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(54) Titre : SYSTEME DE POMPAGE D'EAUX USEES
(54) Title: WASTEWATER PUMPING SYSTEM

(57) Abrégé/Abstract:
A wastewater (sewage) pumping system is provided for municipal and industrial applications with provisions for scouring and aeration of sediments which may accumulate at the bottom of the pumping system wetwell and which may produce hazardous, toxic and corrosive gases such as methane, carbon dioxide and hydrogen sulphide, preventing wastewater pumps plugging with large solids which enter the wastewater pumping system by installation of a large solids retention basket, swab launching connection for cleaning (swabbing) of the pumping system pressure discharge forcemain to maintain the pumping system design capacity, monitoring of the wastewater pumping system flows and wastewater levels and alarm conditions, and providing automatic operation of the wastewater pumping system.

Wastewater Pumping System (WWPS)

Abstract

A wastewater (sewage) pumping system is provided for municipal and industrial applications with provisions for scouring and aeration of sediments which may accumulate at the bottom of the pumping system wetwell and which may produce hazardous, toxic and corrosive gases such as methane, carbon dioxide and hydrogen sulphide, preventing wastewater pumps plugging with large solids which enter the wastewater pumping system by installation of a large solids retention basket, swab launching connection for cleaning (swabbing) of the pumping system pressure discharge forcemain to maintain the pumping system design capacity, monitoring of the wastewater pumping system flows and wastewater levels and alarm conditions, and providing automatic operation of the wastewater pumping system.

WASTEWATER PUMPING SYSTEM

Field of the Invention

The invention relates to a system and apparatus for pumping of municipal and industrial wastewaters (sewage) in a safe and efficient manner and in locations sensitive to people and local environment.

Background of the Invention

Wastewater (sewage) pumping systems are frequently used in municipal, industrial, recreational and commercial wastewater collection and disposal systems. The pumping systems are either a wetwell type or a wetwell and drywell type.

The wetwell and drywell can be one structure divided by a wall or they can be separate structures located close to each other.

In the wet well type pumping system, wastewater enters a wet well and is pumped out predominantly by submersible wastewater pumps located in the wetwell. Occasionally, wastewater self priming pumps are located on the top or beside the wetwell, on or near the ground level.

In the wetwell and drywell pumping system, wastewater enters a wetwell and wastewater pumps are located in a drywell with suction lines extended into the wetwell. The pumps are dry location type pumps.

Usually, minimum two wastewater pumps are installed in a pumping system; but, a number of pumps used is determined by the pumping system capacity and reliability requirements and may vary from one to several pumps in one pumping system.

Both wetwell type and wetwell and drywell type pumping systems can be underground structures without superstructures or they can be provided with superstructures above the ground level.

Typical problems encountered in wastewater pumping systems include:

accumulation of solids on the bottom of wetwells and production of flammable, toxic and corrosive gases which results in complaints and health and safety hazards, and corrosion of the pumping system components,

need for cleaning of the bottom of wetwells,

lack of provisions for swabbing of forcemains which result in reduction of pumping capacity of the pumping systems,

lack of retention of large solids at the inlet of wastewater to the wetwells which results in plugging and damage of the wastewater pumps,

lack of adequate instrumentation for monitoring of the wastewater inlet and discharge flows and pumping pressure for adequate evaluation of the pumping system performance, and mainly the pumping capacity, frequency of the pumps on/off operation, power consumption and a balance of the wastewater collected vs the domestic water used in the area serviced by a wastewater pumping system.

The invention includes provisions for elimination of the problems associated with wastewater pumping systems and which are applicable to small and large wetwell type and drywell and wetwell type pumping systems.

The invention provisions eliminate the concerns of gas hazard, safety, health, corrosion and operation and maintenance, and prolong the pumping system life span, pumping capacity and reliability.

Brief Summary of the Invention

The wastewater pumping system of the present invention is a system and apparatus for pumping of municipal and industrial wastewaters by a wetwell type or wetwell and drywell type pumping systems.

The wastewater pumping system is applicable to small and large wastewater pumping systems, in underground and aboveground installations, in concrete, steel or plastic structures and in underground installations with or without superstructures above the ground level.

The wastewater pumping system major components include a wetwell, submersible wastewater pumps and inlet and outlet piping in a wetwell pumping system, and wetwell, drywell, non-submersible wastewater pumps and inlet and outlet piping in a wetwell & drywell pumping system.

The wastewater pumping system specific additional components comprise the following:

an aeration system for aeration of wastewater in a wetwell and scouring of the wetwell's bottom sediments,

a removable basket at the inlet of wastewater to a wetwell for retention of large solids,

a swab launching connection for swabbing of a forcemain which discharges wastewater from the pumping system,

a water level transmitter for monitoring of the wastewater levels in the wet well, activation and deactivation of wastewater pumps operation and water level alarm conditions, and monitoring of the wastewater inflow volumes and flow rates,

a wastewater pressure transmitter for monitoring of the wastewater pumps discharge pressure, flow rates and volumes and activation of the discharge pressure alarm conditions,

a control panel which receives electrical signals from the wastewater level transmitter and the wastewater pressure transmitter for an automatic and continuous monitoring of the wetwell wastewater level and the wastewater pumps discharge pressure, and which parameters are automatically and continuously transferred to a remote base station, and which parameters are used by the control panel for an automatic start/stop operation of the wastewater pumps, start/stop operation of the aeration system, activation of alarm conditions of the wastewater low and high levels in the wetwell, the

wastewater pumps low and high discharge pressure levels, and the wastewater pumps failure to start.

Brief Description of Drawings

Fig. 1 is a vertical section of a wetwell type wastewater pumping system in an underground installation without a superstructure above the ground level.

Fig. 2 is a horizontal section – plan made below the ground level of the wastewater pumping system shown on Fig. 1.

Fig. 3 is a vertical section of a wetwell and drywell wastewater pumping system in an underground installation with a superstructure above the ground level.

Fig. 4 is a horizontal section – plan made below the ground level of the wastewater pumping system shown on Fig. 3.

