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(54) **GREY WATER PROCESSING AND DISTRIBUTION SYSTEM**

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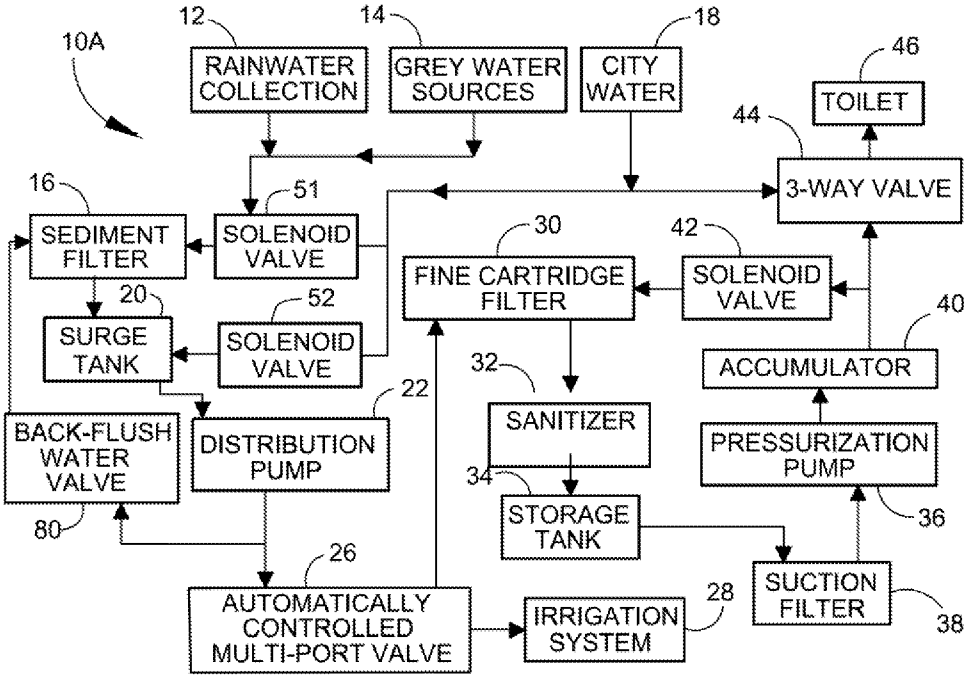
(57) **ABSTRACT**

The Grey Water Processing and Distribution System is a self-contained fully functional grey water collection, processing and dispersing system that runs on grey water collected from internal grey water sources and supplies filtered water to the house's landscaping irrigation system as well as filtered and sanitized flush water to the house's toilets and washing machine for usage and requires standard local power. It incorporates a unique self-cleaning fine screen filter system. The central digital control unit monitors and runs the various system components and manages the house's landscaping irrigation system. The digital control unit also makes sure that the toilets are never without flush water and protects the irrigation system against under and over watering. The internal and external plumbing also allows for the system to be completely bypassed in the event of power failure or the introduction of undesirable contaminants into the grey water source stream.



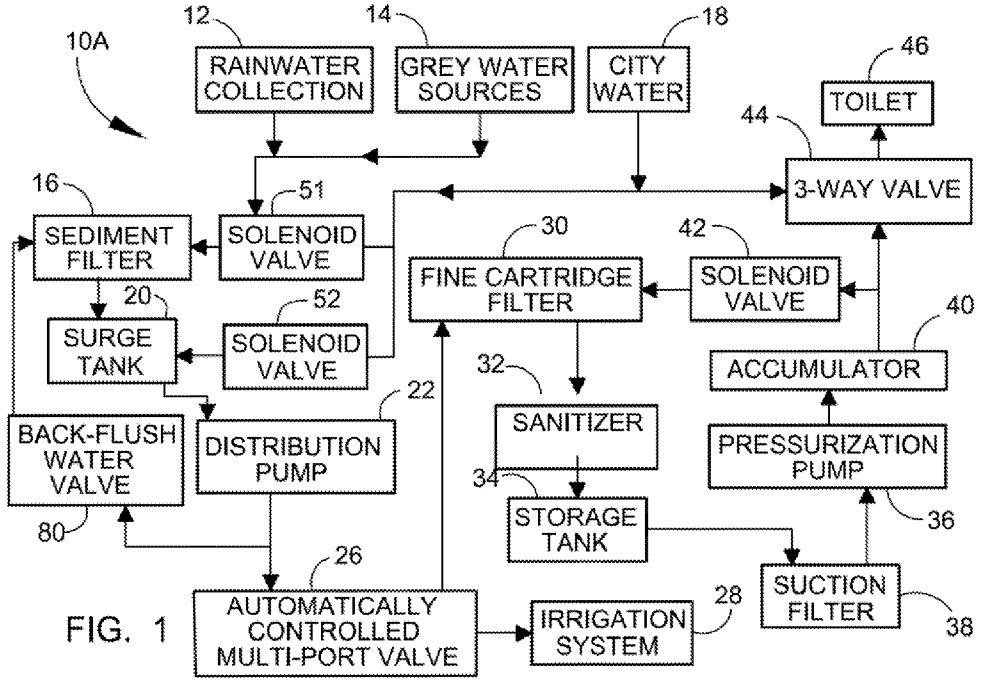
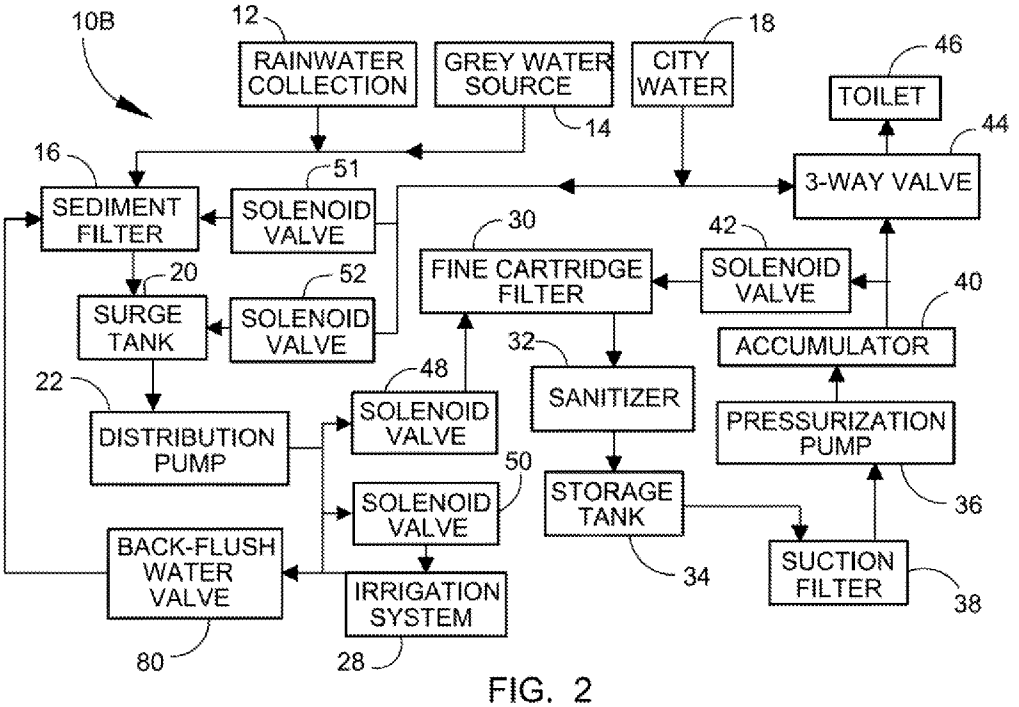

10A
12
RAINWATER COLLECTION
14
GREY WATER SOURCES
18
CITY WATER
46
TOILET
44
3-WAY VALVE
16
SEDIMENT FILTER
51
SOLENOID VALVE
30
FINE CARTRIDGE FILTER
42
SOLENOID VALVE
20
SURGE TANK
52
SOLENOID VALVE
40
ACCUMULATOR
32
SANITIZER
22
BACK-FLUSH WATER VALVE
DISTRIBUTION PUMP
PRESSURIZATION PUMP
34
STORAGE TANK
36
80
26
SUCTION FILTER
38
AUTOMATICALLY CONTROLLED MULTI-PORT VALVE
IRRIGATION SYSTEM
28

