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(54) **High pressure cleaning device**

(57) The invention relates to a system of spraying of the disinfectant and against fermentation product, in the liquid state, which is used in the chemical/biological portable restrooms.

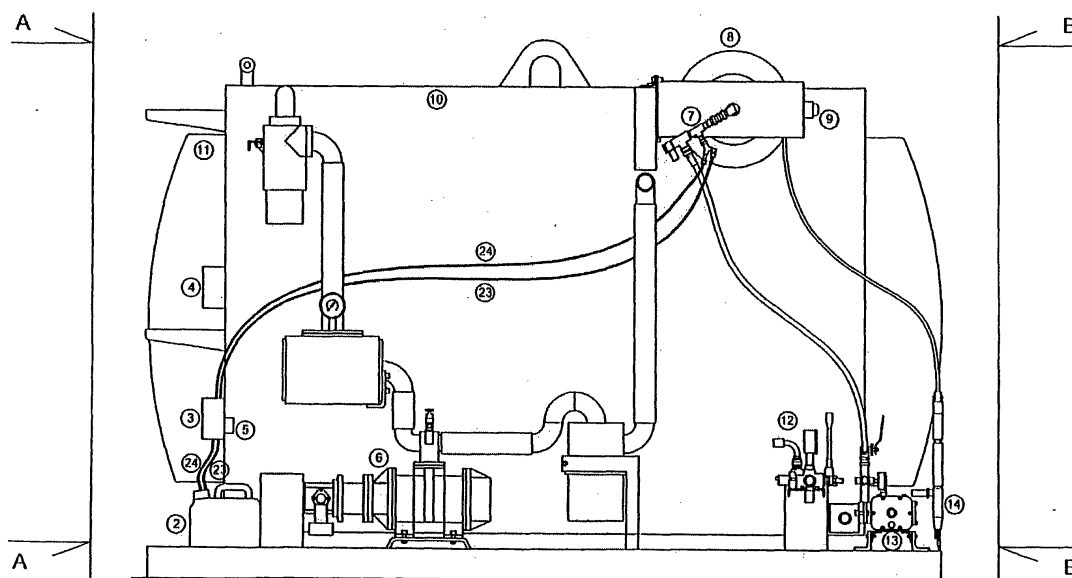
The system is interfaced to the equipment suitable for the portable restrooms cleaning and pumping that is present in the service vehicles, used, precisely, for the assistance of pumping and cleaning on these portable restrooms.

The peculiarity of the interfacing is constituted by the

advantage of using the high-pressure circuit water present on such pumping and cleaning equipment, without it being necessary to build an autonomous circuit for ensuring the removal of the fluid from the tank and spraying it inside the portable toilets septic tank.

The invention in topic, also has the advantage, compared to the manual systems currently used, of power perform the operation of spraying in a very short time (20 seconds approximately, instead of few minutes) and without waste of liquid.

Drawing 1: frontal view of the pumper-cleaner portable restroom equipment



Description

1 - INTRODUCTION ON THE ECOLOGICAL PORTABLE TOILETS (CHEMICAL/BIOLOGICAL OPERATION)

[0001] The ecological portable toilets chemical functioning (also known as chemical toilets) are toilet facilities, with dimensions similar to those of a telephone booth (about 1 mt to 2.20 mt in height), which operate without connections to water and sewerage lines and are easily installables/uninstallable because don't require any building work - hence the name "portable toilets".

[0002] Within each mobile portable toilet is present a watertight septic tank, having a capacity that varies, depending on the models, from 170 to 300 lt., and that is directly connected with the cup toilet, from which it receives the manure.

[0003] To work, the portable toilet needs supply of 15-20 liters of clean water, with added disinfectant/against fermentation product (based on quaternary ammonium salts¹), normally of blue color and fragrant, which has the function to stop the fermentation of manure that gradually are going to flow into the tank.

[0004] By using the portable toilet, manure flow together directly in the tank wastewater aforesaid through one "gravitational flush gravitational"² - without the aid of the mechanical force of the water, but simply to gravitational fall. This allows significant savings in clean water: for a complete cycle (350 uses approximately) you can save 6,000 liters of clean water - and one has also a corresponding lesser amount of liquid waste to be disposed of.

[0005] The portable toilet is called "ecological" precisely because it enables remarkable savings in clean water.

