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(54) **VACUUM SEWER SYSTEM**

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**Related U.S. Patent Documents**

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***E03D 11/00*** (2006.01)

(52) **U.S. Cl.**
CPC ..... ***E03D 11/00*** (2013.01)

(58) **Field of Classification Search**
CPC ..... E03F 1/006
USPC ..... 4/431, 434, 321
See application file for complete search history.

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(57) **ABSTRACT**

Disclosed is a sewer system including a sewage receptacle, sewer piping connected to the sewage receptacle by means of a discharge valve, a mechanism for generating vacuum in the sewer piping, and a control mechanism for controlling the discharge valve. In order to achieve a more rapid closing of the discharge valve after discharge of the sewage from the sewage receptacle, the vacuum sewer system further comprises an aeration device in direct fluid communication with the discharge valve. The control mechanism is arranged to control the aeration device. Also disclosed is a discharge valve (**2**) for such a vacuum sewer system.

**18 Claims, 5 Drawing Sheets**

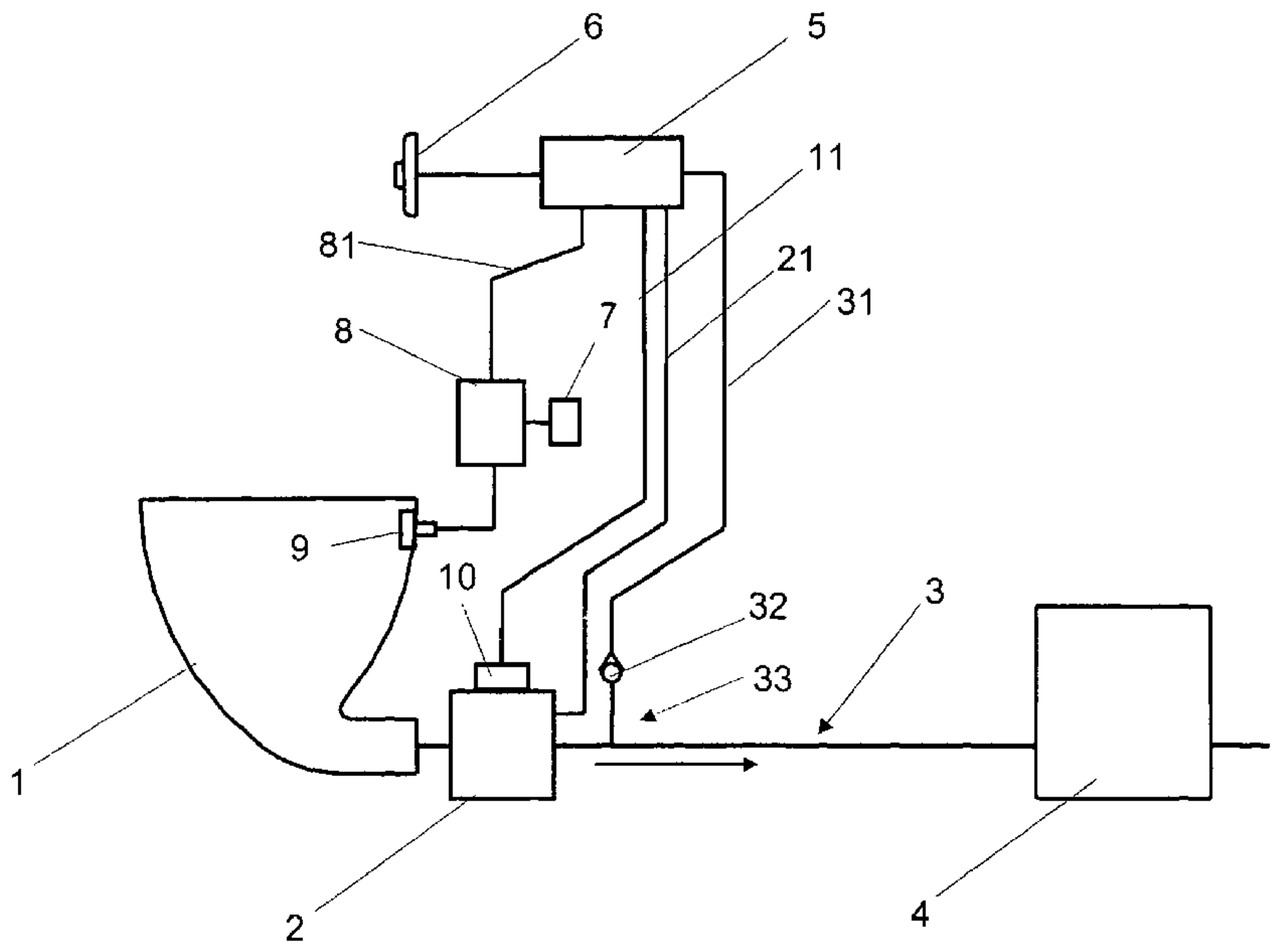

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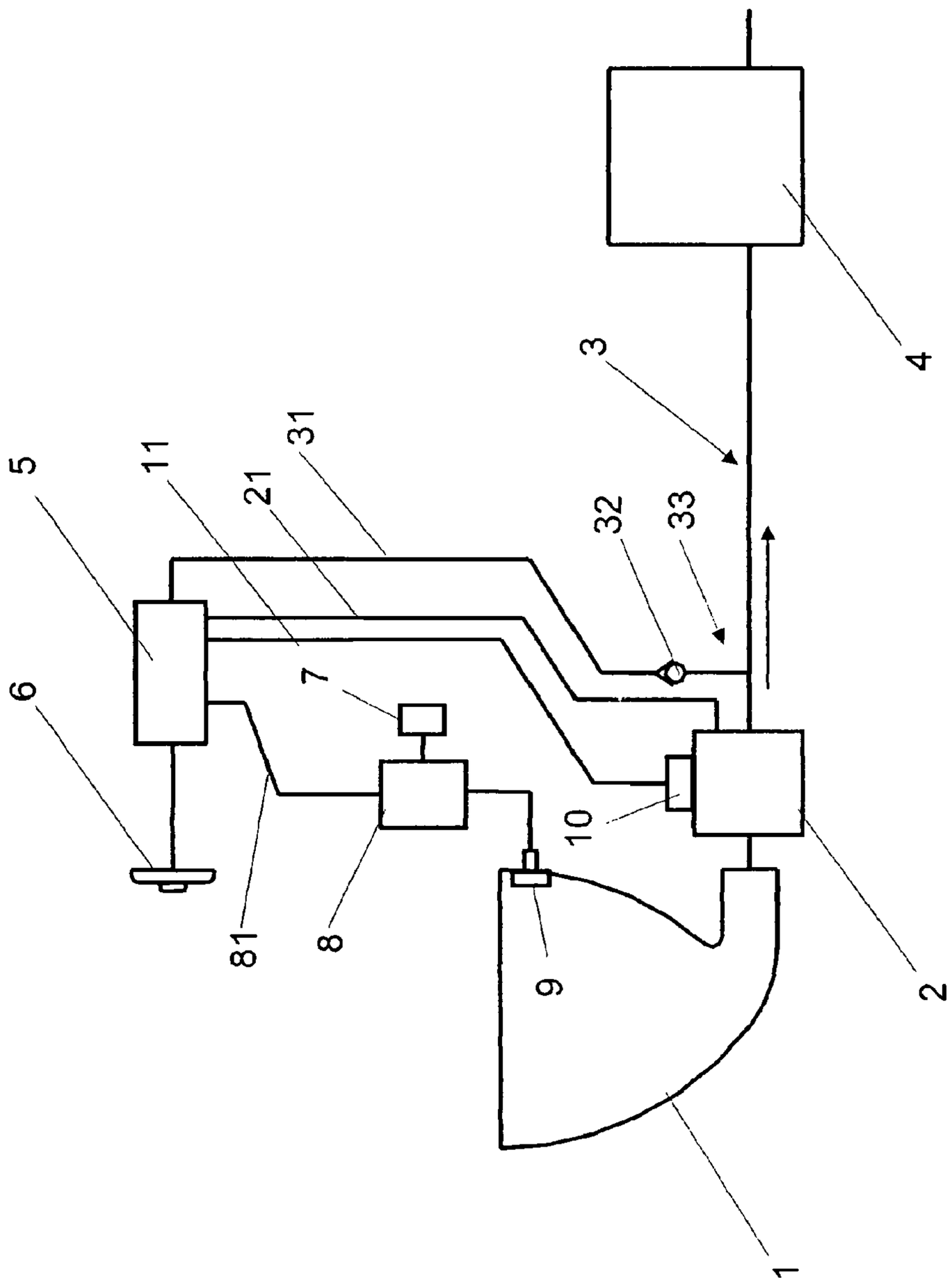
Fig. 1