FIG. 1


10B
12
RAINWATER COLLECTION
GREY WATER SOURCE
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18
CITY WATER
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TOILET
44
3-WAY VALVE
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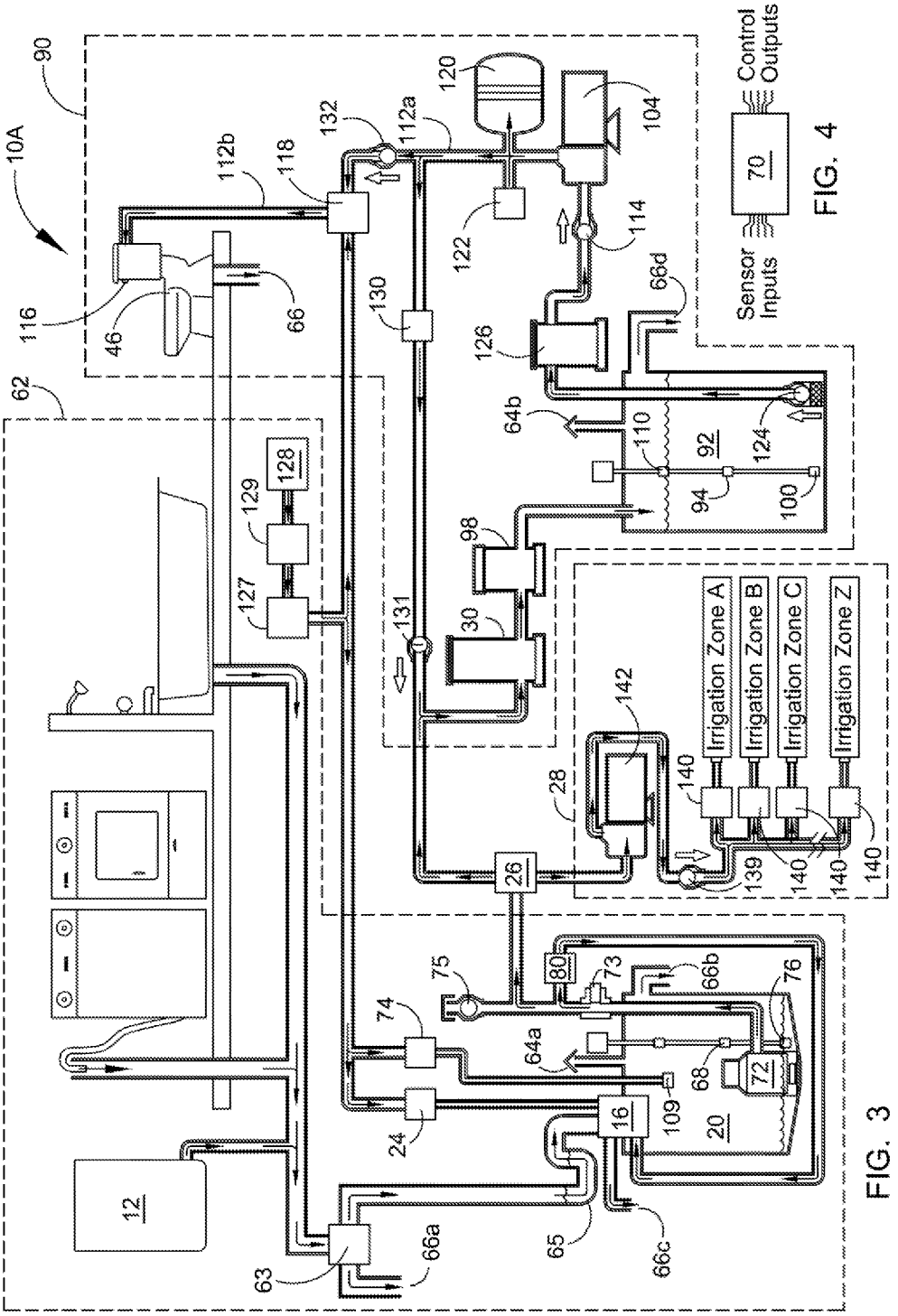
SEDIMENT FILTER
51
SOLENOID VALVE
30
FINE CARTRIDGE FILTER
42
SOLENOID VALVE
20
SURGE TANK
52
SOLENOID VALVE
40
ACCUMULATOR
32
SANITIZER
48
SOLENOID VALVE
22
DISTRIBUTION PUMP
PRESSURIZATION PUMP
50
SOLENOID VALVE
STORAGE TANK
36
BACK-FLUSH WATER VALVE
34
SUCTION FILTER
38
IRRIGATION SYSTEM
80
28

FIG. 2


10A
90
62
116
46
66
112b
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132
112a
120
104
122
114
130
66d
126
64b
110
92
124
94
100
98
30
131
127
129
128
142
140
28
26
Irrigation Zone A
Irrigation Zone B
Irrigation Zone C
Irrigation Zone Z
139
140
75
74
80
73
66b
76
64a
68
72
109
16
20
24
12
63
66a
65
66c
Control Outputs
70
Sensor Inputs

FIG. 4

FIG. 3

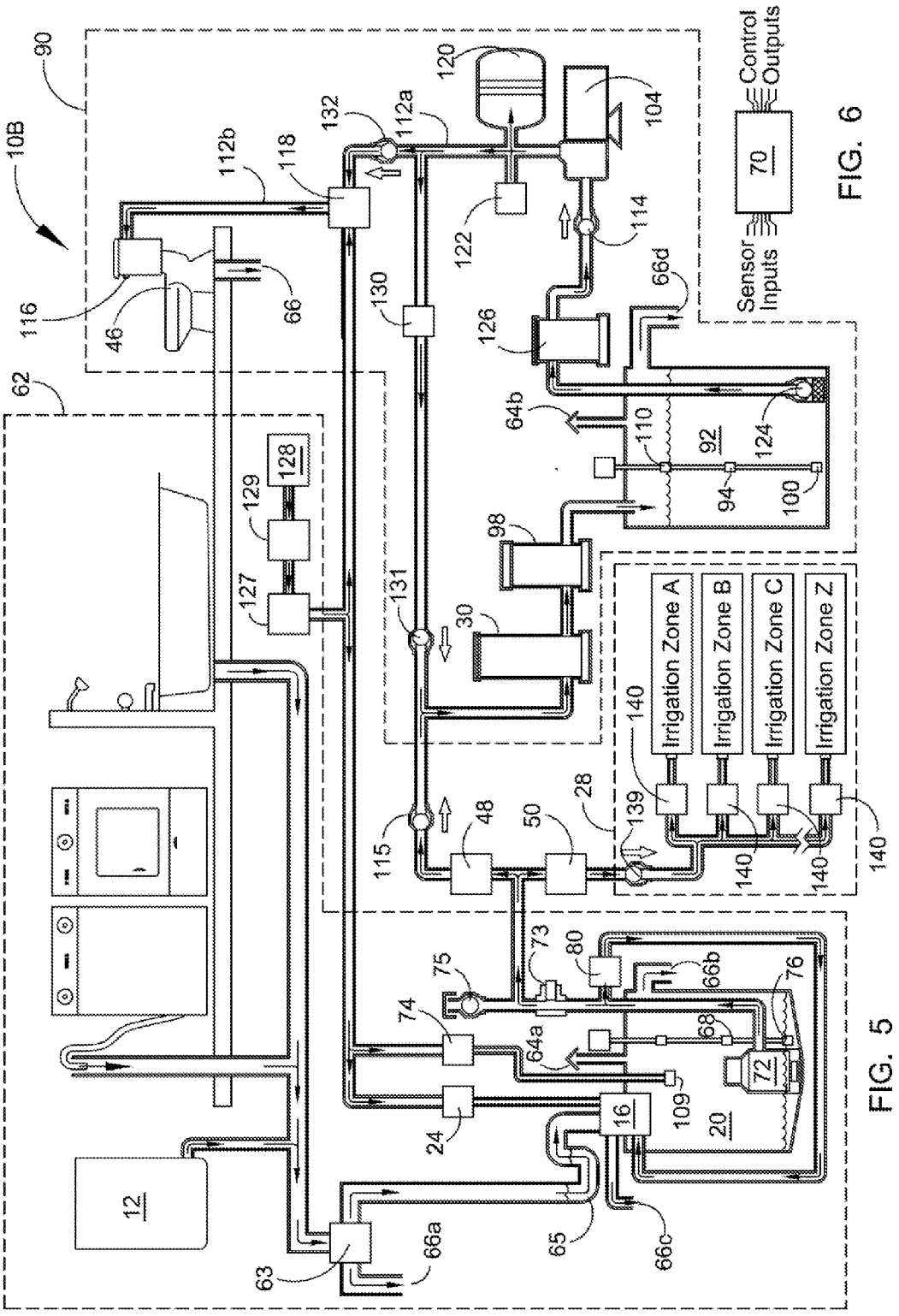

10B
90
62
116
46
66
112b
118
132
112a
120
104
122
114
130
126
66d
64b
110
92
124
94
100
98
131
30
128
129
127
Control Outputs
70
Sensor Inputs
Irrigation Zone A
Irrigation Zone B
Irrigation Zone C
Irrigation Zone Z
140
139
28
48
50
115
73
80
66b
76
75
74
64a
68
72
109
20
16
24
12
63
66a
65
66c