[0006] The usability of portable toilets in question involves the need of the following operations:

a) (at installation) The bathroom furniture is put into operation with the 'supply of disinfectant-water solution in the waste tank and other consumables, such as toilet paper, hand sanitizer, etc.. etc..;

b) (during operation) should be carried out periodically (weekly, minimum, but also daily), the periodical pumping-cleaning service that generally include the following operations:

b1) aspiration of liquid waste generated by the use of the portable toilet and accumulated in the effluent tank of the same;

b2) cleaning and disinfection of the cabin with washing internal and external carried out with jets of water at high pressure, additived of detergent-disinfectant, or with jets of hot water (100 °C) and high pressure (70 atm), with the possible addition of disinfectants;

b3) restoration of supplies (toilet paper, hand sanitizer, etc..), and placing inside the septic

tank, a 15/20 lt. clean water and a few grams (15 to 100, depending) of disinfectant/against fermentation product (blue, usually);

b4) maintenance of the toilet cabind and its components and / or accessories (replacement of worn parts, tighten screws etc. etc.);

b5) transportation of the sewage collected, until the authorized plant operations for disposal / recovery³;

b6) operation of disposal / recovery of sewage;

c) (at unistallation) before loading the portable toilet on the vehicle, you must make a pumping-cleaning operation on it, but without restoring the material consumption and without entering water and disinfectant / against fermantion product inside the toilet tank.

2 - PLACING THE DISINFECTANT-RETARDANT PRODUCT IN THE PORTABLE RESTROOMS SEPTIC TANK (WORKING CHEMICAL / BIOLOGICAL) - CRITICALS.

[0007] Every time you need to enter the disinfectant-retardant product in the effluent tank of each mobile toilet - and this happens during installation and in-drain cleaning work during the period of the toilet operation - it presents a particularly critical where, such product, is used in the liquid state.

2.1 - DOSAGE CRITICAL

[0008] First, the initial problem is constituted by the dosage, which varies depending on the capacity of the tank, the intended use and of the interval time between an intervention of pumping-cleaning and the next. Usually, the smarter operators, use various tricks, like the use of dispensers with pre-calibrated pumps or scoops, but the measurement accuracy depends entirely on the skill of the individual worker and the time and concentration that they can devote at this stage of the process.

[0009] This means that often incurs lower doses, compromising the hygiene of the bathroom cabinet, or overdose that determine significant risings costs of management (keep in mind that the lowest dose for each intervention / bath of these chemicals / biological amounted to tens of cents!).

2.2 - CRITICAL HANDLING

[0010] The placing of the liquid product inside the tank of the mobile toilet involves different handlings.

[0011] Normally, the product liquid is contained in plastic packaging (bins), capable of seating some liters (from 3 to 10 lt.), which are positioned on board of the truck of service.

[0012] Therefore, every time he goes entered the product inside the tank of the toilet (or of the toilets, if it comes to a battery of more toilets positioned in the same point),

the worker will have to take the bin from the truck, carry it by hand until inside the bathroom cabinet and pour, with the aforementioned assay systems, the "right" amount of liquid and then place the bin at the edge of the truck.

[0013] This, of course, takes time (several minutes), if that is multiplied by "n" toilets to serve in a day, will result in several tens of minutes per day for each operator, meaning tens of hours for each worker per year; if a company has several workers, this means that there will be "N" labor hours devoted simply handling the transaction under consideration here, which shall be equal to substantial labor costs which will be added to the cost of the liquid product in the closed sense.

2.3 - CRITICAL OF THE DRIP/SPREADING

[0014] The handling of the bin containing the disinfectant/against fermentation product involves, always, a significant drip/spill.

[0015] This translates into an economic expenditure not indifferent, as well as in staining of the clothing of workers, the surface of the toilet and of the exterior floor.

3 - PLACING THE DISINFECTANT/RETARDANT PRODUCT INTO THE PORTABLE TOILETS SEPTIC TANK (CHEMICAL/ / BIOLOGICAL WORKING) - SOLUTION: "DOSAFACILE".

[0016] The present invention allows you to limit considerably, if not even to eliminate entirely, the critical moment ago mentioned and is easily applicable to the equipments type used for the pumping-cleaning of the portable toilets.