Detailed Description of the Invention

The first preferred embodiment shown on Fig. 1 and Fig. 2 comprises a wetwell 1 with a top cover 2, a bottom floor 3, a gravity wastewater inlet pipe 4, a pressure wastewater outlet pipe (forcemain) 5 and a bottom base 8.

The bottom floor 3 is extended outside the wetwell 1 with a lip (flange) around the wetwell 1 for fastening of the wetwell 1 to the bottom base 8 with fasteners 9.

The bottom floor 3 is also connected to the bottom base 8 with a water tight and a water resistant compound to eliminate any voids between the bottom floor 3 and the

bottom base 8, to prevent any groundwater entry between the bottom floor 3 and the bottom base 8, and to prevent a groundwater direct pressure on the bottom floor 3.

The bottom base 8 is provided to prevent the wetwell 1 buoyancy (uplifting) due to the ground water upward pressure on the bottom floor 3.

The wetwell 1, the top cover 2 and the bottom floor 3 can be made of any material, corrosion resistant and capable of withstanding soil and groundwater pressure, and this can include metal, plastic, concrete, brick and wood. In cases, where the wetwell 1 is made of concrete and preferably reinforced concrete, the bottom base 8 can be integral with the wetwell 1 without the bottom floor 3 and the fasteners 9.

The top cover 2 provides entries to the wetwell 1 for wastewater pumps 21, a large solids retention basket 40 and a manway to a ladder or stairs 55, and a support for vent pipes 10 and 11; air exhaust pipe 10 and fresh air inlet pipe 11, and for an air heater-blower 12 which is preferred in cold climates or an air blower 12 which is preferred in warm and moderate climates for an efficient ventilation of the wetwell 1 to supply large air flows continuously or intermittently.

The wetwell 1 and the bottom floor 3 are connected with a sloped plate to form a cove 7 of which internal surface is at an angle to the wetwell 1 and the bottom floor 3, preferably at 45 degrees or smaller angle to the wetwell 1, but preferably not less than 30 degrees. The wetwell 1 and the bottom floor 3 are also connected horizontally outside the cove 7. The cove 7 extends the entire bottom connection of the wetwell 1 and the bottom

floor 3, and it may be filled with air, water or other material of a high thermal conductivity and adequate mechanical strength.

The wetwell contains pumps, piping, instruments and controls which comprise:

submersible wastewater pumps 21 with discharge riser pipes 24, a collector discharge pipe 27, slide away couplings 22, slide guide rails 23 and slide guide plates 23A,

a swab inlet valve 28 connected to the collector discharge pipe 27,

an aeration system comprising an air aspirator-mixer 20, a wastewater inlet pipe 29, a wastewater and air discharge pipe 37, wastewater and air distribution pipes 38 and an air inlet pipe 17,

a large solids retention basket 40 located inside the wetwell 1 at the inlet pipe 4 entry to the wetwell 1,

a pressure transmitter 30 mounted on the collector discharge pipe 27,

a water level transmitter 46 mounted at the bottom of the wetwell 1,

a control panel 42 which connects electrically with wires 43 to the pumps 21, the pressure transmitter 30, the water level transmitter 46, automatic on/off control valves 31 and 34 mounted on the discharge pipe 27 and the aeration system inlet pipe 29 respectively, and with a wire 45 or through a wireless communication system to a remote central operation station,

an intermediate operating platform (floor) 51 which is preferred in wetwells deeper than approximately 3.2 meters,

an access ladder or stairs 52 in small wetwells and large wetwells respectively.

The pumps 21 are connected to the discharge riser pipes 24 with slide away couplings 22 which allow the pumps 21 removal by lifting from the top cover 2 without any need for a manual disconnection of the pumps 21 from the discharge riser pipes 24. The pumps 21 removal is assisted by slide guide rails 23 and slide guide plates 23A which guide the pumps 21 lifting from and lowering into the original position in the wetwell 1 and precisely into the slide away couplings 22.

The pumps 21 are supported directly on the bottom floor 3 to prevent any direct load on the slide away couplings 22, the discharge riser pipes 24 and the collector discharge pipe 27, and to prevent jamming, leakage or damage of the slide away couplings 22 due to a direct load from the wastewater pumps 21 on the slide away couplings 22.

The swab inlet valve 28 is preferably of the same diameter as the collector discharge pipe 27 and it is mounted at the end of the collector discharge pipe 27 with a straight connecting pipe or on the top of the collector discharge pipe 27 with preferably a "y" fitting with the "y" inlet branch declining in the direction of the wastewater flow direction in the collector discharge pipe 27. The swab inlet valve 28 allows for insertion of a plastic swab into the collector discharge pipe 27 for swabbing of the pressure wastewater outlet pipe (forcemain) 5 to remove any sediment and coating from the outlet

pipe (forcemain) 5 to maintain the design wastewater pumping capacity of the wastewater pumping system.

The swab is forced downstream the collector discharge pipe 27 and the pressure wastewater outlet pipe 5 by the wastewater pumped by the wastewater pumps 21.

The aeration system inlet pipe 29 is provided with a manual shut off valve 33, and the automatic on/off valve 34.

The aeration system distribution pipes 38 extend vertically from the discharge pipe 37 to the coves 7 and are terminated with slanted outlets 39 in a consistent clockwise or anticlockwise direction along the bottom of the wetwell 1 to scour any sediment accumulated on the coves 7 and the bottom floor 3, and to aerate the wastewater in the wetwell 1 without a potential of entry of the air supplied with the wastewater into the pumps 21.

The sediment scour and the wastewater aeration prevent accumulation and anaerobic decomposition of organic solids which result in production of hazardous, toxic and corrosive gases in the wetwell 1.

The air aspirator-mixer 20 is a venturi type air aspirator with a spiral type static mixer, both of non-clog design, with ability to aspire a large quantity of air and thoroughly mix the air with the wastewater which enters the air aspirator. The air aspirator aspires the air through the air inlet pipe 17. The air aspirator-mixer 20 is preferably mounted in the wetwell 1 in a vertical position and above the intermediate operating platform 51 for an easy access for maintenance. The air inlet pipe 17 is

supplied with air from the vent pipe 11 through an air pipe 15 connected to the bottom of the vent pipe 11 and an air pipe 16 which is placed in the cove 7 in a spiral manner to act as a heat exchanger between the air contained in the air pipe 16 and the air or water contained in the cove 7. Such design is preferred in cold climates to increase the temperature of the air aspired by the air aspirator-mixer 20 without any heating of the air by electrical or other means.