FIG. 6

FIG. 5

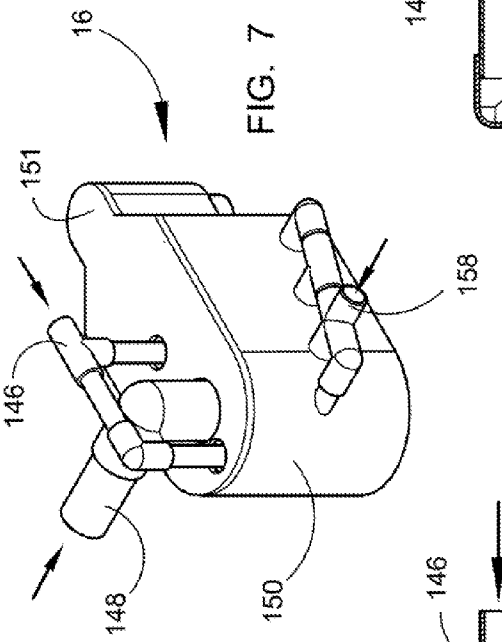


FIG. 7

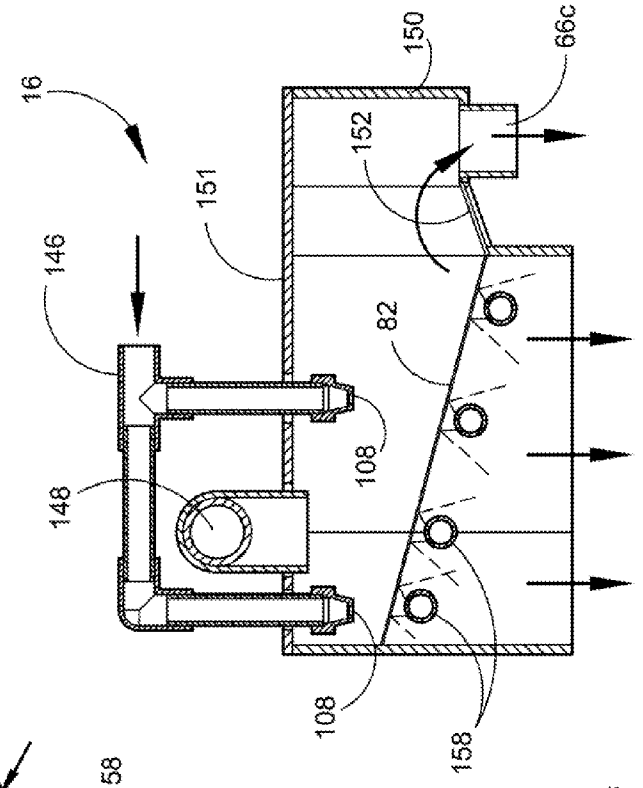


FIG. 9

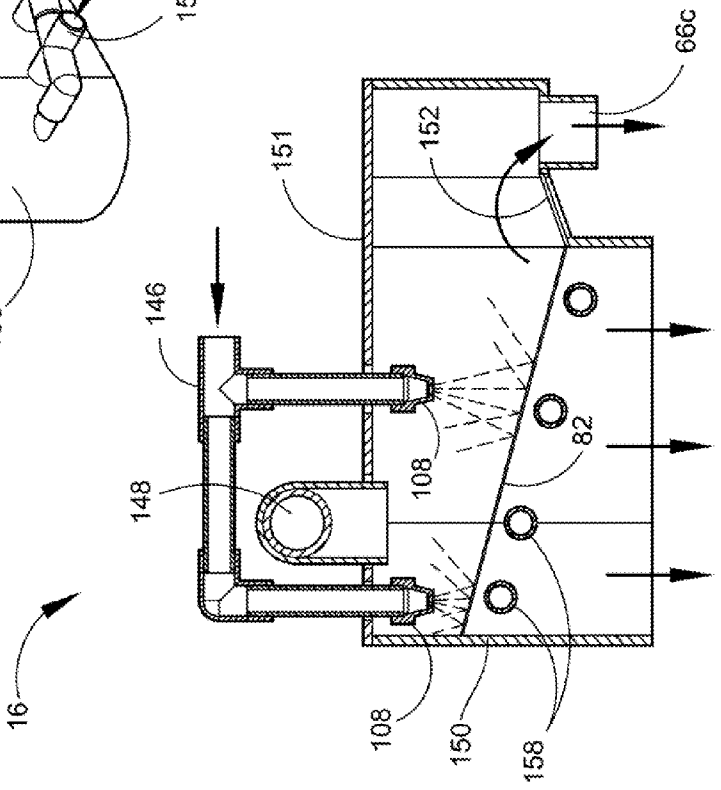


FIG. 8

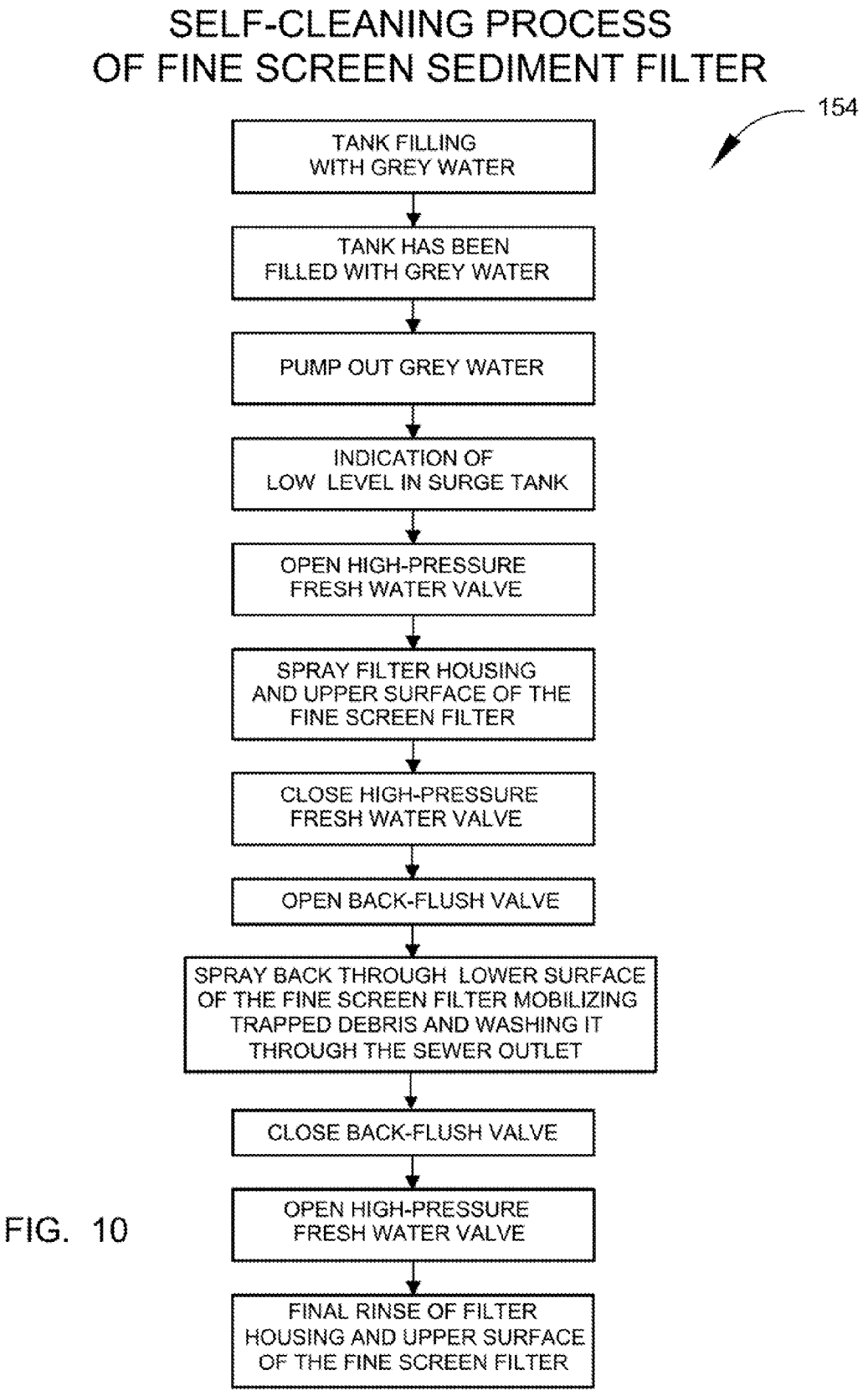
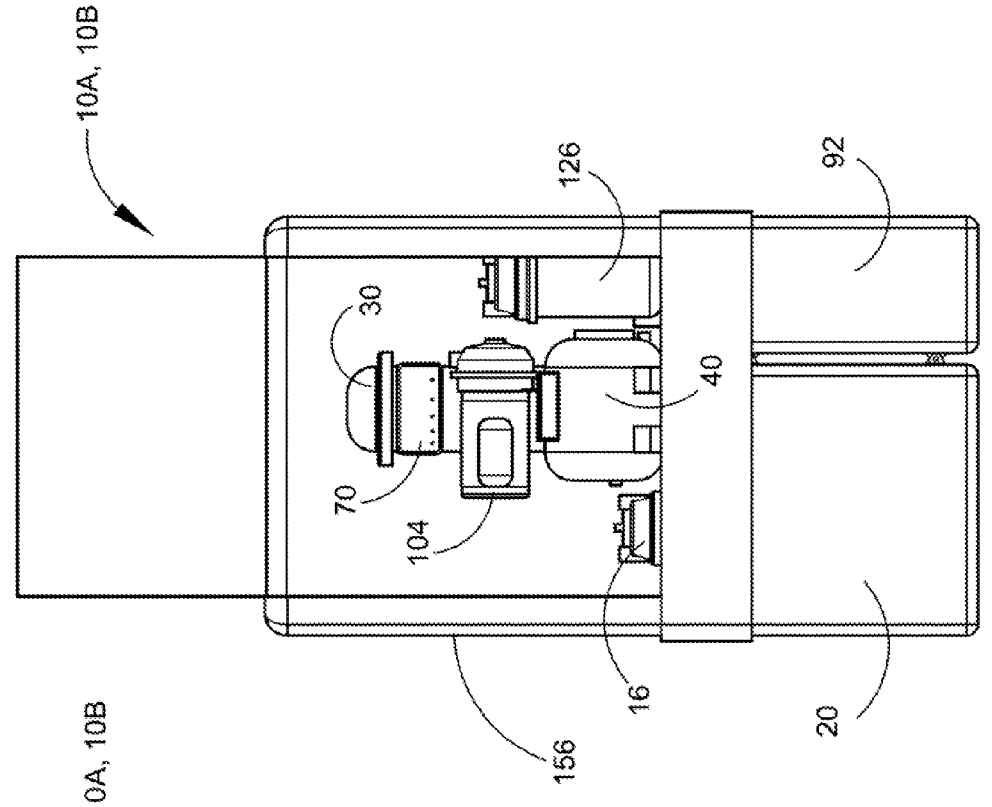

SELF-CLEANING PROCESS
OF FINE SCREEN SEDIMENT FILTER
154
TANK FILLING WITH GREY WATER
TANK HAS BEEN FILLED WITH GREY WATER
PUMP OUT GREY WATER
INDICATION OF LOW LEVEL IN SURGE TANK
OPEN HIGH-PRESSURE FRESH WATER VALVE
SPRAY FILTER HOUSING AND UPPER SURFACE OF THE FINE SCREEN FILTER
CLOSE HIGH-PRESSURE FRESH WATER VALVE
OPEN BACK-FLUSH VALVE
SPRAY BACK THROUGH LOWER SURFACE OF THE FINE SCREEN FILTER MOBILIZING TRAPPED DEBRIS AND WASHING IT THROUGH THE SEWER OUTLET
CLOSE BACK-FLUSH VALVE
OPEN HIGH-PRESSURE FRESH WATER VALVE
FINAL RINSE OF FILTER HOUSING AND UPPER SURFACE OF THE FINE SCREEN FILTER

FIG. 10


10A, 10B
126
92
30
40
70
104
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156
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FIG. 12