[0017] It is a device that, by exploiting the same high pressure washing pipelin, allows, upon operator input, to do flow out, from the same spear-cannula used for spraying the clean water inside the septic tank, the exact quantity of disinfectant-against fermentation product, in a few seconds.

[0018] Is then dropped the whole sequence above highlighted (outlet of the bin from the truck-spill product inside the septic tank-repositioning of the bin inside of the truck etc. etc.), with consequent elimination of all the critical issues already highlighted.

3.1- DOSAFACILE - COMPONENTS

[0019] The device invented, has been conceived to be able to be interfaced to the most common equipment used for the pumping-cleaning of the portable toilets - see front view in **drawing 1** and side views in **drawing 2** -, which are equipped with plant for the water wash to high pressure.

[0020] Provided, however, are used spears of washing equipped with double cannulas - **drawing 3, particular 14** -, so you can opt for differentiated pressures and flow dispensing - usually on uses a cannula (the one with pro-

vision, for a greater pressure) for the washing of the cabin we and the other tube (the one with a lower delivery pressure - no more than 10 atm -, but with greater capacity) for entering the clean water (15-20 liters approximately) inside the tank in the bathroom cabinet.

[0021] The system, perfectly interfaceable, is constituted by the following elements:

- 1) Container of the disinfectant / against fermentation liquid (the one that is placed inside the tank to keep under control the manure) - in **drawing 2, side view AA** is to the left, marked with the number (1);
- 2) Container of another any fluid to be sprayed (the one that can possibly be used for cleansing, the sanitizing or the fragancing of the cabin toilet and of all its components) - in **drawing 2, side view AA** is the right one, marked with the number (2);
- 3) Conduct liaison between the container referred to in point 1) and the conduct of high pressure - **drawing 2, side view AA**, marked with the same number;
- 4) Conduct liaison between the container referred to in item 2) and the conduct of high pressure - **drawing 1**, marked with the **number 24**, and in **drawing 2, side view AA**, marked with the same number;
- 5) Solenoid - cf. **drawing 3**, particular 3, marked with the numbers 16 and 18 -, housed inside the box solenoid valves, which have the function to open the flow of the duct that connects the container to the high pressure water circuit. They recede the electrical impulse from the timer placed inside the control unit (paragraph 11). Solenoid should be mounted as there are many containers of fluid to be connected to conduct high pressure - in the prototype, since there are two fluid containers were provided for two solenoid valves;
- 6) Flow regulators, solenoid valves housed inside the box - cf. **drawing 3**, particular 3, marked with the numbers 17 and 19 -, having the function of limiting the flow of liquid, taken from each individual container, to be placed in the condota at high pressure. It is mounted a flow regulator for each solenoid valve and goes inserted after the same;
- 7) Ejector - cf. **drawing 1**, marked with the number 7 - grafted in the conduct of high pressure and connected with the conduct coming from the container of the fluid to be sprayed. The function of the ejector is to allow the entrance of the fluid within the duct of the water at high pressure and that will be towed by the force of suction exerted by the latter;
- 8) Remote control - cf. **drawing 3**, marked with the special 15 - with the hand control to send commands through the controller referred to in paragraph 11, the solenoid valves in point 5); each button corresponds to a certain amount of product to be sprayed through the conduct of 'high pressure. In the prototype are four buttons: three are used to activate three different doses of the disinfectant / against fermen-

tation product and one to activate a single dose of any other fluid;

9) Horn - cf. **drawing 1**, marked with the number 5 -, which serves to give the evidence of the efficacy of the commands given by the operator. The acoustic signals are varied for each type of operation, selectable from the telecomando.

10) Visual warning - see **drwaing 1**, marked with the number 9 -, having the same functions as the acoustic one, referred to in paragraph 9), gives visual signals differentiated by color and / or frequency;

11) Electrical Box - cf. **drawing 2, side view AA**, marked with the number 4 - for the actuation of the various components of this device. The inputs received from the remote control unit, referred to in paragraph 8, depending on which button pressed, the control unit inside the electrical impulse is sent to one of the timers which will open for the time planned, the 'solenoid. The joint action of timer, solenoid and of the flow regulator allow the inflow of the predetermined dose of liquid product to be sprayed through the conduct of high pressure. Together with the pulses sent to the timers, you will receive the pulses and to the audible and visual alarms.