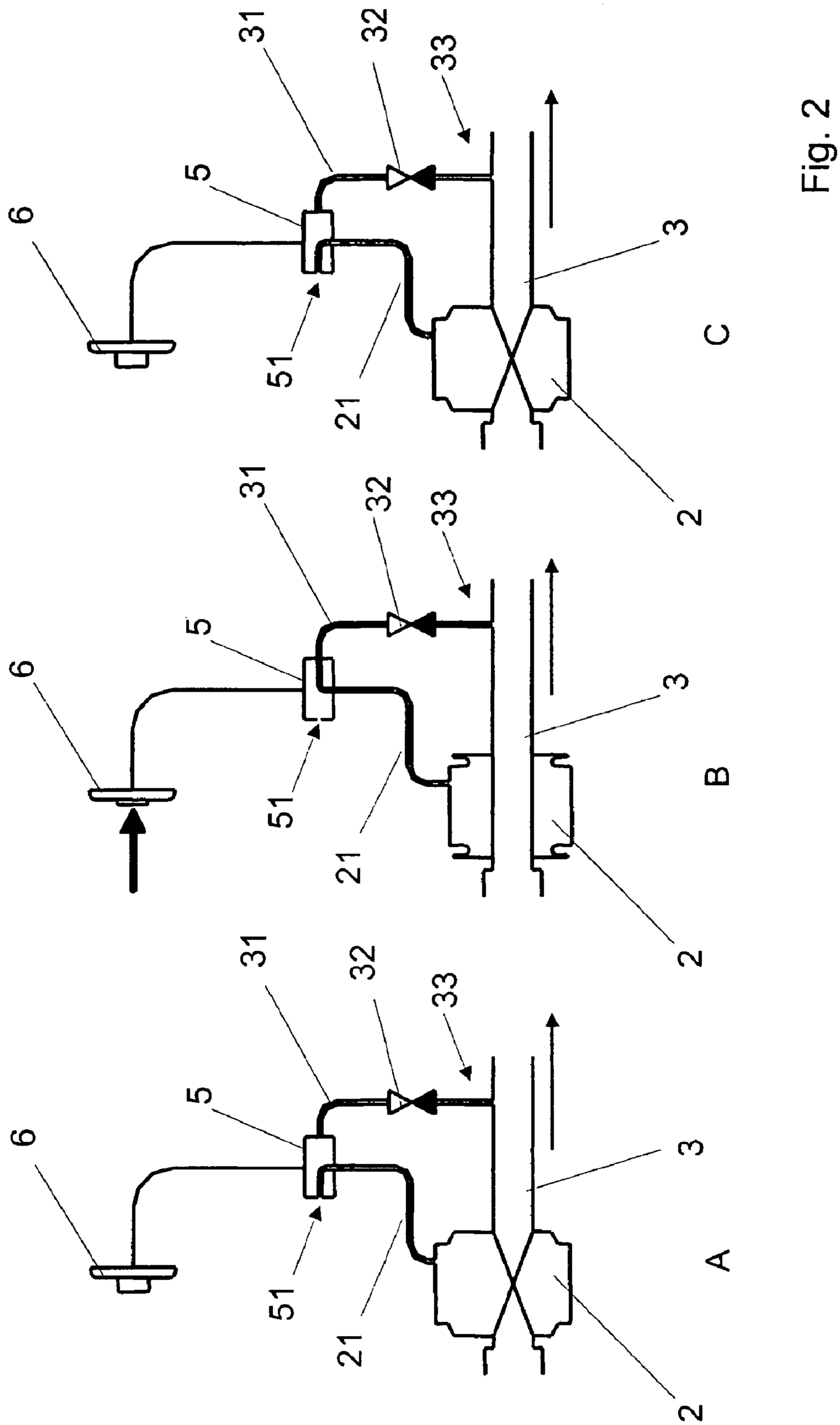



Fig. 2

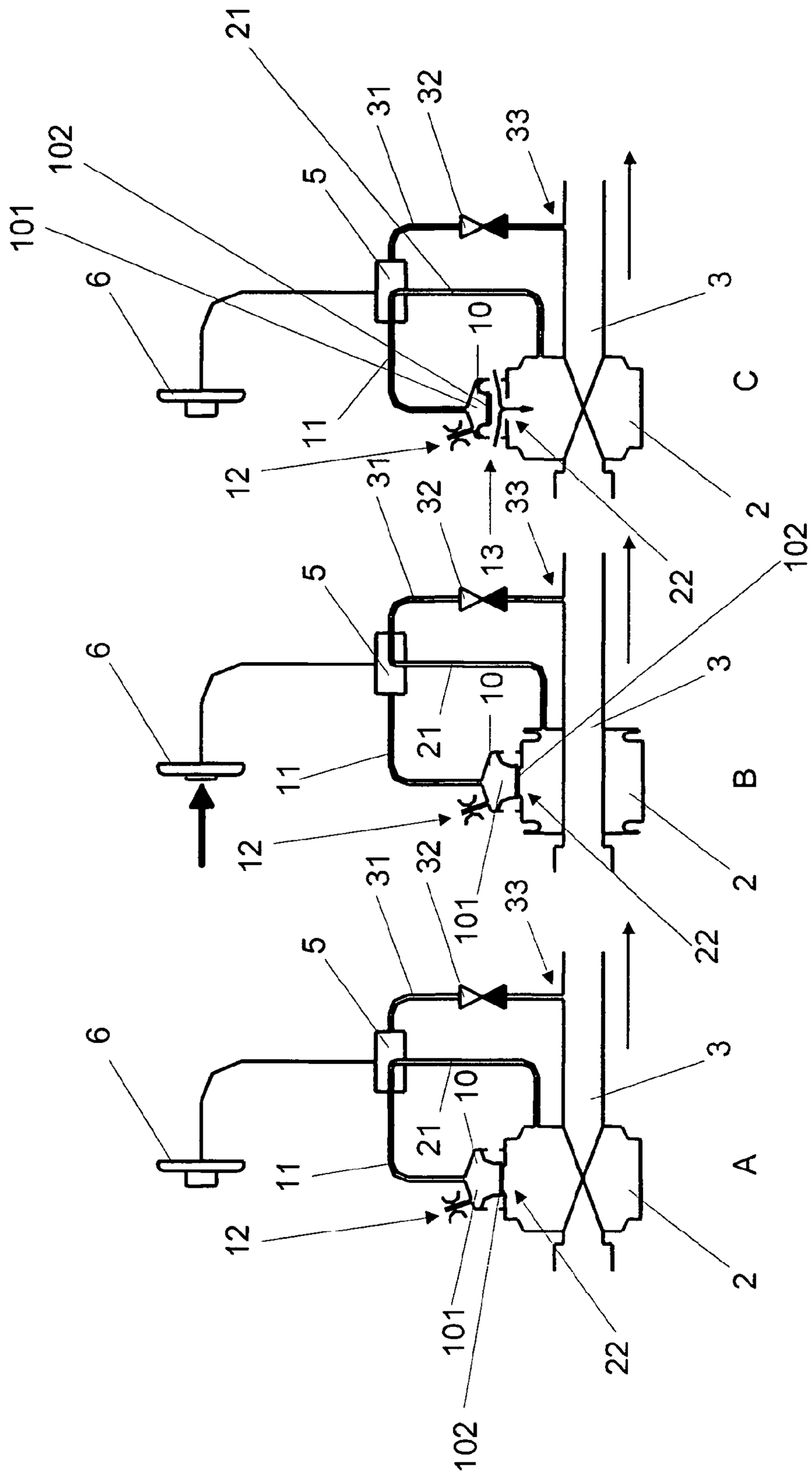



Fig. 3

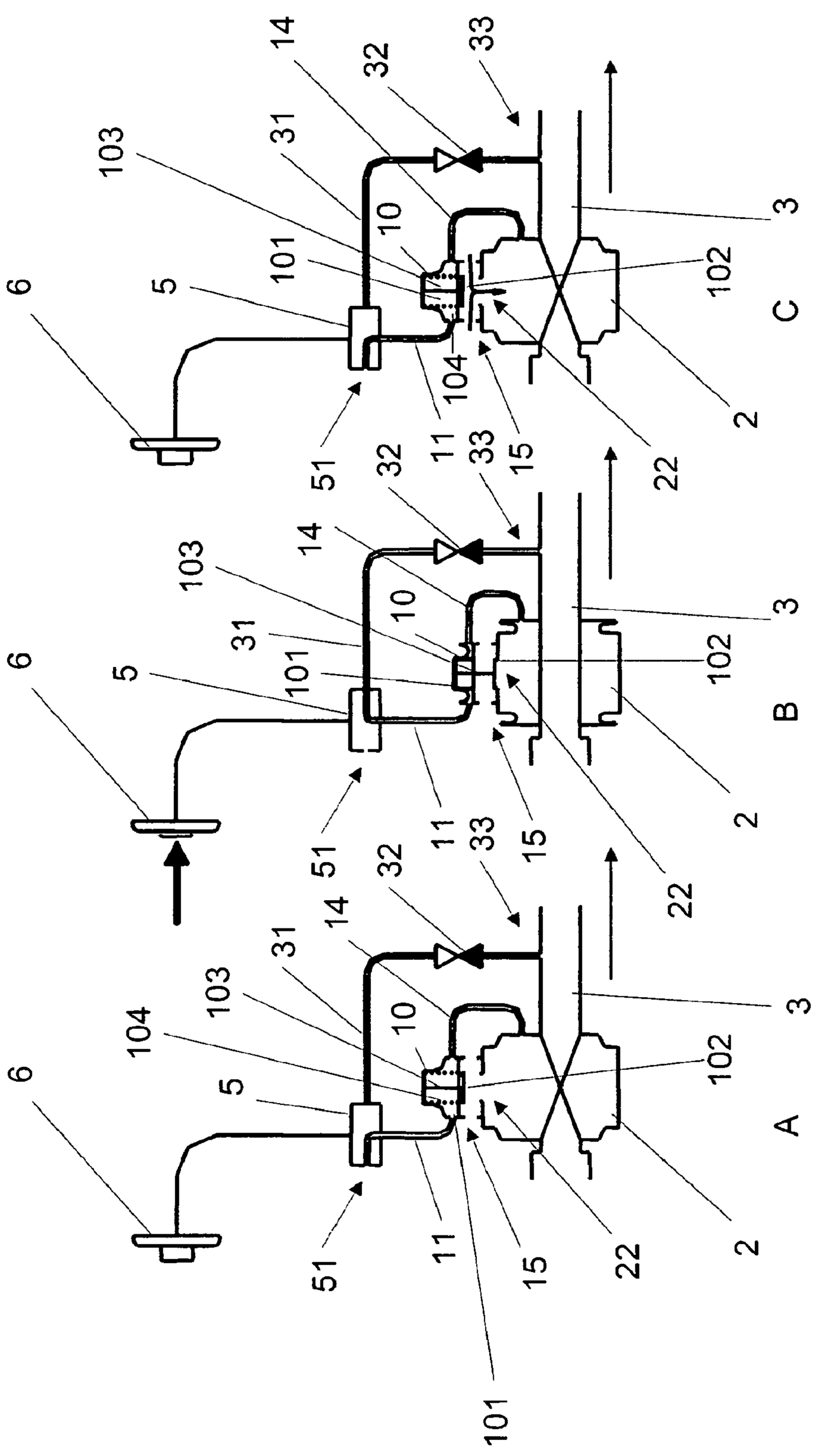



Fig. 4

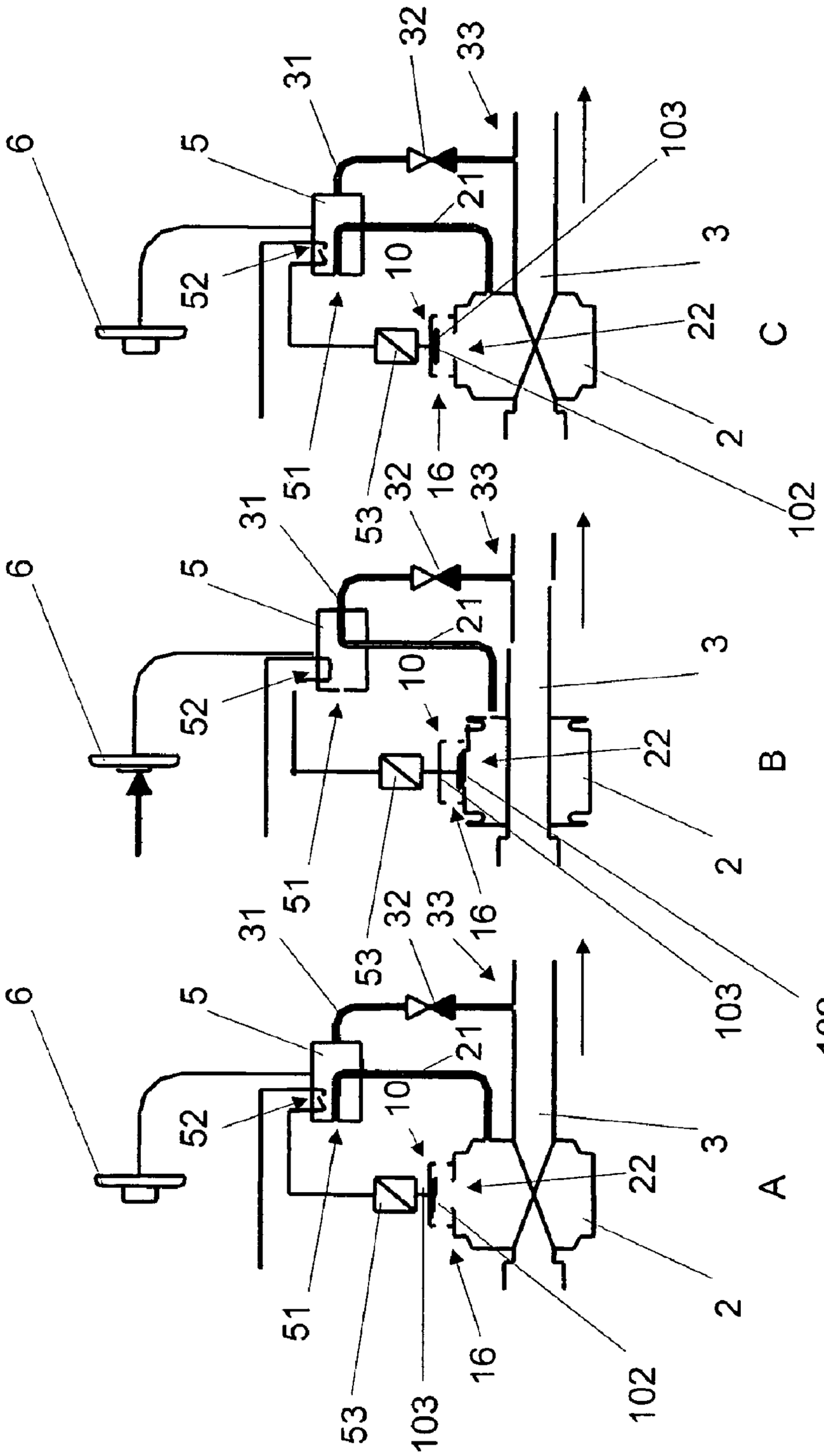



Fig. 5

# VACUUM SEWER SYSTEM

**Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue; a claim printed with strikethrough indicates that the claim was canceled, disclaimed, or held invalid by a prior post-patent action or proceeding.**

## CROSS-REFERENCE TO RELATED APPLICATION

This application claims priority to Finnish Patent Application No. 20065209 filed on Mar. 31, 2006, the contents of which are incorporated herein by reference.

## BACKGROUND OF THE INVENTION

The present invention relates to a vacuum sewer system comprising a sewage receptacle, sewer piping connected to the sewage receptacle by means of a discharge valve, a vacuum generating means for generating vacuum in the sewer piping, and a control mechanism for controlling the discharge valve, according to the preamble of claim **1**. The present invention also relates to a discharge valve for such a vacuum sewer system according to the preamble of claim **11**.

In the context of the present invention the sewage receptacle may be e.g. a toilet unit or toilet bowl, urinal, sink, wash basin, shower, etc. The sewage may be black water originating from e.g. a toilet unit or a urinal, or grey water originating from e.g. a sink, wash basin, shower, etc. A rinse water arrangement may be deployed depending upon the source of sewage.