The air inlet pipe 17 is provided, near the air aspirator-mixer 20, with a non-return valve 18 and a manual shut off valve 19. The non-return valve 18 prevents an entry of the wastewater which flows through the air aspirator-mixer 20 into the air inlet pipe 17, the air pipe 16, the air pipe 15 and the vent pipe 11.

The aeration system operation is controlled by a PLC and programmed to suit the site conditions, and it is preferred to operate in an intermittent manner of one to five minutes "on" (in operation) and one to three hours "off" (idle). The "on" and "off" time intervals depend on the wastewater pumping system capacity, location and the wastewater characteristics such as odor, suspended solids volume, and the wastewater flow rate distribution throughout a day, week or season.

When the aeration system is activated the automatic on/off control valves 31 and 34 are activated such that the valve 31 is closed and the valve 34 is open, and one wastewater pump 21 is also activated. The wastewater is pumped into the discharge pipe 27, the inlet pipe 29 and the air aspirator-mixer 20. The wastewater flow through the air aspirator develops a vacuum condition which aspires air from the air inlet pipe 17. The

aspired air and the wastewater mix initially in the air aspirator and further in the spiral mixer. Thus, wastewater and air mixture flows into the discharge pipe 37 and further into the distribution pipes 28, and the slanted outlets 39 which discharge the wastewater and air mixture into the cove 7 and into the wastewater contained in the lower part of the wetwell 1.

The aeration system can be activated at any time when the wastewater pumps are switched off at a low wastewater level 47 and before the wastewater pumps are switched on at a high water level 48 in the wetwell structure 1. The aeration system is usually switched on and off automatically but a manual operation is also provided for testing and inspections.

The aeration system can also efficiently operate when the wastewater pumps 21 are started at the high wastewater level 48 or a higher level and the wastewater pumps 21 discharge pressure is 15 psi (1 Bar) or higher. In such cases the automatic valves 31 and 34 are open for the duration of the aeration system operation and the valve 34 is closed after the aeration is completed, but the valve 31 remains open or it can be removed if the wastewater pumps 21 discharge pressure is consistently 15 psi (1 Bar) or higher. In a wastewater pumping system with a consistent discharge pressure between 10 and 15 psi (0.67 to 1 Bar) the control valve can be eliminated, but the second pump 21 should be activated when the aeration system is activated.

The wastewater pumps 21 operation is automatically controlled by a PLC located in the control panel 42 and the water level transmitter 46 which detects wastewater levels 47, 47A, 48, 49 and 50 in the wetwell 1.

The wastewater pumps 21 operate predominantly as a single pump at a time, activated at the wastewater level 47 and the pumps 21 operation is automatically alternated, but, the second pump 21 will be activated at the wastewater level 49, and both pumps will be switched off at the wastewater level 47.

The water level transmitter 46 provides a continuous output of 4-20 mA or other electronic output to the PLC located in the control panel 42. The electronic output is used for a continuous display of the wastewater levels, detection of the pumps 21 operating levels 47, 48, 49, detection of a high wastewater level alarm 50, detection of a low wastewater level alarm 47A and calculation of the wastewater inflow rates and volumes when the wastewater pumps 21 are not in operation.

The wastewater inflow rates and volumes are useful for analyses of the wastewater flow pattern throughout a day, week or other periods of time which can be used as design parameters for wastewater collection and pumping systems in similar developments.

The high wastewater level alarm 50 is an indication of an inadequate wastewater pumping system capacity which can be related to the pumps 21 wearout, reduced flow capacity of the pressure wastewater outlet pipe 5, high wastewater inflow rates or breakdown of one pump 21.

The low wastewater level alarm 47A is an indication of a malfunction of the pumps 21 on/off operation control system and a failure to switch off the pumps 21 at the low wastewater level 47.

The pressure transmitter 30 provides a continuous output of 4-20 mA or other electronic output to the PLC located in the control panel 42. The electronic output is used for a continuous display of the wastewater pumps 21 discharge pressure and on/off operation status, and calculations of the wastewater pumping flow rates and volumes by means of an algorithm and the wastewater pumps 21 capacity curves (flow rate vs discharge pressure curve).

The pumps 21 discharge pressure information is used for analyses of the pumps 21 performance which may be affected by the pumps wearout or the pressure wastewater outlet pipe 5 flow capacity reduction which can be caused by sediments, coating, squeezing or kinking of the outlet pipe 5.

The pumps 21 wearout can be checked by observing the pumps discharge pressure at the "shut off condition" by closing the automatic control valve 31 or the manual shut off valve 32 when one pump 21 is in operation and the aeration system is not in operation.

The pumps 21 discharge riser pipes 24 are provided with non-return valves 25 and shut off manual valves 26. The non-return valves 25 are non-clog type and the shut off valves 26 are either gate valves, knife gate valves, plug valves or ball valves preferably a full port design. The non-return valves 25 and the shut off valves 26 are preferably

mounted above the intermediate platform 51 for an easy access for operation and maintenance.

The vent pipe 11 provides fresh air inlet into the wetwell 1 and the aeration system air aspirator-mixer 20. The vent pipe 11 extends into the lower part of the wetwell 1, preferably below the intermediate floor 51.

The vent pipe 11 bottom end is provided with a side outlet and a non-return valve 14 which admits fresh air into the wetwell 1 and a bottom outlet which connects to the air pipe 15, and which supplies fresh air to the air aspirator-mixer 20 through air pipes 16 and 17.

Where the vent pipe 11 is provided with the air heater-blower or air blower 12 and the air heater-blower or the air blower 12 operates in an intermittent manner, it is preferred that the air heater-blower or the air blower 12 is also activated when the aeration system is activated for an efficient air and gases exhaustion from the wetwell 1.

When the aeration system is activated the non-return valve 14 prevents air entry from the lower part of the wetwell 1 into the air pipe 15 and the air aspirator-mixer 20. Thus, only fresh air from the atmosphere is used for the wastewater aeration.