3.2 - DOSAFACILE - WORKING

[0022] After that was done the washing of the toilet cabin and the pumping of the tank waste, in addition to the restoration of consumables, such as toilet paper, hand sanitizer, etc., must enter 15-20 lt. of clean water inside the tank wastewater and add a certain amount of disinfectant product / antifermentativo above said.

[0023] However, the operator, after having finished the washing operation of the cabin, before you enter the water and the liquid aforesaid in the tank, and without deactivating the operation of the high-pressure water conduct, will have to operate a suitable lever / dial - cf. **drawing 3, particular 14**, marked with the number 20 -, placed in the washing nozzle, which determines the deviation of the water flow from the cannula at increased pressure (used for washing of the cab) to that of less pressure. Consequently the pressure in the fall to below 10 atm, making possible the operation of the injection of the fluid that want to enter it.

[0024] Then the operator will take the remote control - cf. **drawing 3**, marked with the particular 15 - and would type on the button corresponding to the quantity of product to enter (in the experiment have been prepared 4 numbered buttons progressively, three of which, corresponding to three different dosages of the product disinfectant / antifermentative, one for the dosage of possible further fluid.

[0025] After pressing the button selected, the control unit - cf. **Drawing 2**, side view AA, marked with the number 4 - will operate the solenoid - cf. **drawing 3**, particular 3, marked with the number 16 - which, in turn,

will open the link between the container of the fluid and the conduct of high pressure, through the intermediary of the ejector.

[0026] Within seconds, into the tank of the toilet you enter the correct amount of water (15 or 20 lt.) and disinfectant / against fermentation product.

[0027] The entire phase will require, roughly, from ten to twenty seconds, depending on the operation performed, and the remote metering system turns off automatically. Resulting in restoration of normal flow of water only in the circuit of 'high pressure.

[0028] Then, the operator, at this point, can stop also the functioning of the water at high pressure, or he can leave it active and raise the pressure again above the 10 atmospheres, after actuation of the knob - cf. **drawing 3**, especially 14, marked with number 20.

3.3 - DOSAFACILE - DRAWINGS

[0029] For a better intelligence of the present description have been realized 4 drawings:

