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(54) **METERING APPARATUS AND METHOD FOR OPERATING IT**

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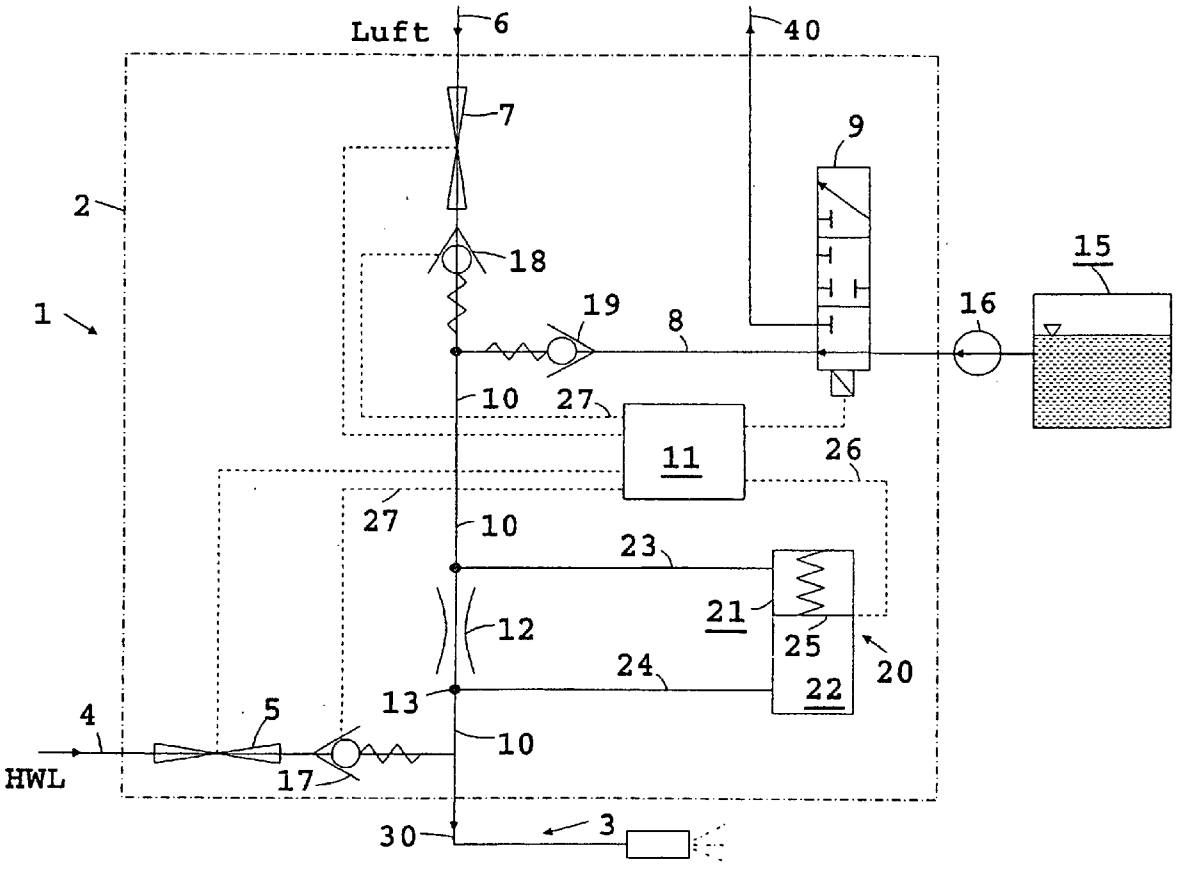
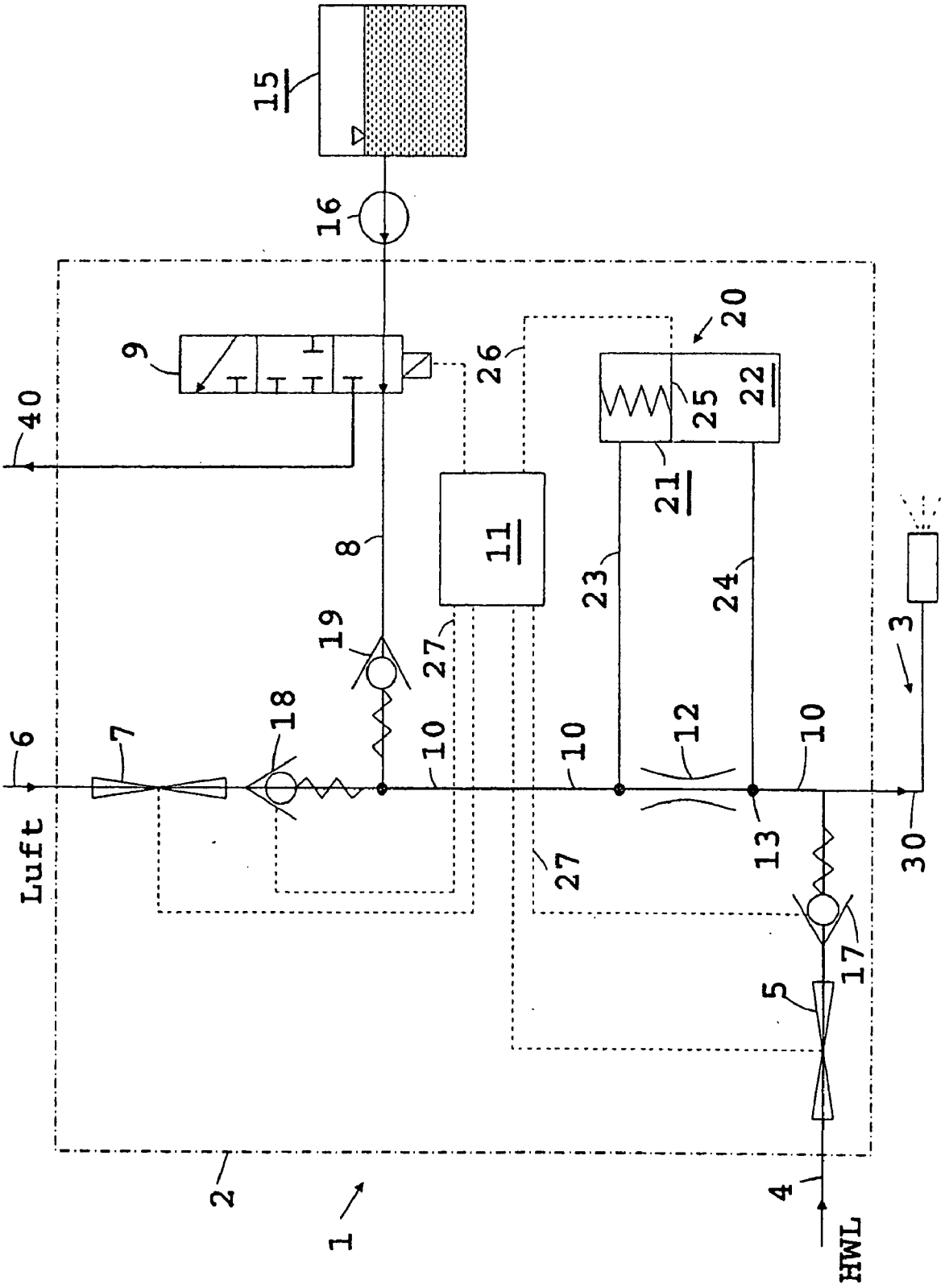
(57) **ABSTRACT**