In vacuum sewer systems, where the function of the sewage receptacle, and particularly the discharge valve, is pneumatically governed, i.e. by air/vacuum, the source of vacuum normally is the sewer piping. Vacuum for the control mechanism is often taken at a point of the sewer piping adjacent the discharge valve in the flow direction of the sewage. When the discharge valve is opened, the vacuum level is lowered due to atmospheric air entering the sewer piping.

The control mechanism functions like a three-way valve, whereby the closing of the discharge valve takes place by aeration of the same by way of the control mechanism. Consequently, the closing speed is dependent on the flow resistance of the aeration conduit.

Previously known vacuum governed discharge valves have a distinctively high noise level as the air-flow through the discharge valve is strongly choked or throttled when the discharge valve is closed.

Examples of previous attempts to lower the noise level may be found in U.S. Pat. No. 6,128,789, in which the discharge valve is closed more rapidly, EP 0 436 357 and EP 0 778 432, in which supplementary air is introduced into the sewer piping. These solutions are rather complex and provide a very limited result.

## DETAILED DESCRIPTION OF THE INVENTION

An object of the present invention is to achieve a vacuum sewer system in which the noise level during a discharge or flushing sequence is lowered. A further object of the present invention is to provide a discharge valve, which improves the operation of the vacuum sewer system. These objects are attained by a vacuum sewer system according to claim **1** and a discharge valve according to claim **11**.



The basic idea of the invention is to provide the vacuum sewer system with an aeration means, a so-called rapid vent valve that provides for an effective and rapid closing of the discharge valve after discharge of the sewage from the sewage receptacle, which also results in a lower noise level. The effective and rapid closing of the discharge valve is achieved by a direct supply of supplementary air to the discharge valve. To this effect the vacuum sewer system comprises an aeration means, which is arranged to provide a direct fluid communication to the discharge valve. The control mechanism, which controls the discharge valve, is also arranged to control the function of the aeration means. Particularly, the discharge valve is provided with such an aeration means.

The aeration means is arranged to supply air to the discharge valve for rapidly closing the discharge valve after a discharge or flushing sequence. The aeration means is arranged to be closed when the discharge valve is provided with vacuum for opening the same for the discharge or flushing sequence. In this way, the aeration means affects the closure time, but does not interfere with the opening of the discharge valve.

Such an aeration means may advantageously be pneumatically or electrically governed.

The aeration means advantageously comprises a vent valve, which is attached to the discharge valve and connected to the control mechanism by means of a fourth conduit. This arrangement provides for direct and rapid aeration of the discharge valve at its closing phase and may be governed by the control mechanism through the fourth conduit. The aeration means is advantageously provided with an aeration nozzle for closing the aeration means with a given delay after the discharge or flushing sequence.

The aeration means may also comprise a vent valve, which is arranged in connection with the discharge valve and connected to the control mechanism by means of a fourth conduit, whereby a fifth conduit is provided between the aeration means and the discharge valve. This arrangement provides for direct and rapid aeration of the discharge valve at its closing phase. The aeration means may be attached to the discharge valve or arranged separately of the discharge valve. The opening and closing function of the aeration means may be governed by the control mechanism in series with the discharge valve.

The function of the aeration means may advantageously also be electrically governed. To this effect the aeration means comprises a vent valve, which is attached to the discharge valve, whereby the control mechanism is arranged to control the aeration means by way of a sensor device and a magnetic valve connected to the aeration means. This arrangement provides for direct and rapid aeration of the discharge valve at its closing phase. The sensor device is advantageously connected to the control means for reading, if the vacuum connection to the discharge valve is switched on or off, and to correspondingly close or open the aeration means.

The above provides easy and reliable ways to govern the function of the aeration means based on the vacuum control of the discharge valve provided by the control mechanism.

## BRIEF DESCRIPTION OF THE DRAWINGS

In the following the present invention is described in more detail, by way of example only, with reference to the attached schematic drawings, in which

FIG. **1** illustrates a vacuum sewer system deploying the present invention,

FIG. **2** illustrates a discharge or flushing sequence,

FIG. **3** illustrates a first embodiment of a discharge or flushing sequence deploying the present invention,

FIG. **4** illustrates a second embodiment of a discharge or flushing sequence deploying the present invention, and

FIG. **5** illustrates a third embodiment of a discharge or flushing sequence deploying the present invention.

## DETAILED DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates in a general manner an embodiment of a vacuum sewer system comprising a sewage receptacle **1**, sewer piping **3** connected to the sewage receptacle **1** by means of a discharge valve **2**, and a vacuum generating means **4** for generating vacuum in the sewer piping **3**. The vacuum sewer system is provided with a control mechanism **5** for controlling the function of the discharge valve **2**. The vacuum sewer system may include a plurality of sewage receptacles with related discharge valves, (water valves), and control mechanisms, whereby the number of vacuum generating means may vary depending upon the layout and size of the whole system.

Vacuum sewer systems, including vacuum operated discharge valves, vacuum operated water valves, and vacuum control mechanisms, are well known in the art and are not therefore explained in further detail in this connection.

The vacuum control mechanism **5** is connected to the sewer piping **3**, at a point **33** adjacent the discharge valve **2** in the flow direction (indicated by an arrow) of the sewage, by means of a first conduit **31** and through a check valve **32**. The control mechanism **5** is connected to the vacuum operated discharge valve **2** by means of a second conduit **21**. The control mechanism **5** is also provided with an activating means **6**, such as a push button or an infrared trigger device, for activating the control mechanism **5** in order to initiate a flushing or discharge sequence.

In this embodiment the sewage receptacle **1** is shown as a toilet bowl also provided with a rinse water arrangement comprising a water supply **7**, a vacuum operated water valve **8** and a rinse water nozzle **9** in connection with the toilet bowl. The control mechanism **5** also governs the function of the water valve **8** and is connected thereto by means of a third conduit **81**.

The sewage receptacle may also be a urinal, sink, washbasin, shower, etc. as discussed above. The rinse water arrangement is optional and its use is dependent of the type of sewage receptacle.

FIG. **1** also shows in a general manner that the vacuum sewer system is provided with an aeration means **10**, in this embodiment in the form of a rapid vent valve, which is in fluid communication with the discharge valve **2** and the control mechanism **5** (by means of a fourth conduit **11**). The purpose of the aeration means **10** is to accelerate or speed up the closing of the discharge valve **2**, whereby its function is controlled by the control mechanism **5**. This will be discussed in more detail in connections with FIGS. **3**, **4** and **5** below.