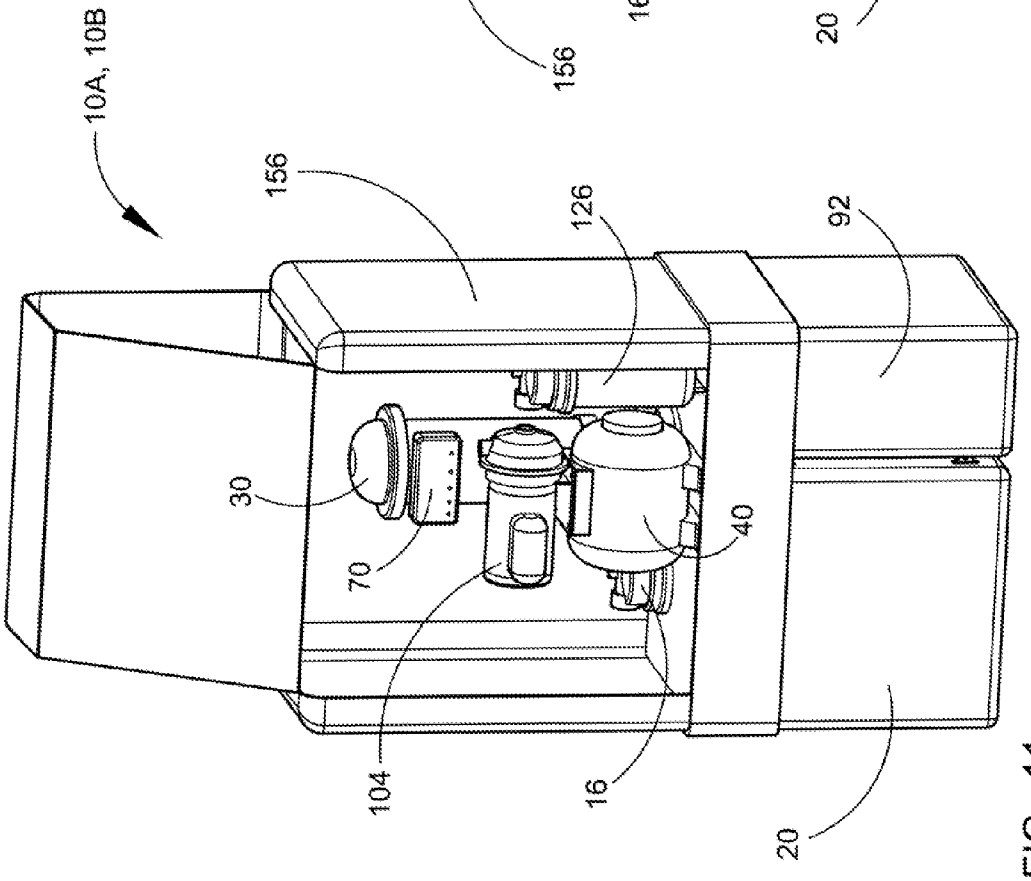
10A, 10B
156
126
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FIG. 11

GREY WATER PROCESSING AND DISTRIBUTION SYSTEM

FIELD OF THE INVENTION

[0001] The present invention provides a system and method which collects grey water and processes it to supply water of sufficient quality for specific reuse purposes. In particular, the system and method comprising a grey water and rainwater source collection sub-system, a digital control unit having input sensors to detect water levels, water flow, water pressure and having control outputs to control integrated pumps and valves, an automatically controlled multi-port valve, an irrigation sub-system and a toilet flush water sub-system.

BACKGROUND OF THE INVENTION

[0002] Grey water is a part of the residential buildings waste water without black water. Black water is part of the household waste water and is the drain from toilets therefore containing urine and/or feces. It is the grey water that drains from bath tubs and shower trays, washbasins and washing machines and may also contain high-strength kitchen waste waters that are significant within this application. The least concentrated flows of the available household waste waters are especially appropriate for grey water recycling.

[0003] Dish, shower, sink, and laundry water comprise 50-80% of residential "waste" water and this water if processed properly may be reused for other purposes. The key challenge is to separate grey water from black water (toilet water) in the collecting of different waste water as well as the supply of different water qualities, drinking water for kitchen, shower and sinks or recycled water for toilet flushing, washing machine and irrigation etc., by the means of the unique Grey Water Processing and Distribution System of this application.

[0004] It must be made clear at this time that residential buildings will include single family homes, apartments, along with a variety of other establishments producing grey water and will still remain within the scope of this application.

[0005] It is not wise to irrigate landscape with great quantities of drinking water when plants thrive on used water containing small bits of compost. Unlike a lot of ecological stopgap measures, grey water reuse is a part of the fundamental solution to many ecological and water availability problems.

[0006] With the intended application of the unique Grey Water Processing and Distribution System less energy and chemicals are used due to the reduced amount of both fresh water and waste water that needs pumping and treatment. For those providing their own water or electricity, the advantage of a reduced burden on the infrastructure is felt directly. Also, treating your waste water in the soil under your own fruit trees definitely encourages you to dump fewer toxic chemicals down the drain.

[0007] Not all water required in household, municipal or commercial applications has to have drinking water quality. By separating the different quality requirements you will find huge saving potentials in recycling grey water and reusing it over and over again.

[0008] Numerous innovations for grey water recycling have been provided in the prior art that are described as follows. Even though these innovations may be suitable for the specific individual purposes to which they address, they differ from the present design as hereinafter contrasted. The following is a summary of those prior art patents most relevant to this application at hand, as well as a description outlining the difference between the features of the Grey Water Processing and Distribution System and the prior art.

[0009] US Patent Application Publication No. US 2010/0122945 of David Williamson describes a grey water recycling system which uses a holding tank receiving waste water from a laundry facility. The holding tank has a pump for withdrawing water from said holding tank. A float, within said holding tank, is activated when a water level within said holding tank exceeds a pre-determined level. The pump communicates with a pressure tank. The pump used to fill and pressurize the pressure tank is activated when pressure within said pressure tank falls below a predetermined level and the float within said holding tank indicates that a water level within said holding tank exceeds a predetermined level.

[0010] This patent describes a grey water recycling system which uses a holding tank receiving waste water from only a laundry facility not including the sinks, shower, tub along with rain water collection. It also does not include passing the water through a unique self-cleaning fine screen filter system supplying irrigation water or through a filter and sanitizing means prior to pumping the water through a fine filter before being made available to fill the toilet or washing machine usage or returning it back through the system.

[0011] U.S. Pat. No. 7,121,292 of Peter G. Aylward et al. describes a method for providing a gray water reclamation system that includes connecting one or more gray water sources and one or more black water sources to a main drain line. A collection valve is also connected to the main drain line, the collection valve having (i) an inlet connected to the main drain line downstream from at least one of the black water sources, and (ii) an outlet connectable to either a gray water drain line or a black water drain line. A black water flow sensor is configured to detect water flow from a black water source, wherein the black water flow sensor is operable to transmit a black water event signal upon detecting water flow from the black water source, and wherein the collection valve is operable to connect the outlet to the black water drain line if the blackwater event signal is received thereby.

[0012] This patent describes a method for providing a gray water reclamation system with a number of valves and sensors detecting and diverting either gray water or black water but does make a specific use of the gray water. It does not include passing the water through a unique self-cleaning fine screen filter system supplying irrigation water or through a filter and sanitizing means prior to pumping the water through a fine filter before being made available for the toilet and washing machine usage or returning back through the system.

[0013] U.S. Pat. No. 6,132,138 of Larry Wayne Haese relates to a gray water recycling invention that utilizes filtered gray water for maintaining constant moisture levels in building foundations and for other irrigation uses. The invention allows for the mixture of pesticides with a gray water stream injected under a building in order to treat for insects. Additionally, pesticides, fungicides, or fertilizers can be injected into a gray water stream prior to its application in landscape irrigating. The invention has applications in both a single residence and large housing developments in a real estate setting, including duplexes, apartments, condominiums, etc.

[0014] This patent relates to a gray water recycling invention that utilizes filtered gray water for maintaining constant moisture levels in building foundations and for other irrigation uses. It does not include passing the water through a

unique self-cleaning fine screen filter system supplying irrigation water or through a filter and sanitizing means prior to pumping the water through a fine filter before being made available for the toilet and washing machine usage or returning back through the system.

[0015] U.S. Pat. No. 5,845,346 of Carl W. R. Johnson, Jr. describes an apparatus for utilizing gray water for flushing a toilet is provided including a holding tank with a top face, a bottom face, and a periphery formed there between thus defining an interior space. The holding tank has an inlet pipe connected to a source of gray water for receiving gray water there from. An outlet pipe is connected between the holding tank adjacent to the bottom face thereof and a toilet. A tee is situated on the outlet pipe between the holding tank and the toilet. The tee has an opening coupled to a water supply adapted to supply water of a first pressure. The tee further has a valve having a first orientation for allowing the flow of water only from the water supply to the toilet and a second orientation for allowing the flow of water only from the holding tank to the toilet. A pump is coupled to the outlet pipe between the holding tank and the compression tee. The pump is adapted to create a second pressure within the outlet pipe which is greater than the first pressure only during the presence of water within the holding tank.

[0016] Although this patent describes an apparatus for utilizing gray water for flushing a toilet it does not have the involved computer controlled system nor does it offer the capability of passing the water through a unique self-cleaning fine screen filter system supplying irrigation water or through a filter and sanitizing means prior to pumping the water through a fine filter before being made available to the toilet and washing machine usage or returning back through the system.

[0017] U.S. Pat. No. 5,759,387 of Robert D. Wilkes describes a grey water recovery system that comprises a filter tank having a filter medium therein. Grey water is delivered to the filter tank by a delivery conduit and filtered grey water is collected in a sump which surrounds the filter tank. A pump removes the filtrate to a distribution system for irrigation and similar use. The recovery system includes a backwash system. The backwash system has a flow responsive poppet valve which permits clean backwashing water and pressurized air to flow upwardly through the filter medium while closing the normal filtrate flow path to the sump.

[0018] This patent describes a grey water recovery system that comprises a filter tank having a filter medium therein but does not incorporate the unique self-cleaning fine screen filter system and does not incorporate the filters and sanitizing means before making use of the water.

[0019] U.S. Pat. No. 5,192,426 of Mare DeCoster et al. describes an invention that relates to a water reclamation system for reclaiming grey water and ground water from sources associated with a domestic dwelling and subsequently utilizing such water in conjunction with a landscape irrigation system. The system generally comprises a storage reservoir which is fluidly connected to a main irrigation line comprising the landscape irrigation system. The reservoir includes a number of inlet conduits connected thereto which are in fluid communication with grey water sources from within the dwelling and with yard drains which receive ground water. The reservoir also includes an overflow line interfaced thereto which is adapted to drain excess water from within the reservoir to a main sewage line. The water provided to the irrigation system via the storage reservoir is supplied only as an alternative to water which may be supplied thereto via a main water line.

[0020] This patent describes a water reclamation system for reclaiming grey water and ground water and utilizing such water in conjunction with a landscape irrigation system. This system does not deal with the use of the water directed to the toilet and does not incorporate the extensive computer controlled filtering processes.