In a metering apparatus for the metered introduction of a first medium into an exhaust gas system of an internal combustion engine, which includes a conditioning apparatus in which also a second medium is introduced via a dispensing apparatus which is connected to the conditioning apparatus and via which the first medium and the second medium are introduced into the exhaust gas system, a supply unit for supplying a third medium, which is different from the second medium in its physical properties and/or its chemical composition, is connected to the conditioning apparatus for cleaning of the conditioning apparatus and the dispensing apparatus from constituent parts of the first medium by the third medium or a mixture of the second and the third medium.

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METERING APPARATUS AND METHOD FOR OPERATING IT

[0001] This is a continuation-in-part application of pending international patent application PCT/EP2007/001307 filed Feb. 15, 2007 and claiming the priority of German patent application 10 2006 007 658.3 filed Feb. 18, 1996.

BACKGROUND OF THE INVENTION

[0002] The present invention relates to a metering apparatus for the metered dispensing of a first medium into an exhaust gas system of an internal combustion engine, having a conditioning apparatus which can be fed the first medium and a second medium, and having a dispensing apparatus which is connected to the conditioning apparatus and via which the first medium and/or the second medium can be introduced into the exhaust gas system, cleaning of the conditioning apparatus and/or the dispensing apparatus from constituent parts of the first medium being made possible by the second medium. Furthermore, the invention relates to a method for operating a metering apparatus.

[0003] DE 102 23 766 A1 discloses a method, in which a urea solution for exhaust gas aftertreatment is introduced as required via an injection nozzle into an exhaust gas flow of a motor vehicle diesel engine. In order to clean the injection nozzle, a cleaning fluid is passed through the injection nozzle immediately after urea metering.

[0004] DE 101 50 518 C1 discloses a method for treating the exhaust gas of an internal combustion engine, wherein a liquid reducing agent from a supply container is fed via a reducing agent line and a metering valve to a mixing chamber and is mixed there with a gas flow. The mixture is introduced into an exhaust gas line via a mixture line. In order to prevent damage to the apparatus as a result of the reducing agent freezing, the flow of the reducing agent is interrupted after the internal combustion engine is switched off, and only gas is fed to the mixing chamber. The mixing chamber, the mixture line, the metering valve and the reducing agent line are filled with gas via suitable valve switching and are therefore protected against damage if the reducing agent freezes.

[0005] DE 102 54 981 A1 discloses an apparatus for exhaust gas aftertreatment, in which apparatus a reducing agent is stored in a supply container. The reducing agent can be fed to an exhaust gas line via a reducing agent line. A switchable valve element, via which compressed air can be introduced into the reducing agent line, is arranged in the reducing agent line. Here, the switchable valve element makes it possible for compressed air to flow through the reducing agent line, optionally in the direction of the exhaust gas line or in the direction of the supply container. It is possible as a result to remove the reducing agent by blowing it out of the reducing agent line.

[0006] It is an object of the present invention to provide a metering apparatus of the type mentioned in the introduction, wherein however simple and effective cleaning is made possible. It is a further object of the present invention to provide a method for operating a metering apparatus of this type in such a way that a satisfactory cleaning action can be achieved.

SUMMARY OF THE INVENTION

[0007] In a metering apparatus for the metered introduction of a first medium into an exhaust gas system of an internal combustion engine, which includes a conditioning apparatus in which also a second medium is introduced via a dispensing apparatus which is connected to the conditioning apparatus and via which the first medium and the second medium are introduced into the exhaust gas system, a supply unit for supplying a third medium, which is different from the second medium in its physical properties and/or its chemical composition, is connected to the conditioning apparatus for cleaning of the conditioning apparatus and the dispensing apparatus from constituent parts of the first medium by the third medium or a mixture of the second and the third medium.

[0008] Herein, the first medium preferably serves as working medium, by way of which a desired physical and/or chemical effect can be achieved in the exhaust gas flow, for example temperature control of the exhaust gas flow, a direct chemical reaction with components of the exhaust gas or a catalytic action for exhaust gas aftertreatment. The second medium and the third medium are two different media for effectively cleaning the conditioning apparatus and/or the dispensing apparatus at least from constituent parts of the first medium. Here, the apparatus can be cleaned with the aid of the second medium, the third medium or any desired combination of the first, second and/or third medium. Furthermore, a mixture formation comprising the first medium and one of the other media can be provided in the conditioning device. The metering apparatus according to the invention makes it possible, in particular, to use in each case a particular medium or a mixture for cleaning the conditioning apparatus and/or the dispensing apparatus by which the best possible cleaning effect can be achieved under the given operating conditions.

[0009] In one particular embodiment, a gas, in particular air, is provided as second medium and a solvent, in which at least constituent parts of the first medium can be dissolved, is provided as third medium. Two media are therefore provided for cleaning the conditioning apparatus and/or the dispensing apparatus, the cleaning action of which is based in each case on different working mechanisms. The feed of a gas makes it possible, in particular, to remove the first medium in a simple way by blowing it out of the apparatus.