Basically each sewage receptacle is provided with a discharge valve, to which the aeration means is connected. As a vacuum sewer system usually comprises one or more, or even a plurality of sewage receptacles, the number of discharge valves and thereto connected aeration means in a system vary accordingly. The discharge valves including the aeration means may separately be installed or replaced in connection with service, repair, or e.g. enlarging the vacuum sewer system.

FIG. **2** illustrates the discharge or flushing sequence usually employed in connection with vacuum sewer systems as discussed above. The function of the vacuum sewer system is usually based on vacuum present in the sewer piping **3**. The



control unit **5** directs or supplies vacuum to the discharge valve **2** (and the water valve **8**, FIG. **1**) for opening the same. The control mechanism **5** generally functions like a three-way valve, whereby also aeration of the discharge valve **2** takes place through the control mechanism **5** by a switch of the three-way valve position.

In a stand-by mode (A) vacuum is connected to the control mechanism **5** for governing the function of the discharge valve **2**. Vacuum is tapped at point **33** of the sewer piping **3**, adjacent and downstream of the discharge valve **2**, and led through the check valve **32** and the first conduit **31** to the control mechanism **5**. The discharge valve **2** is aerated through the second conduit **21** and an aeration valve **51** in the control mechanism **5**.

For the discharge or flushing sequence (B), the control mechanism **5** is activated (indicated by a black arrow) by the activating means **6**. This switches the three-way valve position and establishes a contact between the second conduit **21** and the vacuum available in the control mechanism **5** through the first conduit **31**. Vacuum is thus connected to the discharge valve for opening the same, whereby sewage collected in the sewage receptacle **1** (FIG. **1**) is discharged (direction of sewage flow indicated by arrow) as the discharge valve **2** is opened.

After a given time, the control mechanism **5** closes said contact, by switching the three-way valve position, and re-establishes contact between the second conduit **21** and the aeration valve **51** (corresponding to the stand-by mode A), whereby the discharge valve **2** is aerated and consequently closed (aeration mode C).

The vacuum sewer system is then ready for a new discharge or flushing sequence.

FIG. **3** shows a first embodiment of the present invention. The function of the vacuum sewer system is based on vacuum present in the sewer piping **3**. The control mechanism **5** directs or supplies vacuum to the discharge valve **2** for opening the same. The control mechanism **5** generally functions like a three-way valve.

In this embodiment the vacuum sewer system comprises an aeration means **10**, which is directly attached to the discharge valve **2** and connected to the control mechanism **5** by means of a fourth conduit **11**. The aeration means **10** is in the form of a vent valve, or rapid vent valve and its purpose is to rapidly ventilate, i.e. provide air directly to the vacuum operated discharge valve **2** for the closing of the same. The aeration means **10** comprises an expandable chamber **101** with a valve plate **102** arranged to open or close against a valve seat **22** in the discharge valve **2**. In addition the aeration means **10** is provided with an aeration nozzle **12**. The aeration means is pneumatically governed, by air/vacuum.

In a stand-by mode (A) vacuum is connected to the control mechanism **5**. Vacuum is tapped at point **33**, adjacent and downstream of the discharge valve **2**, of the sewer piping **3** and led through the check valve **32** and the first conduit **31** to the control mechanism **5**. The discharge valve **2** is aerated through the aeration nozzle **12** of the aeration means **10** through the fourth conduit **11** connecting by way of the control mechanism **5** to the second conduit **21** leading to the discharge valve **2**. The aeration means **10** is closed, being aerated through the aeration nozzle **12**, with respect to the discharge valve **2** in this stand-by mode A. This is illustrated by the valve plate **102** being closed against the valve seat **22** in the discharge valve **2**.

For the discharge or flushing sequence (B), the control mechanism **5** is activated (indicated by a black arrow) by the activating means **6**. This switches the three-way valve position and establishes a contact between the second conduit **21**

and the vacuum available in the control mechanism **5** through the first conduit **31**. Vacuum is thus connected to the discharge valve **2** for opening the same, whereby sewage collected in the sewage receptacle **1** (FIG. **1**) is discharged (direction of sewage flow indicated by arrow) as the discharge valve **2** is opened. The control mechanism **5** closes the connection to the fourth conduit **11** and the aeration means **10** remains closed and aerated through the aeration nozzle **12**.

After a given time, the control mechanism **5** closes the vacuum connection by switching the three-way valve position and re-establishes contact between the second conduit **21** and the fourth conduit **11** connected to the aeration means **10**. This switching connects the vacuum in the discharge valve **2** by way of the second conduit **21** through the control means **5** and further through the fourth conduit **11** to the aeration means **10**, whereby the aeration means **10** is opened. The vacuum contracts the expandable chamber **101** of the aeration means **10**, whereby the valve plate **102** is withdrawn from the valve seat **22** in the discharge valve **2**.

As a consequence, the discharge valve **2** receives air (indicated by a double-ended arrow) directly through first openings **13** and the open valve seat **22** and is rapidly closed (aeration mode C). The aeration means **10** is aerated through the aeration nozzle **12** and closes with a given delay (depending on the dimensioning of the aeration nozzle **12**).

The aeration means **10** according to the invention provides a rapid closure of the discharge valve **2** with the advantages discussed above.

The vacuum sewer system is then ready for a new discharge or flushing sequence.

Rapid aeration of the discharge valve may be provided in many ways. An alternative arrangement will be discussed in connection with FIG. **4** as follows.

FIG. **4** shows a second embodiment of the present invention. The function of the vacuum sewer system is based on vacuum present in the sewer piping **3**. The control mechanism **5** directs or supplies vacuum to the discharge valve **2** for opening the same. The control mechanism **5** generally functions like a three-way valve.

In this embodiment the vacuum sewer system comprises an aeration means **10**, which is in connection with the discharge valve **2** and connected to the control means **5** by means of a fourth conduit **11**. The aeration means **10** is in the form of a vent valve, or rapid vent valve and its purpose is to rapidly ventilate, i.e. provide air directly to the vacuum operated discharge valve **2** for the closing of the same. The aeration means **10** comprises an expandable chamber **101** with an internal spring means **104** and a valve stem **103** with a valve plate **102**, which is arranged to open or close against a valve seat **22** in the discharge valve **2**. The aeration means is pneumatically governed, by air/vacuum.

The vacuum connection from the control mechanism **5** to the discharge valve **2** passes through the aeration means **10**, whereby the fourth conduit **11** provides the connection between the control mechanism **5** and the aeration means **2** and a fifth conduit **14** provides a connection between the aeration means **10** and the discharge valve **2**.