The large solids retention basket 40 is provided to retain large solids preferably larger than 32 mm diameter or smallest dimension in any direction, to prevent plugging of the pumps 21 and the discharge riser pipes 24, the collector discharge pipe 27 and the pressure wastewater outlet pipe 5, and the aeration system wastewater inlet pipe 29, air

aspirator-mixer 20, wastewater and air discharge pipe 31, wastewater and air distribution pipes 38 and the slanted outlets 39.

The basket 40 is made preferably of a non-corrosive material such as wire or perforated plate of stainless steel, aluminum, brass or plastics with openings preferably 32 mm diameter or square, and is circular, square, rectangular or other shape in its horizontal cross section, and which is preferably equal to or larger than the diameter of the inlet pipe 4, and its length is preferably two times or larger than the inlet pipe 4 diameter, and it extends at least 100 mm above and 300 mm below the gravity wastewater inlet pipe 4.

The basket 40 is mounted inside the wetwell 1, at the inlet pipe 4 entry into the wetwell 1 on slide rails 41 which allow removal of the basket 40 to the top of the wetwell 1 from the top cover 2 for removal and inspections of the solids retained in the basket 40.

The top cover 2 and the intermediate platform 51 are provided with openings and hinged covers for passing of the pipes 10, 11, 17, 24, 27 & 38, the basket 40, the pumps 21 and the ladder or stairs 55.

The air vent pipe 10 is provided for exhausting of air and gases from the wetwell 1 and it protrudes into the wetwell 1 below the top cover 2 preferably not more than 150 mm.

The vent pipe 11 is provided for a fresh air entry into the wetwell 1 and for the air aspirator-mixer 20.

The air vent pipes 10 and 11 may enter the wetwell 1 through the top cover 1 or on a side through the upper part of the wetwell 1.

The second embodiment of the invention is shown on Fig. 3 and Fig. 4. For the embodiments disclosed herein, the same reference numerals are used for the same or substantially similar features. The essential difference between the first and the second embodiments is in the wastewater pumping system structure which in the second embodiment comprise a wetwell 1 and a drywell 1A and which are separated by a solid wall 57.

The wetwell 1 and the drywell 1A may be covered by a superstructure 56 with a dividing solid wall 58.

The walls 57 and 58 are provided to prevent a direct movement of air and gases which may be contained in the air between the wetwell 1 and the drywall 1A.

The wetwell 1 and the drywell 1A may be installed without the superstructure 56 over one or both wells 1 and 1A. The wetwell 1 and the drywell 1A may be installed as directly connected or separate structures located close to each other.

The wetwell 1 comprises the inlet gravity pipe 4, the large solids retention basket 40 with the slide rails 41, the ventilation pipes 10 and 11, the access ladder or stairs 55, the aeration system discharge pipe 37 and the distribution pipes 38 with the slanted outlets 39, suction pipes 53 with inlet bells 54 for the wastewater pumps 21, and the water level transmitter 46.

The drywell 1A comprises the wastewater pumps 21 with the discharge riser pipes 24, the collector discharge pipe 27, the outlet pressure pipe 5, the aeration system with the inlet pipe 29, the air aspirator-mixer 20, the air inlet pipe 17 to the air aspirator-mixer 20, the pressure transmitter 30, the ventilation pipes 10 and 11, the access ladder or stairs 55 and the control panel 42 which can also be located in the superstructure 56 above the drywell 1A.

The swab inlet valve 28 is located on a "y" fitting mounted on the collector discharge pipe 27.

The air inlet pipe 17 to the air aspirator-mixer 20 receives air directly from the drywell 1A or from the superstructure 56 located above the drywell 1A.

The wastewater pumps 21 are provided with shut off valves 52 on the suction pipes 53 for disconnection of the pumps 21 for a service or replacement.

The wastewater pumping system operation of the second embodiment is identical to the system operation of the first embodiment.

I claim:

1. A wastewater pumping system comprising:

a wetwell,

wastewater pumps,

an aeration system,

a swab launching connection,

a large solids retention basket,

instruments and controls;

said wetwell comprises a top cover, a bottom floor, a bottom base, an intermediate operating platform, a gravity wastewater inlet pipe, a pressure wastewater outlet pipe, air inlet and exhaust ventilation pipes, an air heater-blower or an air blower and a ladder or stairs;

said wastewater pumps comprise slide-away couplings, slide guide rails, slide guide plates, discharge riser pipes and a collector discharge pipe;

said aeration system comprises a wastewater inlet pipe, an air aspirator-mixer, a wastewater and air discharge pipe, wastewater and air distribution pipes and an air inlet pipe;

said swab launching connection comprises a shut off valve and a piping connection;

said large solids retention basket comprises slide guide rails; and

said instruments and controls comprise a water level transmitter, a pressure transmitter, an inlet control valve, a discharge control valve and a control panel.

2. A wastewater pumping system of Claim 1 wherein said wetwell and said bottom floor are connected with a sloped plate to form a cove inside said wetwell along the entire perimeter of said wetwell and said wetwell and said bottom floor are connected horizontally outside said cove along the entire perimeter of said wetwell.

3. A wastewater pumping system of Claim 2 wherein said bottom floor extends outside said wetwell with a lip (flange) along the entire perimeter of said wetwell, and said bottom floor is connected to said bottom base with fasteners and a water tight and water resistant compound to eliminate any voids between said bottom floor and said bottom base, and to prevent any entry of water between said bottom floor and said bottom base.

4. A wastewater pumping system of Claim 2 wherein said cove is at an angle of not less than 45° to said bottom floor and not more than 45° to said wetwell, and said cove is filled with water, and said cove accommodates air pipe for supply of air to

said air aspirator-mixer, and said cove prevents settling and accumulation of solids directly at the connection of said wetwell and said bottom floor.

5. A wastewater pumping system of Claim 1 wherein said bottom base extends outside said bottom floor lip (flange) such to counter groundwater upward pressure on said bottom base and to prevent said wetwell buoyancy due to the groundwater upward pressure.

6. A wastewater pumping system of Claim 1 wherein said ventilation pipes are provided for supply of fresh air to said wetwell and said air aspirator-mixer and for exhausting of air and gases which may be present inside said wetwell from said wetwell, and said ventilation pipes can be mounted on said top cover or on a side of said wetwell.