[0010] Any possible residues of the first medium which cannot be removed by blowing out, for example deposits or crystallizations, can be dissolved and rinsed out by a feed of the solvent. The first medium can also be provided as solvent.

[0011] In a further refinement of the invention, a metering element is arranged in a line of the conditioning apparatus, and the feed of the third medium is provided upstream of the metering element. A flow variable of the medium or mixture which flows through the line can be influenced with the aid of the metering element, for example a throughput or a flow speed. The metering element can be configured, in particular, as a valve, diaphragm valve, nozzle, diffuser or venturi nozzle. Metering elements are particularly susceptible to contamination by the first medium. A flow as required of the third medium through the metering element makes it possible to effectively remove contamination, in particular in the form of deposits and crystallizations.

[0012] In a further refinement of the invention, a sensor apparatus for a measured variable is arranged in a line of the conditioning apparatus, and a feed of the third medium is activated if the measured variable deviates from a reference value or a threshold value is reached. Variables which allow deductions to be made about a degree of contamination of the metering apparatus, for example a throughput or a pressure difference, are preferably provided as measured variables.

Corresponding values for the measured variable at identical operating conditions and with an undisrupted throughflow preferably serve as reference values. The reference values are preferably defined as a function of the operating point of the internal combustion engine or the metering apparatus. It is possible in this way to feed the third medium as required if an operating state of the internal combustion engine or the metering apparatus deviates from a reference state.

[0013] The method according to the invention for operating a metering apparatus having a conditioning apparatus and a dispensing apparatus is distinguished by the fact that the conditioning apparatus is fed a third medium from time to time. Different media or mixtures are therefore available for cleaning the conditioning apparatus and/or the dispensing apparatus from constituent parts of the first medium.

[0014] In one refinement of the invention, the third medium is fed into the system upstream of a metering element which is arranged in a line of the conditioning apparatus. It is possible in this way to clean the metering element if required with the aid of the third medium.

[0015] In a further refinement of the invention, a measured variable is monitored in a line of the conditioning apparatus and/or the dispensing apparatus and the feed of the third medium is performed in the event of a change with respect to a reference value by a predefinable amount or if a predefined threshold value is reached. Disruptions which are caused, in particular, by contamination can be determined by monitoring a measured variable and comparing it with a reference value, so that the third medium can be used as required.

[0016] In a further refinement of the invention, the second medium and the third medium are introduced alternately within a predefinable time period. This refinement of the method is suitable, in particular, for preventative cleaning of the conditioning apparatus and/or the dispensing apparatus, before contamination is formed in a significant amount. Preventative cleaning of this type can take place, for example, under low load conditions or after the internal combustion engine is switched off. An optimum cleaning effect can be achieved by the alternate introduction of the second medium and the third medium.

[0017] In a further refinement of the invention, a feed of the first medium is reduced during the feed of the second medium and/or the third medium. In particular, the feed of the first medium is suppressed completely here. Contamination by the first medium can be removed particularly effectively in the case of a reduced feed of the first medium.

[0018] The invention will become more readily apparent from the following description of an exemplary embodiment thereof on the basis of the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

[0019] The sole FIGURE shows a block circuit diagram illustration of one advantageous embodiment of the metering apparatus according to the invention.

DESCRIPTION OF A PARTICULAR EMBODIMENT

[0020] A metering apparatus **1** which is shown in the FIGURE serves to dispense a urea/water solution HWL into an exhaust gas system (not shown in greater detail) of an internal combustion engine. Here, the urea/water solution is preferably introduced upstream of what is known as an SCR catalytic converter for reducing nitrogen oxide. However, the metering apparatus **1** is not restricted to this application, but rather can be used to dispense any other desired liquid or gaseous media into an exhaust gas system.

[0021] The metering apparatus **1** is part of a conditioning apparatus **2** which comprises a first feed line **4** for a first medium, a second feed line **6** for a second medium and a third feed line **8** for a third medium. Here, the urea/water solution HWL is provided as first medium, air is provided as second medium and a solvent, in which, in particular, urea or urea compounds are soluble, is provided as third medium.