In a stand-by mode (A) vacuum is connected to the control mechanism **5**. Vacuum is tapped at point **33**, adjacent and downstream of the discharge valve **2**, of the sewer piping **3** and led through the check valve **32** and the first conduit **31** to the control mechanism **5**. The discharge valve **2** is aerated through second openings **15**. The aeration means **10** is aerated through the aeration valve **51** by way of the fourth conduit **11** and through the discharge valve **2** by way of the fifth conduit **14**. This keeps the expandable chamber **101** of the aeration means **10** in an expanded state, biased by the internal spring means **104**, which keeps the valve stem **103** with the valve plate **102** withdrawn from the valve seat **22** in the discharge valve **2** allowing for an inflow of air through the second openings **15** as discussed above.

For the discharge or flushing sequence (B), the control mechanism **5** is activated (indicated by a black arrow) by the activating means **6**. This switches the three-way valve position and establishes a contact between the fourth conduit **11** and the vacuum available in the control mechanism **5** through the first conduit **31**. Vacuum is thus connected to the aeration means **10** through the fourth conduit **11**, which contracts the expandable chamber **101** against the force exerted by the internal spring means **104** and pushes the valve stem **103** with the valve plate **102** for closing against the valve seat **22** in the discharge valve **2**.

At the same time vacuum is connected further to the discharge valve **2** through the fifth conduit **14** for opening the discharge valve **2**, whereby sewage collected in the sewage receptacle **1** (FIG. **1**) is discharged (direction of sewage flow indicated by arrow) as the discharge valve **2** is opened.

After a given time, the control mechanism **5** closes the vacuum connection by switching the three-way valve position and re-establishes the contact between the aeration valve **51** in the control mechanism **5** and the fourth conduit **11** connected to the aeration means **10**, whereby air flows into the aeration means **10** expanding the expandable chamber **101**, biased by the internal spring means **104**. As a consequence the valve stem **103** with the valve plate **102** is withdrawn from the valve seat **22** in the discharge valve **2**, whereby the discharge valve **2** receives air (indicated by a double-ended arrow) directly through the second openings **15** (aeration mode C) and the open valve seat **22** rapidly closing the discharge valve **2**. The discharge valve **2** is also aerated by way of the fifth conduit **14** through the aeration means **10**, the fourth conduit **11** and the aeration valve **51** in the control mechanism **5**.

The aeration means **10** according to the invention thus provides a rapid closure of the discharge valve **2** with the advantages discussed above. The aeration means **10**, e.g. the rapid vent valve may be arranged either separated from or attached to the discharge valve **2** in this embodiment.

The vacuum sewer system is then ready for a new discharge or flushing sequence.

FIG. **5** shows a third embodiment of the present invention in which the function of the aeration means **10** is electrically governed.

The function of the vacuum sewer system is based on vacuum present in the sewer piping **3**. The control mechanism **5** directs or supplies vacuum to the discharge valve **2** for opening the same. The control mechanism **5** generally functions like a three-way valve.

In this embodiment the vacuum sewer system comprises an aeration means **10**, which is directly attached to the discharge valve **2**. The aeration means **10** is in the form of a vent valve, or rapid vent valve and its purpose is to rapidly ventilate, i.e. provide air directly to the vacuum operated discharge valve **2** for the closing of the same. The control mechanism **5** comprises a sensor device **52** in connection with an aeration valve **51**. The sensor device **52** reads the state of the aeration valve **51** and controls a magnetic valve **53**, which in turn controls the aeration means **10**. The aeration means **10** comprises a valve stem **103** with a valve plate **102** arranged to open or close against a valve seat **22** in the discharge valve **2**.

In a stand-by mode (A) vacuum is connected to the control mechanism **5**. Vacuum is tapped at point **33**, adjacent and downstream of the discharge valve **2**, of the sewer piping **3** and led through the check valve **32** and the first conduit **31** to the control mechanism **5**. The discharge valve **2** is aerated

through third openings **16** and the by way of the second conduit **21** through the aeration valve **51** in the control mechanism **5**. The sensor device **52** reads the state of the aeration valve **51**, aired and connected to the aerated discharge valve **2** through the second conduit **21**, and keeps the magnetic valve **53** in an idle state and the valve stem **103** with the valve plate **102** in a withdrawn position, away from the valve seat **22** in the discharge valve **2** providing for an inflow of air through the third openings **16** discussed above.

For the discharge or flushing sequence (B), the control mechanism **5** is activated (indicated by a black arrow) by the activating means **6**. This switches the three-way valve position and establishes a contact between the second conduit **21** and the vacuum available in the control mechanism **5** through the first conduit **31**, whereby a vacuum connection to the discharge valve **2** is switched on. Simultaneously the sensor device **52** reads the state of the aeration valve **51**, closed of from the connection with the second conduit **21**, and switches on electric current to the magnetic valve **53**, which activates the valve stem **103** with the valve plate **102** and closes the valve plate **102** against the valve seat **22** in the discharge valve **2**. Vacuum is thus directed to the discharge valve **2** for opening the same, whereby sewage collected in the sewage receptacle **1** (FIG. **1**) is discharged (direction of sewage flow indicated by arrow) as the discharge valve **2** is opened.

After a given time, the control mechanism **5** switches off the vacuum connection to the discharge valve **2** by switching the three-way valve position and re-establishes contact between the aeration valve **51** in the control mechanism **5** and the discharge valve **2** through the second conduit **21**. At the same time the sensor device **52**, reading the changed state of the aeration valve **51**, i.e. reading that the vacuum connection through the control mechanism **5** to the discharge valve **2** is switched off, switches off the electric current to the magnetic valve **53**, whereby the valve stem **103** with the valve plate **102** are withdrawn from the valve seat **22** in the discharge valve **2**. As a consequence, the discharge valve **5** receives air (indicated by a double-ended arrow) directly through the third openings **16** and the open valve seat **22** and is rapidly closed (aeration mode C). Air is also provided by way of the second conduit **21** through the aeration valve **51** in the control mechanism **5**.

The aeration means **10** according to the invention provides a rapid closure of the discharge valve **2** with the advantages discussed above.

The vacuum sewer system is then ready for a new discharge or flushing sequence.

The drawings and the description related thereto are only intended for clarification of the basic idea of the invention. The invention may vary in detail, e.g. vacuum for the control means and for governing the discharge valve may be taken from another location of the sewer piping or another source than described above, different pneumatic or electrical connections from the control mechanism to the aeration means may be used, within the scope of the ensuing claims.