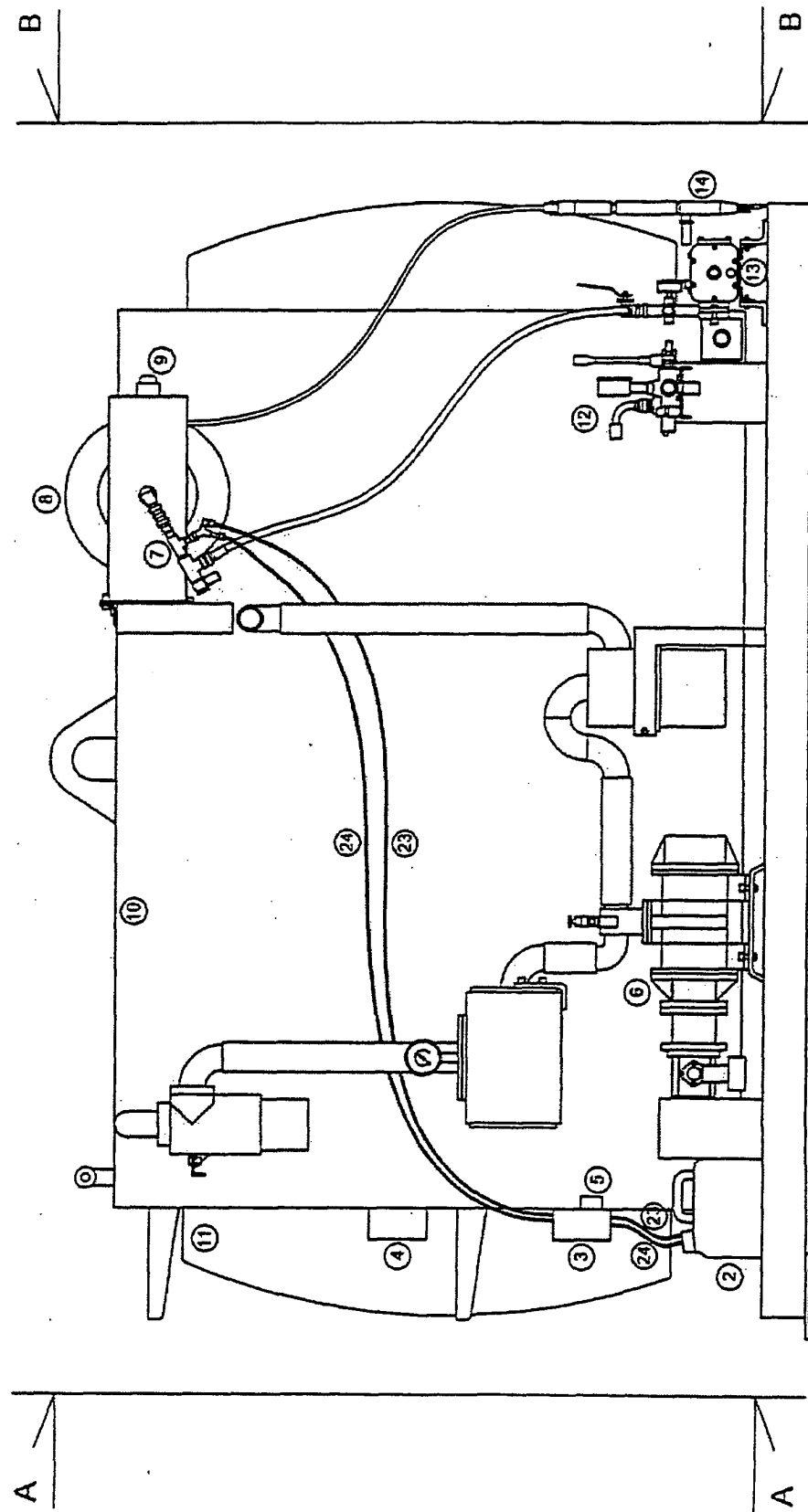
- DRAWING 1: PORTABLE RESTROOMS PUMP-
ING-CLEANING EQUIPMENT FRONT VIEW;
- DRWAING 2: PORTABEL RESTROOMS PUMP-
ING-CLEANING EQUIPMENT SIDE VIEW:
- DRAWING 3: SPECIAL TO SCALE MORE
- DRAWING 4: DIAGRAM OF HYDRAULIC / ELEC-
TRIC

[0030] Within these designs, the main components are marked by the following numbers: 1) Disinfectant/against fermentation liquid container; 2) Any other do spray container; 3) solenoid housing; 4) electrical box; 5) horn; 6) Vacuum pump for the suction of sewage; 7) ejector; 8) reel; 9) visual warning; 10) clean water tank; 11) slurry storage aspirated; 12) Distributor of lever control to operate the hydraulic pump for the high-pressure washing and for the placing of the water at low pressure or to operate the vacuum pump for the suction of liquam; 13) Hydraulic pump for the high-pressure washing and for the placing of the water at low pressure; 14) Lancia with double cannulas, the first high-pressure and the second at low pressure; 15) Remote control; 16) Solenoid valve connected to the circuit of the disinfectant / antifermentative liquid; 17) Flow regulator connected to the circuit of the liquid disinfectant / antifermentative; 18) Solenoid valve connected to the circuit of another any fluid to be sprayed; 19) Flow regulator connected to the circuit of another any fluid to be sprayed; 20) Lever / knob opening of the circuit at low pressure placed on the cannula at low pressure and relative cannula at low pressure; 21) Cannula at high pressure; 22) Manometer pressure control; 23) Conduct of connection of the disinfectant / antifermentative liquid; 24) Conduct of connection of another any fluid to be sprayed.