[0022] The urea/water solution HWL is preferably stored in a supply container which is not shown in the FIGURE. With the aid of a feed unit, the urea/water solution HWL can be removed from the supply container and fed to the conditioning apparatus **2** via the first feed line **4**. Here, the urea/water solution HWL is preferably introduced under pressure. At its outlet-side end, the first feed line **4** is connected to a central line **10** as will be explained in the following text. A first metering element **5**, via which a throughput of the urea/water solution HWL can be set, is arranged in the first feed line **4**. Here, the first metering element **5** also advantageously makes it possible to shut off the first feed line **4**. Furthermore, a spring-loaded first nonreturn valve **17** is arranged in the first feed line **4**, which first nonreturn valve **17** reduces the risk of media flowing back from the central line **10** into the first feed line **4**. In a modified exemplary embodiment, the first nonreturn valve **17** in the first feed line **4** can also be omitted. This refinement makes it possible to introduce one of the media air or solvent which are to be explained in further detail in the following text or a combination of said media into the first feed line **4** from the central line in a targeted manner if required. It is possible as a result to clean line sections of the first feed line **4** between the supply container of the urea/water solution HWL and the central line **10** from constituent parts of the urea/water solution HWL.

[0023] Air can be sucked in from the surroundings and fed to the conditioning apparatus **2**, preferably under pressure, via an intake apparatus which is not shown in the FIGURE. The second feed line **6** is connected to the intake apparatus, it being possible for an air filter to be provided on the inlet side to clean the surrounding air from any possible contamination. The second feed line **6** is connected at its outlet-side end to the central line **10**. A second metering element **7**, by way of which an air throughput can be set, is arranged in the second feed line **6**. Here, the second metering element **7** also preferably makes it possible to shut off the second feed line **6**. In an analogous manner to the first feed line **4**, a spring-loaded second nonreturn valve **18** is arranged in the second feed line **6**, which second nonreturn valve **18** reduces the risk of media flowing back from the central line **10** into the second feed line **6**. In a modified exemplary embodiment, a compressed air store, in which the air which is to be fed to the conditioning apparatus **2** is stored, is provided instead of the intake apparatus. This refinement is distinguished by the fact that air which has already been conditioned, in particular cleaned, can be fed to the conditioning apparatus **2**.

[0024] The solvent is preferably stored in a solvent supply container **15**. Water (optionally mixed with surfactants) or a water/alcohol mixture can be provided, for example, as solvent. The solvent can be removed from the solvent supply container **15** with the aid of a feed unit in the form of a pump **16** and can be fed to the conditioning apparatus **2** via the third feed line **8**. Here, the solvent is preferably fed under pressure. The third feed line **8** is connected at its outlet-side end to the

central line **10**. A third metering element **9**, via which a solvent throughput can be set, is arranged in the third feed line **8**. Here, the third metering element **9** can also preferably shut off the third feed line **8**. Furthermore, a spring-loaded third nonreturn valve **19** is arranged in the third feed line **8**, which third nonreturn valve **19** reduces the risk of media flowing back from the central line **10** into the third feed line **8**.

[0025] The first feed line **4**, the second feed line **6** and the third feed line **8** are connected via a central line **10** to a dispensing apparatus **3** as will be explained in the following text. A fourth metering element in the form of a venturi nozzle **12** is arranged in the central line **10** upstream of a connecting point **13** of the first feed line **4**. When a medium, in particular air, flows through it, the venturi nozzle **12** brings about an increase in the flow speed at its narrowest cross section. The venturi nozzle **12** ensures that line parts upstream of the venturi nozzle **12** remain largely free of constituent parts of the urea/water solution HWL when the urea/water solution HWL is introduced into the central line **10**, through which air flows.