[0021] None of these previous efforts, however, provides the benefits attendant with the Grey Water Processing and Distribution System. The present design achieves its intended purposes, objects and advantages over the prior art devices through a new, useful and unobvious combination of method steps and component elements, with the use of a minimum number of functioning parts, at a reasonable cost to manufacture, and by employing readily available materials.

[0022] In this respect, before explaining at least one embodiment of the present invention in detail it is to be understood that the design is not limited in its application to the details of construction and to the arrangement, of the components set forth in the following description or illustrated in the drawings. The Grey Water Processing and Distribution System is capable of other embodiments and of being practiced and carried out in various ways. In addition, it is to be understood that the phraseology and terminology employed herein are for the purpose of description and should not be regarded as limiting. As such, those skilled in the art will appreciate that the conception, upon which this disclosure is based, may readily be utilized as a basis for designing of other structures, methods and systems for carrying out the several purposes of the present design. It is important, therefore, that the claims be regarded as including such equivalent construction insofar as they do not depart from the spirit and scope of the present application.

SUMMARY OF THE INVENTION

[0023] The principal advantage of the Grey Water Processing and Distribution System is to relieve the strain on the environment by reducing the quantity of reusable waste water put into sewer systems.

[0024] Another advantage of the Grey Water Processing and Distribution System is by separating the grey water from the black water and recycling grey water there are huge saving potentials.

[0025] Another advantage with the Grey Water Processing and Distribution System is having a variety of redundant check and anti-siphon valves to protect against the back flow of processed grey water into the local water supply.

[0026] Another advantage of the Grey Water Processing and Distribution System is being able to supply a moderately filtered water for irrigation and a finely filtered and sanitized water for toilet and washing machine usage.

[0027] Another advantage of the Grey Water Processing and Distribution System is there will be a great reduction of fresh water usage.

[0028] Another advantage of the Grey Water Processing and Distribution System is the capability of reducing the flow into individual septic tanks and sewage treatment systems.

[0029] Another advantage of the Grey Water Processing and Distribution System is using the excess processed water for irrigation.

[0030] Another advantage of the Grey Water Processing and Distribution System is returning excess processed water to recharge the underground water table.

[0031] Another advantage of the Grey Water Processing and Distribution System is being able to build in areas where there is an unsuitable environment for conventional sewage treatment facilities.

[0032] Another advantage of the Grey Water Processing and Distribution System is the reduction of chemicals in the overall processes of sewage treatment.

[0033] Yet another advantage of the Grey Water Processing and Distribution System is the filtered water supplied for irrigation will have some nutrients not in the local fresh water supply, and the chlorine content will have been greatly reduced.

[0034] Another advantage of the Grey Water Processing and Distribution System is that grey water will be filtered by soil preventing phosphates and nitrates entering lakes, rivers and oceans, such nutrients promote excessive algal blooms killing fish and altering water habitat by producing anoxic conditions in the water.

[0035] Another advantage of the Grey Water Processing and Distribution System is that the cost of sewage treatment can be significantly reduced per family household per month translating into significant energy savings as well.

[0036] And still another advantage is to create a Grey Water Processing and Distribution System of a manageable size that can be easily incorporated into a single family dwelling.

[0037] Another advantage of the Grey Water Processing and Distribution System is that no un-sanitized water re-enters the home.

[0038] A further advantage is a Grey Water Processing and Distribution System that enables the landscape to flourish where water may not otherwise be available to support desirable plant growth.

[0039] Another advantage of the Grey Water Processing and Distribution System is that reclaiming nutrients helps to maintain the fertility of the soil.

[0040] The Grey Water Processing and Distribution System is a self-contained fully functional grey water collection, processing and dispersing system. The system runs on grey water collected from the house's laundry system, sinks, bathtub/shower drains and rainwater. The system supplies filtered water to the house's landscaping irrigation system as well as filtered and sanitized flush water to the house's toilets and washing machine for usage and requires standard local power. The central digital control unit (DCU) monitors and runs the various system components and manages the house's landscaping irrigation system. The digital control unit DCU also makes sure that the toilets are never without flush water and protects the irrigation system against under and over-watering. The internal and external plumbing also allows for the system to be completely bypassed in the event of power failure or the introduction of undesirable contaminants into the grey water source stream.

[0041] The preferred embodiment of the Grey Water Processing and Distribution System will have sources that include but are not limited to shower/tub drains, laundry washing machine drains and rainwater collection systems. As grey water leaves the house and flows toward the system it passes through the grey water source P-trap. This P-trap provides a vapor seal between the house and the system.

[0042] When conditions arise where the system needs to be bypassed, for instance unwanted contaminants might enter the grey water source stream or the system needs to be serviced, the grey water diverter 3-way valve can be turned so that the grey water source stream is directed to the sewer instead of the system.

[0043] For a variety of its functions the system needs a supply of fresh water. A city water shut-off valve is supplied to isolate the system from the city water supply. A back flow preventer is used to guarantee that the system cannot contaminate the city water supply. In addition to the back flow preventer all system fresh water valves have anti-siphon features.

[0044] The toilet outlet connects to the sewer or septic tank system. The toilet flush water supply line from Grey Water Processing and Distribution System provides the toilet flush water. Depending on the orientation of the toilet flush water 3-way valve, either the system, or the connected city water supplies the toilet flush water. This water can also be provided for the use in the washing machine.

[0045] The irrigation water outlet connects to the house's irrigation system. The irrigation system control valves are also controlled by the system so that they are operated only when a supply of irrigation water is ready to be dispersed.

[0046] The sewer/septic system outlet is arranged so that the surge tank overflow, storage tank overflow and the screen filter sewer outlet all feed this outlet.

[0047] The complete system is composed of three sub-systems and is managed by the digital control unit (DCU). The collection and distribution sub-system collects all incoming water and pumps it through the distribution valve assembly (DVA) to either the irrigation sub-system or the toilet flush water sub-system. The default orientation of the DVA is toward the irrigation sub-system, but the toilet flush water sub-system has priority and the digital control unit (DCU) will reorient the distribution valve assembly (DVA) toward the toilet flush water sub-system whenever it is in need of water.

[0048] The preferred embodiment of the Grey Water Processing and Distribution System will have an automated distribution valve assembly (DVA) that can divert the flow of water from one sub-system to the other, for example an automatically controlled multi-outlet valve. An alternate embodiment of the Grey Water Processing and Distribution System will have a pair of solenoid valves that can divert the flow of water from one sub-system to the other.

[0049] With the collection and distribution sub-system the grey water enters the system and flows through a unique self-cleaning fine screen filter. This filter separates out particles, lint and other contaminants that could clog other system components. After it passes through this filter, the water falls into the primary collection tank (surge tank). The surge tank is equipped with a vent to prevent any accumulation of gases. The surge tank is also equipped with an overflow port in case the quantity of water in the tank becomes too great. When the level of the incoming water reaches the surge tank's start level sensor, the digital control unit (DCU) waits a predetermined amount of time, checks for system halts or error codes and then, if the system is clear, turns on the distribution pump (sump pump).

[0050] After it turns on the sump pump, the digital control unit (DCU) waits a predetermined amount of time and then checks the status of the distribution pump flow sensor. If the digital control unit (DCU) detects the flow of pumped water, it allows the sump pump to continue to run. If the digital control unit (DCU) does not detect any flow the sump pump is turned off and an error code is set. This error code also

disables the high-flow fresh water valve. This procedure is put in place as a safety feature to help protect system components, for instance, to protect the pump seals from running dry.

[0051] When the water level falls to the surge tank's low level sensor, the digital control unit (DCU) initiates the back-flush sequence for the self-cleaning fine screen filter. This sequence consists of first opening the high pressure fresh water valve for a predetermined amount of time allowing high-pressure fresh water to spray into and wash down the inside of the filter housing. Next the digital control unit (DCU) opens the back-flush valve for a predetermined amount of time allowing the water being pumped from the sump pump to back-flush the filter's screen. Finally the high pressure fresh water valve is opened again for a predetermined amount of time. The water introduced to the filter in this sequence acts to not only back-flush the filter's screen but to also mobilize any particles caught by the filter and carry them off to the filter's sewer outlet. Once the back-flush sequence for self-cleaning the fine screen filter is complete, the digital control unit (DCU) waits a predetermined amount of time and then stops the sump pump.

[0052] In the toilet flush water sub-system, when the water level in the toilet flush water storage tank falls to the storage tank's fill level sensor, the digital control unit (DCU) goes into storage tank fill mode and orients the distribution valve assembly (DVA) to the storage tank position. When the system receives a supply of grey water and the digital control unit (DCU) turns on the sump pump, the pumped water flows through a fine filter and then through an automatic sanitizer on its way to the storage tank. Once the volume of filtered and sanitized water reaches the storage tank's full level sensor, the digital control unit (DCU) switches to irrigation mode and reorients the distribution valve assembly (DVA) to the irrigation position. Like the surge tank, the storage tank has both a vent and an overflow port.

[0053] When the water in the storage tank drops to its low level sensor, and no grey water is available, the DCU goes into storage tank low mode. The digital control unit (DCU) first sets a system halt that prohibits the toilet flush water pressure pump (pressure pump) from being activated. This halt helps protect the pressure pump from losing its prime. Next the digital control unit (DCU) checks for other system halts or error codes and then, if the system is clear, opens the high-flow fresh water valve. The fresh water flows through a spray nozzle and washes down the inside of the surge tank as the tank is being filled. The fresh water is then treated like grey water and pumped through the various system components to the storage tank. Once the water level rises above the low level sensor, the digital control unit (DCU) releases the pressure pump system halt, either waits a predetermined amount of time, or waits until the water level rises to the fill level sensor, and then closes the high flow fresh water valve. When the water level then rises to the fill level sensor the high-flow fresh water valve is closed.

[0054] The toilet flush water supply line is the section of the toilet flush water sub-system plumbing between the toilet flush water one-way check valve and the toilet tank fill valve (s). At equilibrium, the toilet flush water 3-way valve is set so that the system supplies the toilet flush water with the supply line pressurized to approximately 50 psi. After one of the house's toilets is flushed, the toilet tank fill valve opens and the toilet flush water supply line accumulator immediately starts to supply the toilet tank with water. As it supplies water the accumulator, as well as the rest of the supply line, depressurizes. Once the pressure in the supply line falls to a predefined level, the toilet flush water supply line pressure sensor alerts the digital control unit DCU. After it is alerted the digital control unit (DCU) checks for system halts and error codes and then, if the system is clear, turns on the toilet flush water pressure pump. Once activated the pressure pump draws the filtered and sanitized water up from the storage tank, first through the one-way foot valve and then through the fine suction filter and finally through the toilet flush water one-way check valve. This water is pumped into the supply line. As the accumulator is filled, the supply line is pressurized. The accumulator allows the pressure pump to operate at peak capacity, thus minimizing the pump's runtime. Once the toilet is filled and the supply line reaches the correct pressure the pressure pump is turned off.