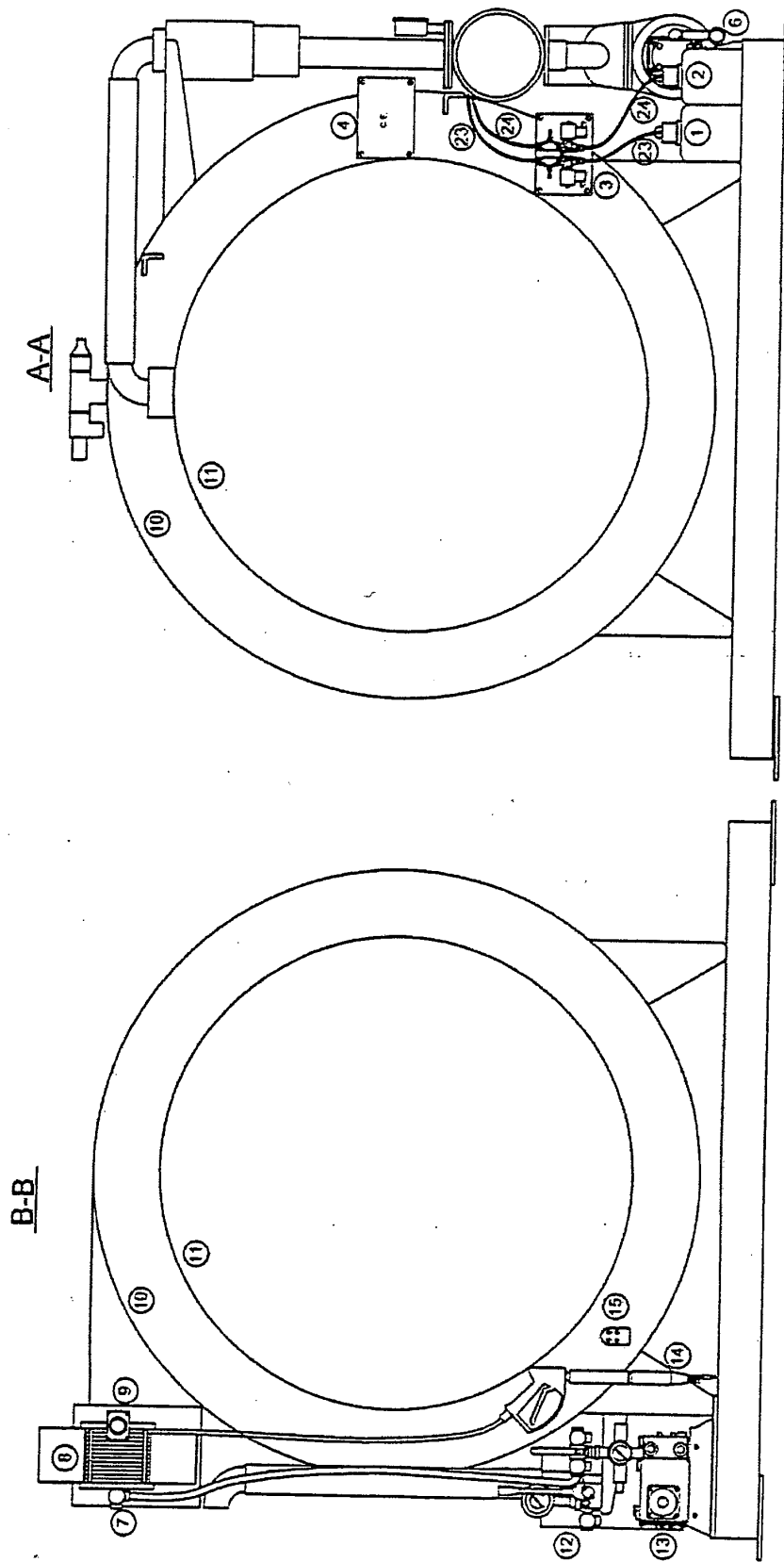
Claims

1. System for spraying, in the septic tank of portable toilets, of the chemical / biological product with disinfectant / antifermentative function, in the liquid state, through the use of the high-pressure water circuit of the equipment suitable for the pumping-cleaning of the same which is accommodated on the truck / trailer / cart of service. It's **characterized by** the use of an ejector that allows the placing in high pressure water circuit at in a specific quantity of product chemical / biological aforesaid, the prior momentary lowering of the pressure, activated by a knob located in the washing nozzle, fitted with double canula (one for the supply of water at high pressure, the other for the supply of water at low pressure), and contextual opening of the flow from the collection container toward the graft (ejector) of the circuit of 'high pressure, through the actuation of a remote control that, by sending a radio transmission to the control unit, actuates, through a special timer, the solenoid valve for a certain time, preset, and the amount of liquid is also limited flow regulator - for each preset amount of fluid, you need a timer.
2. Spraying system of claim 1, where in you can enter into the high pressure further water circuit, fluids (disinfectant / detergent / perfume etc.). For each fluid must be added the additional components (container, pipe connecting the ejector, solenoid valve, timer and flow control) and the ejector must have so many ways as there are input fluids to enter.