[0026] A sensor apparatus in the form of a pressure sensor **20** is arranged next to the venturi nozzle **12**. A pressure difference between the inlet-side end and the outlet-side end of the venturi nozzle **12** can be measured with the aid of the pressure sensor **20**. A pressure difference across the venturi nozzle **12** which is increased in comparison with a reference value can indicate contamination or blockage of the nozzle. The pressure sensor **20** is configured as a cylinder having a first chamber **21** and a second chamber **22** (cf. FIGURE). Here, the first chamber **21** is connected via a first connecting pipe **23** to the central line **10** upstream of the venturi nozzle **12**. The second chamber **22** is connected via a second connecting pipe **24** to the central line **10** downstream of the venturi nozzle **12**. The static pressure in the central line **10** upstream of the venturi nozzle **12** therefore prevails in the first chamber **21** and the static pressure in the central line **10** downstream of the venturi nozzle **12** prevails in the second chamber **22**. The first chamber **21** and the second chamber **22** are separated from one another by a spring-loaded plunger **25** or a diaphragm, with the result that a pressure difference between the two chambers brings about a deflection of the plunger **25** or the diaphragm. The deflection can be converted via a signal transmitter (not shown in greater detail) into a preferably electric signal which can be transferred as an input variable via a control line **26** to a control unit **11** which is explained in the following text. In a modified exemplary embodiment, a further sensor apparatus for monitoring a further measured variable is provided instead of the pressure sensor **20** or in addition to it. The further sensor apparatus can be arranged in any desired feed line or in the central line of the conditioning apparatus. Variables are preferably monitored, with the aid of which contamination or blockage of the metering apparatus **1** can be determined; for example, a throughflow is detected continuously.

[0027] A dispensing apparatus **3** which is connected to the metering apparatus **1** comprises a dispensing line **30** and an injection nozzle **31**. The media which are prepared in the conditioning apparatus **2** can be transported to the injection nozzle **31** via the dispensing line **30**. The injection nozzle **31** is arranged within an exhaust gas line (not shown in greater detail) and makes it possible to dispense the prepared medium into an exhaust gas flow of the internal combustion engine.

[0028] The first metering element **5**, the second metering element **7** and the third metering element **9** can be actuated via a control unit **11**. The signal from the pressure sensor **20** and further characteristic values from an engine control unit are preferably provided as input variables in the control unit **11**, for example operating duration, load state or temperature of the internal combustion engine. A feed of the urea/water solution HWL, the air and the solvent to the conditioning apparatus **2** can be set with the aid of the control unit **11** as a function of an operating state of the internal combustion engine, the exhaust gas system and/or the metering apparatus.

[0029] Under normal operating conditions, a urea/water solution HWL is preferably introduced as an aerosol-like mixture into the exhaust gas system of the internal combustion engine. In order to produce a mixture of this type, the first metering valve **5** and the second metering valve **7** are opened, with the result that urea/water solution HWL and air are fed continuously to the conditioning apparatus **2**. The urea/water solution HWL is introduced into the air flow at the opening point **13** of the first feed line **4** into the central line **10**, a finely distributed aerosol of air and urea/water solution HWL being produced. It is ensured with the aid of the venturi nozzle **12** that the central line **10** upstream of the venturi nozzle **12** remains largely free of constituent parts of the urea/water solution HWL. Furthermore, the turbulences which are caused by the venturi nozzle **12** bring about finer atomization of the urea/water solution HWL which is introduced downstream. The aerosol is guided further in the dispensing line **30** to the injection nozzle **31** and is injected into the exhaust gas system there.

[0030] When metering the urea/water solution HWL, there is the risk of urea crystallizing out and the associated formation of deposits on the walls of the lines, through which flow passes. Urea deposits lead to a reduction in the cross section, through which flow passes, and therefore to an increased flow resistance. Here, the venturi nozzle **12** is particularly at risk because of the eddies which occur here and the low static pressure in the flow. In the extreme case, the venturi nozzle **12** can be blocked completely by urea deposits, with the result that the air flow in the central line **10** comes to a standstill.

[0031] In one preferred method for operating the metering apparatus **1**, the conditioning apparatus **2** is therefore fed a solvent as required, in which urea can be dissolved. To this end, in a first method step, the pressure difference in the central line **10** between the inlet-side end and the outlet-side end of the venturi nozzle **12** is monitored continuously with the aid of the pressure sensor **20**. The measured values are transmitted via the control line **26** to the control unit **11**, where they are compared with a reference value which is optionally a function of the operating state. Reference values for the pressure difference can be stored in the control unit **11**, for example, in the form of characteristic diagrams. A deviation of the measured values from the reference value by more than a predefined amount indicates contamination of the venturi nozzle **12** by urea deposits. In this case, the feed of the urea/water solution HWL and the air via the first metering element **5** and the second metering element **7** is interrupted in a following method step, and the third metering element **9** is opened. The urea deposits are dissolved in the solvent and rinsed out with the solvent flow. In a further, following method step, the feed of the solvent is preferably interrupted again after a predefined time duration, and the feed of the urea/water solution HWL and the air is activated. If an increased pressure difference across the venturi nozzle **12** is still determined via the pressure sensor **20**, the method can be repeated.