7. A wastewater pumping system of Claim 6 wherein said supply of fresh air is provided with an air heater-blower for heating of said fresh air and for supply of a large flow of said heated fresh air into said wetwell and to said air aspirator-mixer continuously or intermittently in cold weather condition, or said supply of fresh air is provided with an air blower for supply of a large flow of said fresh air into said wetwell and to said air aspirator-mixer continuously or intermittently in warm weather conditions; and in an intermittent fresh air supply system with said

air heater-blower or said air blower, it is preferred to activate said air heater-blower or said air blower at the same time said air aeration system is activated.

8. A wastewater pumping system of Claim 1 wherein said top cover and said intermediate operating platform are provided with openings for removal from and lowering into said wetwell of said wastewater pumps and said large solids retention basket, and an entry to said ladder or stairs for service and inspections of said wastewater pumps, said aeration system, said large solids retention basket and said instruments and controls located inside said wetwell above and below said intermediate platform.

9. A wastewater pumping system of Claim 1 wherein said wastewater pumps are connected to said discharge riser pipes with said slide away couplings and said wastewater pumps are supported directly on said bottom floor to prevent any direct load from said wastewater pumps on said slide away couplings, said discharge riser pipes, and said collector discharge pipe, and to prevent jamming, leakage or damage of said slide away couplings due to a direct load from said wastewater pumps on said slide away couplings.

10. A wastewater pumping system of Claim 1 wherein said wastewater pumps are provided with said slide guide rails and said slide guide plates for removal from

and lowering into said wetwell, and in a direct and precise connection with said slide away couplings, and said removal and lowering of said wastewater pumps is done from above of said top cover of said wetwell without any additional guidance of said wastewater pumps into said slide away couplings from inside of said wetwell.

11. A wastewater pumping system of Claim 1 wherein said aeration system is provided for aeration of wastewater in said wet well and scour of solids which may accumulate at the bottom of said wetwell, preferably in an intermittent manner of one to five minutes every one to three hours, to prevent development and accumulation of toxic, flammable, odorous and corrosive gases inside said wetwell from said solids which may accumulate at the bottom of said wetwell, and accumulation of said gases which may enter said wetwell from a wastewater collection system.

12. A wastewater pumping system of Claim 1 wherein said air aspirator-mixer is a venturi type air aspirator with a spiral type static mixer, both of non-clog design, preferably mounted above said intermediate platform in a vertical position, with a downward flow direction, and said air aspirator-mixer aspires air from said air inlet pipe which passes through said cove and connects to said fresh air inlet

ventilation pipe in cold climates or said air inlet pipe connects directly to said fresh air inlet ventilation pipe in warm climates.

13. A wastewater pumping system of Claim 1 wherein said air aspirator-mixer receives wastewater from said wastewater pumps collector discharge pipe through said wastewater inlet pipe, and said air aspirator-mixer discharges mixed wastewater and air into said wastewater and air discharge pipe, and said discharge pipe distributes said mixed wastewater and air into said wastewater and air distribution pipes, and said distribution pipes are terminated with slanted outlets placed on said cove and oriented in a consistent clockwise or counter clockwise direction along said cove to scour sediments which may accumulate on said cove and said bottom floor, and to aerate wastewater present in said wetwell without a potential of air entry into said wastewater pumps.

14. A wastewater pumping system of Claim 1 wherein said swab launching connection is provided for inserting a swab into said collector discharge pipe for cleaning said collector discharge pipe and said pressure wastewater outlet pipe, and said swab is forced downstream said collector discharge pipe and said pressure wastewater outlet pipe by wastewater pumped by said wastewater pumps.

15. A wastewater pumping system of Claim 14 wherein said swab launching connection is attached to said collector discharge pipe in such a manner to allow insertion of a swab into said collector discharge pipe downstream of the connection of said riser pipe and said collector discharge pipe, and said swab launching connection is provided at its inlet with a shut off valve and a pipe or fitting connected to said collector discharge pipe, and said shut off valve and said pipe or fitting connected to said collector discharge pipe are preferably of the same diameter as said collector discharge pipe.

16. A wastewater pumping system of Claim 1 wherein said large solids retention basket is provided for retention of large solids contained in wastewater, preferably larger than 32 mm diameter or the smallest dimension of any shape of said solids, and said large solids retention basket is located inside said wetwell at the inlet of said gravity wastewater inlet pipe to said wetwell, and said large solids retention basket is mounted on slide guide rails to allow said large solids retention basket removal from and lowering into said wetwell from said top cover through said opening provided in said top cover for removal of said large solids retention basket.

17. A wastewater pumping system of Claim 16 wherein said large solids retention basket is made of a wire, bars or a perforated plate with openings preferably 32

mm diameter or square, and said large solids retention basket is preferably circular, rectangular or square in its horizontal cross section, and said horizontal cross section is preferably at least equal to said gravity wastewater inlet pipe across section, and said large solid retention basket extends vertically preferably to at least 100 mm above and 300 mm below said gravity wastewater inlet pipe.

18. A wastewater pumping system of Claim 1 wherein said water level transmitter, said pressure transmitter, said inlet control valve and said discharge control valve are electrically connected to said control panel, and said control panel is electrically or through a wireless communication system connected to a remote control operation station to transmit operating parameters from said wastewater pumping system to said remote control operation station, and said operating parameters comprise wastewater levels in said wetwell, start/stop activation of said wastewater pumps, wastewater discharge pressure of said wastewater pumps, start/stop activation of said aeration system, open/close position of said inlet control valve and said discharge control valve, and alarm conditions comprising high and low wastewater levels in said wetwell, high and low discharge wastewater pressures of said wastewater pumps, overload conditions of said wastewater pumps and failure to start said wastewater pumps.

19. A wastewater pumping system of Claim 18 wherein said water level transmitter provides a continuous electrical signal output to said control panel to continuously display wastewater level in said wetwell, activate stop/start operation of said wastewater pumps, activate low and high wastewater level alarms, and calculate wastewater inlet flow rates and total volumes to said wetwell when said wastewater pumps are not activated excluding said wastewater pumps activation for said wastewater aeration system.