[0055] When conditions arise where the system cannot supply toilet flush water, for example the system is without power or a supply of water, the toilet flush water 3-way valve can be turned so that city water becomes the source of the toilet flush water. The toilet flush water one-way check valve is placed so that the higher pressures of the city water cannot harm any of the system components. This protects the integrity of the home sanitary sewage system.

[0056] In order to prevent stagnation of the filtered and sterilized toilet flush water, a supplemental sanitizing loop is provided. At a variable interval, based on the needs of the system, the digital control unit (DCU) will open the supplemental sanitizing loop valve for a predefined duration. When this valve opens, water from the supply line is able to flow through the supplemental sanitizing loop one-way check valve, fine filter, the automatic sanitizer and then back to the storage tank, thus creating a flow in the supply line. When the pressure in the supply line drops to the predefined level the pressure sensor alerts the DCU and then, if able, the digital control unit (DCU) turns on the pressure pump. Just as when a toilet is being filled, the pressure pump will run as long as the supply line is below full pressure of approximately 50 psi. When the supplemental sanitizing loop valve is closed, the supply line no longer has any flow and is able to be pressurized back to equilibrium. When the supplemental sanitizing loop valve is open the toilet flush water one-way check valve prevents the rest of the supply line from depressurizing. One-way check valves or diverted valves in the DVA prevent the supplemental sanitizing loop water from being pumped back through the distribution valve assembly (DVA).

[0057] When the system is not in storage tank fill mode it is in irrigation mode and the automatically controlled multi-port distribution valve assembly (DVA) is oriented toward the irrigation sub-system. Since the digital control unit (DCU) will control the irrigation system control valves, the irrigation cycle is able to consist of any possible combination or sequence of the attached valves run for any duration as defined by the end-user. When the system receives a supply of grey water the digital control unit (DCU) if able, turns on the sump pump and then initiates the irrigation cycle. Once the current supply of grey water is exhausted the digital control unit (DCU) halts the irrigation cycle. When additional grey water enters the system the digital control unit (DCU) will pick up the irrigation cycle where it left off, thereby always uniformly irrigating the landscaping. If the system happened to be in the middle of the irrigation cycle when the level in the storage tank falls to its low level sensor the digital control unit (DCU) halts the irrigation cycle and switches to storage tank fill mode. Once the storage tank fill cycle is completed the

digital control unit (DCU) switches back to irrigation mode and resumes the irrigation cycle. The irrigation sub-system one-way check valve ensures that no water from the irrigation sub-system can siphon back to the automatically controlled multi-port distribution valve assembly (DVA). An optional booster pump can be added to the system when additional water pressure is needed for irrigation, for example a hilly yard.

[0058] In order to protect the house's yard from under-watering an end-user configurable timer is provided. If the system goes without irrigating the landscaping for longer than allowed by the timer, the digital control unit (DCU) will open the high-flow city water valve and flow enough water to finish running one complete irrigation cycle.

[0059] In order to protect the house's yard from over-watering the digital control unit (DCU) has an end-user configurable sub-routine that limits the number of irrigation cycles in a set time period. Once the final irrigation cycle has been completed for the set time period the digital control unit (DCU) stops the sump pump and then waits the prescribed amount of time. If in the meantime more grey water enters the system it is simply held in the surge tank. Excess grey water simply spills through the surge tank's overflow port. In the event the grey water is stored for longer that a pre-determined amount of time, it is pumped to the sewer in order to prevent the stored grey water from becoming septic. While the irrigation sub-system is waiting to return to normal service, the toilet flush water sub-system continues to function normally.

[0060] With respect to the above description then, it is to be realized that the optimum dimensional relationships for the parts of this application, to include variations in size, materials, shape, form, function and manner of operation, assembly and use, are deemed readily apparent and obvious to one skilled in the art. All equivalent relationships to those illustrated in the drawings and described in the specification intend to be encompassed by the present disclosure. Therefore, the foregoing is considered as illustrative only of the principles of the Grey Water Processing and Distribution System. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the design to the exact construction and operation shown and described, and accordingly, all suitable modifications and equivalents may be resorted to, falling within the scope of this application. For a better understanding of the Grey Water Processing and Distribution System, its operating advantages and the specific objects attained by its uses, reference should be made to the accompanying drawings and descriptive matter in which there are illustrated preferred embodiments of the Grey Water Processing and Distribution System.

BRIEF DESCRIPTION OF THE DRAWINGS

[0061] The accompanying drawings, which are incorporated in and form a part of this specification, illustrate embodiments of the Grey Water Processing and Distribution System and together with the description, serve to explain the principles of this application.

[0062] FIG. **1** depicts a block diagram of the major components of the preferred embodiment of the Grey Water Processing and Distribution System.

[0063] FIG. **2** depicts a block diagram of the major components of the alternate embodiment of the Grey Water Processing and Distribution System.

[0064] FIG. **3** depicts a flow chart of the preferred embodiment Grey Water Processing and Distribution System.

[0065] FIG. **4** depicts a diagram of the digital control unit.

[0066] FIG. **5** depicts a flow chart of the alternate embodiment Grey Water Processing and Distribution System.

[0067] FIG. **6** depicts a diagram of the digital control unit.

[0068] FIG. **7** depicts a perspective view of the unique self-cleaning fine screen filter.

[0069] FIG. **8** depicts a cross section of the unique self-cleaning fine screen filter with the high pressure fresh water spraying the upper surface of the fine screen filter.

[0070] FIG. **9** depicts a cross section of the unique self-cleaning fine screen filter with the back-flush procedure where the lower surface is sprayed with processed water from the sump pump.

[0071] FIG. **10** depicts the fine screen filter block diagram self-cleaning process.

[0072] FIG. **11** depicts a perspective view of the cabinet housing the Grey Water Processing and Distribution System.

[0073] FIG. **12** depicts a front view of the cabinet housing the Grey Water Processing and Distribution System.

[0074] For a fuller understanding of the nature and advantages of the Grey Water Processing and Distribution System, reference should be had to the following detailed description taken in conjunction with the accompanying drawings which are incorporated in and form a part of this specification, illustrate embodiments of the design and together with the description, serve to explain the principles of this application.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0075] Referring now to the drawings, wherein similar parts of the Grey Water Processing and Distribution System **10**A and **10**B are identified by like reference numerals, there is seen in FIG. **1** a block diagram of the major components of the preferred embodiment of the Grey Water Processing and Distribution System **10**A where the rainwater **12** and grey water **14** are directed through the self-cleaning fine screen sediment filter **16** along with the city water **18** to the surge tank **20**. Exiting the surge tank **20** the water is pressurized by the means of the distribution pump **22** and directed to the filter back-flush water valve **24** back through the self-cleaning fine screen sediment filter **16** to the surge tank **20** or by the means of the automatically controlled multi-port distribution valve assembly (DVA) **26** to either the irrigation sub-system **28** or on through the fine filter **30** and the automatic sanitizer **32** into the toilet flush water storage tank **34**. The toilet flush water pressure pump **36** then draws the water through the fine suction filter **38** from the toilet flush water storage tank **34** and directs it into the toilet flush water supply line accumulator **40**. The supplemental sanitizing loop solenoid valve **42** redirects the toilet flush water back through the fine filter **30** and the automatic sanitizer **32** into the toilet flush water storage tank **34** for the supplemental sanitizing loop. The 3-way valve **44** receives water from the accumulator **40** or from the city water **18** where it is then directed to the toilet **46**. The high pressure city water solenoid valve **51** supplies city water **18** to the fine screen sediment filter **16**, and the high flow solenoid valve **52** supplies city water **18** to the surge tank **20**.

[0076] FIG. **2** depicts a block diagram of the major components of the alternate embodiment of the Grey Water Processing and Distribution System **10**B except that the automatically controlled multi-port distribution valve assembly (DVA) **26** is replaced by multiple solenoid valves where sole-

noid valve **48** directs the flow of water to the fine filter **30** and the solenoid valve **50** directs the flow of water to the irrigation sub-system **28**.

[0077] FIG. **3** depicts a flow chart of the preferred embodiment Grey Water Processing and Distribution System **10**A that will have an automatically controlled multi-port distribution valve assembly (DVA) **26** that can divert the flow of water from one sub-system to the other. As the grey water enters the collection and distribution sub-system **62** it first flows through a grey water diverter 3-way valve **63** where it can be directed to overflow port **66***a* to sewer or to the self-cleaning fine screen sediment filter **16**, through the grey source P-trap **65**. The self-cleaning fine screen sediment filter **16** separates out particles like lint and other contaminants that could clog other system components. After it passes through the self-cleaning fine screen sediment filter **16**, the water falls into the primary collection tank (surge tank) **20**. The surge tank **20** is equipped with a vent **64***a* to prevent any accumulation of gases. The surge tank **20** is also equipped with an overflow port **66***b* to sewer in case the quantity of water in the tank becomes too great. When the level of the incoming water reaches the surge tank's start level sensor **68** the digital control unit (DCU) **70** waits a predetermined amount of time, checks for system halts or error codes and then, if the system is clear, turns on the distribution sump pump **72**.

[0078] After digital control unit (DCU) **70** turns on the distribution sump pump **72** the digital control unit (DCU) **70** waits a predetermined amount of time and then checks the status of the distribution pump flow sensor **73**. If the digital control unit (DCU) **70** detects the flow of pumped water, it allows the distribution sump pump **72** to continue to run. If digital control unit (DCU) **70** does not detect any flow the distribution sump pump **72** is turned off and an error code is set. This error code also disables the high-flow fresh water valve **74**.