[0032] In a modified operating method, the second nonreturn valve **18** is used as a sensor apparatus, in order to monitor a throughflow of air through the second feed line **6**. Urea deposits in the second feed line **6** or in the central line **10** bring about an increased flow resistance and therefore a reduced throughflow of air. A deflection of a valve body of the spring-loaded second nonreturn valve **18** therefore also changes. The deflection of the valve body is converted via a signal transmitted (not shown in greater detail) into a preferably electric signal which is transmitted via a further control line **27** to the control unit **11**. In the control unit **11**, the signal is compared with a reference value under normal operating conditions. The feed of the solvent is activated in the event of a deviation by more than a predefined amount or if a predefined threshold value is reached.

[0033] In an operating method which has been modified further, the first nonreturn valve **17** can also be used as a sensor apparatus in an analogous manner, in order to monitor the throughflow of the urea/water solution HWL through the first feed line **4**.

[0034] In a further, modified operating method, the first feed line **4** is also cleaned from constituent parts of the urea/water solution HWL with the aid of the air, the solvent or a combination of said two media. This operating method is suitable, in particular, for metering apparatuses, in which a return flow of media from the central line **10** into the first feed line **4** is made possible. In one method step, the feed of the urea/water solution HWL is interrupted, for example by a feed unit being deenergized. In a following method step, the first metering element **5** is opened, in order to cause pressure equalization between the first feed line **4** and the central line **10**. Subsequently, in a following method step, the third metering element **9** is opened, in order to feed solvent to the central line **10**. The solvent is introduced from the central line **10** into the first feed line **4** and, as a result, the first feed line **4** is cleaned from constituent parts of the urea/water solution HWL. After cleaning of the first feed line **4** with the aid of the solvent, the feed of the solvent via the third metering element **9** is interrupted again. Optionally, the second metering element can subsequently be opened and air can be introduced into the central line and, following this, into the first feed line **4**. This method makes it possible, in particular, to clean the first feed line **4** after the internal combustion engine is switched off and optionally to fill it with air, as a result of which, for example, freezing of the urea/water solution HWL in the first feed line **4** at low temperatures is prevented.

[0035] In a further, modified operating method, the solvent is fed as a function of an operating state of the internal combustion engine, for example, after the internal combustion engine is switched off or in a relatively long low load phase. To this end, in a first method step, the feed of the urea/water solution HWL via the first metering element **5** is interrupted. In a following method step, the second metering element **7** is opened and air is introduced into the conditioning apparatus **2**. As a result of the feed of air, the urea/water solution HWL is blown out of the central line **10** and the dispensing line **31**. After a fixed time interval of, for example, thirty seconds, the air feed via the second metering element **7** is interrupted. In a further method step, the third metering element **9** is opened and the solvent is introduced into the conditioning apparatus **2**. Urea deposits which can have formed within the line parts, through which the aerosol flows during normal operation, are released by the solvent and rinsed out of the metering apparatus **1**. After a further time interval of, for example, fifteen seconds, the feed of the solvent via the third metering element **9** is interrupted. For an optimum cleaning action, the described method steps are advantageously repeated multiple times. This method can particularly advantageously be used in a preventative manner, before relatively large urea deposits have formed in the lines.