20. A wastewater pumping system of Claim 18 wherein said pressure transmitter provides a continuous electrical signal output to said control panel to continuously display said wastewater pumps discharge pressure, activate low and high wastewater discharge pressure alarms, and calculate wastewater discharge flow rates and volumes when said wastewater pumps are in operation excluding said wastewater pumps operation for said wastewater aeration system.

21. A wastewater pumping system of Claim 18 wherein said control panel controls start/stop operation of said aeration system and said start/stop operation is time controlled for duration and frequency of said aeration system operation, and said operation comprise start/stop operation of said wastewater pumps, closing/opening of said discharge control valve and opening/closing of said inlet control valve respectively, and said aeration system operation is permitted at any

time except when said wastewater pumps are activated at a high wastewater level to pump wastewater out of said wetwell to said pressure wastewater outlet pipe.

22. A wastewater pumping system comprising:

a wetwell,

a drywell,

wastewater pumps,

an aeration system,

a swab launching connection,

a large solids retention basket,

instruments and controls;

said wetwell comprises a top cover, a bottom floor, a gravity wastewater inlet pipe, air inlet and exhaust ventilation pipes, an air heater-blower or an air blower and a ladder or stairs;

said drywell comprises a top cover, a bottom floor, a pressure wastewater outlet pipe, air inlet and exhaust ventilation pipes, an air heater-blower or an air blower and a ladder or stairs;

said wastewater pumps comprise suction pipes, discharge riser pipes and a collector discharge pipe;

said aeration system comprises a wastewater inlet pipe, an air aspirator-mixer, a wastewater and air discharge pipe, wastewater and air distribution pipes and an air inlet pipe;

said swab launching connection comprises a shut off valve and a piping connection;

said large solids retention basket comprises slide guide rails; and

said instruments and controls comprise a water level transmitter, a pressure transmitter, an inlet control valve, a discharge control valve and a control panel.

23. A wastewater pumping system of Claim 22 wherein said wetwell is directly adjacent to said drywell and said wetwell share a common wall with said drywell, or said wetwell and said drywell are adjacent to each other but do not share a common wall, and said wetwell and said drywell are separate structures.

24. A wastewater pumping system of Claim 22 wherein said wastewater pumps, said discharge riser pipes and said collector discharge pipe are located in said drywell, and said suction pipes extend from said drywell into said wetwell, and said suction pipes are provided with shut off valves in said drywell and with inlet suction bells in said wetwell, and said inlet suction bells reduce hydraulic losses at the inlets to said suction pipes in said wetwell, and said inlet suction bells are

located close to said bottom floor of said wetwell to promote flow of solids which may accumulate on said bottom floor of said wetwell into said suction pipes.

25. A wastewater pumping system of Claim 22 wherein said aeration system wastewater inlet pipe, said air aspirator-mixer and said air inlet pipe are located in said drywell, and said wastewater and air discharge pipe is located partially in said drywell and partially in said wetwell, and said wastewater and air distribution pipes are located in said wetwell.

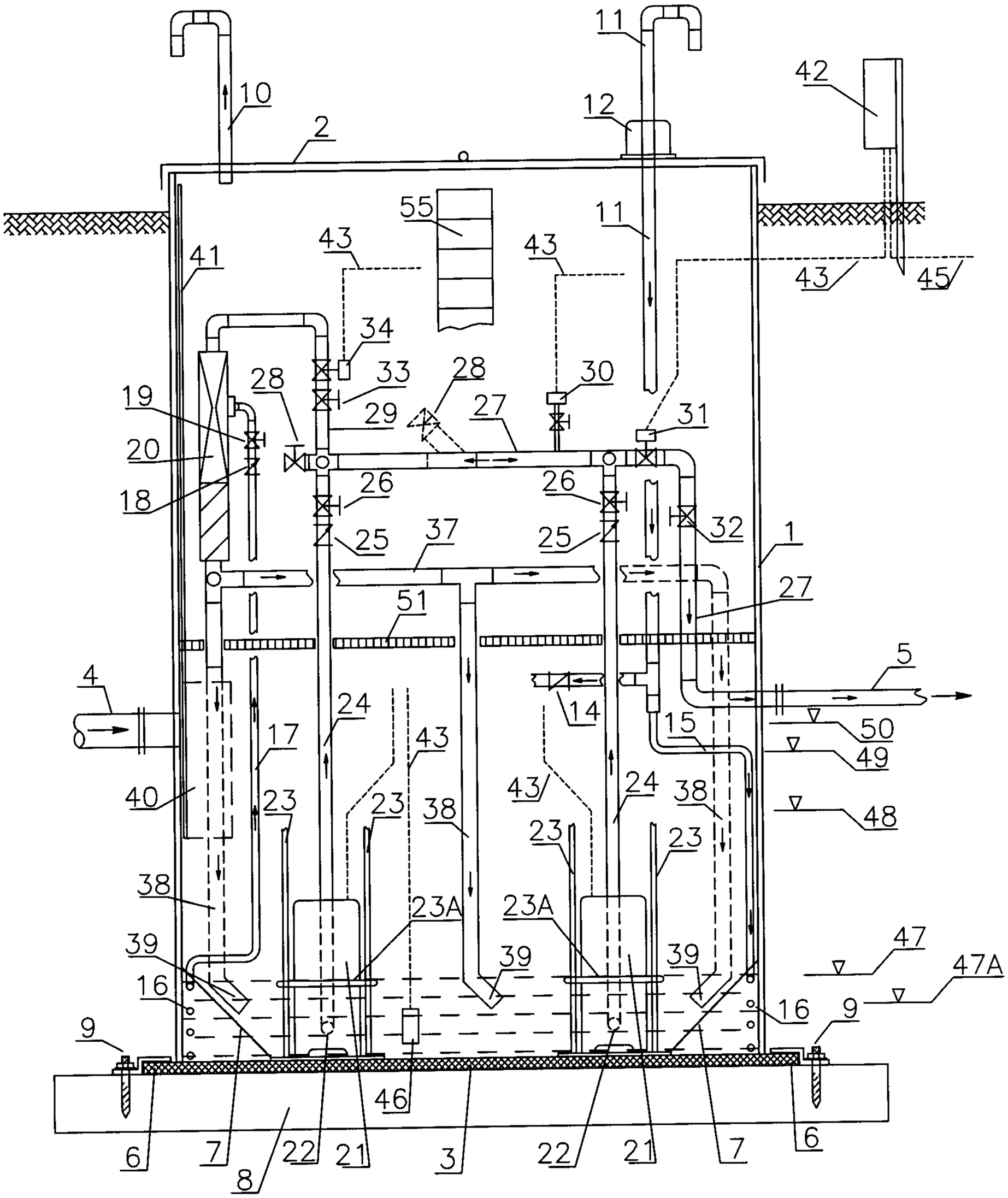
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FIG. 1