[0079] When the water level falls to the surge tanks low level sensor **76** the digital control unit (DCU) **70** initiates the back flush sequence for the self-cleaning fine screen filter **16**. This sequence consists of first opening the high pressure fresh water valve **24** for a predetermined amount of time allowing high-pressure fresh water to spray into and wash down the inside of the fine screen sediment filter **16** housing. Next, the digital control unit (DCU) **70** opens the back-flush valve **80** for a predetermined amount of time allowing the water being pumped from the sump pump **72** to back-flush the filter screen **82** (see FIG. **7-9** for greater detail on the filter screen **82**). Finally, the high-pressure fresh water valve **24** is opened again for a predetermined amount of time. The water introduced to the fine screen sediment filter **16** in this sequence acts to not only back-flush the fine screen sediment filter **16** but to also mobilize any particles caught by the filter screen **82** and carry them off to the filter sewer overflow port **66***c*. Once the back-flush sequence for self-cleaning fine screen sediment filter **16** is complete the digital control unit (DCU) **70** waits a predetermined amount of time and then stops the sump pump **72**. When the sump pump **72** is turned off, the vacuum break **75** enables the pumped water column to drain back to the surge tank **20**.

[0080] Within toilet flush water sub-system **90**, when the water level in the toilet flush water storage tank **92** falls to the storage tank's fill level sensor **94** the digital control unit (DCU) **70** goes into storage tank fill mode and orients the automatically controlled multi-port distribution valve assembly (DVA) **26** to the toilet flush water storage tank **92** position. When the system receives a supply of grey water and the digital control unit (DCU) **70** turns on the sump pump **72**, the pumped water flows through a fine filter **30**, and then through an automatic sanitizer **98** on its way to the toilet flush water storage tank **92**. Once the volume of filtered and sanitized, water reaches the storage tank's full level sensor **110**, the digital control unit (DCU) **70** switches to irrigation mode and reorients the automatically controlled multi-port distribution valve assembly (DVA) **26** to the irrigation position. Like the surge tank **20**, the storage tank **92** has both a tank vent **64***b* and overflow port **66***d* to sewer.

[0081] When the water in the storage tank **92** drops to its low level sensor **100** and there is no water in the surge tank **20** as detected by low level sensor **76**, the digital control unit (DCU) **70** goes into storage tank low mode. The digital control unit (DCU) **70** first sets a system halt that prohibits the toilet flush water pressure pump **104** from being activated. This halt helps protect the toilet flush water pressure pump **104** from losing its prime and running dry. Next the digital control unit (DCU) **70** checks for other system halts or error codes and then, if the system is clear, opens the high-flow fresh water valve **74**. The fresh water flows through spray nozzle **109** and washes down the inside of the surge tank **20** as the tank is being filled. The fresh water is then treated like grey water and pumped through the various system components to the toilet flush water storage tank **92**. Once the water level rises above the low level sensor **100** the digital control unit (DCU) **70** releases the pressure pump system halt and either waits a predetermined amount of time or waits for the water level to raise above the fill level sensor **94** and then closes the high-flow fresh water valve **74**.

[0082] The toilet flush water supply line **112***a* and **112***b* is the section of the toilet flush water sub-system **90** plumbing between the toilet flush water one-way check valve **114** and the toilet tank fill valve **116**. At equilibrium, the toilet flush water 3-way valve **118** is set so that the system supplies the toilet flush water and the toilet flush water supply line **112***a* and **112***b* is pressurized to approximately 50 psi. After one of the house's toilets **46** is flushed, the toilet tank fill valve **116** opens and the toilet flush water supply line accumulator **120** immediately starts to supply the toilet tank with water. As it supplies water the accumulator **120**, as well as the rest of the toilet flush water supply line **112***a* and **112***b* depressurizes. Once the pressure in the toilet flush water supply line **112***a* and **112***b* falls to a predefined level the toilet flush water supply line pressure sensor **122** alerts the digital control unit (DCU) **70**. After it is alerted the digital control unit (DCU) **70** checks for system halts and error codes and then, if the system is clear, turns on the toilet flush water pressure pump **104**. Once activated the toilet flush water pressure pump **104** draws the filtered and sanitized water up from the storage tank **92** first through the One-way foot valve **124** and then through the fine suction filter **126** and finally through the toilet flush water one-way check valve **114**. This water is pumped into the toilet flush water supply line **112***a* and **112***b*. As the accumulator **120** is filled, the toilet flush water supply line **112***a* and **112***b* is pressurized. The accumulator **120** allows the toilet flush water pressure pump **104** to operate at peak capacity, thus minimizing the pump's runtime. Once the toilet **46** is filled and the toilet flush water supply line **112***a* and **112***b* reaches the correct pressure the toilet flush water pressure pump **104** is turned off.

[0083] When conditions arise where the system cannot supply toilet flush water, for example the system is without

power, the toilet flush water 3-way valve **118** can be turned so that city water **128** passes through the back-flow preventer **129** and the city water shutoff valve **127** and becomes the source of the toilet flush water. The toilet flush water one-way check valve **132** is placed so that the higher pressures of the city water **128** cannot harm any of the system components.

[0084] In order to prevent stagnation of and the possible growth of microbiological pathogens in the filtered and sterilized toilet flush water, a supplemental sanitizing loop is provided whereas at variable intervals, based on the needs of the system, the digital control unit (DCU) **70** will open the supplemental sanitizing loop valve **130** for a predefined duration. When this valve opens, water from the toilet flush water supply line **112***a* is able to flow through the supplemental sanitizing loop one-way check valve **131**, fine filter **30**, the automatic sanitizer **98** and then back to the flush water storage tank **92**, thus creating flow in the toilet flush water supply line **112***a*. When the pressure in the toilet flush water supply line **112***a* drops to the predefined level the toilet flush water supply line pressure sensor **122** alerts the digital control unit (DCU) **70** and then, if able, the digital control unit (DCU) **70** turns on the toilet flush water pressure pump **104**. Just as when toilet **46** is being filled, the toilet flush water pressure pump **104** will run as long as the toilet flush water supply line **112***a* is below full pressure of approximately 50 psi. When the supplemental sanitizing loop valve **130** is closed the flush water supply line **112***a* no longer has any flow and is able to be pressurized back to equilibrium. When the supplemental sanitizing loop valve **130** is open the toilet flush water one-way check valve **132** prevents the rest of the flush water supply line **112***b* from depressurizing. Diverted valves in the automatically controlled multi-port distribution valve assembly (DVA) **26** prevent the supplemental sanitizing loop water from being pumped back through the automatically controlled multi-port distribution valve assembly (DVA) **26**.

[0085] When the system is not in storage tank fill mode it is in irrigation mode and the automatically controlled multi-port distribution valve assembly (DVA) **26** is oriented toward the irrigation sub-system **28**. Since the digital control unit (DCU) **70** will control the irrigation system control valves **140**, the irrigation cycle is able to consist of any possible combination or sequence of the attached valves run for any duration as defined by the end-user. When the system receives a supply of grey water the digital control unit (DCU) **70** if able, turns on the sump pump **72** and then initiates the irrigation cycle. Once the current supply of grey water is exhausted the digital control unit (DCU) **70** halts the irrigation cycle. When additional grey water enters the system the digital control unit (DCU) **70** will pick up the irrigation cycle where it left off, thereby always uniformly irrigating the landscaping. If the system happened to be in the middle of the irrigation cycle when the level in the storage tank **92** falls to its low level sensor **100** the digital control unit (DCU) **70** halts the irrigation cycle and switches to storage tank fill mode. Once the storage tank fill cycle is completed the digital control unit (DCU) **70** switches back to irrigation mode and resumes the irrigation cycle. One-way check valve **139** ensures that no water from the irrigation sub-system **28** can siphon back to the automatically controlled multi-port distribution valve assembly (DVA) **26**. Optional booster pump **142** can be added to the system when additional water pressure is needed for irrigation, for example a sloped or hilly yard.

[0086] In order to protect the house's yard from under-watering an end-user configurable timer is provided. If the system goes without irrigating the landscaping for longer than allowed by the timer, the digital control unit (DCU) **70** will open the high-flow fresh water valve **74** and flow enough water to finish running one complete irrigation cycle.

[0087] In order to protect the house's yard from over-watering the digital control unit (DCU) **70** has an end-user configurable sub-routine that limits the number of irrigation cycles in a set time period. Once the final irrigation cycle has been completed for the set time period the digital control unit (DCU) **70** stops the sump pump **72** and then waits the prescribed amount of time. If in the meantime more grey water enters the system, it is simply held in the surge tank **20**. Excess grey water spills through the surge tank's overflow port **66***b*. In the event the grey water is stored for longer that a predetermined amount of time, it is pumped to the sewer in order to prevent the stored grey water from becoming septic. While the irrigation sub-system is waiting to return to normal service the toilet flush water sub-system **90** continues to function normally.

[0088] FIG. **4** depicts a diagram of the digital control unit (DCU) **70**. The DCU **70** has input sensors to detect water levels, water flow, water pressure and control outputs to control pumps and valves. The irrigation sub-system is controlled by the DCU **70**, which is programmable to irrigate a yard and protect from over and under-watering of yard landscaping.

[0089] FIG. **5** depicts a flow chart of the Grey Water Processing and Distribution System **10**B with the same major components as the preferred embodiment of the Grey Water Processing and Distribution System **10**A except that the automatically controlled multi-port distribution valve assembly (DVA) **26** is replaced by solenoid valves **48** and **50** where solenoid valve **48** directs the flow of water to the fine filter **30** and the solenoid valve **50** directs the flow of water to the irrigation system **28**. One-way check valve **115** prevents the supplemental sanitizing loop water from being pumped back through solenoid valve **48**.

[0090] FIG. **6** depicts a diagram of the digital control unit (DCU) **70**. The toilet flush water sub-system is controlled by the DCU **70**, which monitors the quantity of available toilet flush water, calls for gray water when the level is low, fills the tank with a supply of fresh water when the level is critically low and disables the flush water pressure pump when necessary. That is, when the tank level is detected as critically low, the DCU **70** disables the flush water pressure pump when it is determined that such disablement is necessary, and also sends an alarm to indicate this disablement. Based on the inputs from its various sensors, the DCU **70** adjusts the functionality of the system to protect components from harm.