[0036] If the metering apparatus **1** according to the invention is used in an internal combustion engine of a motor vehicle, a cleaning agent from a window washing system or a headlight washing system can also be used as solvent. To this end, it is advantageous to configure the third metering element **9** as a 3/3-way valve **9**, as shown in the FIGURE. In a first working position of the 3/3-way valve, the solvent can be transported from the solvent supply container **15** via the third feed line **8** to the central line **10**. In a second working position, a feed of the solvent to the conditioning apparatus is suppressed. In a third working position, the solvent can be introduced from the solvent supply container **15** into a cleaning line **40** which in turn is connected to a window washing system or headlight washing system (not shown in greater detail). Via corresponding actuation of the 3/3-way valve by the control unit **11**, the cleaning agent can be fed to the window washing system and/or the metering apparatus as required. Without departing from the scope of the invention, further working positions of the third metering element **9** can also be provided, in which, for example, the solvent can be introduced simultaneously into the cleaning line **40** and into the third feed line **8**. Likewise, intermediate positions can also be provided between the described working positions. Furthermore, a further working position can be provided, in which the third feed line **8** is connected to an outlet line (not shown in the FIGURE) to the surroundings. In particular, this working position makes pressure dissipation possible of an excess pressure which possibly prevails in the third feed line **8**.

[0037] In the described exemplary embodiment, the medium which is to be metered is prepared in the conditioning apparatus **2** to form an aerosol and is fed to the exhaust gas system via the dispensing apparatus **3**. However, it is likewise conceivable to feed the medium which is to be metered to the exhaust gas system in pure form, that is to say without mixing it with a further medium in the conditioning apparatus. A mixture formation comprising the second and third media can likewise be provided in the conditioning apparatus **2**.

What is claimed is:

1. A metering apparatus for the metered dispensing of a first medium into an exhaust gas system of an internal combustion engine, comprising

a conditioning apparatus (**2**) to which a first medium (HWL) and a second medium can be supplied,

a dispensing apparatus (**3**) which is connected to the conditioning apparatus (**2**) and via which at least one of the first medium (HWL) and the second medium can be introduced into the exhaust gas system for cleaning at least one of the conditioning apparatus (**2**) and the dispensing apparatus (**3**) from constituent parts of the first medium (HWL) by the second medium, and

means for supplying a third medium to the conditioning apparatus (**2**) for cleaning of the conditioning apparatus (**2**) and the dispensing apparatus (**3**) from constituent parts of the first medium by the third medium or mixtures of the second and the third medium

the third medium differing from the second medium in its physical properties or its chemical composition.

2. The metering apparatus as claimed in claim 1, wherein the second medium is a gas and the third medium is a solvent, in which at least constituent parts of the first medium (HWL) can be dissolved.

3. The metering apparatus as claimed in claim 1, wherein a metering element (12) is arranged in a main line (10) of the conditioning apparatus (2), and the feed of the third medium is provided upstream of the metering element (12).

4. The metering apparatus as claimed in claim 3, wherein a sensor apparatus (20) for sensing a measured variable is arranged in the main line (10) of the conditioning apparatus (2), and a feeder unit of the third medium is activated if the measured variable deviates from a reference value or when a threshold value is reached.

5. A method for operating a metering apparatus for the metered dispensing of a first medium into an exhaust gas system of an internal combustion engine, comprising

a conditioning apparatus (2) to which a first medium (HWL) and a second medium can be supplied,

a dispensing apparatus (3) which is connected to the conditioning apparatus (2) and via which at least one of the first medium (HWL) and the second medium can be introduced into the exhaust gas system for cleaning at least one of the conditioning apparatus (2) and the dispensing apparatus (3) from constituent parts of the first medium (HWL) by the second medium, and

means for supplying a third medium to the conditioning apparatus (2) for cleaning of the conditioning apparatus (2) and the dispensing apparatus (3) from constituent parts of the first medium by the third medium or mixtures of the second and the third medium

the third medium differing from the second medium in its physical properties or its chemical composition.

said method comprising the step of feeding the third medium to the conditioning apparatus (2) intermittently from time to time.

6. The method as claimed in claim 5, wherein a feed of the third medium is introduced into the conditioning apparatus (2) upstream of a metering element (12) which is arranged in a main line (10) of the conditioning apparatus (2).

7. The method as claimed in claim 6, wherein a measured variable is monitored in the main line (10) of the conditioning apparatus (2) or the dispensing apparatus (3) and the third medium is introduced in the event of at least one of a change with respect to a reference value by a predefinable amount and the reaching of a predefined threshold value.

8. The method as claimed in claim 5, wherein the second medium and the third medium are alternately introduce within a predetermined time period.

9. The method as claimed in claim 5, wherein a feed of the first medium (HWL) is reduced when at least one of the second medium and the third medium is supplied to the metering apparatus.

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