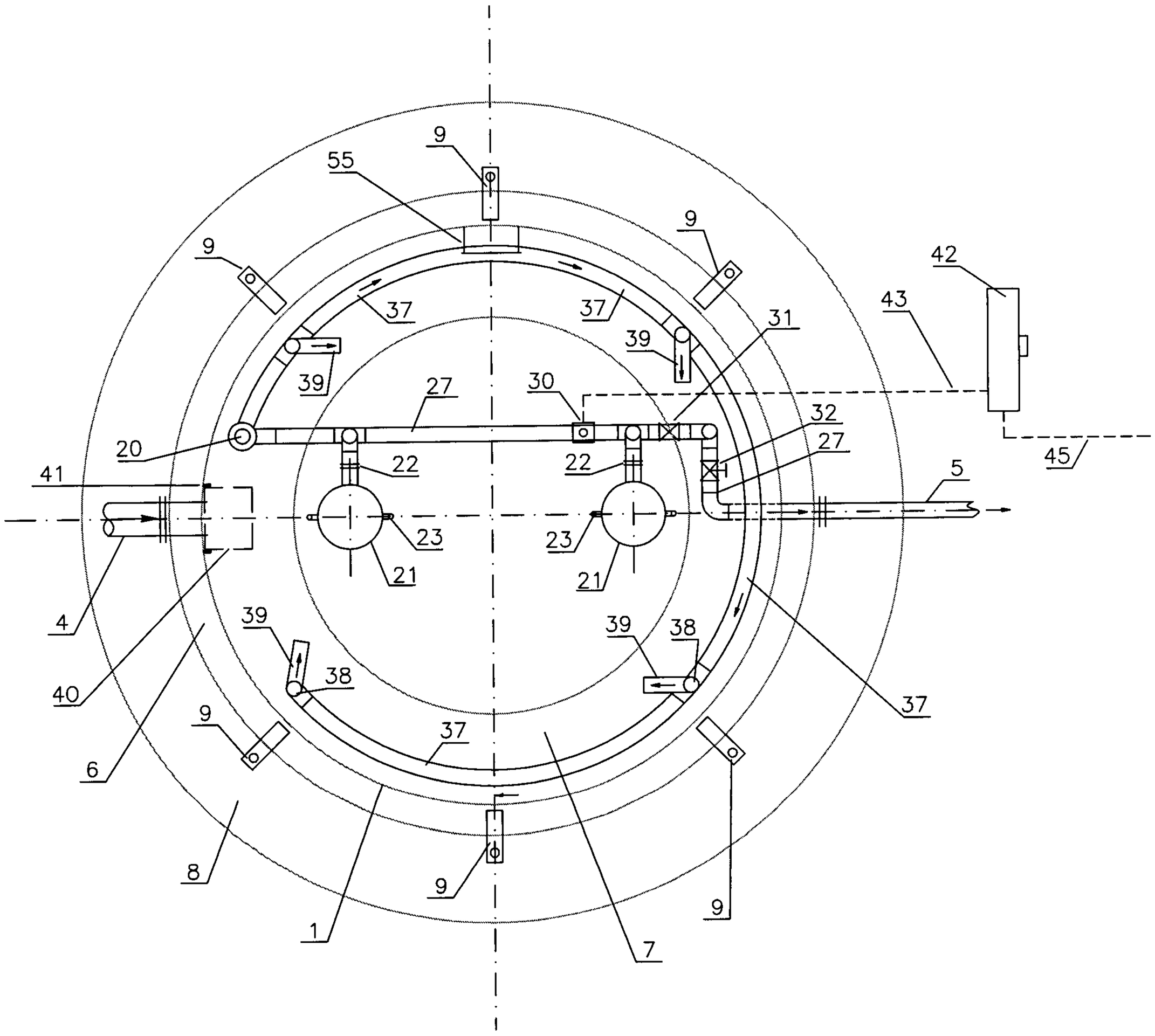
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FIG.2