The invention claimed is:

**1**. A vacuum sewer system comprising a sewage receptacle, sewer piping connected to the sewage receptacle by means of a discharge valve provided with an aeration means, a vacuum generating means for generating vacuum in the sewer piping, and a control mechanism for controlling the discharge valve and the aeration means, wherein (a) the control mechanism is configured to be activated in order to provide a primary vacuum connection between the vacuum generating means and the discharge valve in order to open the discharge valve and discharge the sewage receptacle while the aeration means remains closed, and (b) wherein the aeration means comprises a valve plate configured to open or close against a valve seat in the discharge valve, the aeration means **[**configured to provide**]** *governed by* an auxiliary vacuum that is activated after the control mechanism closes the primary vacuum connection, such that the valve plate is configured to be (i) withdrawn from the valve seat so that air is supplied directly to the discharge valve through the open valve seat for closing the discharge valve after a discharge or flushing sequence, and (ii) closed against the valve seat when the discharge valve is provided with the primary vacuum connection for opening the discharge valve for the discharge or flushing sequence.

**2**. The vacuum sewer system according to claim **1**, wherein the function of the aeration means is pneumatically governed.

**3**. The vacuum sewer system according to claim **1**, wherein the function of the aeration means is electrically governed.

**4**. The vacuum sewer system according to claim **1**, wherein the aeration means comprises a vent valve, which is attached to the discharge valve and connected to the control mechanism by means of a fourth conduit, and in that the aeration means is provided with an aeration nozzle.

**5**. The vacuum sewer system according to claim **4**, wherein the aeration means is arranged to be opened by vacuum provided from the discharge valve by way of a second conduit through the control mechanism and further through the fourth conduit to the aeration means in order to provide air to the discharge valve for closing the discharge valve after the discharge or flushing sequence, and in that the aeration means is arranged to be closed with a given delay after said discharge or flushing sequence by air provided through the aeration nozzle.

**6**. The vacuum sewer system according to claim **1**, wherein the aeration means comprises a vent valve, which is arranged in connection with the discharge valve and connected to the control mechanism by means of a fourth conduit, and in that a fifth conduit is provided between the aeration means and the discharge valve.

**7**. The vacuum sewer system according to claim **6**, wherein the aeration means is arranged to be opened by air provided by way of the fourth conduit through an aeration valve in the control mechanism in order to provide air to the discharge valve for closing the discharge valve after the discharge or flushing sequence, and wherein the aeration means is arranged to be closed by vacuum available in the control mechanism and provided by way of the fourth conduit.

**8**. The vacuum sewer system according to claim **3**, wherein the aeration means comprises a vent valve, which is attached to the discharge valve, and wherein the control mechanism is arranged to control the aeration means by way of a sensor device and a magnetic valve connected to the aeration means.

**9**. The vacuum sewer system according to claim **8**, wherein the aeration means is arranged to be opened by the magnetic valve when the sensor device reads that the vacuum connection to the discharge valve through the control mechanism is switched off in order to provide air to the discharge valve for closing the discharge valve after the discharge or flushing sequence, and wherein the aeration means is arranged to be closed when the sensor device reads that the vacuum connection to the discharge valve through the control mechanism is switched on.

**10**. A discharge valve for a vacuum sewer system comprising a sewage receptacle, sewer piping and a vacuum generating means for generating vacuum in the sewer piping, whereby the discharge valve is (a) provided with an aeration means, (b) arranged between the sewage receptacle and the sewer piping, and (c) controlled by a control mechanism, wherein the control mechanism is configured to be activated in order to provide a primary vacuum connection between the

vacuum generating means and the discharge valve in order to open the discharge valve and discharge the sewage receptacle while the aeration means remains closed, wherein the aeration means is controlled by the control mechanism and comprises a valve plate arranged to open or close against a valve seat in the discharge valve and the valve plate is arranged to be withdrawn from the valve seat so that air is supplied directly to the discharge valve through the open valve seat for closing the discharge valve after a discharge or flushing sequence and arranged to be closed against the valve seat when the discharge valve is provided with vacuum for opening the discharge valve for the discharge or flushing sequence, wherein the aeration means [configured to provide] *is governed by* an auxiliary vacuum that is activated after the control mechanism closes the primary vacuum connection.

**11**. The discharge valve according to claim **10**, wherein the function of the aeration means is pneumatically governed.

**12**. The discharge valve according to claim **10**, wherein the function of the aeration means is electrically governed.

**13**. The discharge valve according to claim **10**, wherein the aeration means comprises a vent valve, which is attached to the discharge valve and connected to the control mechanism by means of a fourth conduit, and in that the aeration means is provided with an aeration nozzle.

**14**. The discharge valve according to claim **13**, wherein the aeration means is arranged to be opened by vacuum provided from the discharge valve by way of a second conduit through the control mechanism and further through the fourth conduit to the aeration means in order to provide air to the discharge valve for closing the discharge valve after the discharge or flushing sequence, and in that the aeration means is arranged to be closed with a given delay after said discharge or flushing sequence by air provided through the aeration nozzle.

**15**. The discharge valve according to claim **10**, wherein the aeration means comprises a vent valve, which is arranged in connection with the discharge valve and connected to the control mechanism by means of a fourth conduit, and in that a fifth conduit is provided between the aeration means and the discharge valve.

**16**. The discharge valve according to claim **15**, wherein the aeration means is arranged to be opened by air provided by way of the fourth conduit through an aeration valve in the control mechanism in order to provide air to the discharge valve for closing the discharge valve after the discharge or flushing sequence, and in that the aeration means is arranged to be closed by vacuum available in the control mechanism and provided by way of the fourth conduit.

**17**. The discharge valve according to claim **12**, wherein the aeration means comprises a vent valve, which is attached to the discharge valve, and in that the control mechanism is arranged to control the aeration means by way of a sensor device and a magnetic valve connected to the aeration means.

**18**. The discharge valve according to claim **17**, wherein the aeration means is arranged to be opened by the magnetic valve when the sensor device reads that the vacuum connection to the discharge valve through the control mechanism is switched off in order to provide air to the discharge valve for closing the discharge valve after the discharge or flushing sequence, and in that the aeration means is arranged to be closed when the sensor device reads that the vacuum connection to the discharge valve through the control mechanism is switched on.

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