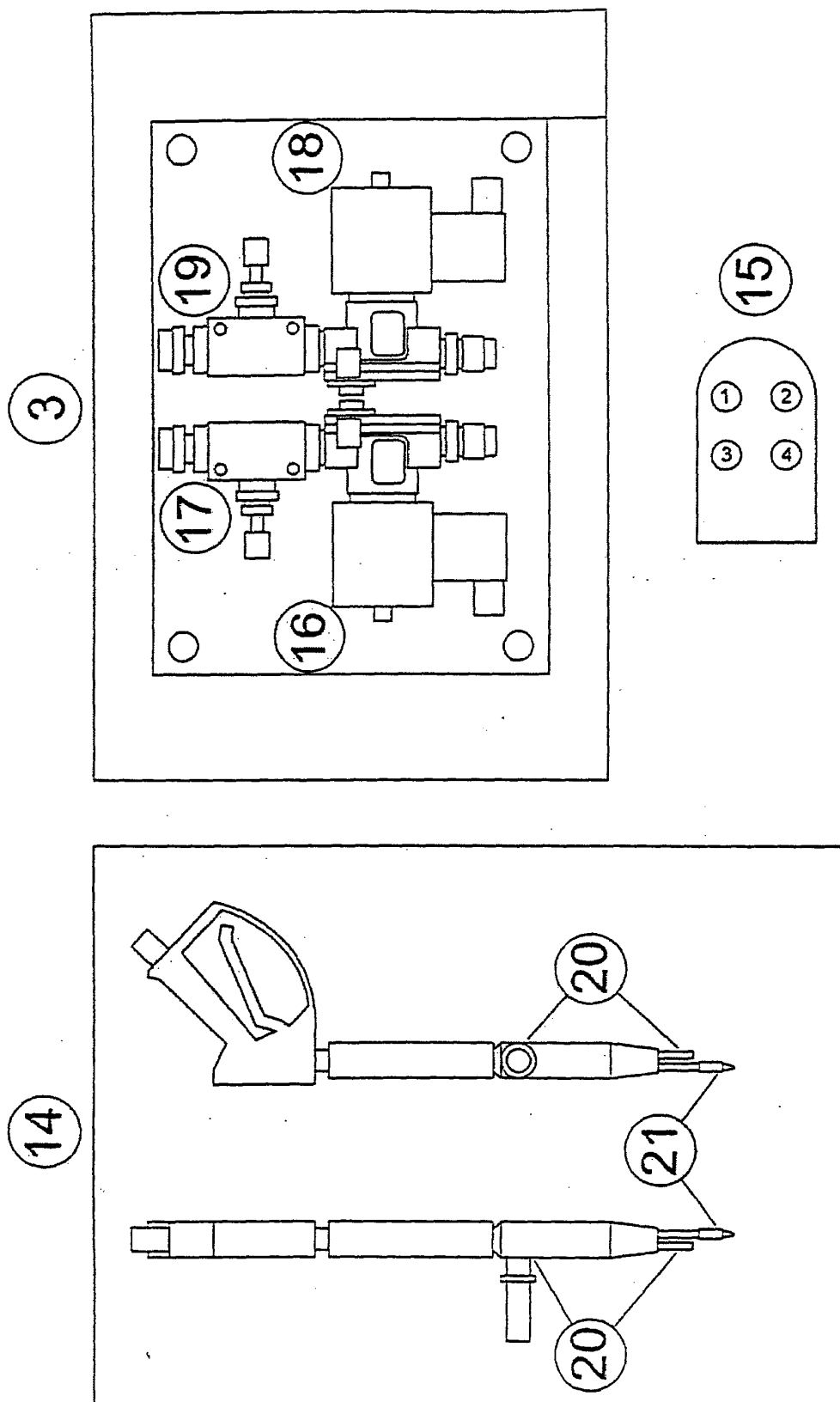
Drawing 1: frontal view of the pumper-cleaner portable restroom equipment



Drawing 2: lateral views of the pumper-cleaner portable restroom equipment



Drawing 3: details on a larger scale



Drawing 4: hydraulic/electrical scheme