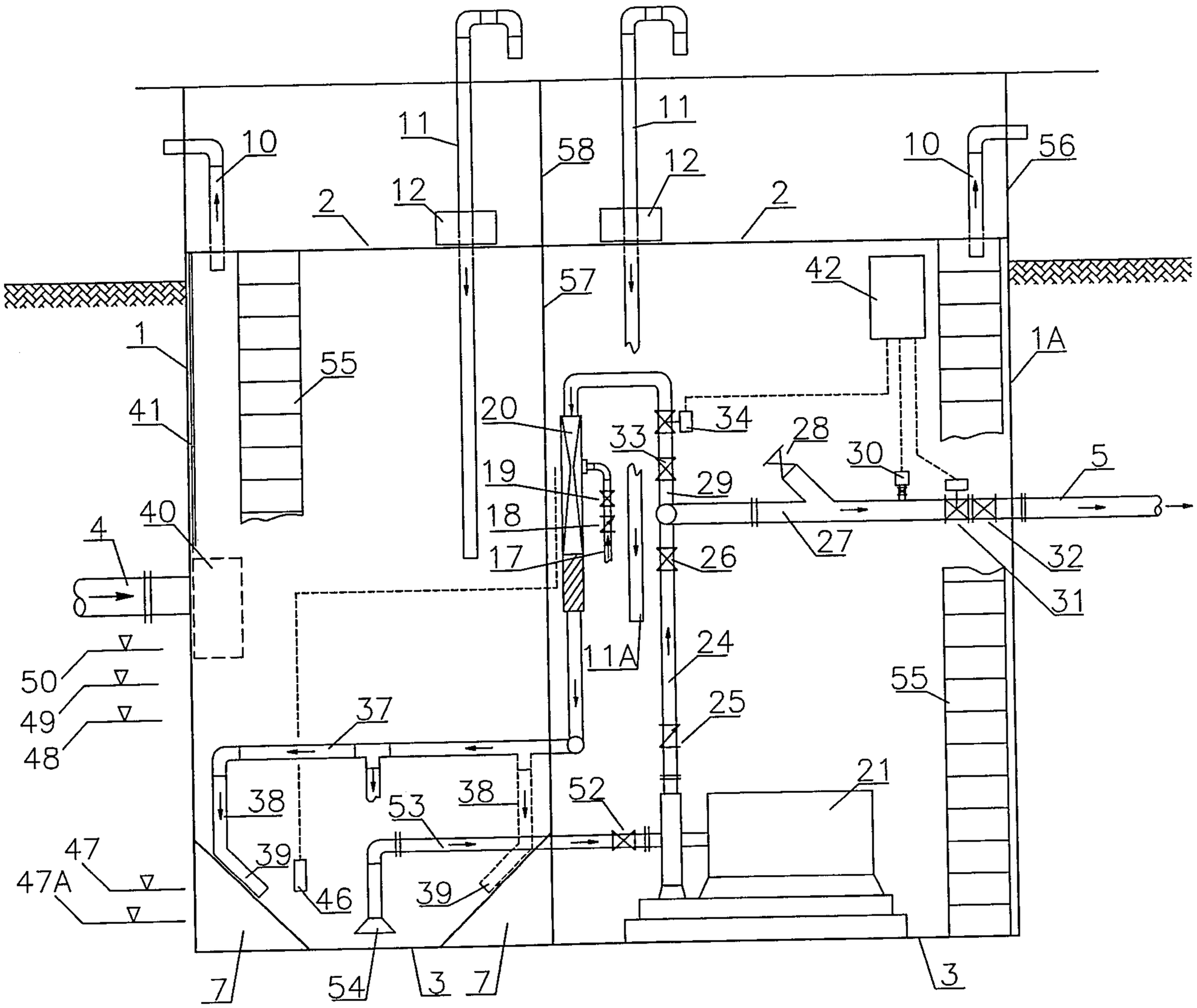
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FIG.3

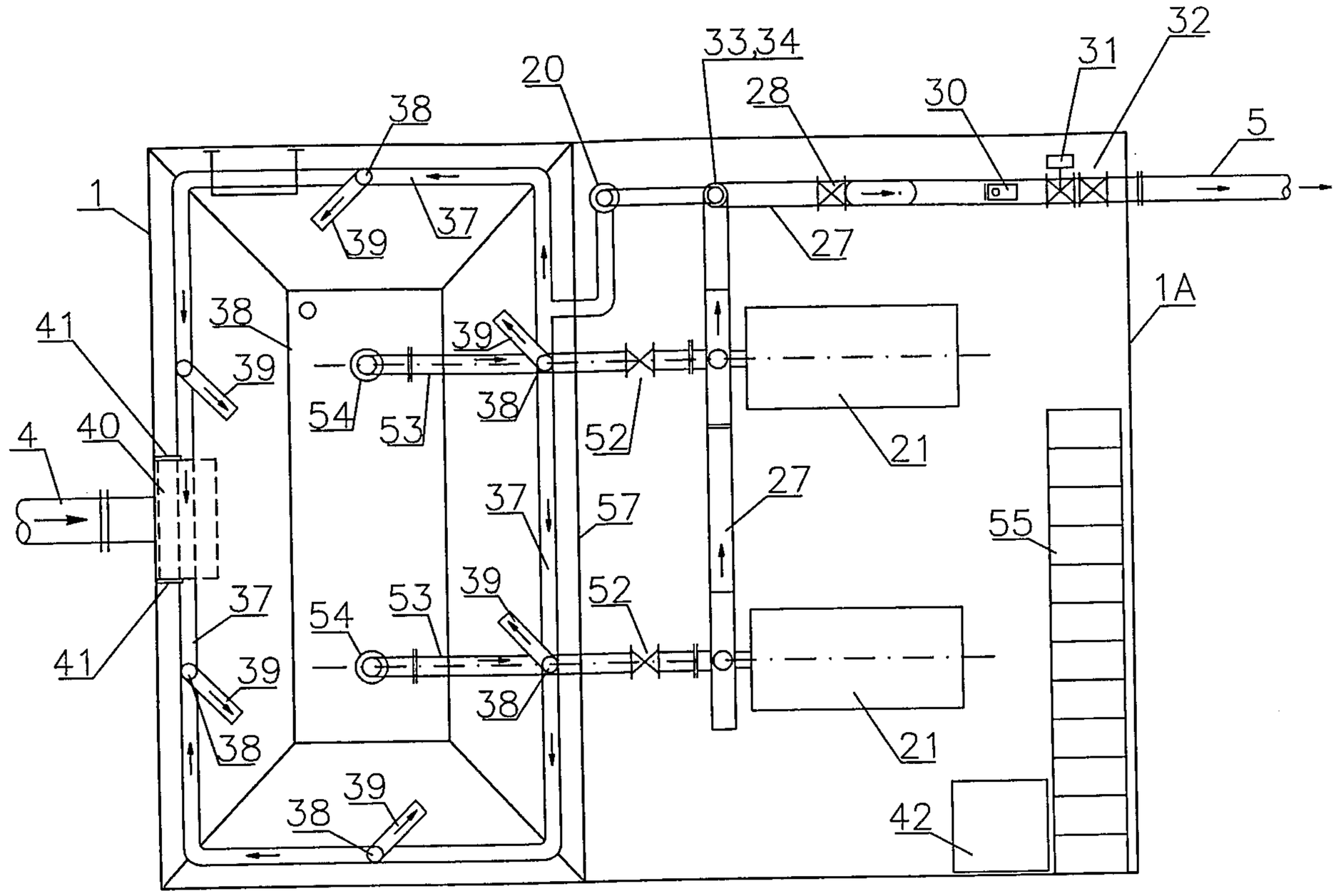

FIG.4