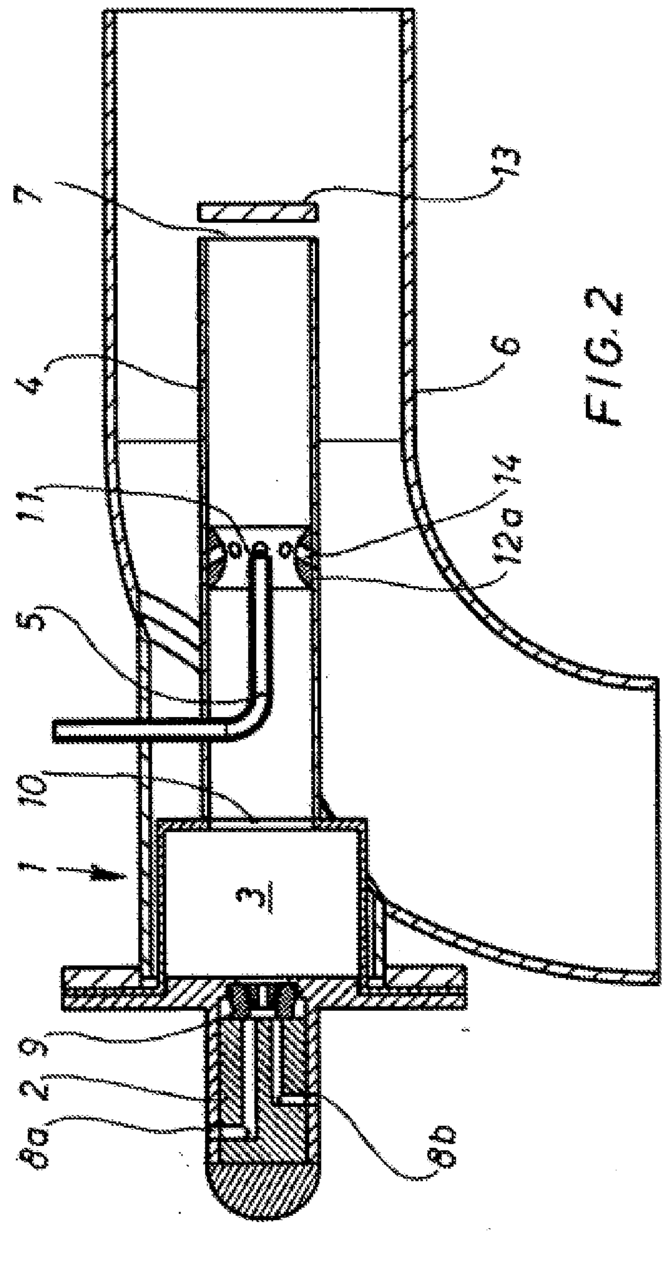

FIG. 2

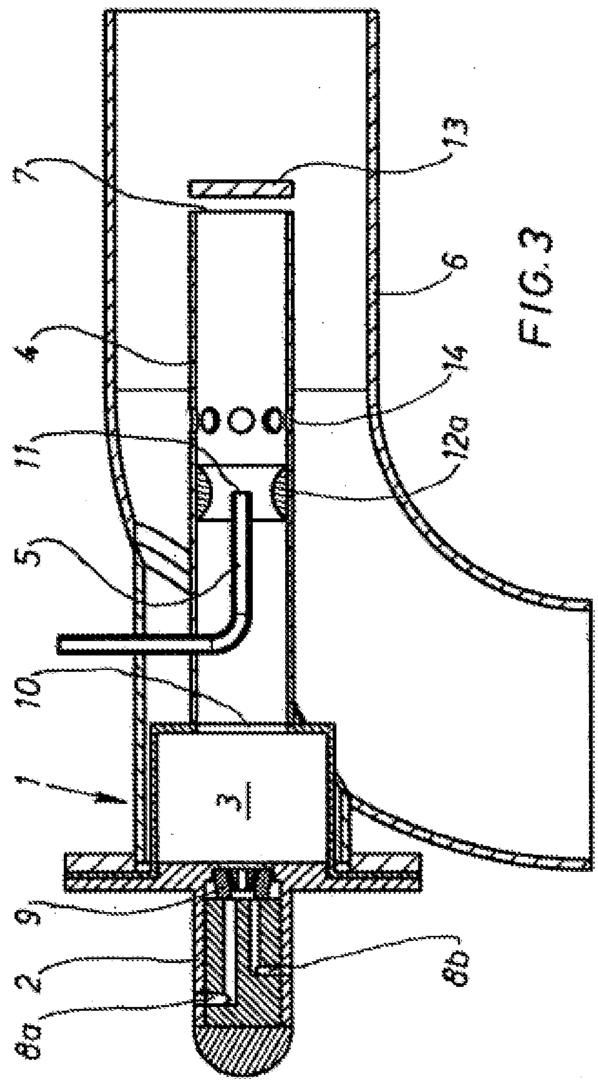

FIG. 3