[0091] FIG. **7** depicts a perspective view of the unique self-cleaning fine screen sediment filter **16** with the high pressure fresh water line **146** coming in from above the grey water input line **148** that is going into the top of the filter housing **150**. The grey water back-flush lines **158** come in from the side of the filter housing **150**. The primary purpose of the filter lid **151** is to help prevent unwanted contaminants from falling into the filter housing **150**. The filter lid **151** also acts as a barrier that helps keep water spray inside the filter housing **150** and helps trap humidity. Keeping the inside of the filter housing **150** humid helps keep any trapped particles moist, which aides in the back-flush process.

[0092] FIG. **8** depicts a cross section of the unique self-cleaning fine screen filter sediment filter **16** with the high pressure fresh water spraying the upper surface of the filter

screen **82** through the spray nozzles **108** and the debris is directed over a ramp **152** and down through the overflow port **66***c* to the sewer.

[0093] FIG. **9** depicts a cross section of the unique self-cleaning fine screen sediment filter **16** with the back flush procedure activated where the lower surface of the filter screen **82** is sprayed with processed grey water through the grey water back flush valve **24** and out the back flush spray lines **158** from the distribution sump pump **72**.

[0094] FIG. **10** depicts the fine screen filter block diagram **154** self-cleaning process.

[0095] FIG. **11** depicts a perspective view of the cabinet housing the Grey Water Processing and Distribution Systems **10**A and **10**B cabinet **156** exposing the relative locations of the self-cleaning fine screen sediment filter **16**, the surge tank **20**, the storage tank **92**, the fine filter **30**, the accumulator **40**, the digital control unit (DCU) **70**, the toilet flush water pressure pump **104**, and the fine suction filter **126**. It must be understood at this time that a variety of cabinet configurations will be used on the Grey Water Processing and Distribution System **10**A and **10**B and thus will be covered within the scope of this application.

[0096] FIG. **12** depicts a front view of the cabinet housing the Grey Water Processing and Distribution System **10**A and **10**B cabinet **156** exposing the relative locations of the self-cleaning fine screen sediment filter **16**, the surge tank **20**, the storage tank **92**, the fine filter **30**, the accumulator **40**, the digital control unit (DCU) **70**, the toilet flush water pressure pump **104**, and the fine suction filter **126**.

[0097] To summarize, the unique features of the Grey Water Processing and Distribution System **10**A and **10**B shown in the drawings and described in detail herein include the following advantages and novel elements not found in the prior art:

[0098] A. an integrated self-cleaning fine screen filter ahead of a surge tank for the temporary storage of the collected gray water and rainwater;

[0099] B. the ability to simultaneously clean and fill the surge tank with fresh water;

[0100] C. a DCU with input sensors to detect water levels, water flow, water pressure and control outputs to control pumps and valves;

[0101] D. an irrigation sub-system, controlled by the DCU, which is programmable to irrigate a yard of one or more zones, and protect from over and under-watering of landscaping;

[0102] E. a toilet flush water sub-system, controlled by the DCU, which monitors the quantity of available toilet flush water, calls for gray water when the level is low, fills the tank with a supply of fresh water when the level is really low and disables the flush water pressure pump when necessary;

[0103] F. based on the inputs from its various sensors, the DCU adjusts the functionality of the system to protect components from harm;

[0104] G. the system contains a multi-part filtration system that reduces contaminants and protects system components;

[0105] H. an integrated toilet flush water supplemental sanitizing loop;

[0106] I. an integrated tank venting and overflow system;

[0107] J. a toilet flush water 3-way valve to switch between the system and city water to prevent the sanitary function of the toilet from being lost by the user;

[0108] K. the highly integrated self-contained system can be used indoors and outdoors;

[0109] L. the system is capable of moving gray water quickly and therefore does not require a bio-digester or settling tank;

[0110] M. in stand-by mode, system is left clean by self-cleaning features; and

[0111] N. the system preserves the nutrients found in gray water for use in landscaping.

[0112] The Grey Water Processing and Distribution System **10**A and **10**B shown in the drawings and described in detail herein disclose arrangements of elements of particular construction and configuration for illustrating preferred embodiments of structure and method of operation of the present application. It is to be understood, however, that elements of different construction and configuration and other arrangements thereof, other than those illustrated and described may be employed for providing a Grey Water Processing and Distribution System **10**A and **10**B in accordance with the spirit of this disclosure, and such changes, alternations and modifications as would occur to those skilled in the art are considered to be within the scope of this design as broadly defined in the appended claims.

[0113] Further, the purpose of the foregoing abstract is to enable the U.S. Patent and Trademark Office and the public generally, and especially the scientists, engineers and practitioners in the art who are not familiar with patent or legal terms or phraseology, to determine quickly from a cursory inspection the nature and essence of the technical disclosure of the application. The abstract is neither intended to define the invention of the application, which is measured by the claims, nor is it intended to be limiting as to the scope of the invention in any way.

We claim:

1. A grey water processing and distribution system comprising:

(a) a grey water and rainwater source collection sub-system;

(b) a digital control unit having input sensors to detect water levels, water flow, water pressure and having control outputs to control integrated pumps and valves;

(c) an automatically controlled multi-port valve;

(d) an irrigation sub-system; and

(e) a toilet flush water sub-system;

whereby said digital control unit directs said automatically controlled multi-port valve to send filtered grey water to said irrigation sub-system and to send grey water to said toilet flush water sub-system.

2. The grey water processing and distribution system, according to claim **1**, further including a self-cleaning fine screen filter ahead of a surge tank for temporary storage of the collected grey water and rainwater.

3. The grey water processing and distribution system, according to claim **2**, wherein said surge tank is capable of simultaneous cleaning and filling with fresh water.

4. The grey water processing and distribution system, according to claim **1**, wherein said irrigation sub-system is controlled by said digital control unit and further wherein said digital control unit is programmable to irrigate a yard having one or more irrigation zones, and protect against over and under-watering of said yard.

5. The grey water processing and distribution system, according to claim **1**, wherein said toilet flush water sub-system is controlled by said digital control unit which moni-

tors the quantity of available toilet flush water, calls for gray water when the level is low, fills the tank with a supply of fresh water when the level is detected as critically low, and disables the flush water pressure pump when it is determined that such disablement is necessary, sending an alarm to indicate this disablement.

6. The grey water processing and distribution system, according to claim **1**, wherein said system comprises an integrated stand-alone compact appliance-sized cabinet capable of being installed indoors and outdoors.

7. The grey water processing and distribution system, according to claim **1**, wherein said digital control unit is programmable to adjust the functionality of each of the sub-systems, to protect sub-system components from harm, and further wherein when the system is in stand-by mode the system is left clean throughout by the action of self-cleaning.

8. The grey water processing and distribution system, according to claim **1**, wherein said system further includes a multi-part filtration system which acts to reduce contaminants and protects said system components, is capable of moving grey water rapidly and does not require a bio-digester or settling tank component, thereby preserving the nutrients found in grey water for use in irrigating landscaping.

9. The grey water processing and distribution system, according to claim **1**, wherein said toilet flush water sub-system includes a grey water sanitizer.

10. The grey water processing and distribution system, according to claim **9**, wherein said grey water sanitizer includes an integrated toilet flush water supplemental sanitizing loop.

11. The grey water processing and distribution system, according to claim **1**, further having an integrated tank venting and overflow mechanism.

12. The grey water processing and distribution system, according to claim **1**, wherein said toilet flush water sub-system includes a 3-way valve enabling a user to switch between sourcing grey water from the system and sourcing city utility water, thereby preventing the sanitary function of the toilet from being lost to the user.

13. A method for making a grey water processing and distribution system comprising the steps of:

(a) providing a grey water and rainwater source collection sub-system;

(b) providing a digital control unit having input sensors to detect water levels, water flow, water pressure and having control outputs to control integrated pumps and valves;

(c) providing an automatically controlled multi-port valve;

(d) providing an irrigation sub-system; and

(e) providing a toilet flush water sub-system;

whereby said digital control unit directs said automatically controlled multi-port valve to send filtered grey water to said irrigation sub-system and to send grey water to said toilet flush water sub-system.

14. The method for making a grey water processing and distribution system, according to claim **13**, further including a self-cleaning fine screen filter ahead of a surge tank for temporary storage of the collected grey water and rainwater.

15. The method for making a grey water processing and distribution system, according to claim **14**, wherein said surge tank is capable of simultaneous cleaning and filling with fresh water.

16. The method for making a grey water processing and distribution system, according to claim **13**, wherein said irrigation sub-system is controlled by said digital control unit and further wherein said digital control unit is programmable to irrigate a yard having one or more irrigation zones, and protect against over and under-watering of said yard.

17. The method for making a grey water processing and distribution system, according to claim **13**, wherein said toilet flush water sub-system is controlled by said digital control unit which monitors the quantity of available toilet flush water, calls for gray water when the level is low, fills the tank with a supply of fresh water when the level is detected as critically low, and disables the flush water pressure pump when it is determined that such disablement is necessary, sending an alarm to indicate this disablement.

18. The method for making a grey water processing and distribution system, according to claim **13**, wherein said system comprises an integrated stand-alone compact appliance-sized cabinet capable of being installed indoors and outdoors.

19. The method for making a grey water processing and distribution system, according to claim **13**, wherein said digital control unit is programmable to adjust the functionality of each of the sub-systems, to protect sub-system components from harm, and further wherein when the system is in stand-by mode the system is left clean throughout by the action of self-cleaning.

20. The method for making a grey water processing and distribution system, according to claim **13**, wherein said system further includes a multi-part filtration system which acts to reduce contaminants and protects said system components, is capable of moving grey water rapidly and does not require a bio-digester or settling tank component, thereby preserving the nutrients found in grey water for use in irrigating landscaping.

21. The method for making a grey water processing and distribution system, according to claim **13**, wherein said toilet flush water sub-system includes a grey water sanitizer.

22. The method for making a grey water processing and distribution system, according to claim **21**, wherein said grey water sanitizer includes an integrated toilet flush water supplemental sanitizing loop.

23. The method for making a grey water processing and distribution system, according to claim **13**, further having an integrated tank venting and overflow mechanism.

24. The method for making a grey water processing and distribution system, according to claim **13**, wherein said toilet flush water sub-system includes a 3-way valve enabling a user to switch between sourcing grey water from the system and sourcing city utility water, thereby preventing the sanitary function of the toilet from being lost to the user.

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